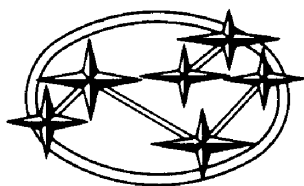


SUBARU

1988

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This chapter describes major inspection and service procedures for the engine mounted on the body. For procedures not found in this chapter, refer to the service procedure section in the applicable chapter.

Ignition Timing

INSPECTION AND ADJUSTMENT

BEFORE CHECKING AND ADJUSTING IGNITION TIMING

- 1) Warm up the engine.
- 2) Make sure that the idle contact of throttle sensor is ON position. (Refer to "Chapter 2-7".)
- 3) Connect the test mode connector.

a. The **CHECK ENGINE** warning light will come on. This does not indicate a problem.

b. Ignition timing must not be adjusted and cannot be checked while the idle switch is off or the test mode connector is disconnected.

CHECKING IGNITION TIMING

- 1) Set gear in neutral position (MT) or "N" or "P" position (AT), and turn off the light.
- 2) To check the ignition timing, connect a timing light to #1 cylinder spark plug cord, adjust the engine idle speed to the specification and illuminate the timing mark with the timing light.

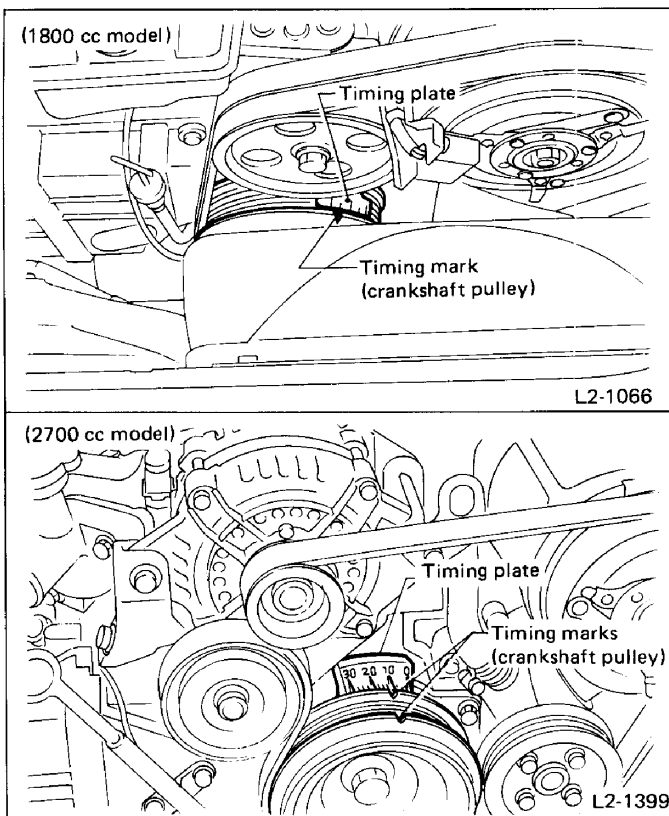


Fig. 1

If the timing is not correct, proceed to the next paragraph for adjustment.

	1800 cc model	2700 cc model
M/T	20°/700	20°/750
A/T	20°/800	20°/750

(BTDC/rpm)

Ignition timing can be set when the test mode connector is connected and the idle switch is turned ON, regardless of engine rpm. Do not check ignition timing while the connector is disconnected and the switch is OFF.

ADJUSTING IGNITION TIMING

- 1) Loosen the 6-mm bolts on the mounting plate of the distributor.
- 2) Turn the distributor housing. The timing is advanced when the distributor housing is turned clockwise and is retarded when turned counterclockwise.
- 3) Tighten the bolts and make sure that the timing is correct.

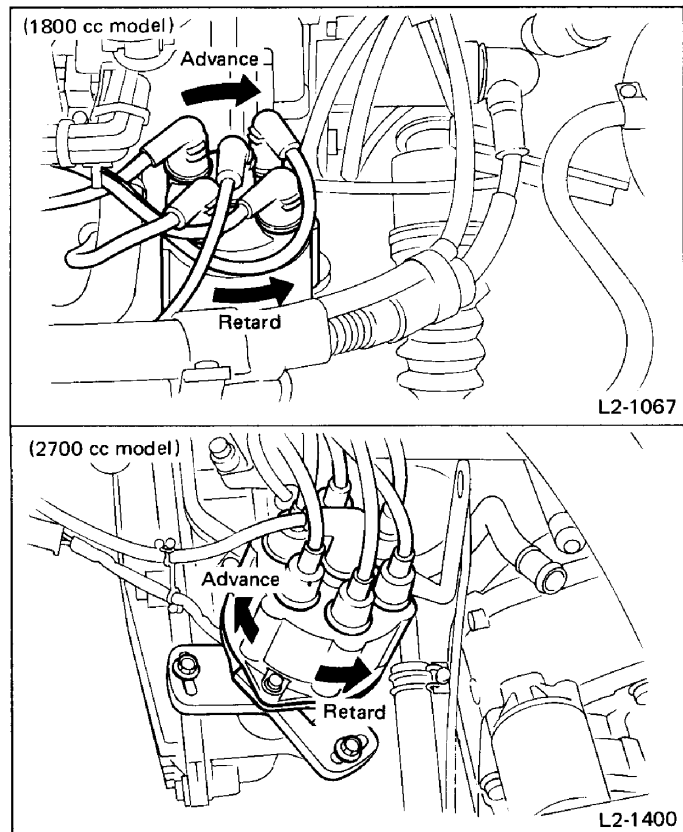


Fig. 2

AFTER CHECKING AND ADJUSTING

Be sure to disconnect the test mode connector.

Engine Compression

MEASUREMENT

- 1) After warming up the engine, turn off the ignition switch.
- 2) Make sure that the battery is fully charged.
- 3) Remove all the spark plugs.
- 4) Disconnect the harness connectors for injectors.
- 5) Fully open the throttle valve.
- 6) Check the starter motor for satisfactory performance and operation.
- 7) Crank the engine by means of the starter motor, and read the maximum value on the gauge when the pointer is steady.

Hold the compression gauge tight against the spark plug hole.

- 8) Perform at least two measurements per cylinder, and make sure that the values are correct.

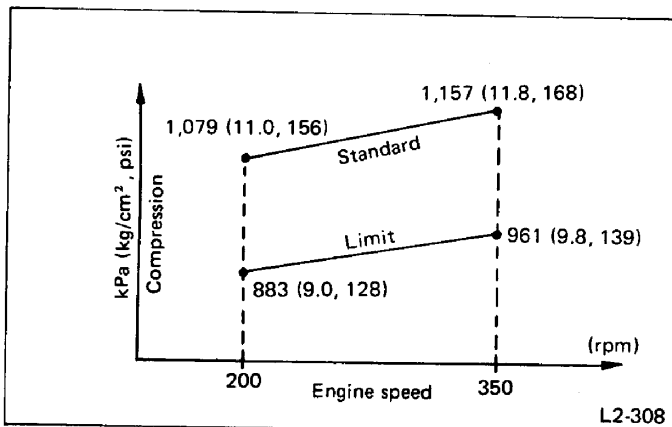


Fig. 3

Difference between cylinders:

196 kPa (2.0 kg/cm², 28 psi) or less

Intake Manifold Vacuum

MEASUREMENT

- 1) Warm up the engine.
- 2) Disconnect the vacuum hose and install the vacuum gauge to the hose fitting on the manifold.
- 3) Keep the engine at the idle speed and read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of the engine can be diagnosed as described in Table below.

Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket or throttle chamber gasket.
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Back pressure too high, or exhaust muffler clogged.
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder.
4. Needle drops slightly and intermittently from normal position.	Leaking valves or irregular valve clearances.
5. Needle drops suddenly and intermittently from normal position.	Sticky valves.
6. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs.
7. Needle vibrates above and below normal position in narrow range.	Incorrect idle adjustment.

Engine Idle Speed

INSPECTION AND ADJUSTMENT

1800 cc model

- a. Make sure that the ignition timing is correctly adjusted prior to this inspection.
- b. Set the gear position at "Neutral" for MT, or "P" or "N" for AT.
- c. Before inspecting the engine idle speed, ensure that:
 - (1) Vacuum hoses, blow-by hoses, rocker cover, oil filler cap, etc. which are connected to the intake system, are tight and secure.
 - (2) The engine has warmed up sufficiently and O₂ sensor has also been warmed up at an engine speed of 2,500 rpm for approximately one minute after engine warm-up.
 - (3) Disconnect the purge hose(s) at the opposite side of canister and then clog it(them).

1) Before inspection, ensure that the auxiliary air valve is completely closed.

2) Adjust the idle speed by using the idle adjusting screw located on the throttle body.

Idle speed (rpm)	MT	700 ± 100
	AT	800 ± 100
CO contents	(%)	0.1, max
HC contents	(ppm)	200, max

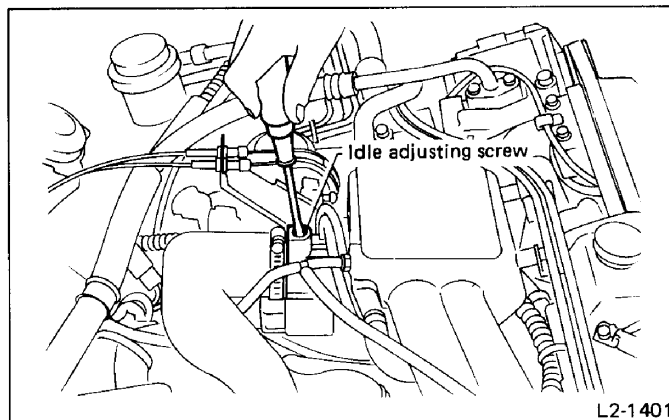


Fig. 4

3) Inspecting the exhaust gas.

(1) After adjusting both ignition timing and idling speed, check both the idle CO and HC contents in the exhaust gas.

The CO content adjusting screw of the air flow meter need not be adjusted as the air-fuel ratio is feedback controlled.

(2) If the CO and HC contents are outside specifications, check and correct the problem using the following chart as a guide.

Troubleshooting

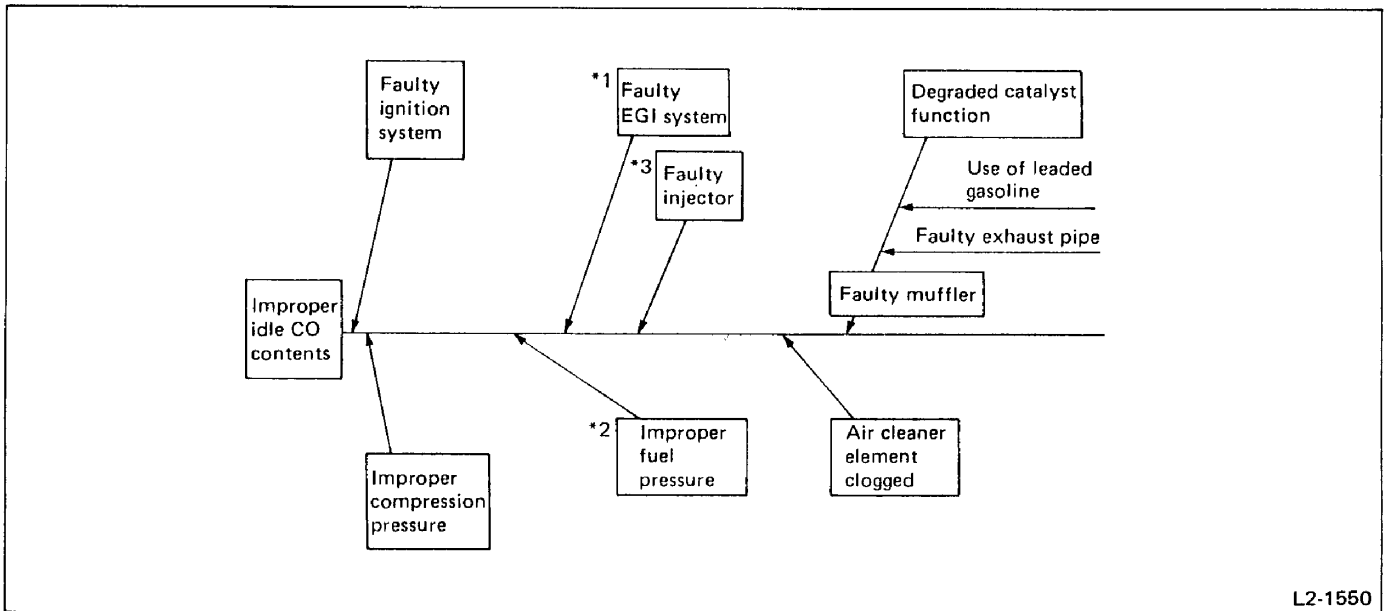


Fig. 5

*1: Check the MPFI system.

Connect a jumper wire and check to see if the CHECK ENGINE warning light flickers with the engine at idle. If it does, the MPFI system is functioning properly.

*2: Check the fuel pressure.

*3: Check fuel injectors.

a: Remove the fuel injector and direct air at a pressure of approximately 196 kPa (2 kg/cm², 28 psi) to see if air leaks at the nozzle tip. If air leaks, replace the injector.

b: The injector is faulty.

2700 cc model

Refer to Chapter 2-7 "Throttle Chamber Assembly".

Oxygen (O₂) Sensor

REPLACEMENT

Oxygen (O₂) sensor is one of the important emission control parts. Therefore, replace it as follows only when it is damaged by external force, or if it seems to be out of order according to troubleshooting etc.

REMOVAL

- 1) Disconnect oxygen (O₂) sensor cord.
- 2) Apply SUBARU CRC (004301003) or its equivalent to threaded portion of oxygen (O₂) sensor, and leave it for one minute or more.
- 3) Loosen oxygen (O₂) sensor by turning it 10 to 40 degrees with SOCKET (499990110).

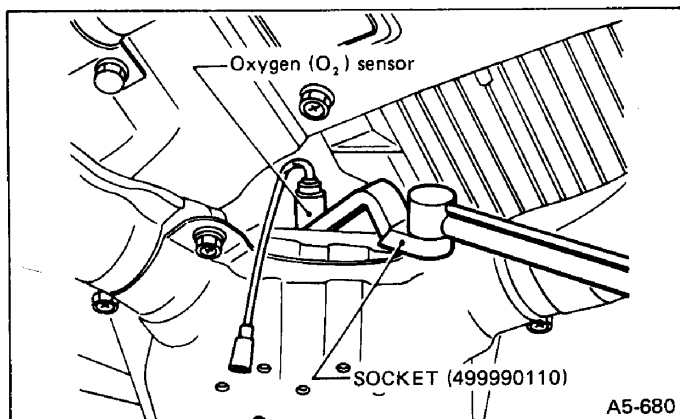


Fig. 6

- 4) Apply SUBARU CRC (004301003) to threaded portion of oxygen (O₂) sensor again, and leave it for one minute or more.
- 5) Remove oxygen (O₂) sensor by using socket and wrench.

When removing, do not force oxygen (O₂) sensor especially when exhaust pipe is cold; otherwise it will damage the exhaust pipe.

INSTALLATION

- 1) Apply anti-seize compound ("SS-30" made by JET-LUBE Inc. in U.S.A. or its equivalent) only to threaded portion of oxygen (O₂) sensor to make the next removal easier.

Never apply anti-seize compound to protector of oxygen (O₂) sensor.

- 2) By using socket and torque wrench, install oxygen (O₂) sensor onto front exhaust pipe by tightening it to the specified torque.

Torque [oxygen (O₂) sensor]:

25 – 34 N·m (2.5 – 3.5 kg·m, 18 – 25 ft·lb)

- 3) Securely connect oxygen (O₂) sensor cord.

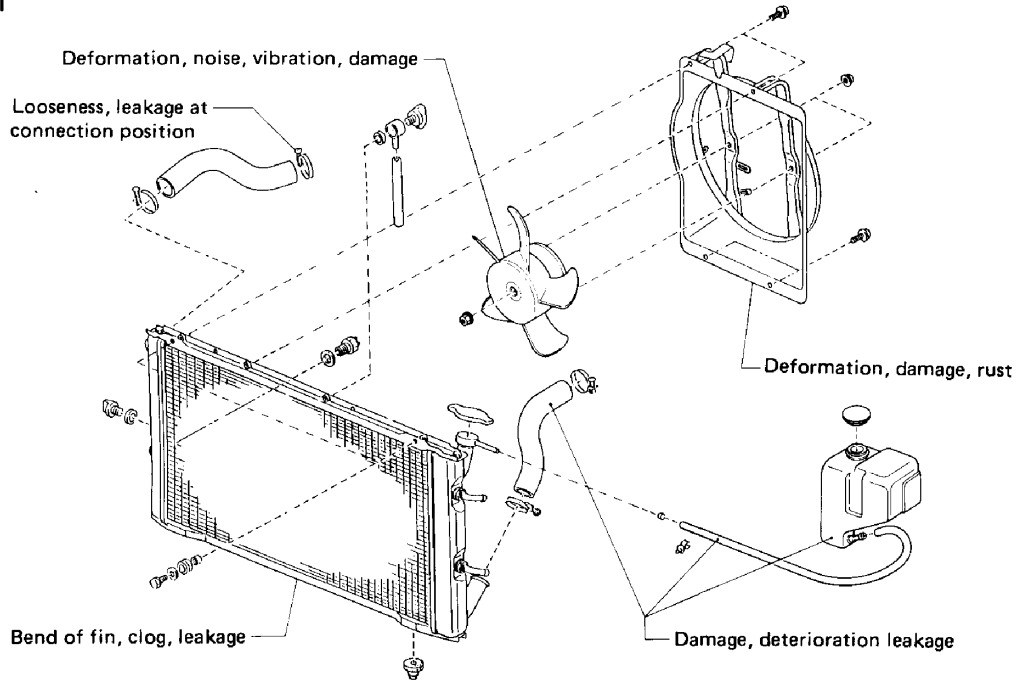
Cooling System

INSPECTION

SYSTEM COMPONENTS

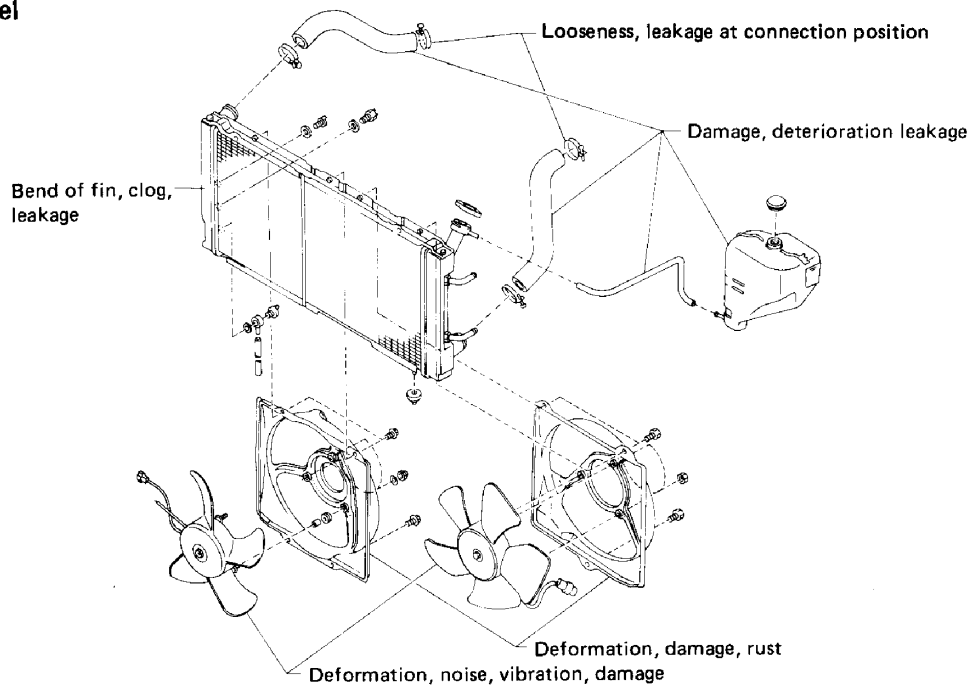
Repair or replace parts which are found faulty.

1800 cc model



L2-1069

2700 cc model



L2-1403

Fig. 7

RADIATOR CAP OPENING PRESSURE

- 1) Attach radiator cap to tester.
- 2) Increase pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for five to six seconds.

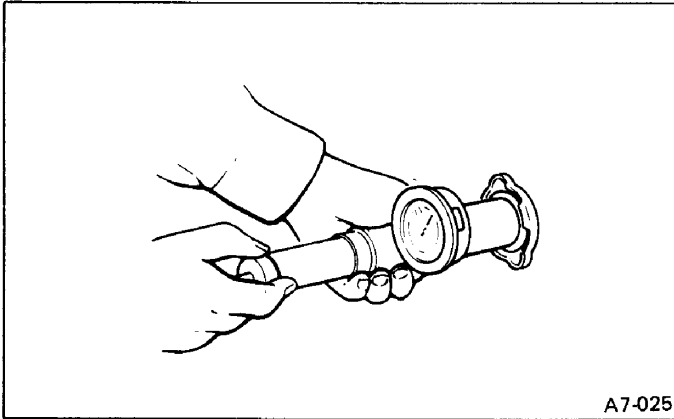


Fig. 8

Standard pressure:

78 – 98 kPa (0.8 – 1.0 kg/cm², 11 – 14 psi)

Service limit pressure:

69 kPa (0.7 kg/cm², 10 psi)

Be sure to remove foreign matter and rust from the cap in advance; otherwise, results of pressure test will be incorrect.

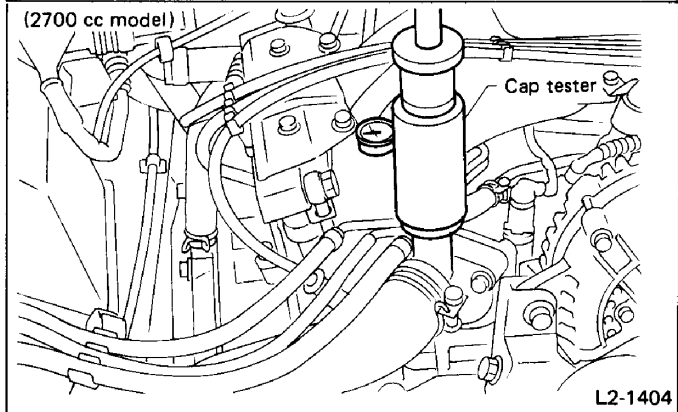
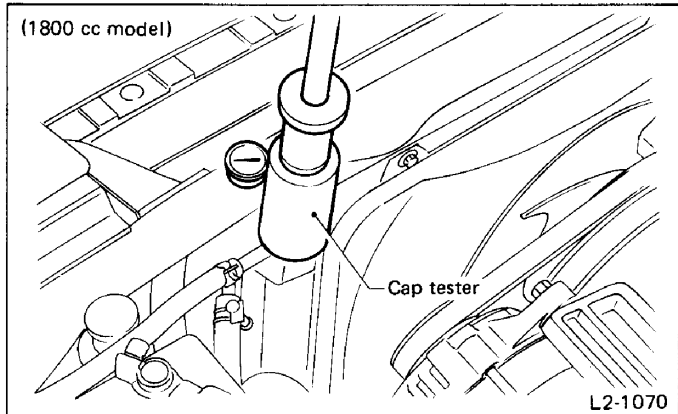


Fig. 9

- a. Engine should be off.
- b. Wipe water from check points in advance.
- c. Be careful to prevent cooling water from spurting out when removing tester.
- d. Be careful also not to deform filler neck of radiator when installing or removing tester.

WATER LEAKAGE FROM RADIATOR

- 1)
 - Remove radiator cap, top off radiator, and attach tester to radiator in place of cap. (1800 cc model)
 - Remove filler cap, and attach tester to thermostat cover in place of cap. (2700 cc model)
- 2) Apply a pressure of 157 kPa (1.6 kg/cm², 23 psi) to radiator to check if:
 - (1) Water leaks at/around radiator.
 - (2) Water leaks at/around hoses or connections.

COOLANT

- 1) Check coolant level.

When the engine is cool, check and add coolant on reserve tank side.

Be careful not to confuse the reserve tank cap which is green and the window washer cap which is blue.

- (1) If coolant level is close to the "LOW" mark, add genuine SUBARU Coolant up to the "FULL" mark.
- (2) If reserve tank is empty, check coolant level in radiator and first add coolant up to filler necks in radiator. Then, perform step (1).

On 2700 cc model, coolant filler is located on top of engine.

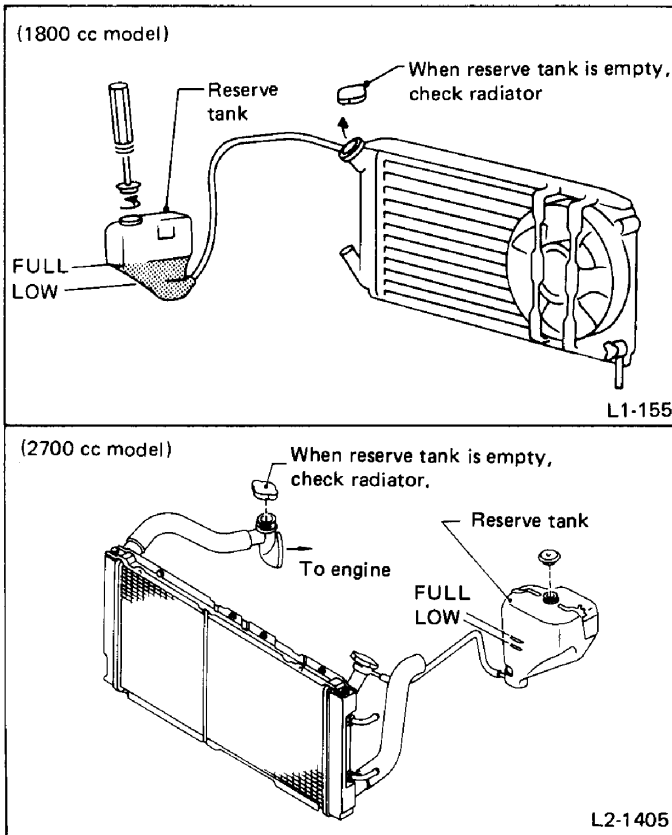


Fig. 10

- 2) Replacement work.
Refer to 1-5 "Periodic Maintenance Services".

High Tension Cords

INSPECTION

Check for:

- 1) Damage to cords, deformation, burning or rust formation of terminals.
- 2) Resistance values of cords.

Unit: [kΩ]

	1800 cc model	2700 cc model
Distributor cord	2.43 – 5.67	2.43 – 5.67
#1 cord	9.87 – 23.03	10.86 – 25.33
#2 cord	2.83 – 6.61	5.67 – 13.24
#3 cord	11.21 – 26.16	11.24 – 26.23
#4 cord	2.27 – 5.29	4.52 – 10.55
#5 cord	—	11.43 – 26.68
#6 cord	—	2.60 – 6.07

Cylinder Head Bolts

(1800 cc engine only)

RETORQUING

After completing engine ASSY and mounting engine on car, be sure to retighten cylinder head bolts.

- 1) Warm up engine.
- 2) After engine has cooled down, remove right and left valve rocker covers.
- 3) Loosen intake manifold mounting bolts next to cylinders No. 1 and No. 3 by 60°. Do not loosen the manifold mounting bolts next to cylinders No. 2 and No. 4.

Do not loosen the mounting bolts more than 90°, or water may leak.

- 4) Loosen bolt at position ① in Figure, and apply oil to the thread. Repeat "loosen and tighten" operation four to five times within the 60° range for a better fit, then tighten bolt to the specified torque.

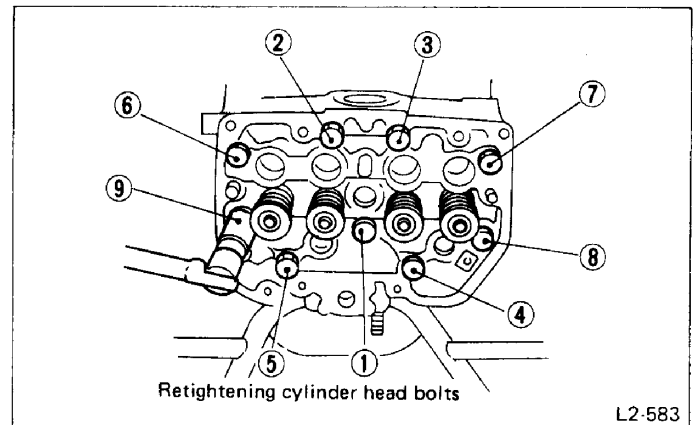


Fig. 11

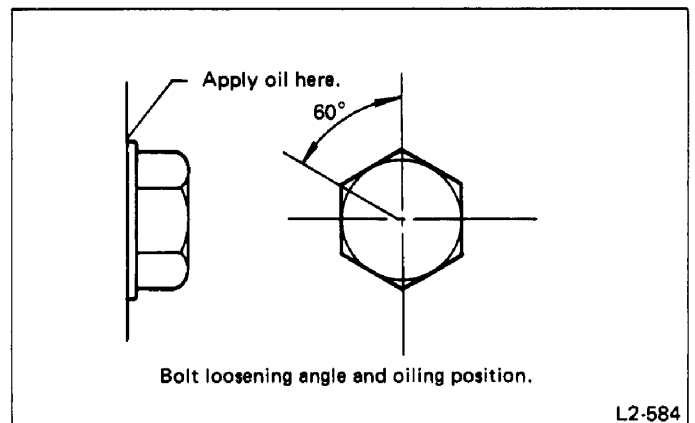


Fig. 12

Specified torque:**64 N·m (6.5 kg-m, 47 ft-lb)**

Tool Part No.	Tool Part Name
499987200	Socket wrench (17)

5) Similarly, retighten each bolt in sequence from ② to ⑨ as shown in Figure.

Finally, retighten bolt ① to the specified torque without loosening.

6) After retightening right and left cylinder head bolts, tighten mounting bolts of intake manifolds.

6) Lower the vehicle.

7) Remove the radiator fan shroud.

(1) Disconnect the fan motor connector.

(2) Remove the bolts from the upper side of the shroud.

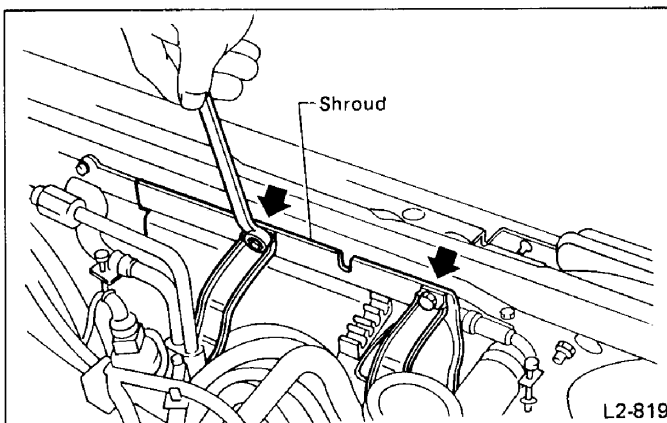


Fig. 14

Oil Pump Assembly

1800 cc model

REMOVAL

- 1) Open the front hood.
- 2) Disconnect the ground cable from the battery.
- 3) Position the lift arm and raise the vehicle with a jack.
- 4) Remove the undercovers.
- 5) Remove the bolts from the lower side of the radiator fan shroud.

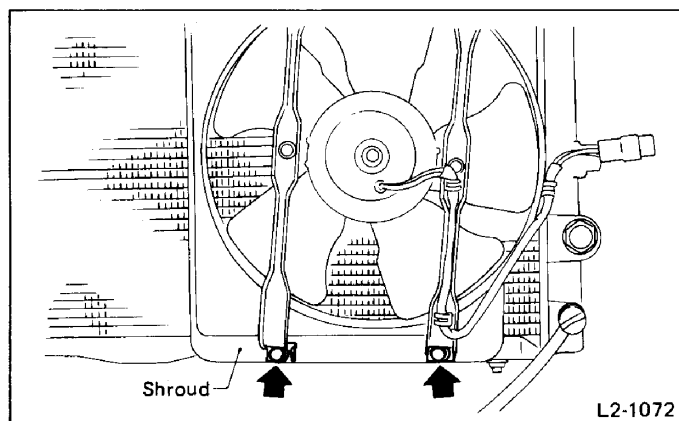


Fig. 13

8) Remove the alternator and V-belt.

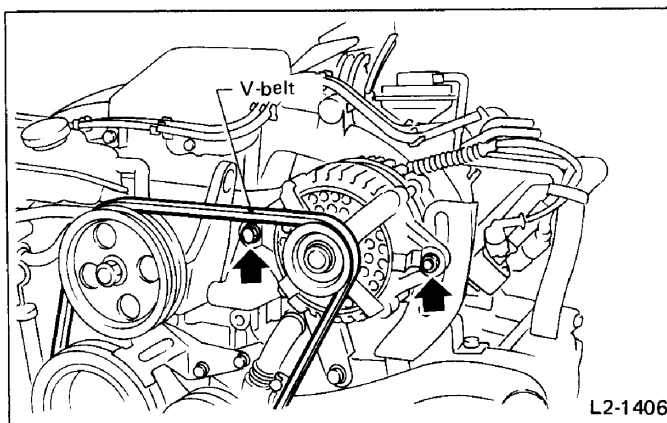


Fig. 15

- 9) Remove the oil level gauge guide and disconnect the oil pressure gauge harness.
- 10) Remove the water pump pulley.
- 11) Remove air intake boot.
- 12) Attach the STOPPER [498277000 (MT)/498497000 (AT)] to flywheel or torque converter to prevent it from turning. Remove the crank pulley.

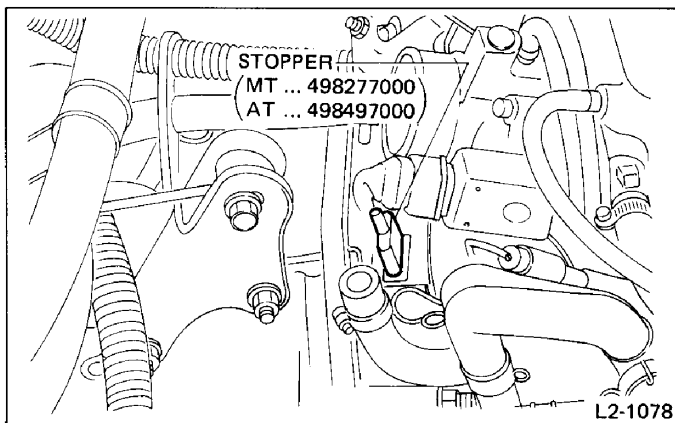


Fig. 16

- 13) Remove the LH, RH and FR belt covers, in that order.
- 14) Remove the right timing belt.

Draw an arrow on the left and right belts with a piece of chalk to indicate the direction of advance.

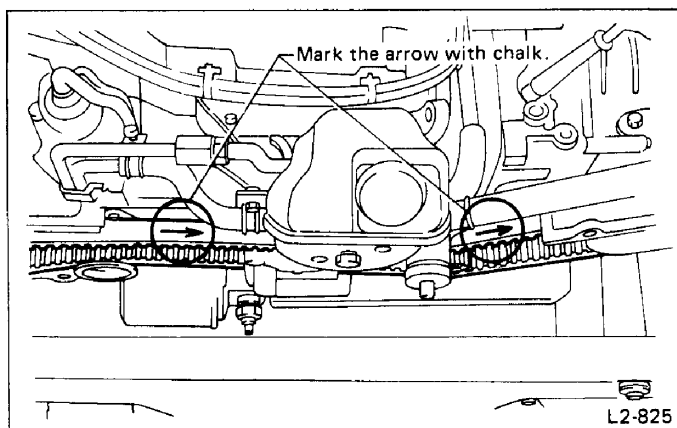


Fig. 17

- (1) Loosen the two bolts which secure the tensioner. Move the tensioner in the direction which loosens it and temporarily tighten the bolts.

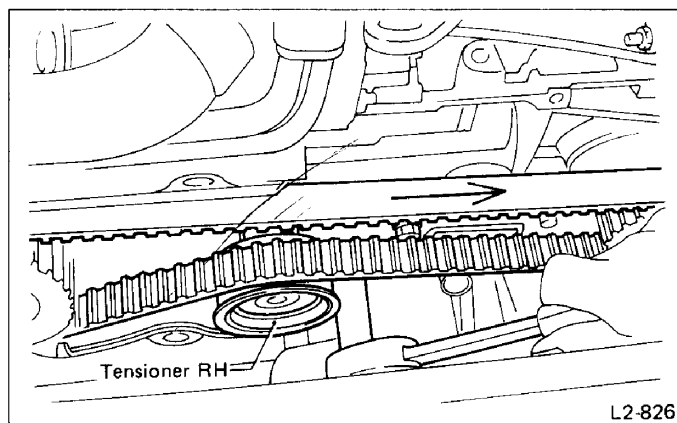


Fig. 18

- (2) Remove the right timing belt.
- 15) Remove the crankshaft sprocket.
- 16) Remove the left timing belt.
- (1) Loosen the two bolts which secure the tensioner. Move the tensioner in the direction which loosens it and temporarily tighten the bolts.

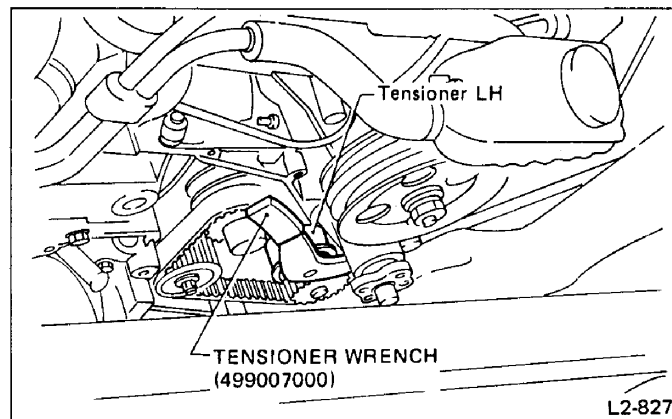
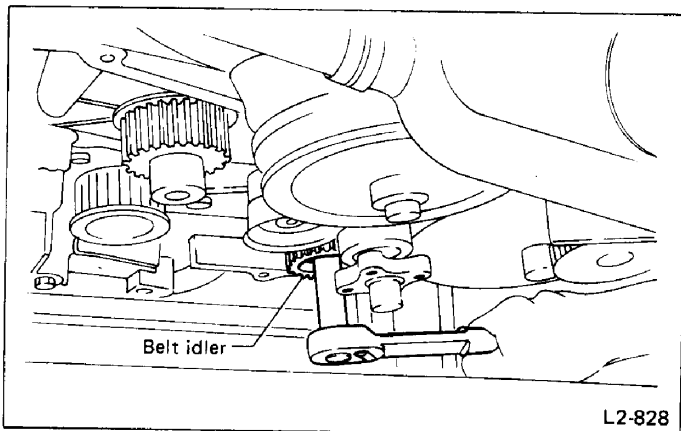


Fig. 19

Be careful not to scratch the crankshaft with a tensioner wrench.

- (2) Remove the left timing belt.

- 17) Remove the belt idler.



L2-828

Fig. 20

- 18) Using the CAMSHAFT SPROCKET WRENCH (499207000), remove the left camshaft sprocket.
 19) Remove the belt cover No. 2 (LH) and the rear belt cover.
 20) Remove the oil pump ASSY.

REINSTALLATION

- 1) Install the oil pump ASSY.

Replace the gasket with a new one.

- 2) Install the belt cover (RR) and the belt cover No. 2 (LH).
 3) Install the camshaft sprocket on the right and left camshafts. Lock the camshaft using the CAMSHAFT SPROCKET WRENCH (499207000).
 4) Install the timing belt. (Refer to Chapter "2-3.")

Timing belts should be replaced when engine is cold.

- 5) Install the belt cover (FR) on the cylinder block. Install the belt cover seals (FR and RR) and the belt cover plug on the belt cover (FR) in advance.

Before installing the belt cover (FR), check that there are no bolts, washers, etc. left in the cover.

- 6) Install the crank pulley. Lock the crank pulley using the STOPPER [49827700 (MT)/498497000 (AT)].

Tightening torque:

93 – 103 N·m (9.5 – 10.5 kg·m, 69 – 76 ft-lb)

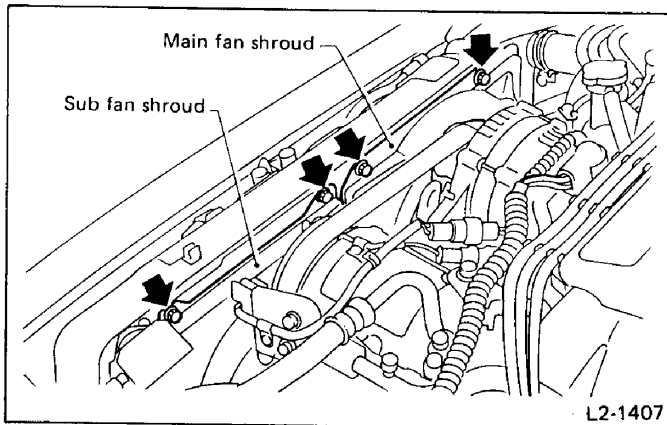
Apply a coat of engine oil to the crank pulley bolts before installation.

- 7) Install the left and right belt covers.
 8) Install the oil level gauge guide.
 9) Install the water pump pulley.
 10) Install the alternator and V-belt, then adjust belt tension.
 11) Install the radiator fan shroud and connect the connector.
 12) Fasten the canister hose, etc. to the clamps.
 13) Install the timing hole plug.
 14) Lower the vehicle.
 15) Connect the ground cable to the battery.
 16) Start the engine.
 17) Add engine oil to the oil pan.
 18) Close the front hood and release the lift arm.

2700 cc model

REMOVAL

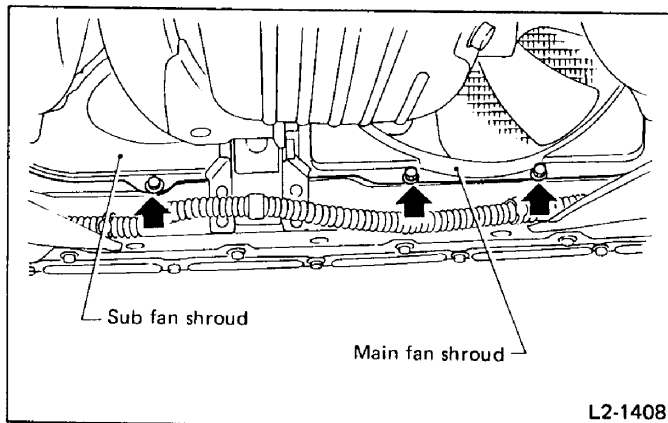
- 1) Open the front hood.
 2) Disconnect the ground cable from the battery.
 3) Position the lift arm and raise the vehicle with a jack.
 4) Remove the bolts from the lower side of the radiator and condenser fan shroud.



L2-1407

Fig. 21

- 5) Lower the vehicle.
 6) Disconnect the radiator and condenser fan motor connector.
 7) Remove the bolts from the upper side of the shroud.



L2-1408

Fig. 22

- 8) Remove the radiator fan shroud ASSY. While moving condenser fan shroud ASSY in the direction in which radiator fan shroud ASSY was installed, lift it out.
- 9) Remove the pulser ASSY (A/C).
- 10) Loosen the tension pulley lock nut to release V-belt tension. When removing V-belt, check that adjuster bolt is turned counterclockwise fully in the direction which loosens the belt.

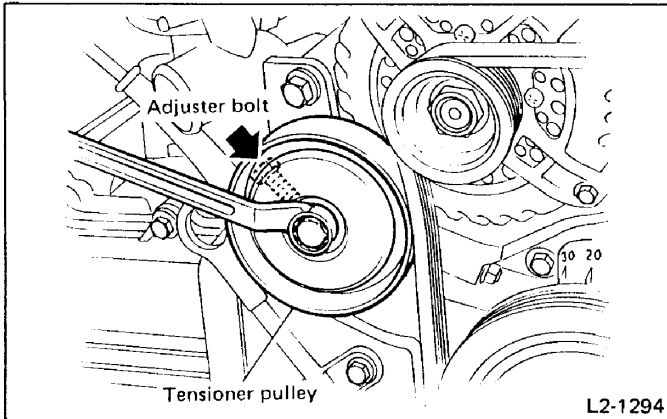


Fig. 23

- 11) Remove the alternator, alternator bracket and tension pulley (RH).
- 12) Remove the water pump pulley.
- 13) Attach the STOPPER [49827700 (MT)/498497000 (AT)] to flywheel or torque converter to prevent it from turning. Remove the crank pulley.
- 14) Remove the LH, RH and CTR belt covers in that order.
- 15) Remove the right timing belt.

Draw an arrow on the left and right belts with a piece of chalk to indicate the direction of advance.

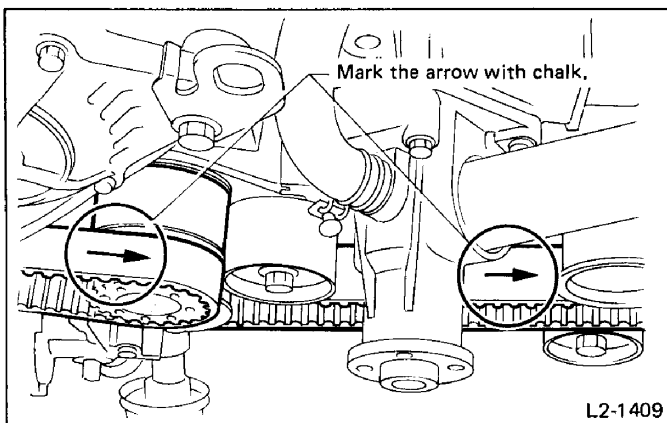


Fig. 24

- (1) Loosen the two bolts which secure the tensioner. Move the tensioner in the direction which loosens it and temporarily tighten the bolts.

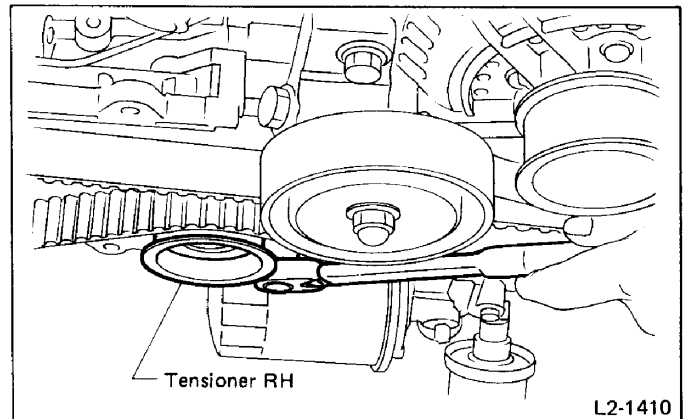


Fig. 25

- (2) Remove the right timing belt.
- 16) Remove the crankshaft sprocket.
- 17) Remove the left timing belt.
- (1) Remove idler pulley.
- (2) Remove plug rubber and then remove plug screw from belt tension adjuster lower side.

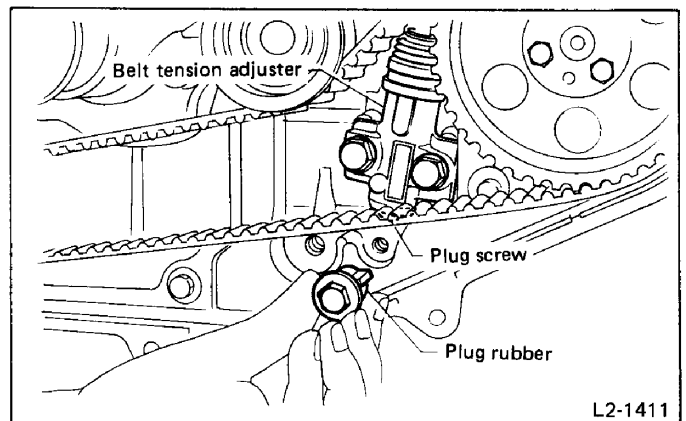


Fig. 26

- (3) Insert a flat-blade screwdriver into hole on bottom of belt tension adjuster. Turn screw clockwise to compress rubber boot. Install BELT ADJUSTER STOPPER (13082AA000), then remove belt tension adjuster.

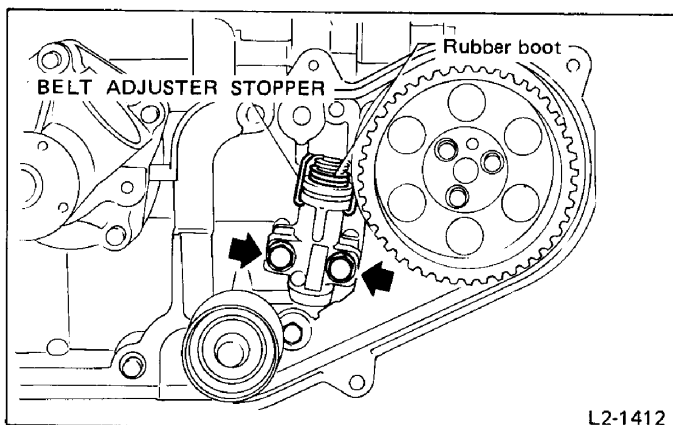


Fig. 27

L2-1412

- (4) Remove the left timing belt.
- 18) Remove the oil pump ASSY.

REINSTALLATION

- 1) Install the oil pump ASSY.

Replace the gasket with a new one.

- 2) Install the timing belt. (Refer to Chapter "2-3.")

Timing belts should be replaced when engine is cold.

- 3) Install the belt cover on the cylinder block.
 - 4) Install the crank pulley.
- Lock the crank pulley using the STOPPER [49827700 (MT)/498497000 (AT)].

Tightening torque:

89 – 107 N·m (9.1 – 10.9 kg·m, 66 – 79 ft·lb)

Apply a coat of engine oil to the crank pulley bolts before installation.

- 5) Install the water pump pulley.
- 6) Install the alternator bracket, tension pulley and alternator.
- 7) Install V-belt, then adjust belt tension. (Refer to Chapter "2-3.")
- 8) Install the condenser and radiator fan shroud and connect the fan motor connectors.
- 9) Install the pulser ASSY (A/C).
- 10) Connect the ground cable to the battery.
- 11) Add engine oil to the oil pan.
- 12) Start the engine.
- 13) Close the front hood and release the lift arm.

Water Pump Assembly

1800 cc model

REMOVAL

- 1) Open the front hood.
- 2) Disconnect the ground cable from the battery.
- 3) Drain the coolant completely.
- 4) Remove the alternator and V-belt.
- 5) Disconnect the radiator outlet hose.

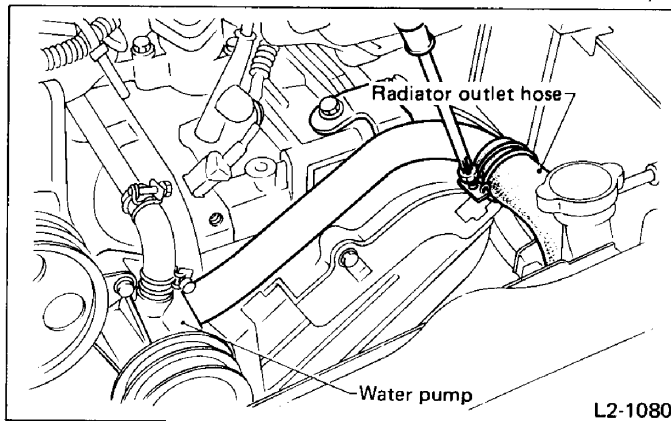


Fig. 28

L2-1080

- 6) Disconnect the water by-pass hose from the pipe.

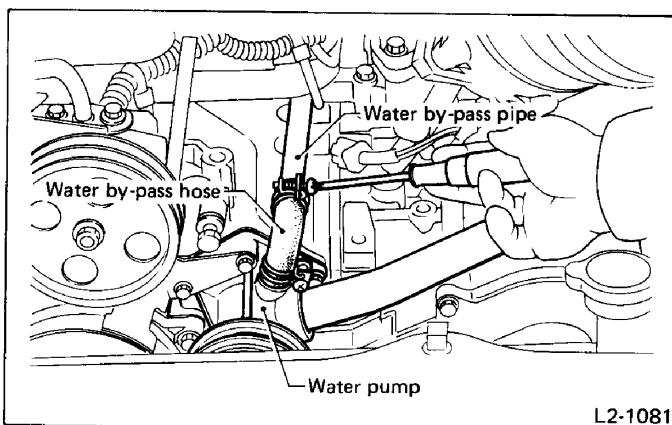


Fig. 29

L2-1081

- 7) Unfasten clips which secure the oil pressure switch harness.
- 8) Remove the oil level gauge guide.
- 9) Remove the water pump pulley.
- 10) Using the stopper, remove the crank pulley.

- 11) Disconnect the water pipe.

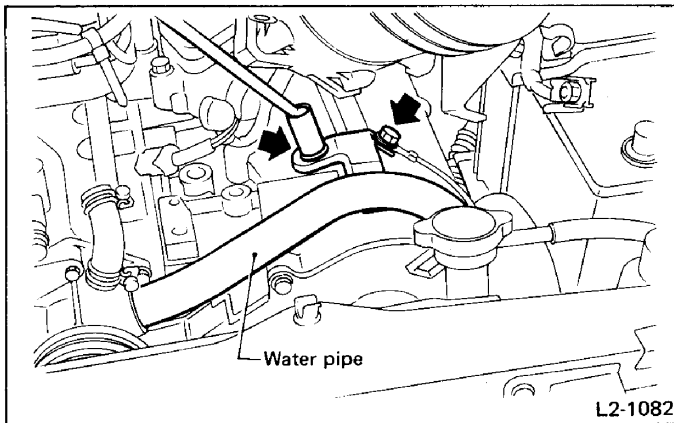


Fig. 30

- 12) Remove the LH, RH and FR belt covers, in that order.
13) Remove the water pump ASSY and timing plate.

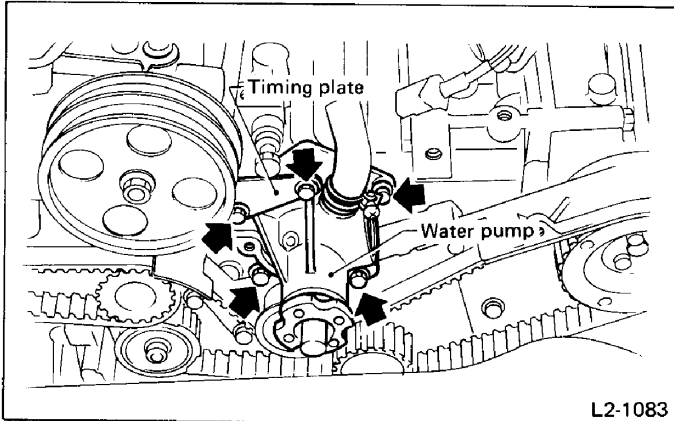


Fig. 31

REINSTALLATION

- 1) Install the water pump ASSY and timing plate.

Replace the gasket with a new one.

- 2) Install the FR, RH and LH belt covers.
- 3) Connect the water pipe.
- 4) Install the crank pulley.
- 5) Install the water pump pulley.
- 6) Install the oil level gauge guide.
- 7) Clamp the oil pressure switch harness clip.
- 8) Connect the water by-pass hose to the pipe.
- 9) Connect the radiator outlet hose.
- 10) Install the alternator and V-belt.
- 11) Add coolant in the radiator.
- 12) Connect the ground cable to the battery.
- 13) Start the engine and check the coolant level.
- 14) Close the front hood and release the lift arm.

2700 cc model

REMOVAL

- 1) Open the front hood.
- 2) Disconnect the ground cable from battery.
- 3) Drain the coolant completely.
- 4) Disconnect the radiator outlet hose and air vent tube.

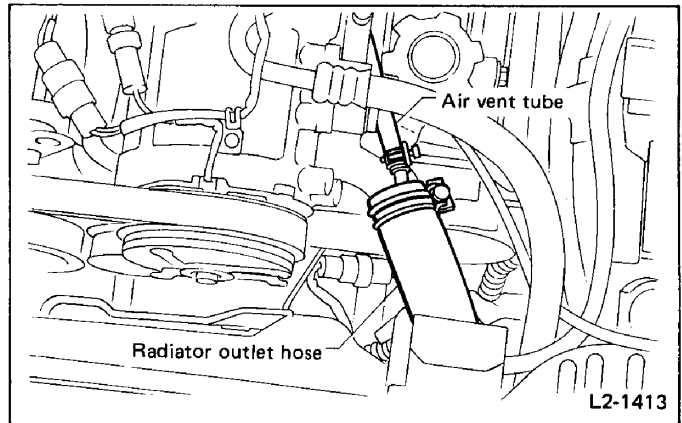


Fig. 32

- 5) Remove the pulser ASSY (A/C).
- 6) Remove the V-belt. (Refer to Chapter 2-2 "Oil Pump Assembly".)
- 7) Remove compressor, alternator and alternator bracket.
- 8) Disconnect the water by-pass hose and water pipe.

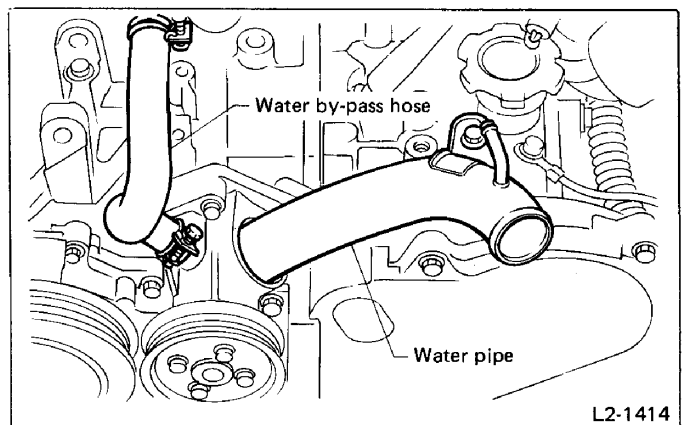


Fig. 33

- 9) Remove the water pump pulley.
- 10) Using the STOPPER [49827700 (MT)/498497000 (AT)], remove the crank pulley.
- 11) Remove the LH, RH and CTR belt covers, in that order.

- 12) Remove the water pump ASSY.

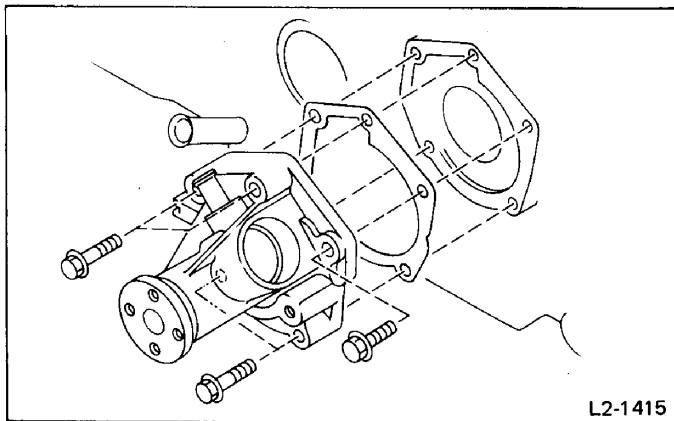


Fig. 34

RE INSTALLATION

- 1) Install the water pump ASSY.

Replace the gasket with a new one.

- 2) Install the CTR, RH and LH belt covers.
- 3) Connect the water pipe and water by-pass hose.
- 4) Install the crank pulley.
- 5) Install the water pump pulley.
- 6) Install alternator bracket, alternator and compressor.
- 7) Install V-belt, then adjust belt tension. (Refer to Chapter "2-3".)
- 8) Install the pulser ASSY (A/C).
- 9) Connect the radiator outlet hose and air vent tube.
- 10) Add coolant in the radiator.
- 11) Connect the ground cable to the battery.
- 12) Start the engine and check the coolant level.
- 13) Close the front hood and release the lift arm.