

WORKSHOP MANUAL

DAIHATSU

TYPE CB-20 ENGINE

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DAIHATSU MOTOR CO., LTD. DAIHATSU MOTOR SALES CO., LTD.

NO. CBE-7807-1

WORKSHOP MANUAL

DAIHATSU

TYPE CB-20 ENGINE

FOREWORD

This workshop manual contains essential information regarding the construction, operation, adjustment procedures and servicing methods of the engine of the DAIHATSU CHARADE.

The DAIHATSU CHARADE has superior running performance and driveability. And it features unmatched fuel economy and further improved safety. However, in order to always make the most of these originally-designed quality features, it is mandatory to carry out proper service on each unit.

This workshop manual explains such vital servicing methods in a manner readily understandable to every technician. We hope that this workshop manual is consulted to the fullest extent in order that quality servicing may be assured at all times.

The descriptions and specifications in this workshop manual were based on the CHARADE engine being produced as of March, 1978. We reserve the right to change the descriptions and specifications because of continuing improvements, without advance notice and without incurring any obligation.

Published in July, 1978

DAIHATSU MOTOR SALES CO., LTD.

WORKSHOP MANUAL

DAIHATSU

TYPE 2

ENGINE

FOREWORD

The workshop manual contains information on the maintenance and repair of the engine and its components. It is intended for use by mechanics and technicians who are responsible for the maintenance and repair of the engine. The manual is divided into two main sections: the first section contains information on the general maintenance and repair of the engine, and the second section contains information on the specific maintenance and repair of the engine components. The manual is written in a clear and concise manner, and it includes many diagrams and photographs to help the reader understand the various parts and procedures. The manual is a valuable resource for anyone who is responsible for the maintenance and repair of the engine.

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DAIHATSU

TYPE CB-20 ENGINE

1

SECTION 1 GENERAL INFORMATION

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GENERAL INFORMATION

LOCATION OF STAMPED ENGINE TYPE (EMBOSSSED LETTERS)

The engine type is stamped on the cylinder block at its upper rear part.

LOCATION OF STAMPED ENGINE SERIAL NUMBER

Each engine serial number is stamped on the cylinder head at its upper edge.

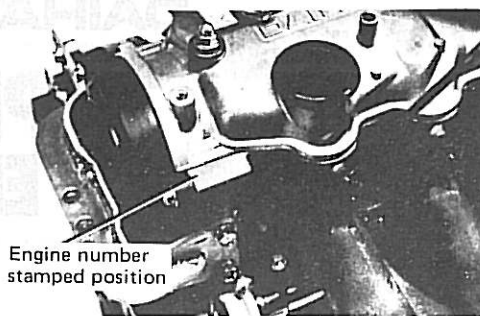


Fig. 1-1 Location of Stamped Engine Serial Number

ABBREVIATION CODES

The abbreviation codes that appear in this workshop manual stand for the following, respectively.

Abbreviation code	Original word	Meaning
RH	Right Hand	Refers to right side.
LH	Left Hand	Refers to left side.
FR	Front	Refers to front side.
RR	Rear	Refers to rear side.
STD.	Standard	When referring to automotive parts, "standard" represents those parts which have been installed originally by the manufacturer and which have standard dimensions.
O/S	Over size	In instances where fitting becomes too loose due to wear resulting from use for a long period of time or due to frequent removal/installation operations, if fitting part (e.g. piston) is replaced with a part having larger dimensions, the other mating part may be put into use again. "Over sized" parts denote those parts having larger dimensions compared standard parts.
U/S	Under size	In the same manner as with the "oversized" parts, if fitting part (e.g. bush and bearing) is replaced with a part having smaller bore dimensions, the other mating part may be put into use again. "Under sized" part denote those parts having smaller dimensions compared with standard parts.
ATDC	After Top Dead Center	Refers to position of piston in cylinder where piston is near but has passed over the top of the stroke.
BTDC	Before Top Dead Center	Refers to position of piston in cylinder where piston is near but has not reached the top of the stroke.
IN	Intake	Refers to intake system.
EX	Exhaust	Refers to exhaust system.
PR	Pry Rating	Represents strength of tires. The larger the pry rating number, the stronger the tire strength.
SAE	Society of Automotive Engineers	For example, automotive oils are designated as SAE so and so number. These designation numbers have been set forth by the Society of Automotive Engineers in the United States of America (SAE). The larger the SAE number, the higher the oil viscosity. Conversely, the smaller the SAE number, the lower the oil viscosity.
API	American Petroleum Institute	The standards set forth by the American Petroleum Institute (abbreviated as API Classification) have been employed to evaluate and classify properties of various oils. Engine oils for gasoline engines are classified as SD, SE and so on, whereas engine oils for diesel engines are classified as CC, CD and so on.
SST	Special Service Tool	Refers to a tool designed for a specific purpose.
T	Torque	Refers to tightening torque.
S/A	Sub-assembly	Refers to a component comprising more than two single parts which are welded, staked, or studded to each other to form a single component.
Ay	Assembly	Refers to an assembled component comprising more than two single parts or sub-assembly parts.
W/	With	Denotes that the following part is attached.
L/	Less	Denotes that the following part is not attached.

GENERAL INFORMATION

ENGINE SPECIFICATION

Item			Engine type	CB-20
Engine proper	Kind		Gasoline, 4-cycle	
	Mounting location		Front	
	Cylinder No. and arrangement		3-cylinder-in-line, mounted transversely	
	Combustion chamber type		Multi-sphere type	
	Valve mechanism		Belt-driven overhead camshaft	
	Cylinder liner type		Integral with cylinder block	
	Bore x stroke		mm (inch)	76 x 73 (2.99 x 2.87)
	Compression ratio		9.0	
	Compression pressure		kg/cm ² -rpm (psi-rpm)	12.5 ~ 350 (177.8 ~ 350)
	Maximum output		PS/rpm	55/5500 [JIS] 50/5500 [DIN]
	Maximum torque		kg-m/rpm (ft-lb/rpm)	7.8/2800 (56.4/2800) [JIS] 7.4/3000 (53.5/3000) [DIN]
	Fuel consumption rate		g/ps-h (rpm)	210 (3200)
	Engine dimensions [Length x width x height]		mm (inch)	548 x 538 x 636 (21.57 x 21.18 x 25.00)
	Service engine weight		kg(lb)	89 (196.2)
	Number of piston rings	Compression ring	2	
		Oil ring	1	
	Valve timing	Intake	Open	21° BTDC
			Close	49° ABDC
		Exhaust	Open	49° BBDC
			Close	21° ATDC
	Valve clearance [hot]	Intake	mm (inch)	0.20 (0.0079)
		Exhaust	mm (inch)	0.20 (0.0079)
	Engine no-load revolution speed		rpm	900
	Blow-by gas recirculating system		Shield type	
Lubricating system	Lubricating method		Fully-forced feed method	
	Oil pump type		Trochoid type	
	Oil filter type		Full-flow filter type, filter paper type	
	Lubrication oil capacity		liter	2.9
Cooling system	Cooling method		Water-cooled, electromotor type	
	Radiator type		Corrugation type forced circulation	
	Coolant capacity		liter	4
	Water pump type		Centrifugal type, "V" belt-driven type	
	Thermostat type		Wax pellet type	
Air cleaner		Type	Filter paper type	
		Number	1	

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GENERAL INFORMATION

Item				Engine type	CB-20	
Fuel system	Fuel tank	Material			Zinc plated steel sheet [JIS] Upper sheet 0.8mm (0.0031 inch), Lower sheet 1.0mm (0.039 inch)	
		Capacity				

Specifications in () denote optional equipment.

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TYPE CB-20 ENGINE

SECTION 2 PERIODIC MAINTENANCE

2

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PERIODIC REPLACEMENT PARTS	2 - 3

LIST OF MAIN SPECIFICATIONS FOR PERIODIC MAINTENANCE SERVICE

Item				Specified value	Remarks		
Electrical system	Distributor	Dwell angle		59° ~ 65°			
		Heel gap	mm (inch)	0.4 ~ 0.5 (0.016 ~ 0.020)	Reference information: point gap is 0.4 ~ 0.5mm (0.016 ~ 0.020 inch).		
	Spark plug type			W16EX-U [W16EXR-U] BP5EAL [BPR5EA-L]	Spark plugs described in [] denote specifications for specific areas.		
	Spark plug gap		mm (inch)	0.7 ~ 0.8 (0.028 ~ 0.031)	Adjustment should be made by using a gap gauge.		
	Ignition timing		BTDC	10°/900 ± 50			
	Battery specific gravity (when electrolyte temperature is 20°C)			1.25 ~ 1.27	Electrolyte should be within the specified level.		
Engine	Engine idle speed			rpm	900 ± 50		
	Cylinder head bolt tightening torque			kg-m (ft-lb)	5.0 ~ 6.0 (36.2 ~ 43.4) [8 bolts]	When cold. [condition that no oil is applied]	
	Cylinder head-to-manifold tightening torque			kg-m (ft-lb)	1.0 ~ 1.6 (7.2 ~ 11.6)	Both for intake and exhaust manifolds	
	Compression pressure kg/cm ² -rpm (psi-rpm)		Specified value		12.5/350 (177.8/350)		
			Allowable limit		10/350 (142.2/350)		
			Difference in cylinders		Within 1.5 (21.3)		
	Valve clearance	Intake	Hot	mm (inch)	0.20 (0.0079)	Between camshaft and rocker arm	
			Cold	mm (inch)	0.18 (0.0071)	Reference information	
		Exhaust	Hot	mm (inch)	0.20 (0.0079)	Between camshaft and rocker arm	
			Cold	mm (inch)	0.18 (0.0071)	Reference information	
	Lubrication oil capacity		Total capacity		liter	2.9	● SAE 10W-30 Chilly region: SAE5W-30 ● Oils equivalent to API Classification SD
			Oil pan capacity [F level]		liter	2.7	
			Oil pan capacity [L level]		liter	1.7	
	Float level [Fuel level]			mm (inch)	22 (0.87) [Measured from body upper surface]	Float adjustment (Reference information) At ascent position 6.0 (0.24) At descent position 0.9 (0.04)	
	Idle adjusting screw backing-off turns				About 2½		
Radiator cap valve opening pressure		Specified value		kg/cm ² (psi)	0.75 ~ 1.05 (10.7 ~ 14.9)		
		Allowable limit		kg/cm ² (psi)	0.6 (8.5)		
Pressure for checking cooling water leakage				kg/cm ² (psi)	1.2 (17.1)		
Deflection of "V" belt [With a force of 8kg (17.6) applied]				mm (inch)	11 ~ 13 (0.43 ~ 0.51)	Middle point between water pump and alternator	

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Item			Specified value	Remarks
Engine	Cooling water capacity	Total capacity liter	4	With heater equipped
		Reservoir tank capacity liter	0.45	
	Anti-freeze solution filling amount liter	-10°C (23%)	0.9	Reservoir tank 0.1
		-20°C (35%)	1.3	Reservoir tank 0.2
		-35°C (50%)	1.7	Reservoir tank 0.3

MAINTENANCE SERVICE ACCORDING TO RUNNING DISTANCE

With regard to those motor vehicles which are operated under greatly different conditions, it is necessary to carry out maintenance service for

the following items given below, according to the covered running distance.

Running distance km		500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000
Maintenance service item		km	km	km	km	km	km	km	km	km	km	km	km	km	km	km	km
Engine oil	Replace	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oil filter element	Replace		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
Air cleaner element	Replace								<input type="checkbox"/>								<input type="checkbox"/>
Fuel filter	Replace						<input type="checkbox"/>						<input type="checkbox"/>				

PERIODIC REPLACEMENT PARTS

With regard to rubber parts, etc. among important safety-related parts, they will gradually deteriorate owing to the use over a long period of time. Moreover, during regular periodic maintenance service it is difficult to accurately predict possible period in which these rubber parts, etc. can be used safely.

Therefore, in order to assure the vehicle safety, make sure to replace part specified below at regular intervals.

However, it should be remembered that these replacement intervals specified below is the standard maximum period under normal operating conditions.

Hence, it may be advisable to replace the part at earlier times even before its due replacement times arrive, if you deem it necessary to do so. Also, it must be noted that this periodic replacement operation is carried out at the owner's obligation and expense.

Fuel hose (inside engine compartment) Every 2 years

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TYPE CB-20 ENGINE

SECTION 3 THE ENGINE PROPER

3

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ENGINE SECTIONAL VIEWS

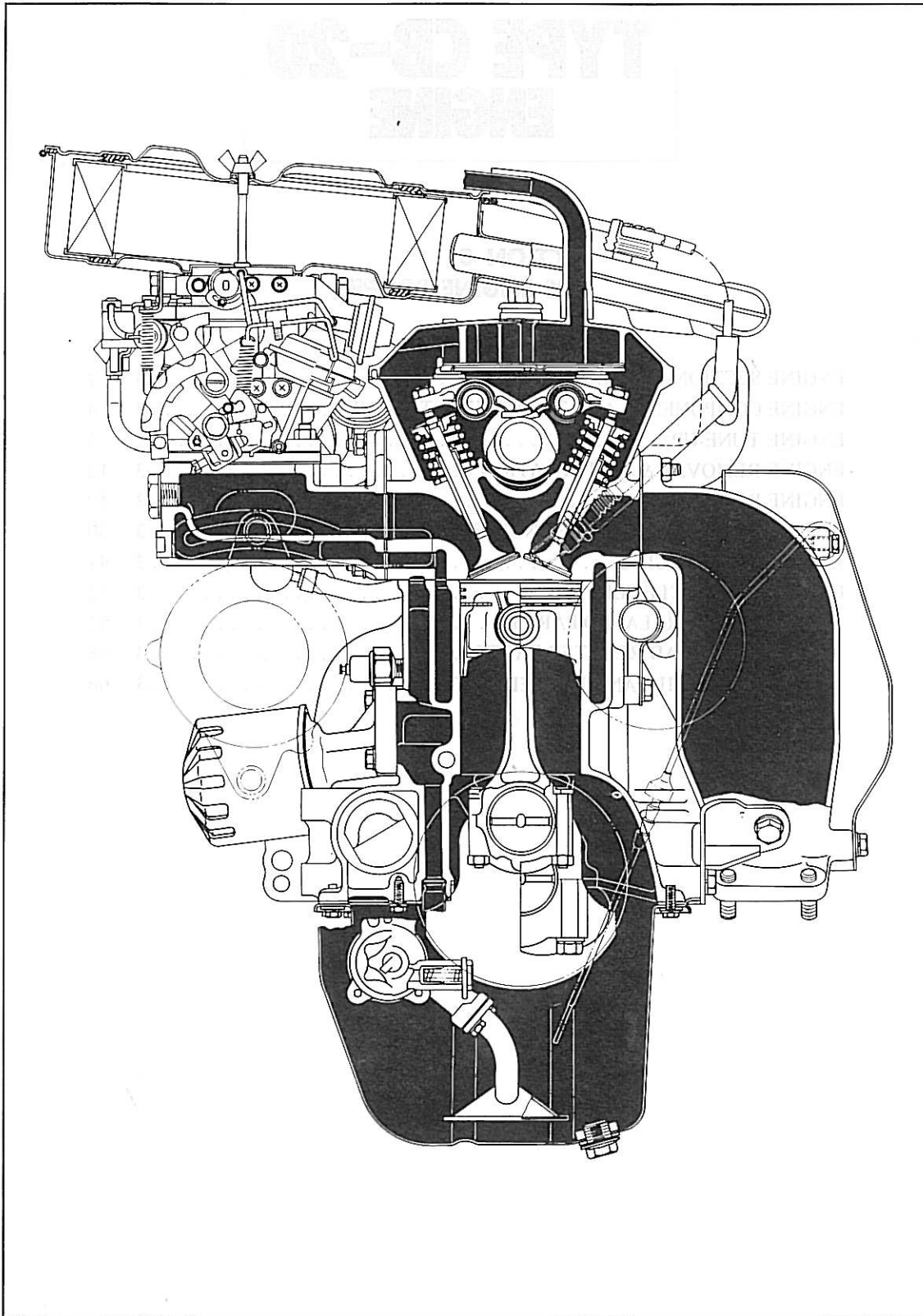


Fig. 3-1 Transverse-Sectional View of Engine

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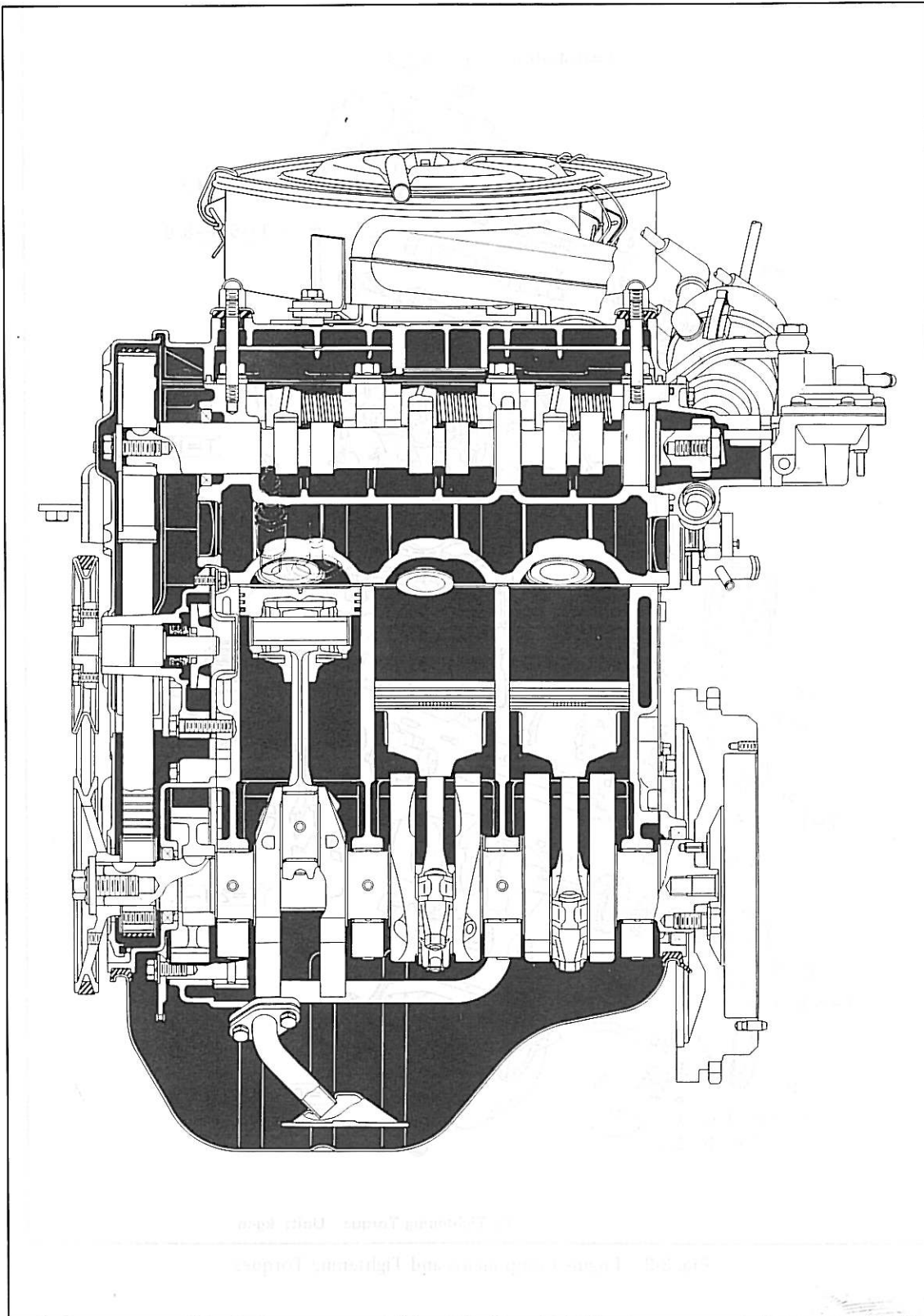


Fig. 3-2 Lengthwise-Sectional View of Engine

ENGINE COMPONENTS AND TIGHTENING TORQUES

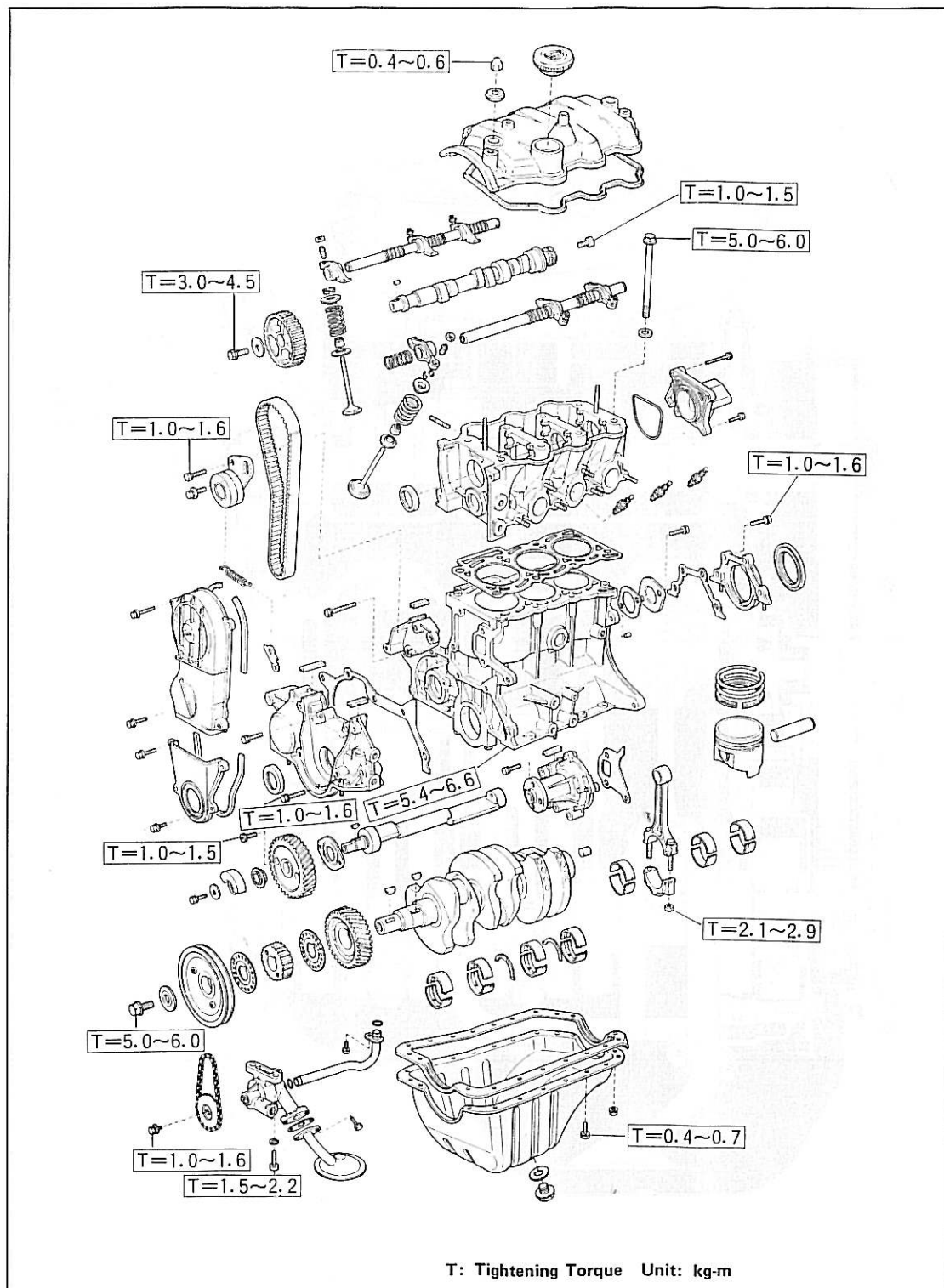
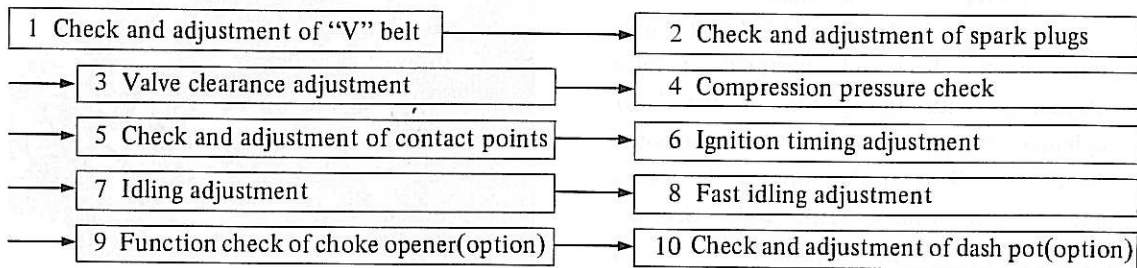


Fig. 3-3 Engine Components and Tightening Torques

ENGINE TUNE-UP**Engine Tune-Up Procedure****Operating Instructions on Engine Tachometer**

A commercially-available engine tachometer can be used on this 3-cylinder engine, as follows:

1. In the case of a tachometer whose pick-up is connected to the primary circuit and which is not equipped with a 3-cylinder range, conduct the test using the 6-cylinder range. Then, multiply the thus-obtained reading by 2. The product is the actual revolution speed for this 3-cylinder engine.
2. In the case of a tachometer where the pulses flowing through the resistive cord of the No.1 cylinder are detected, the reading on the meter directly indicates the actual revolution speed of the engine, regardless of the number of cylinders.

1. Check and adjustment of "V" belt

- (1) Check to see if the "V" belt exhibits wear or cracks.
- (2) Measure the amount of belt deflection.

Specified Deflection of "V" Belt

11.0 to 13.0mm (0.43 to 0.51 inch)

**[With a Force of 8kg (17.6 lb)
Applied]**

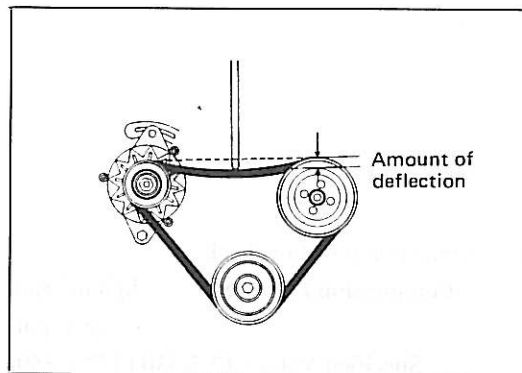


Fig. 3-4 Checking "V" Belt Tension

2. Check and adjustment of spark plugs

- (1) Check to see whether the spark plugs indicate cracks. Clean the spark plugs.
- (2) Check and adjust the spark plug gaps.

Specified Spark Plug Gap:

0.7 to 0.8mm (0.028 to 0.031 inch)

Spark Plug Specifications

NGK	BP5EA-L
Denso	W16EX-U

Spark Plug Specifications for Some European Countries

NGK	BPR5EA-L
Denso	W16EXR-U

3. Valve clearance adjustment

Specified Valve Clearance:**[Hot] 0.20mm (0.0079 inch)****Both for Intake and Exhaust Valves**

Carry out the check and adjustment of valve clearances, with the piston of the No.1 cylinder set at the end of the compression stroke as well as at the tops of the intake and exhaust strokes, respectively. See the table below for the adjustable valves for the respective positions of the No.1 piston.

Crank angle	Cylinder	1	2	3
When No.1 piston is set at end of compression stroke	IN	○		○
	EX	○	○	
When No.1 piston is set at tops of intake and exhaust strokes, respectively	IN		○	
	EX			○

Reference Information:

Valve clearance approximate to the specified value (0.20mm) can be obtained first by turning the adjusting screw until the clearance becomes zero and then by backing off the adjusting screw about 90 degrees.

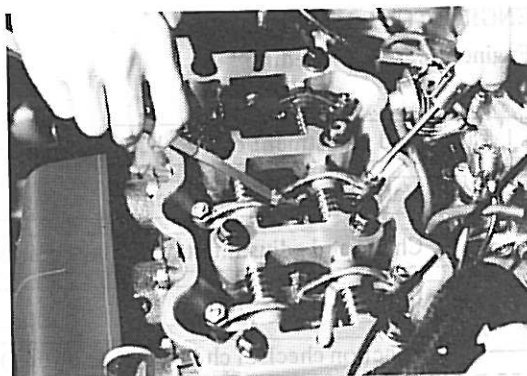


Fig. 3-5 Adjusting Valve Clearances

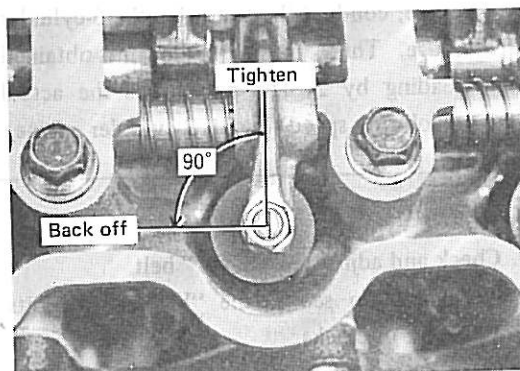


Fig. 3-6 Adjusting Valve Clearances (Reference Information)

4. Compression pressure check

Compression Pressure kg/cm²-rpm
 (psi-rpm)

Specified Value: 12.5-350 (177.8-350)**Minimum Requirement:****10.0-350 (142.2-350)****Variation Among Cylinders:****1.5-350 (21.3-350)**

NOTE: The measurement of compression pressure should be performed for a short period of time. Moreover, care must be exercised to ensure that the measurement time for each cylinder becomes equal.

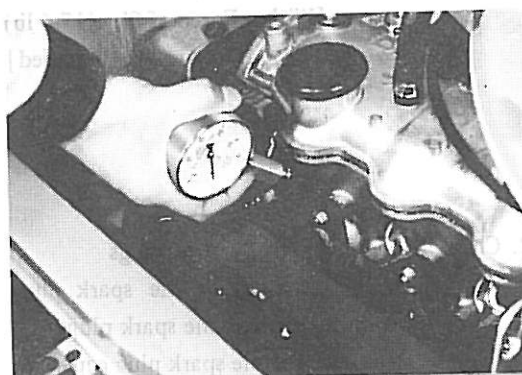


Fig. 3-7 Checking Compression Pressure

5. Check and adjustment of contact points

- (1) Check to see if the contact points exhibit the trace of burning.
- (2) Check and adjust the gap of the contact points.

Specified Heel Gap: 0.4 to 0.5mm
(0.016 to 0.020 inch)

Specified Contact Point Gap:
0.4 to 0.5mm (0.016 to 0.020 inch)

[Reference Information]

Specified Dwell Angle: 59 to 65°

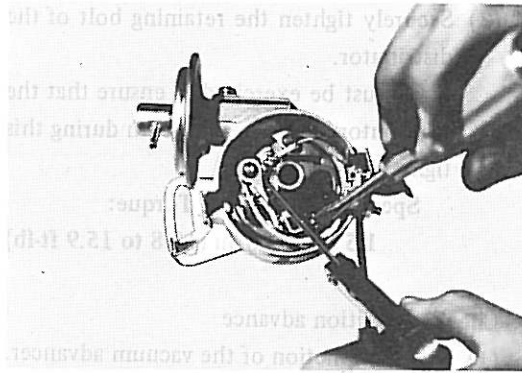


Fig. 3-8 Checking and Adjusting Contact Point Gap

6. Check and adjustment of ignition timing

Check

- (1) Disconnect the vacuum hose from the vacuum advancer. Using a timing light, check the ignition timing, while idling.

Specified Ignition Timing:

BTDC 10°/900 ± 50 rpm

NOTE:

1. Be sure to plug the thus-disconnected vacuum hose, before the ignition timing check is started.
2. Upon completion of the ignition timing check operation, be certain to install the clutch housing cover on the inspection window.

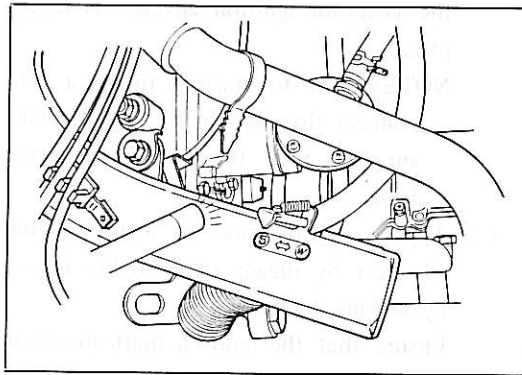


Fig. 3-9 Checking Ignition Timing

Adjustment

- (1) The ignition timing can be adjusted by slackening the retaining bolt of the distributor flange and then by turning the distributor body.

NOTE: When the distributor body is turned counter-clockwise, the ignition timing will be advanced, whereas when the distributor body is turned clockwise, the ignition timing will be retarded.

- (2) After the adjustment has been completed, reconnect the vacuum hose to the advancer. And ensure that the engine revolution speed rises about 50 to 100 rpm. Also, ensure that the engine is emanating normal sound.

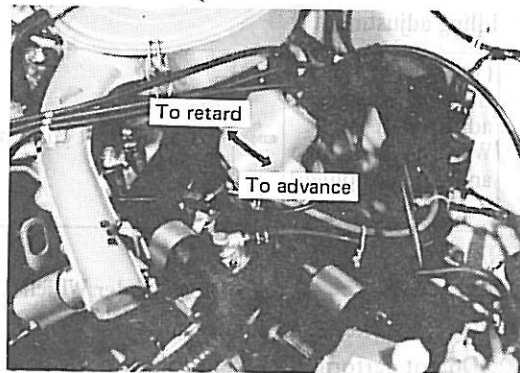


Fig. 3-10 Adjusting Ignition Timing

- (3) Securely tighten the retaining bolt of the distributor.

Care must be exercised to ensure that the distributor body does not turn during this tightening operation.

Specified Tightening Torque:

1.5 to 2.2 kg-m (10.8 to 15.9 ft-lb)

Checking ignition advance

- (1) Kill the function of the vacuum advancer. And accelerate the engine repeatedly. Using a timing light, check to see whether the governor ignition advance is taking place.

NOTE: Prior to starting this test, disconnect the vacuum hose. And make sure to plug the thus-disconnected hose.

- (2) Apply a negative pressure to the vacuum advancer by means of a Mighty bag or by sucking the hose. Ensure that the ignition mark moves in the ignition advance direction.
- (3) Reconnect the vacuum hose in the original position.

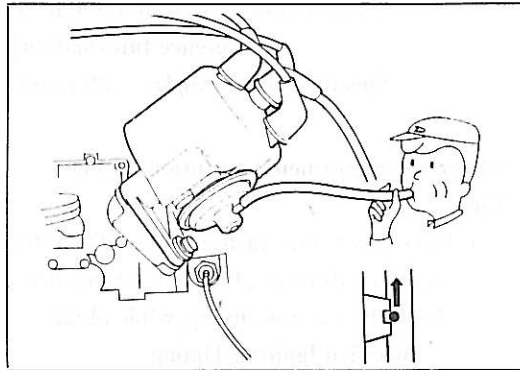
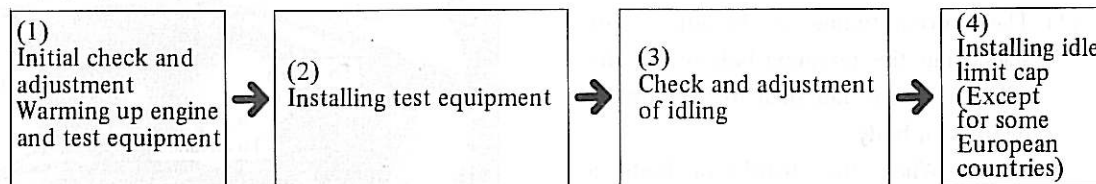


Fig. 3-11 Checking Function of Ignition Timing Advance Mechanism

7. Idling adjustment



Conditions Under Which Engine Idling Speed Must Be Adjusted

1. Warm up the engine thoroughly.
 2. Do not perform the engine idling speed while the fan motor is still functioning.
 3. Be sure to disconnect the HIC (thermostatic valve) hose. And plug the thus-disconnected hose.
 4. The idle limit cap can be removed by cutting off it with pliers, etc. (Except for some European Countries) After the adjustment has been completed, be sure to install a new cap (red color). Make sure that it can rotate freely.
- NOTE:** Idle limit caps mounted on those engines for some European Countries have been so constructed that they have different shape, using different material. The types of these idle limit caps can not be removed.

(1) Initial check and adjustment

Warming up engine and test equipment

① Check the choke valve for proper function.

② Warm-up the engine and test equipment.

- Temperature of engine coolant:

85 to 90°C

(As a guide for this temperature, you may use a point when the fan motor starts to turn.)

- Warm up the CO and HC meter at least 30 minutes.

③ If the engine is equipped with a plastic idle limit cap, remove such idle limit cap. (Except for some European Countries)

(2) Installing test equipment

Install an engine tachometer to the engine.

(3) Check and adjustment of idling

① Back off the idle adjusting screw about 2½ turns from the fully-closed position.

② Start the engine. Turn the throttle adjusting screw, until the engine runs at 950 rpm.

③ Screw-in the idle adjusting screw, until the engine runs at 900 rpm.

Specified Idling Speed:

900 ± 50 rpm

NOTE: In case of those engines for some European Countries, screw-in the idle adjusting screw, by using a special Tool (09243-00010-000).

④ Measure the CO concentration.

Specified CO Concentration:

5 to 6%

1 to 3% (For some European Countries)

Reference Information:

HC Concentration During CO

Concentration Check:

Not To Exceed 600 ppm

⑤ If the CO and HC concentrations do not comply with the specified values, turn the idle adjusting screw.

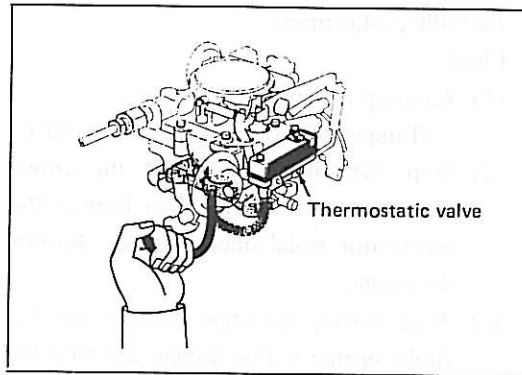


Fig. 3-12 Killing Function of HIC (Thermostatic Valve)

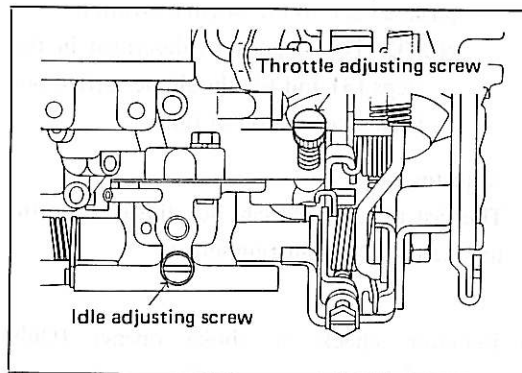


Fig. 3-13 Location of Adjusting Screws

If the engine should run roughly, check to see if the CO concentration or engine revolution speed drops excessively. Set these values at higher points within the allowable ranges.

(4) Installing idle limit cap (Except for some European Countries)

Install the idle limit cap (blue color) in the original position. (This applies to those engines equipped with a plastic idle limit cap.)

8. Fast idling adjustment

Check

- (1) Warm-up the engine.
(Temperature of coolant: 85 to 90°C)
- (2) Stop the engine and pull the choke button out as far as it will go. Depress the accelerator pedal once or twice. Restart the engine.
- (3) After starting the engine, ensure that the choke opener is functioning and that the fast idle adjusting lever rests on the second stage of the fast idle cam.
- (4) Check the engine revolution speed.

Specified Fast Idling Speed:

2300 to 2700 rpm

- (5) Ensure that the engine returns to its idling speed, when the choke button is pushed back to the original position.

NOTE: The operations described in the steps (3) and (4) should be carried out for a short period of time.

Adjustment

The fast idling speed can be adjusted by turning the fast idle adjusting screw.

9. Function check of choke opener (Only engines for some European Countries)

While the engine is idling, disconnect the vacuum hose connected to the choke opener. If the link functions in the way as described in the table below, it represents that the choke opener is functioning properly.

Temperature of coolant	
Above 25°C (Check should be made when temperature is above 35°C.)	If hose is connected, link moves. (Negative pressure is applied.)

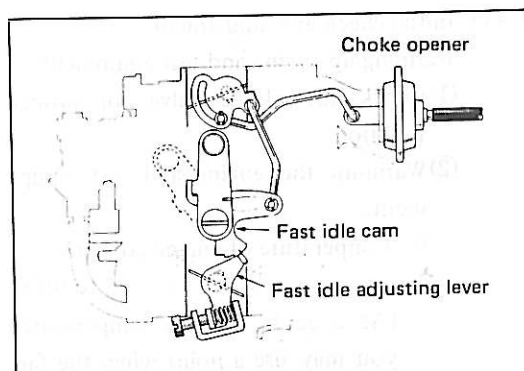


Fig. 3-14 Fast Idling Adjustment (1)

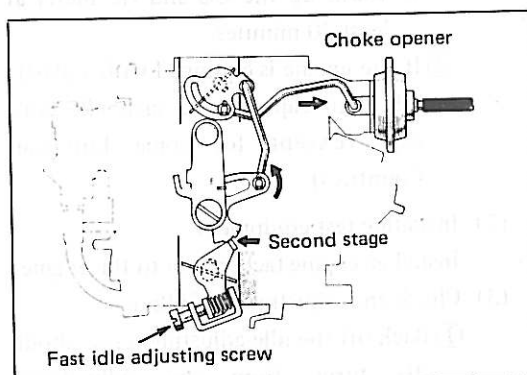


Fig. 3-15 Fast Idling Adjustment (2)

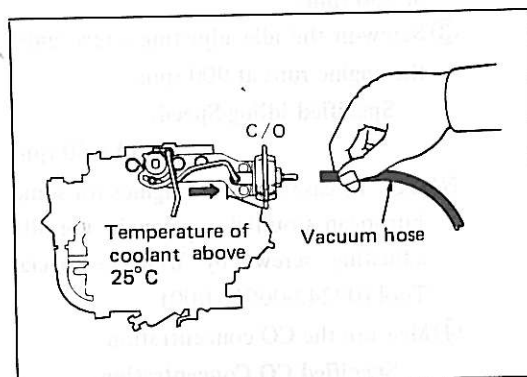


Fig. 3-16 Checking Choke Opener

10. Check and adjustment of dash pot

(Only engines for some European Countries)

Touch revolution speed

Check

- (1) Start the engine. Disconnect the vacuum hose ① from the diaphragm pipe ②.
- (2) Open the throttle so that the throttle touch arm ③ may be held separated from the diaphragm shaft ④.
- (3) Release the throttle valve. And measure the engine revolution speed at a time when the throttle touch arm begins to contact the diaphragm shaft. If this engine speed falls within the following range, it indicates that the system is functioning properly.

Touch Revolution Speed:

1700 to 1900 rpm

Adjustment

- (1) Turn the adjusting screw ⑤, until the specified revolution speed is obtained.
- (2) Upon completion of the adjustment, reconnect the vacuum hose. And ensure

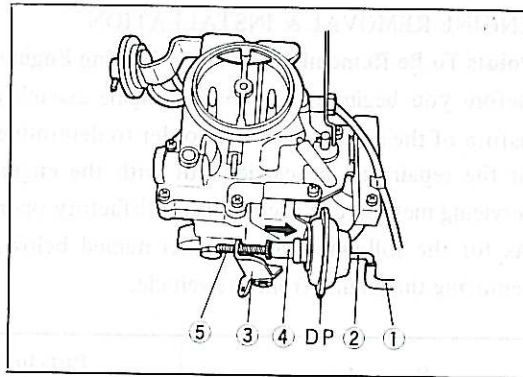


Fig. 3-17 Dash Pot Adjustment

Plus Drehzeit abnimmt
that the engine revolution speed decreases
to idling speed.

Function check of dash pot

(Only engines for specific areas)

- (1) Hold the engine revolution speed at 2500 rpm for a short period of time. Then, release the throttle valve.
- (2) Measure the time required for the engine to decrease its engine revolution speed from 2000 rpm to 1200 rpm.

Specified Time Required:

1.0 to 3.0 seconds

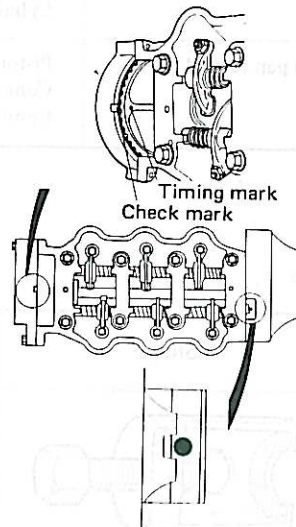
Reference Information

Simple Checking Method of Valve Timing

The valve timing can be checked easily at a time when the piston of the No.1 cylinder is set at the top dead center at the end of the compression stroke for the purpose of checking and adjusting valve clearances. The following is the procedure for this simple checking method of valve timing.

Checking Procedure

1. Turn the crankshaft, until the ignition mark on the flywheel is aligned with the ignition mark of the No.1 cylinder.
2. When the operation as described in the step 1 above has been made, check to see whether the check mark on the timing belt cover is lined up with the timing mark on the camshaft pulley, as indicated in the illustration on the right. When these



marks are aligned to each other, the valve timing is correct.

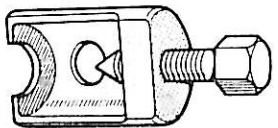

ENGINE REMOVAL & INSTALLATION**Points To Be Remembered Before Starting Engine Removal**

Before you begin to remove the engine assembly, it is necessary to evaluate carefully and correctly the nature of the engine trouble in order to determine whether the engine should be removed from the vehicle or the repair can be carried out with the engine still mounted on the vehicle. Also, determine which servicing method can accomplish satisfactory operation in the shortest period of time.

As for the following components named below, it is possible to perform in-vehicle operation without removing the engine from the vehicle.

Nomenclature	Parts to be checked and repaired	Reference page in workshop manual
Timing belt related parts	Timing belt Timing belt tensioner Crankshaft timing belt pulley	page 3 - 52
	Crankshaft front oil seal	page 3 - 55
Cylinder head related parts	[Valve rocker shaft related parts] Valve rocker arms Compression springs Valve rocker shafts	page 3 - 59
	[Valve stem oil seal related parts] Valve springs Valve stem oil seals	page 3 - 61
	[Camshaft related parts] Camshaft timing belt pulley Camshaft Camshaft oil seals	page 3 - 63
	Cylinder head assembly	page 3 - 64
Piston & oil pan related parts	Pistons & piston rings Connecting rods Connecting rod bearings	page 3 - 66

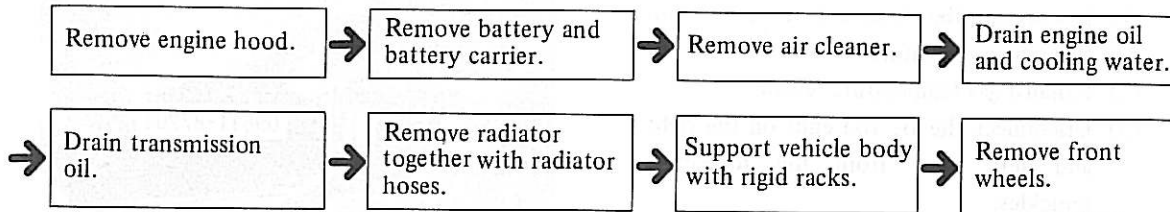
Special Tools

	Shape	Part number & nomenclature	Application	Remarks
Special Tools		09611-87201-000 Tie rod end puller	Used for disconnecting tie rod end from knuckle	For Model L38
		09648-87201-000 Drive shaft replacer	Used for pulling out drive shaft	For Model L38

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Engine Removal

1. Carry out the following preparatory operations.



2. Remove the following parts in the engine compartment in this sequence.

- (1) Accelerator cable ①
- (2) Choke control cable ②
- (3) Brake booster hose
- (4) Ground cable (One on engine ③, one on transmission)

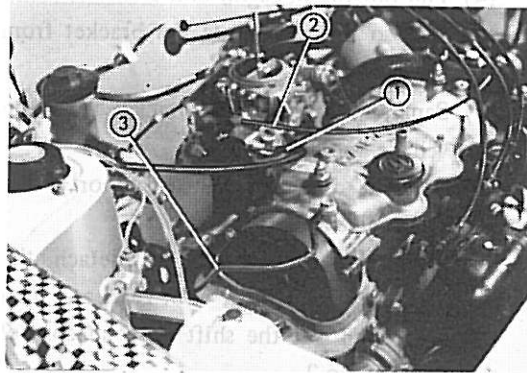


Fig. 3-18 Removing Parts from Engine Compartment (Part 1)

- (5) Fuel hose ④
- (6) Fuel return hose ⑤
- (7) Heater outlet hose
- (8) Multi-connector
- (9) Resistive cords ⑥

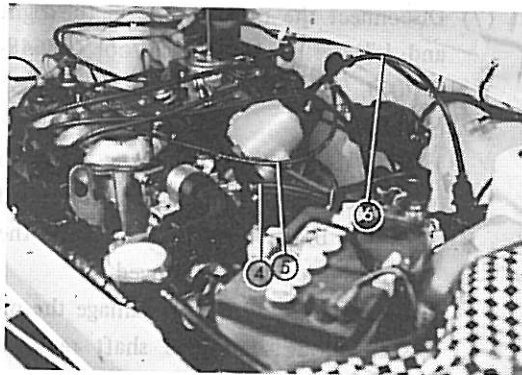


Fig. 3-19 Removing Parts from Engine Compartment (Part 2)

- (10) Clutch cable ⑦
- (11) Speedometer cable ⑧
- (12) Back-up lamp switch ⑨
- (13) Battery carrier stay ⑩
- (14) Starter terminal
- (15) Heater inlet hose

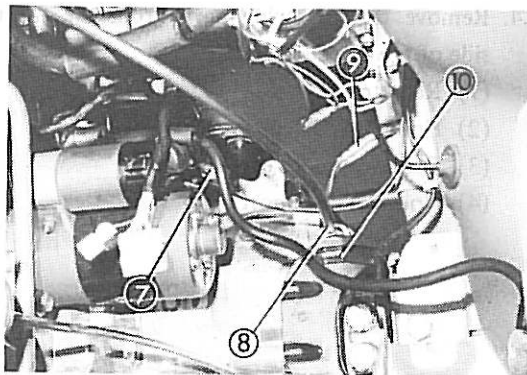


Fig. 3-20 Removing Parts from Engine Compartment (Part 3)

3. Remove the following parts from the under-side of the vehicle.

- (1) Disconnect the front exhaust pipe from the exhaust manifold.
- (2) Exhaust gas temperature sensor.
- (3) Disconnect the tie rod ends on the right and left sides from the respective knuckles.

Special Tool (09611-87201)

- (4) Pull out the hexagon bolt from the lower arm so as to separate the bracket from the lower arm.
- (5) Separate the strut bar bracket from the vehicle body.
- (6) Separate the floor shift support No.1 from the transmission case.

NOTE: It is necessary to detach the control shaft dust boot No.2 and then to pull out the shift & select control lever No.2.

- (7) Disconnect the drive shafts on the right and left with the special tool (09648-87201).

NOTE:

1. Special care must be taken so as to ensure that no strained force is applied to the brake hose bracket while the drive shaft is being removed.
2. Be very careful not to damage the oil seal during the drive shaft removal operation.

4. Remove the following parts from the front side of the vehicle.

- (1) Radiator grille
- (2) Hood lock assembly
- (3) Radiator upper center support
- (4) Hood lock support

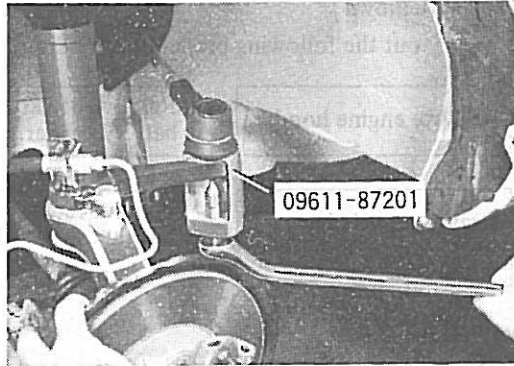


Fig. 3-21 Disconnecting Tie Rod End

Using a piece of wire, etc., suspend the shift lever housing in order to prevent it from falling down.

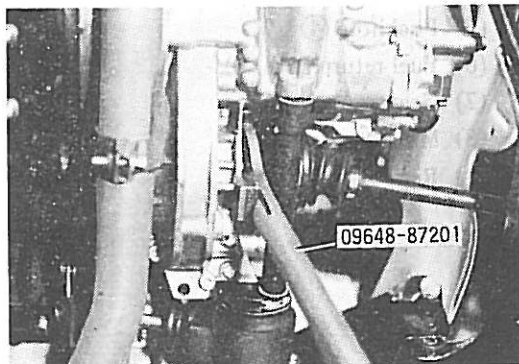


Fig. 3-22 Disconnecting Drive Shaft



Fig. 3-23 Removing Hood Lock Support

5. Remove the engine, following the procedure given below.

- (1) Attach one hook of the engine hanger to the alternator adjusting bar. Also, attach the other hook to the engine mounting LH bracket. See Fig. 3-24 for the attaching points.

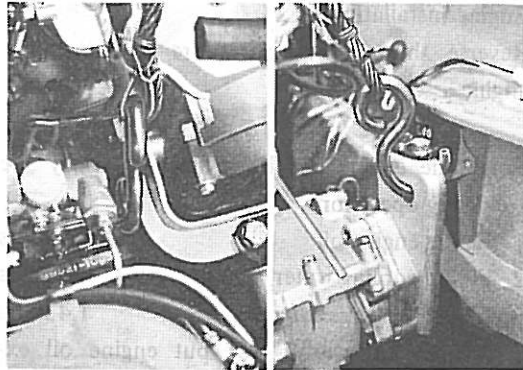


Fig. 3-24 Attaching Location of Engine Hanger Hooks

- (2) Remove the engine mounting front insulator setting bolt. And move the engine as shown in Fig. 3-25 so as to remove the engine mounting front insulator.

NOTE: When the setting bolt of the engine mounting front insulator is removed, the engine will lose its stability. It is, therefore, necessary to raise the engine hanger slightly in order that the engine may be suspended lightly.

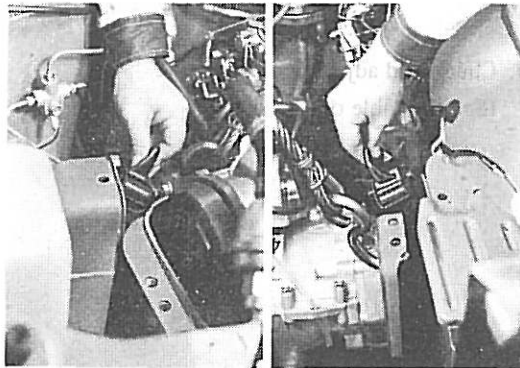


Fig. 3-25 Removing Engine Mounting Front Insulator

- (3) Remove the setting nut of the engine mounting rear insulator. And take out the engine with the transmission mounted on it.

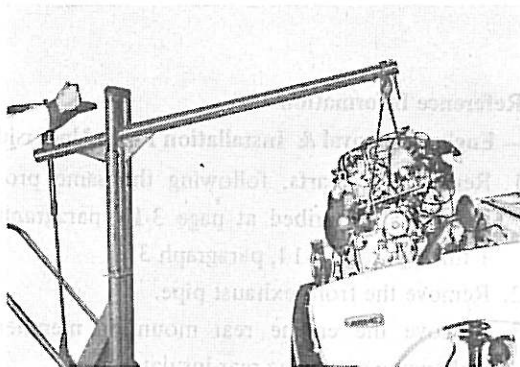


Fig. 3-26 Taking out Engine

6. Remove the attaching bolts which connect the engine with the transmission.

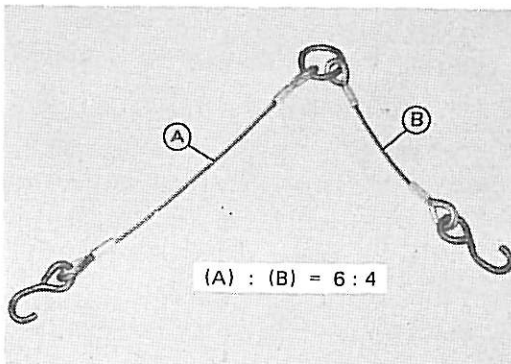


Fig. 3-27 Engine Hanger Dimensions
(Reference Information)

Engine Installation

Reverse the removal procedure to install the engine assembly.

After the engine has been installed, carry the following operations.

1. Filling engine oil 2.9 liters
2. Filling cooling water 4.0 liters
3. Filling transmission oil 1.4 liters

NOTE: Be careful not put engine oil excessively above the specified level. Use the oil level gauge carefully while refilling.

5. Check and adjustment of engine
(See the table on the right.)

NOTE: Particular care must be exercised to prevent the alternator from being interfered with the brake master cylinder.

4. Adjusting clutch free travel

Specified Clutch Free Travel:

15 to 30mm (0.59 to 1.18 inches)

Items to be checked and adjusted	Specifications
Deflection of "V" belt [with a force of 8kg applied] mm (inch)	11 ~ 13 (0.43 ~ 0.51)
Heel clearance mm (inch)	0.4 ~ 0.5 (0.016 ~ 0.020)
Dwell angle (degree)	59 ~ 65
Ignition timing BTDC (degree/rpm)	10/900 ± 50
Idling revolution speed (rpm)	900 ± 50
Valve clearances [hot] mm (inch)	IN, EX 0.20 (0.0079)

Reference Information

— Engine Removal & Installation From Underside

1. Remove the parts, following the same procedures as described at page 3-13, paragraph 1 through page 3-14, paragraph 3.
2. Remove the front exhaust pipe.
3. Remove the engine rear mounting member and engine mounting rear insulator.



Fig. 3-28 Removing Engine Rear Mounting Member

4. Move the lower arms toward the rear side of the vehicle. And place the drive shafts on the respective lower arms. (Fig. 3-30 shows the engine assembly at this stage.)
5. Support the engine by means of a transmission jack with the engine holder placed on it. (Fig. 3-32 shows how to fabricate this engine holder.)
6. Separate the engine mounting front insulators at the right and left sides. Proceed to separate the engine mounting brackets at the front and left sides.
7. Raise the vehicle body, using a 2-post lift, etc. Roll the engine with the transmission attached to it from under the vehicle.

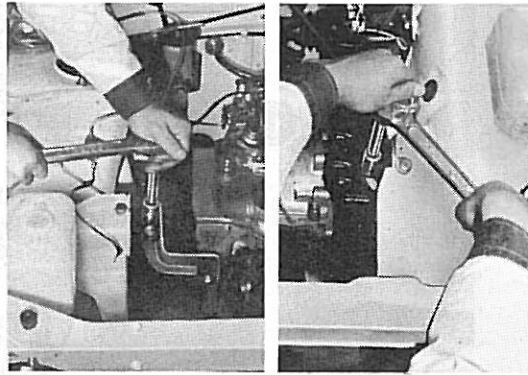


Fig. 3-29 Separating Engine Mounting Brackets

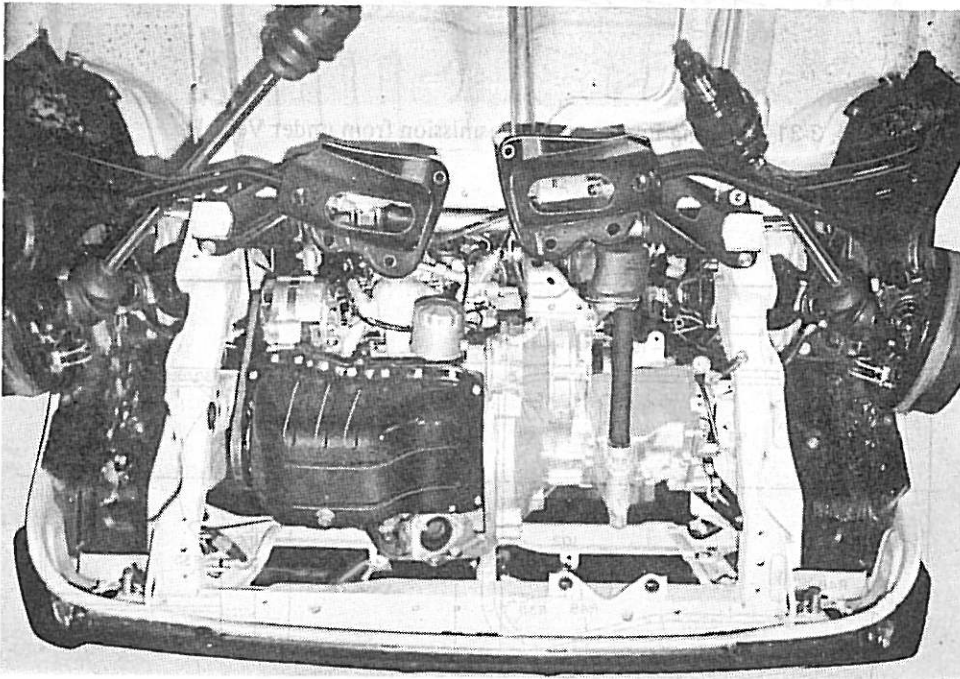


Fig. 3-30 Underside View of Engine and Other Related Parts as Disassembled Partly

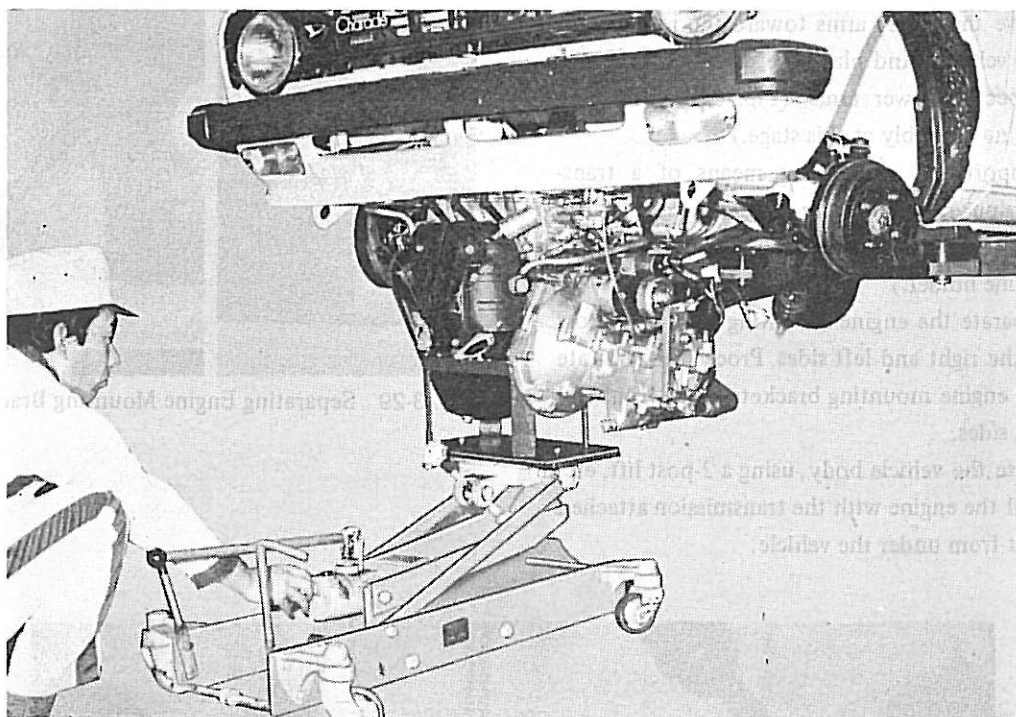


Fig. 3-31 Rolling Engine and Transmission from under Vehicle

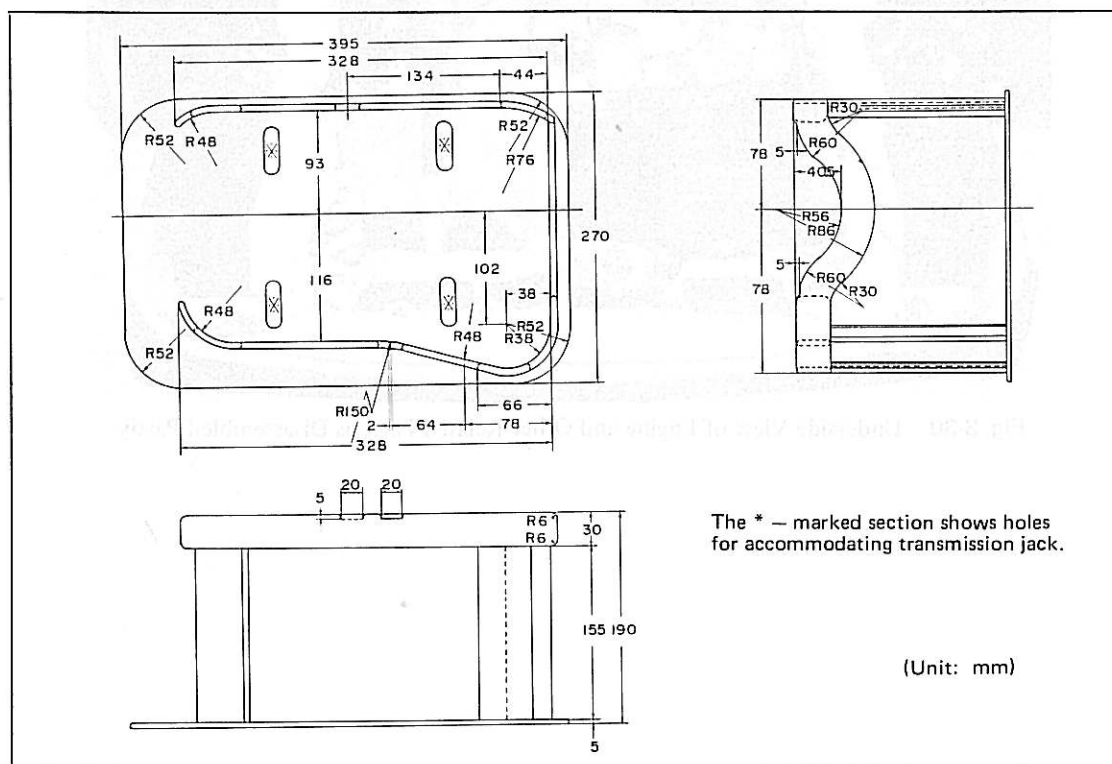
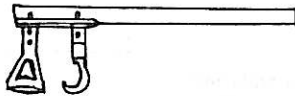
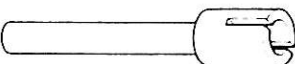

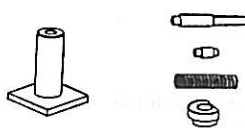
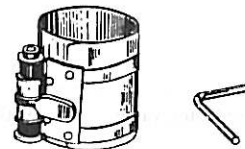
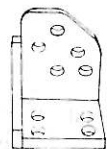
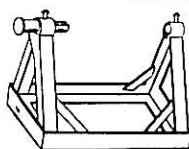



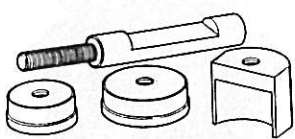
Fig. 3-32 Engine Holder Fabricating Procedure

ENGINE DISASSEMBLY

Special Tools, Tools, Measuring Instruments and Lubricants

	Shape	Part number and nomenclature	Application	Remarks
Special Tool		09202-87701-000 Valve spring replacer	Used for replacing valve springs during in-vehicle operation	Special tool for Type AB engine must be modified partly. (See Fig. 2-121.)
		09201-87701-000 Valve stem oil seal replacer	Used for press-fitting valve stem oil seals	For Type AB engine use
		09219-87702-000 Cylinder head holder	Used for base during cylinder head disassembly & assembly operations	Newly provided
		09221-87702-000 Piston pin remover & replacer	Used for replacing pistons, piston pins and connecting rods	Fitting piece (09221-87702-100) only has been newly provided. Body (09221-25011)
		4610-07 Piston ring replacing guide	Used for installing pistons	Commercially-available
		09219-87701-000 Engine overhaul attachment	Attachment to be used for attaching engine onto engine overhaul stand	Newly provided
		2001-03 Engine overhaul stand	Stand to be used for disassembling and assembling engine	For Type ZM engine use
		4610-02 Valve cotter remover & replacer	Used for removing & installing valve cotters	Commercially-available

THE ENGINE PROPER

	Shape	Part number and nomenclature	Application	Remarks
Special Tool		09215-87701-000 Balance shaft bearing remover & replacer	Used for replacing balance shaft bearing	For Type AB engine use
Tools	Hexagonal rod wrench (commercially-available width-across-flats: 5mm, 6mm) Piston ring expander (commercially-available)			
Measuring instrument	Thickness gauge, dial gauge, torque wrench, straightedge, steel square, caliper gauge, vernier calipers, micrometer, spring tester, cylinder gauge, feeler gauge, spring balancer, and plastigage			
Lubricants	Silicon bond sealer, engine oil SAE 10W-30, bond sealer			

THE ENGINE PROPER

Removal of Parts

1. Remove the exhaust manifold stay. Attach the special tool (09219-87701) onto the cylinder block. And attach this special tool to the engine overhaul stand (special tool No. 2001-03).

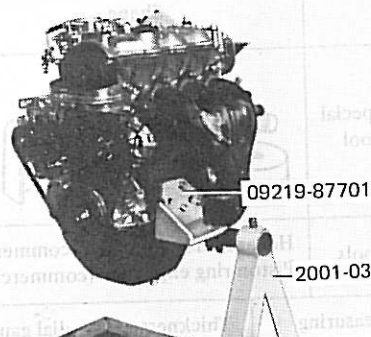


Fig. 3-33 Installing Engine

2. Remove the following parts from the front side of the engine.

- (1) Engine mounting front bracket ①
- (2) "V" belt ②
- (3) Water pump pulley ③
- (4) Crankshaft pulley ④
- (5) Cylinder head cover ⑤
- (6) Timing belt cover ⑥

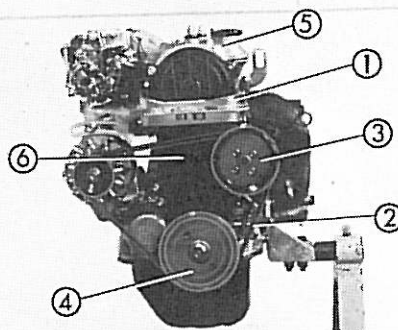


Fig. 3-34 Removing Parts from Front Side of Engine

3. Remove the following parts from the right side of the engine.

- (1) Alternator assembly ①
- (2) Fuel pipe
- (3) Intake manifold (together with carburetor) ②
- (4) Oil filter bracket ③
- (5) Distributor ④

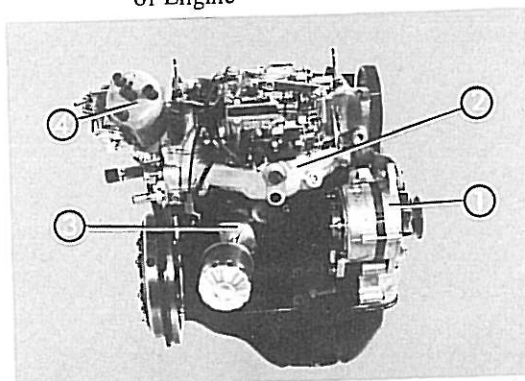


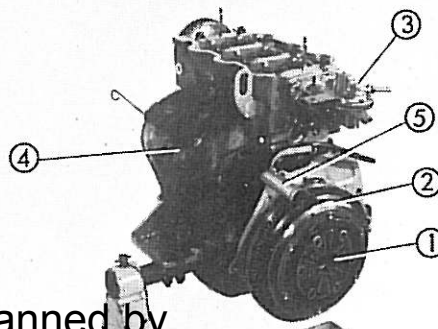
Fig. 3-35 Removing Parts from Right Side of Engine

4. Remove the following parts from the rear and left sides of the engine.

- (1) Clutch cover and clutch disc ①
- (2) Flywheel ②
- (3) Fuel pump ③

NOTE: It is necessary to take out the push rod of the fuel pump, too.

- (4) Exhaust manifold cover and manifold ④
- (5) Water inlet pipe ⑤



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5. Remove the timing belt related parts, following the procedure given below.

- (1) Timing belt tensioner ①
- (2) Timing belt ②
- (3) Tensioner spring ③
- (4) Tension spring bracket ④

NOTE:

1. While removing the timing belt, make sure not to bend the belt sharply to from a small radius.
2. Utmost care must be exercised to keep the timing belt from oils, grease, or water, etc.
3. When the timing belt alone is to be replaced, it is necessary to set the crankshaft and camshaft at the specified position, respectively.
See the section under "In-Vehicle Service, Timing Belt Related Parts, "page 3-52, for the servicing procedure.

6. Remove the camshaft timing belt pulley.

NOTE: During the timing belt pulley removal operation, the camshaft can be prevented from rotation, by inserting a screwdriver through the opening of the pulley, as shown in Fig. 3-38.

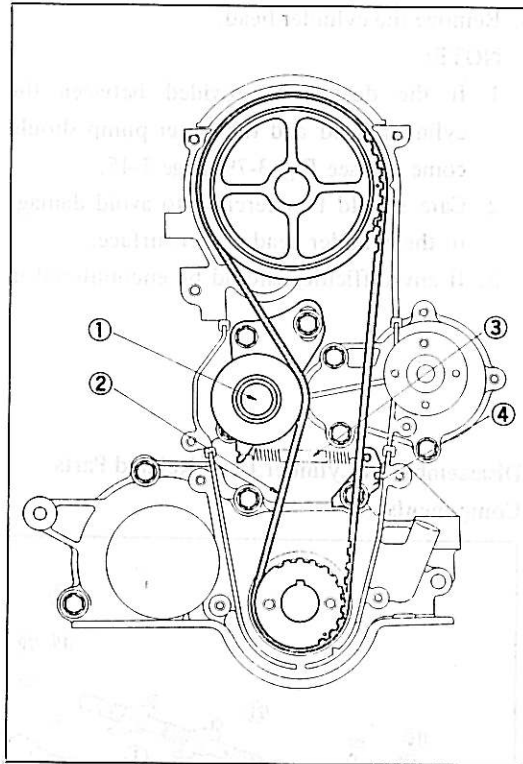


Fig. 3-37 Removing Timing Belt Related Parts

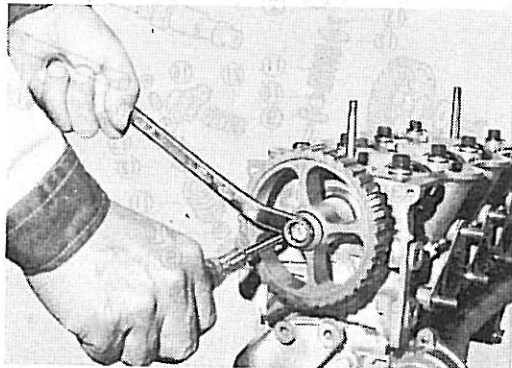
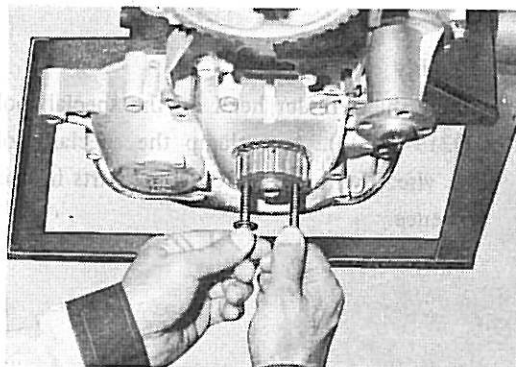


Fig. 3-38 Removing Camshaft Timing Belt Pulley

7. Remove the crankshaft timing belt pulley.

NOTE: If any difficulty should be encountered in removing the crankshaft timing belt pulley, screw-in bolts into the threaded holes provided in the side of the pulley, as indicated in Fig. 3-39. And pull out the bolts together with the timing belt pulley.



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Removing Crankshaft Timing Belt Pulley (Only When Difficulty Is Encountered in Removal)

8. Remove the cylinder head.

NOTE:

1. If the dust seal provided between the cylinder head and the water pump should come off, see Fig. 3-79, page 3-45.
2. Care should be exercised to avoid damage to the cylinder head gasket surface.
3. If any difficulty should be encountered in

removing the cylinder head from the cylinder block, never insert a screwdriver or the like into the mating surface. Such practice most likely will damage the surface of the cylinder head or block.

Disassembly of Cylinder Head Related Parts Components

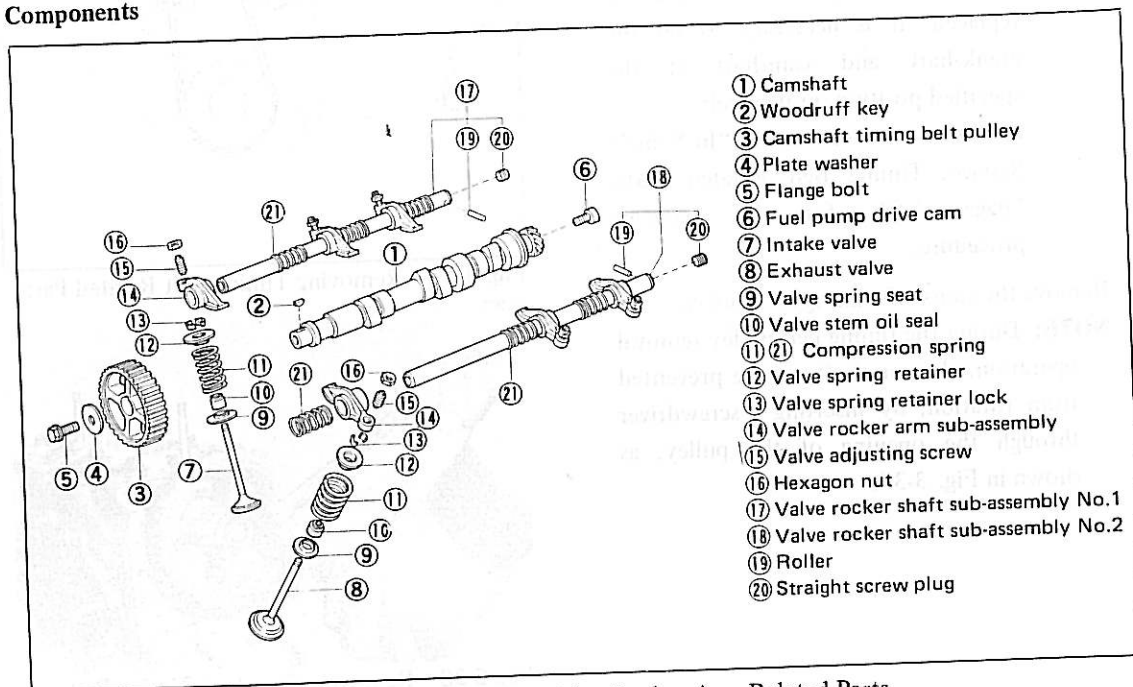
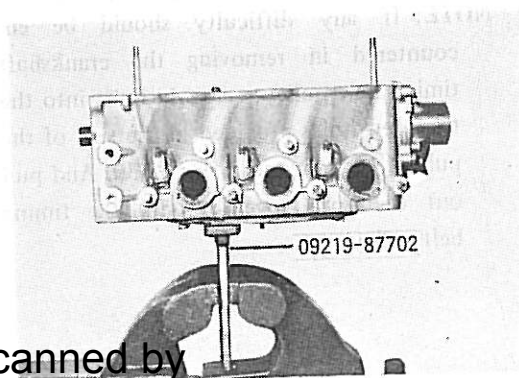


Fig. 3-40 Camshaft and Valve Rocker Arm Related Parts

Disassembly

1. Mount the cylinder head on the special tool (09219-87702). And clamp the special tool in a vise. Remove the following parts in this sequence.



2. Remove the distributor housing.
3. Fully slacken the adjusting screws of the valve rocker arms. Extract the valve rocker shaft. At the same time, remove the valve rocker arms and compression springs.

NOTE: In order to extract the valve rocker shaft, screw-in a bolt into the rear end of the valve rocker shaft. And pull out the bolt to take out the rocker shaft.

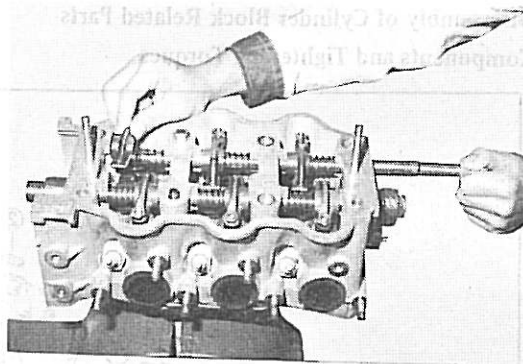


Fig. 3-42 Removing Valve Rocker Shaft

4. Extract the camshaft from the rear end of the cylinder head.

NOTE: While removing the camshaft, be sure to exercise caution to avoid damaging the bearing journals or cam lobe surfaces of the camshaft.

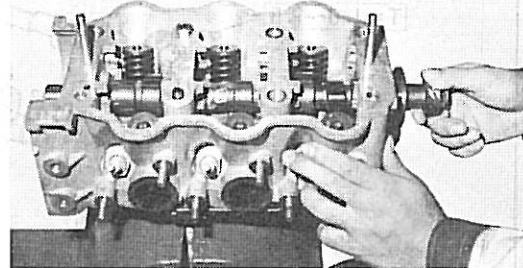


Fig. 3-43 Removing Camshaft

5. Remove the valves and compression spring related parts, using the special tool (09202-87701 or 4610-02).

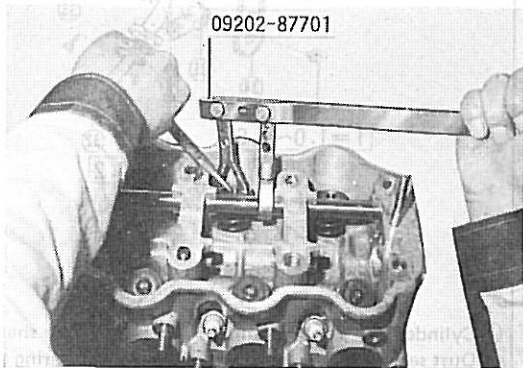


Fig. 3-44 Removing Valves and Compression Springs (1)

Reference Information

If the special tool (09202-87701) is used, it is possible to remove or install the valves and compression springs without removing the exhaust and intake manifolds first.



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Disassembly of Cylinder Block Related Parts Components and Tightening Torques

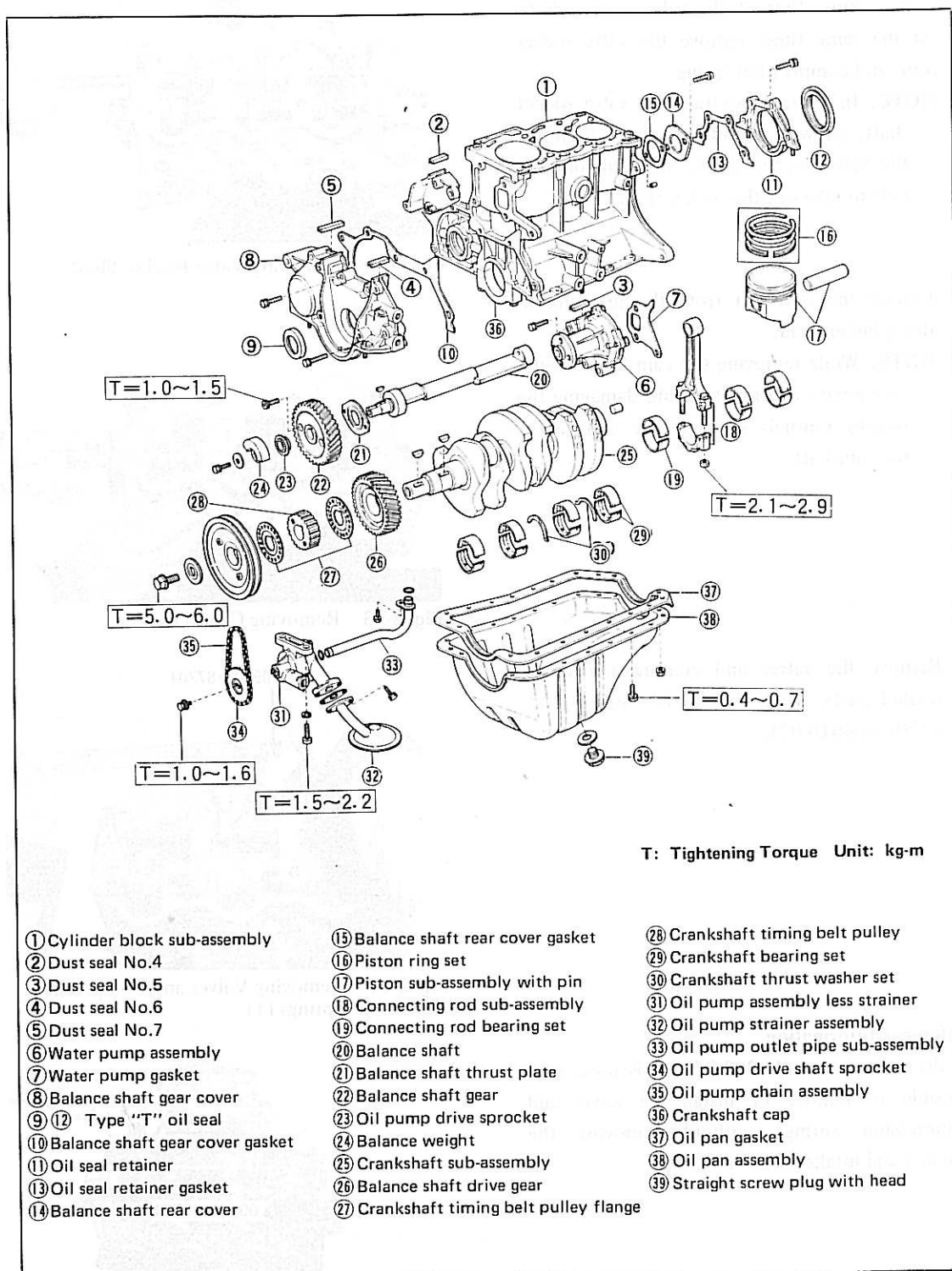


Fig. 3-46 Cylinder Block Related Parts

Disassembly

1. Remove the water pump assembly
2. Remove the oil pan.
3. Detach the balance shaft gear cover and rear oil seal retainer.



Fig. 3-47 Removing Water Pump

4. Remove the oil pump drive sprocket, oil pump drive shaft sprocket and oil pump drive chain.

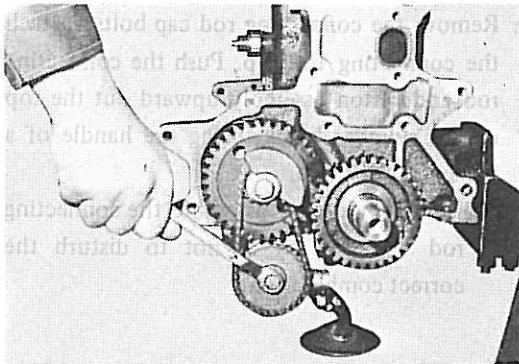


Fig. 3-48 Removing Oil Pump Drive Sprocket

5. Remove the oil pump together with the oil pump outlet pipe.

NOTE: The oil pump proper is attached with hexagon socket head cap bolts. It is, therefore, necessary to employ a hexagon rod wrench (commercially-available tool with a width-across-flats of 6mm) to remove the oil pump proper.

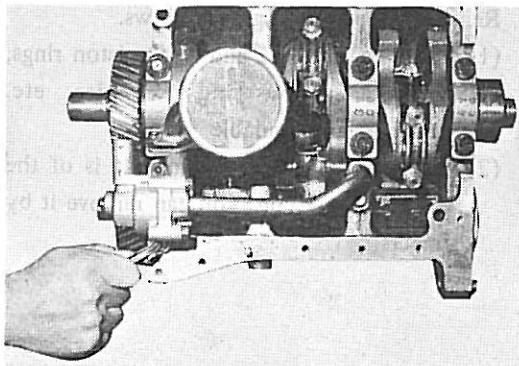
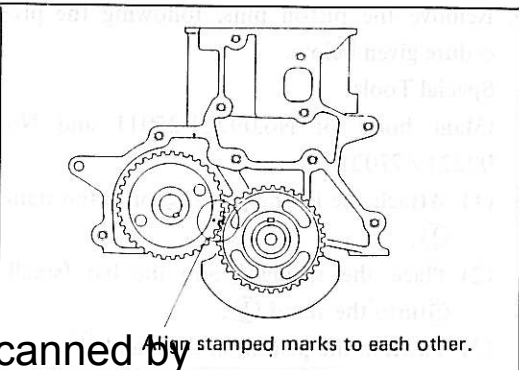


Fig. 3-49 Removing Oil Pump

6. Remove the balance shaft, as follows.

- (1) Align the stamped mark on the balance shaft gear with the stamped mark on the balance shaft drive gear, as shown in Fig. 3-50. Remove the hexagon socket head cap bolts, by using a hexagon rod wrench (commercially-available tool with a width-across-flats of 5mm) through the two holes provided in the balance shaft gear.



Align stamped marks to each other.

Press the pin off from the piston.

NOTE: Care must be exercised to keep the thus-disassembled pistons and pins properly in order that they may be reassembled correctly in their respective cylinders.

10. Remove the crankshaft bearing caps.

11. Remove the crankshaft.

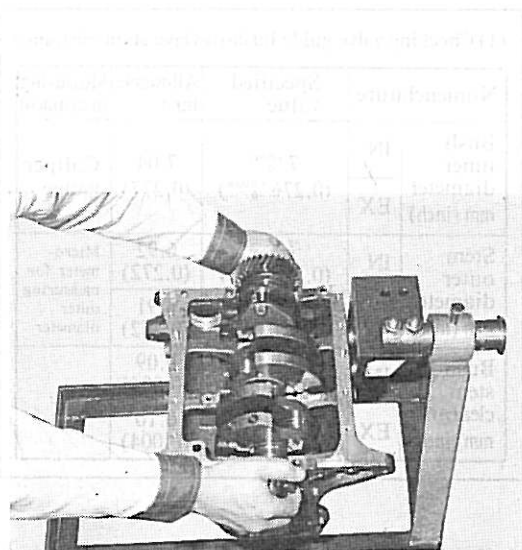


Fig. 3-55 Removing Crankshaft

12. Detach the crankshaft bearings.

NOTE: The crankshaft bearings should be placed correctly in cylinder sequence so that they can be reassembled properly in their original position.

Furthermore, it should be noted that the crankshaft thrust washers are provided only at the front and rear sides of the cylinder block No.3 bearing.

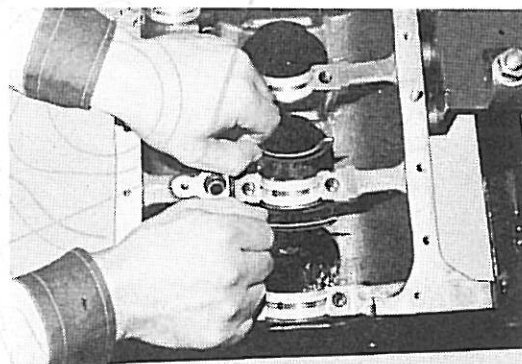


Fig. 3-56 Removing Crankshaft Thrust Washers

13. Remove the stud bolts and taper plug, etc., as required.

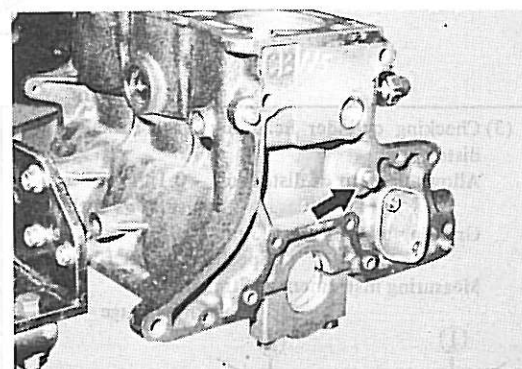


Fig. 3-57 Removing other Parts

INSPECTION AND REPAIR OF ENGINE COMPONENTS

1. Cylinder Head Related Parts

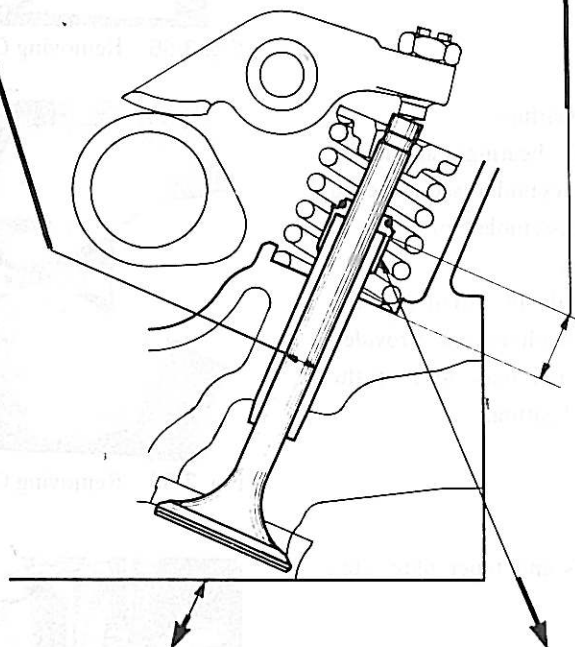
(1) Checking valve guide bush-to-valve stem clearance

Nomenclature		Specified value	Allowable limit	Measuring instrument
Bush inner diameter mm (inch)	IN	$7^{+0.015}_{-0}$	7.04 (0.277)	Caliper gauge
	EX	$(0.276^{+0.0006}_{-0})$		
Stem outer diameter mm (inch)	IN	$7^{-0.040}_{-0.035}$	6.92 (0.272)	Micro-meter for measuring outer diameter
	EX	$(0.276^{-0.0016}_{-0.0022})$		
Bush-to-stem clearance mm (inch)	IN	$0.040 \sim 0.070$ (0.0016 ~ 0.0028)	0.09 (0.004)	—
	EX	$0.045 \sim 0.075$ (0.0018 ~ 0.0030)		

(2) Replacing valve guide bush

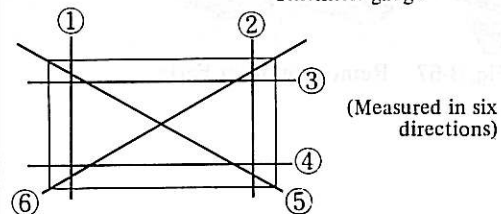
Bush projection height: 14.5 to 15.8 mm
(0.571 to 0.622 inch)

- ① Drive the valve guide bush out toward the combustion chamber side.
- ② Discard the old valve guide that has been driven out, since it can no longer provide snug fitting. Be sure to install a valve guide bush [O/S 0.03mm (0.0012 inch)] for replacement use.



(3) Checking cylinder head for cracks, damage, or distortion.

Allowable limit of distortion – 0.1mm
(0.0039 inch)
Grinding tolerance – 0.3mm (0.0118 inch)
(Specified height 126 ± 0.1)
Measuring instrument – Straightedge
Thickness gauge



(4) Checking lip-section of valve stem oil seal for damage

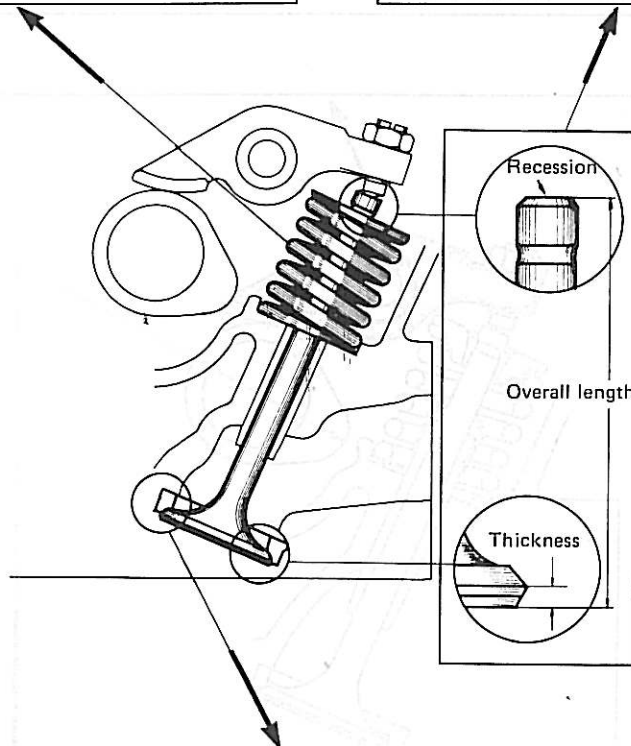
- ① Be certain not to reuse the valve stem oil seal that once has been removed from the engine. When assembling, make sure to use a new oil seal.
- ② See, page 3-45 for the valve stem oil seal installation procedure.

(5) Checking free length, squareness and tension as assembled of valve springs.

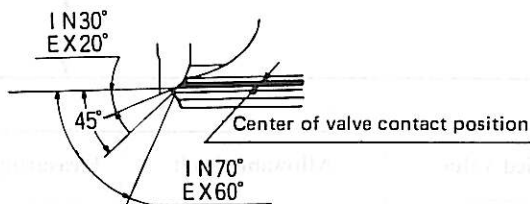
Item	Specified value	Allowable limit	Measuring instrument
Free length mm (inch)	43.3 (1.705)	42.0 (1.654)	Vernier calipers
Squareness mm (inch)	—	1.5 (0.059)	Surface plate and steel square
Tension as assembled kg (lb) [at assembled height of 34.9 mm (1.374 inch)]	29.9 ± 1.4 (65.9 ± 3.1)	25.7 (56.7)	Spring tester

(6) Checking thickness of valve head stock, recession in valve stem end, and overall length of valve.

Nomenclature		Specified value	Allowable limit	Measuring instrument
Valve head stock thickness mm (inch)	IN	1.2±0.3 (0.0472±0.012)	0.8 (0.031)	Vernier calipers
	EX	1.5±0.3 (0.059±0.012)	1.0 (0.039)	
Recession mm (inch)		—	0.4 (0.016)	
Overall length mm (inch)		101.65±0.3 (4.002±0.012)	100.85 (3.970)	



(7) Checking and refacing valve seats.



Seat contact width
Specified value: 1.4 ± 0.4mm
(0.055 ± 0.016 inch)
Allowable limit of valve seat recession:
0.5mm (0.020 inch)

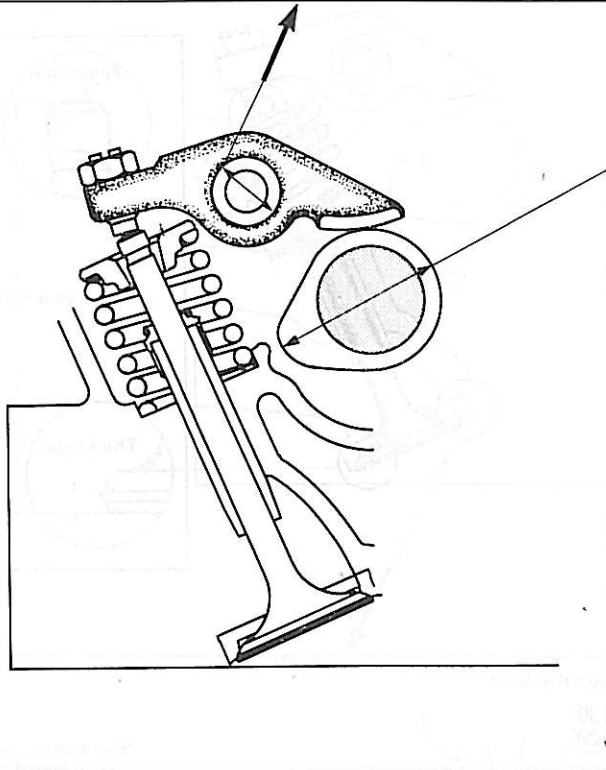
- ① In order to ascertain the valve seat width and position, thinly apply a film of red lead to the valve seat. Let the valve drop by its own weight onto the valve seat two or three times. Check the seat width and contact position by observing the thus-obtained red lead pattern.
- ② The valve reface operation should be performed as follows: First, use a 45-degree cutter to recondition the rough seat surface. Check the valve-to-valve seat contact position. Use a 30-degree cutter (a 20-degree cutter for the exhaust valve seat) or a 70-degree cutter (a 60-degree cutter for the exhaust valve seat)

so that the contact area comes at the center of the valve face and also the contact width becomes the specified valve at this point. After the valve seat has been ground by the cutters, carry out hand grinding of the valves, using valve grinding compound.

- ③ Before you begin refacing the valve seats, be sure to check the valve guide bushes for their wear condition. If the valve guide bushes should prove to be worn out beyond the tolerable limit, first replace these worn bushes. Then, proceed to perform the valve refacing operation.

(8) Checking valve arm-to-valve rocker shaft oil clearance

Nomenclature	Specified value	Allowable limit	Measuring instrument
Arm inner diameter mm (inch)	$16^{+0.018}_{-0}$ (0.630 $^{+0.0007}_{-0}$)	16.06 (0.6323)	Caliper gauge
Shaft outer diameter mm (inch)	$16^{-0.016}_{-0.042}$ (0.630 $^{-0.0006}_{-0.0017}$)	15.93 (0.6272)	Micrometer for measuring outer diameter
Arm-to-shaft oil clearance mm (inch)	0.016~0.060 (0.0006~0.0024)	0.09 (0.0035)	—

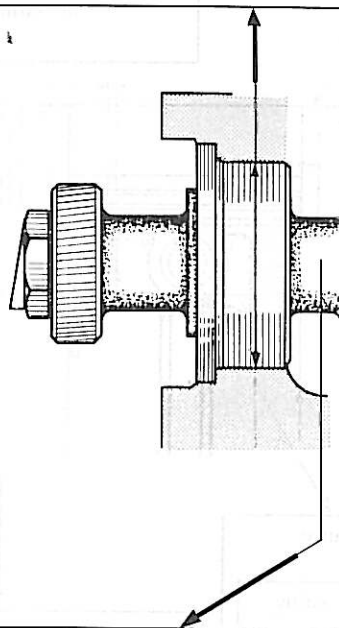


(9) Checking camshaft lobe height

Nomenclature	Specified value	Allowable limit	Measuring instrument
Cam lobe height mm [Overall height] (inch)	39.654 ± 0.05 (1.5612 ± 0.0020)	39.4 (1.5512)	Micrometer for measuring outer diameter

(10) Checking camshaft-to-cylinder head clearance

Nomenclature		Specified value	Allowable limit	Measuring instrument
Camshaft journal outer diameter mm (inch)	Front	$32.0_{-0.020}^{-0.040}$ (1.2598 $_{-0.0008}^{-0.0016}$)	31.92 (1.2567)	Micrometer for measuring outer diameter
	Center	$47.5_{-0.115}^{-0.090}$ (1.8701 $_{-0.0045}^{-0.0035}$)	47.34 (1.8638)	
	Rear	$48.5_{-0.085}^{-0.060}$ (1.9094 $_{-0.0033}^{-0.0024}$)	48.37 (1.9043)	
Cylinder head journal section inner diameter mm (inch)	Front	$32.0_{+0.020}^{+0.045}$ (1.2598 $_{+0.0008}^{+0.0018}$)	32.11 (1.2642)	Caliper gauge
	Center	$47.5_{+0}^{+0.025}$ (1.8701 $_{+0}^{+0.0010}$)	47.59 (1.8736)	
	Rear	$48.5_{+0}^{+0.025}$ (1.9094 $_{+0}^{+0.0010}$)	48.59 (1.9130)	
Camshaft-to-cylinder head oil clearance mm (inch)	Front	0.04~0.09 (0.0016~0.0035)	0.14 (0.0055)	—
	Center	0.09~0.14 (0.0035~0.0055)	0.19 (0.0075)	
	Rear	0.06~0.11 (0.0024~0.0043)	0.16 (0.0063)	

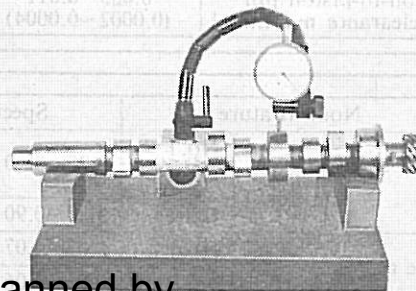


(11) Checking camshaft for runout

Support the camshaft at its front and rear journals with a Vee-shaped block. Measure the camshaft runout at the center journal section.

Allowable Limit of Runout:

0.03mm (0.0012 inch)



2. Cylinder Block Related Parts

(1) Checking cylinder-to-piston oil clearance

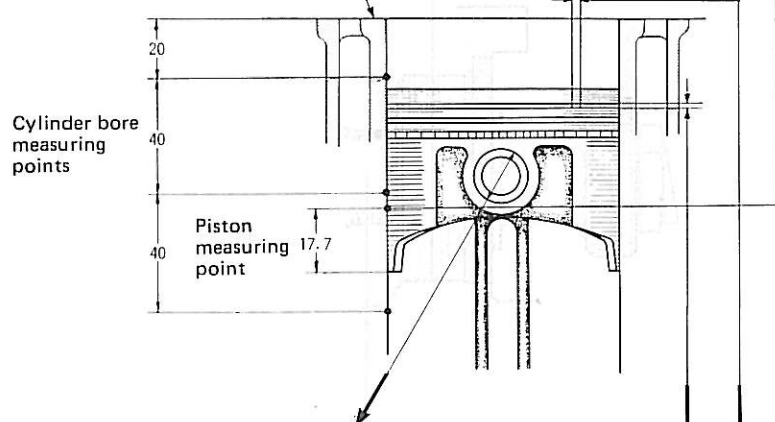
Nomenclature	Specified value	Allowable limit	Measuring instrument
Cylinder bore measurement (Measure bore diameter at specified six measuring points, including those in thrust and longitudinal directions.) mm (inch)	$76^{+0.01}_{-0} (2.9921^{+0.0012}_{-0})$	0.10 (0.0039)	Cylinder gauge
Piston outer diameter measurement (Measure piston outer diameter at specified measuring point in thrust direction.) mm (inch)	$76^{-0.025}_{-0.055} (2.9921^{-0.0010}_{-0.0022})$	—	Micrometer for measuring outer diameter
Cylinder-to-piston clearance mm (inch)	0.045~0.065 (0.0018~0.0026)	0.12 (0.0047)	Thickness gauge

NOTE: When it becomes necessary to carry out cylinder boring, first use [0.5mm (0.020 inch)] O/S pistons for replacement use.

Piston outer diameter specified value:
O/S 0.5mm (0.020 inch)
 $76.5^{-0.025}_{-0.055} (3.0118^{-0.0010}_{-0.0022})$

(2) Checking cylinder block for cracks, damage, or distortion

Allowable limit of distortion – 0.05mm
(0.0020 inch)
Grinding tolerance – 0.3mm (0.012 inch)
[Specified height 201 ± 0.15 mm]
(7.91 ± 0.0059 inches)
Measuring instruments – Straightedge
Thickness gauge

(3) Checking piston-to-piston pin oil clearance
(Reference information)

Nomenclature	Specified value
Piston pin bore diameter mm (inch)	$18^{+0.008}_{-0.001} (0.7087^{+0.0003}_{-0.0004})$
Piston pin mm (inch)	$18^{+0}_{-0.009} (0.7087^{+0}_{-0.0004})$
Piston-to-piston pin oil clearance mm (inch)	0.005~0.011 (0.0002~0.0004)

(4) Checking piston ring end gaps and side clearances

NOTE: The piston ring end gap must be measured by inserting each piston ring into its cylinder bore down to a lower part where very little wear exists and by squaring the piston ring using the head section of the piston placed upside down.

Nomenclature		Specified value	Allowable limit	Measuring instrument
Ring end gap mm (inch)	No.1	0.20~0.40 (0.0079~0.0157)	0.7 (0.0276)	Thickness gauge
	No.2			
	Oil ring	0.20~0.90 (0.0079~0.0354)	1.3 (0.0512)	
Side clearance mm (inch)	No.1	0.03~0.07 (0.0012~0.0028)	0.12 (0.0047)	Thickness gauge
	No.2	0.02~0.06 (0.0008~0.0024)	0.12 (0.0047)	
	Oil ring	—	—	

(5) Checking crankshaft for runout or wear

- ① Measure the crankshaft runout at the crankshaft journal No.3.

Allowable Limit of Runout:

0.03mm (0.0012 inch)

- ② Inspect and measure the main and crankpin journals of the crankshaft for damage or uneven wear (out-of-roundness and taper). The measurement should be made at various points over the entire circumference.

Allowable Limit of Out-of-

**Roundness and Taper: 0.02mm
(0.0008 inch)**

- ③ If the main and crankpin journals of the crankshaft should show excessive scores or be severely burned out, or if the uneven wear (out-of-roundness and taper) should exceed the tolerable limit, the crankshaft must be reground so that under-sized bearings may be employed.

Before the crankshaft is ground, it is necessary to remove the balance shaft drive gear from the crankshaft, as follows.

Removal

Press the balance shaft drive gear off, using the special tool (09253-87201) in conjunction with a press.

Installation

Press the balance shaft drive gear into position, using the special tools (09506-87303 and 09253-87201) in conjunction with a press.

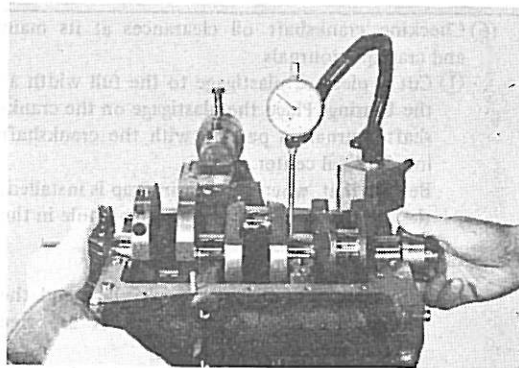


Fig. 3-58 Measuring Crankshaft Runout

Crankshaft Finishing Dimensions

Bearing size	Main journal outer diameter finishing dimensions mm (inch)	Crankpin journal outer diameter finishing dimensions mm (inch)
Repair STD	41.976~42.000 (1.6526~1.6535)	39.976~40.000 (1.5739~1.5748)
U/S 0.25	41.732~41.742 (1.6430~1.6434)	39.732~39.742 (1.5642~1.5646)
U/S 0.50	41.482~41.492 (1.6331~1.6335)	39.482~39.492 (1.5544~1.5548)

NOTE: It is mandatory to grind accurately the corner sections of the main and crankpin journals to a radius of 0.25R.

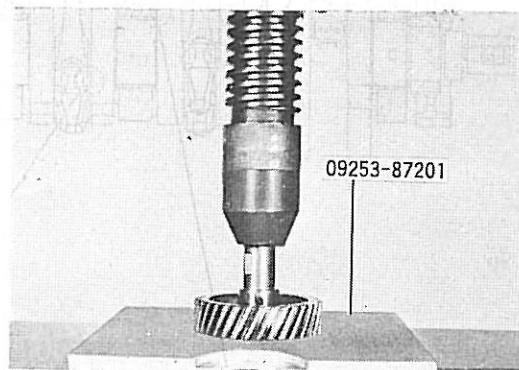
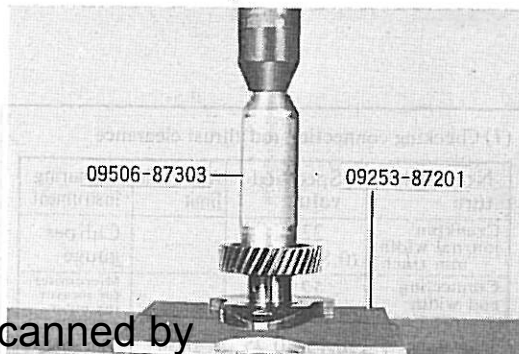


Fig. 3-59 Removing Balance Shaft Drive Gear



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(6) Checking crankshaft oil clearances at its main and crankpin journals

- ① Cut a piece of plastigage to the full width as the bearing. Place the plastigage on the crankshaft journal in parallel with the crankshaft longitudinal center.

Be sure that, when the bearing cap is installed, the plastigage will not be at the oil hole in the journal.

NOTE:

1. Ensure that the measuring place and the backside of the bearing insert are free from oil.
 2. Place the plastigage on the side where the weight of the crankshaft is not applied.
 - ② Position the crankshaft bearing and bearing cap. And tighten the bearing cap to the specified torque.
- Be certain not to turn the crankshaft with the plastigage in place.

Crankshaft Bearing Cap

Tightening Torque: 5.4 to 6.6 kg-m
(39.1 to 47.7 ft-lb)

Connecting Rod Bearing Cap

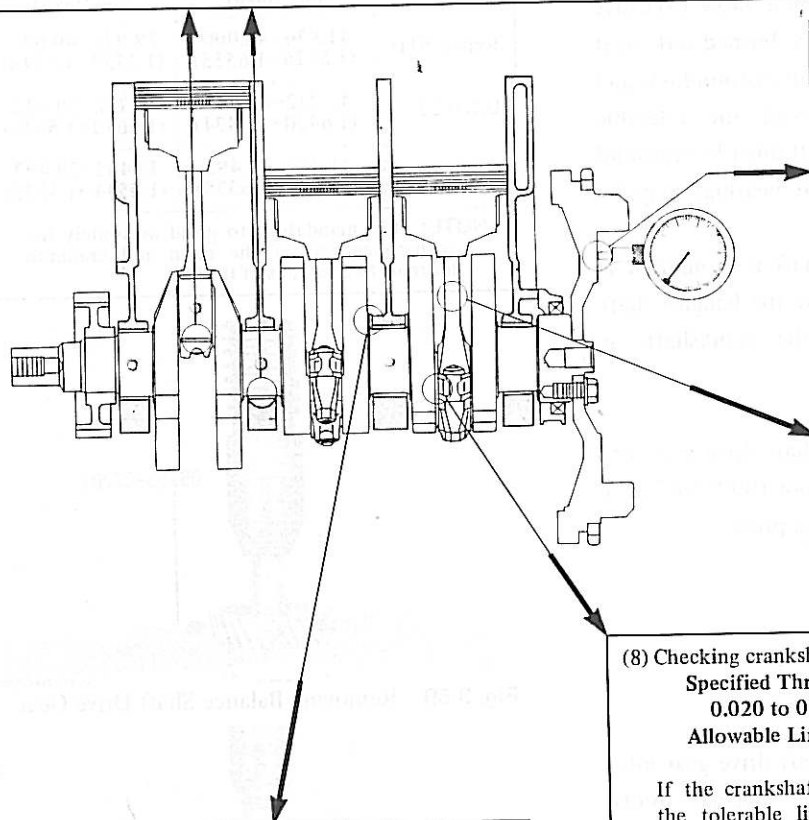
Tightening Torque: 2.1 to 2.9 kg-m
(15.2 to 21.0 ft-lb)

- ③ Remove the bearing cap. Measure the width of the squeezed-out plastigage, using the scale printed on the plastigage's envelope. The measurement should be made at the widest point of the flattened plastigage.
- Nevertheless, care must be exercised as to the difference in dimension at both ends of the plastigage.

Specified Oil Clearance: 0.020 to 0.044 mm
(0.0008 to 0.0017 inch)

Allowable Limit of Oil Clearance:
0.07 mm (0.0028 inch)

- ④ If the oil clearances of the bearings have exceeded the tolerable limit, replace the bearings with suitable ones.



(9) Checking flywheel

If the flywheel should exhibit any excessive damage or if the runout should exceed the tolerable limit, recondition or replace such flywheel.

Allowable Limit of Runout: 0.10 mm
(0.0039 inch)

(10) Checking connecting rod for bend and twist

Allowable Limit of Bend: 0.05 mm
(0.0020 inch)

Allowable Limit of Twist: 0.05 mm
(0.0020 inch)

(7) Checking connecting rod thrust clearance

Nomenclature	Specified value	Allowable limit	Measuring instrument
Crankpin journal width mm (inch)	22 ⁻⁰ _{+0.05} (0.8661 ⁻⁰ _{+0.0020})	—	Caliper gauge
Connecting rod width mm (inch)	22 ^{-0.15} _{-0.20} (0.8661 ^{-0.0059} _{-0.0079})	—	Micrometer for measuring outer diameter
Thrust clearance mm (inch)	0.15~0.25 (0.0059~0.0098)	0.30 (0.0118)	Thickness gauge

(8) Checking crankshaft thrust clearance

Specified Thrust Clearance:
0.020 to 0.220 mm (0.0008 to 0.0087 inch)

Allowable Limit of Thrust Clearance:
0.30 mm (0.0118 inch)

If the crankshaft thrust clearance has exceeded the tolerable limit, replace the existing thrust washer with a suitable washer which should be selected from among those listed in the table below.

Kind	Thickness mm (inch)
Repair STD	2.000 ^{-0.010} _{-0.060} (0.0787 ^{-0.0004} _{-0.0024})
O/S 0.125	2.125 ^{-0.010} _{-0.060} (0.0837 ^{-0.0004} _{-0.0024})
O/S 0.250	2.250 ^{-0.010} _{-0.060} (0.0886 ^{-0.0004} _{-0.0024})

(11) Checking thrust and oil clearances of balance shaft

- ① Measure the thrust clearance of the balance shaft. The measurement should be conducted, after the thrust plate has been tightened to the specified torque.

Specified Tightening Torque:

1.0 to 1.5 kg-m
(7.2 to 10.8 ft-lb)

Specified Thrust Clearance:

0.03 to 0.13mm
(0.0012 to 0.0051 inch)

Allowable Limit of Thrust

Clearance: 0.20mm (0.0079 inch)

- ② Measure the oil clearance between the balance shaft and the bearing.

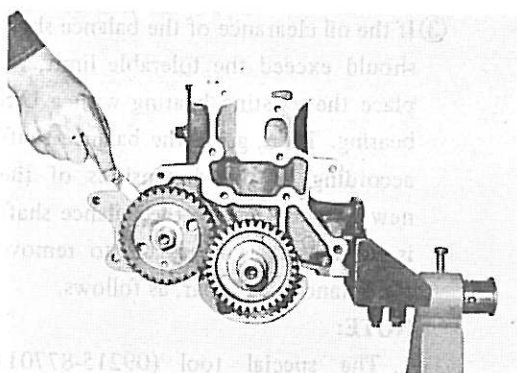


Fig. 3-61 Measuring Balance Shaft Thrust Clearance

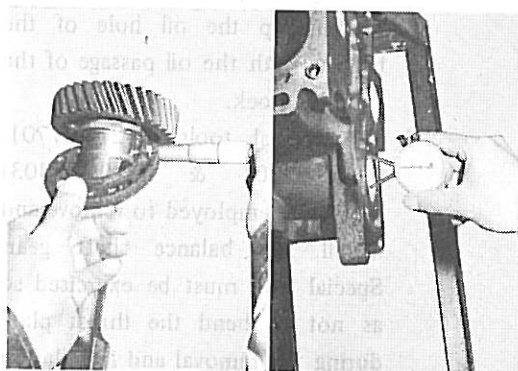


Fig. 3-62 Measuring Balance Shaft Oil Clearance

Nomenclature		Specified value	Allowable limit	Measuring instrument
Bearing inner diameter mm (inch)	Front	45.000 ~ 45.025 (1.7717 ~ 1.7726)	—	Caliper gauge
	Rear	34.000 ~ 34.025 (1.3386 ~ 1.3396)	—	Caliper gauge
Shaft outer diameter mm (inch)	Front	44.959 ~ 44.975 (1.7700 ~ 1.7707)	—	Micrometer for measuring outer diameter
	Rear	33.959 ~ 33.975 (1.3370 ~ 1.3376)	—	Micrometer for measuring outer diameter
Oil clearance	mm (inch)	0.025 ~ 0.066 (0.0010 ~ 0.0026)	0.1	—

- ③ If the oil clearance of the balance shaft should exceed the tolerable limit, replace the existing bearing with a U/S bearing. Then, grind the balance shaft according to the dimensions of the new bearing. Before the balance shaft is ground, it is necessary to remove the balance shaft gear, as follows.

NOTE:

1. The special tool (09215-87701) should be employed to remove and install the balance shaft bearing.

When driving the balance shaft bearing into position, make certain to line up the oil hole of the bearing with the oil passage of the cylinder block.

2. The special tools (09214-87701, 09253-87201 & 09506-87303) should be employed to remove and install the balance shaft gear. Special care must be exercised so as not to bend the thrust plate during the removal and installation operation.

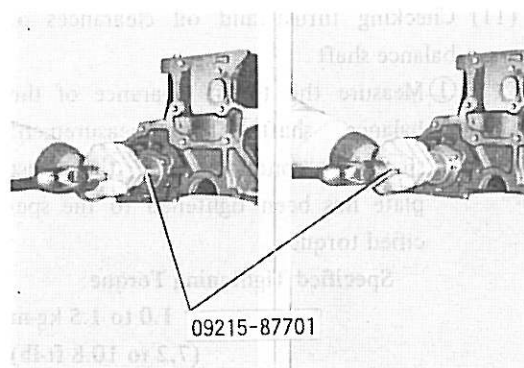


Fig. 3-63 Replacing Balance Shaft Bearing

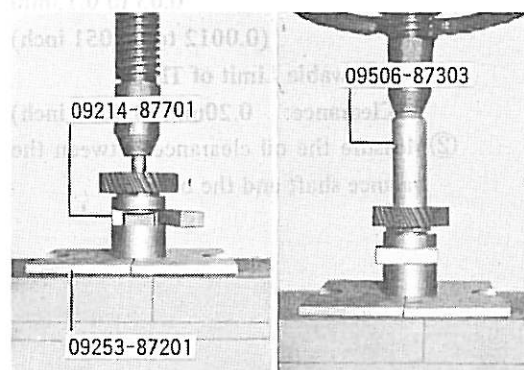


Fig. 3-64 Replacing Balance Shaft Gear

Bearing size		Bearing inner diameter mm (inch)	Shaft outer diameter finishing dimensions mm (inch)
U/S 0.5	Front	44.526~44.556 (1.7530~1.7542)	44.490~44.500 (1.7516~1.7520)
	Rear	33.526~33.556 (1.3199~1.3211)	33.490~33.500 (1.3185~1.3189)

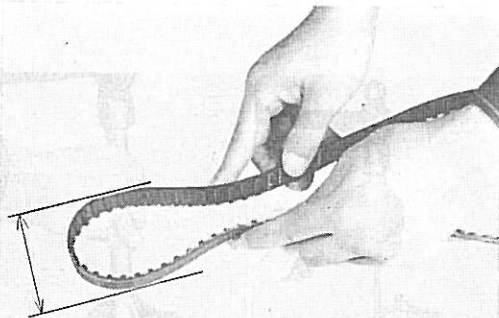
(12) Checking timing belt for damage

Check the timing belt for signs of tooth separation, tooth deformation, or damage.

NOTE:

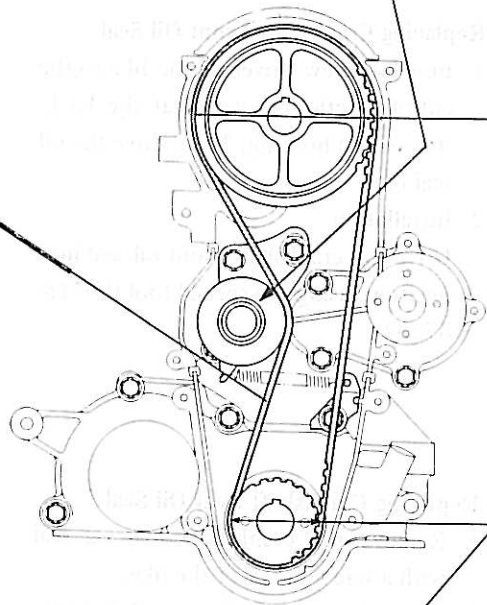
1. The timing belt contains glass fibers as ingredient. Glass fibers have superior durability against tensile force. However, when these glass fibers are once bent, they are susceptible to breakage, resulting in greatly-reduced strength. Therefore, when handling the timing belt, exercise caution to avoid damaging it.
2. If oils or water should get to the timing belt, the rubber ingredient may swell. Hence, make sure that the timing belt is kept absolutely free from oils or water.
3. If the timing belt has been exposed to water continually for a certain period of time because of a leaky water pump, etc., be certain to replace such timing belt.
4. If the timing belt has swollen due to oil stuck on the belt, make sure to replace such timing belt.
5. If the timing belt has swollen due to oil stuck to the timing belt owing to the seizure of the camshaft and so forth, be sure to replace such timing belt.
6. When handling the timing belt, be very careful not to bend the timing belt so as to form a small radius.

Bending Under No Circumstances, Should Width: Timing Belt Be Bent to Form Width of Less Than 25mm (0.98 inch)



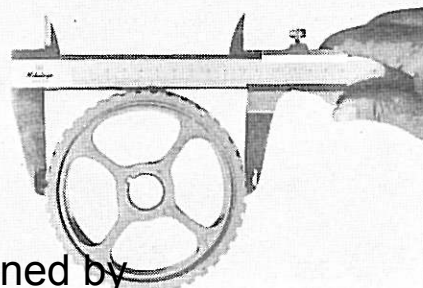
(13) Checking timing belt tensioner

Turn the timing belt tensioner bearing by one's hand. Check to see if the bearing emanates abnormal sound. Moreover, inspect to see whether any score or damage, etc. is present at the belt-contact area.



(14) Checking timing belt pulleys for wear

Nomenclature	Specified value	Allowable limit	Measuring instrument
Crankshaft pulley mm (inch)	59.26 ^{+0.1} ₋₀ (2.3331 ^{+0.0039} ₋₀)	59.2 (2.3307)	Vernier calipers
Camshaft pulley mm (inch)	119.9 ^{+0.14} _{-0.04} (4.7205 ^{+0.0055} _{-0.0016})	119.8 (4.7165)	



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NOT FOR RESALE

- (15) Replacement procedure for oil seal related parts

NOTE: After the oil seal has been installed, be sure to apply engine oil to the lip section of the oil seal.

Replacing Camshaft Oil Seal

- 1 Remove the camshaft oil seal with a screw driver or the like.
- 2 Installation
Drive the camshaft oil seal into position, using the special tool (09515-87202).

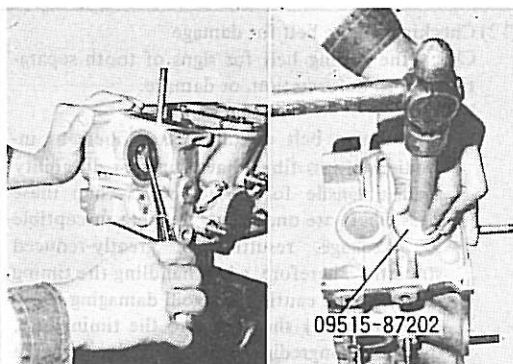


Fig. 3-65 Replacing Camshaft Oil Seal

Replacing Crankshaft Front Oil Seal

- 1 Insert a screw driver or the like to the cut-off section provided at the back-side of the housing. Then, drive the oil seal out.
- 2 Installation
Drive the crankshaft front oil seal into position, using the special tool (09515-87202).

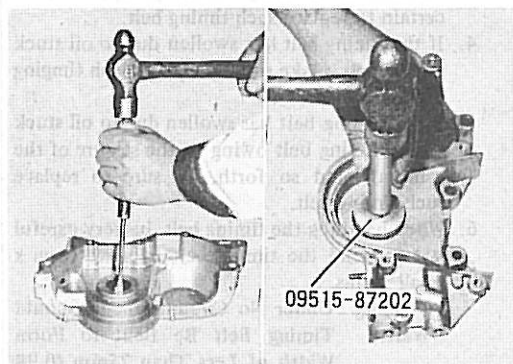


Fig. 3-66 Replacing Crankshaft Front Oil Seal

Replacing Crankshaft Rear Oil Seal

- 1 Remove the crankshaft rear oil seal with a screw driver or the like.
- 2 Drive the crankshaft rear oil seal into position, using the special tool (09608-87301).

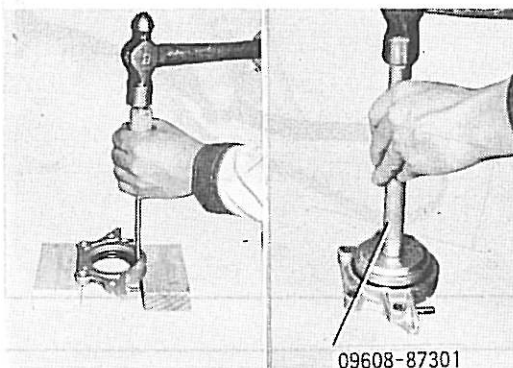


Fig. 3-67 Replacing Crankshaft Rear Oil Seal

ASSEMBLY OF ENGINE

NOTE:

1. Be sure to thoroughly clean those parts to be assembled.
2. As for rotating or sliding sections, make certain to apply a film of new engine oil, previous to reassembly.
3. When reassembling the engine, use only new gaskets, "O" rings and so forth.
4. In order to prevent water or oil leakage, use liquid bond sealer, as required.
5. Make certain that attaching bolts, nuts, washers and so forth are installed correctly at respective places.
Torque bolts, nuts and the like, to specifications. Especially, particular attention should be exercised as to stud bolts that are installed on aluminum-alloy components in order that they may not be overtorqued.
6. As regards engine components where mate marks were scribed at the time of disassembly, they should be assembled properly so as to assure correct combination. Moreover, in the case of bearings and pistons, etc., special care must be taken to ensure that they are correctly mated with their respective clearances undisturbed.

Assembly of Cylinder Block Related Parts

1. Assemble the piston and connecting rod, following the procedure given below.

Special Tools

(Main body of 09221-25011 and 09221-87702)

- (1) Attach the fitting piece ② onto the stand ①. Place the bar (large) ④ into position. Ensure that the fitting piece is flush with the pin-stepped section.
- (2) Assemble the connecting rod in such a way that the front mark located at the side of the connecting rod and the front mark provided on the top of the piston come on the same side.

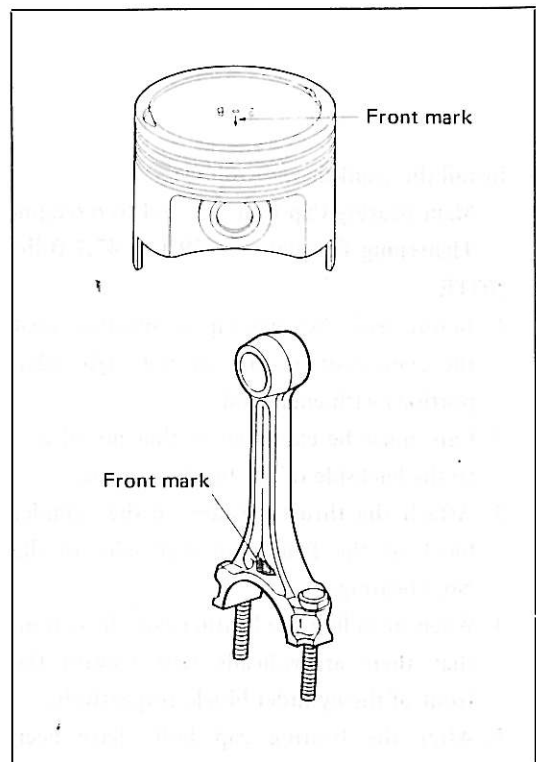


Fig. 3-68 "Front" Marks on Piston and Connecting Rod

(3) Insert the spring ③ and bar (large) ④ into the stand ①.

(4) Place the bar (small) ⑤ into the pin. Then, press the piston pin into position, using a press.

NOTE: After the connecting rod has been assembled in the piston, ensure that the piston can move freely, when tested with the connecting rod held by one's hand.

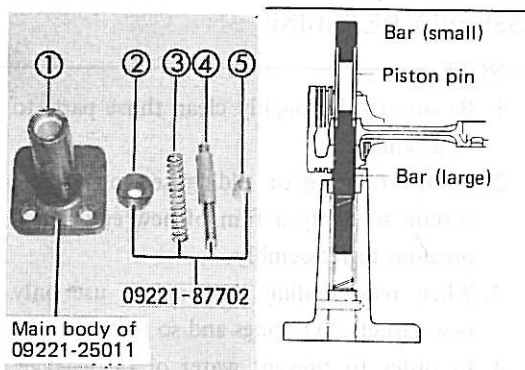


Fig. 3-69 Assembling Piston Pin

2. Install the piston rings.

The piston rings should be installed in the sequence of the oil ring, compression rings No.2 and No.1.

NOTE: When installing these piston rings, make sure that the marks stamped by the manufacturer face upward, respectively.

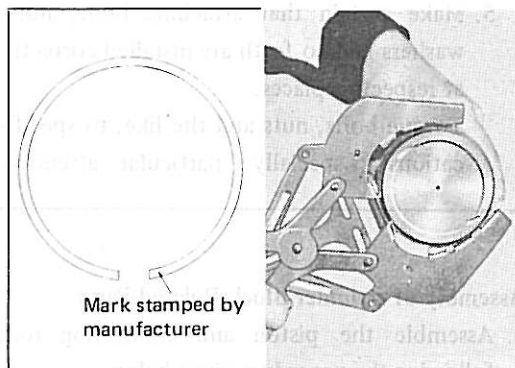


Fig. 3-70 Installing Piston Rings

3. Install the crankshaft as follows.

Main Bearing Cap Bolt 5.4 to 6.6 kg-m
Tightening Torque: (39.1 to 47.7 ft-lb)

NOTE:

1. Before each bearing cap is installed, coat the crankshaft bearing cap bolts (threaded portion) with engine oil.
2. Care must be exercised so that no oil gets to the backside of the bearing inserts.
3. Attach the thrust washers on the cylinder block at the front and rear sides of the No.3 bearing.
4. When installing the bearing caps, be certain that their arrow-heads face toward the front of the cylinder block, respectively.
5. After the bearing cap bolts have been torqued to the specification, ensure that the crankshaft can rotate lightly.

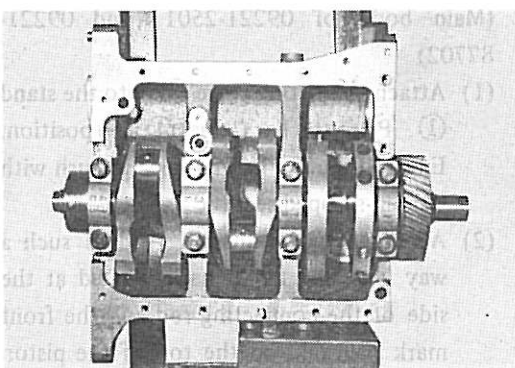


Fig. 3-71 Installing Crankshaft

4. Install the connecting rod and piston assembly, following the procedure given below.

(1) Thoroughly clean the connecting rod bearings and those places where the bearings are to be fitted.

Place each bearing in the connecting rod and cap, respectively.

(2) Coat the bearings with engine oil.

Position the piston ring gaps around the piston's circumference in such a way that the ring gap ends will not coincide with the thrust sides or the piston boss sections, as indicated in Fig. 3-72.

Push the connecting rod and piston assembly into the cylinder block, using the special tool (4610-07). Be sure that the front mark provided on the top of each piston faces toward the front of the engine.

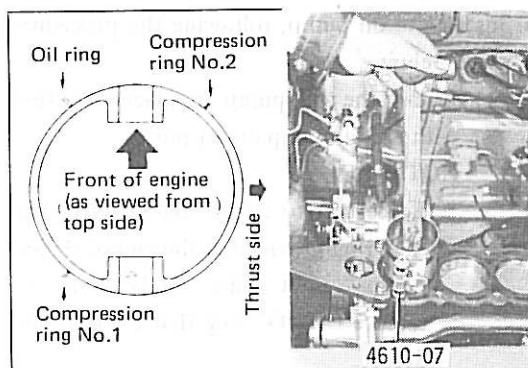



Fig. 3-72 Installing Piston

NOTE: When installing the connecting rod and piston assembly into the cylinder bore, utmost care must be exercised to ensure that the connecting rod bolts will not touch the crankpin journal. Failure to observe this caution will cause damage to the crankpin journal surface.

(3) Install the cap on the connecting rod, making sure that the front mark (projected) on the bearing cap is aligned with the  mark provided on the connecting rod.

Connecting Rod Cap Nut Tightening Torque: 2.1 to 2.9 kg-m
(15.2 to 21.0 ft-lb)

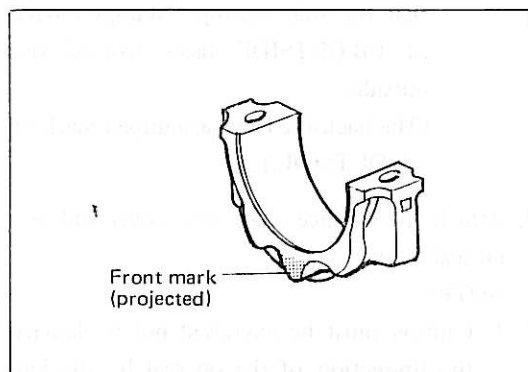


Fig. 3-73 Installing Connecting Rod Cap

5. Install the balance shaft as follows.

Align the stamped mark on the balance shaft drive gear with the stamped mark on the balance shaft gear. Then secure the balance shaft with a hexagon rod wrench (commercially-available) having a width-across-flats of 5mm.

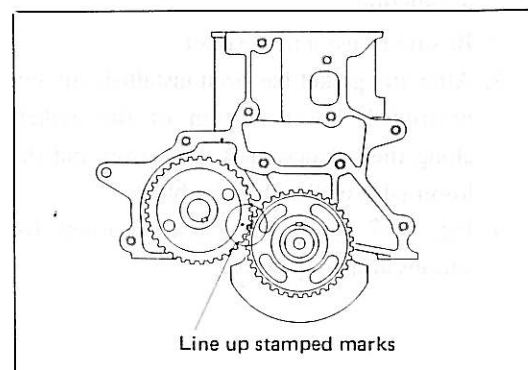


Fig. 3-74 Installing Balance Shaft

6. Install the oil pump, following the procedure given below.

- (1) Install the oil pump in place, together with the oil pump outlet pipe.

NOTE:

1. Be certain to apply engine oil to the "O" ring provided at the end of the oil pump outlet pipe. Make sure to replace the "O" ring that exhibits any defect.
2. Secure the oil pump proper, using a hexagon rod wrench (commercially-available) having a width-across-flats of 6mm.

- (2) First attach the chain over the sprocket at the balance shaft side. Then, attach the chain over the sprocket at the oil pump side. Install the sprocket to the oil pump shaft.

NOTE: The sprocket at the oil pump side should be attached in such a way that the side bearing a stamped mark of CB-OUTSIDE faces toward the outside.

(The backside bears a stamped mark of AB-OUTSIDE.)

7. Attach the balance shaft gear cover and rear oil seal retainer.

NOTE:

1. Caution must be exercised not to damage the lip-section of the oil seal by the key groove of the crankshaft during the installation.
2. Be sure to use a new gasket.
3. After the gasket has been installed, cut any protruded, lower portion of the gasket, along the balance shaft gear cover and the lower edge of the cylinder block.
4. Fig. 3-77 shows respective locations for various attaching bolts.



Fig. 3-75 Installing Oil Pump

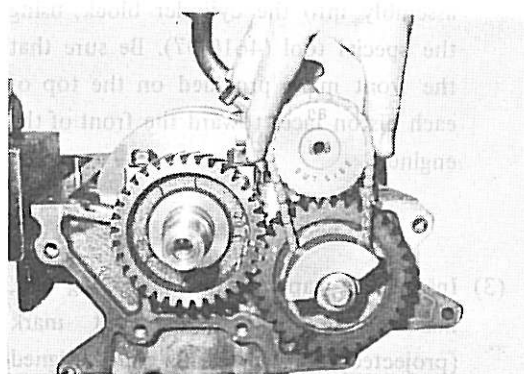


Fig. 3-76 Installing Oil Pump Chain

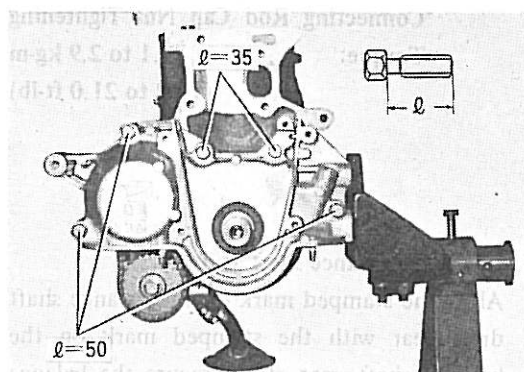


Fig. 3-77 Attaching Balance Shaft Gear Cover

8. Install the oil pan.

(See page 6-10 for the installation procedure.)

- (1) Replace the old oil pan gasket with a new one. Prior to the installation, apply silicon bond sealer to the gasket.

- (2) Place the gasket on the cylinder block.

And attach the oil pan.

Retaining Bolt **0.4 to 0.7 kg-m****Tightening Torque:** **(2.9 to 5.1 ft-lb)**

9. Install the water pump.

NOTE: If the dust seal at each top section of the water pump, timing belt tensioner spacer and balance shaft gear cover should come off, affix them into position, using a bond sealer.

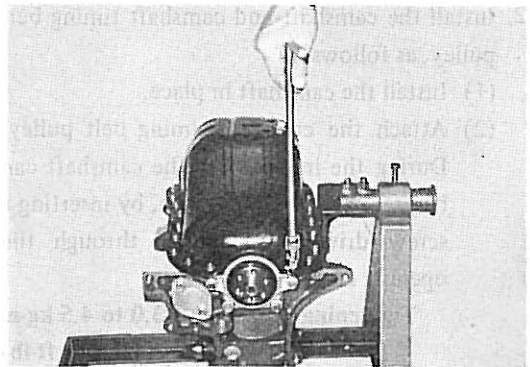


Fig. 3-78 Attaching Oil Pan

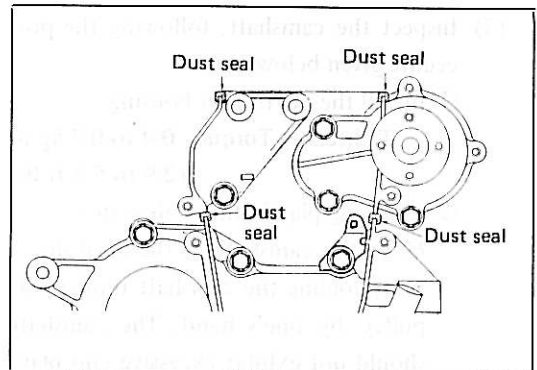


Fig. 3-79 Installing Dust Seals

Assembly of Cylinder Head Related Parts

1. Assemble the valve related parts, following the procedure given below.

- (1) Place the plate washer.
- (2) Position the valve into the valve guide bush in the cylinder head.
- (3) Fit a new valve stem oil seal, using the special tool (09201-87701).

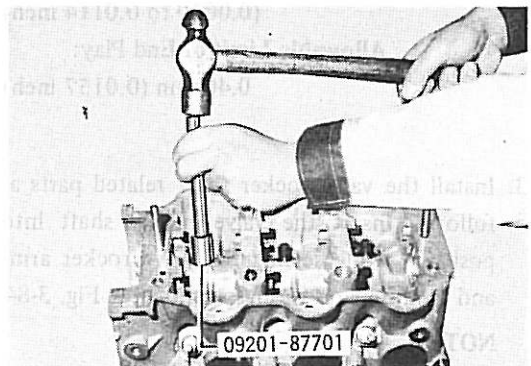


Fig. 3-80 Fitting Valve Stem Oil Seal

- (4) Install the compression spring and valve spring retainer in this sequence. And install the valve spring retainer locks with the special tool (09202-87701).

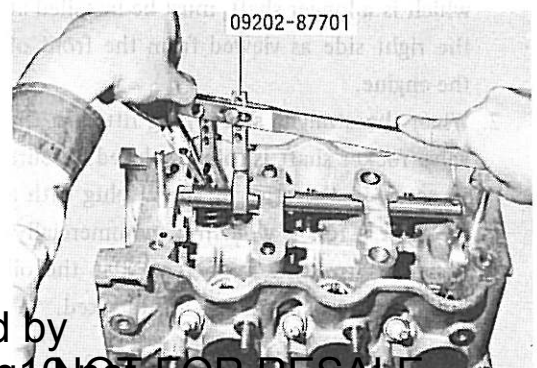


Fig. 3-81 Installing Valve Spring Retainer Locks

2. Install the camshaft and camshaft timing belt pulley, as follows.

- (1) Install the camshaft in place.
- (2) Attach the camshaft timing belt pulley. During the installation, the camshaft can be prevented from rotation, by inserting a screw driver or the like through the opening of the pulley.

Tightening Torque: 3.0 to 4.5 kg-m
(21.7 to 32.5 ft-lb)

- (3) Inspect the camshaft, following the procedure given below.

- ① Install the distributor housing.

Tightening Torque: 0.4 to 0.7 kg-m
(2.9 to 5.1 ft-lb)

- ② Checking play in thrust direction

Move the camshaft in the axial direction, holding the camshaft timing belt pulley by one's hand. The camshaft should not exhibit excessive end play.

Specified End Play:
0.050 to 0.290 mm
(0.0020 to 0.0114 inch)

Allowable Limit of End Play:
0.40 mm (0.0157 inch)

3. Install the valve rocker shaft related parts as follows. Insert the valve rocker shaft into position, while setting the valve rocker arms and compression springs as shown in Fig. 3-84.

NOTE:

1. The valve rocker shaft for the exhaust side, which is a longer shaft, must be installed at the right side as viewed from the front of the engine.
2. When the straight screw plug fitted in the valve rocker shaft is to be replaced, be sure to screw-in the straight screw plug with a hexagon rod wrench (commercially-available) to such an extent that the oil hole in the rocker shaft is not blocked.

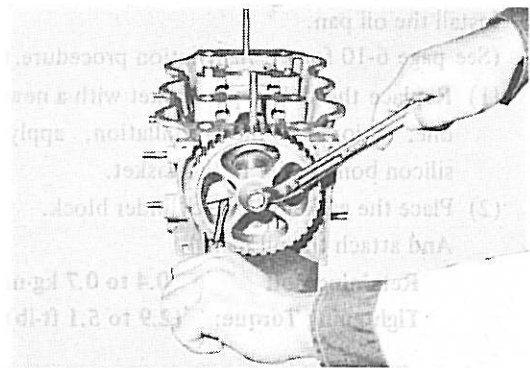


Fig. 3-82 Installing Camshaft Timing Belt Pulley

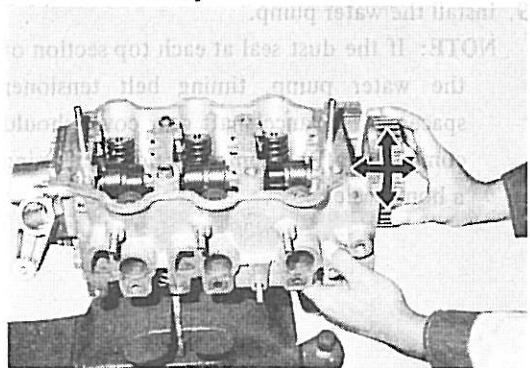


Fig. 3-83 Checking Camshaft End Play

- ③ Rotate the pulley to see if the camshaft can rotate freely.
- ④ Remove the distributor housing.

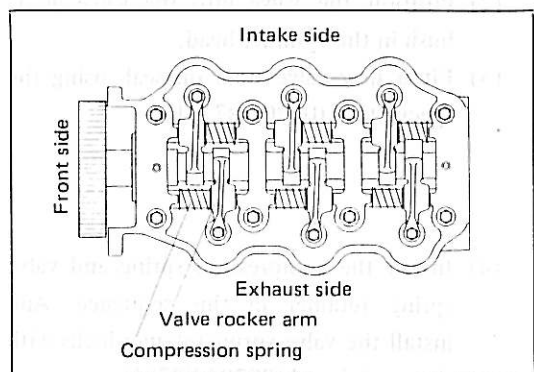


Fig. 3-84 Installing Valve Rocker Shaft

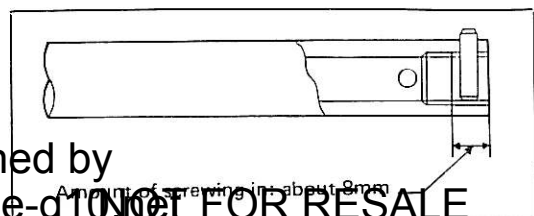


Fig. 3-85 Installing Straight Screw Plug

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4. Attach the distributor housing.

Tightening Torque: 0.4 to 0.7 kg-m
(2.9 to 5.1 ft-lb)

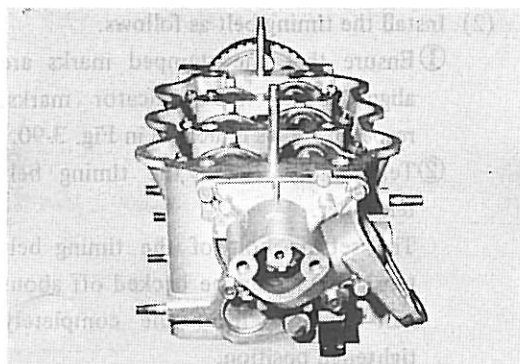


Fig. 3-86 Attaching Distributor Housing

5. Mount the cylinder head on the cylinder block.

- (1) During the cylinder head mounting operation, none of the pistons should come at the top dead center position in order that the pistons may not interfere with the valves.

NOTE: Be sure to align the stamped mark on the camshaft timing belt pulley with the indicator of the cylinder head.

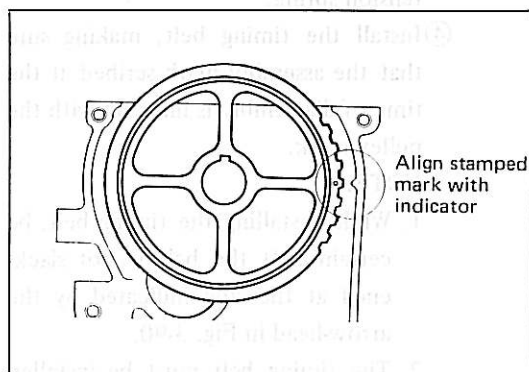


Fig. 3-87 Aligning Mate Marks

- (2) Make sure to use a new cylinder head gasket. And torque the cylinder head bolts to the specifications, following the tightening sequence as indicated in Fig. 3-88.

Cylinder Head Bolt 5.0 to 6.0 kg-m
Tightening Torque: (36.2 to 43.4 ft-lb)

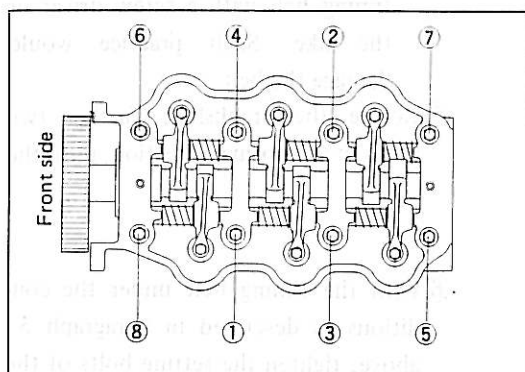


Fig. 3-88 Cylinder Head Bolt Tightening Sequence

6. Install the timing belt related parts, following the procedure given below.

- (1) Install the crankshaft timing belt pulley.

NOTE: Ensure that the flanges are installed only in the correct direction.

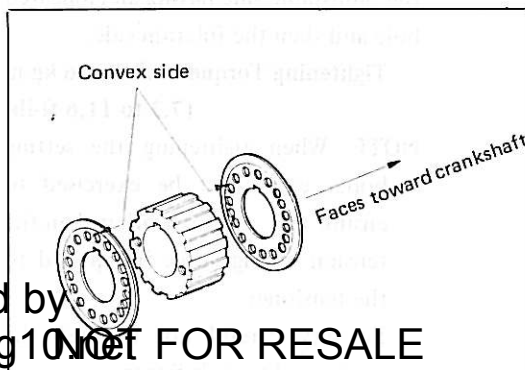


Fig. 3-89 Installing Crankshaft Timing Belt Pulley Flanges

(2) Install the timing belt as follows.

① Ensure that the stamped marks are aligned with the indicator marks, respectively, as indicated in Fig. 3-90.

② Temporarily attach the timing belt tensioner.

The setting bolt of the timing belt tensioner should be backed off about half a turn from the completely tightened position.

③ Install the tension spring bracket and tension spring.

④ Install the timing belt, making sure that the assembly mark scribed at the time of disassembly is lined up with the pulley mark.

NOTE:

1. While installing the timing belt, be certain that the belt is not slackened at the side indicated by the arrow-head in Fig. 3-90.

2. The timing belt must be installed by one's hand. Never try to pry the timing belt with a screw driver or the like. Such practice would damage the belt.

⑤ Rotate the crankshaft further two turns in the normal direction, until the

⑥ With the timing belt under the conditions as described in paragraph 5 above, tighten the setting bolts of the timing belt tensioner in this order; first the adjustable side having an elongated hole and then the fulcrum side.

**Tightening Torque: 1.0 to 1.6 kg-m
(7.2 to 11.6 ft-lb)**

NOTE: When tightening the setting bolts, care must be exercised to ensure that no force other than the tension spring force be applied to the tensioner.

(c) Be very careful not to push the tensioner by one's finger.

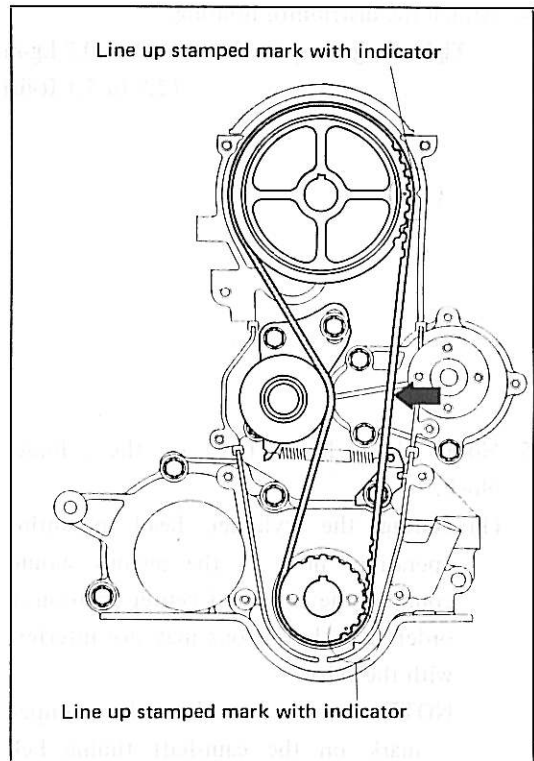


Fig. 3-90 Installing Timing Belt

piston comes again at the top dead center. Make sure that the timing belt pulley assumes again the correct relationship.

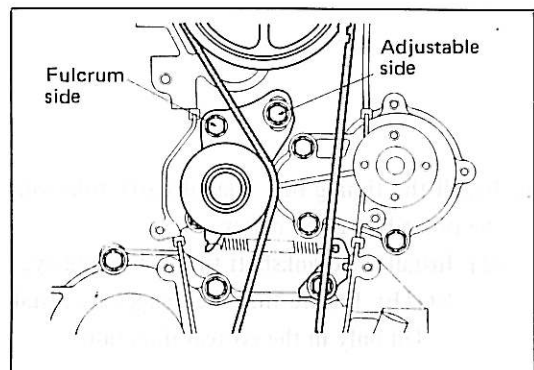


Fig. 3-91 Timing Belt Tensioner Tightening Sequence

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7. Adjust the valve clearances to specifications. Carry out the check and adjustment of valve clearances, with the piston of the No.1 cylinder set at the end of the compression stroke as well as at the tops of the intake and exhaust strokes, respectively. See the table below for the adjustable valves for the respective positions of the No.1 piston.

Crank angle	Cylinder	1	2	3
When No.1 piston is set at end of compression stroke	IN	○		○
	EX	○	○	
When No.1 piston is set at tops of intake and exhaust strokes, respectively	IN		○	
	EX			○

8. Attach the timing belt cover ①.

9. Install the crankshaft pulley ②.

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

10. Attach the cylinder head cover ③.

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

11. Install the water pump pulley ④.

12. Install the spark plugs ⑤.

Reference Information

Tightening Torque: 1.8 to 2.4 kg-m
(13.0 to 17.4 ft-lb)

13. Attach the water inlet pipe ⑥.

14. Mount the exhaust manifold ⑦.

NOTE: Be sure to use a new gasket.

Tightening Torque: 1.0 to 1.6 kg-m
(7.2 to 11.6 ft-lb)

15. Install the alternator ⑧.

16. Install the "V" belt ⑨.

Specified Deflection of "V" Belt

[With a Force of 8kg (17.6 lb) applied]

17. Install the fuel pump.

NOTE:

1. Make sure to use a new fuel pump gasket.
2. Ensure that the fuel pump push rod is fitted properly in place.

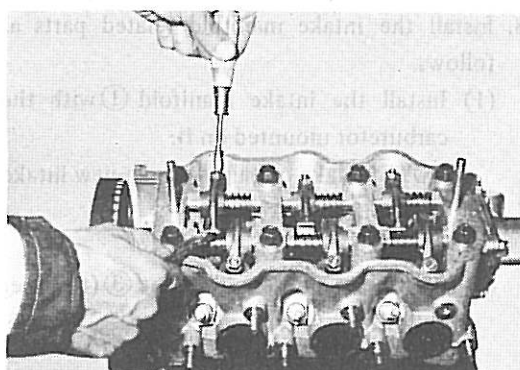


Fig. 3-92 Adjusting Valve Clearances

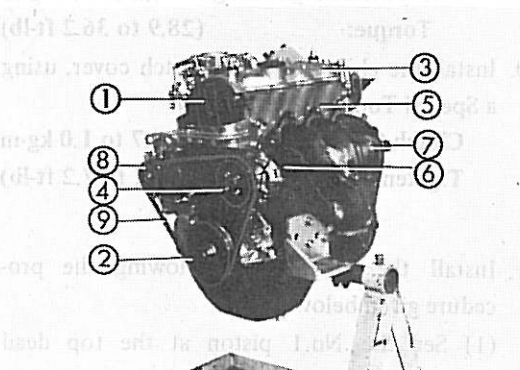


Fig. 3-93 Installing Various Components

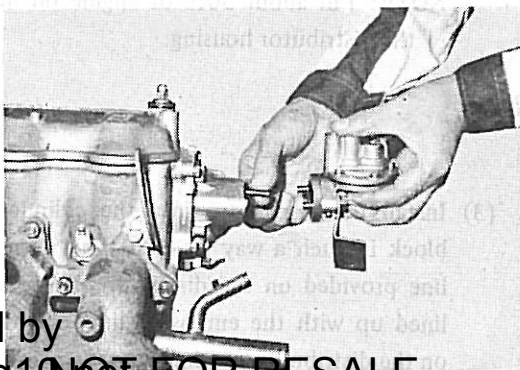


Fig. 3-94 Installing Fuel Pump

18. Install the intake manifold related parts as follows.

- (1) Install the intake manifold ① with the carburetor mounted on it.

NOTE: Make certain to use a new intake manifold gasket.

- (2) Attach the fuel pipe ② .
(3) Install the oil filter bracket ③ (together with the oil filter).

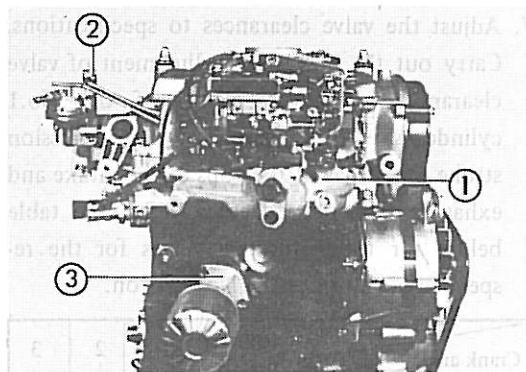


Fig. 3-95 Installing Various Components

19. Install the flywheel.

NOTE: The flywheel should be secured properly, aligning with the slotted spring pins for locating the flywheel.

Flywheel Tightening 4.0 to 5.0 kg-m

Torque: (28.9 to 36.2 ft-lb)

20. Install the clutch disc and clutch cover, using a Special Tool (09301-87201).

Clutch Cover 0.7 to 1.0 kg-m

Tightening Torque: (5.1 to 7.2 ft-lb)

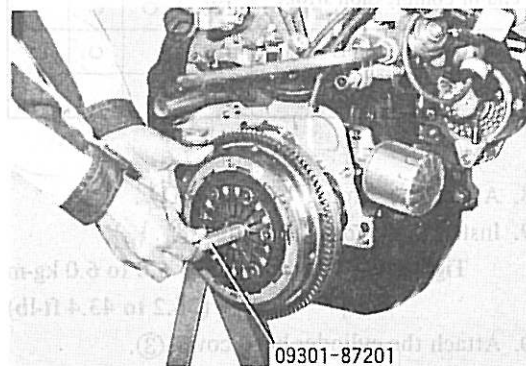


Fig. 3-96 Installing Clutch Disc

21. Install the distributor, following the procedure given below.

- (1) Set the No.1 piston at the top dead center at the end of the compression stroke.

- (2) Turn the distributor shaft, until the stamped mark located at the end of the distributor shaft is aligned with the recessed mark, as indicated in Fig. 3-97.

Thus, the distributor is set at the correct position for installation.

NOTE: Fill about 30cc of engine oil in the distributor housing.

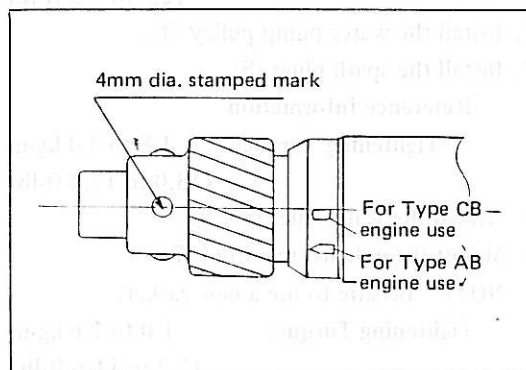


Fig. 3-97 Aligning Stamped Mark of Distributor

- (3) Install the distributor into the cylinder block in such a way that the mold seam line provided on the distributor body is lined up with the embossed line located on the distributor housing.

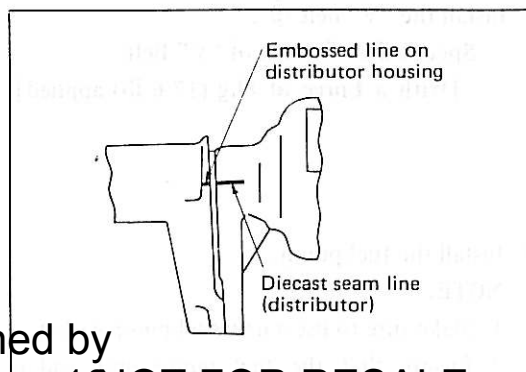


Fig. 3-98 Installing Distributor (1)

- (4) Tighten the distributor retaining bolt temporarily.

NOTE: Make sure to tighten the distributor retaining bolt securely, after the engine assembly has been mounted on the vehicle body and the engine tune-up operation has been completed.

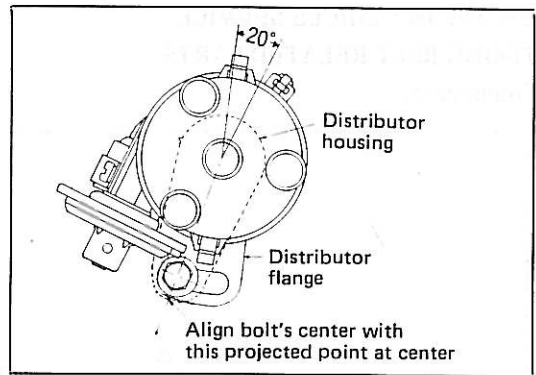
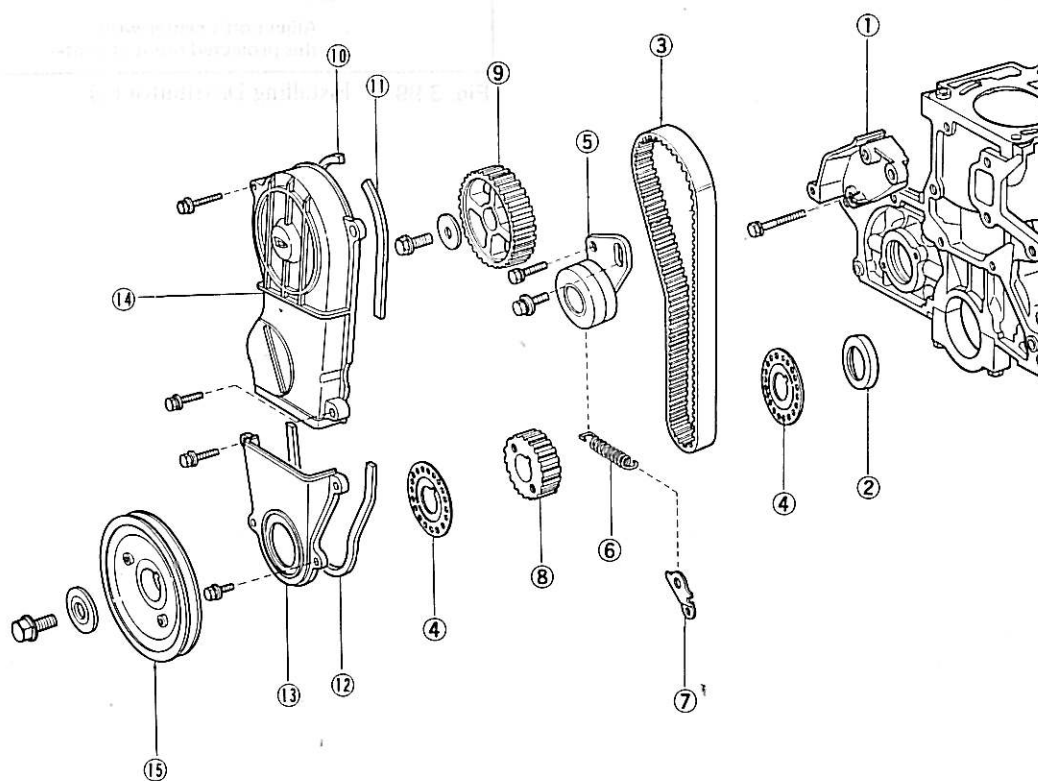


Fig. 3-99 Installing Distributor (2)

ENGINE IN-VEHICLE SERVICE TIMING BELT RELATED PARTS

Components



- | | |
|--|-------------------------------|
| ① Timing belt tensioner spacer | ⑨ Camshaft timing belt pulley |
| ② Type "T" oil seal | ⑩ Dust seal No.1 |
| ③ Timing belt | ⑪ Dust seal No.2 |
| ④ Crankshaft timing belt pulley flange | ⑫ Dust seal No.3 |
| ⑤ Timing belt tensioner sub-assembly | ⑬ Timing belt lower cover |
| ⑥ Tension spring | ⑭ Timing belt upper cover |
| ⑦ Tension spring bracket | ⑮ Crankshaft pulley |
| ⑧ Crankshaft timing belt pulley | |

Fig. 3-100 Timing Belt Related Components

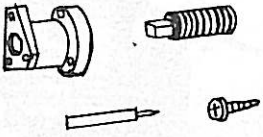
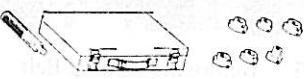
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Specifications

Timing Belt Specifications

Type	Cogged belt	
Pitch number	90	
Belt width	mm (inch)	10.5 (0.77)
Pitch	mm (inch)	9.525 (0.37)
Pulleys	Tooth number at drive side	20
	Tooth number at driven side	40

Special Tool

	Shape	Part number and nomenclature	Application	Remarks
Special Tools		09223-87701-000 Oil seal remover & replacer set	Used for replacing crankshaft front oil seal and camshaft oil seal	For Type AB engine use
		09608-12010-000 Front hub & drive pinion bearing replacer set	Used for press-fitting camshaft oil seal	

Timing Belt

Removal

Replace the following parts.

1. Air cleaner
2. "V" belt
3. Water pump pulley
4. Crankshaft pulley

Place the transmission control lever in the top gear position. Depress the brake pedal so as to lock the crankshaft.

Then, slacken the bolt, as shown in Fig. 3-101.

NOTE: Be sure not to try to slacken the setting bolt of the crankshaft pulley, by holding the setting bolt of the camshaft pulley.



Fig. 3-101 Removing Crankshaft Pulley

5. Engine ground
6. Engine mounting front bracket & insulator
7. Cylinder head cover
8. Timing belt cover

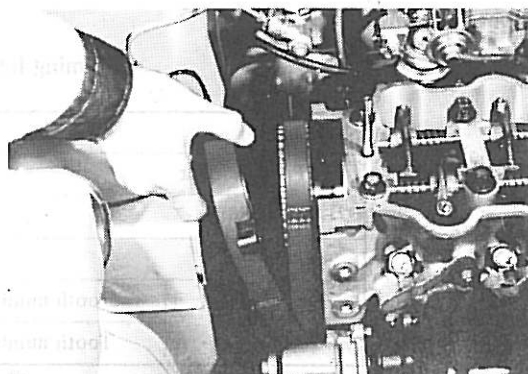


Fig. 3-102 Removing Timing Belt Cover

9. Timing belt and timing belt tensioner

Set the No.1 piston at the top dead center at the end of the compression stroke.

NOTE: After the timing belt has been removed from the engine, be sure not to turn the crankshaft.

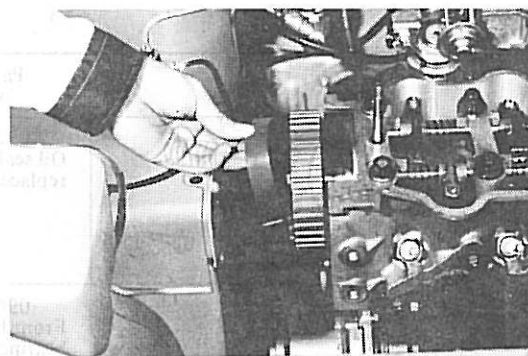


Fig. 3-103 Removing Timing Belt

CAUTION

1. The timing belt contains glass fibers as ingredient.
Glass fibers have superior durability against tensile force. However, when these glass fibers are once bent, they are susceptible to breakage, resulting in greatly-reduced strength. Therefore, when handling the timing belt, exercise caution to avoid damaging it.
2. If oils or water should get to the timing belt, the rubber ingredient may swell. Hence, make sure that the timing belt is kept absolutely free from oils or water.
3. If the timing belt has been exposed to water continually for a certain period of time because of a leaky water pump, etc., be certain to replace such timing belt.

4. If the timing belt has swollen due to oil stuck on the belt, make sure to replace such timing belt.
5. If an excessive force must have been applied to the timing belt owing to the seizure of the camshaft and so forth, be sure to replace such timing belt.
6. When handling the timing belt, be very careful not to bend the timing belt so as to form a small radius.

**Bending Under No Circumstances,
Width: Should Timing Belt Be Bent
to Form Width of Less Than
25 mm (0.98 inch)**

10. Crankshaft timing belt pulley

If any difficulty should be encountered in removing the pulley, screw-in bolts into the threaded holes provided in the side of the pulley in order that the pulley may be removed.

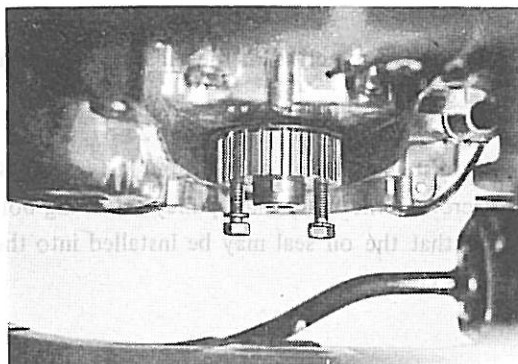


Fig. 3-104 Removing Crankshaft Timing Belt Pulley

Installation

Install the timing belt, following the procedure as described in page 3-47, paragraph 6.

Crankshaft Front Oil Seal

Carry out the removal and installation of the crankshaft front oil seal, after the timing belt related parts have been removed. (See page 3-53.)

Removal

1. Remove the crankshaft timing belt pulley, flange and woodruff key.
2. Remove the oil seal, using the special tool (09223-87701), as follows.
 - (1) Position the special tool replacer (09223-87701-001) as shown in Fig. 3-105. Drive the special tool (09223-87701-002) into the oil seal so as to make a hole.
 - (2) Screw-in the special tool tapping screw (09223-87701-004) into the hole provided in the oil seal, with the replacer positioned in place.
 - (3) Screw-in the special tool puller (09223-87701-003) into the replacer so that the oil seal may be removed.



Fig. 3-105 Removing Crankshaft Oil Seal

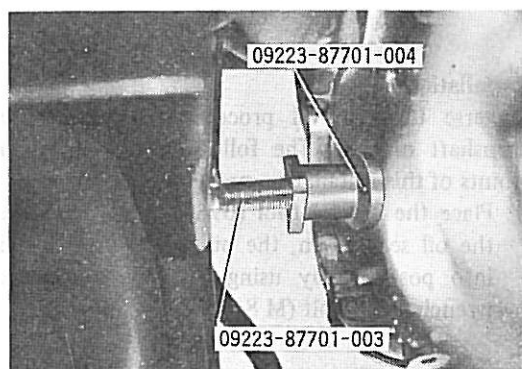


Fig. 3-106 Removing Crankshaft Oil Seal

Installation

1. Coat the lip section of the oil seal with a film of engine oil.
2. Place the special tool (09223-87701-001) against the oil seal, as indicated in Fig. 3-108. Screw-in the crankshaft pulley attaching bolt so that the oil seal may be installed into the gear cover.

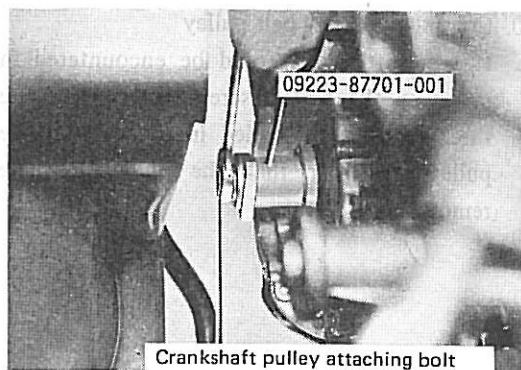


Fig. 3-107 Installing Crankshaft Oil Seal

Camshaft Oil Seal

Previous to starting to replace the camshaft oil seal, first set the No.1 piston at the top dead center at the end of the compression stroke. Then, replace the oil seal, following the procedure given below.

Removal

1. Remove the following parts.
 - (1) Air cleaner
 - (2) "V" belt
 - (3) Water pump pulley
 - (4) Ground cable (engine side)
 - (5) Engine mounting front bracket and insulator
 - (6) Cylinder head cover
 - (7) Timing belt upper cover
 - (8) Timing belt tensioner
 - (9) Timing belt (cam side)
 - (10) Camshaft timing belt pulley

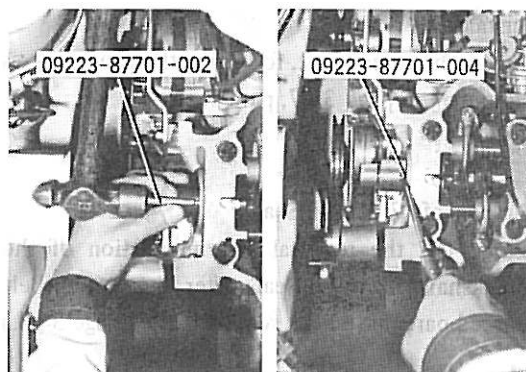


Fig. 3-108 Removing Camshaft Oil Seal

2. Drive the special tool (09223-87701-002) into the oil seal so as to make a hole.
3. Screw the special tool (09223-87701-004) into the hole now provided in the oil seal.
4. Pry the oil seal out with a screw driver or the like, as indicated in Fig. 3-108.

Installation

Reverse the removal procedure to install the camshaft oil seal. The following are the main points of this installation procedure.

1. Place the special tool (09608-12010) against the oil seal. Then, the oil seal is press-fitted into position, by using a 32mm long box wrench and a bolt (M 8, P 1.25, 40mm long).

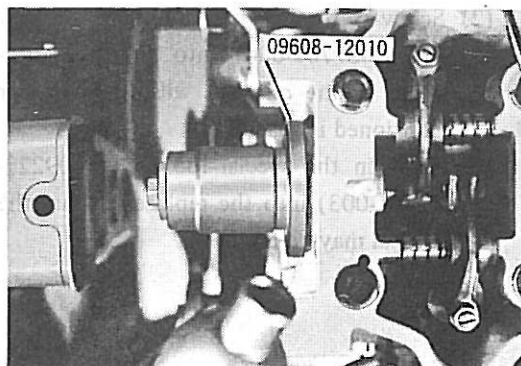


Fig. 3-109 Press-Fitting Camshaft Oil Seal

2. Install the timing belt as follows.

- (1) Make sure that the camshaft timing belt pulley is set at the top dead center of the No.1 piston at the end of the compression stroke.
- (2) Install the timing belt in place. Care must be exercised so as to ensure that the timing belt is not slackened.
(See Fig. 3-110.)
- (3) Stretch the timing belt by means of the timing belt tensioner.
- (4) Turn the crankshaft two turns in the normal direction. And stop the crankshaft, when the No.1 piston comes again at the top dead center. Ensure that the stamped mark on the camshaft timing belt pulley is lined up with the indicator.
(See pages 3-11 and 3-47.)

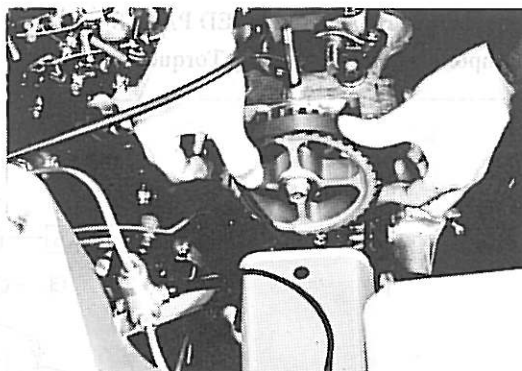


Fig. 3-110 Installing Timing Belt

CYLINDER HEAD RELATED PARTS

Components and Tightening Torques

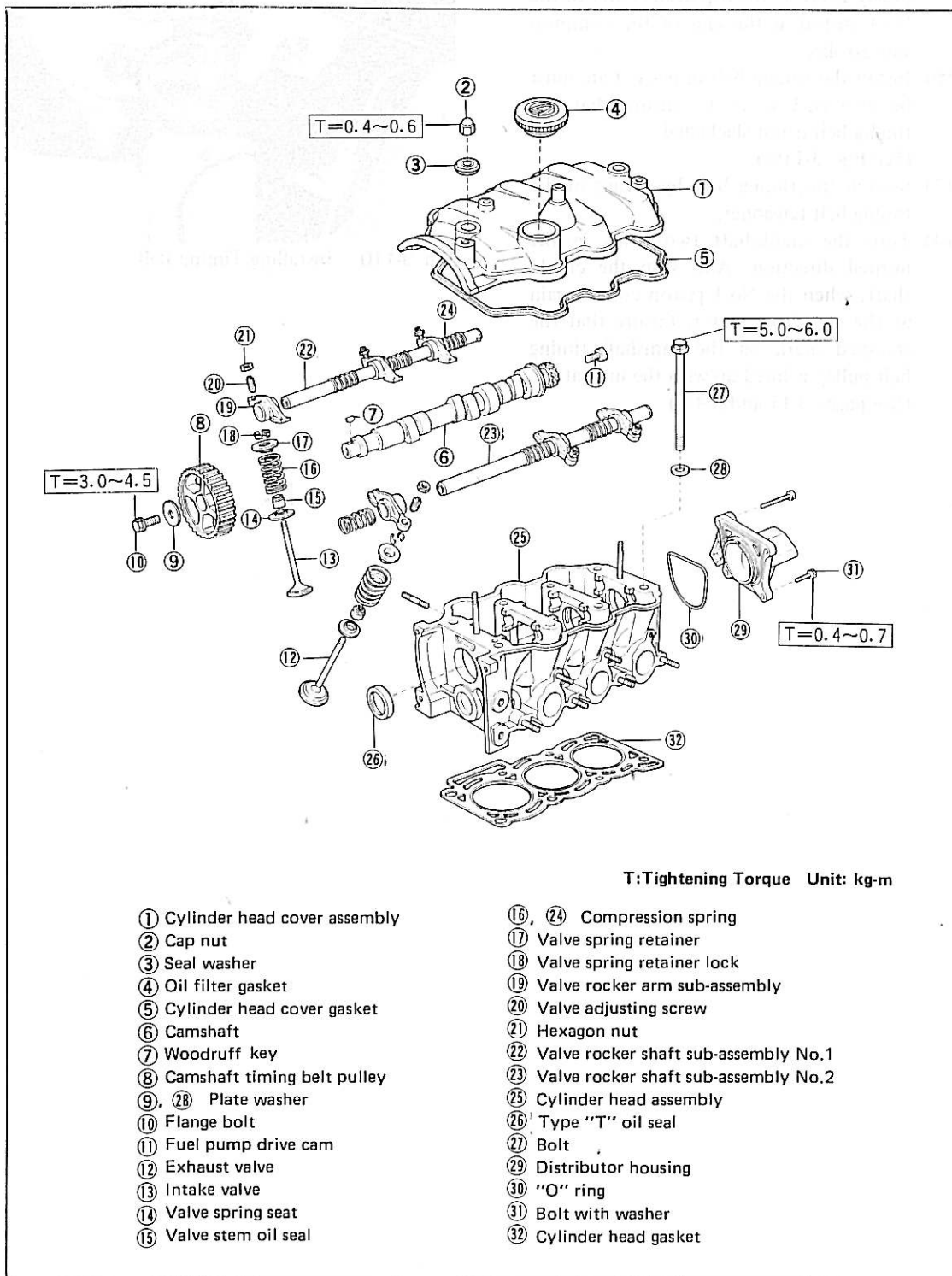
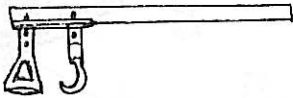
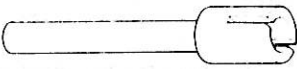



Fig. 3-111 Cylinder Head Related Components and Tightening Torques

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Special Tools

	Shape	Part number and nomenclature	Application	Remarks
Special Tools		09202-87701-000 Valve spring replacer	Used for replacing valve springs during in-vehicle service	Partly modify to tool for Type AB engine use. (See Fig. 3-120.)
		09201-87701-000 Valve stem oil seal replacer	Used for press-fitting valve stem oil seals	Tool for Type AB engine use
		09219-87702-000 Cylinder head holder	Stand to be used for disassembling cylinder head	Newly provided

Valve Rocker Shaft Related Parts

Removal

1. Remove the air cleaner.
2. Remove the distributor together with the resistive cords.
3. Detach the cylinder head cover.
4. Detach the fuel pipe and fuel pump.
NOTE: Care must be taken not to lose the fuel pump push rod.
5. Remove the distributor housing.

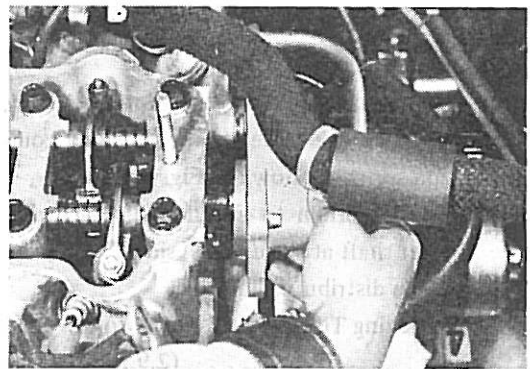


Fig. 3-112 Removing Distributor Housing

6. Fully slacken the adjusting screws of the valve rocker arms of the valve rocker shafts No.1 and No.2. In order to extract the valve rocker shaft, screw the crankshaft pulley attaching bolt into the threaded hole provided in the rear end of the valve rocker shaft. And pull out the bolt so as to take out the rocker shaft.
7. Take out the valve rocker arms and compression springs from the engine.

NOTE: The valve rocker arms should be placed correctly in sequence in order that they may be assembled in their original positions, respectively.

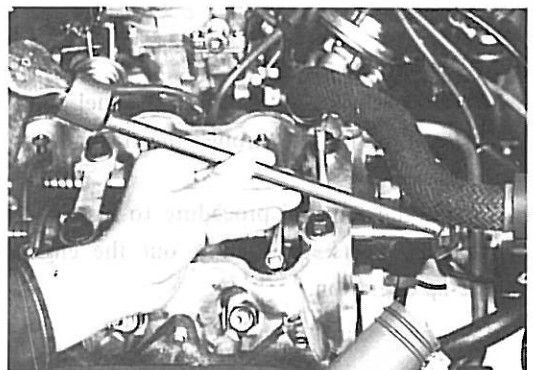


Fig. 3-113 Removing Valve Rocker Shaft

Inspection and Repair

1. Blow compressed air into each oil passage hole so as to remove foreign matter.
2. Check the bore inner wall (shaft side) of each valve rocker arm as well as its cam-lobe-contact-area for sign of wear.

If they exhibit slight scores, correct these surfaces with an oil stone. However, if they are worn out excessively or damaged, replace such defective valve rocker arm.

Specified Inner Diameter of

Valve Rocker Arm: 16.000 to 16.018 mm
(0.6299 to 0.6306 inch)

3. Check the valve rocker shaft. If the shaft shows damage or other defects, replace such shaft.

Specified Outer Diameter of

Valve Rocker Shaft: 15.958 to 15.984 mm
(0.6283 to 0.6293 inch)

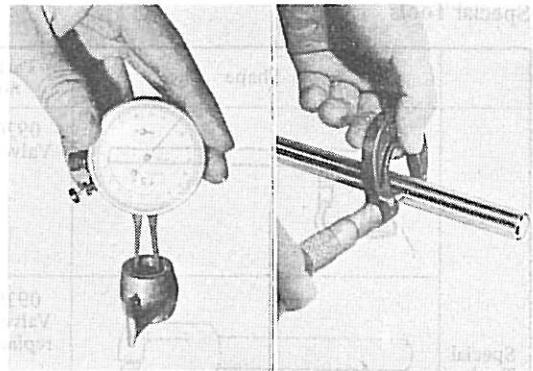


Fig. 3-114 Checking Rocker Shaft and Arm

Valve Rocker Shaft-to-Arm Clearance

Specified Value: 0.016 to 0.060 mm
(0.0006 to 0.0024 inch)

Allowable Limit: 0.90 mm
(0.0035 inch)

Installation

1. Insert the valve rocker shaft into position, while setting the valve rocker arms and compression spring as shown in Fig. 3-115.

NOTE: Be certain to install the longer valve rocker shaft at the exhaust side.

2. Install the distributor housing.

Tightening Torque: 0.4 to 0.7 kg-m
(2.9 to 5.1 ft-lb)

NOTE: Make sure to use a new seal ring.

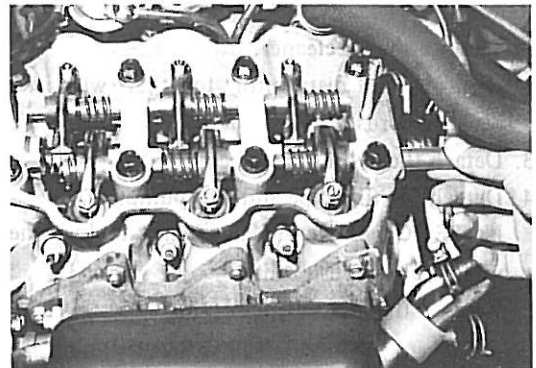


Fig. 3-115 Installing Valve Rocker Shaft

3. Attach the fuel pump.

NOTE: The air vent pipe for the fuel pump should be routed through the transmission case hole.

4. Reverse the removal procedure to install the remaining parts. And carry out the engine tune-up operation.

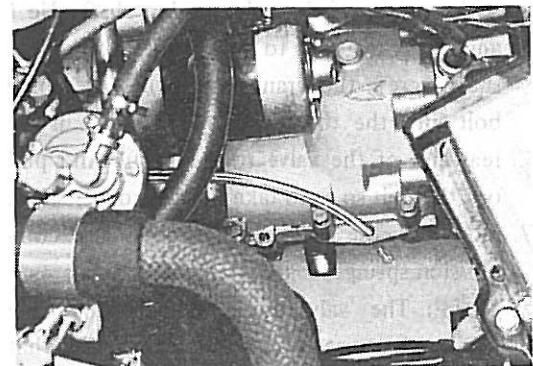


Fig. 3-116 Routing Fuel Pump Air Vent Pipe

Valve Stem Oil Seal Related Parts

Removal

Remove the valve rocker shafts, following the procedure described in page 3-60. Then, perform the following operations given below.

1. Remove the spark plugs so as to release compression.
2. Install only the valve rocker shafts onto the cylinder head.
3. Set the piston at the top dead center in the cylinder which now you are going to check.

How to Find Top Dead Center of

Each Cylinder

When the timing mark on the crankshaft pulley comes just the top part, the No.1 piston is at the top dead center. Starting from this timing mark, turn the crankshaft 120 degrees in the normal direction the No.3 piston reaches the top dead center. Turn the crankshaft further 120 degrees to set the No.2 piston at its top dead center.

If you put marks using chalk etc, on the periphery of the crankshaft pulley at intervals of 120 degrees starting from the timing mark, this will help you to easily locate the top dead center of each cylinder.

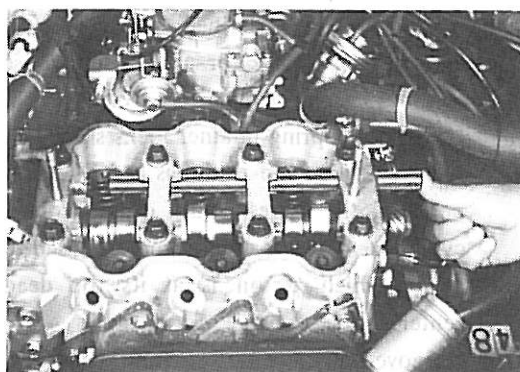


Fig. 3-117 Installing Valve Rocker Shaft Only

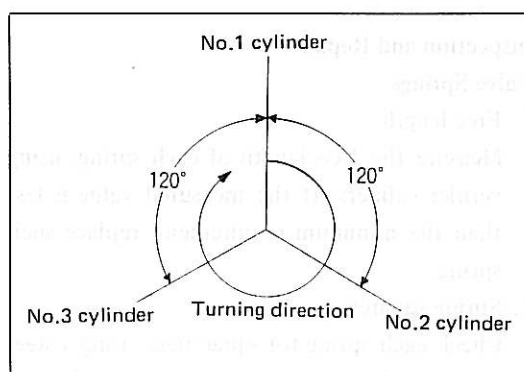


Fig. 3-118 How to Find Top Dead Center of Each Cylinder

4. Using a cloth, plug the oil return holes provided in the cylinder head so as to prevent the valve spring retainer locks from dropping into the inside of the engine through these holes.
5. Attach the hook section of the special tool (09202-87701) to the rocker shaft. (See Fig. 3-119 for partial modification to be made on this special tool.) Then, place the body of the special tool on the valve spring seat. Raise the lever upward with the rocker shaft as the fulcrum so as to remove the valve spring retainer locks.

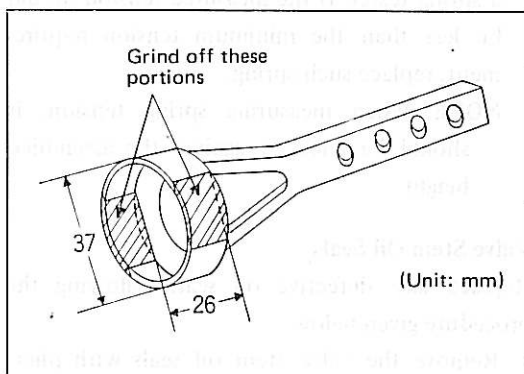


Fig. 3-119 Modification to Be Made on Special Tool

NOTE: The above-described operation must be performed only for a cylinder whose piston is near the top dead center.

If the valve spring retainer locks should be removed when the piston is at its descent position, the valves would drop into the cylinders. Hence, care must be exercised to assure which piston is at its top dead center.

Moreover, be sure not to turn the crankshaft further, before the operation for a particular cylinder is completed.

Inspection and Repair

Valve Springs

1. Free length

Measure the free length of each spring, using vernier calipers. If the measured value is less than the minimum requirement, replace such spring.

2. Spring squareness

Check each spring for squareness, using a steel square and a surface plate. Measure the gap between the top coil of the spring and the square. If the spring should be out-of-square more than the allowable limit, replace the spring.

3. Spring tension

Measure the spring tension of each spring with a spring tester. If the measured tension should be less than the minimum tension requirement, replace such spring.

NOTE: When measuring spring tension, it should be checked against the assembled height.

Valve Stem Oil Seals

Replace any defective oil seal, following the procedure given below.

1. Remove the valve stem oil seals with pliers or the like.
2. Install the valve stem oil seals, using the special tool (09201-87701).



Fig. 3-120 Removing Valve Spring Retainer Locks

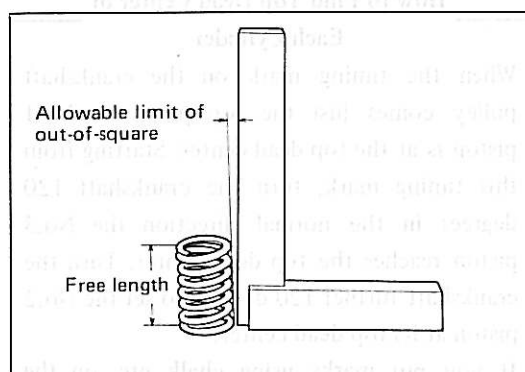


Fig. 3-121 Measuring Valve Spring (Free Length & Squareness)

Item	Specified value	Allowable limit
Free length mm (inch)	43.3 (1.705)	42.0 (1.654)
Squareness mm (inch)	—	1.5 (0.059)
Tension as assembled [Assembled height 34.9mm(1.37inches)]	29.9 ± 1.4 (65.9 ± 3.1)	25.7 (56.7)

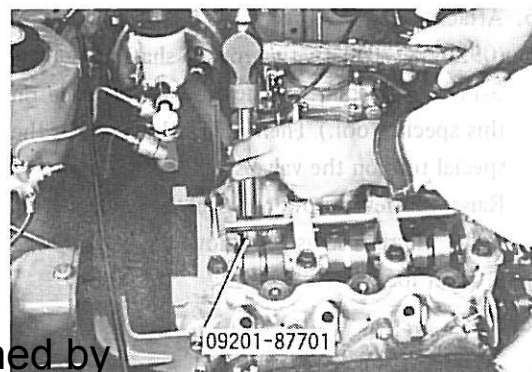


Fig. 3-122 Installing Valve Stem Oil Seal

Reverse the removal procedure to install the valve stem oil seals.

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Camshaft Related Parts

Removal

Remove the valve rocker shafts, following the procedure described in page 3-59. Then, perform the following operations given below.

1. Remove the engine mounting front bracket.
2. Remove the "V" belt and spark plugs.
3. Remove the water pump pulley.
4. Detach the timing belt upper cover.
5. Slacken the timing belt tensioner. Set the No.1 piston at its top dead center at the end of the compression stroke.

Proceed to remove the timing belt.

6. Remove the camshaft timing belt pulley.

NOTE: During the timing belt pulley removal operation, the camshaft can be prevented from rotation, by inserting the handle of a hammer through the opening of the pulley, as shown in Fig. 3-124.

7. Remove the camshaft.

Pull out the camshaft toward the rear end of the cylinder head, making sure that no damage is made to the surfaces of the bearing journals and camshaft lobes.

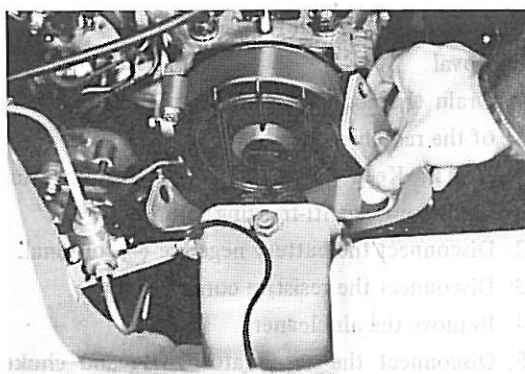


Fig. 3-123 Removing Engine Mounting Front Bracket

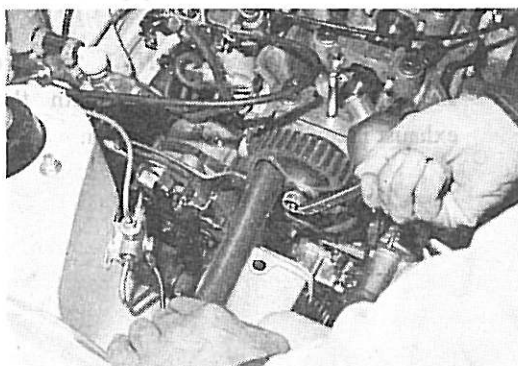


Fig. 3-124 Removing Camshaft Pulley

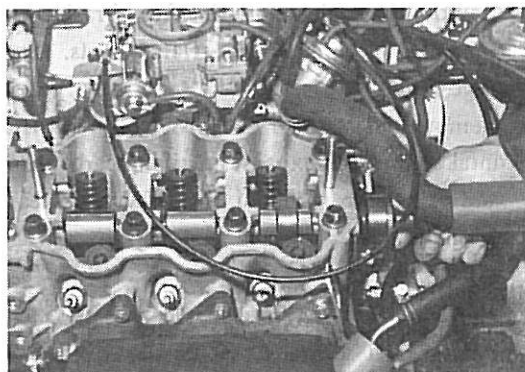


Fig. 3-125 Removing Camshaft

Inspection and Repair

As for the inspection and repair of the camshaft and camshaft timing belt, see pages 3-32 & 3-33 and 3-39.

Installation

Reverse the removal procedure to install the camshaft related parts.

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Cylinder Head Assembly

Removal

1. Drain the cooling water from the drain plug of the radiator.

NOTE: Keep the cooling water, if it contains coolant or anti-freezing solution.

2. Disconnect the battery negative \ominus terminal.
3. Disconnect the resistive cords.
4. Remove the air cleaner.
5. Disconnect the accelerator cable and choke control cable.
6. Disconnect the wires.
7. Disconnect the exhaust front pipe from the exhaust manifold.

NOTE: The exhaust pipe No.1 support should be removed together with the exhaust manifold attaching section.

8. Detach the cylinder head cover.
9. Remove the engine mounting front bracket.
10. Remove the timing belt related parts. (See page 3-54).
11. Remove the cylinder head assembly with the intake manifold, exhaust manifold, carburetor and fuel pump mounted on the cylinder head assembly.

NOTE:

1. The cylinder head bolts should be slackened diagonally, starting from the outside.
2. Check to see whether the dust seals provided at the tops of the water pump and timing belt tensioner spacer have come off or not. If they have come off, affix them into position, using the bond sealer.

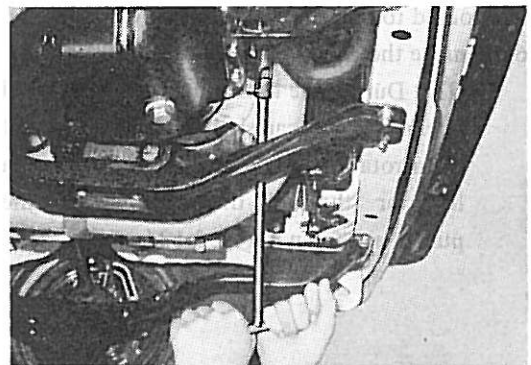


Fig. 3-126 Disconnecting Exhaust Front Pipe

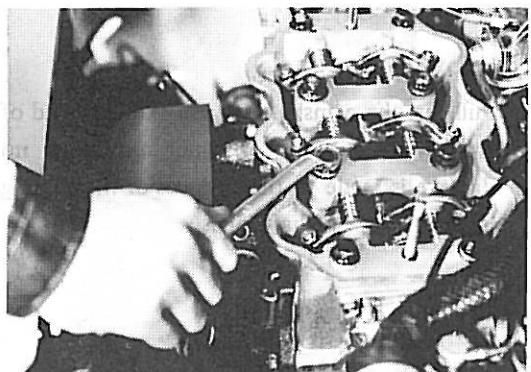


Fig. 3-127 Removing Cylinder Head Bolts

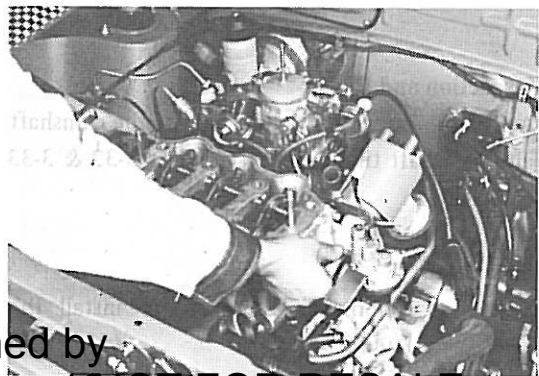


Fig. 3-128 Removing Cylinder Head

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Inspection and Repair

When the above-described parts have been removed, the cylinder head assembly and cylinder block are checked for distortion at the respective top surfaces. Moreover, the inner wall of the cylinder bores can be checked, too.

See pages 3-30 and 3-34 for the specified values.

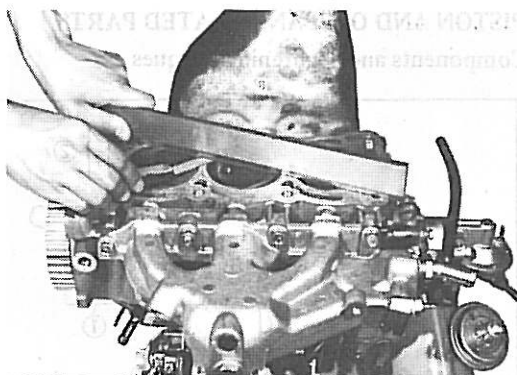


Fig. 3-129 Checking Cylinder Head for Distortion

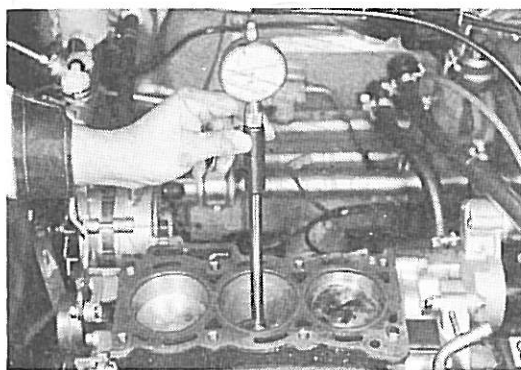


Fig. 3-130 Checking Cylinder Bore

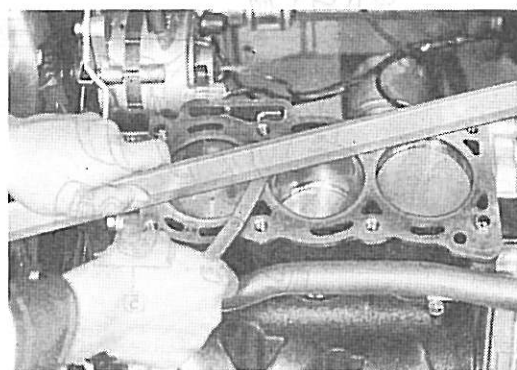


Fig. 3-131 Checking Cylinder Block Top Surface for Distortion

Installation

Reverse the removal procedure to install the cylinder head related parts.

NOTE:

- Before the cylinder head is mounted on the cylinder block, make sure that the camshaft is set at the top dead center at the end of the compression stroke of the No.1 cylinder.
- Be sure to thoroughly clean those parts to be assembled.
- As for rotating or sliding sections, make certain to apply a film of new engine oil, previous to reassembly.
- When reassembling, use only new gasket.
- The cylinder head bolts should be torqued evenly little by little at a time.

Cylinder Head Bolt Tightening Torque:

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

- Intake manifold

Tightening Torque: 1.0 to 1.6 kg-m
(7.2 to 11.6 ft-lb)

- Exhaust manifold

Tightening Torque: 1.0 to 1.6 kg-m
(7.2 to 11.6 ft-lb)

PISTON AND OIL PAN RELATED PARTS

Components and Tightening Torques

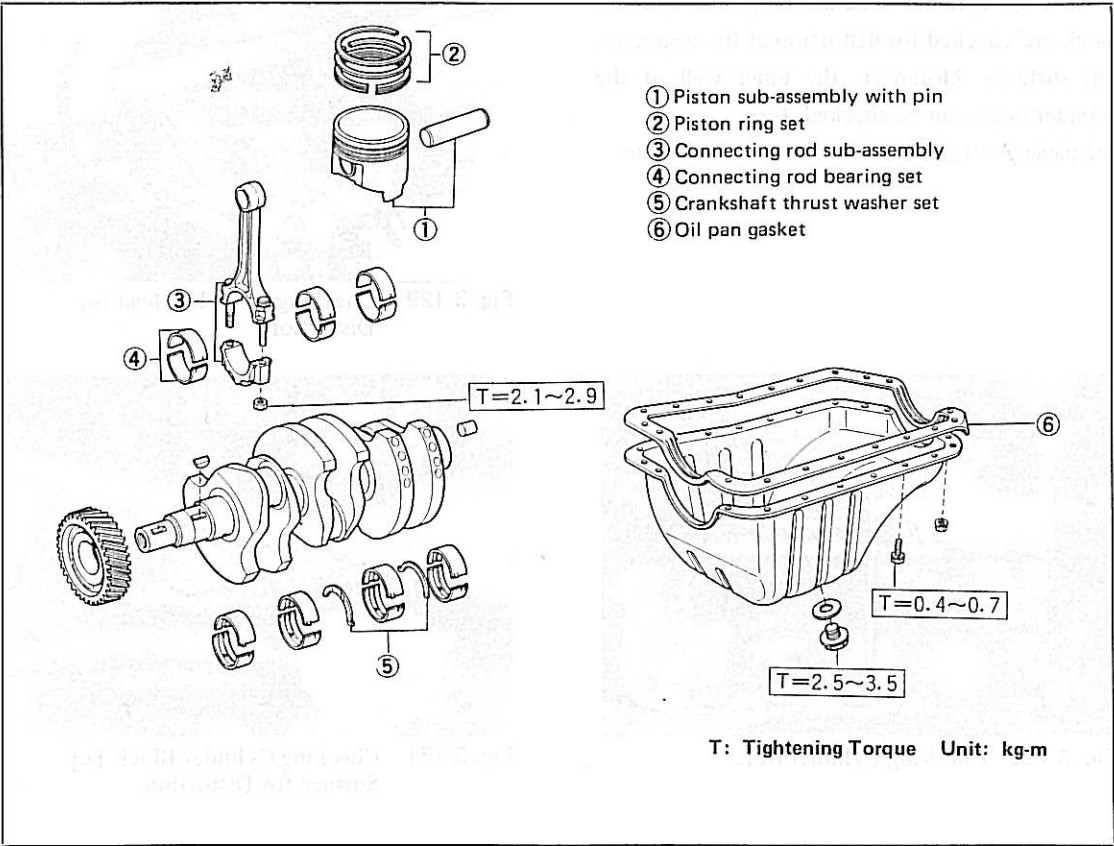
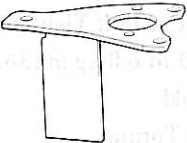
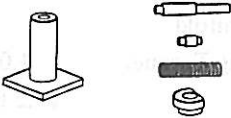



Fig. 3-132 Piston Related Components and Tightening Torques

Special Tools

	Shape	Part number and nomenclature	Application	Remarks
Special Tools		09720-87701-100 Front shock absorber holder	Used for lifting cylinder block during in-vehicle service	Newly provided
		09221-87702-000 Piston pin remover & replacer	Used for replacing pistons, piston pins and connecting rods	Fitting piece (09221-87702) alone has been newly provided. Main body (09221-25011)
		4610-07 Piston replacing guide	Guide to be used during piston installation	Commercially-available

Removal and Disassembly

Remove the cylinder head assembly, following the procedure described in page 3-64. Then, perform the following operation given below.

1. Hold the cylinder block securely, using the special tool (09720-87701-100).
2. Drain the engine oil.

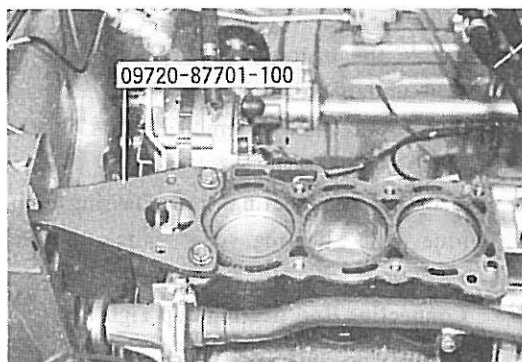


Fig. 3-133 Holding Cylinder Block

3. Remove the engine rear mounting member, engine mounting rear insulator and clutch housing undercover.
4. Remove the oil pan.



Fig. 3-134 Removing Engine Rear Mounting Member

5. Remove the connecting rod cap bolts. And remove the connecting rod cap. Push the connecting rod and piston assembly upward out the top of the cylinder block, using the handle of a hammer, etc.

NOTE: Temporarily assemble the connecting rod and cap so as not to disturb the correct combination.

6. Disassemble further the piston related parts.
(See page 3-28).



Fig. 3-135 Removing Connecting Rod

Inspection and Repair

When the above-described parts have been removed, the pistons, piston rings, connecting rods, connecting rod bearings and so forth can be inspected or repaired, as required.

See pages 3-34 and 3-36 for the specified values.

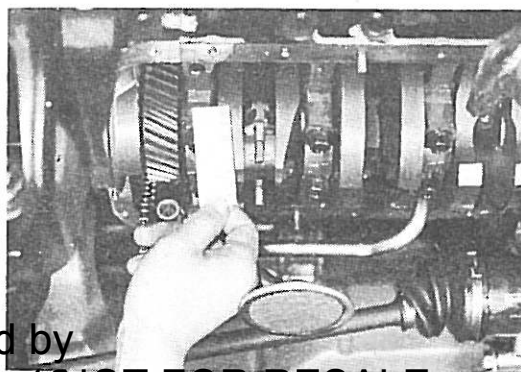


Fig. 3-136 Measuring Connecting Rod Bearing Oil Clearance

Installation

1. Assemble the piston related parts. (See the section under "Assembly of Engine," page 3-41.) Install these assembled parts in the cylinder block.
2. Attach the connecting rod bearing cap. Torque the bearing cap nuts to the specification.

Connecting Rod Bearing Cap Tightening

Torque: 2.1 to 2.9 kg-m
(15.2 to 21.0 ft-lb)

NOTE: Be certain to attach the connecting rod bearing cap in such a direction that the front mark stamped on the bearing cap faces toward the front of the engine.

3. Install the oil pan gasket.
(See pages 6-9 and 6-10 for the details.)
4. Install the oil pan.

Sealer To Be Used: Silicon Bond Sealer

Tightening Torque: 0.4 to 0.7 kg-m
(2.9 to 5.1 ft-lb)

5. Install the oil pan drain plug.
Tightening Torque: 2.5 to 3.5 kg-m
(18.1 to 25.3 ft-lb)

6. Attach the clutch housing undercover.
Using a screwdriver, etc., provide a gap underneath the oil pan gasket, as indicated in Fig. 3-139. And push the undercover into the thus-provided gap.
7. Install the engine mounting rear insulator and engine rear mounting member.

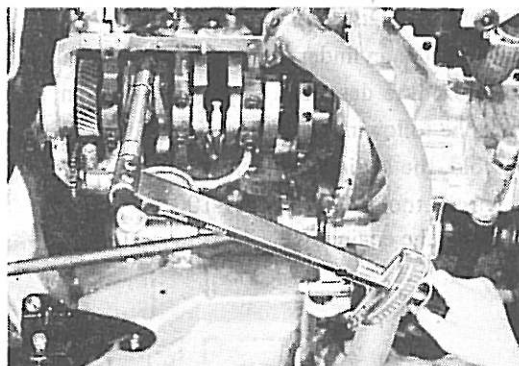


Fig. 3-137 Tightening Connecting Rod Bearing Cap Nuts

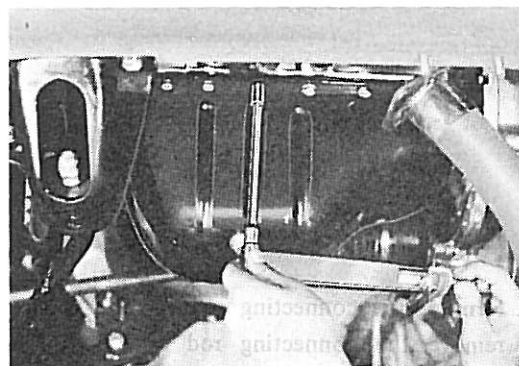


Fig. 3-138 Installing Oil Pan

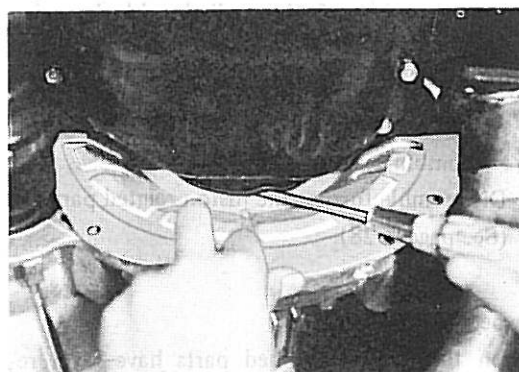


Fig. 3-139 Installing Clutch Housing Undercover

8. Reverse the removal procedure to install the remaining parts.

Cylinder Head Bolt Tightening Torque:

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

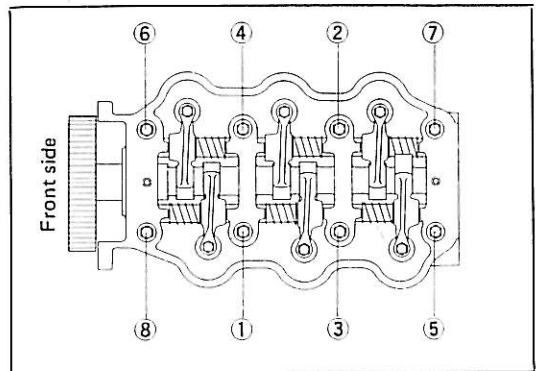


Fig. 3-140 Tightening Cylinder Head Bolts



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DAIHATSU

TYPE CB-20 ENGINE

SECTION 4 FUEL SYSTEM

FUEL PUMP	4-2
CARBURETOR	4-6

4

FUEL PUMP

Sectional View

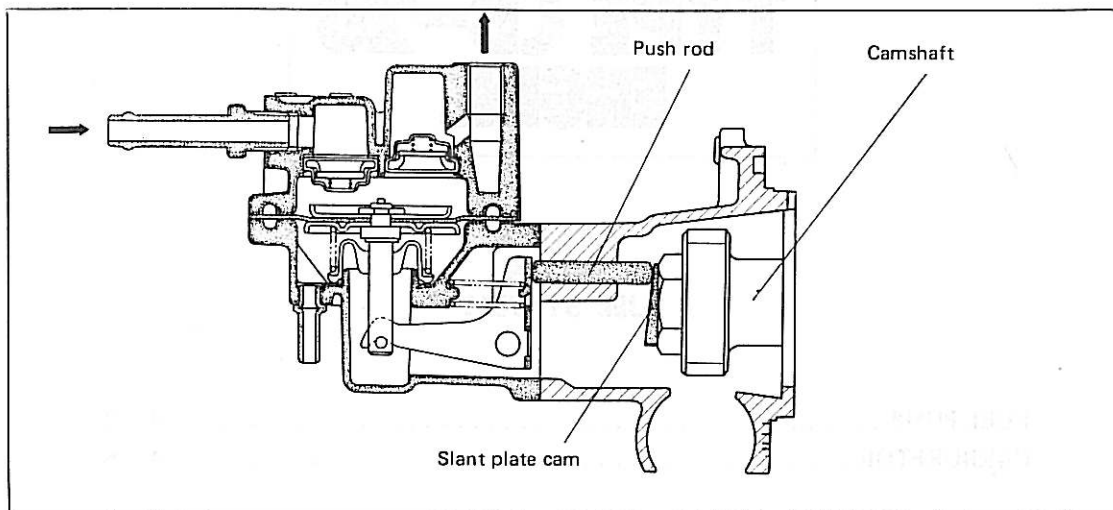


Fig. 4-1 Sectional View of Fuel Pump

Specifications

Type	Diaphragm type
Delivery Output	850 cc/min (at camshaft revolution speed of 2500 rpm)

Components

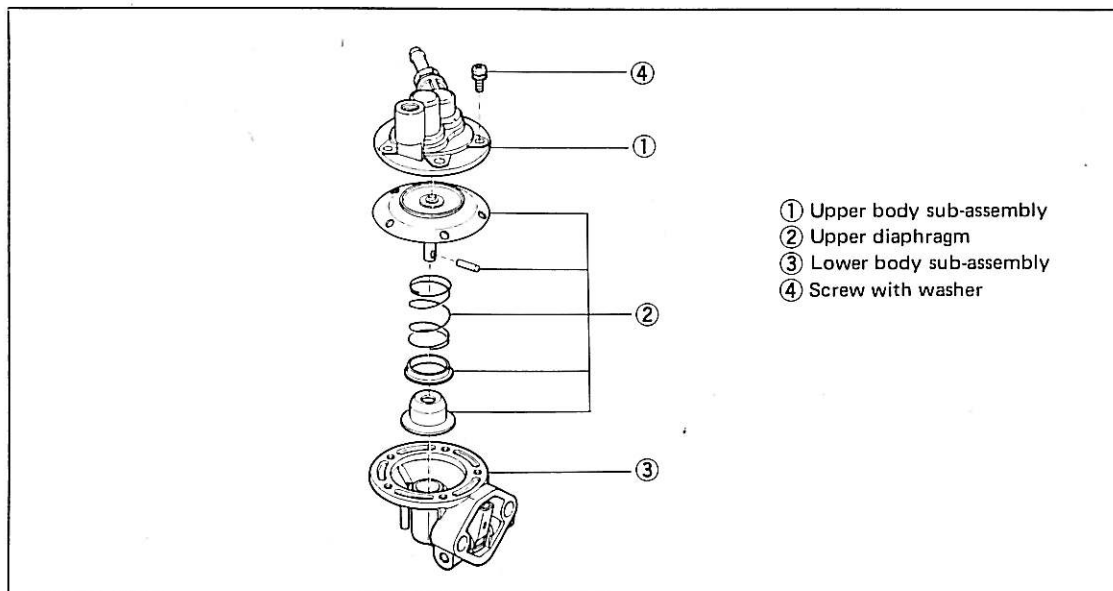


Fig. 4-2 Fuel Pump Components

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Removal

1. Remove the air cleaner. Disconnect the pump inlet pipe ① and outlet pipe ② from the fuel pump body.

NOTE: Utmost caution must be exercised to ensure that no fuel droplet drops onto the exhaust pipe, while it is still heated.

2. Detach the clamp ③ provided at the fuel pump side of the water hose between the radiator and the thermostat.
3. Remove the fuel pump retaining bolts so as to take out the fuel pump assembly. And remove the push rod.

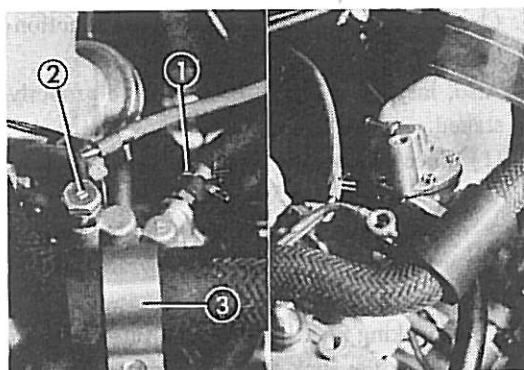


Fig. 4-3 Removing Fuel Pump

Disassembly

1. Put a mate mark (punched mark, etc.) on each of the upper and lower bodies of the fuel pump. Then, separate the upper body from the lower body.
2. Turn the diaphragm about 90 degrees, while applying a force onto the center part of the disengaged so that the diaphragm may be disengaged from the lever. Proceed to remove the diaphragm and diaphragm spring.

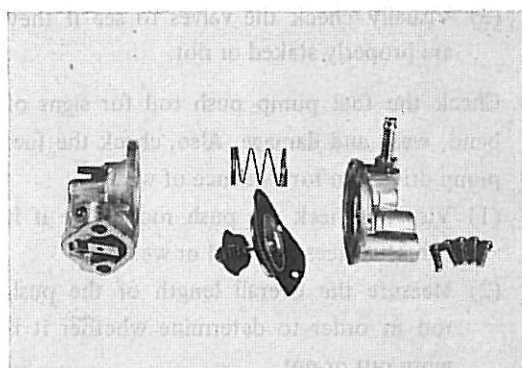


Fig. 4-4 Disassembling Fuel Pump

Inspection

Thoroughly wash each part of the fuel pump.

Blow each fuel passage with compressed air. Inspect each part for evidence of defects listed below. Replace any part that shows defects.

1. Visually check the upper and lower bodies for sign of cracks.
2. Visually check to see if the diaphragm exhibits rupture.
3. Visually check the diaphragm spring and oil seal for evidence of excessive wear.
4. Visually check the rocker arm for severe damage or wear.

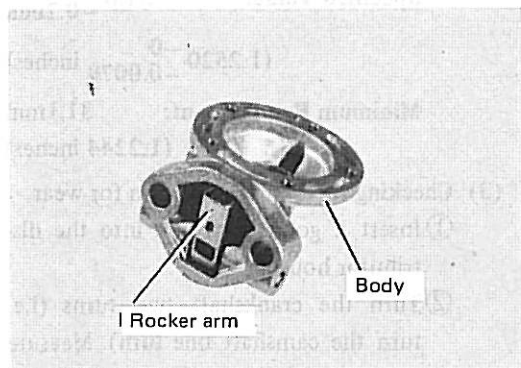


Fig. 4-5 Checking Rocker Arm for Damage or Wear

5. Check to see whether the valves are functioning properly.

Also, inspect to see if the valves are properly staked.

- (1) Checking function of inlet valve

When you blow your breath into the inlet port, the valve must open. Moreover, the valve must close without any air leakage, when sucked.

- (2) Checking function of outlet valve

When you suck the outlet port, the valve must open. Furthermore, the valve must close without any air leakage, when you blow your breath into the outlet valve.

- (3) Visually check the valves to see if they are properly staked or not.

6. Check the fuel pump push rod for signs of bend, wear and damage. Also, check the fuel pump drive cam for evidence of wear.

- (1) Visually check the push rod to see if it exhibits excessive bend or wear.

- (2) Measure the overall length of the push rod in order to determine whether it is worn out or not.

Specified Value: $31.8 \begin{smallmatrix} -0 \\ -0.2 \end{smallmatrix} \text{mm}$

$(1.2520 \begin{smallmatrix} -0 \\ -0.0079 \end{smallmatrix} \text{inches})$

Minimum Requirement: 31.1mm
 (1.2244inches)

- (3) Checking fuel pump drive cam for wear

- ① Insert a good push rod into the distributor housing.

- ② Turn the crankshaft two turns (i.e. turn the camshaft one turn). Measure the maximum amount as well as the minimum amount of protrusion between the distributor housing's edge and the tip-end of the push rod.

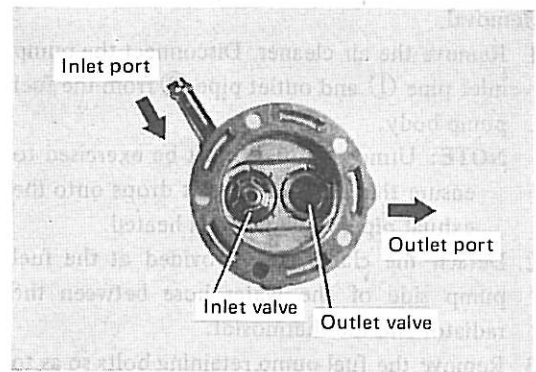


Fig. 4-6 Inspecting Function of Check Valves

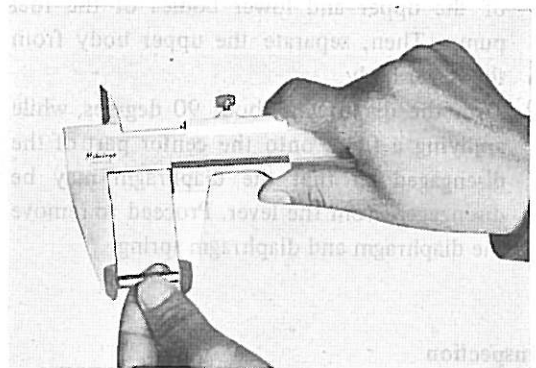


Fig. 4-7 Checking Fuel Pump Push Rod for Wear

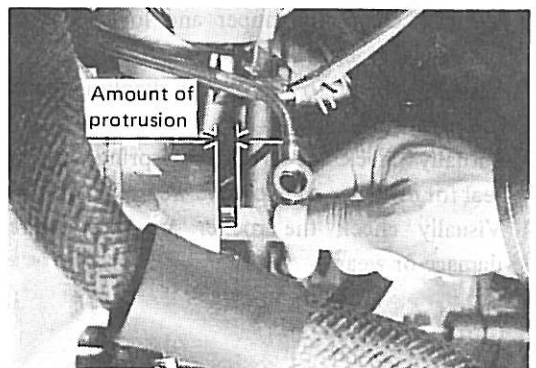


Fig. 4-8 Measuring Amount of Push Rod Protrusion

- ③ If the thus-measured value is less than the minimum requirement, replace the fuel pump drive cam, after removing the distributor housing.

Unit mm (inch)	Specified value	Minimum requirement
Maximum amount of protrusion	9.7 ± 0.5 (0.3819 ± 0.0197)	8.7 (0.3425)
Minimum amount of protrusion	7.7 ± 0.5 (0.3031 ± 0.0197)	6.7 (0.2638)
Stroke (reference information)	2.0 (0.0787)	—

Assembly

Reverse the disassembly procedure to assemble the fuel pump

NOTE: After the assembly of the fuel pump has been completed, actuate the rocker arm by hand to see whether the fuel pump functions normally.

Installation

Reverse the removal procedure to install the fuel pump.

NOTE:

1. Make certain to replace the gaskets, etc. with new ones.
2. After the fuel pump has been installed, start the engine. And make sure that no fuel is leaking from each connection or the mounting section.



Fig. 4-9 Checking Fuel Pump

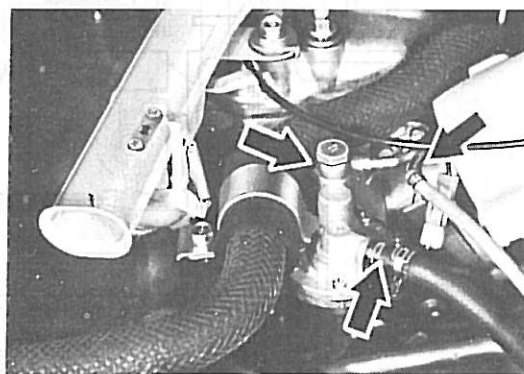


Fig. 4-10 Checking Fuel Pump for Fuel Leakage

CARBURETOR

Schematic Diagram

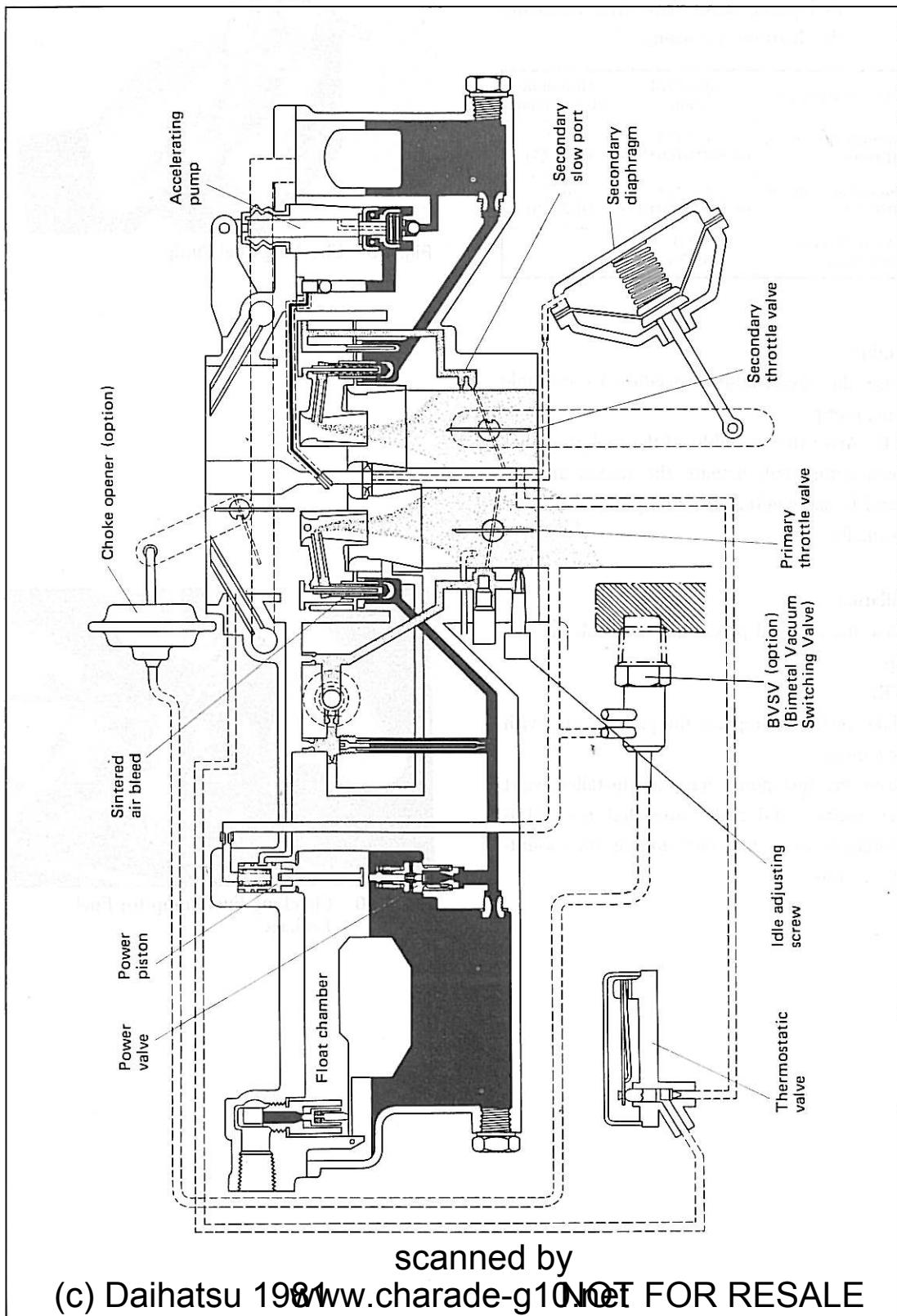


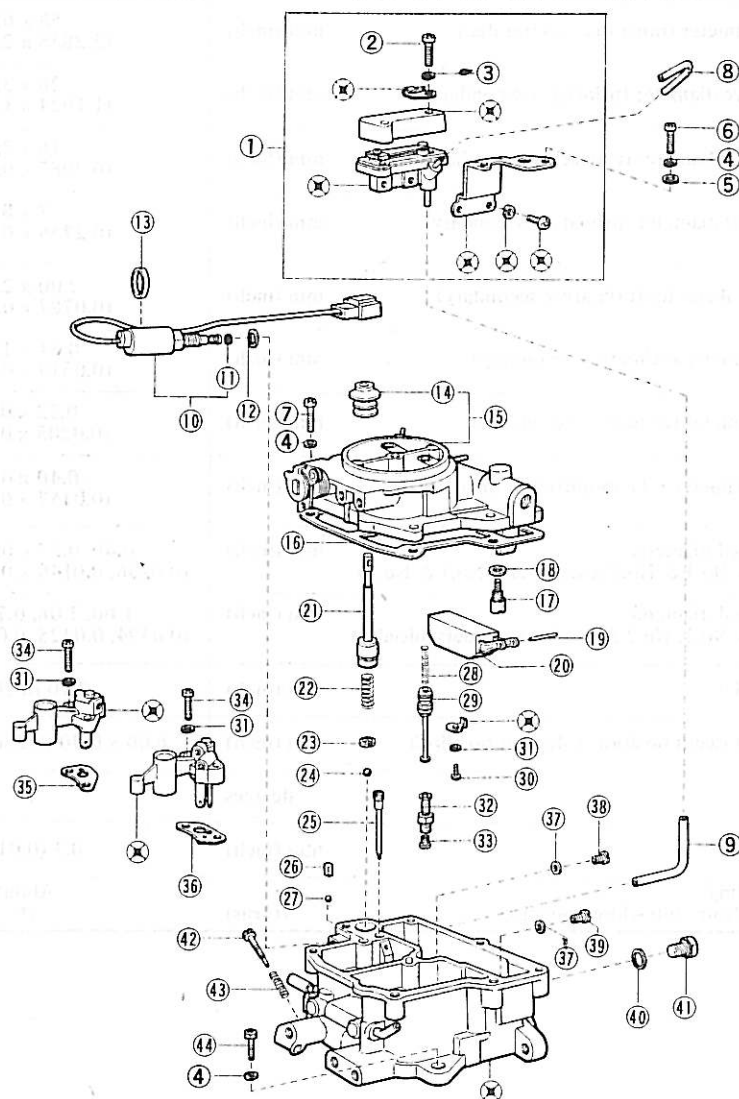
Fig. 4-11 Carburetor Schematic Diagram

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Specifications

Engine type			CB-20
Venturi related parts	Air horn diameter (inner dia. x outer dia.)	mm (inch)	58 x 63 (2.2835 x 2.4803)
	Throttle bore diameter (primary x secondary)	mm (inch)	28 x 32 (1.1024 x 1.2598)
	Large venturi diameter (primary x secondary)	mm (inch)	18 x 25 (0.7087 x 0.9843)
	Small venturi diameter (primary x secondary)	mm (inch)	7 x 8 (0.2756 x 0.3150)
Jet related parts	Main nozzle diameter (primary x secondary)	mm (inch)	2.00 x 2.20 (0.0787 x 0.0866)
	Main jet diameter (primary x secondary)	mm (inch)	0.81 x 1.35 (0.0319 x 0.0531)
	Slow jet diameter (primary x secondary)	mm (inch)	0.52 x 0.57 (0.0205 x 0.0224)
	Power jet diameter x Economizer jet diameter	mm (inch)	0.40 x 0.90 (0.0157 x 0.0354)
	Main air bleed diameter (primary No.1 & No.2 x secondary No.1 & No.2)	mm (inch)	0.60, 0.37 x 0.80, 0.60 (0.0236, 0.0146 x 0.0315, 0.0236)
	Slow air bleed diameter (primary No.1, No.2 & No.3 x secondary bleeder)	mm (inch)	1.00, 1.08, 0.70 x 0.65 (0.0394, 0.0425, 0.0276 x 0.0256)
Acceleration pump stroke		mm (inch)	2.70 (0.1063)
Float adjustment value (ascent position x descent position)		mm (inch)	6.00 x 0.90 (0.2362 x 0.0354)
Fast idle		degrees	17
Kick-up		mm (inch)	0.3 (0.0118)
Idle adjusting screw setting Number of backing off from fully-closed position		(turns)	About 2½

Components



The ⊗-marked parts are not handled as service replacement parts.

- | | | |
|------------------------------------|------------------------------|-------------------------------|
| ① Thermostatic valve sub-assembly | ①⑦ Needle valve sub-assembly | ②⑨ Power piston |
| ②, ⑥, ⑦, ③④, ④④, ④⑨, ⑤⑧, ⑥① Screw | ①⑧ Needle valve seat gasket | ③⑩ Power piston stopper screw |
| ③, ④, ③①, ⑥②, ⑦①, ⑦② Spring washer | ①⑨ Float lever pin | ③② Power valve sub-assembly |
| ⑤ Washer | ②⑩ Float sub-assembly | ③③ Power jet |
| ⑧, ⑨, ⑤⑨ Pipe | ②① Pump plunger sub-assembly | ③⑤, ③⑥ Venturi gasket |
| ⑩ Solenoid valve sub-assembly | ②② Pump damping spring | ③⑦ Main jet gasket |
| ⑪ "O" ring | ②③ Check ball retainer | ③⑧ 1st main jet |
| ⑫, ④⑩ Main passage plug gasket | ②④ Steel ball | ③⑨ 2nd main jet |
| ⑬ Support | ②⑤ Slow jet sub-assembly | ④① Main passage plug |
| ⑭, ⑤④ Boot | ②⑥ Pump discharge weight | ④② Throttle adjusting screw |
| ⑮ Air horn | ②⑦ Steel ball | ④③ Adjusting screw spring |
| ⑯ Air horn gasket | ②⑧ Power piston spring | |

Fig. 4-12 Carburetor Components (1)

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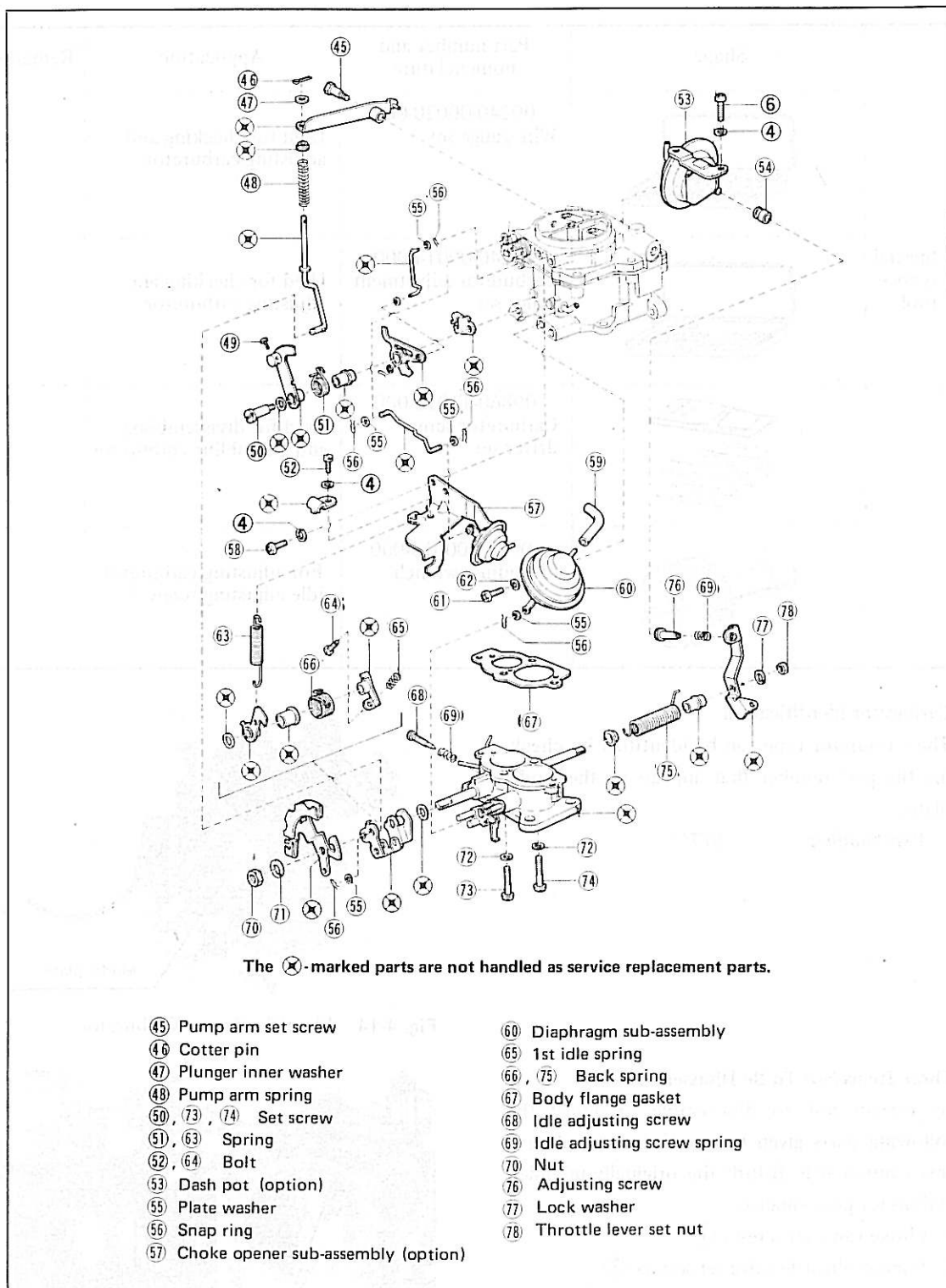
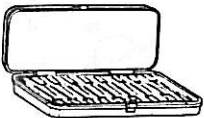

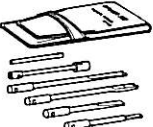
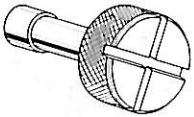


Fig. 4-13 Carburetor Components (2)

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Special Service Tools

	Shape	Part number and nomenclature	Application	Remarks
Special service tool		09240-00020-000 Wire gauge set	Used for checking and adjusting carburetor	
		09240-00014-000 Carburetor adjustment gauge set	Used for checking and adjusting carburetor	
		09860-11010-000 Carburetor screw driver set	Used for disassembling and assembling carburetor	
		09243-00010-000 Idle adjust wrench	For adjusting carburetor idle adjusting screw	

Carburetor Identification

The carburetor type can be identified by checking the part number that appears on the model plate.

Part Number 877□□

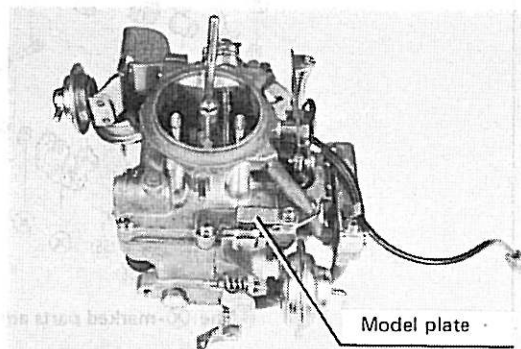
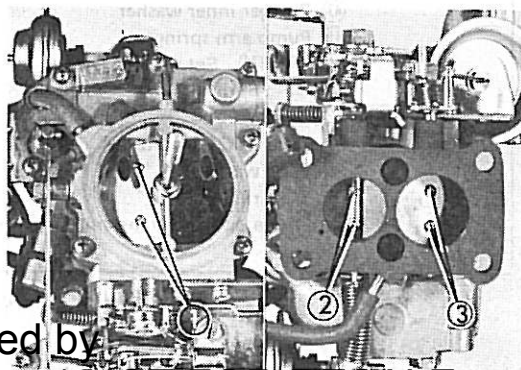


Fig. 4-14 Identification of Carburetor

Those Items Not To Be Disassembled

Be certain not to disassemble or adjust the following parts given below. Failure to observe this caution will disturb the originally-intended carburetor performance.

1. Choke valve set screws ①
2. Primary throttle valve set screws ②
3. Secondary throttle valve set screws ③



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Removal

The check and adjustment of the float level as well as the check of the inside of the float chamber can be performed with the carburetor

Air Horn Section

1. Remove the air cleaner.
2. Disconnect the carburetor fuel pipe ① at the carburetor side. (Also, slacken the connection of the fuel pipe above at the fuel pump side.)
3. Remove the acceleration pump arm set screw ②.
4. Disconnect the fast idle connector ③.
5. Detach the back spring ④.
6. Disconnect the accelerator cable ⑤ and choke control cable ⑥ from the carburetor.
7. Disconnect the thermostatic valve hose ⑦ and the power system hose ⑧-1 at the air horn side.
8. Remove the air horn attaching screws so as to detach the air horn proper.

Carburetor Assembly

1. Carry out the operations as described in paragraphs 1, 2 and 6 under the section "Air Horn Section" removal above.
2. Disconnect various hoses ⑧ as follows. (4 pieces)
 - (1) Disconnect the power system hose ⑧-1 and the choke opener system hose ⑧-2 (option), respectively, at the carburetor side.
 - (2) Disconnect the dash pot system hose ⑧-3 (option) at the VTV (brown) (option) side.
 - (3) Disconnect the AD port system hose ⑧-4 at the air filter side.
 - (4) Disconnect the connector ⑩ of the solenoid valve.
3. Remove the carburetor attaching nuts ⑪. And take out the carburetor assembly.

Reference Information

The carburetor attaching nuts can be removed and installed very easily by means of a fabricated tool as shown in Fig. 4-18.

4. Plug the opening of the manifold with a cloth.

still mounted on the engine, after removing the carburetor air horn section.

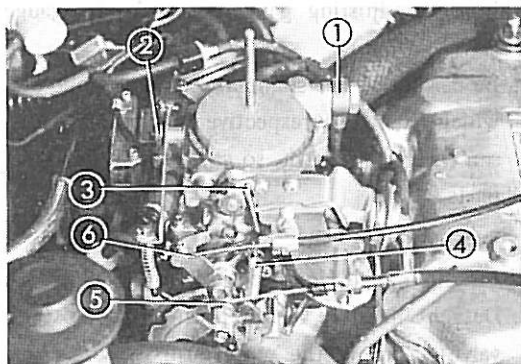


Fig. 4-16 Removing Air Horn

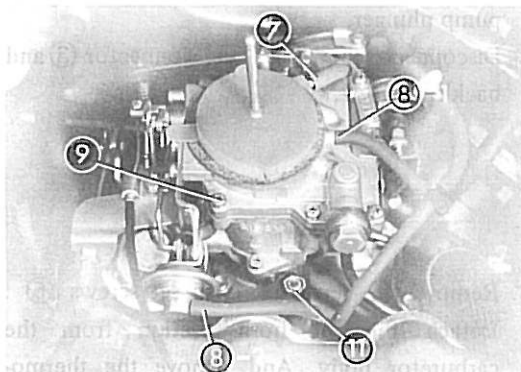


Fig. 4-17 Removing Air Horn and Carburetor Assembly

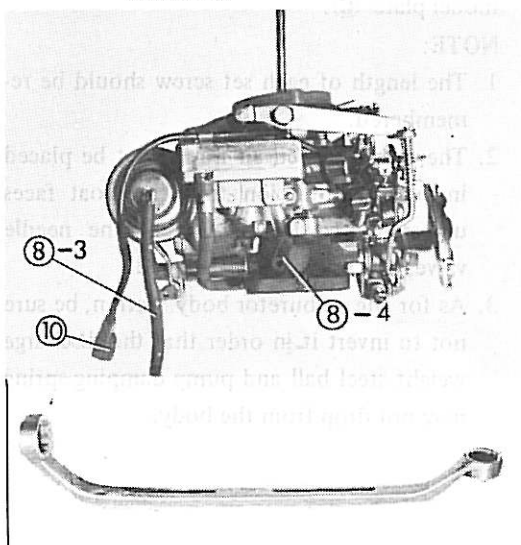


Fig. 4-18 View of Carburetor Assembly as Removed

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Disassembly**NOTE:**

1. To disassemble, assemble and adjust the carburetor, it is mandatory to employ the special tool carburetor screw driver set, carburetor adjusting gauge set and wire gauge set.
2. Be certain to use spanners, screw drivers, etc. which fit exactly respective nozzles, jets, nuts, screws and so forth, so as to avoid damaging parts.

Disassembling Air Horn Section

1. Detach the hose ① (air horn-to-thermostatic valve). Remove the pump arm set screw ②, thus disconnecting the connection with the pump plunger.
2. Disconnect the fast idle connector ③ and back spring ④.

3. Remove the seven air horn set screws ⑤. Detach the air horn section from the carburetor body. And remove the thermostatic valve ①, dash pot ② (option) and model plate ③.

NOTE:

1. The length of each set screw should be remembered.
2. The thus-removed air horn must be placed in such a direction that the float faces upward in order to prevent the needle valve, etc. from being distorted.
3. As for the carburetor body section, be sure not to invert it in order that the discharge weight steel ball and pump damping spring may not drop from the body.

3. The carburetor consists of a great number of parts. Hence, there are possibilities of misinstallation during reassembly. Therefore, be sure to keep disassembled parts in separate containers, according to each system of the carburetor.

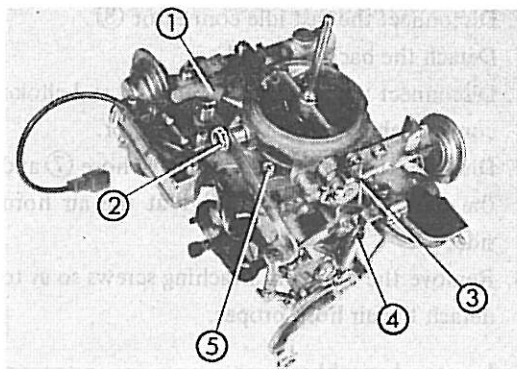


Fig. 4-19 Removing Air Horn (1)

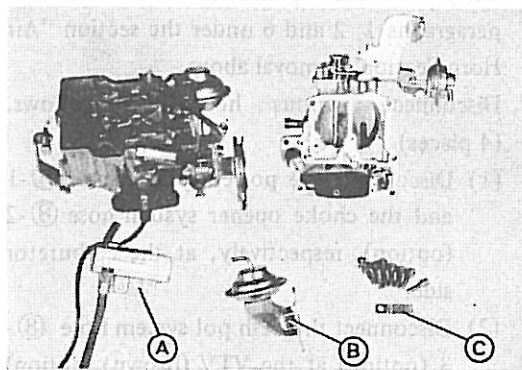


Fig. 4-20 Removing Air Horn (2)

4. Extract the float lever pin ① . And remove the float and needle valve sub-assembly ② .
 5. Take out the acceleration pump plunger ③ and boot.
 6. Slacken the stopper. Remove the power piston ④ together with the spring.
- NOTE:** Be sure not to lose the spring which will jump out during the removal operation.
7. Remove the choke opener ⑤ (option).

NOTE: Make sure not to disassemble the choke valve and choke shaft.

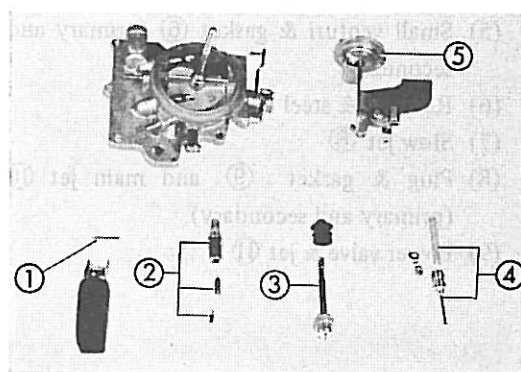


Fig. 4-21 Disassembling Air Horn Section

Disassembling Body Section

1. Detach the discharge weight ① , steel ball and pump damping spring ② .

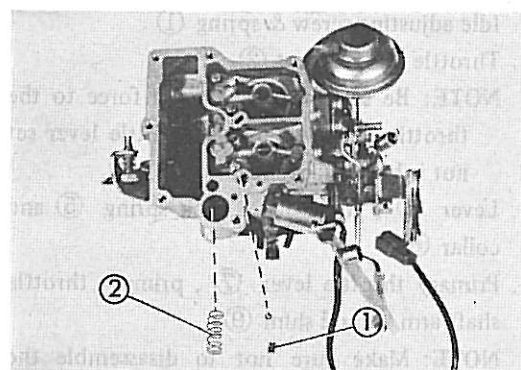


Fig. 4-22 Removing Discharge Weight, Steel Ball and Spring

2. Disconnect the diaphragm link ① and throttle spring ② .
3. Remove the two flange set bolts ③ and two set screws ④ in order to separate the body section from the flange section.

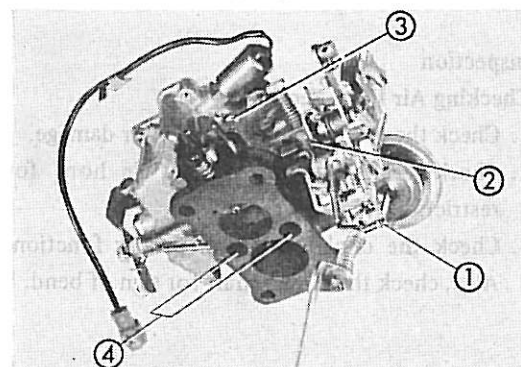


Fig. 4-23 Removing Link, Spring and Set Bolts

4. Remove the following parts.
 - (1) Solenoid valve ①
 - (2) Secondary diaphragm ②
 - (3) Fast idle cam set screw ③ & fast idle lever and back spring hanger arm ④
 - (4) Throttle adjusting screw & spring ⑤



Fig. 4-24 Disassembling Body Section (1)

- (5) Small venturi & gasket ⑥ (primary and secondary)
- (6) Retainer & steel ball ⑦
- (7) Slow jet ⑧
- (8) Plug & gasket ⑨ and main jet ⑩ (primary and secondary)
- (9) Power valve & jet ⑪

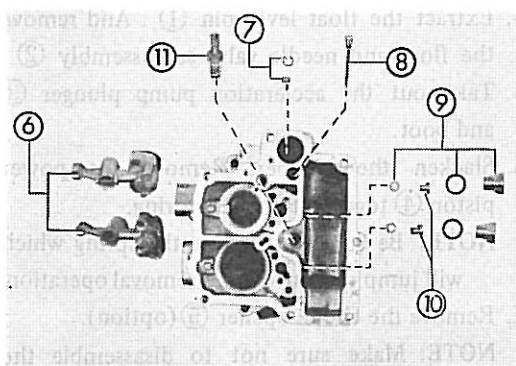


Fig. 4-25 Disassembling Body Section (2)

Disassembling Flange Section

Remove the following parts.

- 1. Idle adjusting screw & spring ①
- 2. Throttle lever set nut ②

NOTE: Be sure not to apply a force to the throttle valve while the throttle lever set nut is being slackened.

- 3. Lever ③, guide ④, back spring ⑤ and collar ⑥
- 4. Primary throttle lever ⑦, primary throttle shaft arm ⑧ and shim ⑨

NOTE: Make sure not to disassemble the throttle valve and throttle shaft.

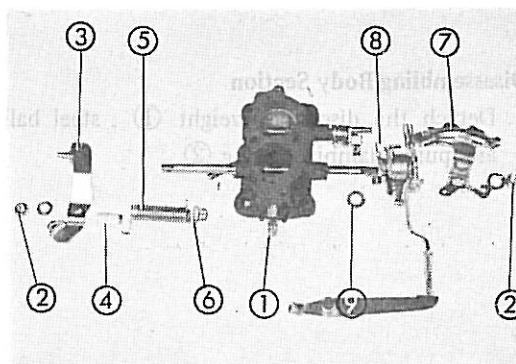


Fig. 4-26 Disassembling Flange Section

Inspection

Checking Air Horn Section

- 1. Check the air horn for distortion or damage.
- 2. Check each passage of the air horn for restriction.
- 3. Check the choke valve for proper function. Also, check the choke shaft for sign of bend.

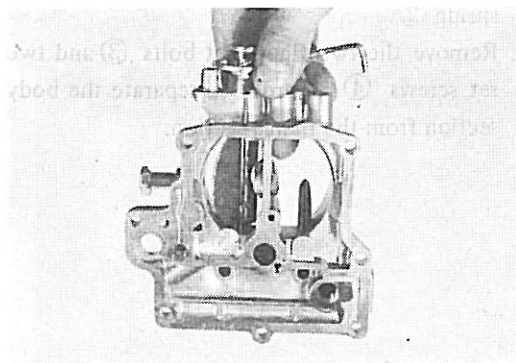


Fig. 4-27 Checking Air Horn

4. Check to see if the needle valve slides freely. Also, check the spring for deterioration.
5. Check the needle valve seat for presence of dirt. Also, check the strainer for restriction, etc.

NOTE: The needle valve sub-assembly can be inspected as follows. Invert the air horn, with the float installed in place. Suck air through the inlet port. If the needle valve sub-assembly exhibits no air leakage, it is functioning properly.

6. Check the float lip and lever pin hole for sign of wear.
7. Check the leather ① of the pump plunger for evidence of wear, deterioration or damage.
8. Check the boot ② of the pump plunger for deterioration or breakage.
9. Check the pump damping spring ③ for deterioration.
10. Check the power piston ④ for damage and the spring ⑤ for deterioration.

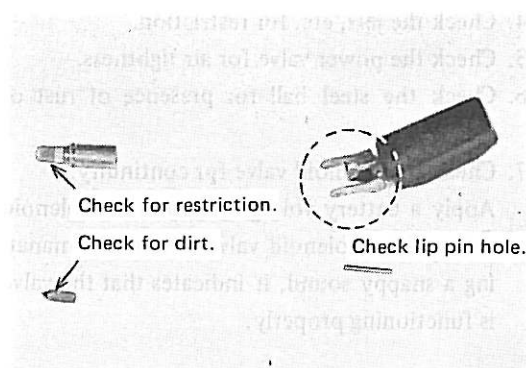


Fig. 4-28 Checking Needle Valve and Float

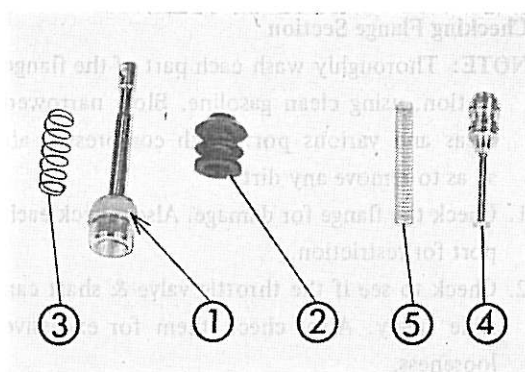


Fig. 4-29 Checking Pump Plunger

Checking Body Section

NOTE:

1. Thoroughly wash each part of the body section, using clean gasoline. Blow narrowed areas, such as fuel or air passages with compressed air so as to remove any dirt.
2. Under no circumstances should the jets and related parts be cleaned with a piece of wire, etc. Such practice would cause the sophisticated holes to be distorted.

1. Check the body for cracks. Check each hole for restriction.
2. Check the small venturi for restriction.
3. Check the large venturi for looseness or excessive wear.

If the venturi exhibits looseness, secure the venturi by staking it at the three ✖ marked points of the venturi-and-body joint area, as indicated in Fig. 4-30.

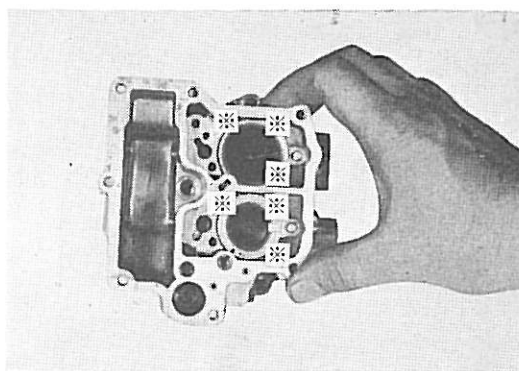


Fig. 4-30 Checking Body

4. Check the jets, etc. for restriction.
5. Check the power valve for air tightness.
6. Check the steel ball for presence of rust or scores.
7. Check the solenoid valve for continuity.

Apply a battery voltage (12V) to the solenoid valve. If the solenoid valve functions, emanating a snappy sound, it indicates that the valve is functioning properly.

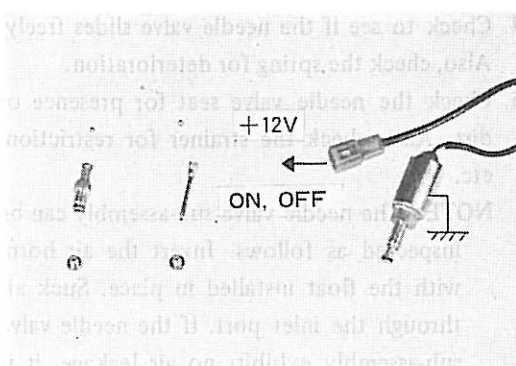


Fig. 4-31 Checking Jets, Steel Ball and Solenoid Valve

Checking Flange Section

NOTE: Thoroughly wash each part of the flange section, using clean gasoline. Blow narrowed areas and various ports with compressed air so as to remove any dirt.

1. Check the flange for damage. Also, check each port for restriction.
2. Check to see if the throttle valve & shaft can slide freely. Also, check them for excessive looseness.
3. Check the throttle valve for air tightness.
4. Check to see if any damage is present at the tapered section at the tip-end of the idle adjusting screw as well as at its threaded portion.

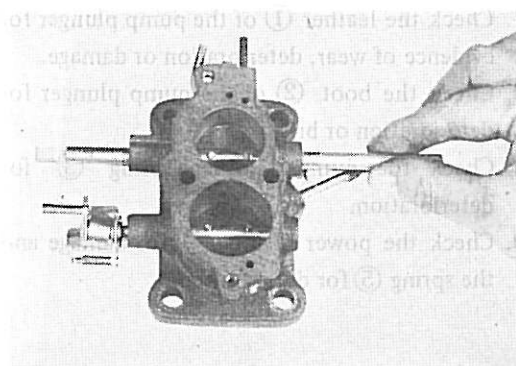


Fig. 4-32 Checking Flange

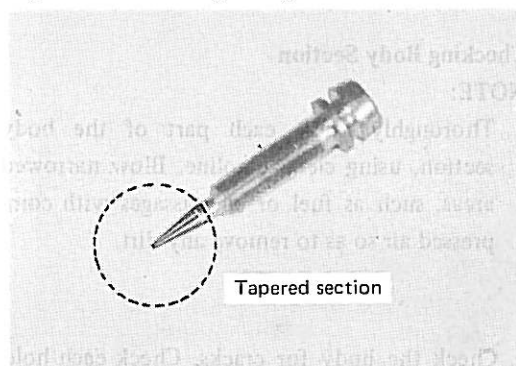


Fig. 4-33 Checking Idle Adjusting Screw

Checking Diaphragm and Other Items

1. Checking diaphragm

- (1) Dash pot ① (option).
- (2) Secondary diaphragm ② (There is a cushion jet inside the hose.)
- (3) Choke opener ③ (option) ,

Checking Procedure

1. When the rod is at its depressed position, plug the pipe. If the rod does not return to the original position, it indicates a satisfactory operation.
2. When your finger is released from the pipe, the rod should quickly return to the original position.
3. If oil should be found inside the hose or diaphragm, replace such diaphragm.

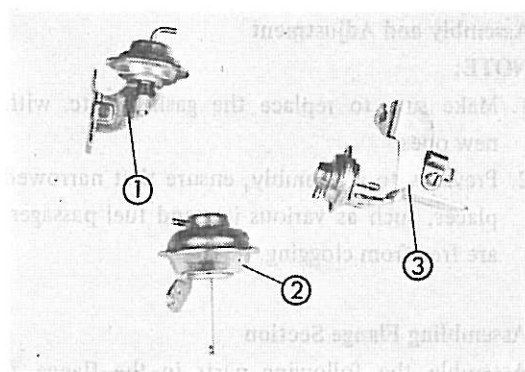


Fig. 4-34 Checking Diaphragm (1)

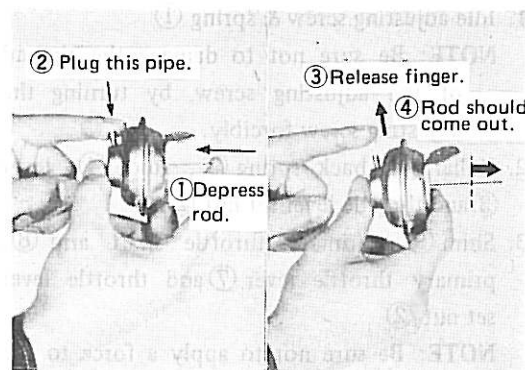


Fig. 4-35 Checking Diaphragm (2)

2. Checking other items

- (1) Checking thermostatic valve air tightness
Lightly blow your breath into the thermostatic valve through the ① side. If there is no air continuity, it indicates a satisfactory operation.
- (2) Check each rubber hose for restriction or damage.
- (3) Check each link for function, wear or damage.
- (4) Check each spring for operation or damage.
- (5) Check each spring for evidence of damage.

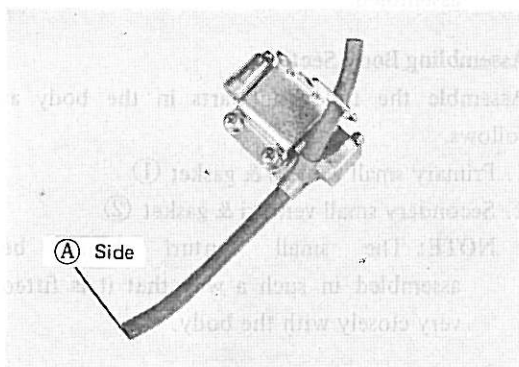


Fig. 4-36 Checking Thermostatic Valve

Assembly and Adjustment

NOTE:

1. Make sure to replace the gaskets, etc. with new ones.
2. Previous to reassembly, ensure that narrowed places, such as various jets and fuel passages, are free from clogging.

Assembling Flange Section

Assemble the following parts in the flange as follows.

1. Idle adjusting screw & spring ①

NOTE: Be sure not to damage the tip-end of the adjusting screw, by turning the adjusting screw forcibly.

2. Collar ⑥, back spring ⑤, guide ④, lever ③ and throttle lever set nut ②
3. Shim ⑨, primary throttle shaft arm ⑧, primary throttle lever ⑦ and throttle lever set nut ②

NOTE: Be sure not to apply a force to the throttle valve, while the nut ② is being assembled.

3. As for rotating or sliding sections, make certain to apply a film of new oil or grease, prior to reassembly. Moreover, be sure that various link related parts function smoothly.

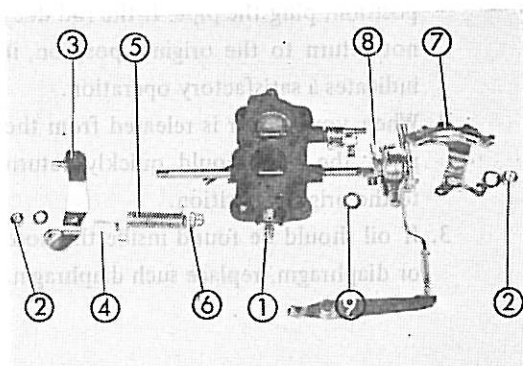


Fig. 4-37 Assembling Flange Related Parts

Assembling Body Section

Assemble the following parts in the body as follows.

1. Primary small venturi & gasket ①
2. Secondary small venturi & gasket ②

NOTE: The small venturi should be assembled in such a way that it is fitted very closely with the body.

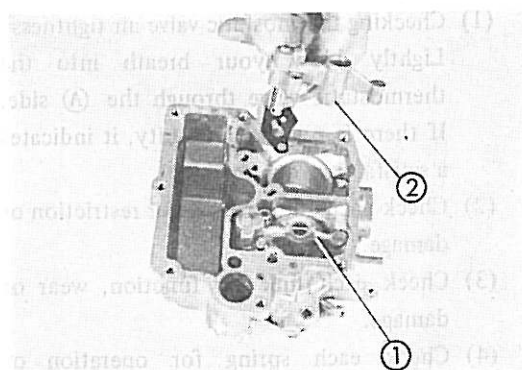


Fig. 4-38 Assembling Small Venturi

3. Steel ball

NOTE: When assembling the steel balls, be sure to install the smaller one underneath the discharge weight.

The other steel ball (larger one) is for the outlet valve use.

4. Retainer

NOTE: Make sure that the retainer is fitted positively in the groove.

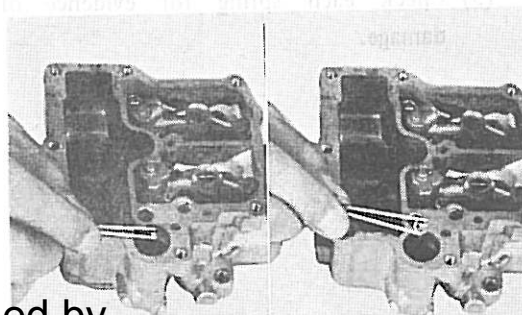


Fig. 4-39 Assembling Steel Ball and Retainer

5. Slow jet
 6. Primary main jet & gasket
 7. Secondary main jet & gasket
- NOTE: Primary main jet Yellow
 Secondary main jet White
8. Plugs & gaskets (two each)

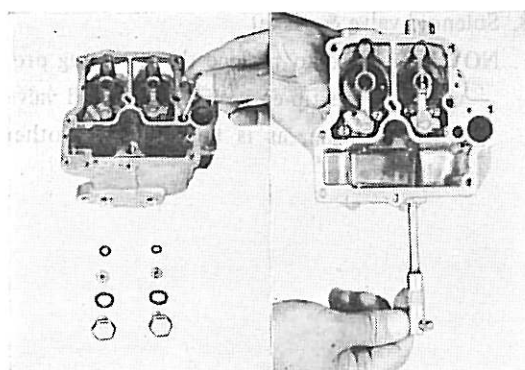


Fig. 4-40 Assembling Slow Jet and Main Jets

9. Power jet & valve

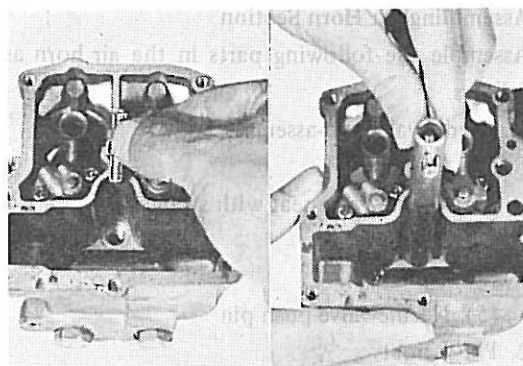


Fig. 4-41 Assembling Power Jet and Valve

10. Back spring hanger arm ① and fast idle lever ②

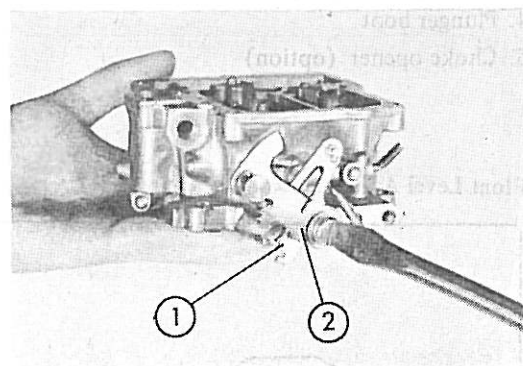


Fig. 4-42 Assembling Fast Idle Lever

11. Secondary diaphragm ③
12. Throttle adjusting screw & spring ④

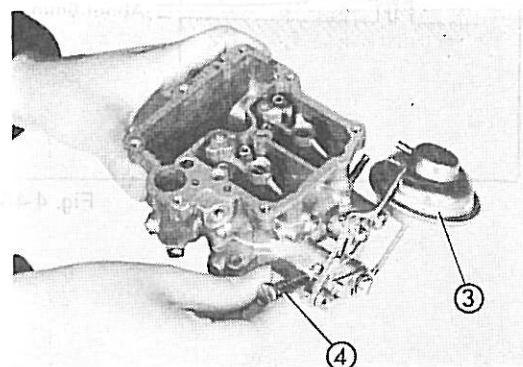


Fig. 4-43 Assembling Diaphragm and Throttle Adjusting Screw

13. Solenoid valve & gasket

NOTE: Be sure to replace the "O" ring provided at the tip-end of the solenoid valve with new one, as is the case with other gaskets.

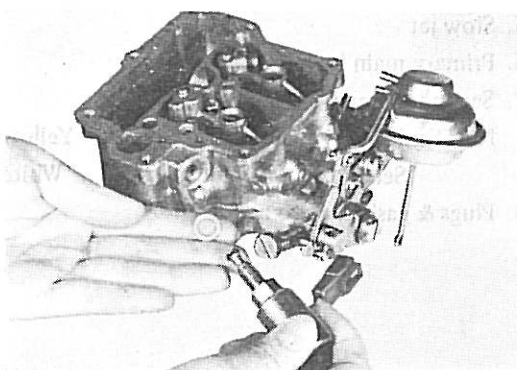


Fig. 4-44 Assembling Solenoid Valve

Assembling Air Horn Section

Assemble the following parts in the air horn as follows.

1. Needle valve sub-assembly
 - (1) Gasket
 - (2) Needle valve seat with strainer
 - (3) Needle valve
 - (4) Spring
 - (5) Needle valve push pin
2. Pin & float
3. Power piston spring & power piston
4. Plunger boot
5. Choke opener (option)

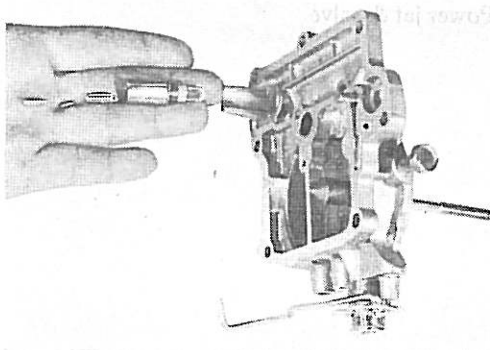


Fig. 4-45 Assembling Needle Valve

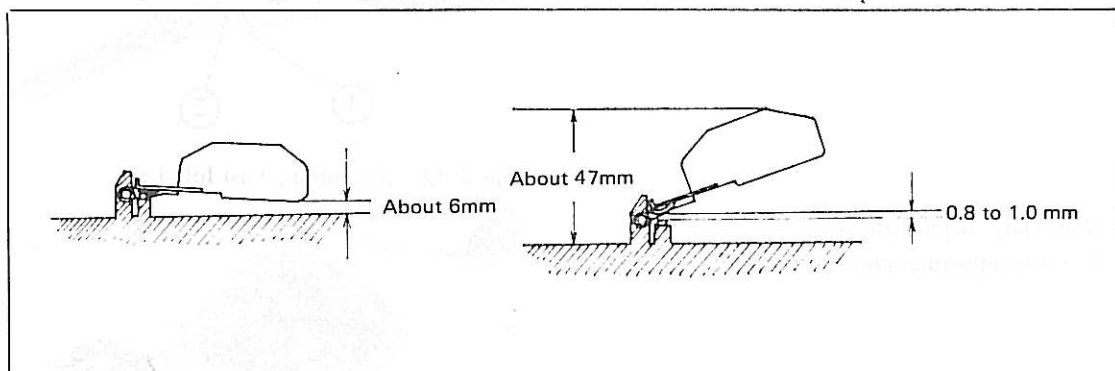
Float Level Adjustment

Fig. 4-46 Adjusting Float

Float Adjusting Points

Adjust the ascent and descent positions of the float to specifications, using respective block gauges.

With the float adjusted as stated above, the float level during the engine operation is maintained at the specified level [21 to 23mm (0.8268 to 0.9055 inch) measured from the body's top surface].

Specified Values

Float Ascent Position: About 6mm
(0.2362 inch)

(Gap between Float and Body with
Float Hung by Its Own Weight)

Float Descent Position: 0.8 to 1.0mm
(0.035 to 0.0394 inch)

(Lip Clearance with Float in
Raised Position)

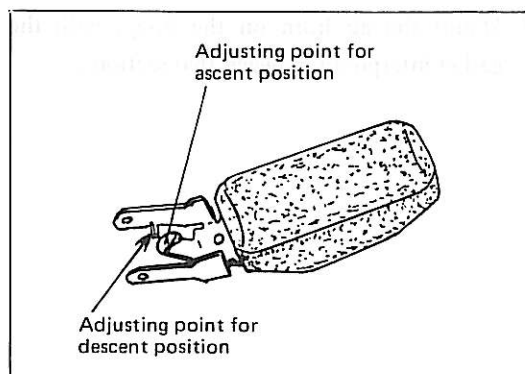


Fig. 4-47 Float Level Adjusting Points

Total Assembly

Assemble the whole carburetor in this sequence: the flange section, body section and air horn.

1. Mount the body section on the flange section, with the gasket interposed between two sections. Install the two set screws from the flange side, while install the two set bolts from the body side.

NOTE: There are two kinds of set screws: one with a hole and the other without a hole. However, these set screws can be installed indiscriminately, since the power system uses an outside passage.

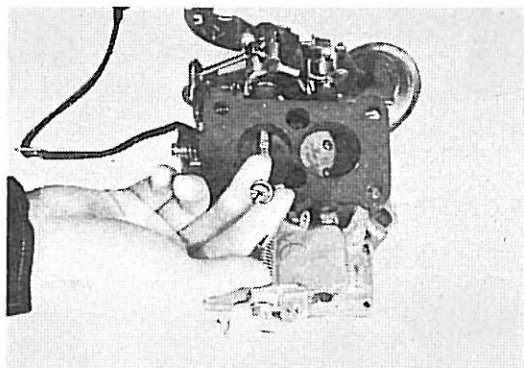


Fig. 4-48 Assembling Body on Flange

2. Assemble the following parts in the body.
Spring & pump plunger ①
Steel ball (larger one) & discharge weight ②

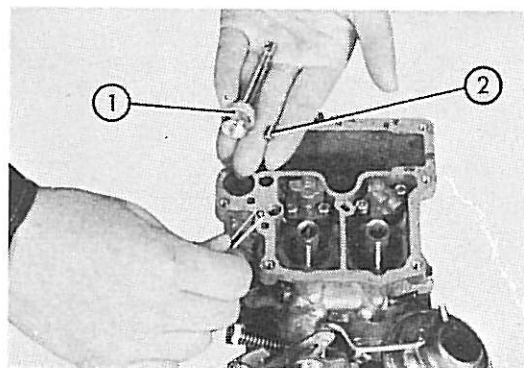


Fig. 4-49 Assembling Pump Plunger, Steel Ball and Discharge Weight

3. Mount the air horn on the body, with the gasket interposed between two sections.

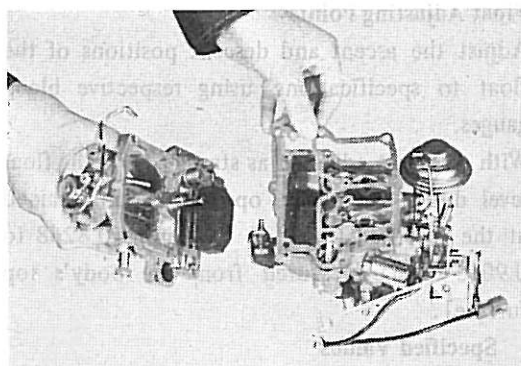


Fig. 4-50 Assembling Air Horn on Body

4. Assemble the following parts.

Thermostatic valve ①

Dash pot ② (option)

Model plate ③

Air horn set screw ④

Choke opener ⑤ (option)

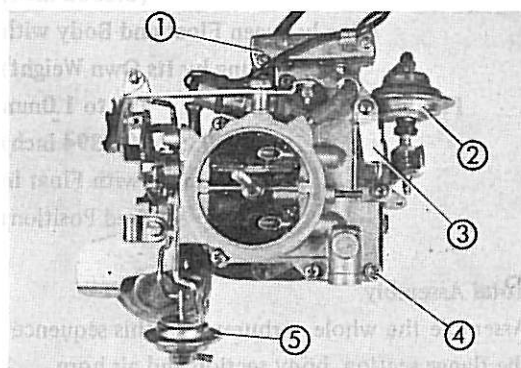
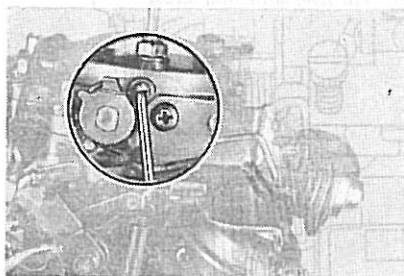


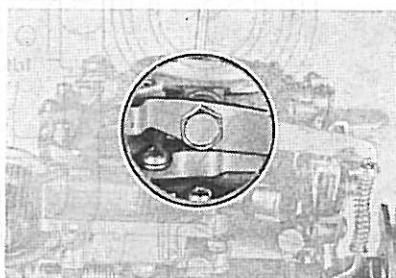
Fig. 4-51 Assembling Air Horn Set Screws

5. Connect the following links and hoses listed below.

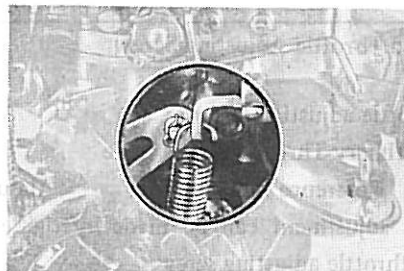
Fast idle connector



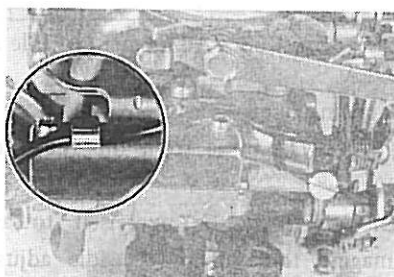
Pump arm & connecting link



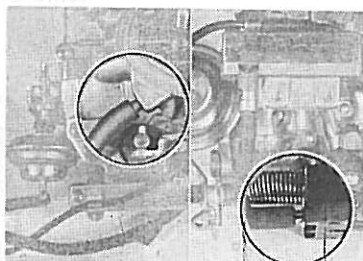
Back spring



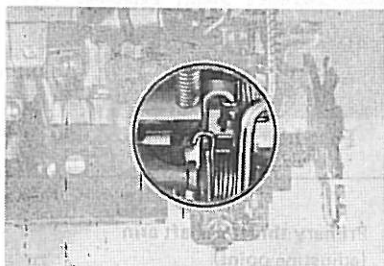
Solenoid valve cord



Thermostatic valve hose



Back spring



Diaphragm rod

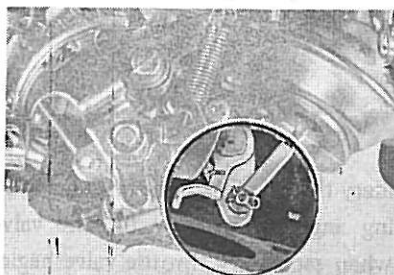


Fig. 4-52 Assembling Links and Hoses

NOTE:

1. Be certain to positively install plate washers and potbelly-shaped retaining pins.
2. Upon completion of assembly, recheck all link and hose connections. And make sure that each linkage moves smoothly.
3. After the fuel pump has been installed, apply a small amount of grease or oil to the joint area of each linkage.

Adjustments To Be Made After Assembly

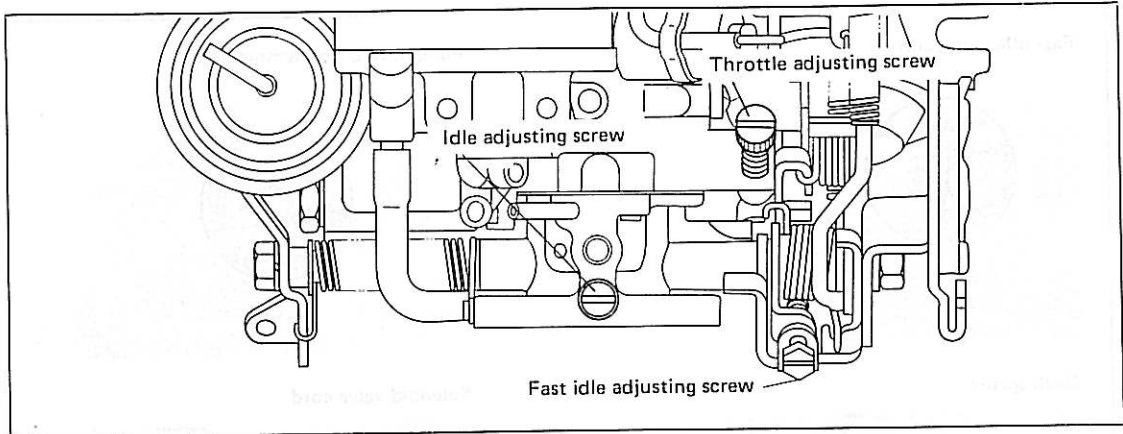


Fig. 4-53 Adjustment of Idle Adjusting Screw and Throttle Adjusting Screw

1. Idle adjusting screw

Back off 2 1/2 turns from the fully-closed position.

NOTE: Care must be exercised to avoid damaging the end of the idle adjusting screw, by tightening it forcibly at the fully-closed position.

2. Throttle adjusting screw

Primary Throttle Valve Angle**Reference Information****About 4°**

This adjustment can be made by tightening the throttle adjusting screw.

NOTE: For this adjustment, it is necessary to remove the dash pot. (option)

3. Fast idle adjusting screw

Angle of primary throttle valve at time when choke valve is fully closed.

Specified Value

Valve Angle: 17°

This adjustment can be made by tightening the fast idle adjusting screw.

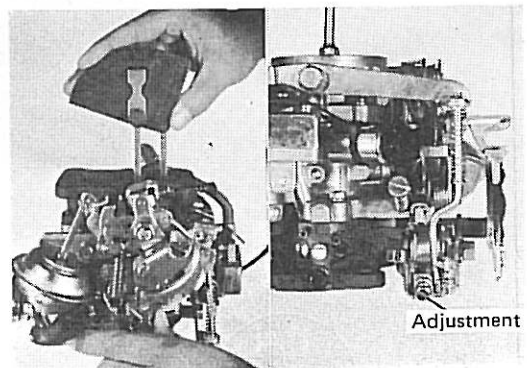


Fig. 4-54 Fast Idle Adjustment

4. Secondary throttle function-starting angle

Opening angle of primary throttle valve at time when secondary throttle valve begins to open.

Specified Value

Valve angle: 50°

This adjustment can be made by bending the claw of the primary throttle shaft arm.

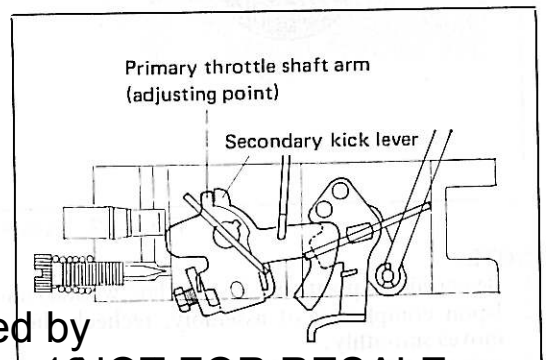


Fig. 4-55 Secondary Throttle Function-Starting Angle Adjustment

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5. Kick-up setting (kick angle)

Clearance between secondary throttle valve and body at time when primary throttle valve is fully opened.

Specified Value

Valve Clearance: **0.25 to 0.35 mm**
 (0.0098 to 0.0138 inch)

This adjustment can be made by bending the secondary throttle shaft arm.

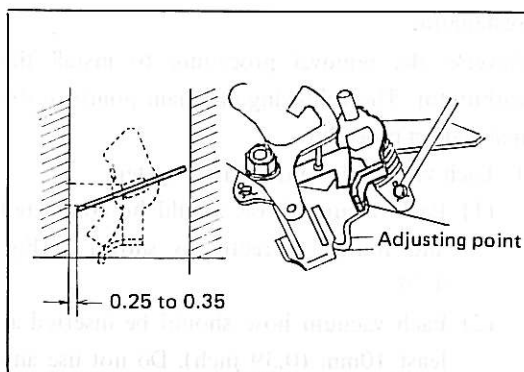


Fig. 4-56 Kick-Up Mechanism Adjustment

6. Acceleration pump stroke

Specified Value: **2.55 to 2.85 mm**
 (0.1004 to 0.1122 inch)

This adjustment can be made by bending the pump connecting link.

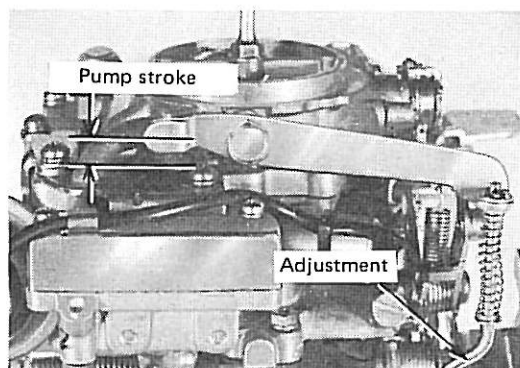


Fig. 4-57 Acceleration Pump Stroke Adjustment

7. Choke opener (option)

Angle of choke valve at time when choke opener is functioning.

Specified Value

Pulling Angle: **28 to 32°**
 (This Pulling Angle of 28 to 32°
 Corresponds to 48 to 52° When
 Measured from Horizontal Position of
 Choke Valve.)

This adjustment can be made by bending the choke opener link.

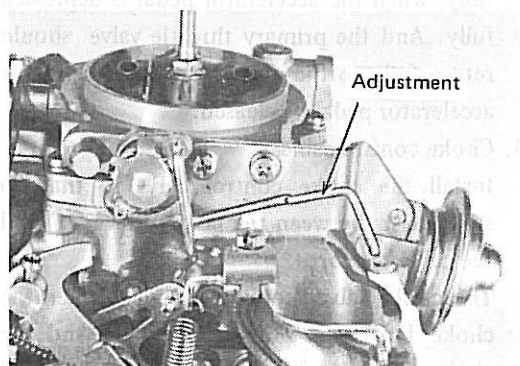


Fig. 4-58 Choke Opener Adjustment (Option)

Installation

Reverse the removal procedure to install the carburetor. The following are main points of the installation procedure.

1. Each vacuum hose of control system
 - (1) Each vacuum hose should be connected and routed correctly as shown in Fig. 4-59.
 - (2) Each vacuum hose should be inserted at least 10mm (0.39 inch). Do not use any lubricant, when inserting vacuum hoses.

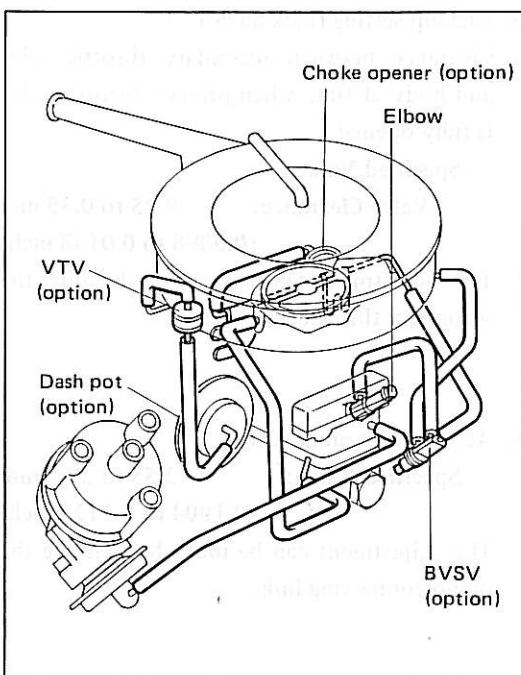


Fig. 4-59 Vacuum Hose Connecting Diagram

2. Accelerator cable

The primary throttle valve should open fully, when the accelerator pedal is depressed fully. And the primary throttle valve should return fully to the original position, when the accelerator pedal is released.

3. Choke control cable

Install the choke control cable so that no slack exists between the fast idle lever ① and the cable support ②.

The choke valve should close fully, when the choke button is pulled out fully. And the choke valve should return to its fully-opened position, when the choke button is pushed back to the original position.

4. After the engine has been warmed up, carry out the engine tune-up operation.
(See page 3-5 for the engine tune-up procedure.)

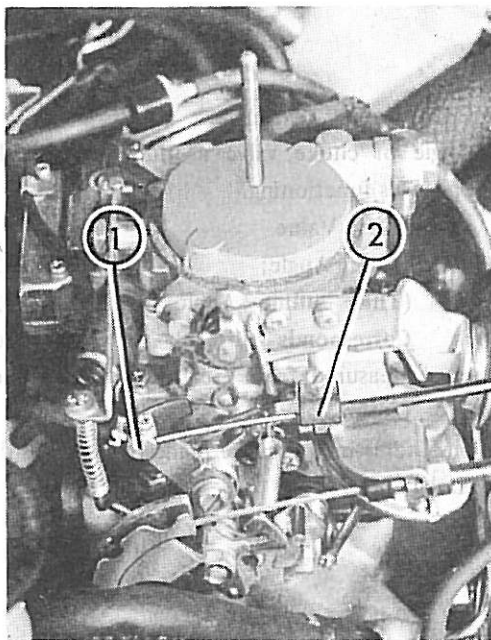


Fig. 4-60 Adjustments of Accelerator and Choke Control Cable

DAIHATSU

TYPE CB-20 ENGINE

SECTION 5 INTAKE AND EXHAUST SYSTEMS

AIR CLEANER	5 - 2
INTAKE MANIFOLD	5 - 3
EXHAUST MANIFOLD	5 - 7
EXHAUST PIPE	5 - 11

5

AIR CLEANER

Components

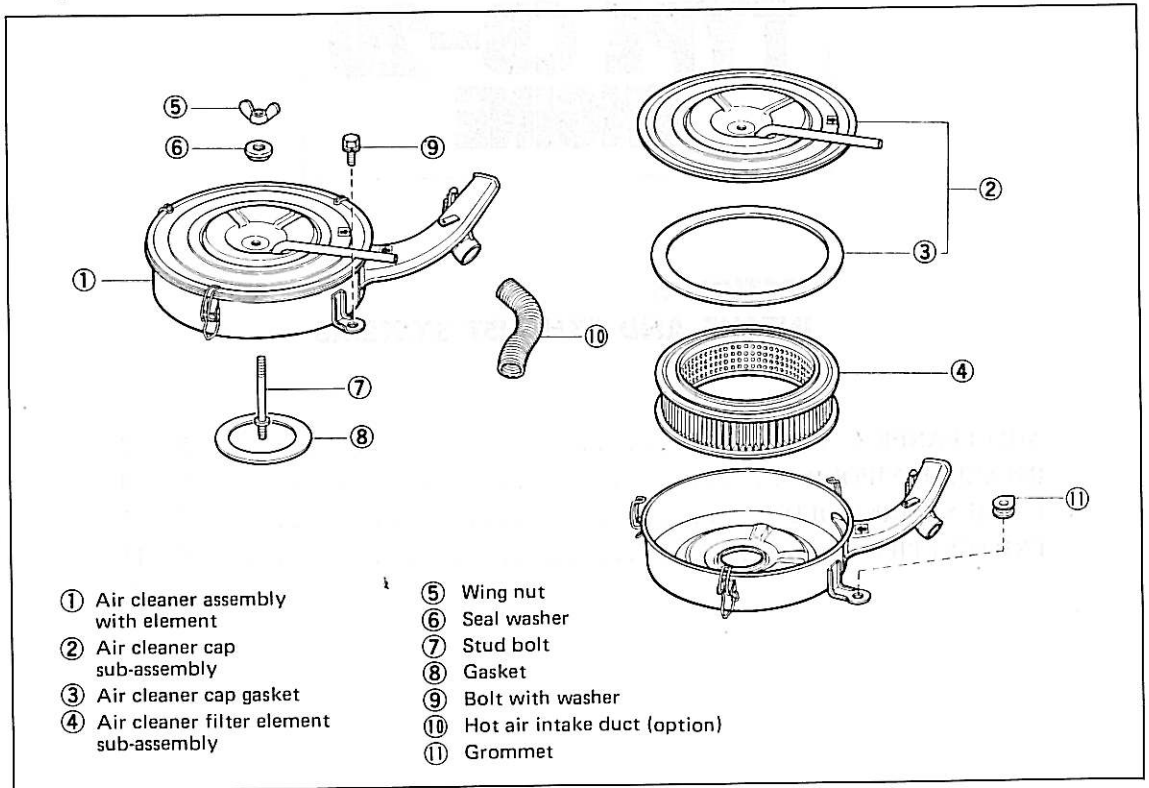


Fig. 5-1 Air Cleaner Element

Specifications

Specifications in [] denote those for some European Countries.

Filter material	Filter paper [Unwoven fabric]
Effective filtrating area	About 10,000 cm ² (1550 inch ²) [2100 cm ² (325.5 inch ²)]
Number of pleats	312 [73]

Inspection

1. Check the air cleaner cap and case for deformation or damage. Replace or repair any defective parts.
2. Check the air cleaner element. If it should be excessively dirty, clogged, or damaged, clean or replace such element.

	Element
Cleaning intervals	10,000 km
Replacement intervals	40,000 km

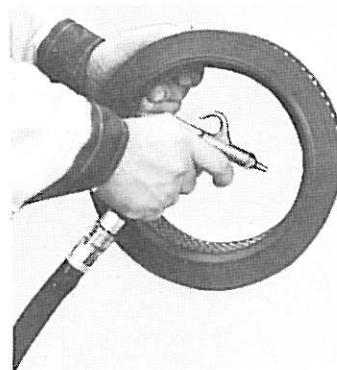


Fig. 5-2 Cleaning Filter Element

NOTE: If the vehicle should be operated in a dusty area, cleaning and replacement of the element must be made at earlier time than intervals above.

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INTAKE MANIFOLD

Components and Tightening Torques

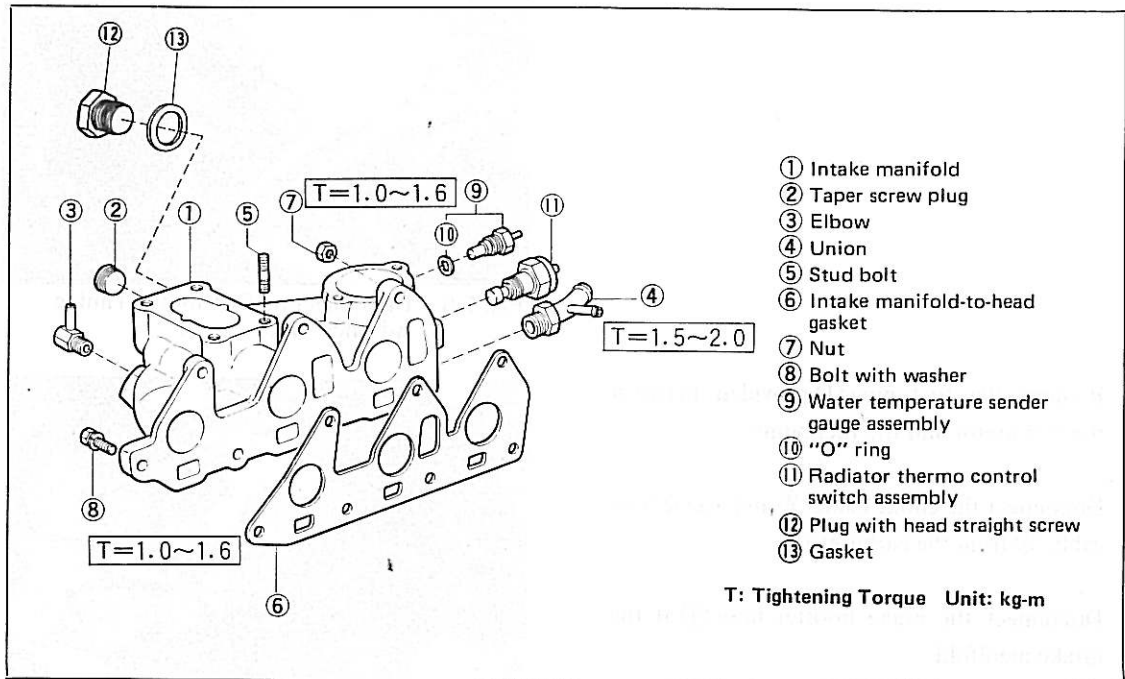


Fig. 5-3 Intake Manifold Components and Tightening Torques

Removal

The following is the removal procedure for the intake manifold together with the carburetor.

1. Drain the cooling water.
2. Remove the air cleaner.
3. Disconnect the following cooling water hoses.
 - (1) Radiator-to-thermostat ①
 - (2) Heater-to-intake manifold (option)
 - (3) Intake manifold-to-water pump (by-pass hose) ②
4. Disconnect the following wirings.
 - (1) Radiator thermo control switch ①
 - (2) Water temperature sender gauge ②
 - (3) Fuel cut solenoid valve

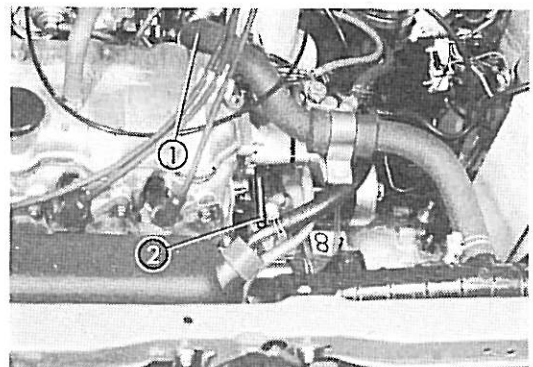


Fig. 5-4 Disconnecting Cooling Water Hoses

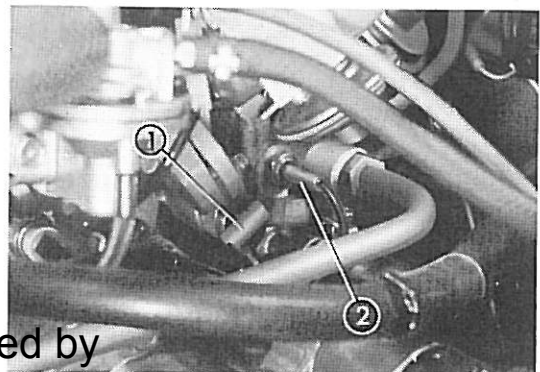


Fig. 5-5 Disconnecting Various Wirings

5. Disconnect the distributor timing advance hose ① at the distributor side.

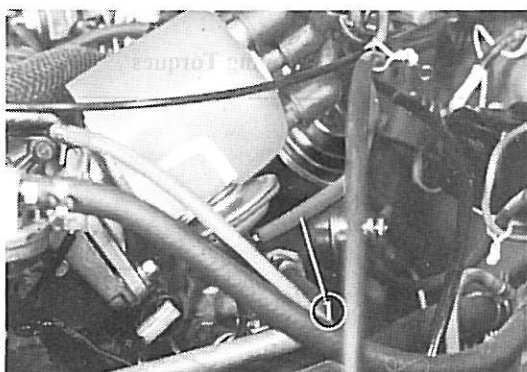


Fig. 5-6 Disconnecting Distributor Timing Advance Hose

6. Remove the fuel pipe ① provided between the carburetor and the fuel pump.

7. Disconnect the choke cable ② and accelerator cable ③ from the carburetor.

8. Disconnect the brake booster hose ④ at the intake manifold.

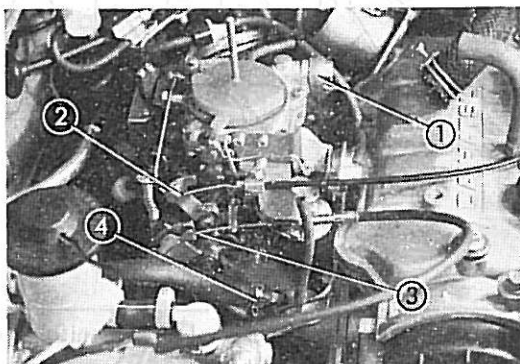


Fig. 5-7 Removing Fuel Pipe, Etc.

9. Remove the intake manifold with the carburetor mounted on it.

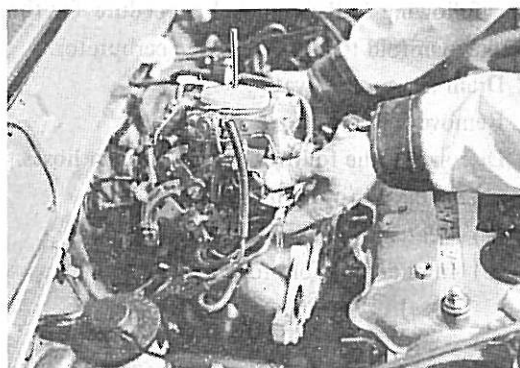


Fig. 5-8 Removing Intake Manifold (Together with Carburetor)

Inspection

1. Check the instake manifold for evidence of corrosion, damage, or cracks. Repair or replace the manifold that exhibits such defects.
2. Inspect the cylinder head attaching surface of the intake manifold for distortion. If the distortion should exceed the tolerable limit, correct the attaching surface or replace the manifold.

Allowable Limit of	0.10 mm
Distortion:	(0.0039 inch)

Disassembly

If the above-described inspection should reveal that the intake manifold is defective, disassemble the intake manifold, following the procedure given below. And correct the intake manifold (unit) or replace it, if needed.

1. Remove the carburetor assembly as follow.
 - (1) Pull out each hose from the BVS[®] (option). Prior to disconnection, put an identification mark on each hose.
 - Air cleaner ①
 - Choke opener ② (option)
 - (2) Remove the carburetor assembly from the intake manifold with various hoses installed on the carburetor.

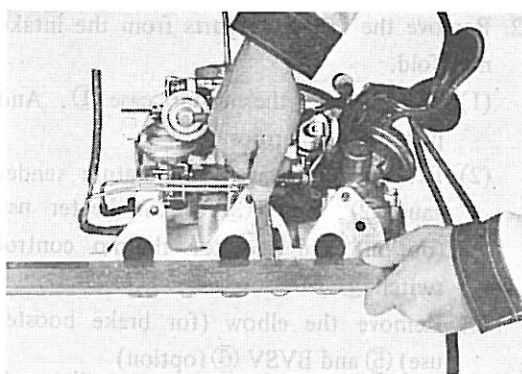


Fig. 5-9 Measuring Intake Manifold Distortion

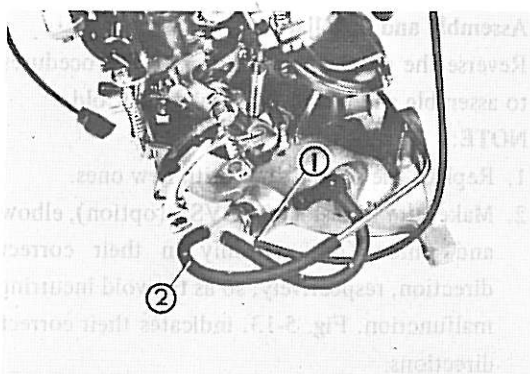


Fig. 5-10 Disconnecting Hoses Related with BVS

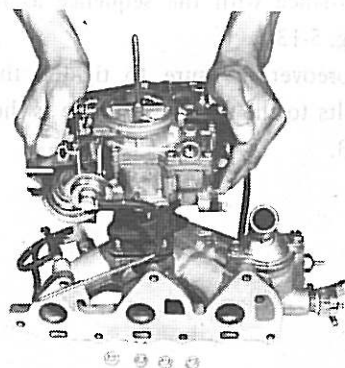


Fig. 5-11 Removing Carburetor Assembly

2. Remove the following parts from the intake manifold.

- (1) Remove the thermostat case ①. And pick up the thermostat.
- (2) Remove the water temperature sender gauge ②, union ③ for car heater, use (option) and radiator thermo control switch ④.
- (3) Remove the elbow (for brake booster use) ⑤ and BVSV ⑥ (option)
- (4) Remove the stud bolt ⑦ and taper screw plug ⑧.

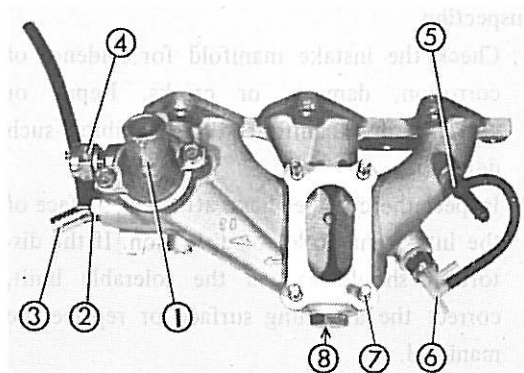


Fig. 5-12 Removing Intake Manifold Related Parts

Assembly and Installation

Reverse the disassembly and removal procedures to assemble and install the intake manifold.

NOTE:

1. Replace the gaskets, etc. with new ones.
2. Make sure to install the BVSV (option), elbow and union (option) only in their correct direction, respectively, so as to avoid incurring malfunction. Fig. 5-13. indicates their correct directions.

Furthermore, be certain to apply the bond sealer to the threaded portions.

3. The intake manifold should be torqued in accordance with the sequence as indicated in Fig. 5-13.

Moreover, be sure to tighten the attaching bolts to the specified torque as shown at page 5-3.

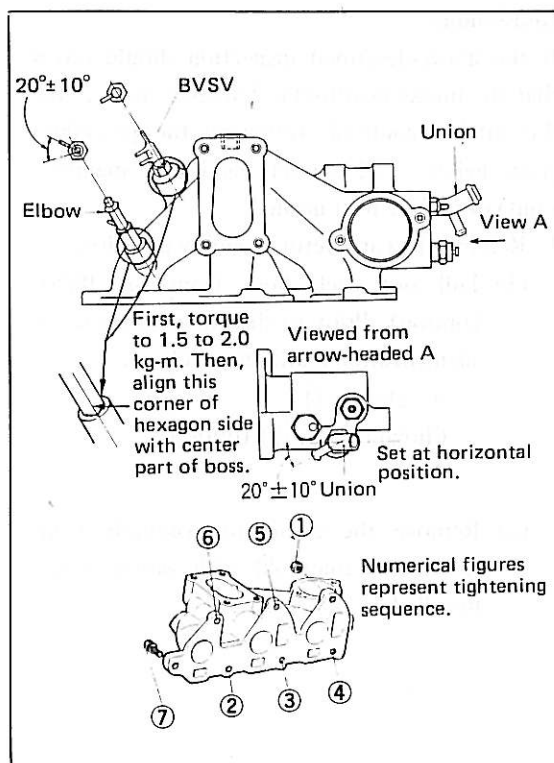
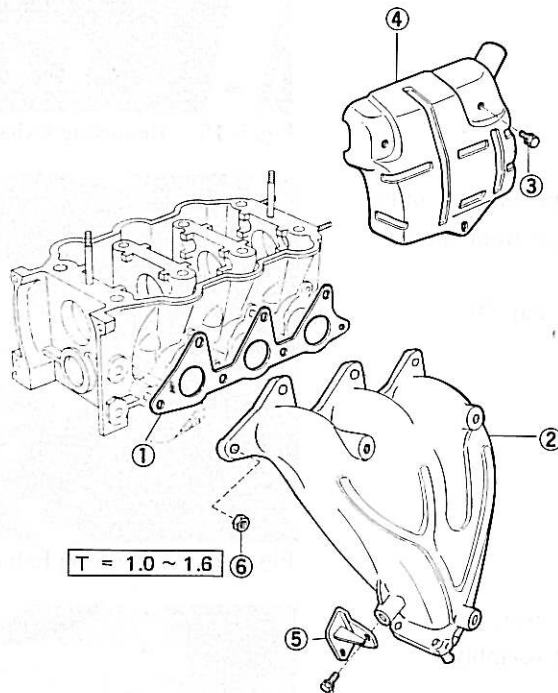


Fig. 5-13 Correct Installing Direction of BVSV, Elbow and Union and Intake Manifold Tightening Sequence

EXHAUST MANIFOLD

Components and Tightening Torques



T = 1.0 ~ 1.6

T: Tightening Torque Unit: kg-m

- ① Exhaust manifold to head gasket
- ② Exhaust manifold
- ③ Bolt with washer
- ④ Exhaust manifold cover
- ⑤ Exhaust manifold stay
- ⑥ Nut

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Removal

1. Jack up the front part of the vehicle.
2. Slacken sufficiently those bolts which connect the exhaust front pipe to the exhaust tail pipe.
3. Slacken the exhaust pipe support No.1 ① so as to separate it from the transmission case.

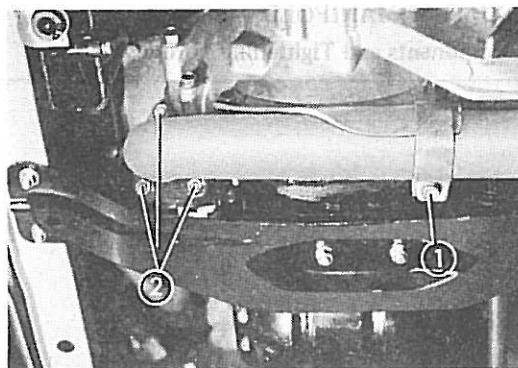


Fig. 5-15 Removing Exhaust Front Pipe

4. Remove the exhaust front pipe retaining nuts ② so as to separate the pipe from the exhaust manifold.
6. Remove the exhaust manifold stay ③.
7. Jack down the vehicle.

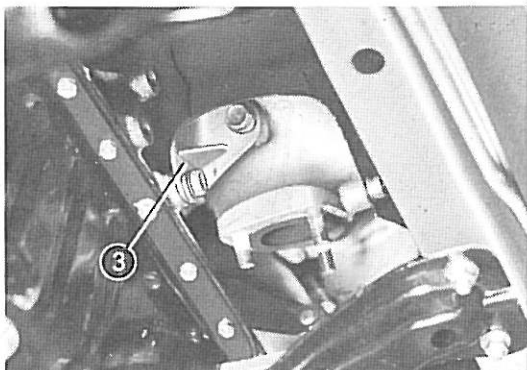


Fig. 5-16 Removing Exhaust Manifold Stay

8. Detach the exhaust manifold cover.
9. Remove the exhaust manifold assembly.

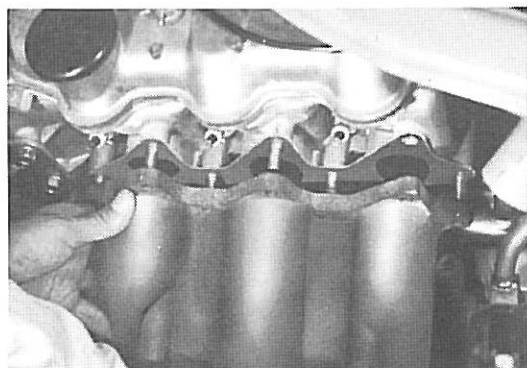


Fig. 5-17 Removing Exhaust Manifold Assembly

Inspection

1. Check the exhaust manifold for evidence of corrosion, damage, or cracks. Repair or replace the manifold that exhibits such defects.
2. Inspect the cylinder head attaching surface of the exhaust manifold for distortion. If the distortion should exceed the tolerable limit, correct the attaching surface or replace the manifold.

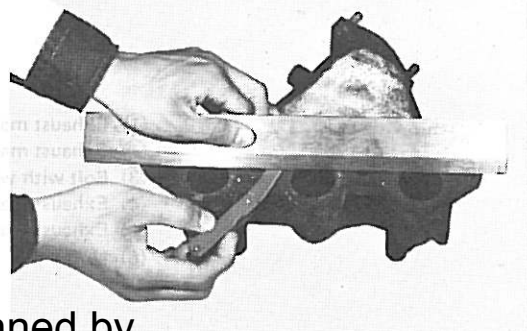


Fig. 5-18 Measuring Exhaust Manifold Distortion

Allowable Limit of Distortion: 0.10 mm (0.0039 inch)

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Installation

Reverse the removal procedure to install the exhaust manifold.

Exhaust Manifold Tightening Torque:

1.0 to 1.6 kg-m (7.2 to 11.6 ft-lb)

(See Fig. 5-19 for the correct tightening sequence.)

NOTE: Replace the gasket with a new one.

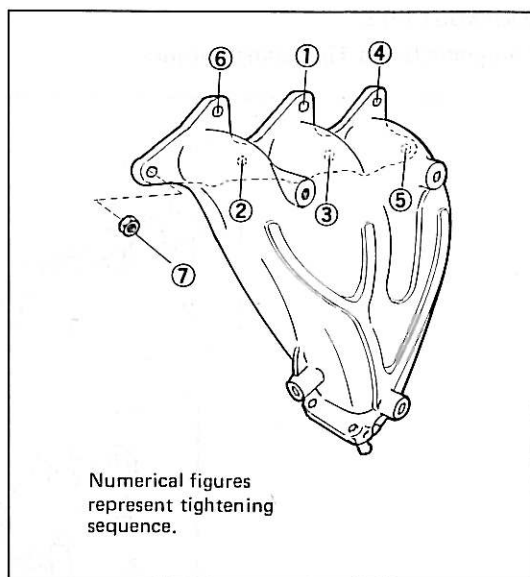


Fig. 5-19 Exhaust Manifold Tightening Sequence

EXHAUST PIPE

Components and Tightening Torques

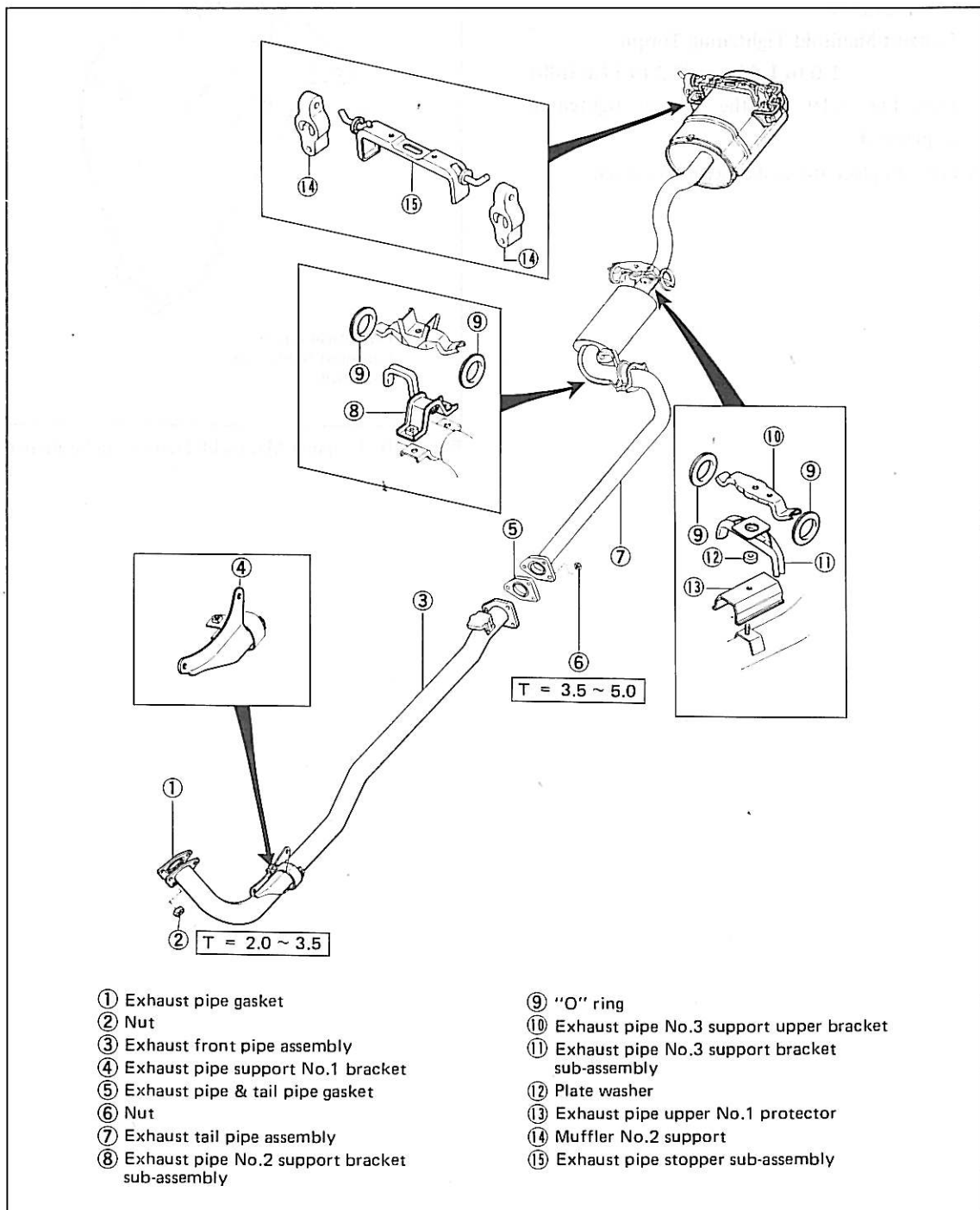


Fig. 5-20 Exhaust Pipe Components and Tightening Torques

Removal

Exhaust Front Pipe

1. Jack up the front and rear parts of the vehicle.
Support the vehicle with rigid racks.
2. Remove the bolts which connect the exhaust front pipe to the exhaust tail pipe.
3. Slacken the clamp bolt of the exhaust pipe support No.1 in order to separate the exhaust front pipe from the transmission case.
4. Remove the nuts which connect the exhaust front pipe to the exhaust manifold so as to remove the exhaust front pipe.

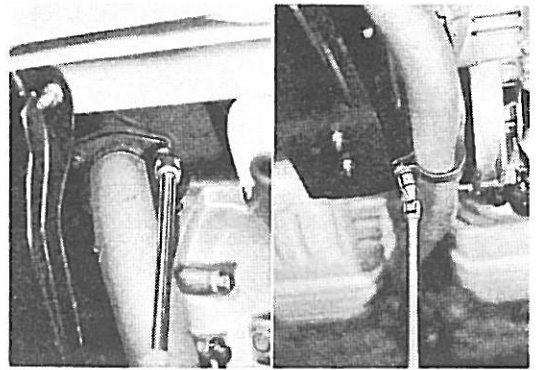


Fig. 5-21 Removing Exhaust Front Pipe

Exhaust Tail Pipe

1. Jack up the front and rear parts of the vehicle.
Support the vehicle with rigid racks.
2. Disconnect the exhaust tail pipe from the exhaust front pipe.
3. Remove the bolt which connects the rear shock absorber (right) to the rear axle beam so as to lower the right end of the rear axle beam.
4. Remove the attaching bolt of the muffler support No.2.
5. Detach the "O" rings from the exhaust pipe supports No.2 and No.3.
6. Pull the exhaust tail pipe toward the front side, while lowering the rear axle beam slightly.

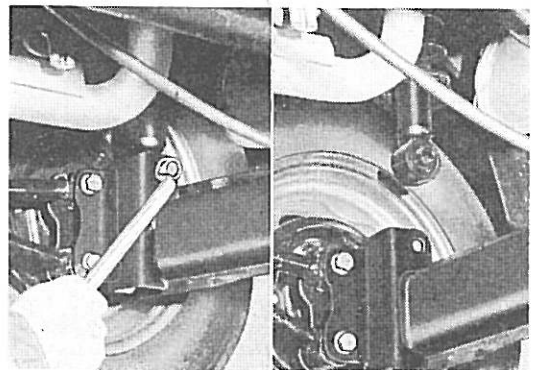


Fig. 5-22 Lowering Rear Axle Beam

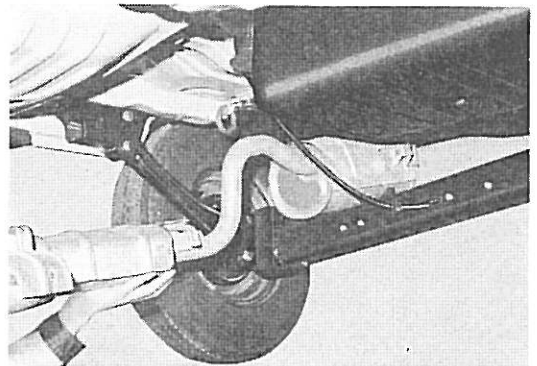


Fig. 5-23 Removing Exhaust Tail Pipe

Inspection

Check the exhaust pipe related parts for signs of damage or corrosion, etc. Repair or replace any parts which show such defects.

Installation

Reverse the removal procedure to install the exhaust pipe related parts.

NOTE: Replace the gaskets, etc. with new ones.

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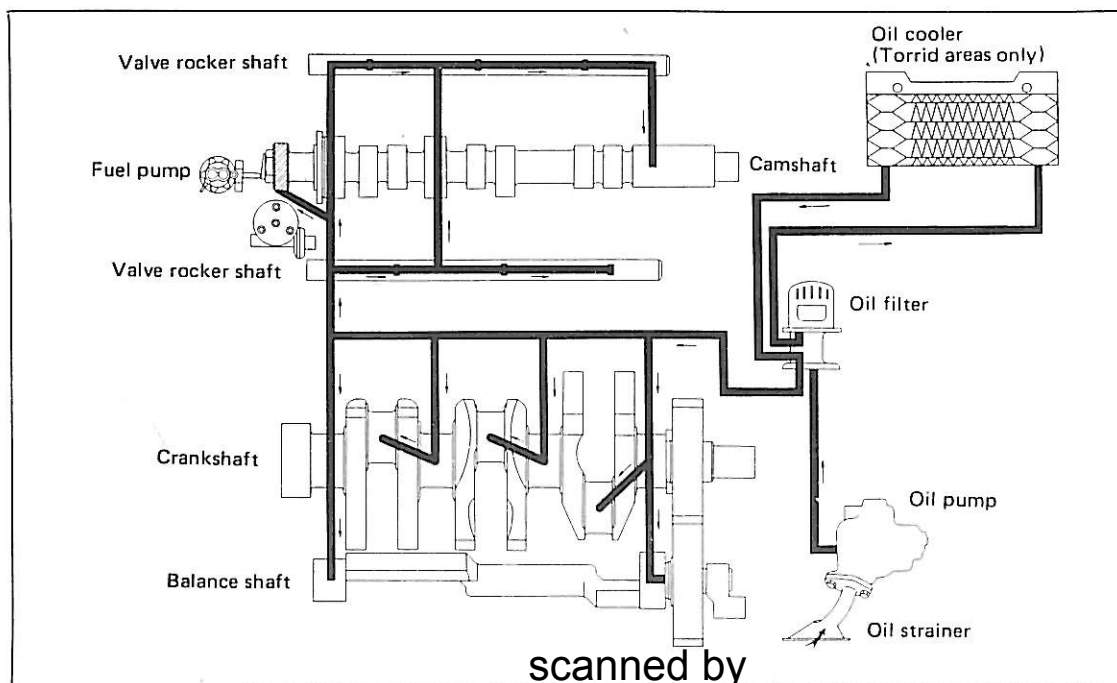
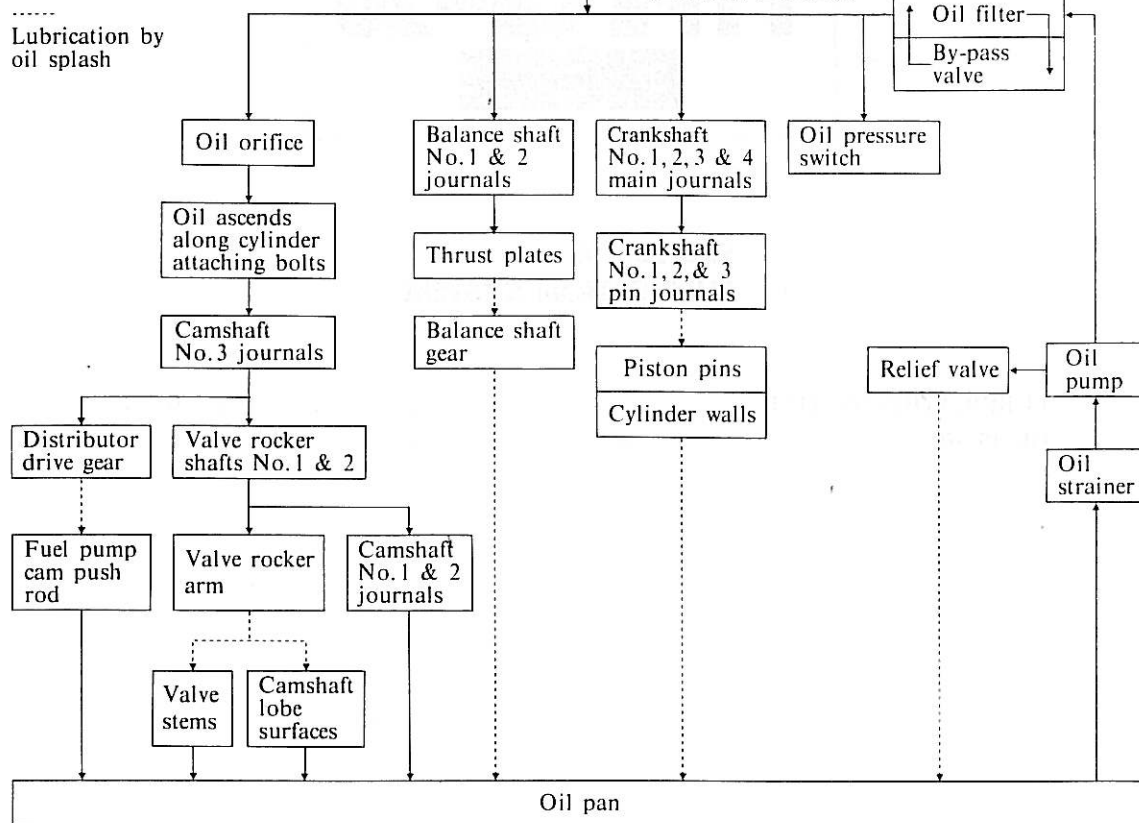
SECTION 6 LUBRICATION SYSTEM

LUBRICATION SYSTEM	6-2
OIL PUMP	6-3

6

LUBRICATION SYSTEM

Block Diagram of Lubrication System



OIL PUMP

Components and Tightening Torques

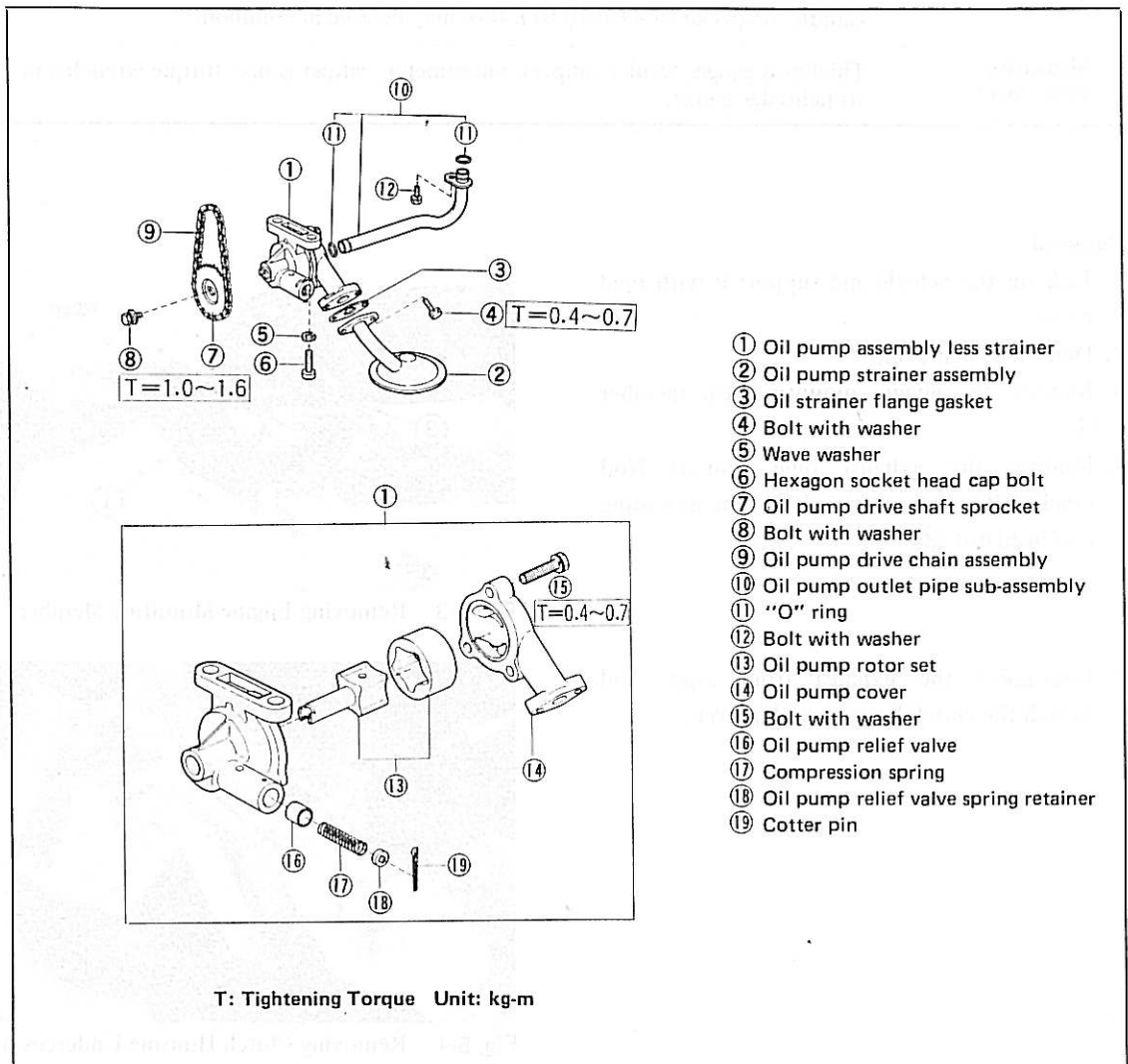


Fig. 6-2 Oil Pump Components and Tightening Torques

Specifications

Oil pump			Relief valve			
Oil pump type		Trochoid		Valve opening pressure	Begins to open at:	3.6 ± 0.5 kg/cm ² (51.2 ± 7.1 psi)
Driving method		Driven by chain				
Delivery output	Pump revolution speed 600 rpn:	4.0 liter/min [oil pressure of no less than 2 kg/cm ² (28.4 psi)]			Fully opens at:	6.5 ± 0.5 kg/cm ² (92.4 ± 7.1 psi)
	Pump revolution speed 2500 rpm	16.0 liter/min [oil pressure of no less than 3 kg/cm ² (42.7 psi)]				
Oil used: SAE 10W-30 5W-30			Oil level gauge			
(c) Daihatsu 1981			Upper level: 2.7 liters			
www.charade-g10.net			Lower level: 1.7 liters			

Tools and Measuring Instruments

Tools	Hexagon rod wrench (having a width-across-flats of 6mm) Handle of special tool (4610-07), too, may be used in common.
Measuring instruments	Thickness gauge, vernier calipers, micrometer, caliper gauge, torque wrench and straightedge gauge.

Removal

1. Jack up the vehicle and support it with rigid racks.
2. Drain the engine oil.
3. Remove the engine mounting rear member ①.
4. Remove the exhaust pipe support No.1 bracket ②. And remove the engine mounting rear insulator ③.

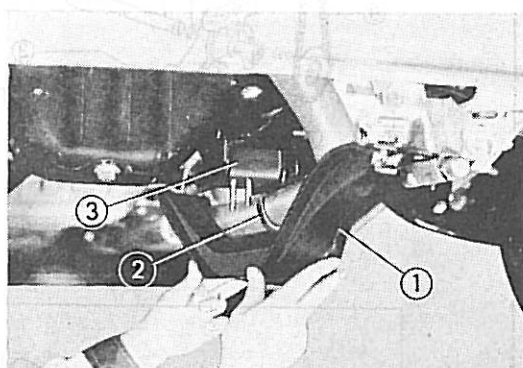


Fig. 6-3 Removing Engine Mounting Member

5. Disconnect the exhaust front pipe. And detach the clutch housing undercover.

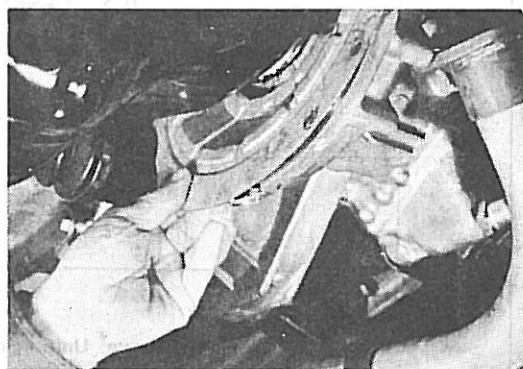


Fig. 6-4 Removing Clutch Housing Undercover

6. Remove the oil pan.

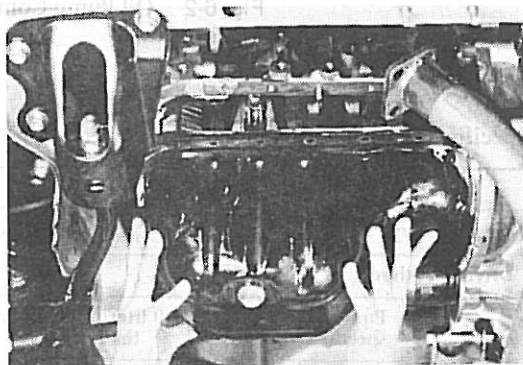


Fig. 6-5 Removing Oil Pan

7. Measure the deflection of the oil pump chain, as indicated in Fig. 6-6.

This deflection should be measured with the chain depressed at the mid-point between the sprockets.

Allowable Limit of Deflection:

7mm (0.28 inch)

8. Remove the oil pump drive shaft sprocket ①. When removing the sprocket, the oil pump chain ② should be left on the sprocket at the balance shaft side.

9. Remove the oil pump assembly ③ together with the oil pump outlet pipe ④.

As for the attaching bolts (hexagon socket head cap bolts) of the oil pump assembly, use a hexagon rod wrench (commercially-available).

10. Remove the oil pump strainer ⑤ from the oil pump assembly ③.



Fig. 6-6 Checking Oil Pump Chain Deflection

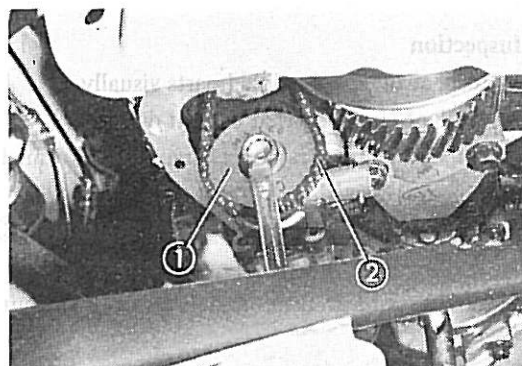


Fig. 6-7 Removing Sprocket

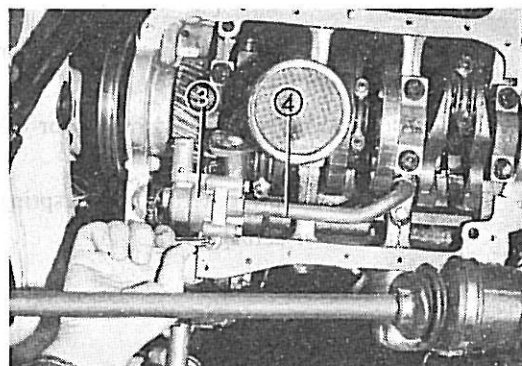


Fig. 6-8 Removing Oil Pump (1)

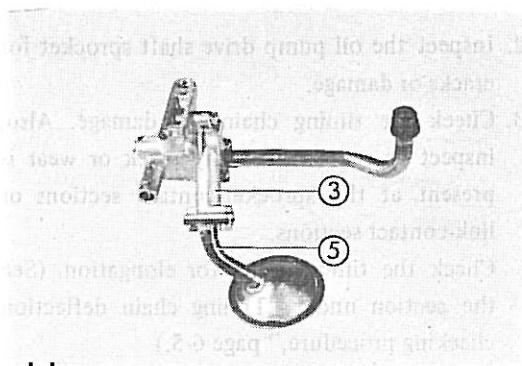


Fig. 6-9 Removing Oil Pump (2)

Disassembly

1. Remove the oil pump cover (6), by removing the three attaching bolts.
2. Take the oil pump rotor set (7) out from the oil pump.
3. Remove the cotter pin (8). And take out the relief valve spring retainer (9), spring (10) and relief valve (11).

NOTE: While removing the cotter pin, care must be exercised to ensure that the spring will not jump out.

Inspection

1. Inspect the disassembled parts visually.
Replace any parts that exhibit defects.
 - (1) Oil pump strainer (1) cracked, deformed, or damaged.
 - (2) Oil pump outlet pipe "O" ring (2) cracked, deformed, or damaged.
 - (3) Oil pump cover (3) cracked or worn out.
 - (4) Oil pump body (4) worn, deformed, or cracked.
 - (5) Oil pump drive rotor and driven rotor (5) worn or damaged.
 - (6) Relief valve, spring retainer and spring (6) cracked or damaged.

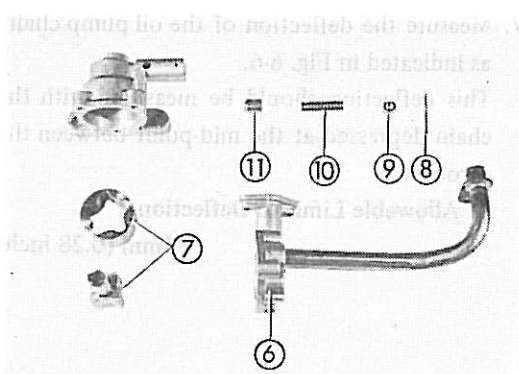


Fig. 6-10 Disassembling Oil Pump

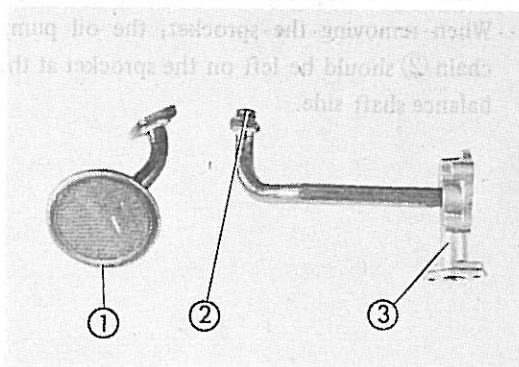


Fig. 6-11 Checking Strainer and Outlet Pipe

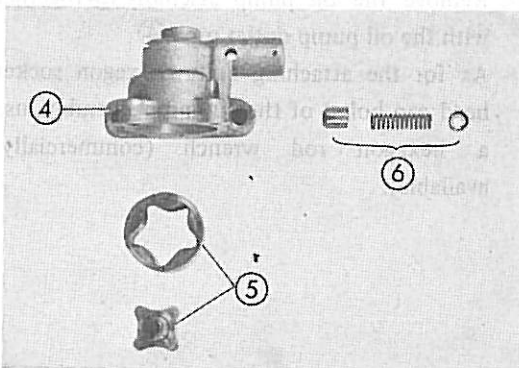


Fig. 6-12 Checking Oil Pump

2. Inspect the oil pump drive shaft sprocket for cracks or damage.
3. Check the timing chain for damage. Also, inspect to see whether any crack or wear is present at the sprocket-contact sections or link-contact sections.
Check the timing chain for elongation. (See the section under "Timing chain deflection checking procedure," page 6-5.)

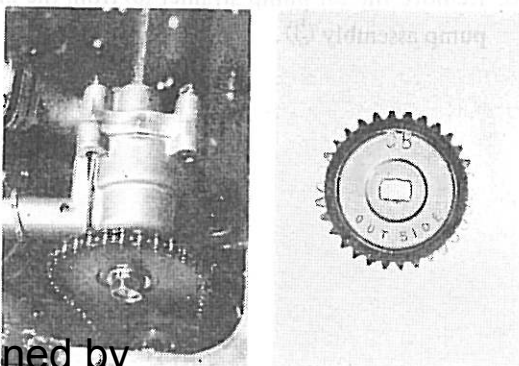


Fig. 6-13 Checking Sprocket and Chain

4. Measure the clearance between the oil pump shaft and the oil pump body.

Specified Clearance: 0.045 to 0.085 mm
(0.0018 to 0.0033 inch)

Allowable Limit of Clearance: 0.10mm
(0.0039 inch)

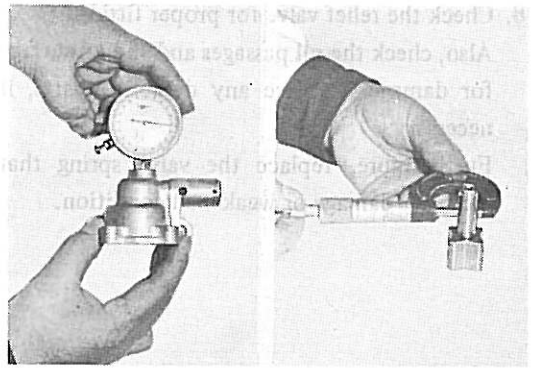


Fig. 6-14 Checking Oil Pump Shaft-to-Body Clearance

5. Measure the tip clearance (the gap between the tooth ends of the drive rotor and driven rotor).

Specified Tip Clearance:

Not to exceed 0.15 mm (0.0059 inch)

Allowable Limit of Tip Clearance:

0.25 mm (0.0098 inch)

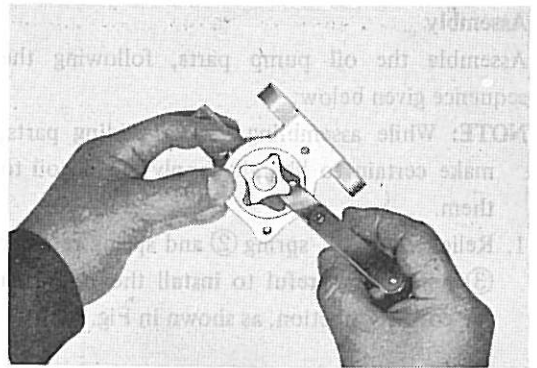


Fig. 6-15 Measuring Tip Clearance

6. Measure the side clearance (the gap between the rotor and the cover attaching surface).

Specified Side Clearance: 0.03 to 0.09 mm
(0.0012 to 0.0035 inch)

Allowable Limit of Side Clearance:

0.20 mm (0.0079 inch)

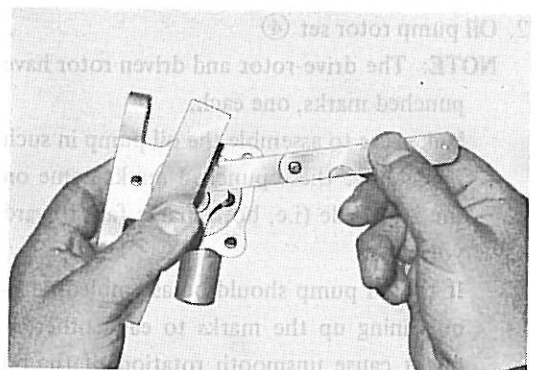


Fig. 6-16 Measuring Side Clearance

7. Measure the body clearance (the gap between the driven rotor and the body).

Specified Body Clearance:

0.10 to 0.16 mm (0.0039 to 0.0063 inch)

Allowable Limit of Body Clearance:

0.30 mm (0.0118 inch)

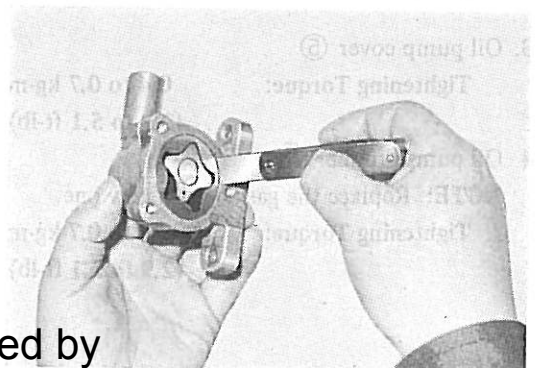


Fig. 6-17 Measuring Body Clearance

8. Check the relief valve for proper fitting.
Also, check the oil passages and sliding surface for damage. Replace any defective parts, if necessary.
Furthermore, replace the valve spring that indicates damage or weakened condition.

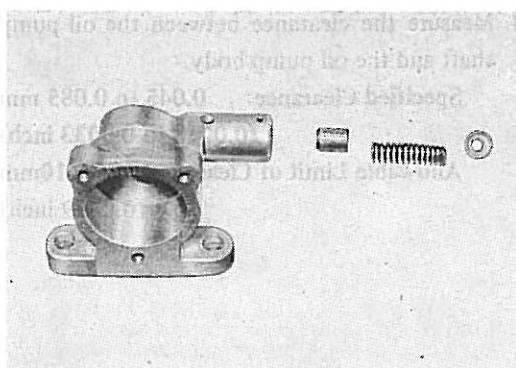


Fig. 6-18 Checking Relief Valve

Assembly

Assemble the oil pump parts, following the sequence given below:

NOTE: While assembling various sliding parts, make certain to liberally apply engine oil to them.

1. Relief valve ①, spring ② and spring retainer ③. Be very careful to install these parts in the correct direction, as shown in Fig. 6-19.

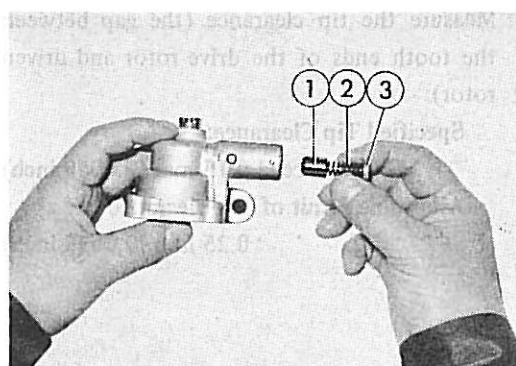


Fig. 6-19 Assembling Relief Valve

2. Oil pump rotor set ④

NOTE: The drive rotor and driven rotor have punched marks, one each.

Make sure to assemble the oil pump in such a way that these punched marks come on the same side (i.e. both marks face toward you).

If the oil pump should be assembled without lining up the marks to each other, it might cause unsmooth rotation of the oil pump.

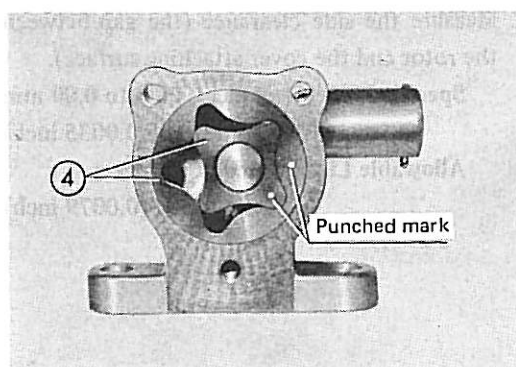


Fig. 6-20 Assembling Oil Pump Rotor Set

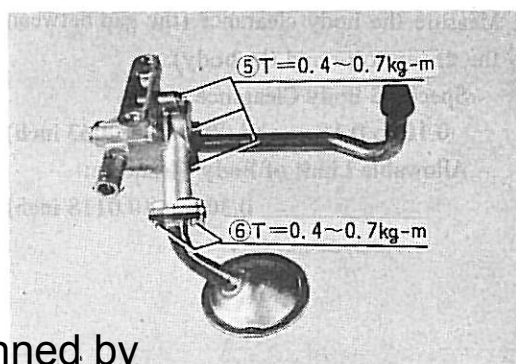
3. Oil pump cover ⑤

Tightening Torque: 0.4 to 0.7 kg-m
(2.9 to 5.1 ft-lb)

4. Oil pump strainer ⑥

NOTE: Replace the gasket with new one.

Tightening Torque: 0.4 to 0.7 kg-m
(2.9 to 5.1 ft-lb)



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5. Upon completion of the assembly operation, carry out a test to ensure that the assembled oil pump functions properly, as follows:
 Submerge the inlet port of the oil pump into the oil in a container, as indicated in Fig. 6-22. Turn the oil pump in a clockwise direction, with the sprocket or a screw driver. When the oil is discharged from the oil outlet port of the oil pump body, it denotes that the oil pump is functioning properly.
 Next, plug the outlet port by your finger.
 Repeat the above-described test on the assembled oil pump.
 If the rotation of the oil pump shaft becomes harder, until the oil pump shaft can not be

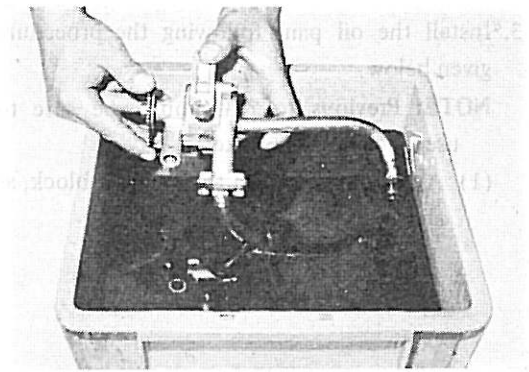


Fig. 6-22 Simple Test Checking Oil Pump Operation

rotated any more, it indicates that the oil pump is functioning properly.

Installation

1. Attach the oil pump assembly to the cylinder block.

NOTE: Prior to reassembly, make certain to coat the "O" ring of the oil pump outlet pipe with engine oil.

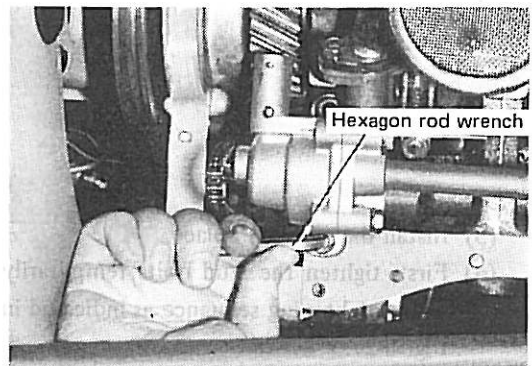


Fig. 6-23 Attaching Oil Pump

2. Position the oil pump chain and oil pump drive shaft sprocket as follows.

The oil pump drive shaft sprocket should be installed in such a direction that the side bearing a stamped mark of "CB-OUTSIDE" faces the outside. (As a result, the back side bears a stamped mark of "AB-OUTSIDE.")

Tightening Torque: 1.0 to 1.6 kg-m
(6.2 to 11.6 ft-lb)

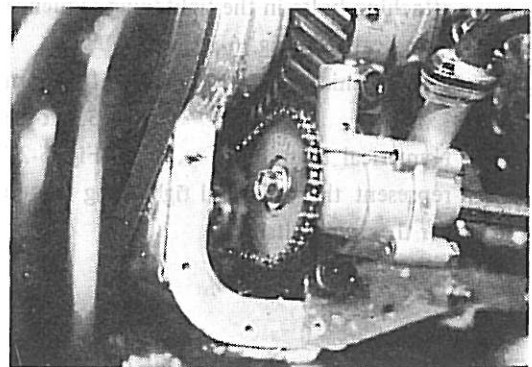


Fig. 6-24 Installing Sprocket

3. Install the oil pan, following the procedure given below.

NOTE: Previous to reassembly, be sure to use a new oil pan gasket.

- (1) Apply the sealer to the cylinder block, as shown in Fig. 6-25.

Sealer To Be Used:

Silicon Bond Sealer

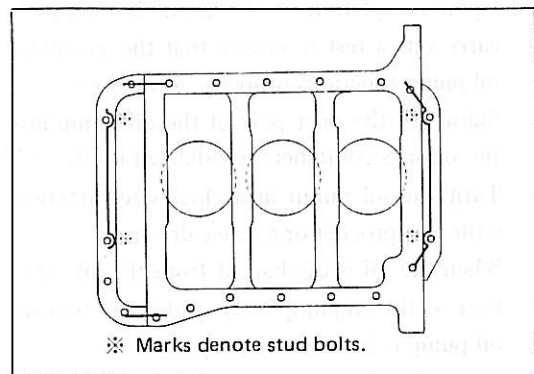


Fig. 6-25 Sealer Applying Procedure (Cylinder Block Side)

- (2) Apply the sealer to the oil pan gasket at its oil pan side, as shown in Fig. 6-26. Then, place the oil pan gasket onto the cylinder block.

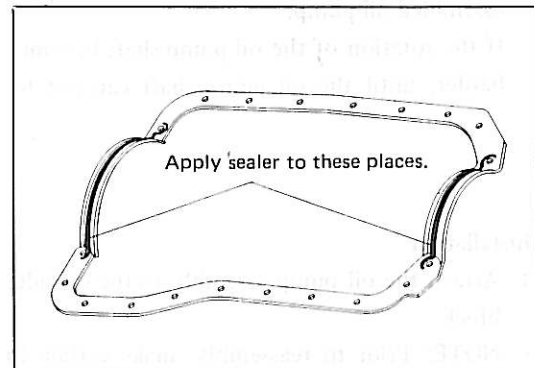


Fig. 6-26 Sealer Applying Procedure (Oil Pan Side)

- (3) Install the oil pan in place.
(4) First, tighten the stud bolts temporarily in the tightening sequence as indicated in Fig. 6-27.

Then, proceed to tighten the oil pan attaching bolts in the tightening sequence as indicated in Fig. 6-27.

Tightening Torque: 0.4 to 0.7 kg-m
(2.9 to 5.1 ft-lb)

Numerical figures in () in Fig. 6-27 represent the temporal tightening torque for the stud bolts.

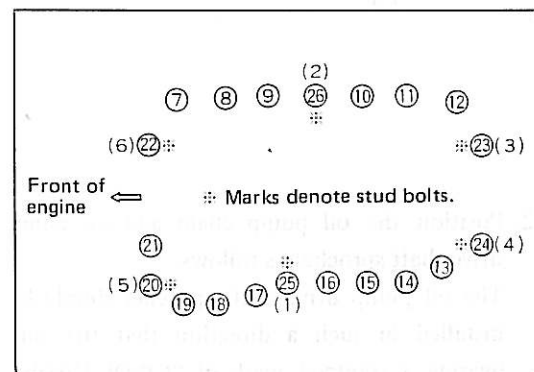


Fig. 6-27 Oil Pan Attaching Bolt Tightening Sequence

4. Attach the clutch housing undercover.

Using a screw driver, etc., spread the oil pan gasket so as to provide a gap, as shown in Fig. 6-28. Then, push the undercover into the thus-provided gap.

5. Install the following parts in this sequence: the exhaust pipe support No.1 bracket, engine mounting rear insulator, engine mounting rear member and exhaust front pipe.
6. Install the oil pan drain plug.

Tightening Torque: 2.5 to 3.5 kg-m
 (18.1 to 25.3 ft-lb)

7. Fill the engine oil.

Oil To Be Used:

SAE 10W-30

SAE 5W-30

(Chilly regions)

To Be Filled: 2.7 liters

(Oil Pan Capacity)

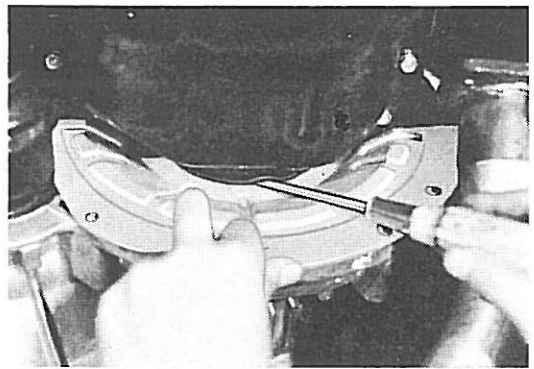


Fig. 6-28 Attaching Clutch Housing Undercover

DAIHATSU

TYPE CB-20 ENGINE

SECTION 7 COOLING SYSTEM

COOLING SYSTEM	7 - 2
RADIATOR	7 - 3
WATER PUMP	7 - 5
THERMOSTAT	7 - 10
FORCED COOLING MECHANISM	7 - 11

7

COOLING SYSTEM

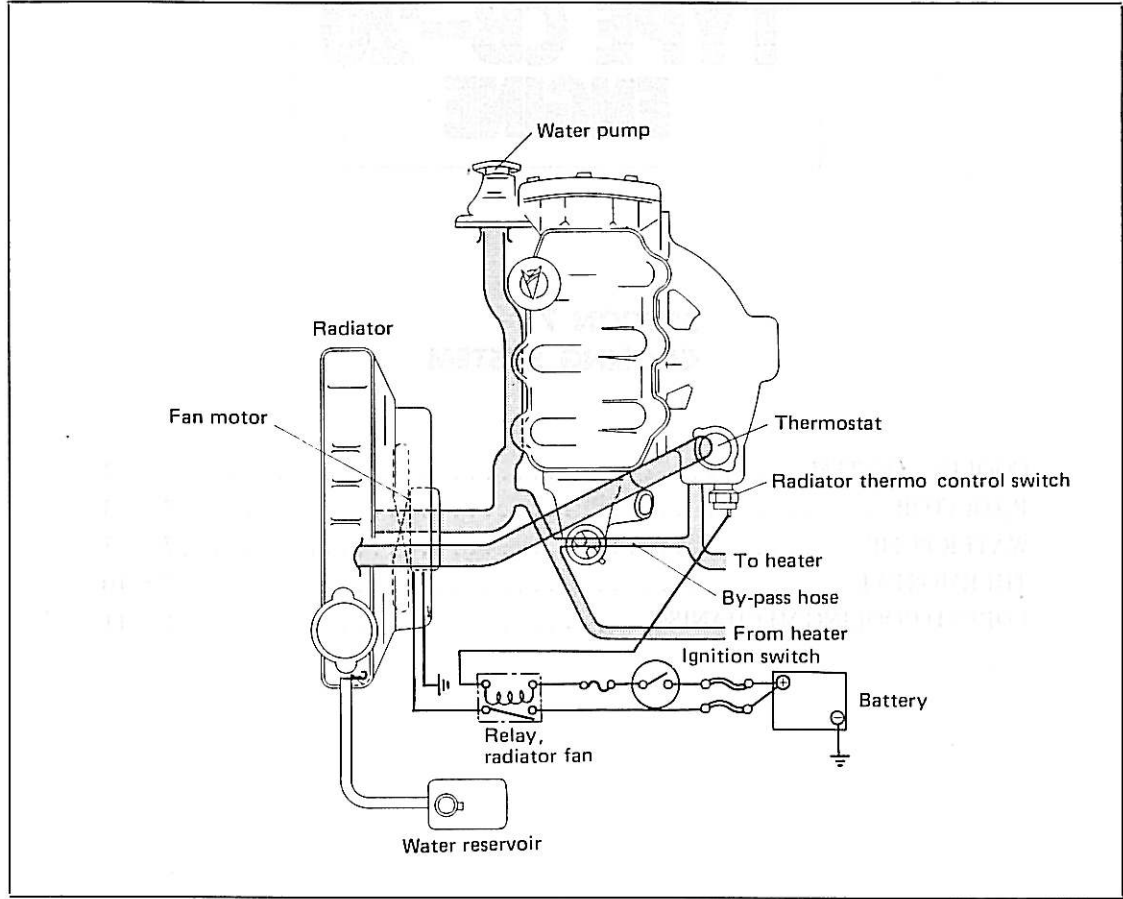


Fig. 7-1 Schematic View of Cooling System

Specifications

Radiator

Fin shape	Corrugate type
Radiator water capacity	0.85 liter
Total heat radiating area	4.303 m ²
Heat radiating rate	21.500 Kcal/h
Cap valve opening pressure	0.9 ± 0.15 kg/cm ² (12.8 ± 2.1 psi)
Core dimensions (height x width x thickness)	350 x 310 x 32 mm (13.78 x 12.20 x 1.26 inches)

Water Pump

Type	Centrifugal type
Delivery output [at water temperature of 15°C]	60 liter/min – 3500 rpm

Thermostat

Figures in [] denote option

Type	Wax type
Opening-start temperature	82 ± 1.5 [88 ± 1.5]
Full-opening temperature	95 [100]

Fan Motor

Figures in [] denote option

Type	Totally-enclosed direct current printed circuit
Rotating direction	Right
No-load revolution speed	2700 ± 300 rpm [2200 ± 300]
Current	6.7 ± 0.7 A [9.5 ± 1]

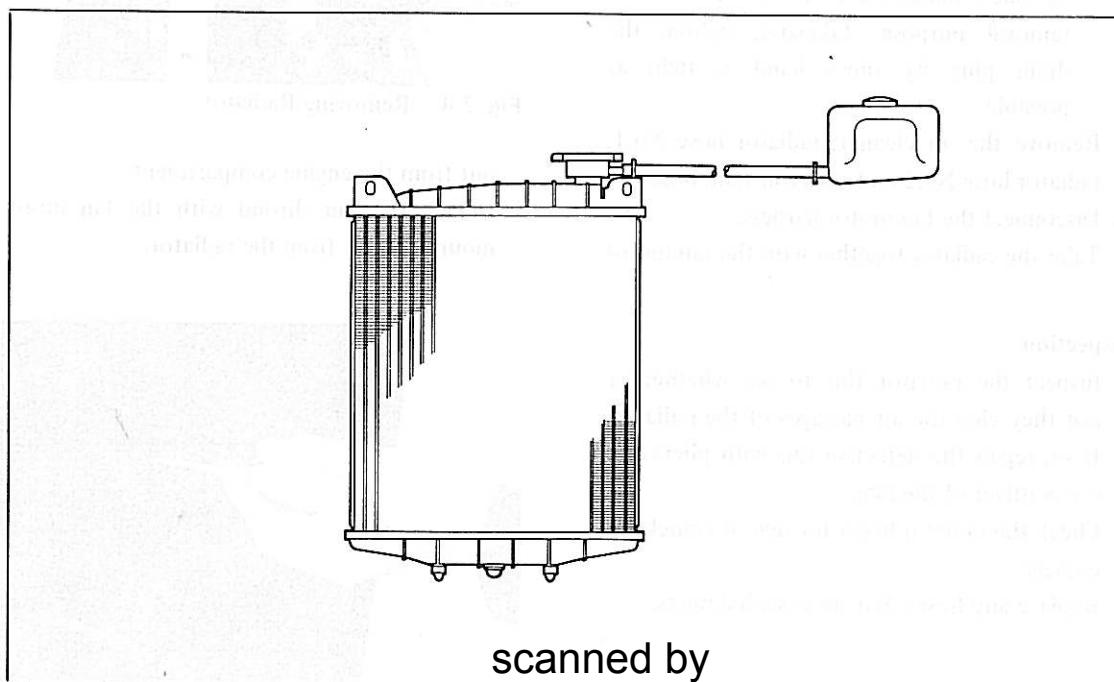
Radiator Thermo Control Switch

Figures in [] denote option

Type	Wax sealing type
ON temperature (°C)	92 ± 2 [98 ± 2]
OFF temperature (°C)	87 ± 2 [93 ± 2]

Filling Amount of Anti-Freezing Solution

Temperature	Radiator	Reservoir tank
-10°C	0.9 liter	0.1 liter
-20°C	1.3 liter	0.2 liter
-35°C	1.7 liter	0.3 liter

RADIATOR

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Measuring Instrument

Measuring instrument	Radiator cap tester
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In-Vehicle-Check

Using a radiator cap tester, pressurize the cooling system up to 1.2 kg/cm^2 (17.1 psi). Check to see whether any leak is present at those critical points, such as the radiator's upper tank-or lower tank-to-tube welded area and radiator tubes.

Replace such radiator that exhibits defects or leakage.

NOTE:

1. Make sure to replace the radiator assembly, if required. Never try to disassemble and repair the radiator.
2. Be sure not to start the engine, while the

Removal

1. Drain the cooling water.

NOTE:

1. The cooling water containing coolant or anti-freezing solution should be kept for reuse.
2. The radiator drain plug should be removed by one's hand. Never use a tool for the removal purpose. Likewise, tighten the drain plug by one's hand as tight as possible.
2. Remove the air cleaner, radiator hose No.1, radiator hose No.2 and reservoir tank hose.
3. Disconnect the fan motor harness.
4. Take the radiator together with the fan motor

Inspection

1. Inspect the radiator fins to see whether or not they clog the air passages of the radiator. If so, repair the defective fins with pliers of a screw driver of the like.
2. Check the radiator hoses for sign of cracks or damage.

Replace any hoses that show such defects.

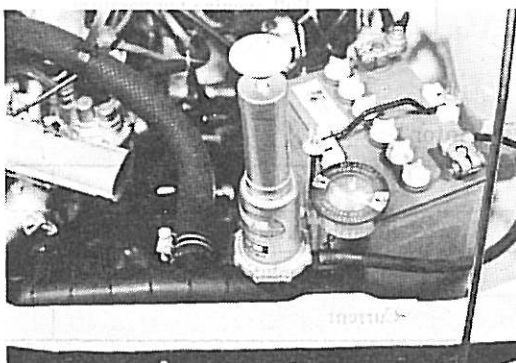


Fig. 7-3 Checking Radiator Water Leak
radiator cap tester is still attached to the radiator.

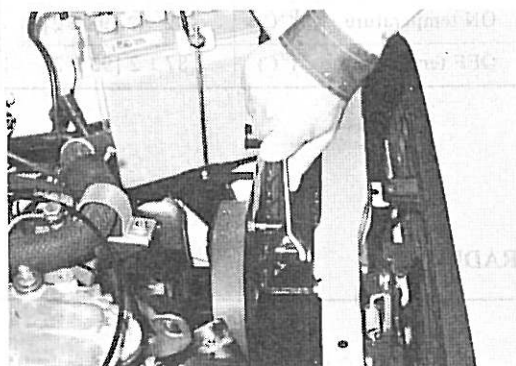
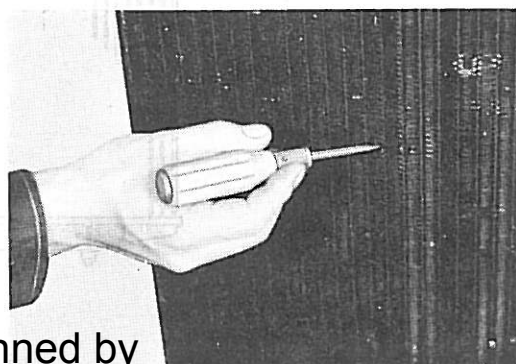


Fig. 7-4 Removing Radiator

out from the engine compartment.

5. Detach the fan shroud with the fan motor mounted on it from the radiator.



3. Check the radiator cap to see whether the spring tensions of the pressure regulating valve and negative pressure valve meet specifications. Also, check these valves for proper seating. If the radiator cap should start functioning at a pressure below the specified value, replace such radiator cap.

Specified Valve Opening Pressure:

$0.9 \pm 0.15 \text{ kg/cm}^2$ ($12.8 \pm 2.1 \text{ psi}$)

Allowable Limit of Valve Opening Pressure:

0.6 kg/cm^2 (8.5 psi)

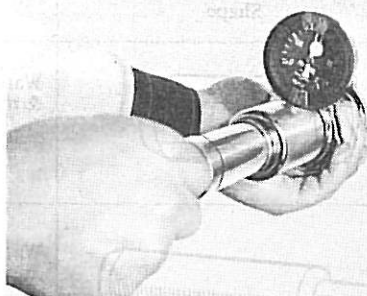


Fig. 7-6 Checking Radiator Cap

Installation

Reverse the removal procedure to install the radiator.

NOTE:

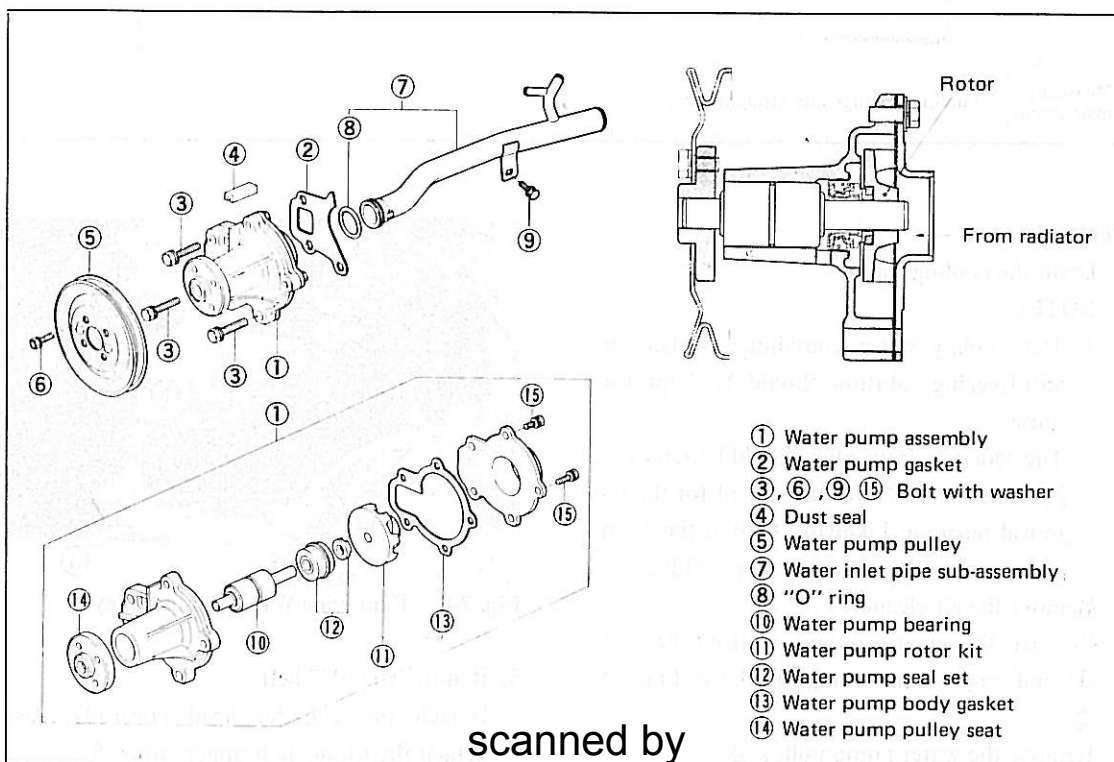
1. After filling the cooling system with cooling water, pressurize the system up to 1.2 kg/cm^2 , using a radiator cap tester.

And make sure that there is no water leakage in the cooling system.

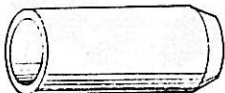



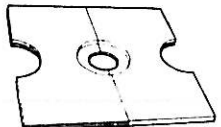
Cooling Water Capacity: About 4.0 liters

WATER PUMP

Components and Sectional View



Special Service Tools and Measuring Instrument

	Shape	Part number and nomenclature	Application	Remarks
Special service tool		09238-87701-000 Water pump bearing remover & replacer	Used for press-fitting and removal of bearing	
		09238-87201-000 Water pump bearing remover & replacer	Used for press-fitting of pulley seat and removal of rotor	For Model L 38 use
		09254-87201-000 Crankarm receiver	Used as anvil during press-fitting of bearing, seal set and rotor	For Model L 38 use
		09237-87201-000 Water pump seal set replacer	Used for press-fitting of seal set and rotor	For Model L 38 use
		09253-87201-000 or 09253-87202-000 Crankshaft center bearing anvil	Used as anvil during removal of pulley seat, bearing, seal set and rotor	For Model L 38 use
Measuring instrument	Thickness gauge and straightedge.			

Removal

1. Drain the cooling water.

NOTE:

1. The cooling water containing coolant or anti-freezing solution should be kept for reuse.
2. The radiator drain plug should be removed by one's hand. Never use a tool for the removal purpose. Likewise, tighten the drain plug by one's hand as tight as possible.
2. Remove the air cleaner.
3. Remove the engine mounting front bracket ① and engine mounting insulator bracket ②.
4. Remove the water pump pulley ③.

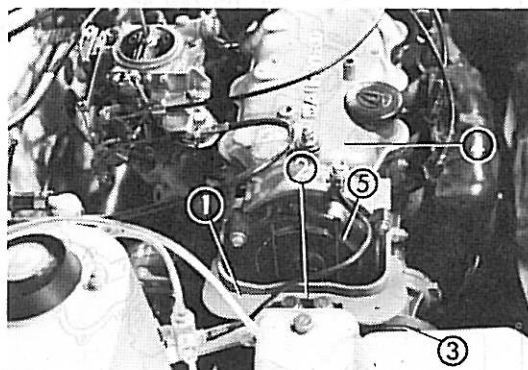


Fig. 7-8 Removing Water Pump Pulley

5. Remove the "V" belt.
6. Detach the cylinder head cover ④. Also, detach the timing belt upper cover ⑤.

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7. Remove the water pump, by removing the three setting bolts ⑥ of the water pump.

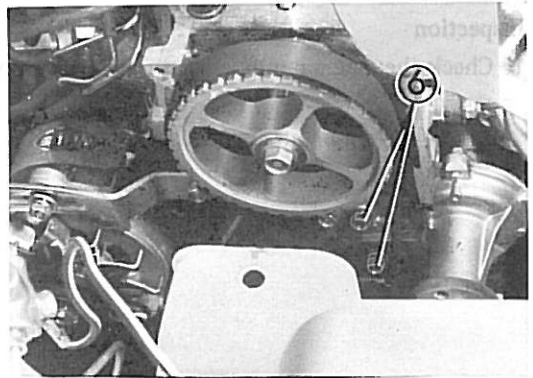


Fig. 7-9 Removing Water Pump

Disassembly

1. Press off the water pump pulley seat.
Special Tool (09253-87201)
Special Tool (09238-87201)

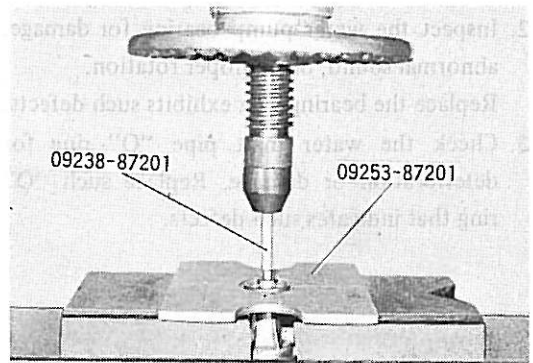


Fig. 7-10 Removing Water Pump Pulley Seat

2. Press off the water pump bearing and seal set.
Special Tool (09253-87201)
Special Tool (09238-87701)

NOTE: The above-described installation operation can be made by pressing the bearing outer race.

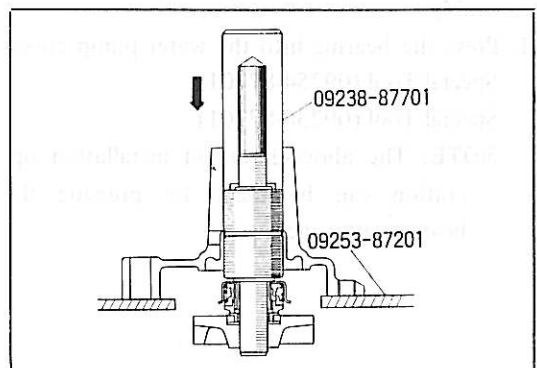


Fig. 7-11 Removing Bearing and Seal Set

3. Press the rotor off the water pump bearing.
Special Tool (09253-87201)
Special Tool (09238-87201)

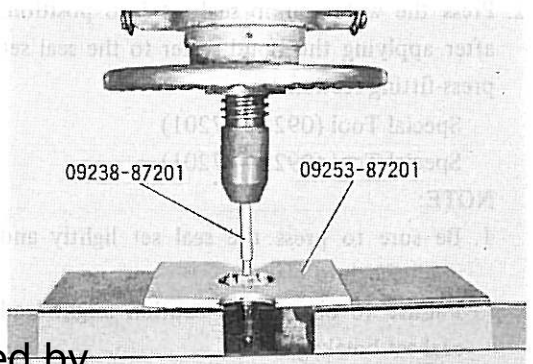


Fig. 7-12 Removing Water Pump Rotor

Inspection

1. Check the water pump rotor and water pump seal set for evidence of damage or wear.
Replace any parts that show such defects.

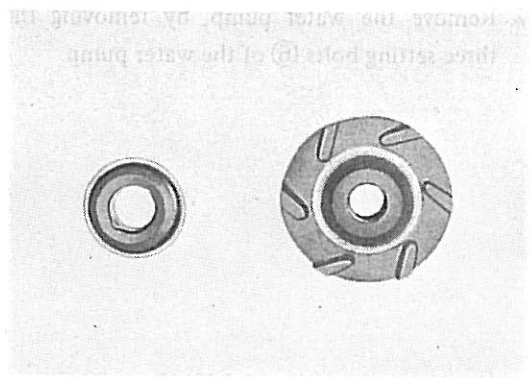


Fig. 7-13 Checking Rotor and Seal Set

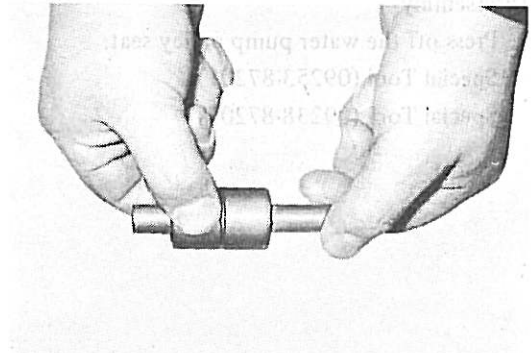


Fig. 7-14 Checking Water Pump Bearing

Assembly

1. Press the bearing into the water pump cover.
Special Tool (09254-87201)
Special Tool (09238-87701)

NOTE: The above-described installation operation can be made by pressing the bearing outer race.

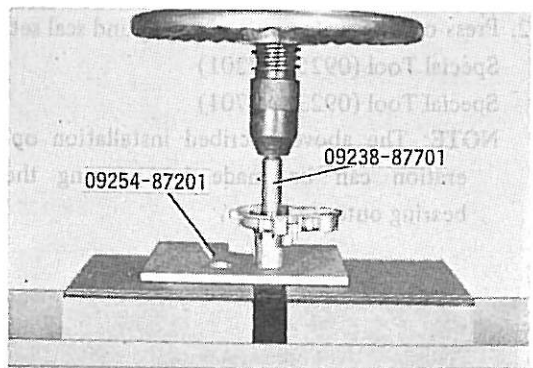


Fig. 7-15 Press-Fitting Water Pump Bearing

2. Press the water pump seal set into position, after applying the bond sealer to the seal set press-fitting section.

Special Tool (09237-87201)

Special Tool (09254-87201)

NOTE:

1. Be sure to press the seal set lightly and gradually into place.
Failure to observe this caution might lead seal set breakage.

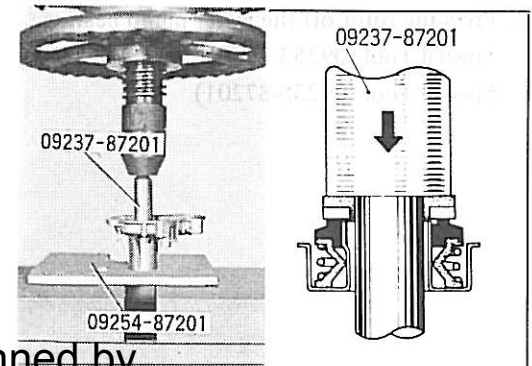


Fig. 7-16 Press-Fitting Water Pump Seal Set

2. The seal set must be assembled only in the correct direction as indicated in Fig. 7-16.
3. Extra bond sealer that has oozed out from the water pump seal set press-fitting section must be wiped off.

3. Press the water pump rotor into position.
Special Tool (09237-87201)

NOTE: Rotor press-fitting allowance

Press the rotor, until the dimension A in Fig. 7-17 becomes the numerical value given below.

Dimension A: 0 to 0.2mm
(0 to 0.0079 inch)

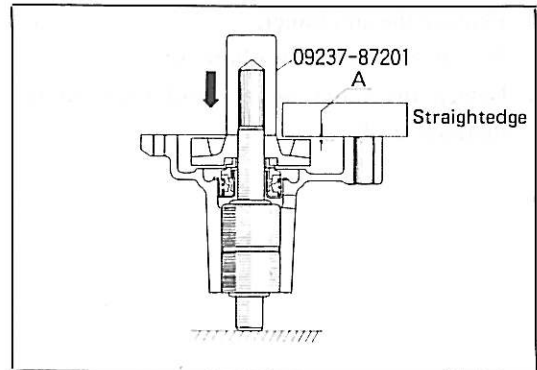


Fig. 7-17 Press-Fitting Water Pump Rotor

4. Press the water pump seat into the water pump bearing.

Special Tool (09238-87201)

NOTE:

1. The water pump set must be assembled only in the correct direction.
2. Press the seat, until the dimension A in Fig. 7-18 becomes the numerical value given below.

Dimension A: 0.8mm (0.0315 inch)

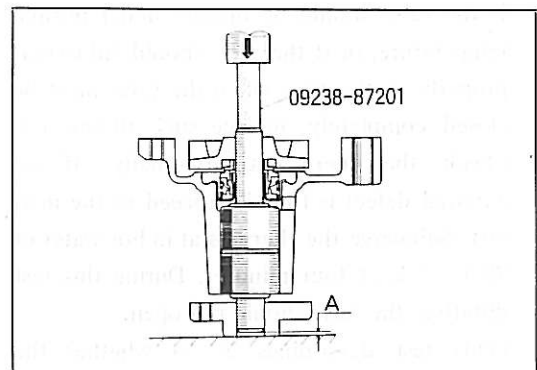


Fig. 7-18 Press-Fitting Water Pump Pulley Seat

Installation

Reverse the removal procedure to install the water pump.

NOTE: Replace the gaskets with new ones.

1. Cylinder head cover

Tightening Torque: 0.4 to 0.6 kg-m
(2.9 to 43. ft-lb)

2. Filling amount of cooling water

Whole Capacity: 4.0 liters

3. Deflection of "V" belt

11 to 13mm (0.43 to 0.51 inch)

[With a Force of 8 kg (17.6 lb) Applied]

THERMOSTAT**Measuring Instrument**

Measuring instrument	Thermometer
----------------------	-------------

Removal

1. Drain the cooling water.
2. Remove the air cleaner.
3. Disconnect the radiator hose No.1 ①.
4. Detach the water outlet. And take out the thermostat ②.

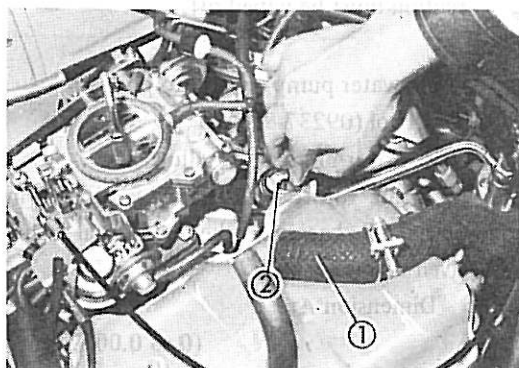


Fig. 7-19 Removing Thermostat

Inspection

1. If the valve should be opened under normal temperature, or if the valve should fail to seat properly at the time when the valve must be closed completely, replace such thermostat.
2. Check the thermostat externally. If no external defect is found, proceed to the next test. Submerge the thermostat in hot water of 78°C at least four minutes. During this test duration, the valve should not open.

(This test determines as to whether the thermostat opens too early before the temperature of coolant reaches an optimum temperature.)

3. With the thermostat still in hot water, raise water temperature gradually until the thermostat just begins opening in order to measure

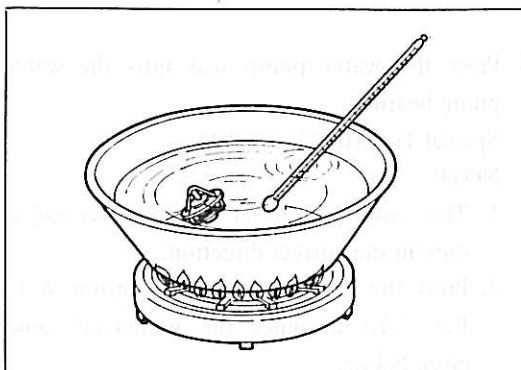


Fig. 7-20 Checking Thermostat

the valve opening temperature.

If the valve starts to open at 80.5 to 83.5°C and the valve opens at least 8mm (0.32 inch) at 95°C, it indicates a proper function of the thermostat.

Installation

1. Position the thermostat. And mount the water outlet with the gasket in place.

NOTE: Replace the gasket with new one.

2. Install the radiator hose No.1. And install the air cleaner.

NOTE: The radiator hose clamp should be installed in such a direction that the clamp tightening screw comes at the distributor side.

3. Fill the cooling system with cooling water.

FORCED COOLING MECHANISM

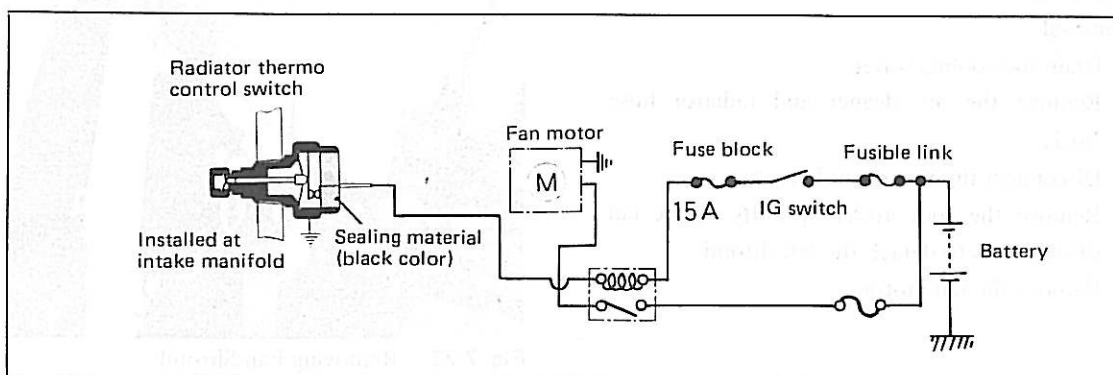


Fig. 7-21 Schematic Diagram of Forced Cooling Mechanism

Measuring Instruments

Measuring instrument	Thermometer and circuit tester
----------------------	--------------------------------

In-Vehicle-Check of Circuit

In case that the fan motor won't rotate irrespective of water temperature:

1. Turn ON the ignition switch.
2. Disconnect the radiator thermo control switch terminal and ground it directly to the body. And check to see if the fan motor can turn or not.

3. If the fan motor turns during the above-described test, it indicates that the circuit up to the radiator thermo control switch is satisfactory. Therefore, proceed to check the switch, following the procedure described below.

Radiator Thermo Control Switch Check

Connect a circuit tester to the radiator thermo control switch, as shown in Fig. 7-22.

(The circuit tester should be set at its resistance range.)

Under this setting, change the water temperature. And observe the behavior of the circuit tester's pointer. If the pointer of the tester behaves as follows, it represents that the radiator thermo control switch is functioning normally.

Water temperature — Low (Raise temperature)

$92 \pm 2^{\circ}\text{C}$ (Lower temperature) $87 \pm 2^{\circ}\text{C}$
 [option: $98 \pm 2^{\circ}$] [option: $93 \pm 2^{\circ}$]

Tester pointer — Pointer won't swing — Pointer swings

Pointer won't swing

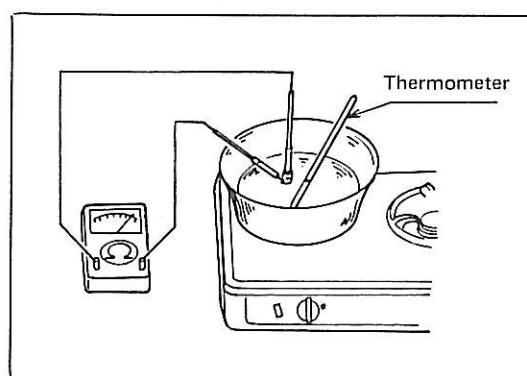


Fig. 7-22 Checking Radiator Thermo Control Switch

NOTE: Before the radiator thermo control switch is installed, be sure to apply the body sealer to the switch.

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Fan Motor

Removal

1. Drain the cooling water.
2. Remove the air cleaner and radiator hose No.1.
3. Disconnect the fan motor harness.
4. Remove the four attaching bolts of the fan shroud so as to detach the fan shroud.
5. Remove the fan motor.

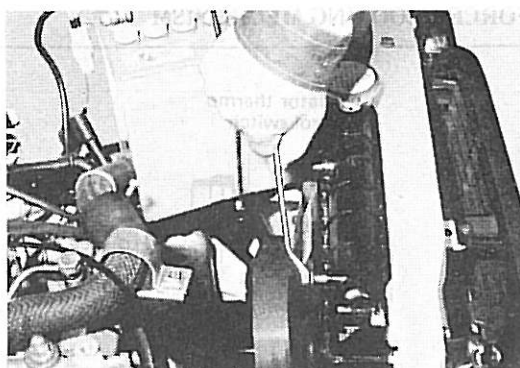


Fig. 7-23 Removing Fan Shroud

Inspection

1. Hook up the fan motor relative to the battery, as indicated in Fig. 7-24.

[Connect motor positive \oplus terminal to battery positive \oplus terminal.]

[Connect motor negative \ominus terminal to battery negative \ominus terminal.]

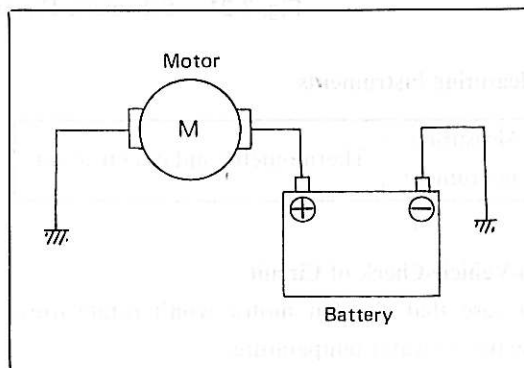


Fig. 7-24 Checking Fan Motor

Installation

Reverse the removal procedure to install the fan motor.

DAIHATSU

TYPE CB-20 ENGINE

SECTION 8 ENGINE ELECTRICAL SYSTEM

ENGINE ELECTRICAL WIRING DIAGRAM	8 - 2
STARTING SYSTEM	8 - 3
CHARGING SYSTEM	8 - 8
IGNITION SYSTEM	8 - 17

ENGINE ELECTRICAL WIRING DIAGRAM

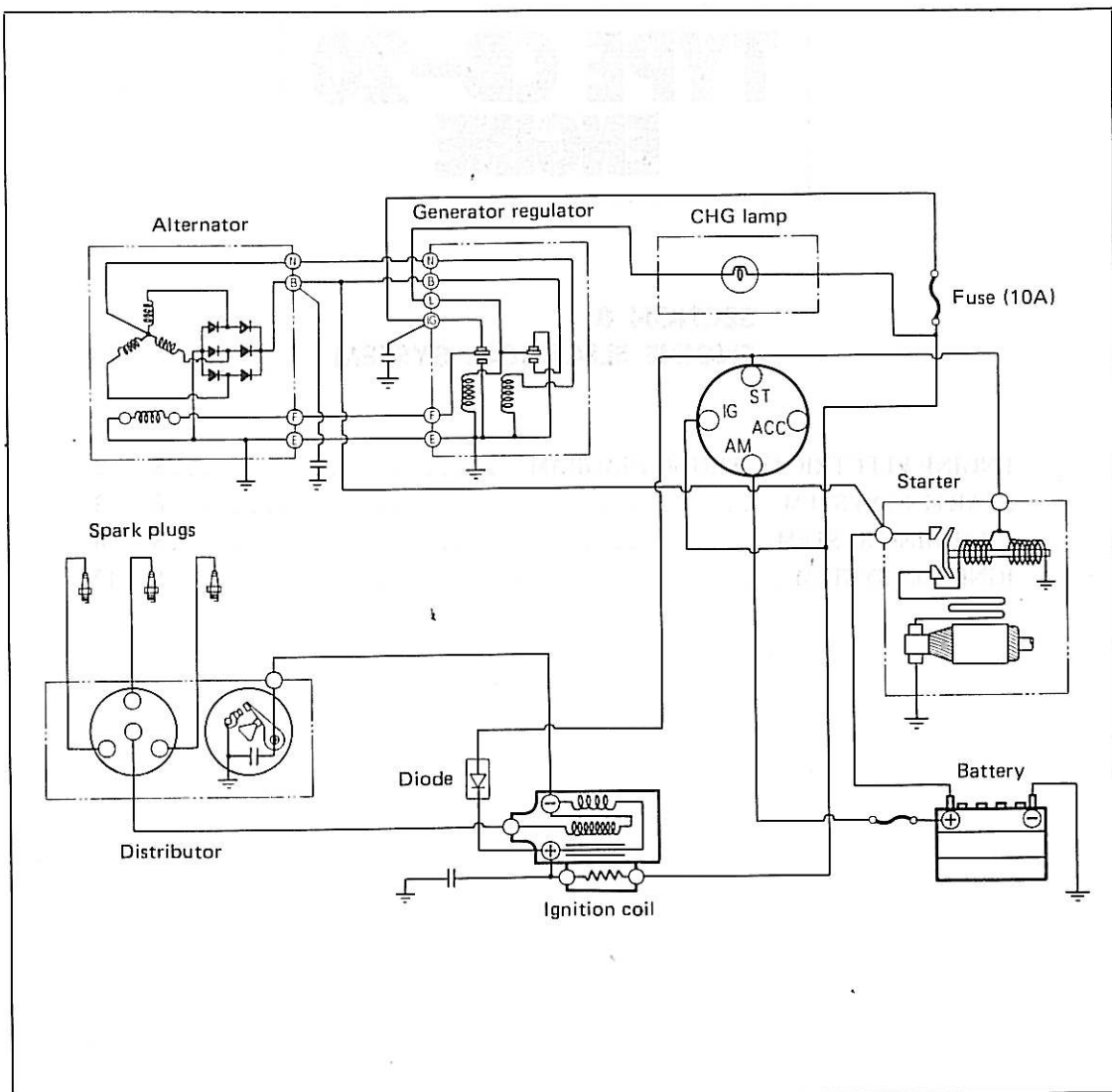


Fig. 8-1 Engine Electrical Wiring Diagram

The engine electrical system is composed of the following main circuits: the starting circuit consisting mainly of a starter; the ignition circuit consisting of a distributor, an ignition coil and spark plugs, etc.; and the charging system consisting of an alternator and a generator regulator, etc.

Furthermore, in order to obtain strong and positive sparks, an external resistance-type ignition coil has been employed. In addition, a resistance-by-pass type starter system which is capable of delivering snappy ignition sparks even during starting period has been used in this engine.

STARTING SYSTEM

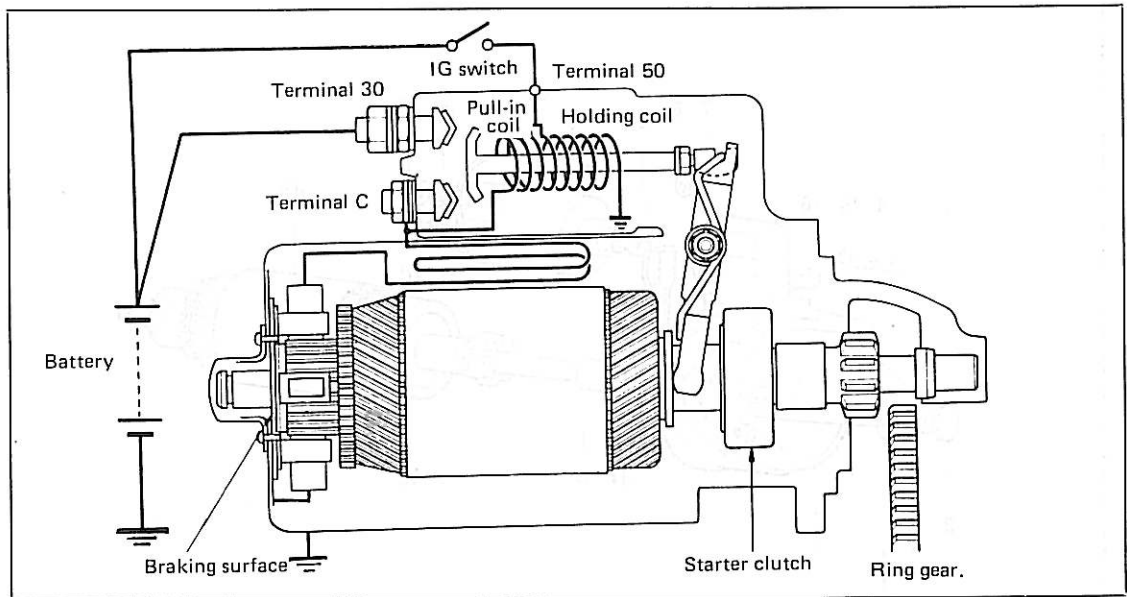


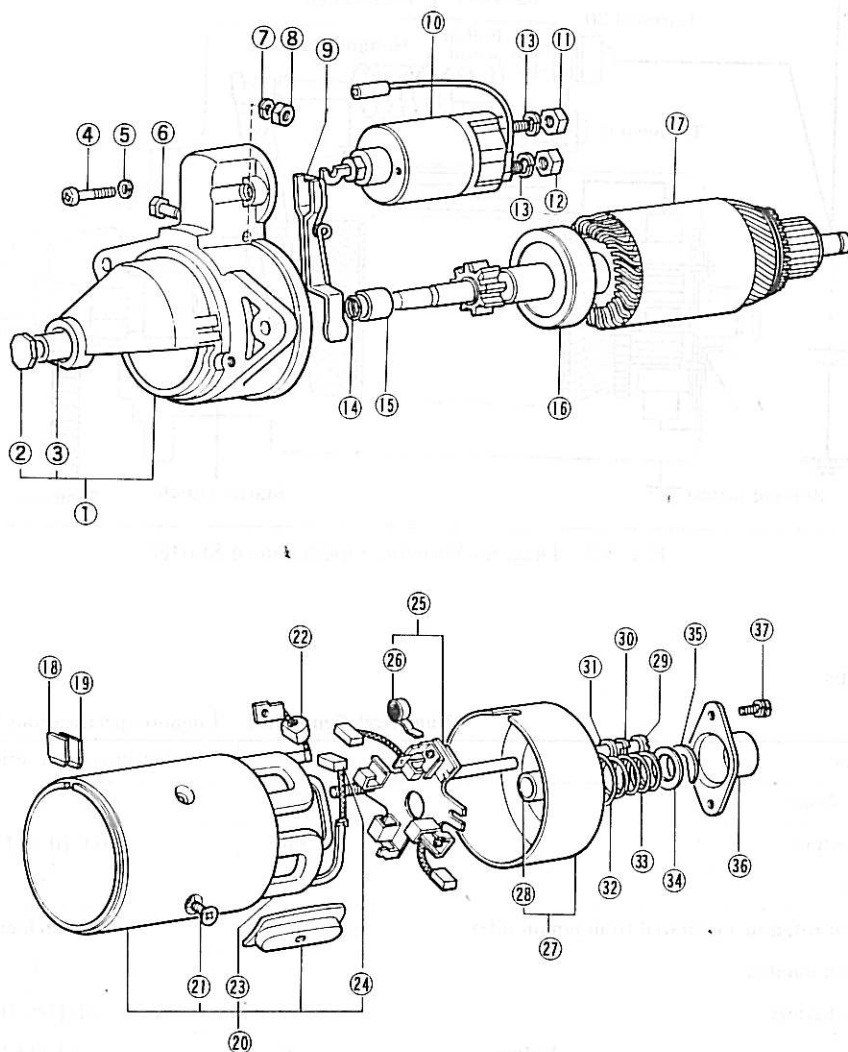
Fig. 8-2 Diagram Showing Operation of Starter

Specifications

Numerical figures in [] denote specifications for chilly regions.

Starter type		Direct-current series winding
Nominal voltage		V12
Nominal output		kW0.6 [0.8] [1.0]
Rated time		sec30
Direction of rotation (as viewed from pinion side)		Counterclockwise
Pinion tooth number		9
Applicable battery		NS 40 – SL [NX 100 – S 6 L]
No-load characteristics	Voltage	V11 [11.5]
	Current	ANot more than 55 [50] [90]
	Revolution speed	rpmNot less than 3500 [5000] [3000]
Locking characteristics	Voltage	V8.5
	Current	ANot more than 450 [600] [300]
	Torque	kg-m (ft-lb)Not more than 1.1 (8.0) [1.3 (9.4)] [0.7(5.1)]
Commutator undercut	Specified value	mm (inch)0.5 ~ 0.8 (0.020 ~ 0.032)
	Allowable limit	mm (inch)0.2 (0.0079)
Commutator outer diameter	Specified value	mm (inch)32.7 (1.29)
	Allowable limit	mm (inch)30.7 (1.21)
Brush length	Specified value	mm (inch)19 (0.75) [16 (0.63)]
Brush spring tension as assembled	Specified value	g1050 ~ 1350 [1090 ~ 1610]

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- | | | |
|----------------------------------|--------------------------------|--|
| ① Starter drive housing assembly | ①⑥ Starter clutch sub-assembly | ②⑦ Starter commutator end frame sub-assembly |
| ② Starter bearing cover | ①⑦ Starter armature assembly | ②⑧ Bush |
| ③ Bush | ①⑧ Starter yoke plate | ②⑨ Through bolt |
| ④ Screw | ①⑨ Starter yoke rubber | ③① Steel plate |
| ⑤, ⑦, ⑬, ③① Spring | ②① Starter yoke sub-assembly | ③② Rubber seal |
| ⑥ Starter drive lever set pin | ②② Screw | ③③ Brake spring |
| ⑧, ⑪, ⑫ Nut | ②③ Insulator bushing | ③④ Washer |
| ⑨ Pinion drive lever | ②④ Field coil | ③⑤ Lock plate |
| ⑩ Magnetic switch | ②⑤ Brush | ③⑥ Frame end cover |
| ⑭ Snap ring | ②⑥ Brush holder sub-assembly | ③⑦ Screw with washer |
| ⑮ Pinion stop collar | ②⑦ Spring | |

Fig. 8-3 Starter Components

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Handling Instructions on Starter

1. Be certain to tighten the starter terminal and battery terminals positively in order that poor connection may not occur.

Current of a large ampere flows through the starter during the operation. Hence, even the slightest poor connection may incur a trouble.

2. When you want to remove the starter, first disconnect the negative \ominus terminal of the battery. Then, proceed to remove the starter. Always the battery voltage is applied to the terminal 30 of the starter. Therefore, if you should try to inadvertently remove the terminal without disconnecting the battery terminal first, the battery might be shorted, leading to an accident.
3. When you want to install the starter, ensure that the starter is fitted properly and positively. And tighten the attaching bolts securely. If the attaching bolts should be tightened improperly, it might cause premature wear of the pinion gear and ring gear or housing breakage.

In-Vehicle-Check

NOTE: Ensure that the shift lever is in the neutral position.

Directly connect the starter terminal 30 with the terminal 50 (magnetic switch terminal), using a lead wire.

1. If the starter rotates smoothly without emanating any abnormal sound, it is unnecessary to remove the starter for further tests.
2. If the starter should require a great turning effort, fail to turn, or emanate abnormal sound, proceed to remove the starter for further tests described below.

Removal

1. Disconnect the battery negative \ominus terminal.
2. Disconnect the starter cable and connector from the starter.
3. Remove the starter.

See to it that the owner of each vehicle knows the following three important caution tips.

1. Be sure not to crank the engine continuously for a period of more than five seconds.

If the engine should fail to start for the first cranking, wait for a period of about 10 seconds, before you attempt to operate the starter.

2. Never to turn ON the starter switch, while the engine is running.

Failure to observe this caution would cause the pinion gear to be broken or the shaft to be bent.

3. As soon as the engine fires, turn OFF the starter switch.

If the starter switch should remain ON for a prolonged period of time, the starter would be operated under a no-load condition, thus increasing its revolution speed tremendously. As a result, the centrifugal force might cause jumping out of the armature coil or seizure of the pinion and shaft.

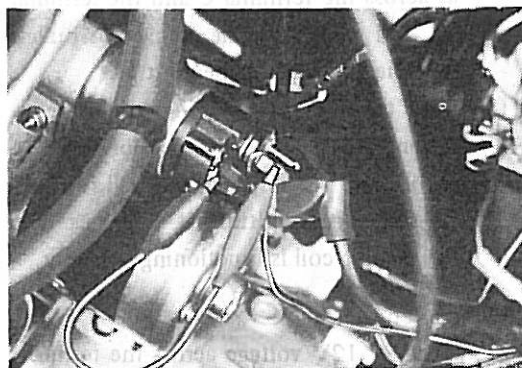


Fig. 8-4 Starter In-Vehicle-Check



Fig. 8-5 Removing Starter

Inspection**Magnetic Switch****NOTE:**

1. The magnetic switch should be checked, after the switch has been assembled onto the starter.
2. Be sure to disconnect the field coil wiring from the terminal C.

1. Pull-in coil drawing test

Apply a 12V voltage across the magnetic switch terminal 50 and the terminal C. If the pinion gear jumps out, the magnetic switch is functioning properly.

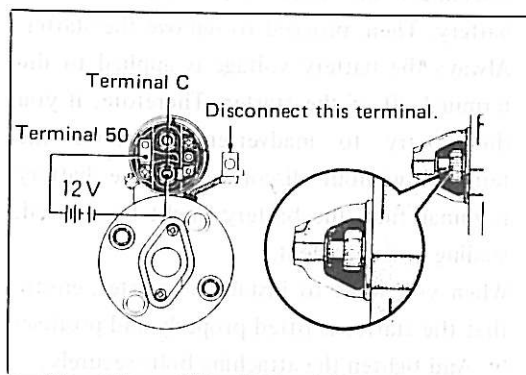


Fig. 8-6 Pull-In Coil Drawing Test

2. Holding Coil Retention Test

- (1) Apply a 12V voltage across the magnetic switch body and the terminal 50 as well as across the terminal C and the terminal 50. In this way, the plunger is pulled in. (The pinion is jumped out.)
- (2) With the plunger held in a pulled condition, release the connection of the terminal C. If the plunger is still retained in a drawn condition, it indicates that the holding coil is functioning properly.

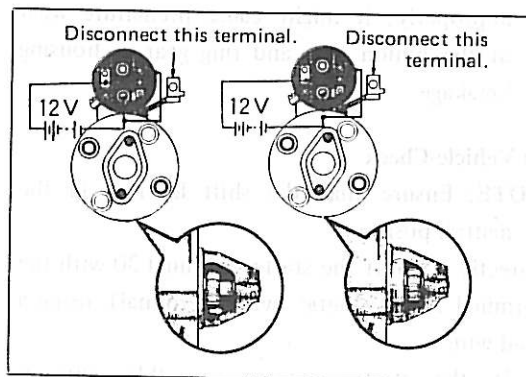


Fig. 8-7 Holding Coil Retention Test

3. Pinion Return Test

- (1) Apply a 12V voltage across the terminal C and the magnetic switch body.
- (2) Pull manually the pinion gear out, using a screw driver. And release your hand. If the pinion gear returns quickly to its stationary position, it shows a normal function.

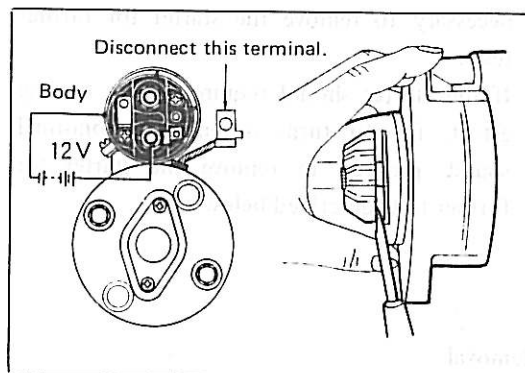


Fig. 8-8 Pinion Return Test

4. Pinion Gap

Disconnect the field coil wiring from the terminal C so as to prevent the starter from rotation. Apply a 12V voltage across the magnetic switch terminal 50 and the terminal C. And measure the gap between the tip-end of the pinion and the stop collar.

Specified Gap 0.1 to 4 mm
(0.0039 to 0.1575 inch)

NOTE: This pinion gap adjustment can be made, by adjusting the length of the moving stud.

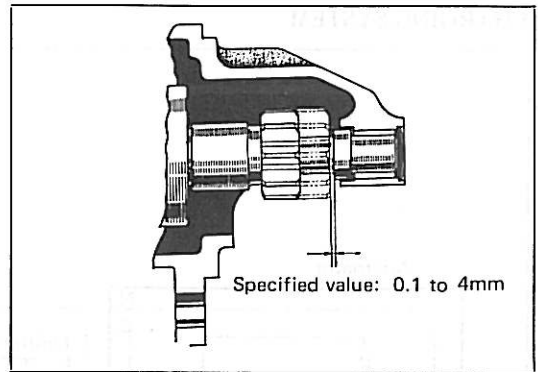


Fig. 8-9 Checking Pinion Gap

Armature Shaft Thrust Clearance Check

Detach the frame end cover. With the armature shaft pushed backward, measure the thrust clearance.

Specified Thrust Clearance: 0.05 to 0.6mm
(0.0020 to 0.0236 inch)

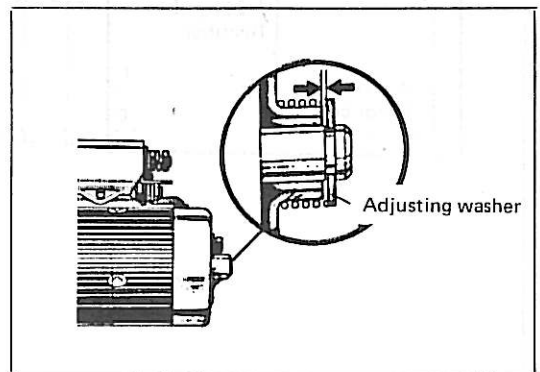


Fig. 8-10 Checking Thrust Clearance

No-Load Test

Apply a reference voltage of 12V to the starter. If the starter turns smoothly in a stable behavior and the ampere drawing does not exceed 55A, it indicates that the starter is functioning properly. (See Fig. 8-11).

Reference Information

Revolution Speed During Test Above:
Not Less Than 3500 rpm

If the above-described desirable performance test results can not be obtained, see the chart below that contains symptoms and possible causes.

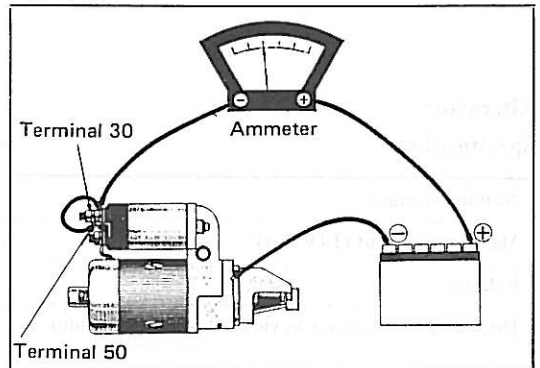


Fig. 8-11 Starter No-Load Test

Symptoms That May Appear During No-Load Test and Their Possible Causes

1. Starter won't rotate at all.	Armature coil open-circuited, grounded, or shorted.
2. Starter rotates too slowly.	Field coil open-circuited, grounded, or shorted.
3. Starter revolution speed fluctuates.	Poor contact between brushes and commutator.
4. Starter draws excessive current.	Internal resistance of starter is excessive because of mechanical defects.

Alternator Components and Tightening Torque

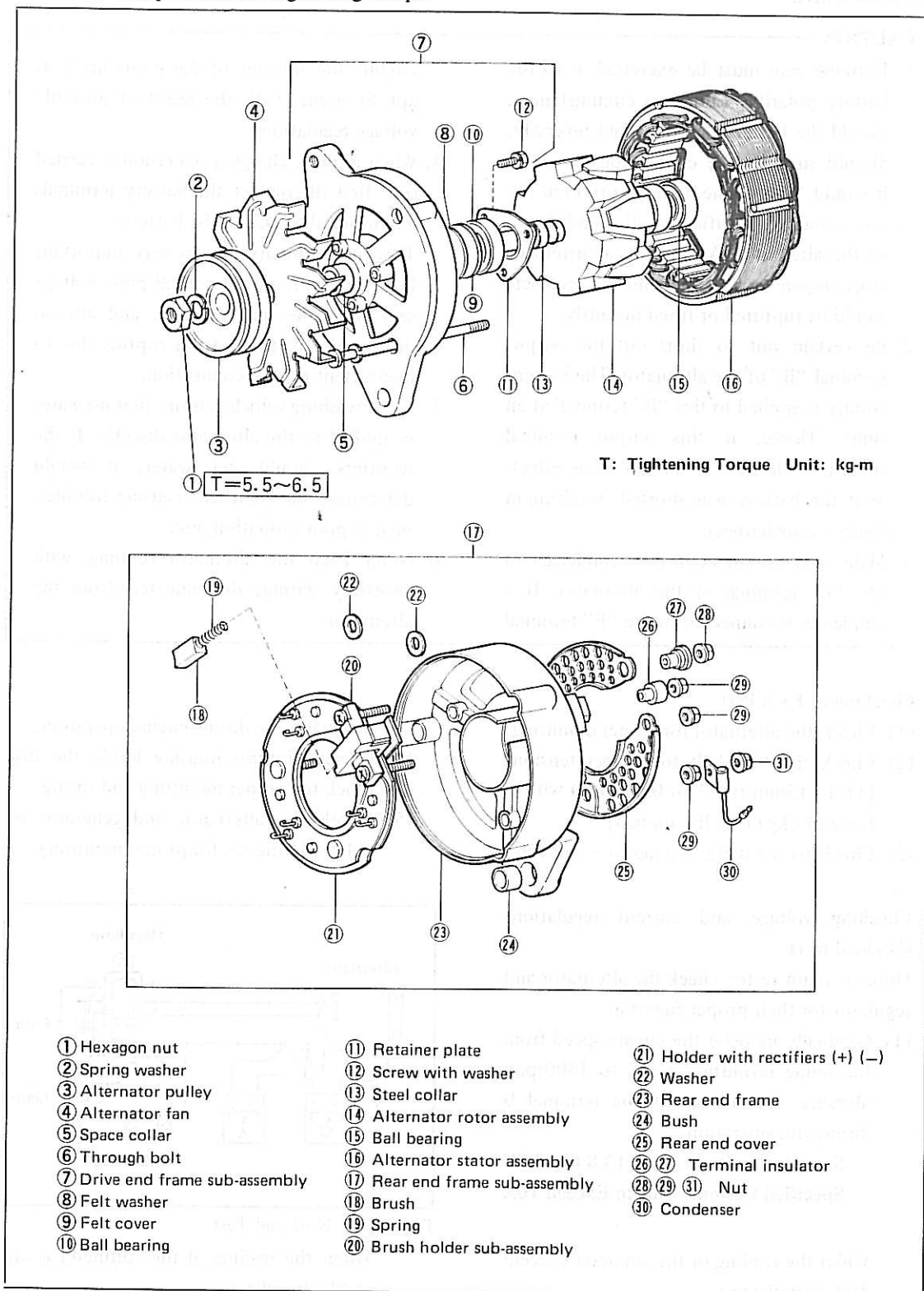


Fig. 8-13 Alternator Components and Tightening Torques

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In-Vehicle-Check

CAUTION

1. Extreme care must be exercised as to the battery polarity. Under no circumstances, should the battery be connected reversely. Should such reverse connection be made, it would "short" the battery current at the self-contained rectifiers at the end frame of the alternator. As a result, a current of large ampere would flow and the rectifiers would be ruptured or fused instantly.
2. Be certain not to short out the output terminal "B" of the alternator. The battery voltage is applied to this "B" terminal at all times. Hence, if this output terminal should be shorted, it has the same effect, as if the battery was shorted, resulting in burnt wiring harness.
3. Make sure not to connect a condenser to the "F" terminal of the alternator. If a condenser is connected to the "F" terminal

circuit, the transfer of the point metal is apt to occur, with the result of unstable voltage regulation.

4. When a quick charging operation is carried out, first disconnect the battery terminals and proceed to charge the battery. This precautionary step is very important in order to prevent abnormal pulse voltage sent from the quick charger and also to protect the rectifiers from rupture due to inadvertent reverse connection.
5. When washing vehicle, ensure that no water is applied to the alternator directly. If the rectifiers should get water, it would deteriorate the rectifiers, causing troubles, such as poor insulation, etc.
6. Never keep the alternator running, with necessary wirings disconnected from the alternator.

1. Checking of Each Part

- (1) Check the alternator for proper mounting.
- (2) Check the "V" belt for proper tension. [11 to 13mm (0.43 to 0.51 inch) with a force of 8kg (17.6 lb) applied]
- (3) Check to see if the alternator is emitting

unusual noise during engine operation.

2. Checking voltage and current regulations (No-load test)

Using a circuit tester, check the alternator and regulator for their proper function.

- (1) Gradually increase the engine speed from the idling revolution speed to 1500rpm. Measure the voltage at the terminal B during this operation.

Specified Voltage: 13.8 to 14.8V

Specified Current: Not to Exceed 10A

When the reading of the ammeter exceeds 10A, it indicates:

- ① Discharged battery
- ② Internally-shorted battery

- (4) Check all fuses housing inside the fuse block for proper mounting and fusing.
- (5) Check the alternator and generator regulator harnesses for proper mounting.

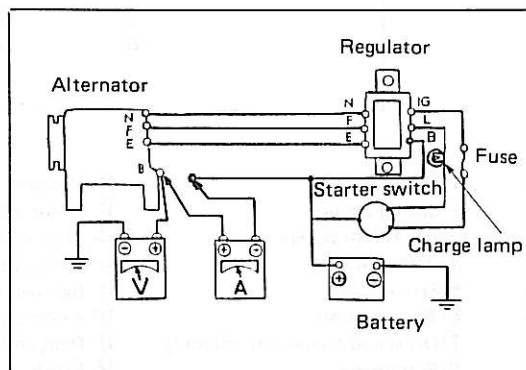


Fig. 8-14 No-Load Test

When the reading of the voltmeter is unstable, it indicates:

- ① Dirty or nearly burnt contact-points of the generator regulator
- ② Poor contact at the terminal F

When the reading of the voltmeter is excessively high, it indicates:

- ① Excessive point gap of the voltage regulator at the high-speed side

Specified Contact Point Gap:

0.3 to 0.45mm

(0.012 to 0.018 inch)

(Reference Information)

- (2) When the reading of the voltmeter does not conform to specifications, proceed to the following test.

Stop the engine. Disconnect the alternator terminal wire connector. With the ignition switch alone turned ON, measure the voltage between the terminals F and E.

Specified Voltage: 12V

When the reading of the voltmeter is zero or very low, it indicates:

- ① Open circuit or poor contact in the fuse, regulator terminal IG wire, or terminal F wire
② Fused points at the high-speed side

3. Checking of each resistance

- (1) Disconnect the connector of the generator regulator. Measure the resistance across the terminals IG and F.

Specified Resistance: 0 ohm

If the reading of the ohmmeter is more than 0 ohm, it denotes that the contact resistance at the low-speed side is excessively high.

- ② Excessive contact resistance at the high-speed side
③ Open circuit in the voltage coil
④ Excessive contact point pressure at the low-speed side or fused points
⑤ Poorly-grounded generator regulator

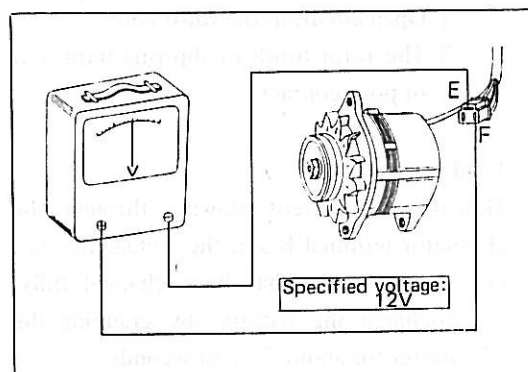


Fig. 8-15 Checking Voltage Across F and E of Regulator Terminals

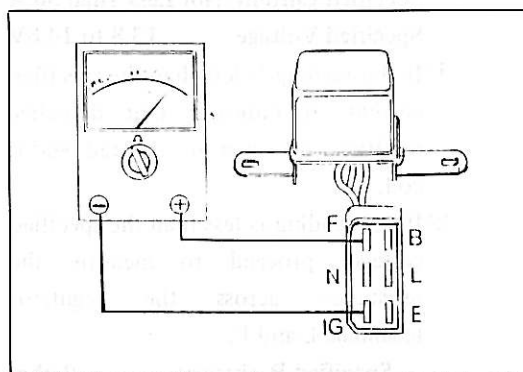


Fig. 8-16 Checking Resistance Across IG and F of Regulator Terminals

- (2) Measure the resistance across the terminals F and E (rotor coil) of the alternator proper.

Specified Resistance: 4.2 ohms

If the reading of the ohmmeter is very low and near 0 ohm, it indicates that the rotor coil or wiring is shorted.

If the reading of the ohmmeter exceeds 9 ohms, it shows:

- ① Open circuit in the rotor coil
- ② The rotor brush or slip ring burnt-out or poor-contact

4. Load test

Measure the current flowing through the alternator terminal B and the voltage thereof.

- (1) If the battery has been charged fully, discharge the battery, by cranking the starter for about 5 to 10 seconds.
- (2) Turn ON the upper beams of the head-lamps.
- (3) Set the engine revolution speed at about 1300 rpm. Observe the readings of the ammeter and voltmeter under this setting.

Specified Current: Not Less Than 30 A

Specified Voltage: 13.8 to 14.8V

- ① If the reading is less than the specified current, it indicates that defective rectifier, or open or shorted stator coil.
- ② If the reading is less than the specified voltage, proceed to measure the resistance across the regulator terminals L and F.

Specified Resistance: 0 ohm

If the thus-measured resistance exceeds the specified value, it denotes that the contact points of the voltage regulator is defective.

5. Checking diodes for short

NOTE: When a rectifier is tested with a circuit tester (ohmmeter), current flows from the tester negative \ominus terminal to the tester positive \oplus terminal because of a battery housed inside the tester.

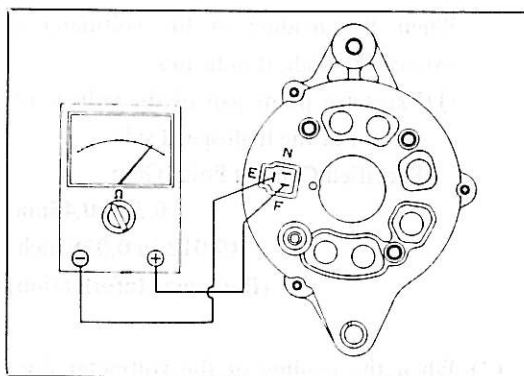


Fig. 8-17 Checking Resistance Across F and E of Alternator Terminals

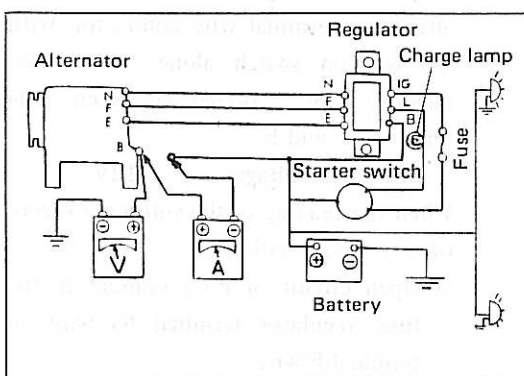


Fig. 8-18 Load Test

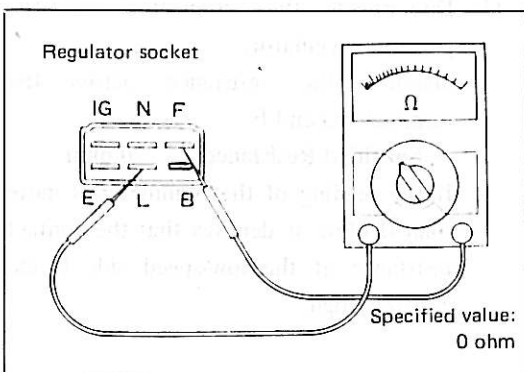


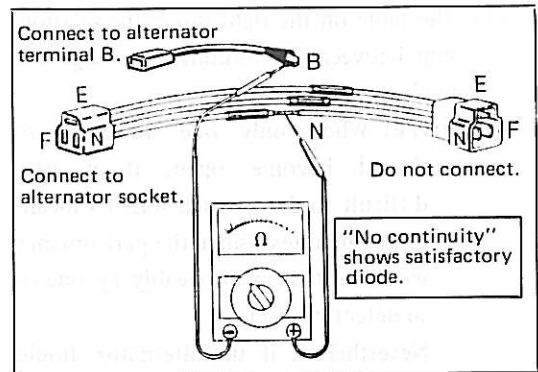
Fig. 8-19 Checking Resistance Across L and F of Regulator Terminals

Hence, the tester positive \oplus terminal becomes the negative \ominus , whereas the tester negative \ominus terminal becomes positive \oplus .

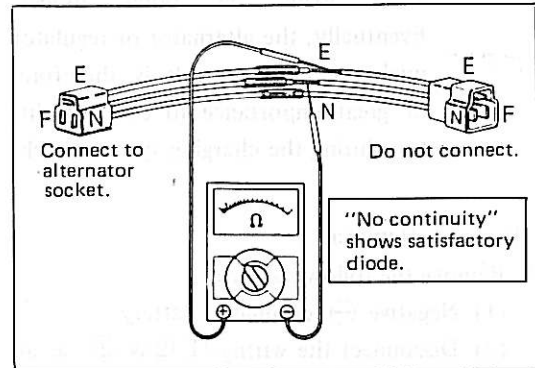
Particular attention must be given as to this

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- (1) Checking positive \oplus diode for short
 Carry out continuity test as follows.
 Connect the positive \oplus side of the tester to the alternator terminal N, while
 Connect the negative \ominus side of the tester to the alternator terminal B.
 If there is no continuity, the diode is satisfactory.

Fig. 8-20 Checking Positive \oplus Diode

- (2) Checking negative \ominus diode for short
 Carry out continuity test as follows.
 Connect the negative \ominus side of the tester to the alternator terminal N, while
 connect the positive \oplus side of the tester to the alternator terminal E (ground).
 If there is no continuity, the diode is satisfactory.

Fig. 8-21 Checking Negative \ominus Diode

6. Carry out open check of rectifiers by means of the terminal N voltage, as follows.
 Measure the voltage of the alternator terminal N.

- (1) Carry out this test, while the battery is under its fully-charged state.
 (2) Observe the reading of the voltmeter, while the engine revolution speed is about 1100 rpm.

Specified Voltage: 13.8 to 14.8V

Fig. 8-22 shows the wiring hook-up for measuring the terminal N voltage.

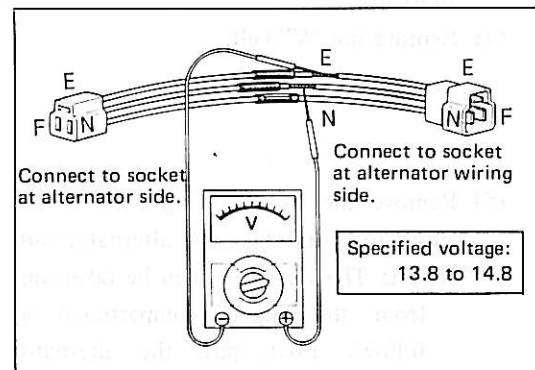


Fig. 8-22 Checking Terminal N Voltage

- (3) The table on the right shows the relationship between the terminal N voltage and diodes.

NOTE: When only one diode or so should become open, it is very difficult to detect such state by means of the load test, since the performance would not drop noticeably by one or so defective diodes.

Nevertheless, if the alternator should be operated continually, it would pose extra loads on other diodes. Eventually, the alternator or regulator might be burnt out. It is, therefore, of great importance to conduct this test during the charging system check.

Terminal N voltage	Diode
13.8 ~ 14.8	Normal
16 ~ 20	One diode open at positive ⊕ side
More than 20	Two diodes open at positive ⊕ side
7 ~ 11	One diode open at negative ⊖ side
5 or less	Two diodes open at negative ⊖ side

Alternator Removal

1. Remove the following parts.

- (1) Negative ⊖ terminal of battery
- (2) Disconnect the wirings ① ② & ③, as indicated in Fig. 8-23, from the alternator.
- (3) Slacken the three setting bolts of the alternator.
- (4) Remove the "V" belt.

- (5) Remove the three setting bolts of the alternator. And take the alternator out.

NOTE: The alternator can be taken out from the engine compartment as follows. First, pass the alternator under the air cleaner, and then pick it up from the transmission side.

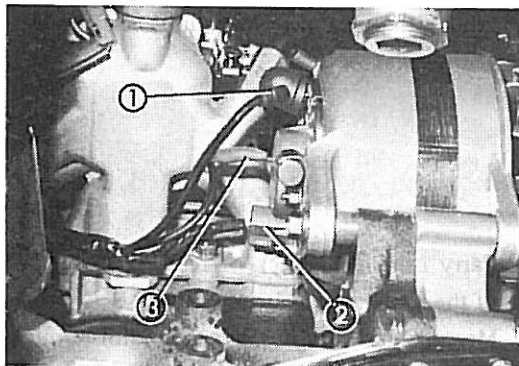


Fig. 8-23 Disconnecting Alternator Wirings

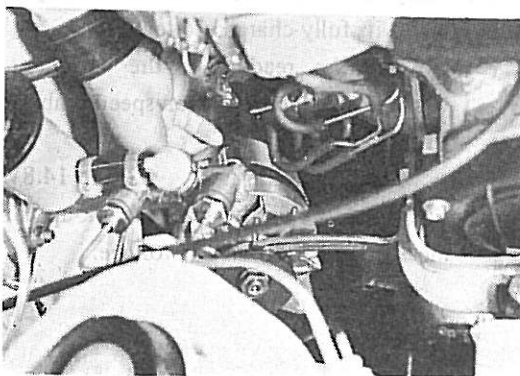


Fig. 8-24 Removing Alternator

Generator Regulator Specifications

Regulated voltage	V	13.8 ~ 14.8
Relay operating voltage	V	4.0 ~ 5.8

Check and adjustment

Checking Each Resistance of Generator Regulator

Check the internal conditions of the generator, using the procedure as indicated in the table below.

NOTE:

1. If the surface of the contact points are dirty,

clean them with a piece of paper or the like.

2. If the regulator should exhibit severe damage, such as fused contact points, be certain to replace such regulator assembly.

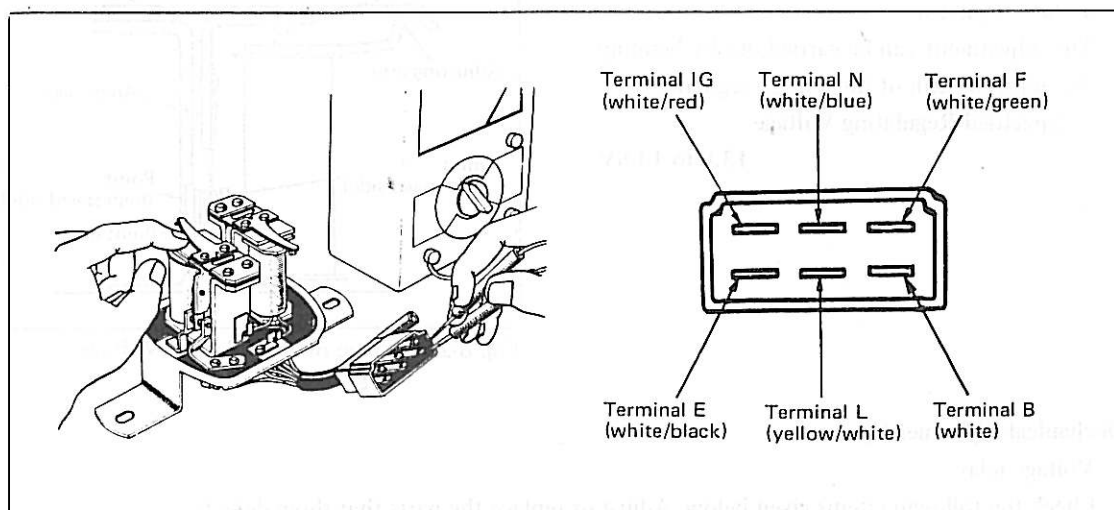


Fig. 8-25 Checking Each Resistance of Regulator

Measuring terminal	Condition of voltage relay	Condition of voltage regulator	Resistance during normal operation (ohm)	Reading of defective unit and possible causes
IG - F		Stationary	0	Reading of more than zero indicates poorly-contacted low-speed point of voltage regulator.
		Pulled	Approx. 11	Infinite reading denotes open circuit in regulating resistor
L - E	Stationary		0	Reading of more than zero indicates poorly-contacted point P_1 of voltage relay
	Pulled		Approx. 100	Reading of zero indicates fused point P_1 of voltage relay point. Infinite reading denotes open voltage coil
N - E			Approx. 23	Reading of zero shows shorted pressure coil. Infinite reading indicates open pressure coil.
B - E	Stationary		∞	Reading other than "infinite" denotes fused point P_2 of voltage relay.
B - L	Pulled		0	Reading of more than zero indicates poorly-contacted point P_2 of voltage relay.

NOTE: 1. "Pulled" condition denotes a condition in which the armature point is pulled to the high-speed side or to the low-speed side of the voltage relay.
2. "Stationary" condition denotes a condition in which the armature point is pulled to the low-speed side or to the point P_1 .

Electrical Adjustment

1. Checking and adjusting operating voltage of voltage relay

While the engine is stopped, ensure that the relay points are open. And ensure that the relay points are closed during engine idling.

Reference Information**Specified Relay**

Operating Voltage: 4.0 to 5.8V

2. Checking and adjusting regulating voltage of voltage regulator

The adjustment can be carried out by bending the adjusting arm of the voltage regulator.

Specified Regulating Voltage:

13.8 to 14.8V

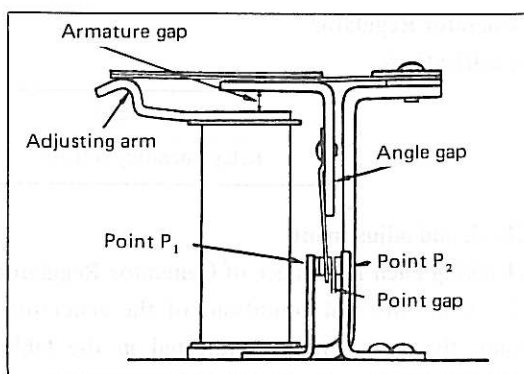


Fig. 8-26 Name of Each Part of Voltage Relay

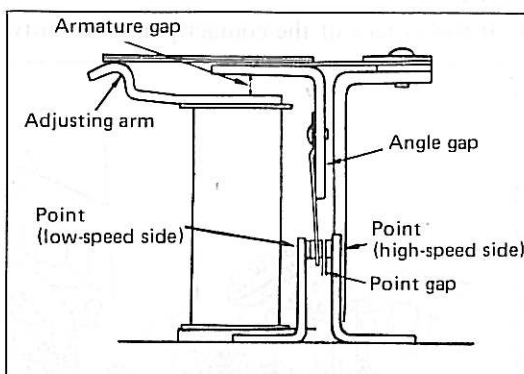


Fig. 8-27 Name of Each Part of Voltage Regulator

Mechanical adjustment

1. Voltage relay

Check the following items given below. Adjust or replace the parts that show defects.

Check item	Specified value	Adjusting point or replacement
Armature gap	0 (when pulled)	Point P ₂ holder
Contact spring deflection	0.2 to 0.9mm (0.0079 to 0.0354 inch) (when pulled)	Point P ₂ holder
Point gap	0.4 to 1.2mm (0.0157 to 0.0472 inch)	Point P ₁ holder

2. Voltage regulator

Check item	Specified value	Adjusting point or replacement
Armature gap	No less than 0.3mm (0.0118 inch)	Low-speed point holder
Point gap	0.30 to 0.45mm (0.0118 to 0.0177 inch)	High-speed point holder
Contact spring deflection	0.2 to 0.6mm (0.0079 to 0.0236 inch) (when pulled)	High-speed point holder
Angle gap	No less than 0.2mm (0.0079 inch) (When pulled)	High-speed point holder

NOTE:

1. "Pulled" condition denotes a condition in which the armature point is pulled to the high-speed side or to the point P₂ with the armature held by one's finger.
2. Prior to checks and adjustments, be certain to disconnect the regulator connector.

IGNITION SYSTEM

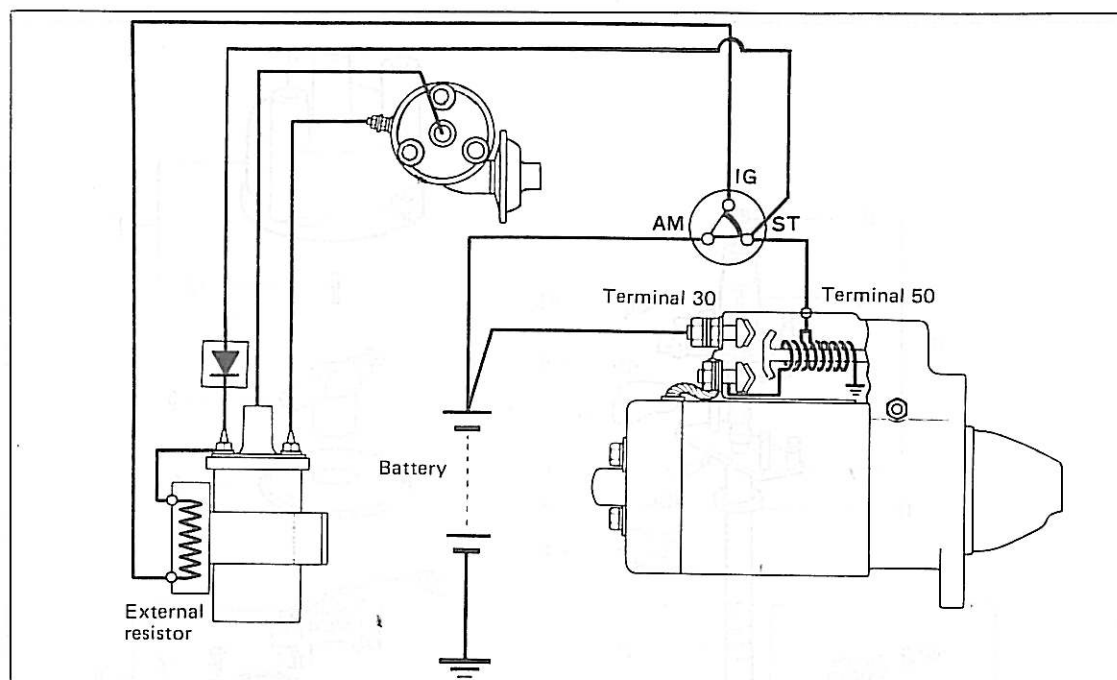


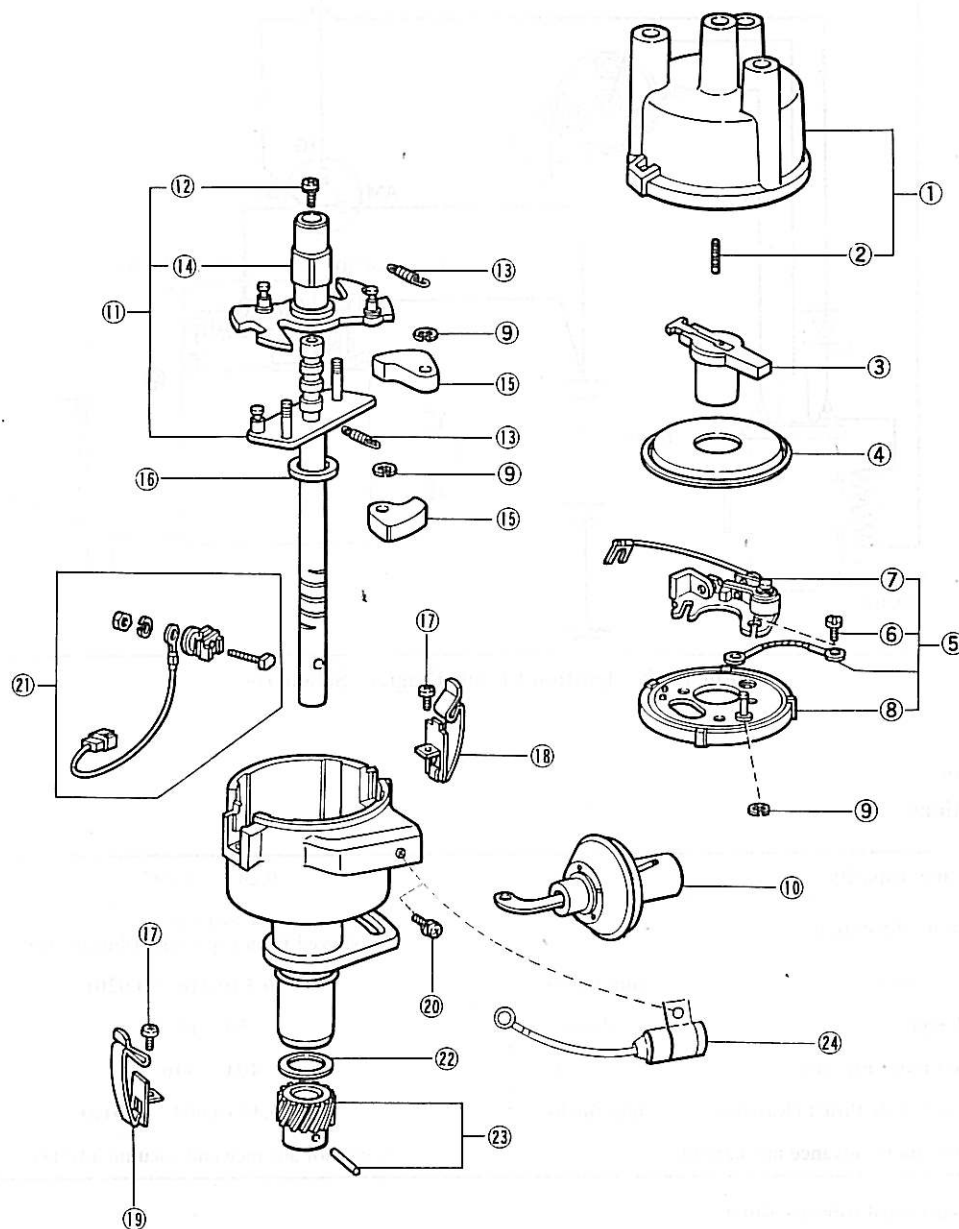
Fig. 8-28 Ignition Circuit Diagram Schematic

Distributor Specifications

Condenser capacity	μF	0.243 ~ 0.297
Direction of rotation		Clockwise (as viewed from top of distributor cap)
Heel clearance	mm (inch)	0.4 ~ 0.5 (0.016 ~ 0.020)
Dwell angle	degree	59 ~ 65
Contact point pressure	g	404 ~ 546
Governor shaft thrust clearance	mm (inch)	0.1 ~ 0.45 (0.004 ~ 0.018)
Ignition timing advance mechanism		Governor advance and vacuum advance
Centrifugal Advance Curve 		Vacuum Advance Curve

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Distributor Components



- | | | |
|----------------------------------|----------------------------------|--------------------------|
| ① Distributor cap sub-assembly | ⑨ Snap washer | ⑬ Tapping screw |
| ② Distributor center piece | ⑩ Vacuum controller sub-assembly | ⑭ Cap clamp sub-assembly |
| ③ Distributor rotor sub-assembly | ⑪ Shaft & governor assembly | ⑮ Distributor terminal |
| ④ Dust proof cover | ⑫ ⑫ Screw with washer | ⑯ "O" ring |
| ⑤ Breaker assembly | ⑬ Governor spring | ⑰ Distributor gear kit |
| ⑥ Screw | ⑭ Distributor cam sub-assembly | ⑱ Condenser |
| ⑦ Arm & bracket assembly | ⑮ Flyweight sub-assembly | |
| ⑧ Breaker plate sub-assembly | ⑯ Cap washer | |

Fig. 8-29 Distributor Components

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In-Vehicle-Check**1. Checking each part**

- (1) Inspect each electrical component for proper mounting.
- (2) Check each wiring for secure mounting.
- (3) Check to see whether the distributor is emanating abnormal sound during the engine operation.
- (4) Inspect each part for evidence of dirt.

3. Checking and adjusting distributor**(1) Rotor and cap**

Inspect each part for signs of crack, rust, dirt, or corrosion.

(2) Checking cap by means of electronic tester

Prior to measurement, strongly apply your breath into the inside of the cap from a point about 50mm (1.97 inches) apart in order that the inside of the cap may be dampened.

Range To Be Used: Insulation M Ohm
Insulation Resistance:

Not Less Than 20 M Ohm

If the insulation resistance is less than 20M ohms, clean the cap, using a neutral detergent. After drying the cap completely, remeasure the insulation resistance. If the resistance is still less than 20M ohms, replace such cap.

(3) Heel gap

Specified Gap: 0.4 to 0.5mm
(0.016 to 0.020 inch)

2. Checking spark

Hold the tip-end of one high-tension cord approximately 6 mm (0.24 inch) apart from a suitable ground surface. If a strong, bluish white spark can be obtained, it indicates that the ignition system is functioning properly.

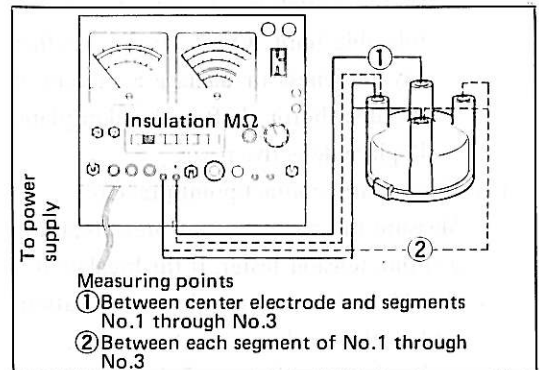


Fig. 8-30 Checking Distributor Cap

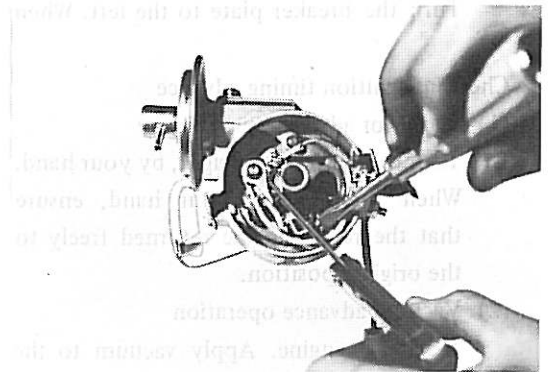


Fig. 8-31 Checking Heel Gap

(4) Dwell angle and variation test

① Dwell angle

Specified Angle: 59 to 65°

② While watching the tester, reduce the engine revolution speed from 1500 rpm to idling speed.

Measure the deflection of the pointer during this test.

Allowable Limit of Variation:

Not To Exceed 3°

If the variation should exceed the tolerable limit, Check to see whether any looseness or damage is present at the distributor shaft or breaker plate. Replace defective parts.

(5) Breaker arm contact-point pressure

Measure the contact-point pressure, using a spring tension tester. If the breaker arm should fail to reach the specification, replace the breaker arm set.

Breaker Arm Contact-Point Pressure:

400 to 550 g

NOTE: Pull the point section of the breaker arm in a direction normal to the point. Read the reading of the gauge at the moment when the contact-points begin opening. Care should be exercised as to the correct alignment of the contact-points.

(6) Sliding resistance of breaker plate

Turn the breaker plate to the left. When

you release your hand, ensure that the breaker plate can be returned freely to the original position.

Reference Information

Breaker Plate Sliding Resistance:

Not To Exceed 1 Kg (2.2 lbs)

(7) Condenser capacity

Measure the condenser capacity by means of a circuit tester. If the reading does not fall within the specified range, replace such condenser.

Specified Capacity: 0.25 to 0.30 μ F

NOTE: If the condenser capacity should be deviated from the specified value, it would cause the drop in secondary voltage. Furthermore, it would cause the contact points to be burnt due to sparks.

(8) Resistive cord continuity test

Connect a circuit tester lead wire to each end of the resistive cord, respectively.

Check the continuity of the resistive cord, while waving the center portion of the cord gently.

If the resistive cord exhibits continuity and the pointer of the tester shows no deflection while waving the cord, it denotes that the cord is satisfactory.

Resistive Cord Resistance

Specified Resistance: 16K Ohm/m

Allowable Limit: 25K Ohm/m

4. Checking ignition timing advance

(1) Governor advance operation

Turn the rotor to the right, by your hand. When you release your hand, ensure that the rotor can be returned freely to the original position.

(2) Vacuum advance operation

Start the engine. Apply vacuum to the vacuum advancer by using a Mighty Bag or sucking the port. Using a timing light, ensure that the timing mark on the fly-wheel moves against the engine rotating direction.

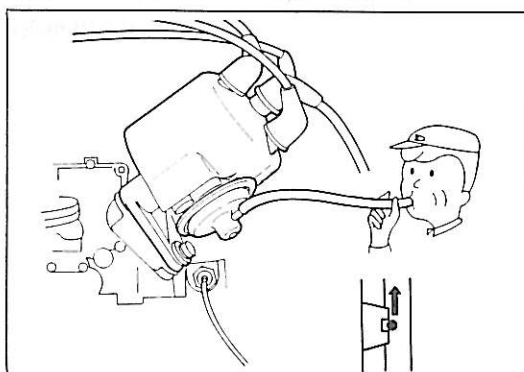


Fig. 8-32 Checking Vacuum Advance Operation

NOTE: Be sure to plug the vacuum hose, after disconnecting it.

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Installation

1. Set the crankshaft at the ignition firing position of the No.1 cylinder.

Ignition Timing: **BTDC 10°**
 Yellow Paint Daub

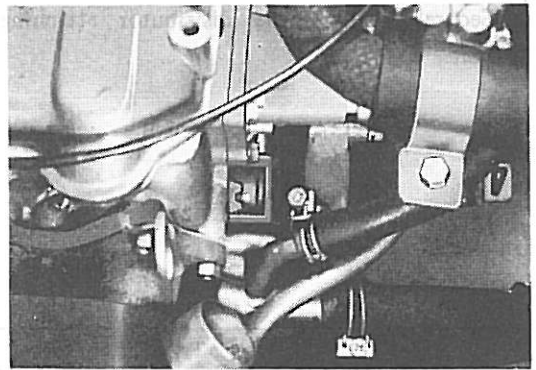


Fig. 8-33 Ignition Timing

2. Align the recessed mate mark provided at the end of the distributor housing boss section with the stamped mark of the distributor gear.

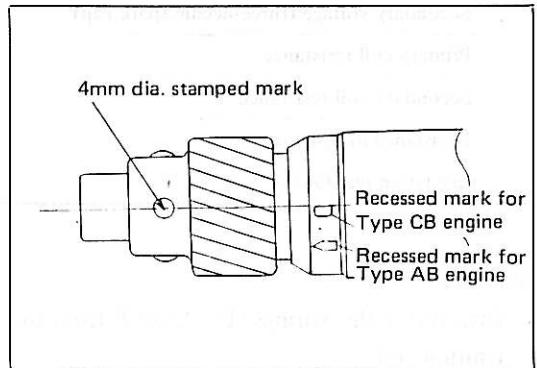


Fig. 8-34 Aligning Mate Marks of Distributor

3. Install the distributor in place in such a way that the diecast mold seam line on the distributor body may be lined up with the embossed line on the housing.

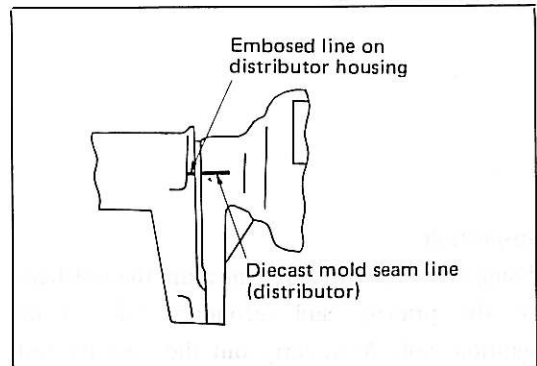


Fig. 8-35 Installing Distributor

4. Attach the dust proof cover, rotor and distributor cap.
5. Install the coil cord and spark plug cords.
6. Start the engine. Adjust the ignition timing at the specified value, using a timing light and an engine tachometer.

Specified Ignition Timing:
 BTDC 10°/900 rpm

- Securely tighten the distributor attaching bolt.

Ignition Coil Specifications

Type		Equipped with external resistance
Primary voltage	V	12
Secondary voltage (three-needle spark gap)	mm (inch)	10.5 (0.41)
Primary coil resistance	Ω	1.0 ± 0.1
Secondary coil resistance	K Ω	17.5 ± 2.6
Resistance of resistor	Ω	1.9 ± 0.2
Insulation resistance		∞

Removal

- Disconnect the wirings ①, ② & ③ from the ignition coil.
- Remove the attaching bolts so as to remove the ignition coil.

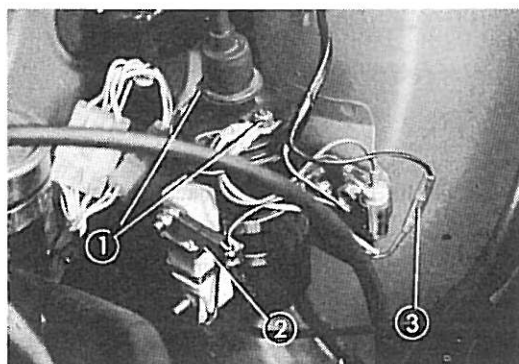


Fig. 8-36 Removing Ignition Coil

Inspection

Using an electronic tester, measure the resistance of the primary and secondary coils of the ignition coil. Also, carry out the capacity test, as indicated in Fig. 8-37.

Measurement of Primary Coil Resistance

Measure the resistance of the primary coil. If the thus-measured resistance is not within the specification, replace such ignition coil.

Specified Primary Coil Resistance:

$1.0 \pm 0.1 \text{ Ohm}$

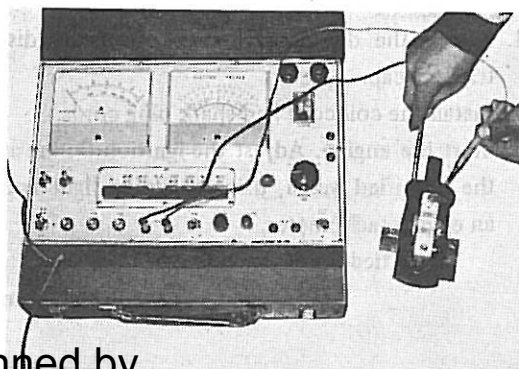


Fig. 8-37 Measuring Primary Coil Resistance

Measurement of Secondary Coil Resistance

Measure the resistance of the secondary coil. If the thus-measured resistance is not within the specification, replace such ignition coil.

Specified Secondary Coil Resistance:

$$17.5 \pm 2.6K \text{ Ohm}$$

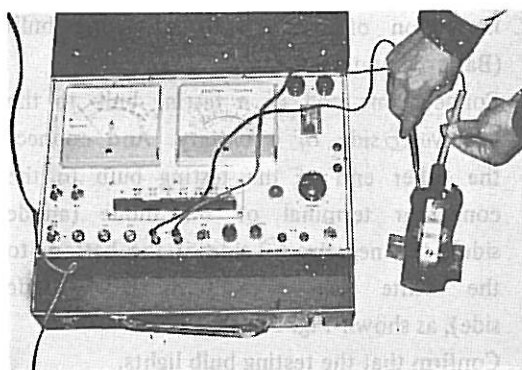


Fig. 8-38 Measuring Secondary Coil Resistance

Measurement of Resistor Resistance

Measure the resistance of the resistor. If the thus-measured resistance is not within the specification, replace such resistor.

Specified Resistance of Resistor:

$$1.9 \pm 0.2 \text{ Ohm}$$

Capacity Test

1. Turn the gap adjusting dial in order that the maximum gap may be obtained. Check to see whether sparks jump from the secondary terminal to the primary terminal. If sparks should jump, replace the coil.
2. Turn the gap adjusting dial to find a position where the sparks cease to occur. Read the spark gap at this position.

Spark Gap:

Not Less Than 10.5mm (0.41 inch)

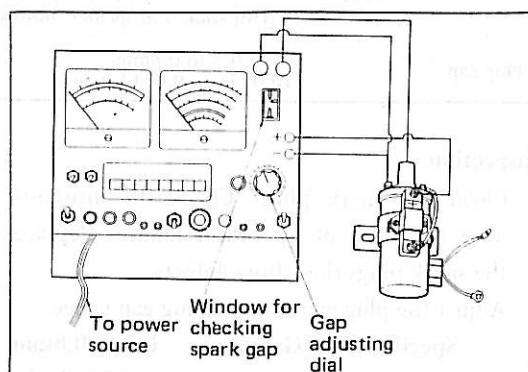


Fig. 8-39 Ignition Coil Capacity Test

Inspection of Diode

1. Inspection of diode with an electro tester
Confirm the continuity by connecting the positive \oplus terminal of an electro tester to the connector terminal of the diode (anode side); the negative \ominus terminal of the electro tester to the white lead wire terminal (cathode side), as shown in Fig. 8-40.

Range To Be Used: $K\Omega$

Deflection: Not Less Than 40% of Tester Scale

Not Less Than 3K Ohm

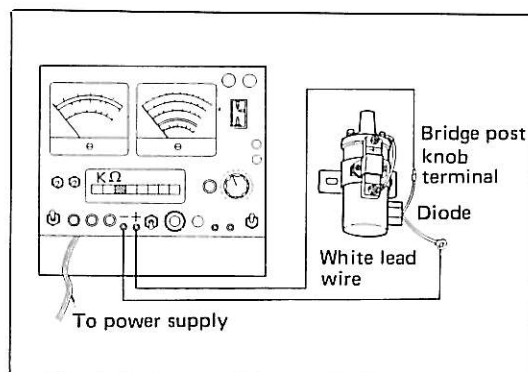


Fig. 8-40 Diode Continuity Test (1)

Furthermore, ensure that the pointer shows no deflection when the above-described connection between the tester and the diode has been reversed.

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2. Inspection of diode with a testing bulb (Battery and testing bulb)

Connect one end of a testing bulb to the positive \oplus side of a battery. And connect the other end of the testing bulb to the connector terminal of the diode (anode side); the negative \ominus side of the battery to the white lead wire terminal (cathode side), as shown Fig. 8-41.

Confirm that the testing bulb lights.

Furthermore, ensure that the testing bulb will not light, when the connections as indicated in Fig. 8-41 have been reversed.

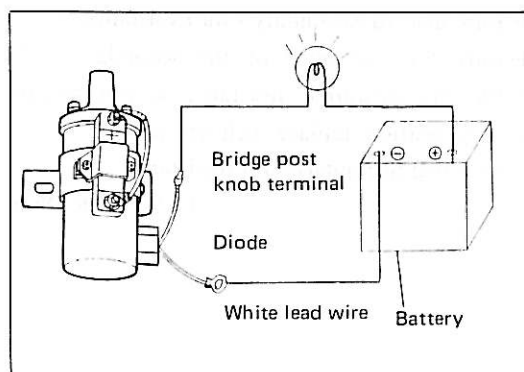


Fig. 8-41 Diode Continuity Test (2)

Spark Plugs

Type	Nippon Denso	W16EX-U
		W16EXR-U (for some European Countries only)
	NGK	BP5EA-L
		BPR5EA-L (for some European Countries only)
Plug gap	0.7 to 0.8mm (0.0275 to 0.0314 inch)	

Inspection

1. Clean the spark plugs. Check the insulator nose for signs of operation failure. Replace the spark plugs that show defects.
2. Adjust the plug gap, using a plug gap gauge.

Specified Plug Gap: **0.7 to 0.8mm**
 (0.0275 to 0.0314 inch)

DAIHATSU

TYPE CB-20 ENGINE

SECTION 9 EXHAUST EMISSION CONTROL SYSTEM

LIST OF EXHAUST EMISSION CONTROL SYSTEM	9 - 2
CHOKE OPENER SYSTEM	9 - 8
BLOW-BY GAS RECIRCULATION SYSTEM	9 - 9
TROUBLE SHOOTING	9 - 10

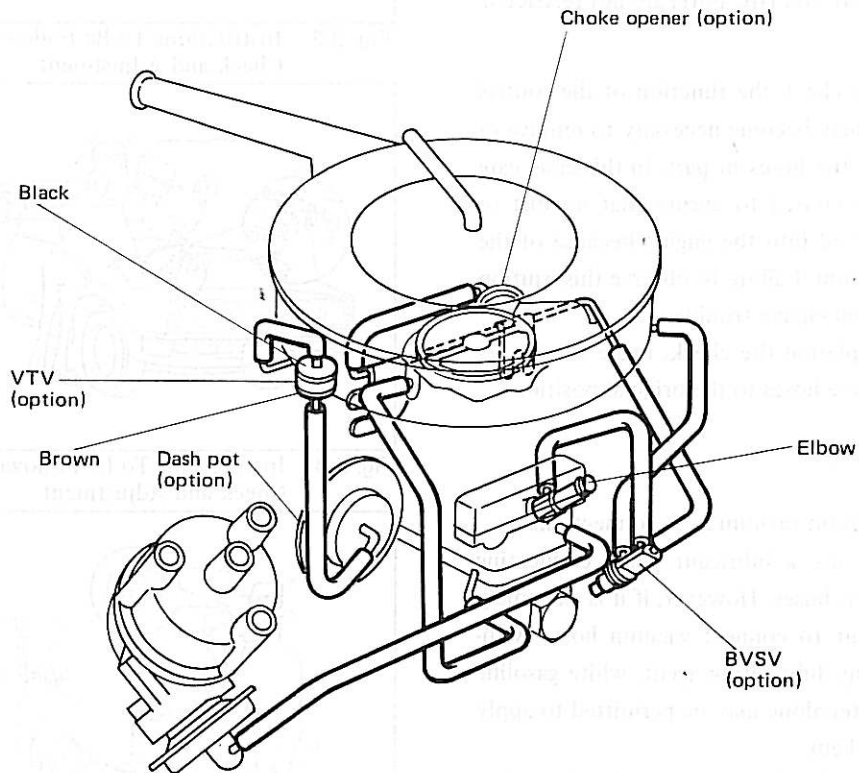
LIST OF EXHAUST EMISSION CONTROL SYSTEM

System	Pollutants to be controlled			Purpose and function
	HC	CO	NOx	
Dash pot (option)	○	○		This device prevents throttle valve from being closed quickly during deceleration period, thus controlling emission of unburnt gases.
Choke opener (option)	○	○		If driver should forget to return choke valve and it remains at its fully-closed position, choke opener will forcibly open choke valve to a certain degree, thus preventing carburetor from supplying overly-rich mixture.
Blow-by gas recirculation system				This system prevents blow-by gases from being released directly to atmosphere. Blow-by gases are led to air cleaner to be burnt again in combustion chamber. (Sealed type)

List of Abbreviation of Component Names of Exhaust Emission Control System

The table below shows abbreviation of components names of the exhaust emission control system. The components of the emission control system are often described in this workshop manual in their abbreviated forms.

Abbreviation		Component name
1	BVSV	Bimetal Vacuum Switching Valve. This is a valve which detects water temperature.
2	C/O	Choke Opener (option)
3	DP	Dash Pot (option)
4	HIC	Hot Idle Compensator



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Instructions To Be Followed During Check and Adjustment

1. Check of each system must be made only after the engine has been tuned-up.
2. Ensure that the hoses are inserted properly. (There should no disconnection or looseness, etc.) Make sure that these hoses exhibit no clinch, wrong connection, or damage.
3. Ensure that the hoses, pipes and port (e.g. advance port and HIC port) are not restricted.
4. In order to check the function of the control system, it may become necessary to remove or disconnect the hoses in part. In this case, care must be exercised to ensure that no dirt or dust is sucked into the engine because of the intake vacuum. Failure to observe this caution may incur an engine trouble. Upon completion the check, make sure to re-connect these hoses to the original positions.

5. Instructions on vacuum hose connections

- (1) Never use a lubricant when connecting vacuum hoses. However, if it is extremely difficult to connect vacuum hoses without any lubricating agent, white gasoline or water alone may be permitted to apply onto them.

NOTE: In this case, dip the tip-end of each vacuum hose into white gasoline or water. Then, shake it lightly and fit it to the pipe.

- (2) Vacuum hoses should be inserted up to the stopper, if equipped so. As for other vacuum hoses, they should be inserted at least 10mm.
- (3) If vacuum hoses are connected so that they are crossed to each other, it is most likely that their connections are wrong.

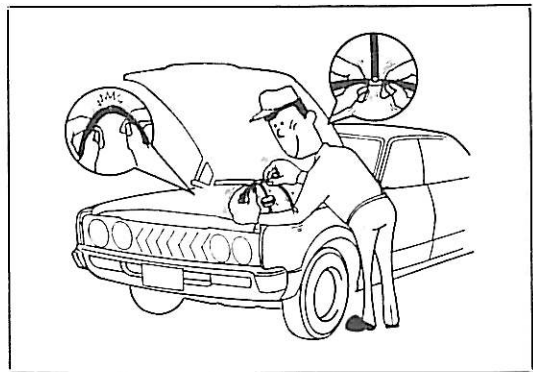


Fig. 9-2 Instructions To Be Followed During Check and Adjustment

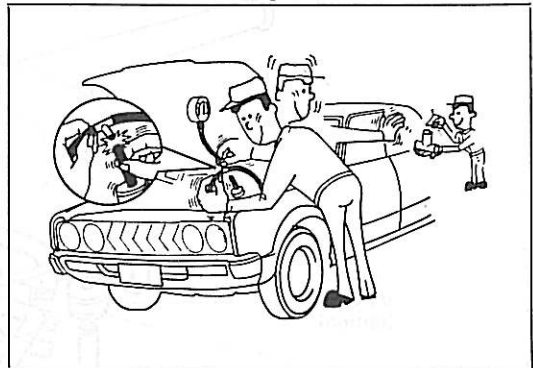


Fig. 9-3 Instructions To Be Followed During Check and Adjustment

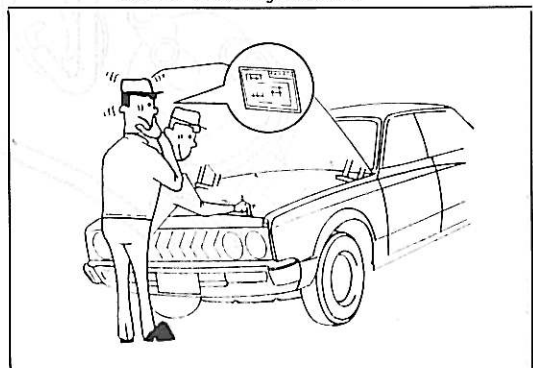


Fig. 9-4 Instructions To Be Followed During Check and Adjustment

Measuring Instruments

Measuring instruments	Engine tachometer, Mighty Bag, vacuum gauge and thermometer.
-----------------------	--

[Prior To Check]

Engine Tachometer

Engine revolution speed can be obtained, using an engine tachometer commercially available and using the following procedure given below.

1. In the case of a tachometer where signals are picked up from the primary circuit and there is no range for three-cylinder engine, use the six-cylinder range of the tachometer. And multiply the thus-obtained reading by two. The product is the actual revolution speed for

the three-cylinder engine.

2. In the case of a tachometer where pulses flowing through the resistive cord of the No.1 cylinder are detected, the engine revolution speed can be read directly, regardless of the number of cylinders.

Handling Instructions on Mighty Bag

1. If the atmospheric pressure is allowed to apply suddenly after negative pressure has been created, it might cause the zero-point of the pointer to be deviated. Therefore, make sure to apply the atmospheric pressure gradually by means of the lever, as indicated in Fig. 9-6.
2. If dirt should be sucked into the Mighty Bag, it might lodge at the pump or piston, thereby making it impossible to generate negative pressure. Therefore, do not operate the Mighty Bag with the inlet port of the hose faced toward dirt or dust.
3. The body of the Mighty Bag is made of a plastic material and its sections are glued to each other. Hence, the Mighty Bag can not be disassembled or repaired. Therefore, particular attention must be taken while handling it so as not to drop and break it.
4. The Mighty Bag should be used in conjunction with the hose and attachment that have been furnished along the Mighty Bag.

NOTE: When the VTV and orifices are to be checked, a vacuum hose whose overall length does not exceed 100mm must be employed.

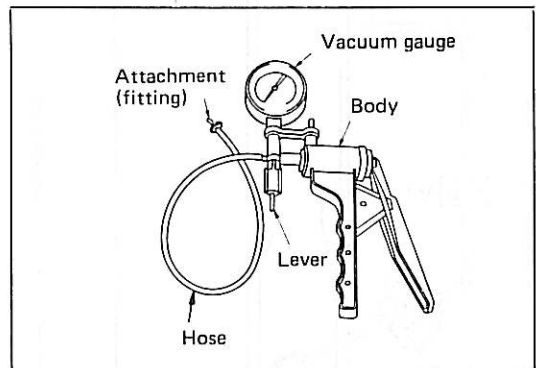


Fig. 9-5 Handling Instructions on Mighty Bag (1)

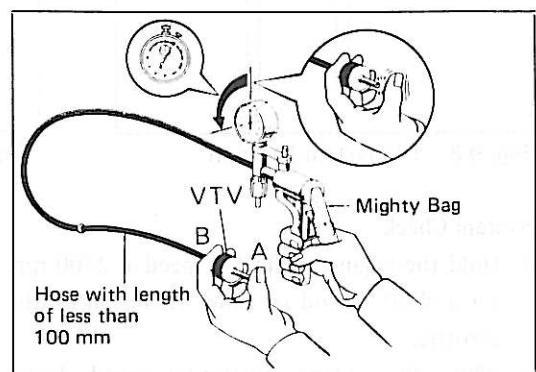


Fig. 9-6 Handling Instructions on Mighty Bag (2)

5. BVSV.

Gradually heat the BVSV. Then, gradually cool the BVSV. Check the vent continuity of the valve during these checks.

Port \ Test water temperature	K	L	J
10°C or below		○ — ○	
35°C or above	○ — ○		

○ — ○ marks denote that there is vent continuity.

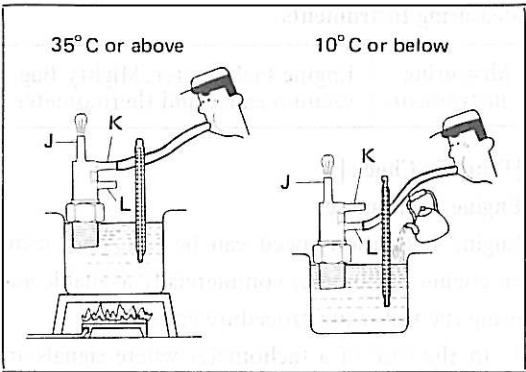


Fig 9-7 Checking BVSV

Dash Pot System (Deceleration Control System) [option]

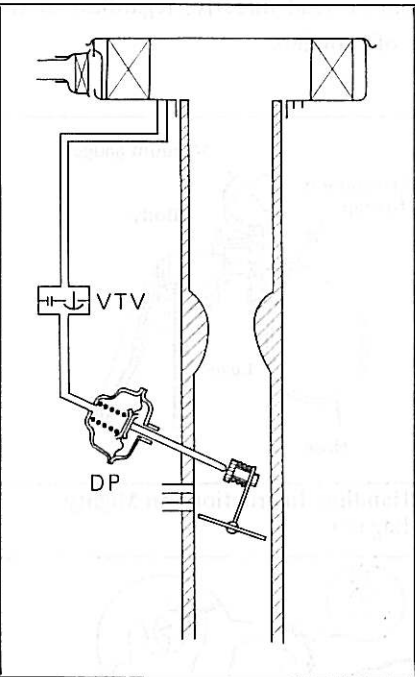


Fig. 9-8 DP System Diagram

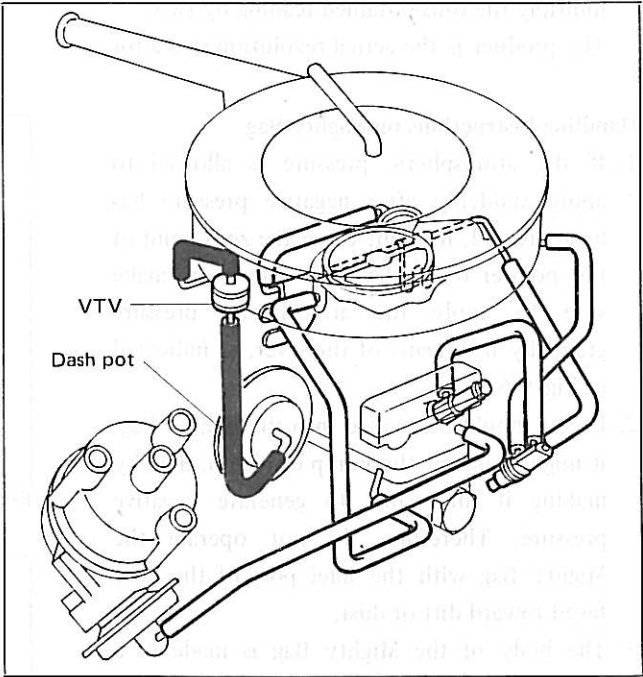


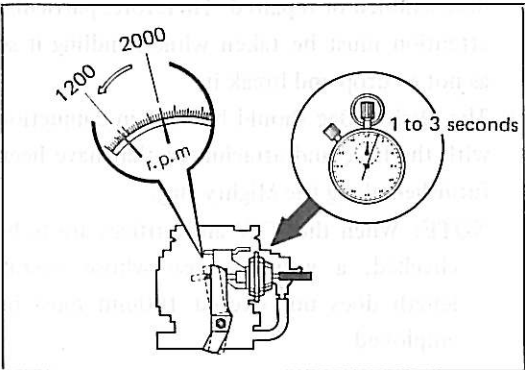
Fig. 9-9 Schematic View of DP System

System Check

1. Hold the engine revolution speed at 2500 rpm for a short period of time. Then, release the throttle.
2. While the engine revolution speed drops, measure the time required for the engine speed to drop from 2000 rpm to 1200 rpm. If the required time falls within the range given below, the dash pot system is functioning properly.

Specified Time:

1 to 3 seconds



Checking DP System

Unit Check**1. Dash pot.**

With a Mighty Bag connected, apply a vacuum of 200 mm Hg. to the dash pot. If the shaft is pulled out, it represents a normal function.

Next, release the vacuum. If the shaft is returned quickly, it represents a normal function.

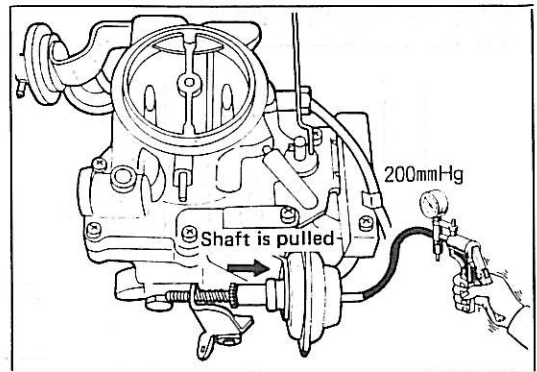


Fig. 9-11 DP Unit Check

2. VTV (Brown)

(1) Connect the Mighty Bag to the B side (black). With the A side (brown) plugged by finger, apply a vacuum of 500 mm Hg. If the pointer is steady, it indicates a normal function.

(2) Next, release the A side. If the time required for the vacuum to drop from 400 mm Hg. to 200 mm Hg. is 0.2 to 5 seconds, it shows a normal function.

(3) Lightly blow into the valve through the B side (black). If there is a continuity vent, it denotes a normal operation.

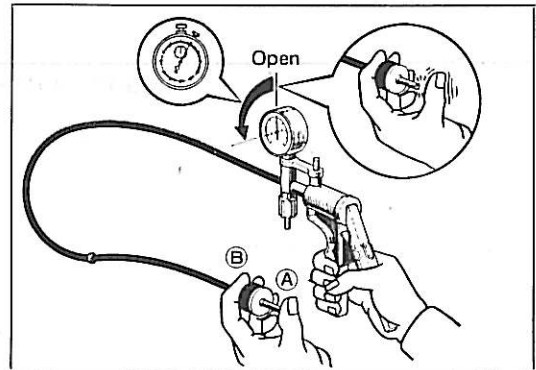


Fig. 9-12 Checking VTV

CHOKE OPENER SYSTEM

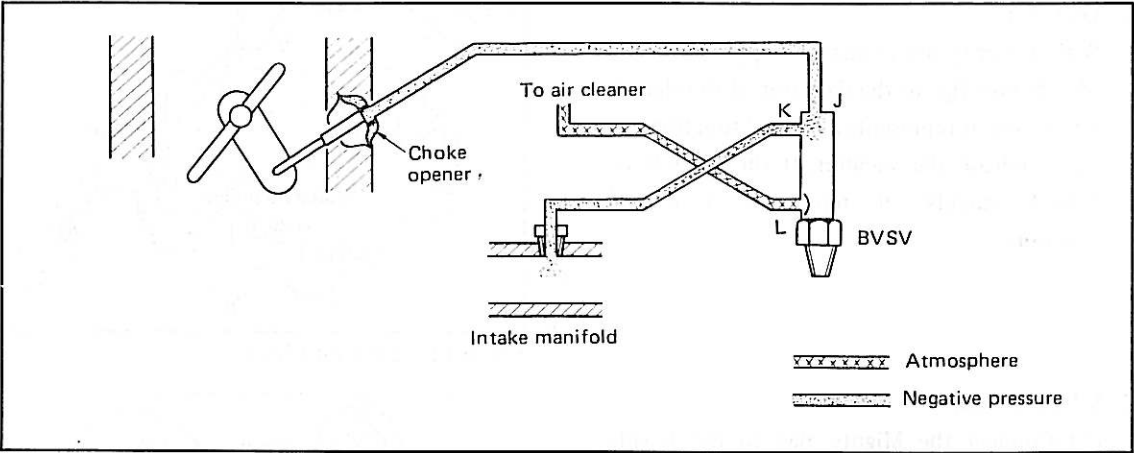


Fig. 9-13 C/O System Diagram

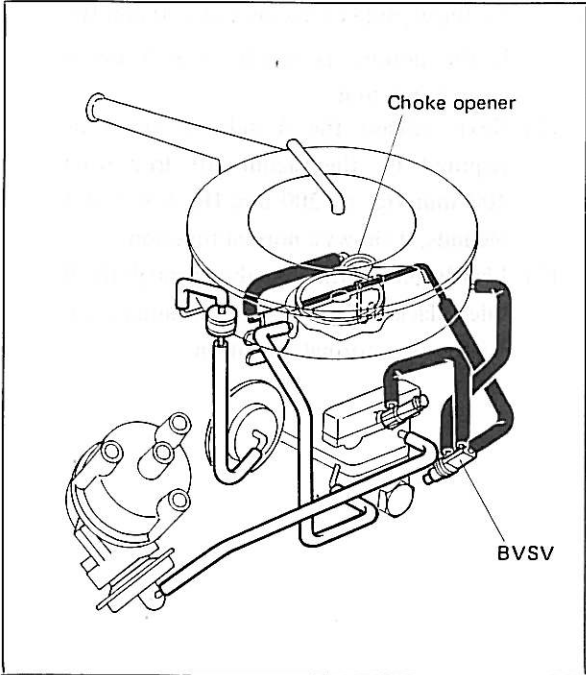
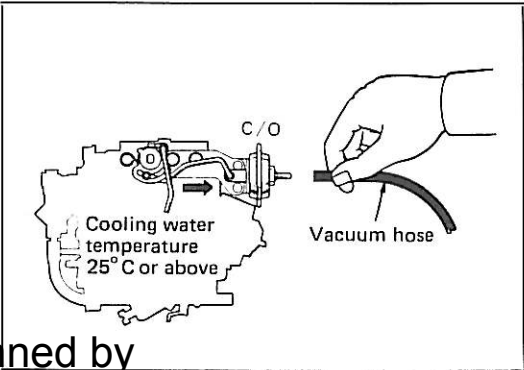


Fig. 9-14 Schematic View of C/O System

System Check

While the engine is running at the idling speed, disconnect the vacuum hose connected to the choke opener. If the link shows the following behaviors described in the table below, it represents a satisfactory operation.

Cooling water temperature	When hose is connected
10° C or below	Link will not move. (No vacuum is applied to hose.)
25° C or above	Link moves. (Vacuum is applied to hose.)



Unit Check

1. With a Mighty Bag connected, apply a vacuum of 200 mm Hg to the choke opener. If the link is pulled, it represents a normal operation.
Next, release the vacuum. If the link is returned quickly, it indicates a normal operation.
2. BVS V
See the section under "Unit Check of BVS V" page 9-7.

BLOW-BY GAS RECIRCULATION SYSTEM**Inspection**

1. Ensure that the ventilation hoses exhibit no cracks, damage, or restriction.
2. Ensure that the baffle plate of the cylinder head cover exhibits no restriction.
3. Remove the oil filler cap. Lightly blow into the inside through the ventilation hose. If there is a vent continuity, it represents a normal operation.

TROUBLE SHOOTING

Malfunctions which will likely encounter with the engine and its exhaust emission control system as well as their possible causes have been summarized here in the form of flow charts.

These flow charts have been so arranged that the check operations for comparatively simple items and items having a large degree of possibility are carried out first.

It is, however, advisable to remedy first a trouble which has been found out during the operation and which is believed to be a cause for the malfunction.

1. Engine Won't Start.
2. Rough Idling (Engine stalls.)
3. Lack of Power and Poor Acceleration.
4. Excessive Fuel Consumption.

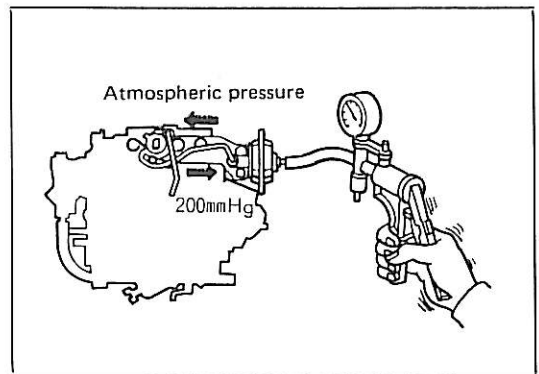


Fig. 9-16 Checking C/O

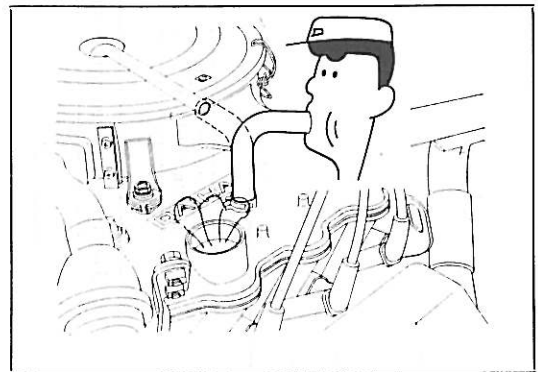


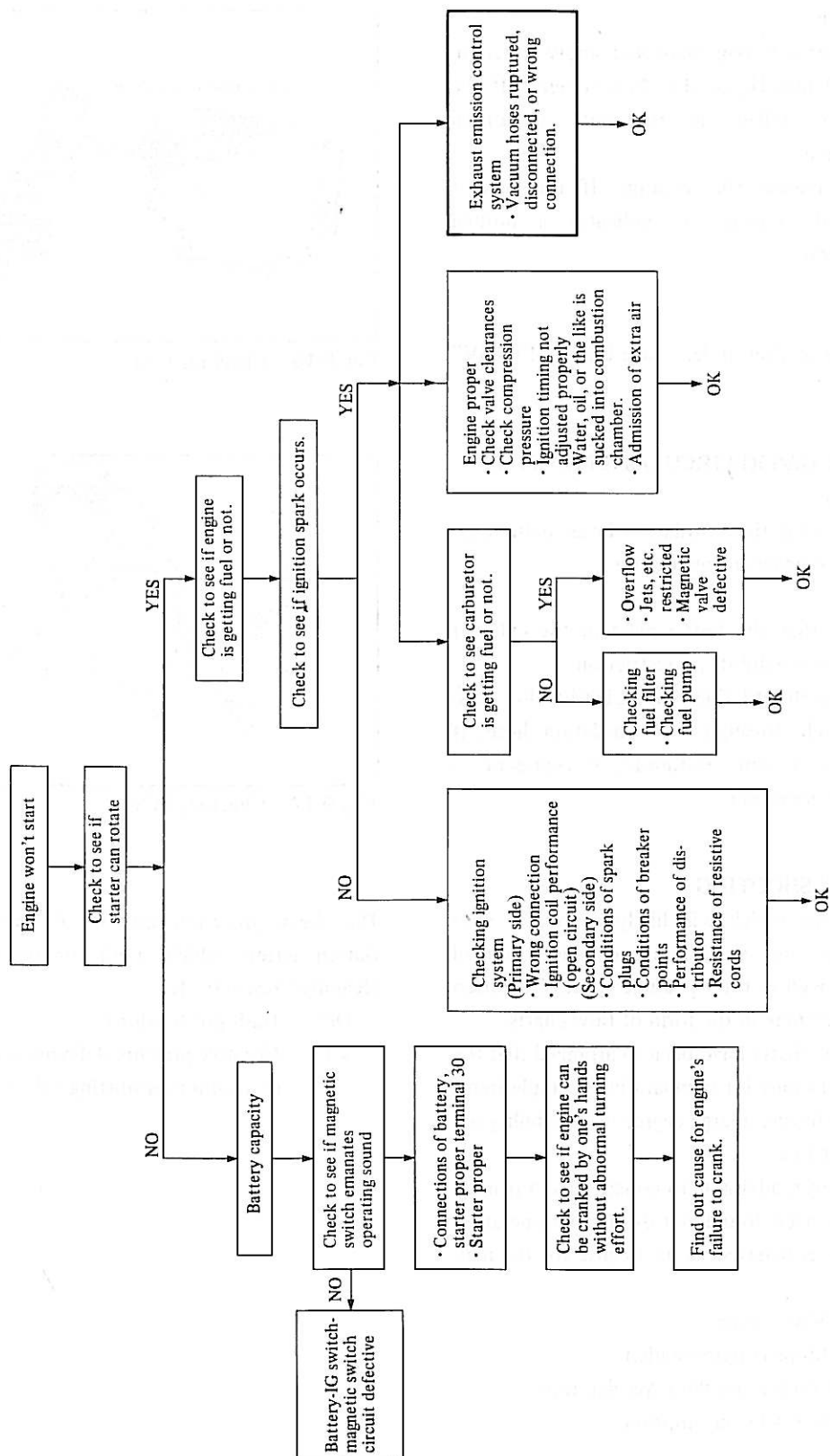
Fig. 9-17 Checking PCV

The check procedure uses the following abbreviation letters which stand for the following Meanings, respectively.

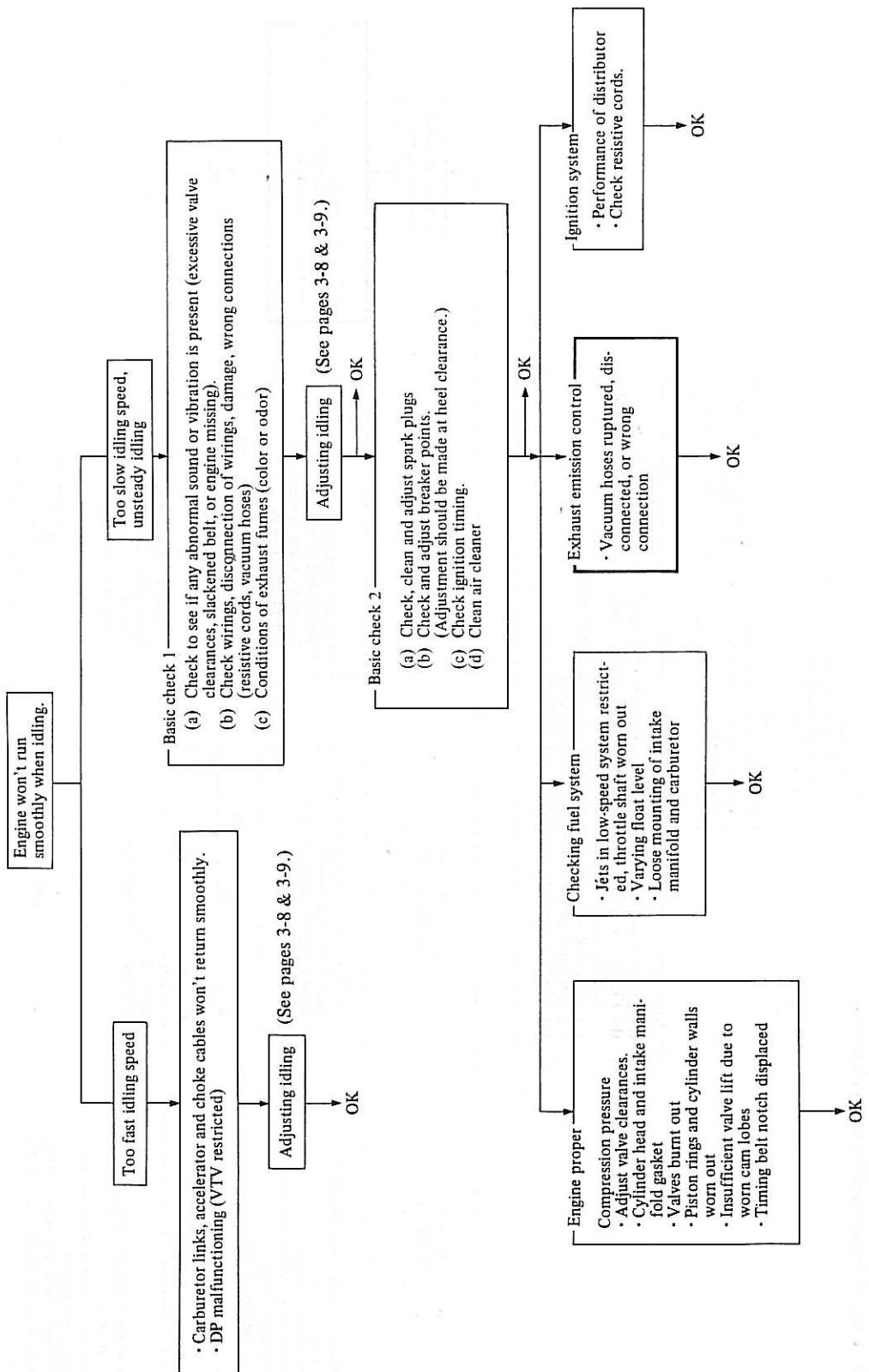
DP: Dash pot (option)

VTV: Negative pressure delaying valve
(Vacuum transmitting valve) [option]

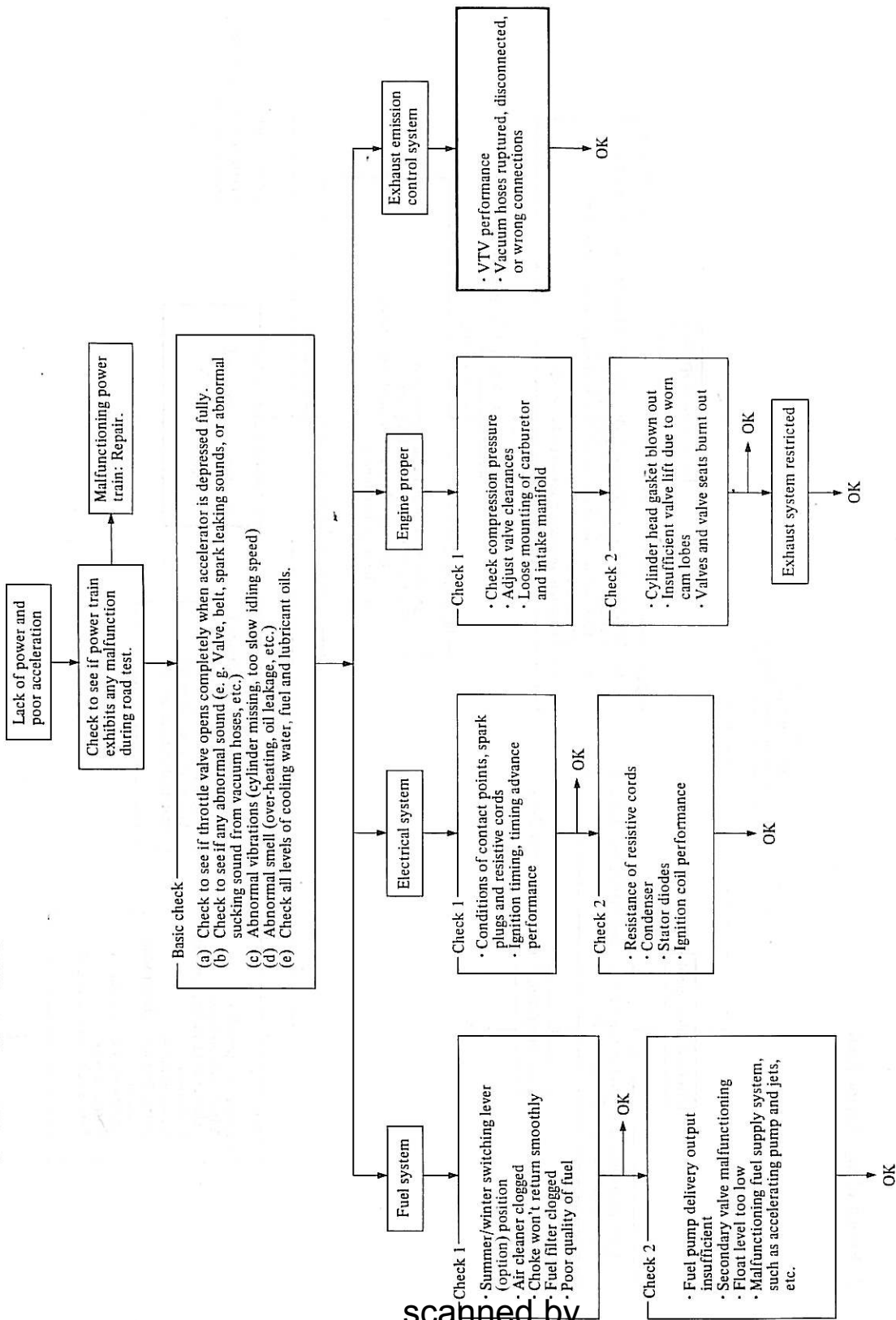
1. Engine Won't Start.



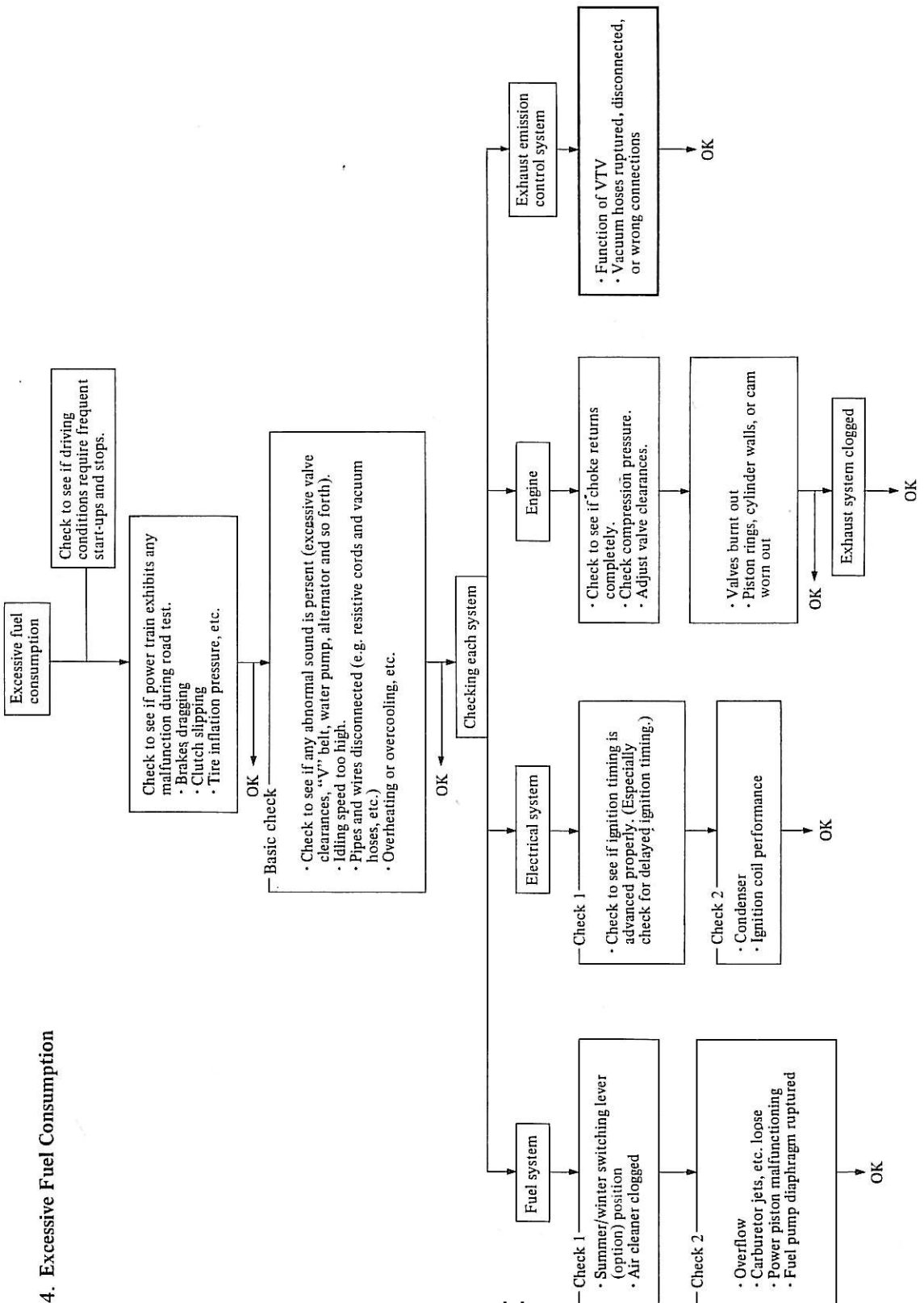
2. Rough Idling (Engine Stalls.)



3. Lack of Power and Poor Acceleration



4. Excessive Fuel Consumption



DAIHATSU

TYPE CB-20 ENGINE

SECTION 10 APPENDIX

SERVICE SPECIFICATIONS	10 - 2
TIGHTENING TORQUES	10 - 6
LIST OF SPECIAL TOOLS	10 - 8

10

SERVICE SPECIFICATIONS

Cylinder head

Item			Specified value	Allowable limit	Remarks
Cylinder head lower gasket surface distortion			mm (inch)	—	0.10 (0.0039)
Manifold gasket surface distortion			mm (inch)	—	0.10 (0.0039)
Valve seat	Seat width	Intake	1.0 ~ 1.8 (0.039 ~ 0.071)	—	
		Exhaust	1.0 ~ 1.8 (0.039 ~ 0.071)	—	
	Seat angle		45°	—	
	Recession allowable limit		mm (inch)	—	0.5 (0.020)

Valve guide bush

Item		Specified value	Allowable limit	Remarks
Valve stem-to-bush clearance	Intake	0.040 ~ 0.070 (0.0016 ~ 0.0028)	0.09 (0.0035)	
	Exhaust	0.045 ~ 0.075 (0.0018 ~ 0.0030)	0.10 (0.0039)	

Valves

Item		Specified Value	Allowable limit	Remarks
Seat width	Intake	1.0 ~ 1.8 (0.039 ~ 0.071)	—	
	Exhaust	1.0 ~ 1.8 (0.039 ~ 0.071)	—	
Seat angle		45°	—	
Valve head stock thickness	Intake	0.9 ~ 1.5 (0.035 ~ 0.059)		
	Exhaust	1.2 ~ 1.8 (0.047 ~ 0.071)	1.0 (0.039)	
Valve stem outer diameter	Intake	6.945 ~ 6.960 (0.2734 ~ 0.2740)	6.920 (0.2724)	
	Exhaust	6.940 ~ 6.955 (0.2732 ~ 0.2738)	6.910 (0.2720)	

Valve spring

Item	Specified value	Allowable limit	Remarks
Free length mm (inch)	43.3 (1.7047)	42.0 (1.6535)	
Length as installed mm (inch)	34.9 (1.3740)	—	
Tension as installed kg (lb)	29.9 (65.9)	25.7 (56.7)	
Out-of-squareness mm (inch)	—	1.5 (0.059)	

Valve rocker shaft and Rocker arm

Item	Specified value	Allowable limit	Remarks
Rocker shaft-to-rocker arm clearance mm (inch)	0.016 ~ 0.060 (0.0006 ~ 0.0024)	0.09 (0.0035)	

Cylinder block

Item	Specified value	Allowable limit	Remarks
Top gasket surface distortion mm (inch)	—	0.05 (0.0020)	
Cylinder bore	Wear mm (inch)	0.10 (0.0039)	
	Out-of roundness, taper mm (inch)	0.10 (0.0039)	

Piston, piston pin and piston ring

Item	Specified value	Allowable limit	Remarks
Piston-to-cylinder clearance mm (inch)	0.045 ~ 0.065 (0.0018 ~ 0.0026)	0.12 (0.0047)	
Piston ring	End gap mm (inch)	Compression No.1 and No.2 0.12 ~ 0.4 (0.0079 ~ 0.0157)	0.70 (0.0276)
		Oil 0.2 ~ 0.9 (0.0079 ~ 0.0354)	1.30 (0.0512)
	Side clearance mm (inch)	Compression No.1 0.03 ~ 0.07 (0.0012 ~ 0.0026)	0.12 (0.0047)
		Compression No.2 0.02 ~ 0.06 (0.0008 ~ 0.0024)	0.12 (0.0047)
Piston outer diameter mm (inch)	75.945 ~ 75.975 (2.9900 ~ 2.9911)	—	
Piston-to-piston pin clearance mm (inch)	0.005 ~ 0.011 (0.0002 ~ 0.0004)	—	

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Connecting rod

Item		Specified value	Allowable limit	Remarks
Bend of rod per 100mm (3.94 inches)	mm (inch)	—	0.05 (0.0020)	
Twist of rod per 100mm (3.94 inches)	mm (inch)	—	0.05 (0.0020)	
Connecting rod bearing oil clearance	mm (inch)	0.020 ~ 0.044 (0.0008 ~ 0.0017)	0.07 (0.0028)	
Big end thrust clearance	mm (inch)	0.150 ~ 0.220 (0.0059 ~ 0.0087)	0.30 (0.0118)	

Crankshaft

Item		Specified value	Allowable limit	Remarks
Crankshaft run-out	mm (inch)	—	0.03 (0.0012)	
Uneven wear of journal section	mm (inch)	—	0.02 (0.0008)	
Crankshaft bearing oil clearance	mm (inch)	0.020 ~ 0.044 (0.0008 ~ 0.0017)	0.07 (0.0028)	
Side clearance	mm (inch)	0.020 ~ 0.220 (0.0008 ~ 0.0087)	0.30 (0.0118)	

Balance shaft

Item		Specified value	Allowable limit	Remarks
Thrust clearance	mm (inch)	0.03 ~ 0.13 (0.0012 ~ 0.0051)	0.20 (0.0079)	
Balance shaft bearing oil clearance	mm (inch)	0.025 ~ 0.066 (0.0010 ~ 0.0026)	0.10 (0.0039)	

Camshaft

Item		Specified value	Allowable limit	Remarks
Thrust clearance	mm (inch)	0.050 ~ 0.290 (0.0020 ~ 0.0114)	0.40 (0.0157)	
Cam lobe height	mm (inch)	39.604 ~ 39.704 (1.5592 ~ 1.5631)	39.40 (1.5512)	
Camshaft journal uneven wear	mm (inch)	—	0.04 (0.0016)	
Camshaft bearing oil clearance mm (inch)	Front	0.04 ~ 0.09 (0.0016 ~ 0.0035)	0.14 (0.0055)	
	Center	0.09 ~ 0.14 (0.0035 ~ 0.0055)	0.19 (0.0075)	
	Rear	0.06 ~ 0.11 (0.0024 ~ 0.0043)	0.16 (0.0063)	

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Timing belt pulley

Item		Specified value	Allowable limit	Remarks
Pulley outer diameter mm (inch)	Camshaft pulley	119.86 ~ 120.04 (4.7189 ~ 4.7260)	119.80 (4.7165)	
	Crankshaft pulley	59.26 ~ 59.36 (2.3331 ~ 2.3370)	59.20 (2.3307)	

Manifold

Item		Specified value	Allowable limit	Remarks
Intake manifold gasket surface distortion	mm (inch)	—	0.10 (0.0039)	
Exhaust manifold gasket surface distortion	mm (inch)	—	0.10 (0.0039)	

Flywheel

Item	Specified value	Allowable limit	Remarks
Flywheel run-out		0.10 (0.0039)	

TIGHTENING TORQUES

Table of general standard bolt tightening torque

Kind	diameter	Pitch	Standard tightening torque kg-m (ft-lb)	
			Standard value	Tightening range
4T (Bolt bearing mark of 4 at bolt head) (Example of part number) 91○○○-4○○○○	6	1	0.47 (3.4)	0.4~ 0.7 (2.9~ 5.1)
	8	1.25	1.11 (8.0)	1.0~ 1.6 (7.2~ 11.6)
	10	1.25	2.25 (16.3)	1.9~ 3.1 (13.7~ 22.4)
	10	1.5	2.14 (15.5)	1.8~ 3.0 (13.0~ 21.7)
	12	1.25 (ISO)	4.40 (31.8)	3.5~ 5.5 (25.3~ 39.8)
	12	1.5	3.89 (28.1)	3.5~ 5.5 (25.3~ 39.8)
	12	1.75	3.74 (27.1)	3.0~ 5.0 (21.7~ 36.2)
	13	1.5	5.08 (36.7)	4.5~ 7.0 (32.5~ 50.6)
	14	1.5	6.33 (45.8)	5.0~ 8.0 (36.2~ 57.9)
	14	2	5.93 (42.9)	4.7~ 7.7 (34.0~ 55.7)
	16	1.5	9.57 (69.2)	7.5~ 11.0 (54.2~ 79.6)
	16	2	9.10 (65.8)	7.1~ 10.6 (51.4~ 76.7)
5T (Bolt bearing mark of 5 at bolt head) (Example of part number) 91○○○-5○○○○	6	1	0.71 (5.1)	0.6~ 0.9 (4.3~ 6.5)
	8	1.25	1.66 (12.0)	1.5~ 2.3 (10.8~ 16.6)
	10	1.25	3.37 (24.4)	3.0~ 4.5 (21.7~ 32.5)
	10	1.5	3.20 (23.1)	2.7~ 4.2 (19.5~ 30.4)
	12	1.25 (ISO)	6.60 (47.7)	5.0~ 8.0 (36.2~ 57.9)
	12	1.5	5.84 (42.2)	5.0~ 7.0 (36.2~ 50.6)
	12	1.75	5.60 (40.5)	4.8~ 6.8 (34.7~ 49.2)
	13	1.5	7.63 (55.2)	6.5~ 9.0 (47.0~ 65.1)
	14	1.5	9.50 (68.7)	7.5~ 11.0 (54.2~ 79.6)
	14	2	8.90 (64.4)	7.0~ 10.5 (50.6~ 75.9)
	16	1.5	14.36 (103.9)	12.0~ 17.0 (86.8~ 123.0)
	16	2	13.58 (98.2)	11.5~ 16.5 (83.2~ 119.3)
6T (Bolt bearing mark of 6 at bolt head) (Example of part number) 91○○○-6○○○○	6	1	0.71 (5.1)	0.6~ 0.9 (4.3~ 6.5)
	8	1.25	1.66 (12.0)	1.5~ 2.2 (10.8~ 15.9)
	10	1.25	3.37 (24.4)	3.0~ 4.5 (21.7~ 32.5)
	10	1.5	3.20 (23.1)	2.7~ 4.2 (19.5~ 30.4)
	12	1.25 (ISO)	6.60 (47.7)	5.0~ 8.0 (36.2~ 57.9)
	12	1.5	5.84 (42.2)	5.0~ 7.0 (36.2~ 50.6)
7T (Bolt bearing mark of 7 at bolt head) (Example of part number) 91○○○-7○○○○	12	1.75	5.61 (40.6)	4.8~ 6.8 (34.7~ 49.2)
	6	1	0.95 (6.9)	0.8~ 1.2 (5.8~ 8.7)
	8	1.25	2.20 (15.9)	2.0~ 3.0 (14.5~ 21.7)
	10	1.25	4.50 (32.5)	4.0~ 5.5 (28.9~ 39.8)
	10	1.5	4.30 (31.1)	3.7~ 5.2 (26.8~ 37.6)
	12	1.25 (ISO)	8.80 (63.7)	7.5~ 10.5 (54.2~ 75.9)
	12	1.5	7.78 (56.3)	7.0~ 9.0 (50.6~ 65.1)
	12	1.75	7.48 (54.1)	6.0~ 8.5 (43.4~ 61.5)
	13	1.5	10.17 (73.6)	8.0~ 12.0 (57.9~ 86.8)
	14	1.5	12.67 (91.6)	10.0~ 15.0 (72.3~ 108.5)
	14	2	11.86 (85.8)	9.5~ 14.0 (68.7~ 101.3)
	16	1.5	19.15 (138.5)	15.0~ 23.0 (108.5~ 166.4)
	16	2	18.11 (131.0)	14.0~ 22.0 (101.3~ 159.1)

NOTE: Example 91111-40620

Bolt length below head (ℓ) mm
 Diameter of bolt (d) mm



Example Bolt (40620)

4 stands for mark bearing at bolt head

06 stands for diameter of bolt

20 stands for length below head

Standard tightening torque denotes value when the material is made of steel.

In case that the materials other than steel made are tightened or, heat or stress such as vibration load etc. is applied to a bolt, standard tightening torque must be increased as follows.

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Engine

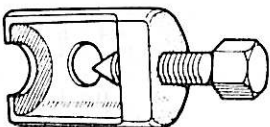
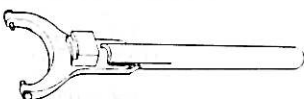
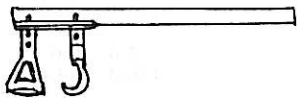
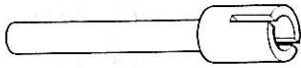

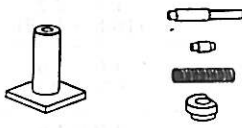
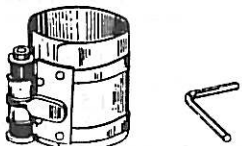
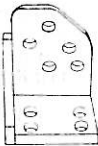
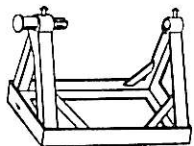
Unit: kg-m (ft-lb)

Tightening component	Tightening Torques
Cylinder block x cylinder head	5.0 ~ 6.0 (36.2 ~ 43.4)
Cylinder block x crankshaft bearing cap	6.4 ~ 6.6 (39.1 ~ 47.7)
Cylinder block x balance shaft thrust plate	1.0 ~ 1.5 (7.2 ~ 10.8)
Cylinder head x manifold	IN 1.0 ~ 1.6 (7.2 ~ 11.6) EX 1.0 ~ 1.6 (7.2 ~ 11.6)
Cylinder head x spark plug	1.8 ~ 2.4 (13.0 ~ 17.4)
Cylinder head x head cover	0.4 ~ 0.6 (2.9 ~ 4.3)
Crankshaft x flywheel	4.0 ~ 5.0 (28.9 ~ 36.2)
Crankshaft x crankshaft pulley	5.0 ~ 6.0 (36.2 ~ 43.4)
Connecting rod x connecting rod cap	2.1 ~ 2.9 (15.2 ~ 21.0)
Camshaft x camshaft timing belt pulley	3.0 ~ 4.5 (21.7 ~ 32.5)
Camshaft x fuel pump drive cam	1.0 ~ 1.5 (7.2 ~ 10.8)
Timing belt tensioner x cylinder block	1.0 ~ 1.6 (7.2 ~ 11.6)
Oil pan x cylinder block	0.4 ~ 0.7 (2.9 ~ 5.1)
Oil pan x drain plug	2.5 ~ 3.5 (18.1 ~ 25.3)
Oil pump x cylinder block	1.5 ~ 2.2 (10.8 ~ 15.9)
Oil pump drive shaft sprocket x oil pump rotor	1.0 ~ 1.6 (7.2 ~ 11.6)
Balance shaft gear cover x cylinder block	1.0 ~ 1.6 (7.2 ~ 11.6)
Distributor housing x cylinder block	0.4 ~ 0.7 (2.9 ~ 5.1)
Fuel pipe x fuel pump	1.5 ~ 2.0 (10.8 ~ 14.5)
Fuel pipe x carburetor	1.5 ~ 2.0 (10.8 ~ 14.5)
Distributor x distributor housing	1.5 ~ 2.2 (10.8 ~ 15.9)
Oil seal retainer x cylinder block	1.0 ~ 1.6 (7.2 ~ 11.6)

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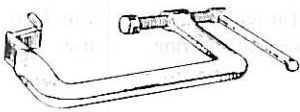
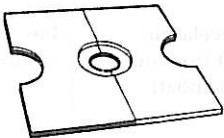
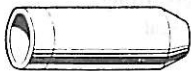
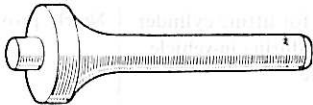
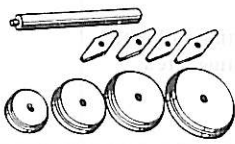
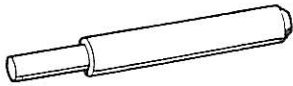


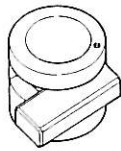
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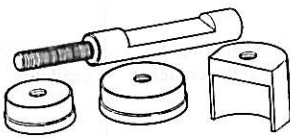
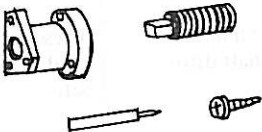

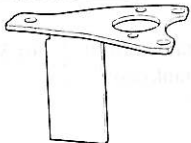
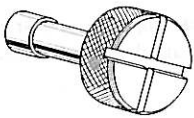
LIST OF SPECIAL TOOLS

Group	Shape	Part number & nomenclature	Application	Remarks
Engine		09611-87201-000 Tie rod end puller	Used for disconnecting tie rod end from knuckle	For Model L38
		09648-87201-000 Drive shaft replacer	Used for pulling out drive shaft	For Model L38
		09202-87701-000 Valve spring replacer	Used for replacing valve springs during in-vehicle operation	Special tool for Type AB engine must be modified partly. (See Fig. 3-119.)
		09201-87701-000 Valve stem oil seal replacer	Used for press-fitting valve stem oil seals	For Type AB engine use
		09219-87702-000 Cylinder head holder	Used for base during cylinder head disassembly & assembly operations	Newly provided
		09221-87702-000 Piston pin remover & replacer	Used for replacing pistons, piston pins and connecting rods	Fitting piece (09221-87702-100) only has been newly provided. Body (09221-25011)
		4610-07 Piston ring replacing guide	Used for installing pistons	Commercially-available
		09219-87701-000 Engine overhaul attachment	Attachment to be used for attaching engine onto engine overhaul stand	Newly provided
		2001-03 Engine overhaul stand	Stand to be used for disassembling and assembling engine	For Type ZM engine use

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Group	Shape	Part number & nomenclature	Application	Remarks
Engine		4610-02 Valve cotter remover & replacer	Used for removing & installing valve cotters	Commercially-available
		09253-87201-000 Crankshaft center bearing anvil	Used for replacing balance shaft drive gear	These tools must be used as combination set.
		09506-87303-000 Differential drive pinion front bearing cone replacer	Used for replacing balance shaft drive gear	
		09515-87202-000 Rear axle inner bearing replacer	Used for installing front oil seals of crankshaft and camshaft	For Model L38 use
		09608-87301-000 Axle hub & pinion bearing tool set	Used for installing crankshaft rear oil seal	For DV and SV series use
		09301-87201-000 Clutch guide tool	Used for installing clutch disc (centering)	For Model L38 use
		4131-03 Valve guide remover & replacer	Used for replacing valve guides	For A10, 20 series use
		Oil filter wrench	Used for removing oil filter	Commercially-available
		09214-87701-000 Balance shaft gear anvil	Used for replacing balance shaft gear	Newly provided

Group	Shape	Part number and nomenclature	Application	Remarks
Engine		09215-87701-000 Balance shaft bearing remover & replacer	Used for replacing balance shaft bearing	For Type AB engine use
		09223-87701-000 Oil seal remover & replacer set	Used for replacing crankshaft front oil seal and camshaft oil seal	For Type AB engine use
		09608-12010-000 Front hub & drive pinion bearing replacer set	Used for press-fitting camshaft oil seal	
		09720-87701-100 Front shock absorber holder	Used for lifting cylinder block during in-vehicle service	Newly provided
		09243-00010-000 Idle adjust wrench	For adjusting carburetor idle adjusting screw	

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