

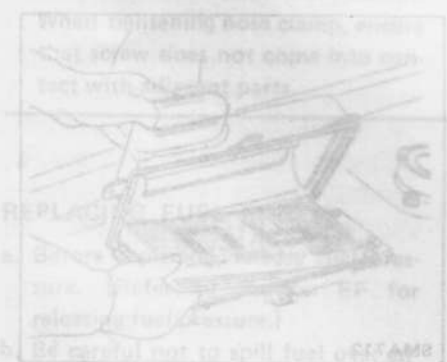
SECTION**ET****ET****CONTENTS**

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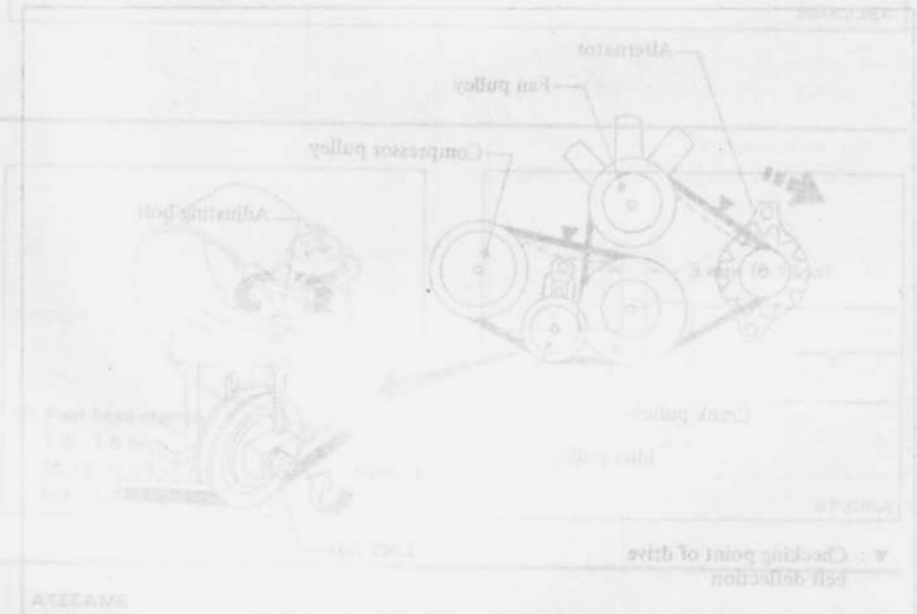
REPLACING AIR CLEANER FILTER

- Do not use any oil or grease on the filter.
- The viscous paper type air cleaner filter does not require any cleaning operation between intervals.
- Replace the air cleaner filter at the specified maintenance interval.
- When replacing, install the air cleaner filter with the "UP" mark facing up.
- Remove and replace the air filter with the "UP" mark facing up.



REPLACING FUEL FILTER

- Remove the fuel filter from the engine compartment. Place a rag to catch any fuel that leaks out.
- Remove the old fuel filter. Do not touch the filter element.
- Install the new fuel filter. Tighten the cap.
- Check for leaks.

**CHANGING ENGINE COOLANT**

WARNING:
Do not attempt to remove the coolant reservoir cap when the engine is hot.

For coolant engine oil change, refer to the "TEMP" label on the "HOT" label.

ENGINE MAINTENANCE

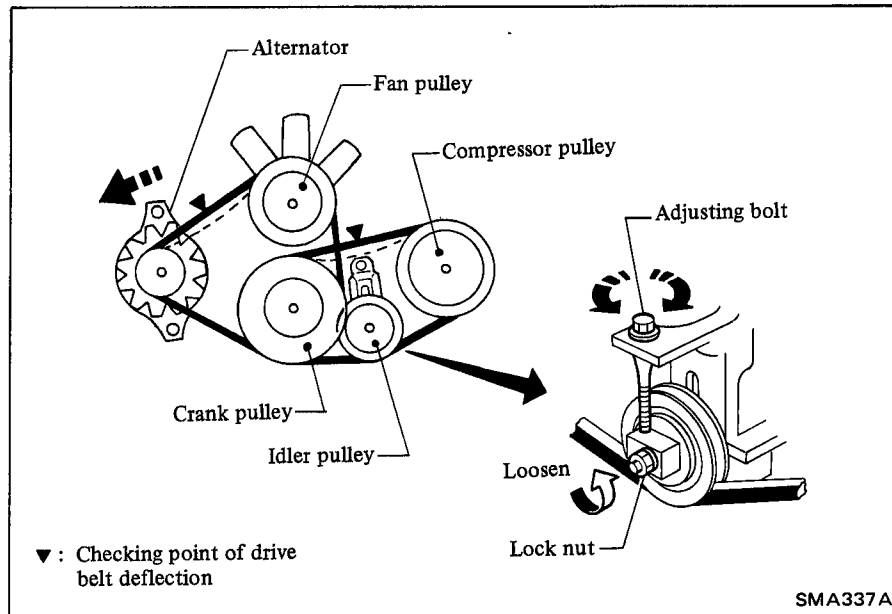
BEFORE ENGINE START CHECKING AND ADJUSTING DRIVE BELTS

1. Visually inspect for cracks or damage.

The belts should not touch the bottom of the pulley groove.

2. Check belt tension by pushing. The belts should deflect by the specified amount.

Drive belt deflection		Adjust deflection of used belt	Set deflection of new belt
Cooling fan	mm (in)	8 - 10 (0.31 - 0.39)	5.5 - 7.5 (0.217 - 0.295)
Air conditioner compressor	mm (in)	7 - 10.5 (0.28 - 0.413)	7 - 8 (0.28 - 0.31)
Applied pushing force	N (kg, lb)	98 (10, 22)	



3. Adjust belt tension as follows:

Fan and alternator belt

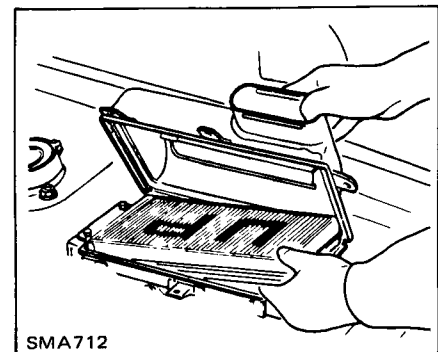
1. Loosen the upper and lower alternator securing bolts until the alternator can be moved slightly.
2. Move the alternator with a prying bar until the belt tension is within the specified range. Then tighten the bolts securely.

Air conditioner compressor belt

1. Loosen the idler pulley lock nut.
2. Adjust the adjusting bolt until the belt tension is within the specified amount.
3. Tighten the idler pulley lock nut securely.

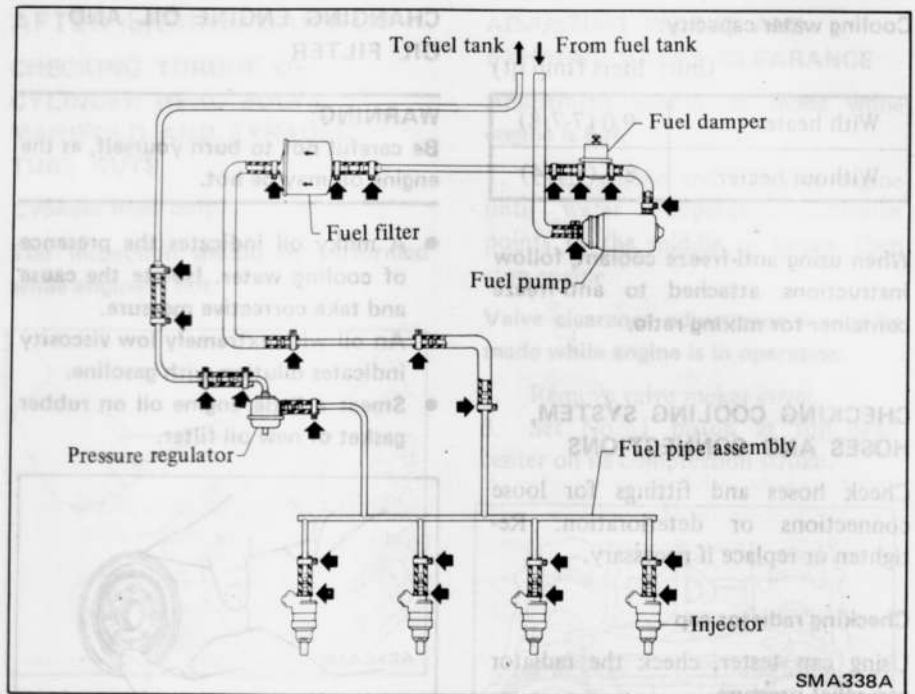
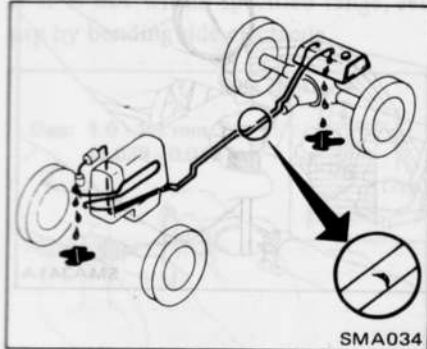
REPLACING AIR CLEANER FILTER

- a. The viscous paper type air cleaner filter does not require any cleaning operation between renewal.
- b. Replace air cleaner filter at the specified maintenance intervals.
- c. When replacing, install air cleaner filter with "UP" mark facing upward.



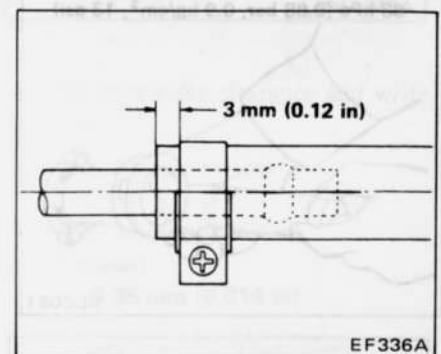
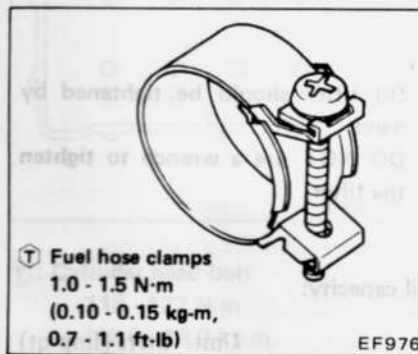
CHECKING FUEL LINES (Hoses, piping, connections, etc.)

1. Check fuel line for leaks, particularly around connection of fuel pipe and fuel hose.
2. Retighten loose connections and replace any damaged or deformed parts.



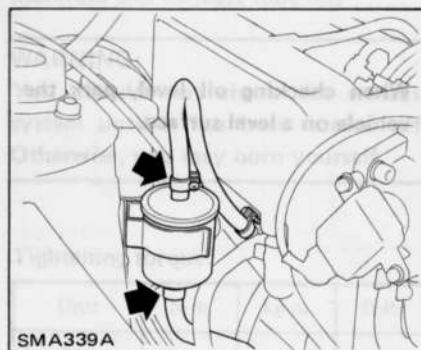
CAUTION:

- a. Do not reuse fuel hose clamp after loosening.
- b. Tighten high pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end or screw position (wider than other portions of clamp) is flush with hose end. Tightening torque specifications are the same for all rubber hose clamps. When tightening hose clamp, ensure that screw does not come into contact with adjacent parts.



REPLACING FUEL FILTER

- a. Before replacing, release fuel pressure. (Refer to Section EF for releasing fuel pressure.)
- b. Be careful not to spill fuel over engine compartment. Place a rag to absorb fuel. And plug opening of fuel hose immediately.



CHANGING ENGINE COOLANT

WARNING:

To avoid the danger of being scalded, never attempt to change the coolant when the engine is hot.

When changing engine coolant, set heater "TEMP" control lever at fully "HOT" position.

Cooling water capacity:

Unit: liters (Imp qt)

With heater	9.0 (7-7/8)
Without heater	8.3 (7-1/4)

When using anti-freeze coolant, follow instructions attached to anti-freeze container for mixing ratio.

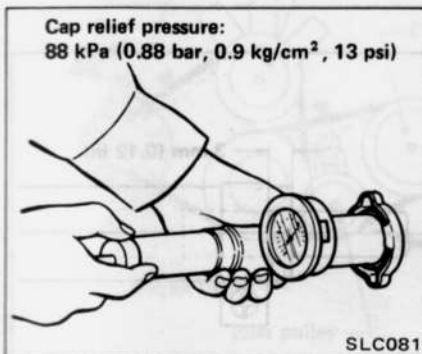
CHECKING COOLING SYSTEM, HOSES AND CONNECTIONS

Check hoses and fittings for loose connections or deterioration. Retighten or replace if necessary.

Checking radiator cap

Using cap tester, check the radiator cap relief pressure.

If the pressure gauge drops rapidly and excessively, replace the radiator cap.



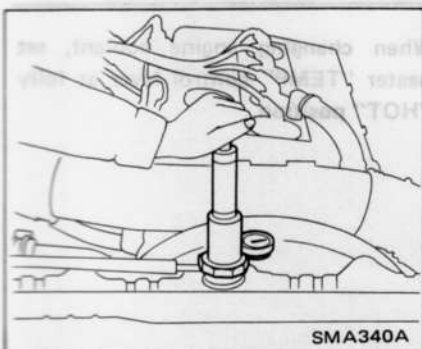
Checking cooling system for leaks

Attach pressure tester and pump tester to the specified pressure.

Check for drop in pressure.

If the pressure drops, check for leaks from hoses, radiator, or water pump.

If no external leaks are found, check heater core, block and head.

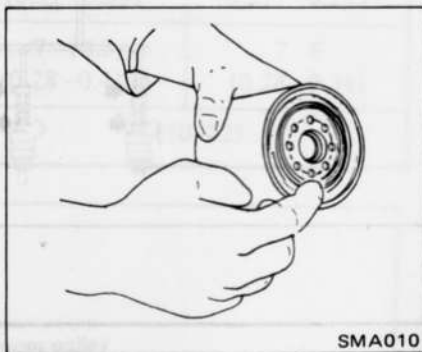


CHANGING ENGINE OIL AND OIL FILTER

WARNING:

Be careful not to burn yourself, as the engine oil may be hot.

- A milky oil indicates the presence of cooling water. Isolate the cause and take corrective measure.
- An oil with extremely low viscosity indicates dilution with gasoline.
- Smear a little engine oil on rubber gasket of new oil filter.



- Oil filter should be tightened by hand.
DO NOT use a wrench to tighten the filter.

Oil capacity:

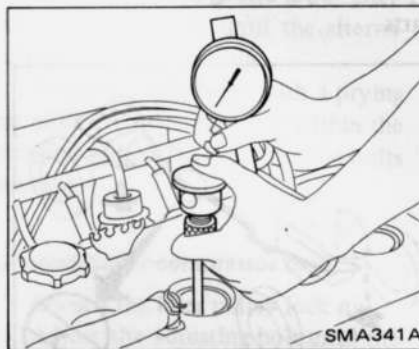
Unit: liters (Imp qt)

With oil filter	4.7 (4-1/8)
Without oil filter	4.2 (3-3/4)

- When checking oil level, park the vehicle on a level surface.

CHECKING ENGINE COMPRESSION PRESSURE

- This inspection should be performed while engine is hot.
- Disconnect all injector connectors before inspection.



Compression pressure:

Unit: kPa (bar, kg/cm², psi)/rpm

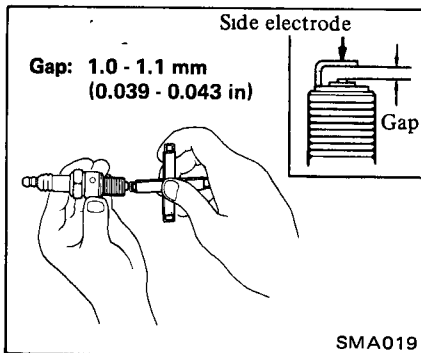
Standard	1,177 (11.77, 12.0, 171)/350
Minimum	981 (9.81, 10.0, 142)/350

If cylinder compression in one or more cylinders is low, pour a small quantity of engine oil into cylinders.

- If adding oil helps the compression pressure, chances are that piston rings are worn or damaged.
- If pressure stays low, valve may be sticking or seating improperly.
- If cylinder compression in any two adjacent cylinders is low, and if adding oil does not help the compression, there is leakage past the gasketed surface.
Oil and water in combustion chambers can result from this problem.

CHECKING AND REPLACING SPARK PLUGS

1. Clean plugs in sand blast cleaner. And inspect insulator for cracks or chips. If they are excessively worn, replace with new spark plugs.
 2. Using feeler gauge, check spark plug gap.
- If it is not within specified range, set gap by bending side electrode.



Spark plug:
Standard type:
 BP6ES-11
Cold type:
 BP7ES-11

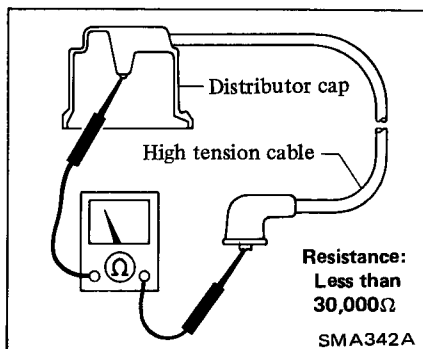
⊕: Spark plug
 20 - 29 N·m
 (2.0 - 3.0 kg-m,
 14 - 22 ft-lb)

All cables are marked to identify their original locations.

CHECKING IGNITION WIRING

1. Visually check wiring for cracks, and damaged and burned terminals.
2. Using an ohmmeter, measure the resistance between cable terminal on the spark plug side and corresponding electrode inside cap.

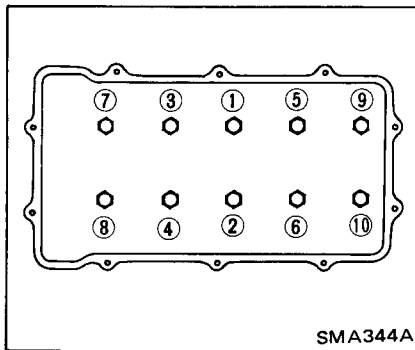
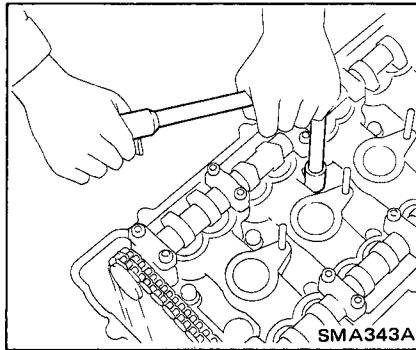
Shake the wire while measuring resistance to check for intermittent brakes.



AFTER ENGINE WARM-UP CHECKING TORQUE OF CYLINDER HEAD BOLTS, MANIFOLD AND EXHAUST TUBE NUTS

Cylinder head bolt

The inspection should be performed while engine is hot.



⊕: Cylinder head bolt
 118 - 127 N·m
 (12.0 - 13.0 kg-m,
 87 - 94 ft-lb)

Manifold and exhaust tube nut

WARNING:

You should not check the exhaust system until it has been cooled off. Otherwise, you may burn yourself.

Tightening torque:

Unit	N·m	kg-m	ft-lb
Intake manifold	31 - 42	3.2 - 4.3	23 - 31
Exhaust manifold	16 - 21	1.6 - 2.1	12 - 15
Exhaust tube	26 - 36	2.7 - 3.7	20 - 27

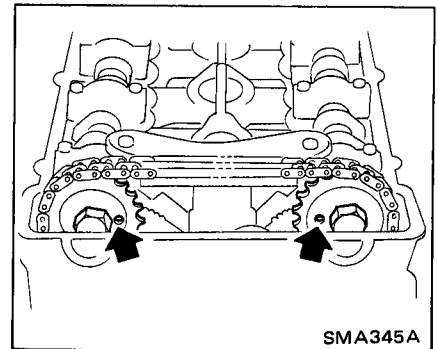
ADJUSTING INTAKE AND EXHAUST VALVE CLEARANCE

Adjustment should be made while engine is hot.

1. Start engine and warm up engine until water temperature indicator points to the middle of gauge, then stop engine.

Valve clearance adjustment cannot be made while engine is in operation.

2. Remove valve rocker cover.
3. Set No. 1 piston at top dead center on its compression stroke.



4. Measure valve clearance and write it down.

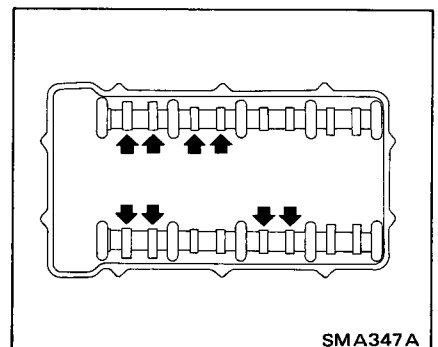
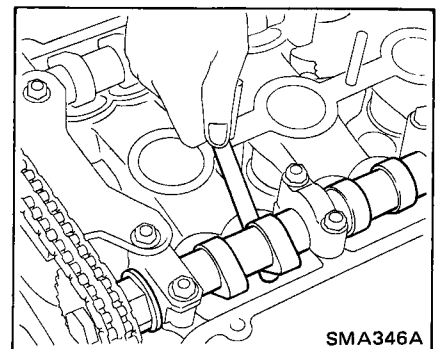
Valve clearance (Hot)

Intake

0.30 mm (0.012 in)

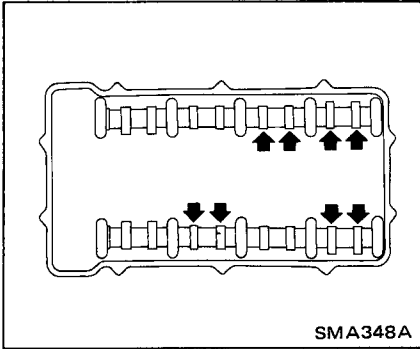
Exhaust

0.35 mm (0.014 in)

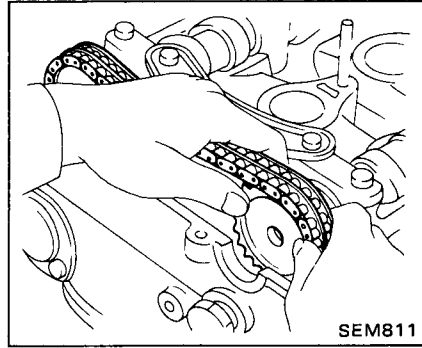


ENGINE MAINTENANCE

5. Set No. 4 piston at top dead center on its compression stroke.
6. Measure valve clearance and write it down.

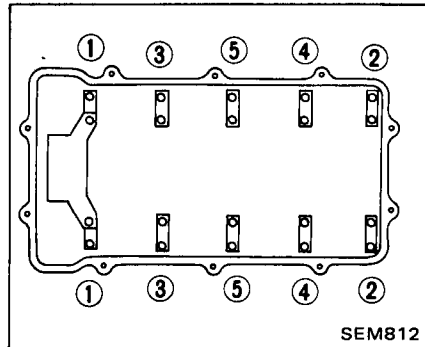


- (5) Remove camshaft sprockets.



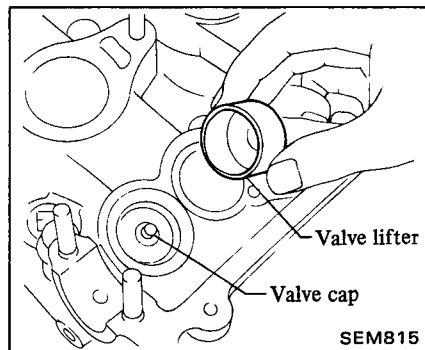
Support timing chain by a proper wire to ensure it does not drop.

- (6) Remove camshaft brackets and chain guide A in the sequence below.



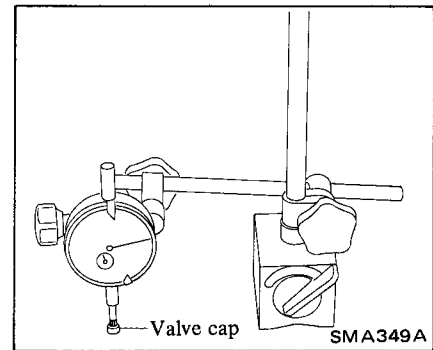
Keep removed brackets in order.

- (7) Remove camshafts.
- (8) Remove valve lifter and cap.



- Valve lifter can be removed easily by using magnet or suction rubber.
- Keep valve lifter and cap in order.

- (9) Measure thickness of removed valve cap using surface plate and dial gauge, and write it down.



- (10) Calculate optimum thickness of valve cap.

Intake:

$$t = t_I + T_I - 0.30 \text{ (mm)}$$

Exhaust:

$$t = t_E + T_E - 0.35 \text{ (mm)}$$

t_I, t_E : Measured valve cap thickness (mm)

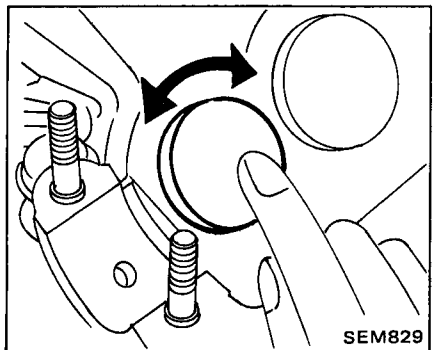
T_I, T_E : Measured valve clearance (mm)

- (11) Pick out proper valve cap from the list of valve cap thicknesses in S.D.S.

Before installation, it is necessary to check thickness of new valve cap.

- (12) Install valve cap and valve lifter.

- a. Apply engine oil on valve cap and outer wall of valve lifter.
- b. Pay particular attention not to damage valve lifter guide hole.
- c. Check valve lifter for smooth rotation.



- (13) Install camshafts and tighten camshaft bracket nuts with chain guide A in the reverse order of removal in two or three stages.

Ⓙ: Camshaft bracket nut

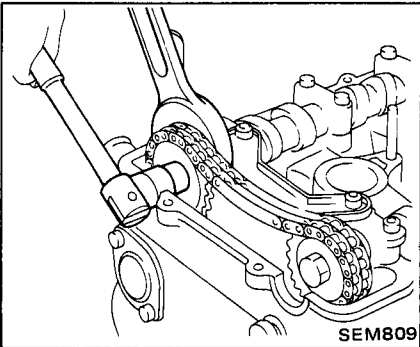
14 - 18 N·m

(1.4 - 1.8 kg-m,

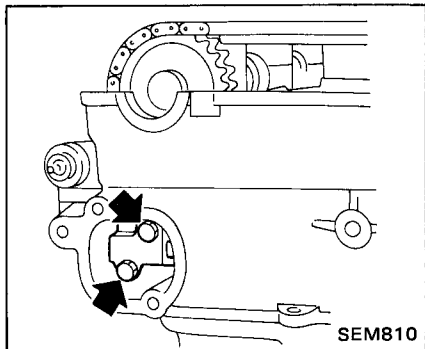
10 - 13 ft-lb)

7. If out of specification, adjust valve clearance.

- (1) Reset No. 1 piston at top dead center on its compression stroke.
- (2) Scribe marks on timing chain and camshaft sprockets with paint.
- (3) Loosen camshaft sprocket bolts.

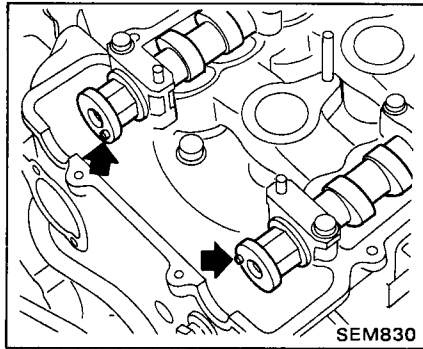


- (4) Remove chain tensioner cover and chain tensioner A.



Be careful not to drop chain tensioner sleeve and spring.

- a. Install camshafts so that No. 1 cams are at top dead center.



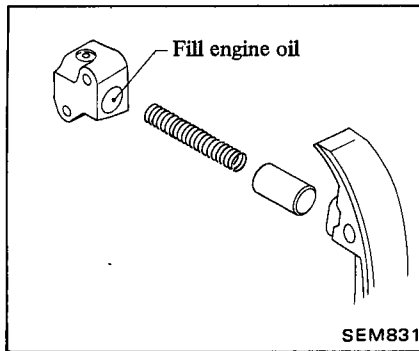
- b. Apply sealant on cam, camshaft journal, camshaft bearing and valve lifter upper surface.

(14) Set timing chain on camshaft sprockets by aligning each mark scribed before removal. Then, install camshaft sprockets to camshafts.

- Ⓣ: Camshaft sprocket bolt
127 - 177 N·m
(13.0 - 18.0 kg-m,
94 - 130 ft-lb)

- (15) Install chain tensioner A.

- Ⓣ: Chain tensioner A bolt
6.3 - 8.3 N·m
(0.64 - 0.85 kg-m,
4.6 - 6.1 ft-lb)
Before installation, fill engine oil
in chain tensioner A.



- (16) Install chain tensioner cover.
(17) Install rubber plug with sealant.
(18) Install valve rocker cover.

- Ⓣ: Valve rocker cover bolt and nut
9.1 - 11.8 N·m
(0.93 - 1.2 kg-m,
6.7 - 8.7 ft-lb)

- a. Rocker cover bolts should be tightened in criss-cross fashion.
b. Always use new rocker cover gasket.

(19) Start engine and warm it up until water temperature indicator points to the middle of gauge, then stop engine.

(20) Remove valve rocker cover and recheck valve clearance.

CHECKING AND ADJUSTING IDLE RPM, IGNITION TIMING AND MIXTURE RATIO

Preparation

1. Make sure that the following parts air in good order.

- Battery
- Ignition system
- EFI harness connectors
- Vacuum hoses
- Air intake system
- Oil filler cap, oil level gauge etc.

2. Connect engine tachometer and timing light in their proper positions.

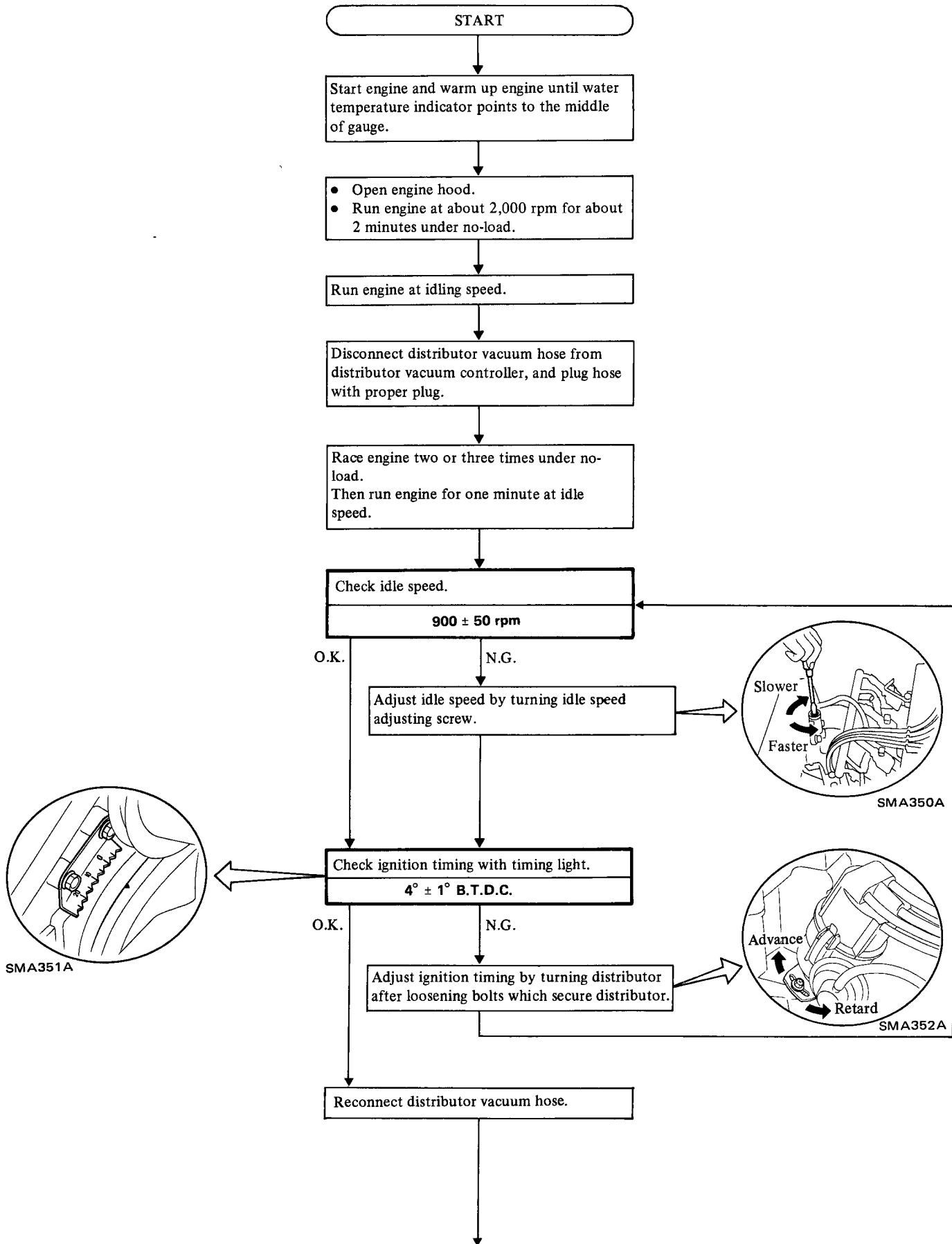
3. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".

WARNING:

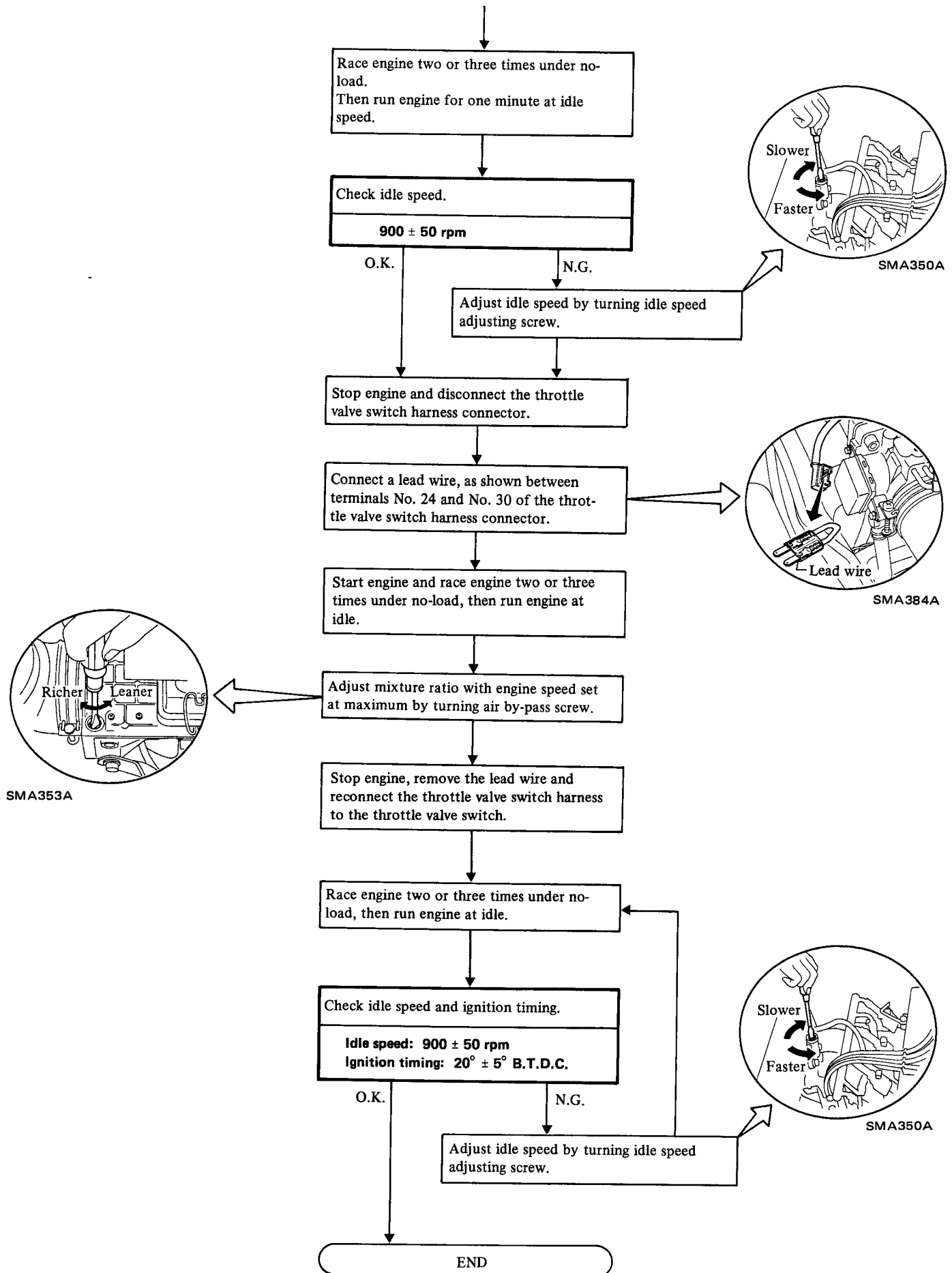
- a. When inspecting idle speed, apply parking brake and block both front and rear wheels with chocks.
b. After the inspection has been made, remove wheel chocks.

ENGINE MAINTENANCE

Checking and adjusting procedure

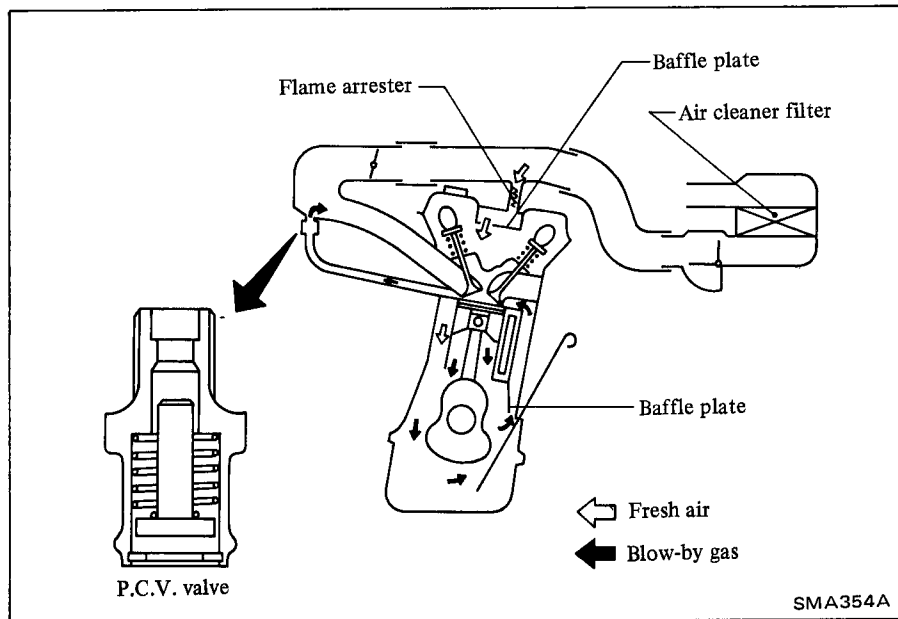


ENGINE MAINTENANCE



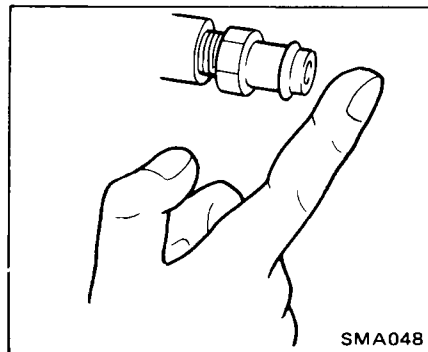
EMISSION CONTROL SYSTEM

CHECKING POSITIVE CRANKCASE VENTILATION (P.C.V.) SYSTEM



Checking P.C.V. valve

With engine running at idle, remove the ventilator hose from P.C.V. valve. If the valve is working, a hissing noise will be heard as air passes through the valve and a strong vacuum should be felt immediately when a finger is placed over valve inlet.

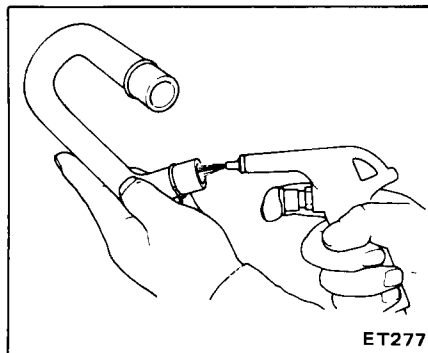


Checking ventilation hoses

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air.

If any hose cannot be free of obstructions, replace.

Ensure that flame arrester is surely inserted in hose between air pipe and rocker cover.



SERVICE DATA AND SPECIFICATIONS

ENGINE MAINTENANCE

INSPECTION AND ADJUSTMENT

Basic mechanical system

Engine model	FJ20		
Valve clearance (Hot)	mm (in)		
Intake		0.30 (0.012)	
Exhaust		0.35 (0.014)	
Drive belt deflection	mm (in)	Adjust deflection of used belt	Set deflection of new belt
Cooling fan		8 - 10 (0.31 - 0.39)	5.5 - 7.5 (0.217 - 0.295)
Air conditioner compressor		7 - 10.5 (0.28 - 0.413)	7 - 8 (0.28 - 0.31)
Applied pushing force	N (kg, lb)	98 (10, 22)	
Engine oil capacity	liter (Imp qt)		
With oil filter		4.7 (4-1/8)	
Without oil filter		4.2 (3-3/4)	
Water capacity	liter (Imp qt)		
With heater		9.0 (7-7/8)	
Without heater		8.3 (7-1/4)	
Radiator cap relief pressure	kPa (bar, kg/cm ² , psi)	88 (0.88, 0.9, 13)	
Cooling system leakage testing pressure	kPa (bar, kg/cm ² , psi)	147 (1.47, 1.5, 21)	
Compression pressure	kPa (bar, kg/cm ² , psi)/rpm		
Standard		1,177 (11.77, 12.0, 171)/300	
Minimum		981 (9.81, 10.0, 142)/350	

Valve cap

Part number	Thickness mm (in)
13229-A0200	1.25 (0.0492)
13229-A0201	1.30 (0.0512)
13229-A0202	1.35 (0.0531)
13229-A0203	1.40 (0.0551)
13229-A0204	1.45 (0.0571)
13229-A0205	1.50 (0.0591)
13229-A0206	1.55 (0.0610)
13229-A0207	1.60 (0.0630)
13229-A0208	1.65 (0.0650)
13229-A0209	1.70 (0.0669)
13229-A0210	1.75 (0.0689)
13229-A0211	1.80 (0.0709)
13229-A0212	1.85 (0.0728)
13229-A0213	1.90 (0.0748)
13229-A0214	1.95 (0.0768)
13229-A0215	2.00 (0.0787)
13229-A0216	2.05 (0.0807)
13229-A0217	2.10 (0.0827)
13229-A0218	2.15 (0.0846)
13229-A0219	2.20 (0.0866)
13229-A0220	2.25 (0.0886)

Ignition and fuel system

Ignition timing and engine idle speed

Engine model	FJ20	
Ignition timing (degree)	4° ± 1°*	
Idle speed	rpm	900 ± 50
Spark plug		
Type	Standard	BP6ES-11
	Cold	BP7ES-11
Gap	mm (in)	1.0 - 1.1 (0.039 - 0.043)
High tension cable resistance	(Ohm)	Less than 30,000 Ω

* Distributor vacuum hose disconnected and plugged.

SERVICE DATA AND SPECIFICATIONS

TIGHTENING TORQUE

Unit	N·m	kg·m	ft·lb
Cylinder head bolt	118 - 127	12.0 - 13.0	87 - 94
Camshaft bracket nut	14 - 18	1.4 - 1.8	10 - 13
Camshaft sprocket bolt	127 - 177	13.0 - 18.0	94 - 130
Chain tensioner bolt	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Intake manifold nut	31 - 42	3.2 - 4.3	23 - 31
Exhaust manifold nut	16 - 21	1.6 - 2.1	12 - 15
Spark plug	20 - 29	2.0 - 3.0	14 - 22
Oil pan drain plug	35 - 47	3.6 - 4.8	26 - 35