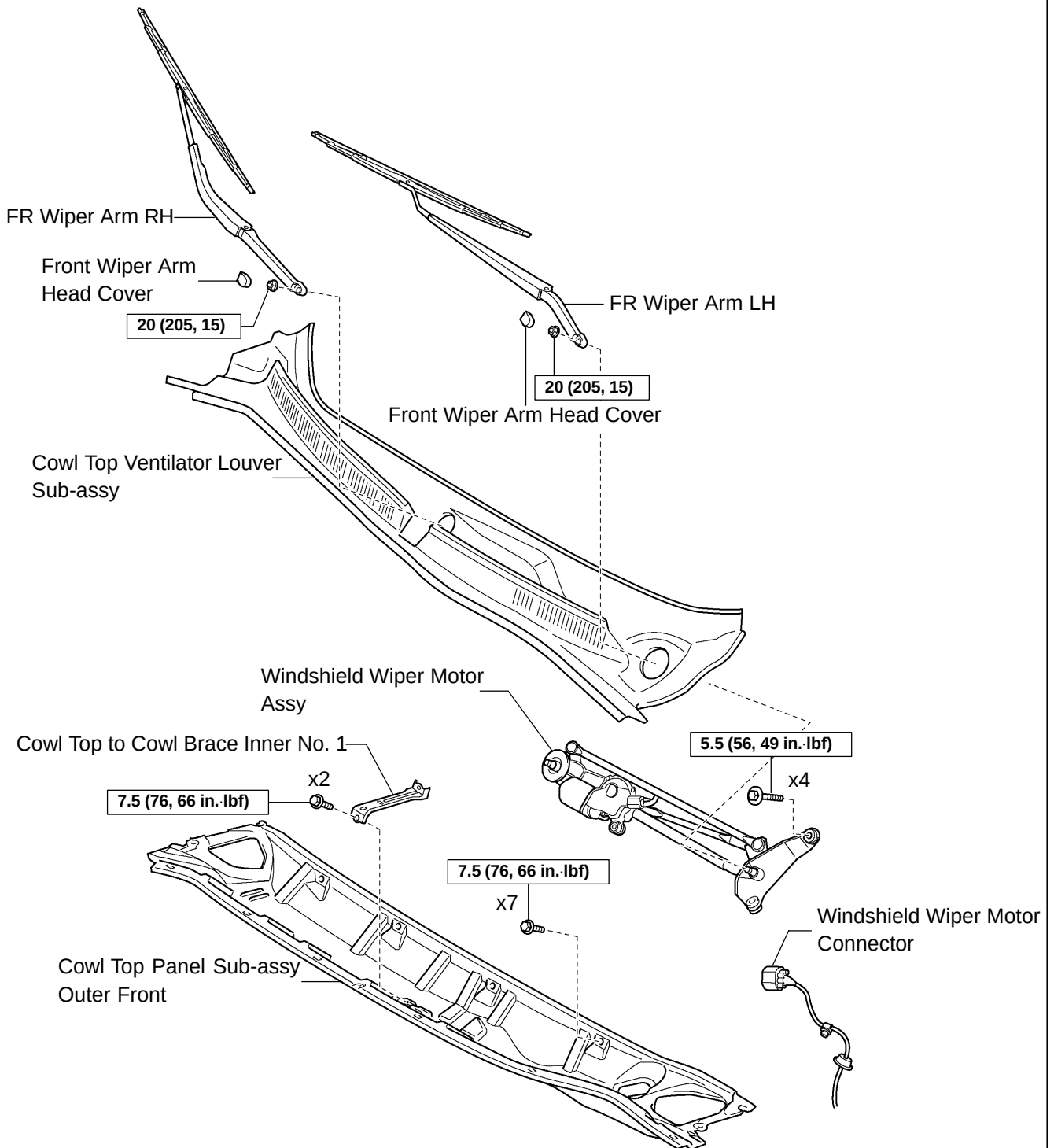


WATER PUMP ASSY COMPONENTS

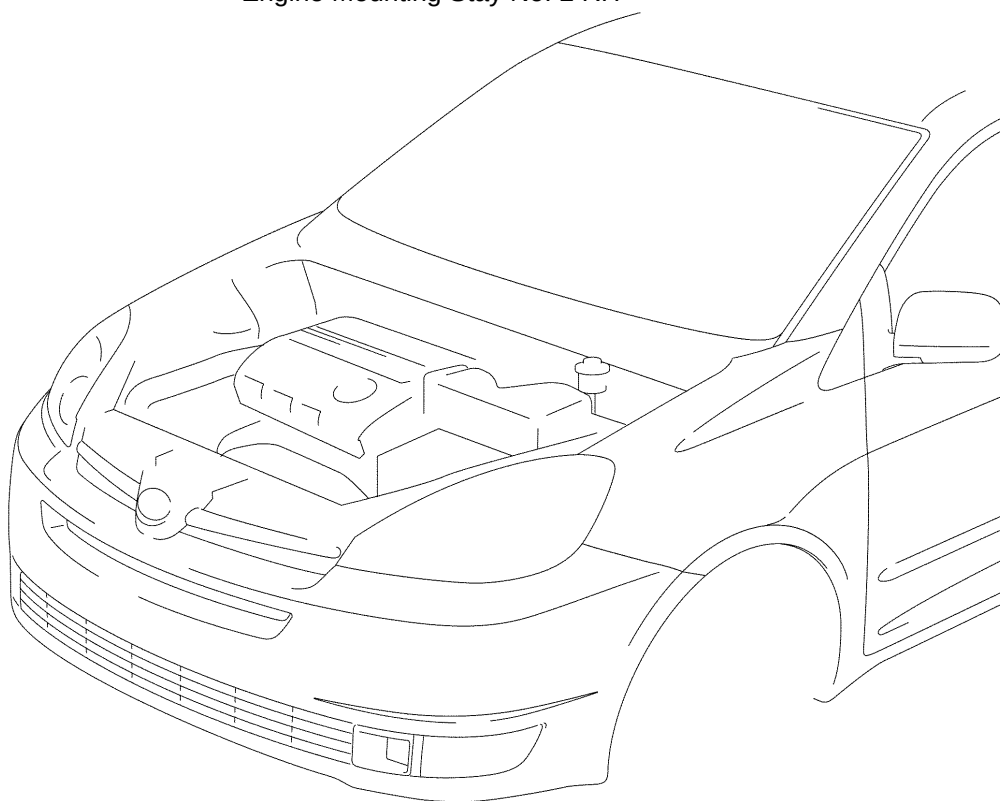
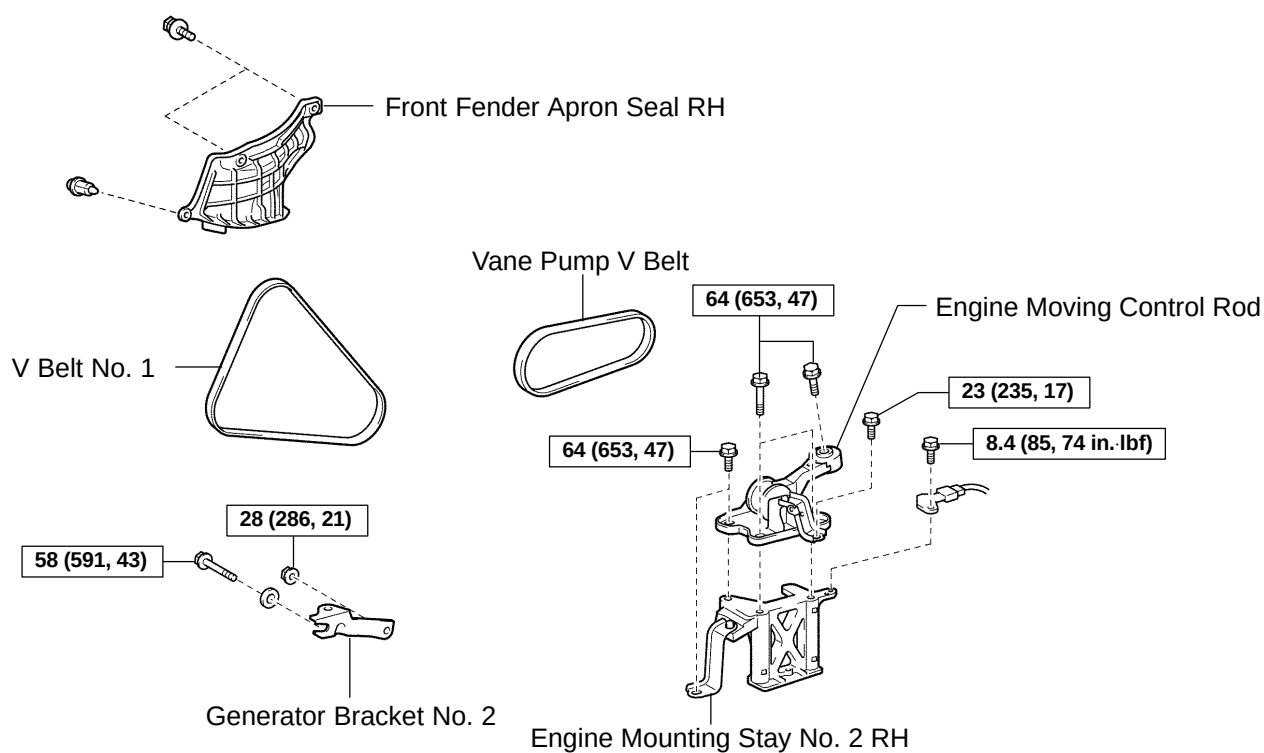
160M1-02



N·m (kgf·cm, ft·lbf) : Specified torque

Y

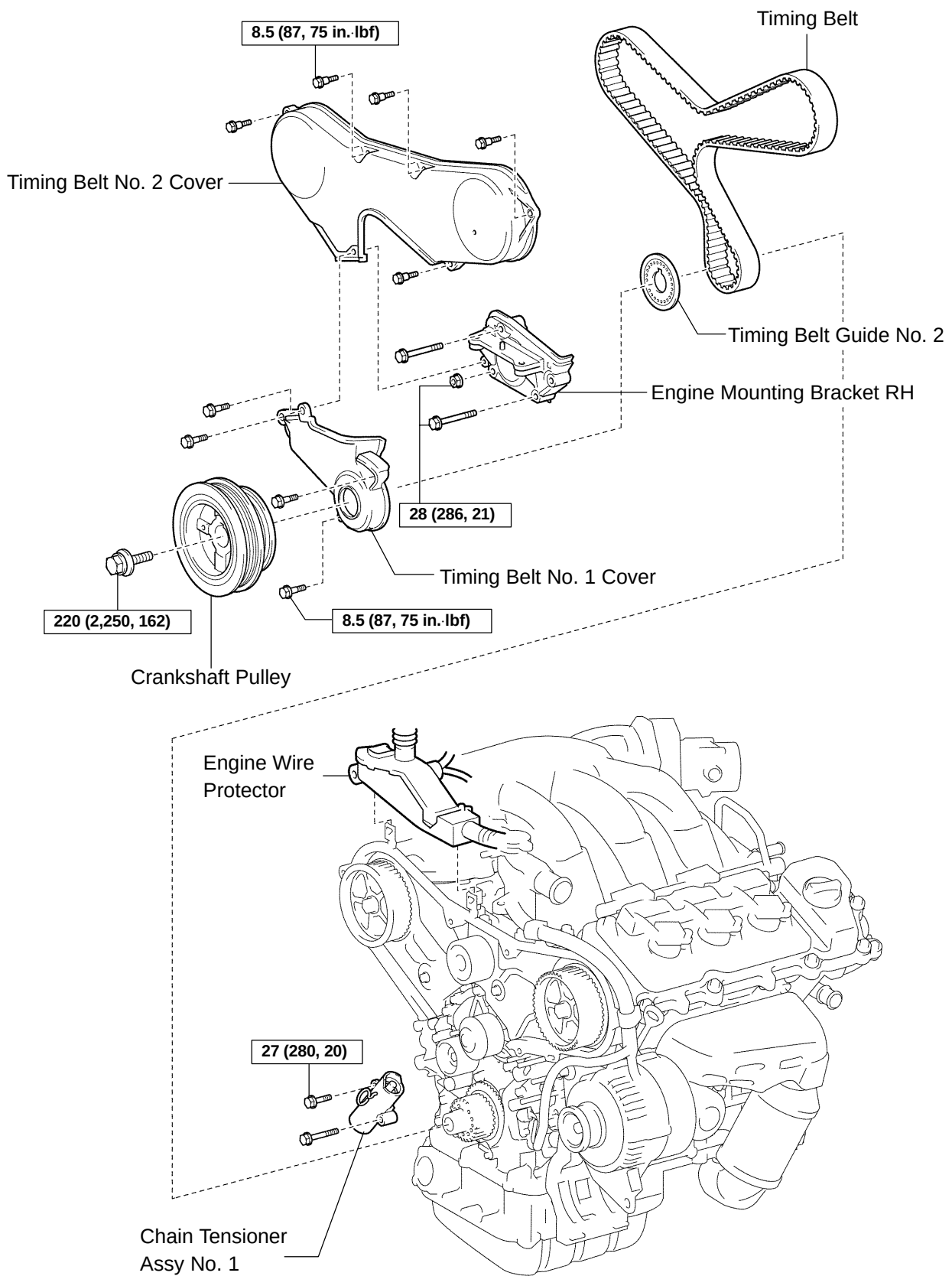
A79467

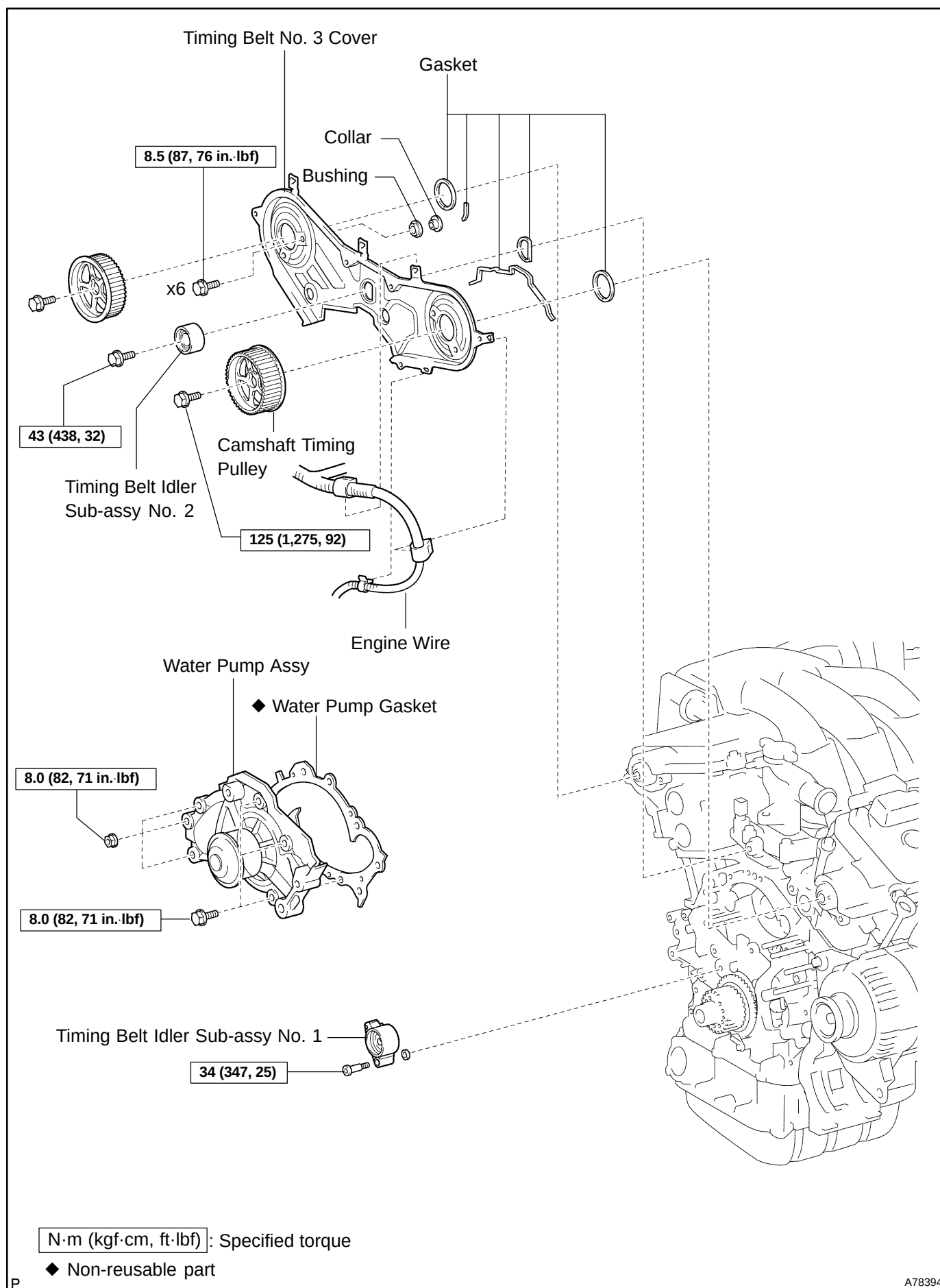


P

N·m (kgf·cm, ft·lbf): Specified torque

A78352

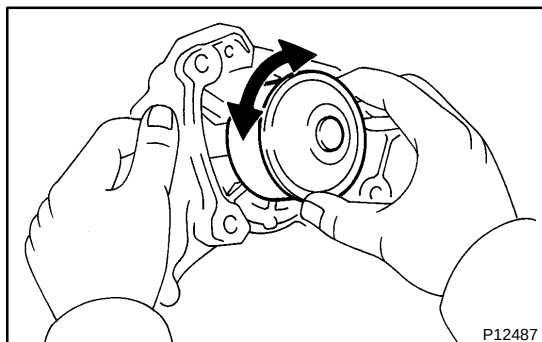




P

A78394

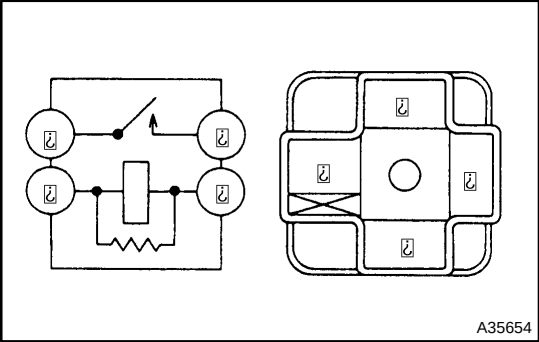
INSPECTION



1. INSPECT WATER PUMP ASSY

- (a) Visually check the drain hole for coolant leakage.
- (b) Turn the pulley and check that the water pump bearing moves smoothly and does not make noise.

INSPECTION



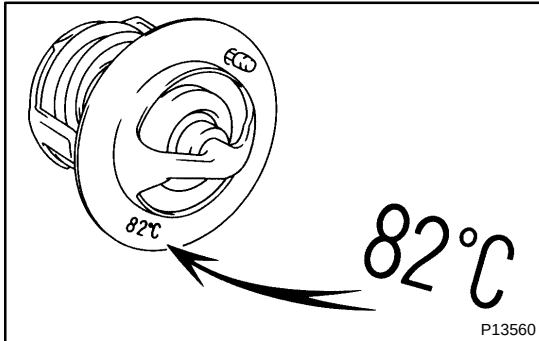
1. INSPECT COOLING FAN RELAY

- (a) Continuity inspection.
- (1) Using an ohmmeter, check for continuity between each terminal.

Specified condition:

Terminal No.	Specified condition
1 - 2	Continuity
3 - 5	No continuity
	Continuity (Apply battery voltage terminals 1 and 2)

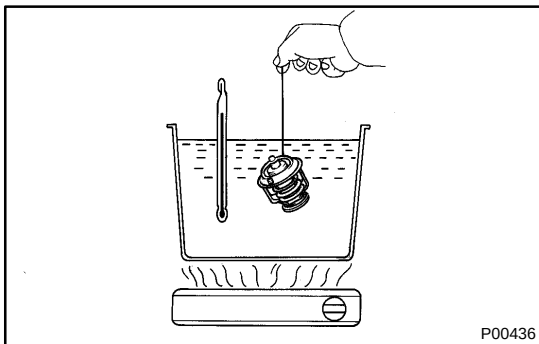
INSPECTION



1. INSPECT THERMOSTAT

HINT:

The thermostat is numbered with the valve opening temperature.



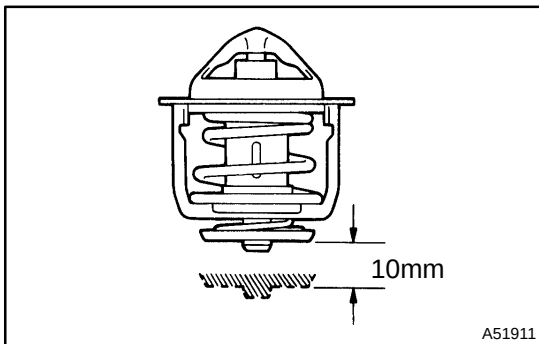
(a) Immerse the thermostat in water and gradually heat the water.

(b) Check the valve opening temperature of the thermostat.

Valve opening temperature:

80 to 84°C (176 to 183°F)

If the valve opening temperature is not as specified, replace the thermostat.



(c) Check the valve lift.

Valve lift: 10 mm (0.394 in.) or more at 95°C (203°F)

If the valve lift is not as specified, replace the thermostat.

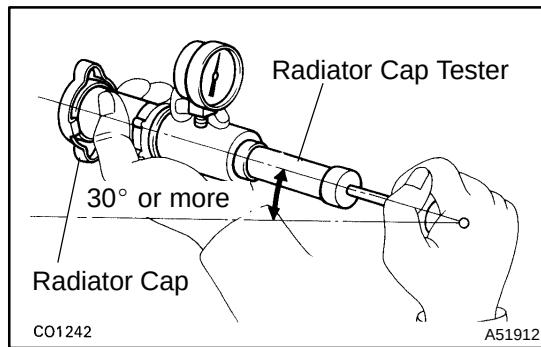
(d) Check that the valve is fully closed when the thermostat is at low temperatures (below 77°C (171°F)).

If not closed, replace the thermostat.

2. INSPECT WATER OUTLET CAP SUB-ASSY

NOTICE:

- If the radiator cap has contaminations, rinse it with water.
- Before using a radiator cap tester, wet the relief valve and pressure valve with engine coolant or water.
- When performing steps (a) and (b) below, keep the tester at an angle of over 30° above the horizontal.



- (a) Using a radiator cap tester, slowly pump the tester and check that air is coming from the vacuum valve.

Pump speed: 1 push / 3 seconds or more

NOTICE:

Push the pump at a constant speed.

If air is not coming from the vacuum valve, replace the radiator cap.

- (b) Pump the tester and measure the relief valve opening pressure.

Pump speed: 1 push within 1 second

NOTICE:

The following pump speed is for the first pump only (in order to close the vacuum valve). After the first pump, the pump speed can be reduced.

Standard opening pressure:

83 to 113 kPa (0.85 to 1.15 kgf/cm², 12.1 to 16.4 psi)

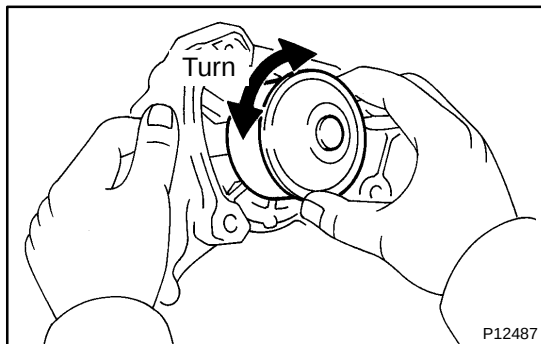
Minimum opening pressure:

69 kPa (0.7 kgf/cm², 10.0 psi)

If the opening pressure is less than minimum, replace the radiator cap.

HINT:

Use the tester's maximum reading as the opening pressure.



3. INSPECT WATER PUMP ASSY

- (a) Visually check the drain hole for coolant leakage.

If leakage is found, replace the water pump.

- (b) Turn the pulley, and check that the water pump bearing moves smoothly and does not make noise.

If necessary, replace the water pump.

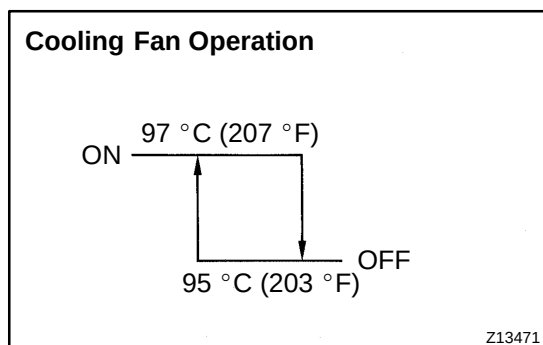
COOLING FAN SYSTEM

ON-VEHICLE INSPECTION

160M7-02

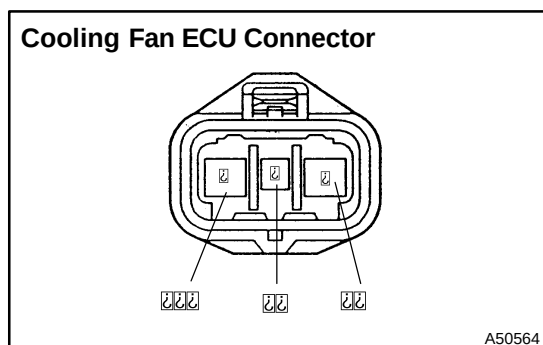
1. INSPECT COOLING FAN OPERATION WHEN COOLANT TEMPERATURE IS 95°C (203°F) BELOW

- Check that the cooling fan does not operate when turning the ignition switch ON with A/C switch OFF.
- Check that the cooling fan operates when turning the ignition switch ON with disconnecting the engine coolant temperature sensor connector.



2. INSPECT COOLING FAN OPERATION WHEN COOLANT TEMPERATURE IS 97°C (207°F) ABOVE

- Warm up the engine and turn the A/C switch OFF.
- Check that the cooling fan operates when coolant temperature is 97°C (207°F) above.
- Check that the cooling fan stops when coolant temperature is 95°C (203°F) below.



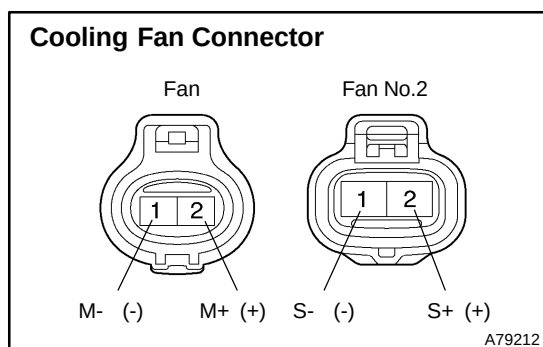
3. INSPECT COOLING FAN ECU

- Check the cooling fan ECU power source.
 - Disconnect the cooling fan ECU connector.
 - Measure the voltage between the terminals +B and GND.

Voltage: 9 to 14 V

If the voltage is not specified, check the fusible link, fuse, wire harness and fan relay.

- Reconnect the connectors.



- Check the cooling fan operation.
 - Disconnect the cooling fan connectors.
 - Check that the fan operates when applying battery positive to terminal M+ and and battery negative to terminal M-.
 - Measure the amperage.

Fan operation amperage: 10.6 to 16.6 A

- Disconnect the cooling fan No.2 connector.
- Check that the fan operates when applying battery positive to terminal S+ and and battery negative to terminal S-.
- Measure the amperage.

Fan No. 2 operation amperage: 5.6 to 11.6 A

If it is not as specified, replace the fan motor(s).

- Reconnect the cooling fan connectors.

- (c) Check the wire harness continuity (ECM - cooling fan ECU).
- (1) Disconnect the ECM connector and cooling fan ECU connector SI.
 - (2) Check the wire harness continuity.

If it is not specified, repair or replace the wire harness.

HINT:

Wire harness condition is diagnosed by cooling fan operation.

Cooling fan operation	Wire harness condition
Not operate	Short
Operate continuously	Open

- (d) Check the ECM power source.

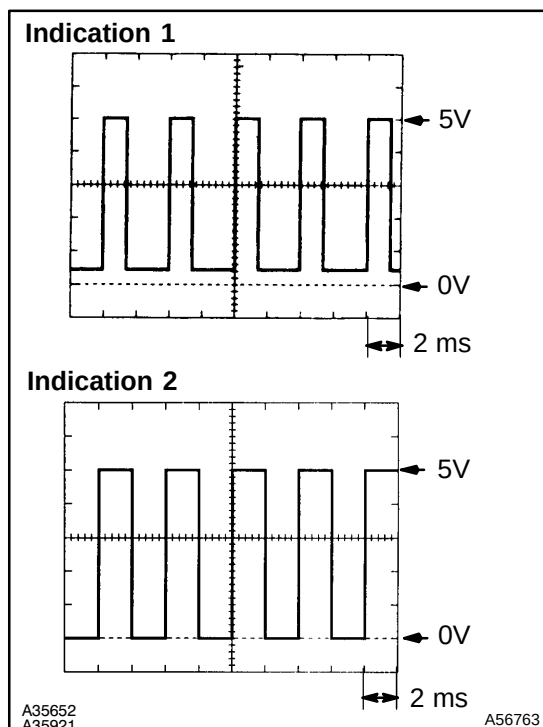
- (e) Check RFC signal generation.

NOTICE:

Perform this inspection when coolant temperature is 82°C (180°F) below.

- (1) Connect SST to M+ wire.
SST 09082-00040, 09083-00350
- (2) Connect an oscilloscope to terminals RFC and E1 of the ECM.
- (3) Check the signal generation and measure fan amperage under the condition.

Condition	RFC signal generation	Fan amperage	Fan operation
Engine stopped, IG switch ON	-	-	Not operate
Engine idling, A/C OFF	-	-	Not operate
Engine idling, A/C ON	Indication 1	7 to 11 A	Operate
Engine idling, Disconnect engine coolant temperature sensor connector	Indication 2	10 to 19 A	Operate (High speed)



Oscilloscope indication:

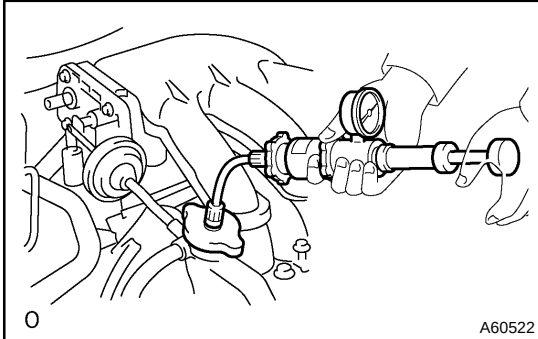
HINT:

- If RFC signal is not specified, replace the ECM.
- When the fan amperage has a problem in spite that the RFC signal has no problem, replace the cooling fan ECU.

COOLING SYSTEM

ON-VEHICLE INSPECTION

160M5-02



1. INSPECT COOLING SYSTEM FOR LEAKS

CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot. Thermal expansion will cause hot engine coolant and steam to blow out from the radiator.

- Fill the radiator with coolant and attach a radiator cap tester.
- Warm up the engine.
- Pump it to 118 kPa (1.2 kgf/cm², 17.1 psi) and check that the pressure does not drop.

HINT:

If the pressure drops, check the hoses, radiator and water pump for leaks. If the coolant has not leaked outside, check the heater core, the cylinder block and the cylinder head.

2. CHECK ENGINE COOLANT LEVEL AT RESERVOIR

- Check that the engine coolant level is between the "LOW" and "FULL" lines when the engine is cold.

HINT:

If it is below the "LOW" line, check for leaks and add "Toyota Super Long Life Coolant" or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology up to the "FULL" line.

3. CHECK ENGINE COOLANT QUALITY

- Remove the radiator cap.

CAUTION:

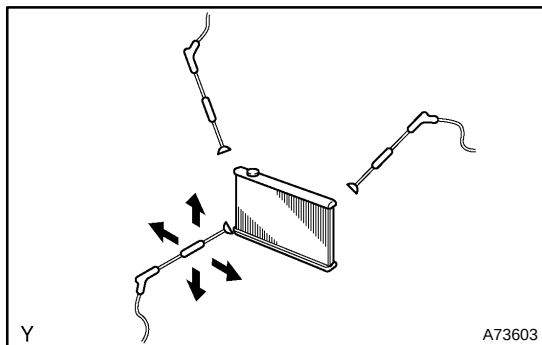
To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot. Thermal expansion will cause hot engine coolant and steam to blow out from the radiator.

- Check around the radiator cap and radiator filler hole for any excessive deposits of rust or scale, and that the coolant is free from oil.

HINT:

If excessively dirty, replace the coolant.

- Reinstall the radiator cap.



4. INSPECT FINS BLOCKAGE

- (a) If fins are clogged, wash them with water or a steam cleaner and dry with compressed air.

NOTICE:

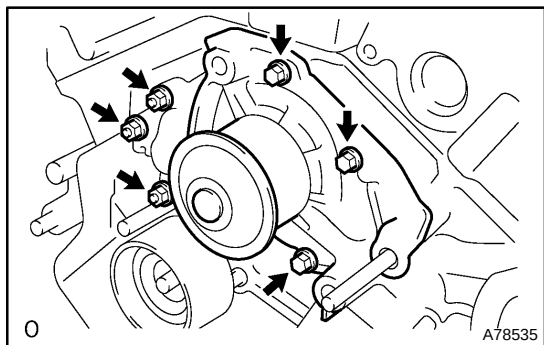
- If the distance between the steam cleaner and the core is too close, there is a possibility of damaging the fins, so keep the following injection distance.

Injection Pressure kPa (kgf/cm ² , psi)	Injection Distance mm (in.)
2,942 to 4,903 (30 to 50, 427 to 711)	300 (11.811)
4,903 to 7,845 (50 to 80, 711 to 1,138)	500 (19.685)

- If the fins are bent, straighten them with a screwdriver or pliers.
- Be careful not to expose electronic components to water.

REPLACEMENT

1. DRAIN COOLANT (See page 16-8)
2. REMOVE FRONT WHEEL RH
3. REMOVE FRONT WIPER ARM HEAD CAP
4. REMOVE FR WIPER ARM RH (See page 66-8)
5. REMOVE FR WIPER ARM LH (See page 66-8)
6. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSY (See page 66-8)
7. REMOVE WIPER LINK ASSY (See page 66-8)
8. REMOVE COWL TOP TO COWL BRACE INNER NO.1 (See page 11-13)
9. REMOVE COWL TOP PANEL SUB-ASSY OUTER FRONT (See page 11-13)
10. REMOVE FRONT FENDER APRON SEAL RH
11. REMOVE V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page 14-5)
12. REMOVE VANE PUMP V BELT (See page 14-5)
13. REMOVE ENGINE MOVING CONTROL ROD (See page 14-84)
14. REMOVE ENGINE MOUNTING STAY NO.2 RH (See page 14-84)
15. REMOVE GENERATOR BRACKET NO.2 (See page 14-84)
16. REMOVE CRANKSHAFT PULLEY (See page 14-84)
SST 09213-54015 (91651-60855), 09330-00021, 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05031)
17. REMOVE TIMING BELT NO.1 COVER
18. REMOVE TIMING BELT NO.2 COVER (See page 14-84)
19. REMOVE ENGINE MOUNTING BRACKET RH (See page 14-84)
20. REMOVE TIMING BELT GUIDE NO.2
21. REMOVE TIMING BELT (See page 14-84)
22. REMOVE TIMING BELT IDLER SUB-ASSY NO.2
23. REMOVE CAMSHAFT TIMING PULLEY (See page 14-99)
SST 09960-10010 (09962-01000, 09963-01000), 09249-63010
24. REMOVE TIMING BELT NO.3 COVER (See page 14-99)
25. REMOVE TIMING BELT IDLER SUB-ASSY NO.1
(a) Using a 10 mm socket hexagon wrench, remove the pivot bolt, the timing belt idler No.1 and the plate washer.



26. REMOVE WATER PUMP ASSY

- (a) Remove the 3 bolts, the 3 nuts and the water pump.

27. INSTALL WATER PUMP ASSY

- (a) Install a new gasket and the water pump with the 3 bolts and the 3 nuts.

Torque: 8.0 N·m (82 kgf·cm, 71 in·lbf)

28. INSTALL TIMING BELT IDLER SUB-ASSY NO.1

- (a) Using a 10 mm socket hexagon wrench, install the plate washer and the timing belt idler No.1 with the pivot bolt.

Torque: 34 N·m (347 kgf·cm, 25 ft.lbf)

29. INSTALL TIMING BELT NO.3 COVER (See page [14-99](#))**30. INSTALL CAMSHAFT TIMING PULLEY (See page [14-99](#))**

SST 09960-10010 (09962-01000, 09963-01000), 09249-63010

31. INSTALL TIMING BELT IDLER SUB-ASSY NO.2 (See page [14-99](#))**32. INSPECT TIMING BELT (See page [14-84](#))****33. INSTALL TIMING BELT (See page [14-84](#))**

SST 09960-10010 (09962-01000, 09963-01000)

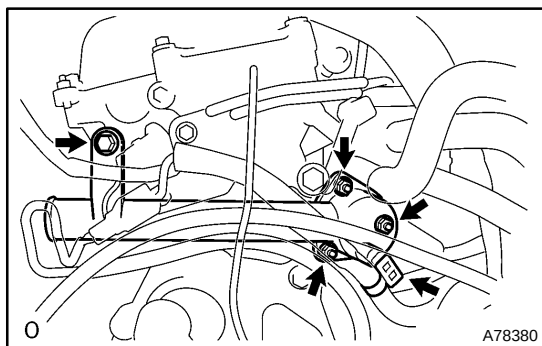
34. INSTALL CHAIN TENSIONER ASSY NO.1 (See page [14-84](#))**35. INSTALL TIMING BELT GUIDE NO.2 (See page [14-84](#))****36. INSTALL ENGINE MOUNTING BRACKET RH (See page [14-84](#))****37. INSTALL TIMING BELT NO.2 COVER (See page [14-84](#))****38. INSTALL TIMING BELT NO.1 COVER (See page [14-84](#))****39. INSTALL CRANKSHAFT PULLEY (See page [14-84](#))**

SST 09213-54015 (91651-60855), 09330-00021

40. INSTALL GENERATOR BRACKET NO.2 (See page [14-84](#))**41. INSTALL ENGINE MOUNTING STAY NO.2 RH (See page [14-84](#))****42. INSTALL ENGINE MOVING CONTROL ROD (See page [14-84](#))****43. INSTALL VANE PUMP V BELT (See page [14-5](#))****44. INSTALL V (COOLER COMPRESSOR TO CRANKSHAFT PULLEY) BELT NO.1 (See page [14-5](#))****45. INSPECT DRIVE BELT DEFLECTION AND TENSION (REFERENCE) (See page [14-1](#))****46. INSTALL COWL TOP PANEL SUB-ASSY OUTER FRONT (See page [11-13](#))****47. INSTALL COWL TOP TO COWL BRACE INNER NO.1 (See page [11-13](#))****48. INSTALL WIPER LINK ASSY (See page [66-8](#))****49. INSTALL FR WIPER ARM LH (See page [66-8](#))****50. INSTALL FR WIPER ARM RH (See page [66-8](#))****51. INSTALL FRONT WHEEL RH (See page [14-5](#))****52. ADD COOLANT (See page [16-8](#))****53. CHECK FOR ENGINE COOLANT LEAKS (See page [16-1](#))**

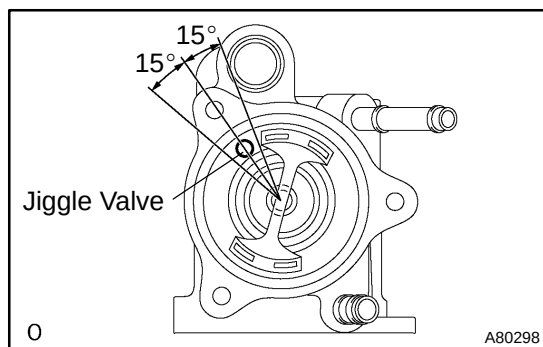
THERMOSTAT REPLACEMENT

1. DRAIN COOLANT (See page 16-8)
2. REMOVE BATTERY
3. REMOVE AIR CLEANER CAP SUB-ASSY (See page 19-5)
4. REMOVE AIR CLEANER FILTER ELEMENT SUB-ASSY
5. REMOVE AIR CLEANER INLET NO.2 (See page 19-5)
6. REMOVE AIR CLEANER CASE (See page 19-5)
7. REMOVE AIR CLEANER BRACKET (See page 19-5)
8. REMOVE AIR CLEANER INLET NO.1 (See page 19-5)
9. REMOVE STARTER ASSY (See page 19-5)
10. DISCONNECT RADIATOR HOSE OUTLET



11. REMOVE WATER INLET
 - (a) Disconnect the wire harness clamp.
 - (b) Remove the bolts, the 3 nuts and the water inlet.

12. REMOVE THERMOSTAT



13. INSTALL THERMOSTAT
 - (a) Install a new gasket to the thermostat.
 - (b) Align the thermostat jiggle valve with the upper stud bolt, and insert the thermostat in the water inlet housing.

HINT:

The jiggle valve may be set within 15 ° of either side of the prescribed position.

14. INSTALL WATER INLET

Torque:

Nut 8.0 N·m (82 kgf·cm, 71 in·lbf)

Bolt 20 N·m (199 kgf·cm, 14 ft·lbf)

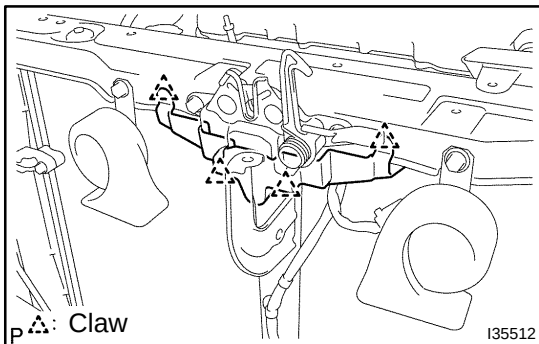
15. INSTALL STARTER ASSY (See page 19-5)
16. INSTALL AIR CLEANER INLET NO.1 (See page 19-5)
17. INSTALL AIR CLEANER BRACKET (See page 19-5)
18. INSTALL AIR CLEANER CASE (See page 19-5)
19. INSTALL AIR CLEANER INLET NO.2 (See page 19-5)
20. INSTALL AIR CLEANER CAP SUB-ASSY (See page 19-5)

21. ADD COOLANT (See page [16-8](#))
22. CHECK FOR ENGINE COOLANT LEAKS (See page [16-1](#))

NO.2 RADIATOR ASSY REPLACEMENT

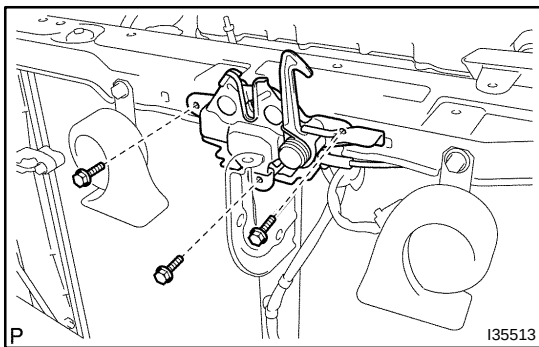
160M4-02

1. DRAIN COOLANT (See page 16-8)
2. DISCONNECT RADIATOR HOSE INLET
3. DISCONNECT RADIATOR HOSE OUTLET
4. DISCONNECT OIL COOLER INLET HOSE NO.1
5. DISCONNECT OIL COOLER OUTLET HOSE NO.1
6. REMOVE FRONT BUMPER COVER (See page 76-2)
7. REMOVE AIR CLEANER CAP SUB-ASSY (See page 19-5)
8. REMOVE AIR CLEANER FILTER ELEMENT SUB-ASSY
9. REMOVE AIR CLEANER INLET NO.2 (See page 19-5)
10. REMOVE AIR CLEANER CASE (See page 19-5)
11. REMOVE AIR CLEANER BRACKET (See page 19-5)
12. REMOVE AIR CLEANER INLET NO.1 (See page 19-5)



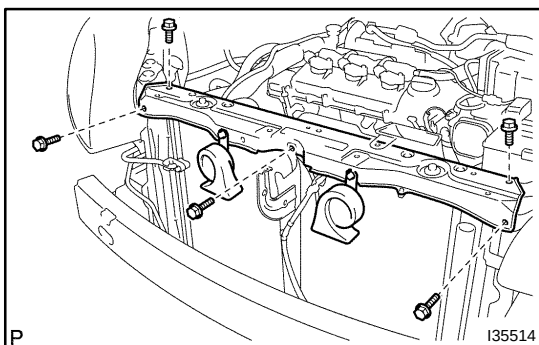
13. REMOVE HOOD LOCK RELEASE LEVER PROTECTOR

- (a) Release the 4 claws and remove the hood lock release lever protector.



14. REMOVE HOOD LOCK ASSY

- (a) Remove the 3 bolts and separate hood lock.

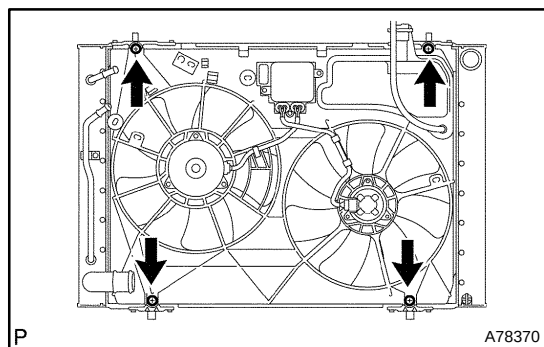


15. REMOVE RADIATOR SUPPORT SUB-ASSY UPPER

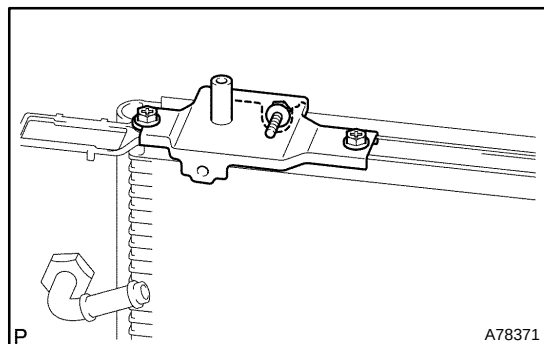
- (a) Disconnect the horn connectors.
- (b) Remove the 5 bolts and the radiator upper support.

16. REMOVE FAN SHROUD

- (a) Disconnect the engine coolant reservoir hose.
- (b) Disconnect the fan motor connector.

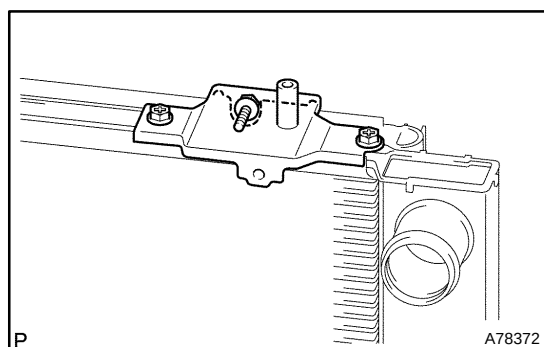


- (c) Remove the 4 bolts and the fan shroud.



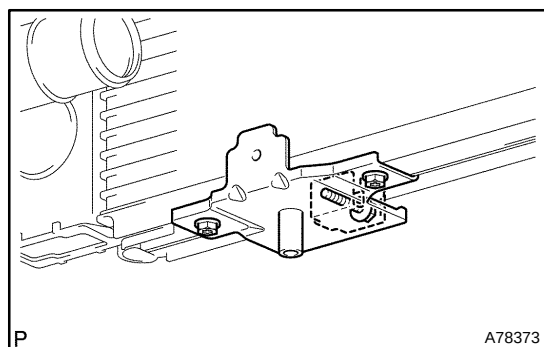
17. REMOVE RADIATOR SUPPORT SUB-ASSY UPPER LH

- (a) Remove the 3 bolts and the radiator support upper LH.



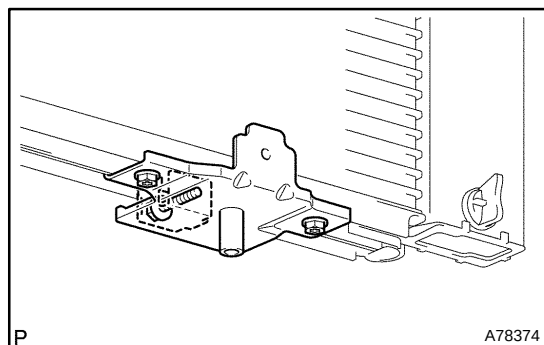
18. REMOVE RADIATOR SUPPORT SUB-ASSY UPPER RH

- (a) Remove the 3 bolts and the radiator support upper RH.



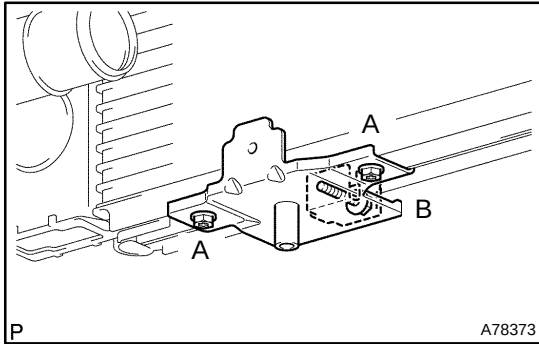
19. REMOVE RADIATOR SUPPORT SUB-ASSY LOWER LH

- (a) Remove the 3 bolts and the radiator support lower LH.



20. REMOVE RADIATOR SUPPORT SUB-ASSY LOWER RH

- (a) Remove the 3 bolts and the radiator support lower RH.

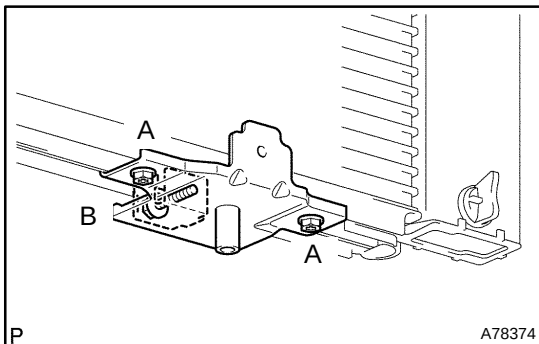
21. REMOVE NO.2 RADIATOR ASSY**22. INSTALL NO.2 RADIATOR ASSY****23. INSTALL RADIATOR SUPPORT SUB-ASSY LOWER LH**

- (a) Install the radiator support lower LH with the 3 bolts.

Torque:

Bolt A 5.0 N·m (51 kgf·cm, 44 in·lbf)

Bolt B 3.9 N·m (40 kgf·cm, 35 in·lbf)

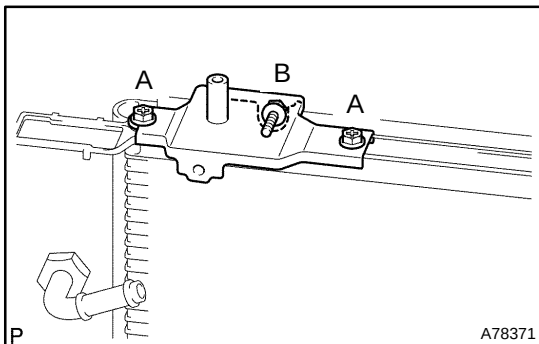
**24. INSTALL RADIATOR SUPPORT SUB-ASSY LOWER RH**

- (a) Install the radiator support lower RH with the 3 bolts.

Torque:

Bolt A 5.0 N·m (51 kgf·cm, 44 in·lbf)

Bolt B 3.9 N·m (40 kgf·cm, 35 in·lbf)

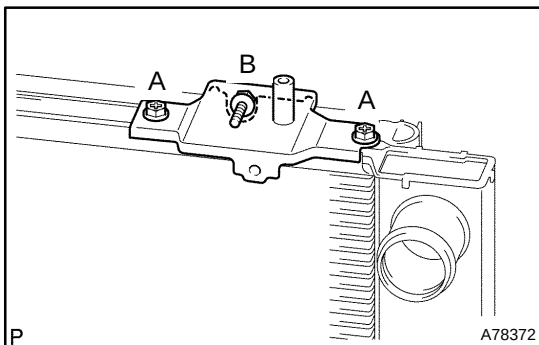
**25. INSTALL RADIATOR SUPPORT SUB-ASSY UPPER LH**

- (a) Install the radiator support upper LH with the 3 bolts.

Torque:

Bolt A 5.0 N·m (51 kgf·cm, 44 in·lbf)

Bolt B 3.9 N·m (40 kgf·cm, 35 in·lbf)

**26. INSTALL RADIATOR SUPPORT SUB-ASSY UPPER RH**

- (a) Install the radiator support upper RH with the 3 bolts.

Torque:

Bolt A 5.0 N·m (51 kgf·cm, 44 in·lbf)

Bolt B 3.9 N·m (40 kgf·cm, 35 in·lbf)

27. INSTALL FAN SHROUD

Torque: 5.0 N·m (51 kgf·cm, 44 in·lbf)

28. INSTALL RADIATOR SUPPORT SUB-ASSY UPPER

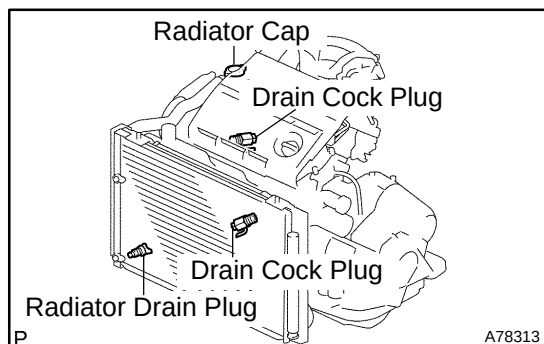
Torque: 5.0 N·m (51 kgf·cm, 44 in·lbf)

29. INSTALL HOOD LOCK ASSY

Torque: 8.0 N·m (82 kgf·cm, 71 in·lbf)

- 30. INSTALL AIR CLEANER INLET NO.1 (See page [19-5](#))**
- 31. INSTALL AIR CLEANER BRACKET (See page [19-5](#))**
- 32. INSTALL AIR CLEANER CASE (See page [19-5](#))**
- 33. INSTALL AIR CLEANER INLET NO.2 (See page [19-5](#))**
- 34. INSTALL AIR CLEANER CAP SUB-ASSY (See page [19-5](#))**
- 35. ADJUST HOOD SUB-ASSY (See page [75-2](#))**
- 36. ADD COOLANT (See page [16-8](#))**
- 37. CHECK FOR ENGINE COOLANT LEAKS (See page [16-1](#))**

ENGINE COOLANT REPLACEMENT



1. DRAIN COOLANT

- (a) Remove the radiator.

CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot. Thermal expansion will cause hot engine coolant and steam to blow out from the radiator.

- (b) Loosen the radiator drain plug and the 2 drain cock plugs, and drain the coolant.
 (c) Tighten the 2 drain cock plugs.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

2. ADD COOLANT

- (a) Tighten the drain plug of the radiator.
 (b) Slowly fill the cooling system with coolant.
Capacity: 11.7 liters (12.4 US qts, 10.3 Imp. qts)

NOTICE:

Do not use plain water by itself.

HINT:

- Use of improper coolant may damage the engine cooling system.
 - Use only "Toyota Super Long Life Coolant" or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology. (Coolant with long-life hybrid organic acid technology consists of the combination of low phosphates and organic acids.)
 - "Toyota Super Long Life Coolant" is premixed with 50% coolant and 50% deionized water. This coolant provides protection down to about -35°C (-31°F).
 - Observe the coolant level inside the radiator by pressing the inlet and outlet radiator hoses several times by hand. If the coolant level is low, add coolant.
- (c) Install the radiator cap securely.
 (d) Fill the radiator reservoir tank with the coolant.
 (e) Warm up the engine.

NOTICE:

Warm up the engine until the fan starts running with the A/C, heater and defroster all off.

- (f) Press the inlet and outlet radiator hoses several times by hand while warming up the engine.
 (g) Stop the engine and wait until the coolant cools down.
 (h) Remove the radiator cap and check the coolant level inside the radiator.
 (i) If the coolant level is below the full level, perform the steps from (c) through (i) and repeat the operation until the coolant level stays the full level.
 (j) Recheck the coolant level inside the radiator reservoir tank. If it is below the full level by +10 mm, add the coolant.

3. CHECK FOR ENGINE COOLANT LEAKS

- (a) Fill the radiator with coolant and attach a radiator cap tester.
 (b) Pump it to 118 kPa (1.2 kgf/cm²), and check for leakage.