170NC–02

REPLACEMENT

1. REMOVE ENGINE UNDER COVER SUB–ASSY NO.1

(a) Remove the 4 bolts and engine under cover No.1.

2. REMOVE ENGINE UNDER COVER ASSY REAR

(a) Remove the 4 bolts and engine under cover rear.

3. DRAIN COOLANT (See pub. No. RM990E, 16–50)

4. DRAIN ENGINE OIL

5. REMOVE RADIATOR ASSY (See pub. No. RM990E, 16–55)

6. REMOVE FAN SHROUD (See page 14–204)

7. REMOVE FAN AND GENERATOR V BELT (See pub. No. RM990E, 14–189)

HINT:

Loosen the 4 nuts for the fan with fluid coupling assy in advance.

8. REMOVE FAN W/ FLUID COUPLING

(a) Remove the 4 nuts and fan w/ fluid coupling.

9. REMOVE FAN PULLEY

10. REMOVE TIMING BELT NO.1 COVER (See pub. No. RM990E, 14–214)

11. REMOVE TIMING BELT (See pub. No. RM990E, 14–214)

12. REMOVE INTERCOOLER PROTECTOR (See page 13–18)

13. REMOVE INTERCOOLER ASSY (See page 10–22)

14. REMOVE DIESEL THROTTLE BODY ASSY (See page 10–22)

15. REMOVE AIR CLEANER ASSY

(a) Disconnect the intake air flow meter S/A connector, and remove the wire harness clamp.

(b) Loosen the hose clamp, and remove the air cleaner cap with air cleaner hose No.1.

(c) Remove the air cleaner filter element.

(d) Remove the 3 bolts and air cleaner case sub–assy.

16. REMOVE COMPRESSOR AND MAGNETIC CLUTCH (W/ AIR CONDITIONING)

(a) Disconnect the connector, and remove the 4 bolts and cooler compressor and magnetic clutch assy.

HINT:

It is not necessary to remove the hose from the cooler compressor assy when you remove that assembly. Also, for the following removal process, put and hang the removed cooler compressor assy with a rope to an appropriate location of the vehicle.

17. REMOVE GENERATOR ASSY (See pub. No. RM990E, 19–40)

18. REMOVE IDLE PULLEY ASSY (See page 13–10)

19. REMOVE COMPRESSOR MOUNTING BRACKET NO.1 (See page 13–10)

20. REMOVE GENERATOR BRACKET

(a) Remove the bolt and generator bracket.

21. REMOVE CYLINDER HEAD COVER SUB–ASSY NO.2 (See page 14–218)

22. REMOVE INJECTION PIPE (See page 11–52)

23. REMOVE FUEL INLET PIPE SUB–ASSY (See page 11–67)

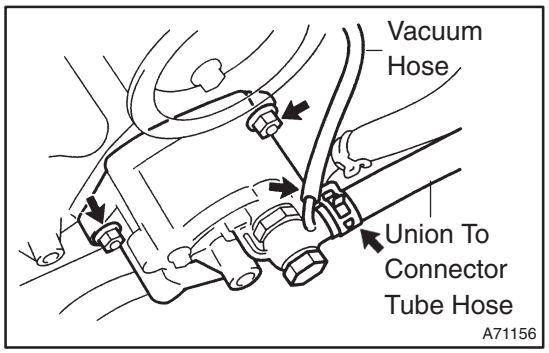
24. REMOVE CYLINDER HEAD COVER SUB–ASSY (See page 11–52)

25. REMOVE CAMSHAFT TIMING PULLEY (See page 14–218)

26. REMOVE TIMING BELT IDLER SUB–ASSY NO.1 (See page 14–218)

27. REMOVE TIMING BELT NO.2 COVER (See page 14–218)

28. REMOVE WATER PUMP ASSY (See page 16–27)



29. REMOVE VACUUM PUMP ASSY

(a) Remove the vacuum hoses.
(b) Remove the union–to–connector tube hose (w/o VSC).
(c) Remove the 2 nuts, vacuum pump assy and the 2 O–rings.

30. REMOVE VANE PUMP OIL RESERVOIR ASSY

(a) Remove the 3 bolts and vane pump oil reservoir assy.

HINT:

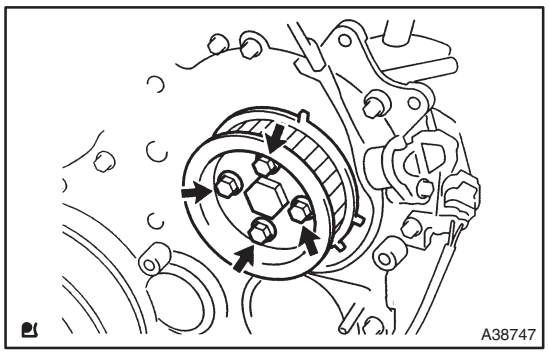
It is not necessary to remove the hose from the vane pump oil reservoir assy when you remove that assembly. Also, for the following removal process, put and hang the removed oil reservoir assy with a rope to an appropriate location of the vehicle.

31. REMOVE VANE PUMP ASSY

(a) Remove the 2 nuts, vane pump assy and its O–ring.

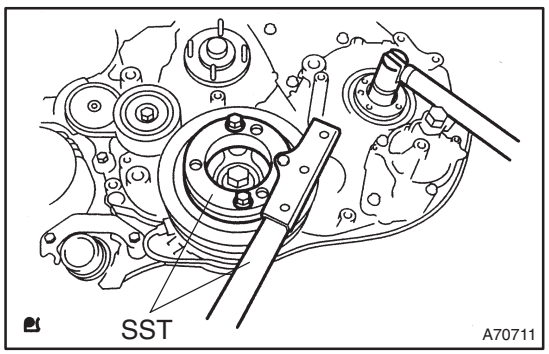
HINT:

It is not necessary to remove the hose from the vane pump assy when you remove that assembly. Also, for the following removal process, move the removed assembly aside to an appropriate location.



32. REMOVE PUMP DRIVE SHAFT PULLEY

(a) Remove the 4 bolts, camshaft timing pulley flange No. 2 and pump drive shaft pulley.



33. SUPPLY PUMP GEAR SET NUT

(a) While holding the crankshaft using SST, remove the nut and O–ring.
SST 09213–58013, 09330–00021

34. REMOVE CRANKSHAFT PULLEY (See pub. No. RM990E, 14–244)

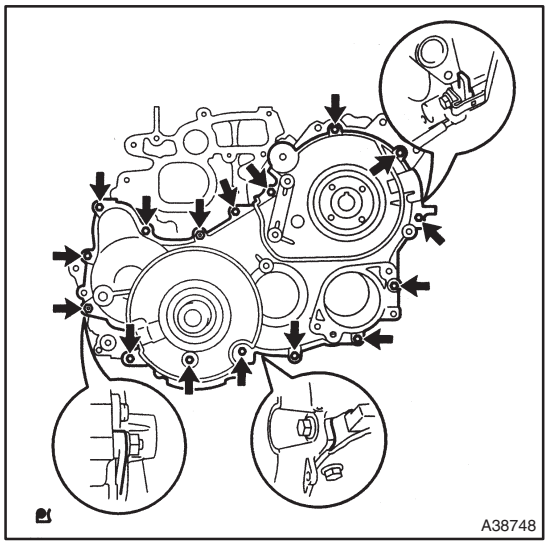
SST 09213–58013, 09330–00021, 09950–50013 (09951–05010, 09952–05010, 09953–05020, 09954–05021)

35. REMOVE CRANK POSITION SENSOR

(a) Disconnect the crank position sensor connector, and then remove the bolt and crank position sensor.

36. REMOVE CRANK POSITION NO.2 SENSOR

(a) Disconnect the crank position No.2 connector, and remove the bolt and crank position No.2 sensor.



37. REMOVE TIMING GEAR CASE

(a) Remove the wire harness clamp.

(b) Remove the 14 bolts and 2 nuts.

(c) Separate its cover from the timing gear case softly using a screwdriver.

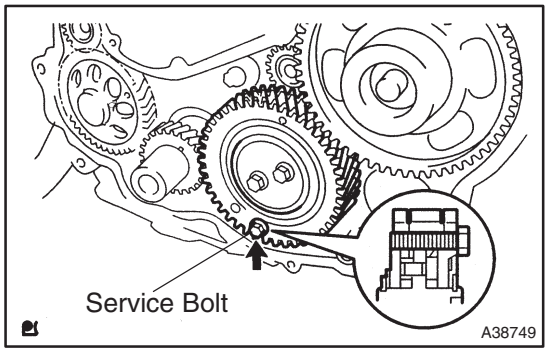
HINT:

There are some tiny slots that allow you to insert a screwdriver tip in order to separate the timing gear case and its cover. Refer to the illustration for these slot locations.

(d) Remove the case cover and O–ring.

CAUTION:

Be carefule not to damage each contact face of the timing gear case and its cover separating and removing steps.



38. FIX IDLE GEAR NO.1

(a) Fix the sub idle gears to the idle gear No.1 with the service bolt.

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

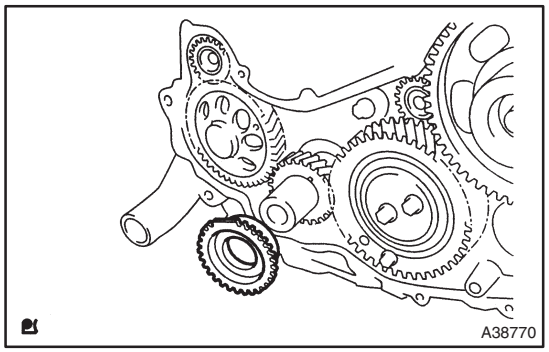
HINT:

Be sure to fix the gears in order to eliminate a torsional force caused by the idle gear springs (which are set between the idle gear No.1 and each sub idle gear).

The torsional force may cause misalignment of the sub idle gear and idle gear No.1.

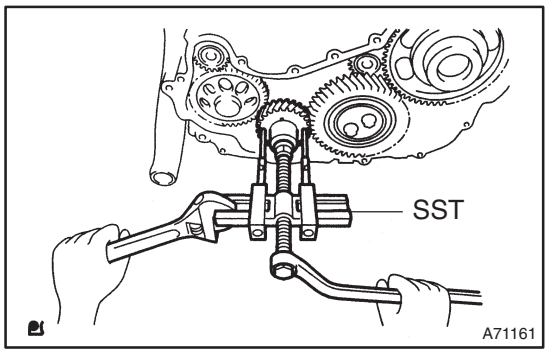
NOTICE:

If a screw hole of the rear sub idle gear is not at a correct position, rotate the crankshaft in counterclockwise direction to correct, and then screw the service bolt.



39. REMOVE CRANKSHAFT POSITION SENSOR PLATE NO.1

(a) Remove the crankshaft sensor plate No.1.



40. REMOVE CRANKSHAFT TIMING GEAR OR SPROCKET

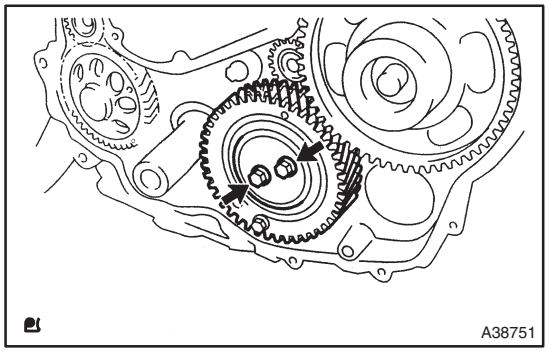
(a) Install the service bolt to the crankshaft.

(b) Remove the crankshaft timing gear with SST.

SST 09950–50013 (09951–05010, 09952–05010, 09953–05020, 09954–05010)

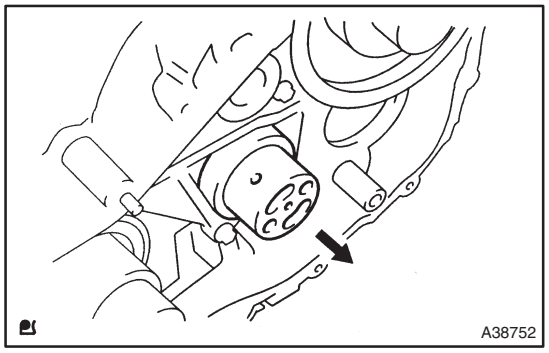
NOTICE:

Apply grease to the threads and tip of the SST before use.

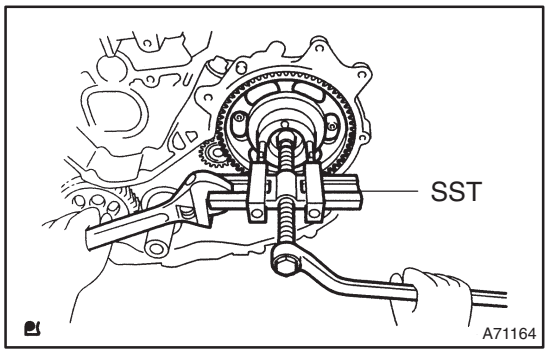


41. REMOVE IDLE GEAR NO.1

(a) Remove the 2 bolts, idle gear thrust plate and idle gear No.1.



(b) Remove the idle gear shaft No.1.



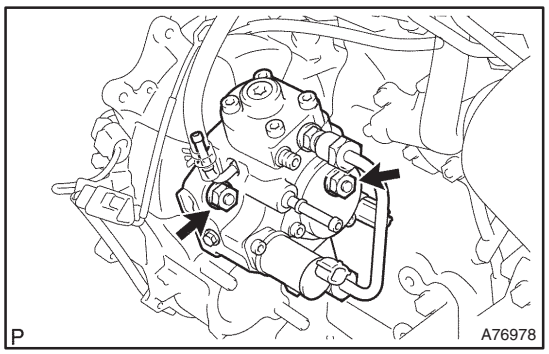
42. REMOVE INJECTION GEAR

(a) Remove the injection gear with SST.

SST 09950–50013 (09951–05010, 09952–05010, 09953–05020, 09954–05021)

NOTICE:

Apply grease to the threads and tip of the SST before use.



43. REMOVE INJECTION OR SUPPLY PUMP ASSY

(a) Remove the 2 nuts, supply pump assy and O–ring.

44. REMOVE DIFFERENTIAL CARRIER ASSY FRONT (See pub. No. RM990E, 29–13)

45. REMOVE TRANSMISSION ASSY

HINT:

M/T TRANSMISSION (RA61F)... See page 41–26

A/T TRANSMISSION (A750F)... See page 40–38

46. REMOVE CLUTCH DISC ASSY (MANUAL TRANSMISSION) (See page 42–5)

47. REMOVE OIL COOLER INLET TUBE NO.1 (AUTOMATIC TRANSMISSION) (See page 40–38)

48. REMOVE OIL COOLER OUTLET TUBE NO.1 (AUTOMATIC TRANSMISSION) (See page 40–38)

49. REMOVE FLYWHEEL SUB–ASSY (See pub. No. RM990E, 14–247)

SST 09213–58013, 09330–00021

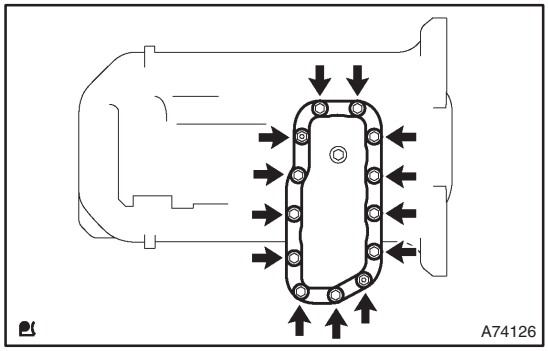
50. REMOVE REAR END PLATE

(a) Remove the bolt and rear end plate.

51. REMOVE OIL LEVEL GAGE SUB–ASSY

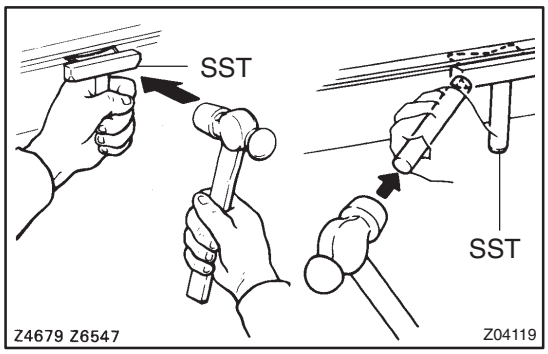
52. REMOVE OIL PAN COVER SUB–ASSY NO.1

(a) Remove the 4 bolts and oil pan cover sub–assy No.1.

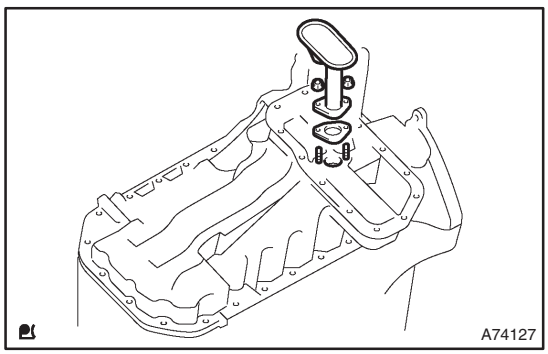


53. REMOVE OIL PAN SUB–ASSY NO.2

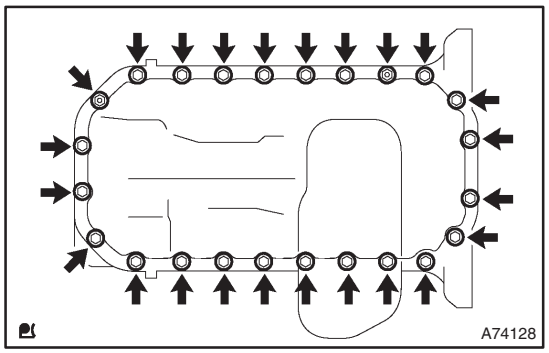
(a) Remove the 11 bolts and 2 nuts.



(b) Remove the oil pan No.2 with SST.
SST 09032–00100



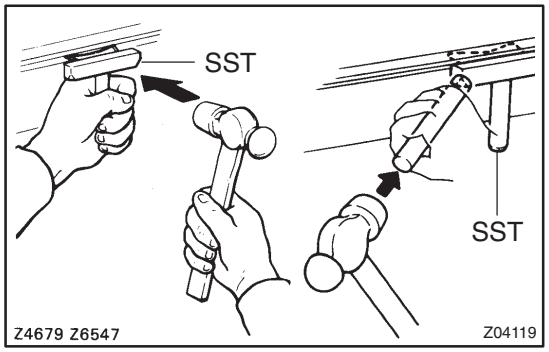
54. REMOVE OIL STRAINER SUB–ASSY



55. REMOVE OIL PAN SUB–ASSY

(a) Disconnect the engine oil level sensor connector.

(b) Remove the 22 bolts and 2 nuts.

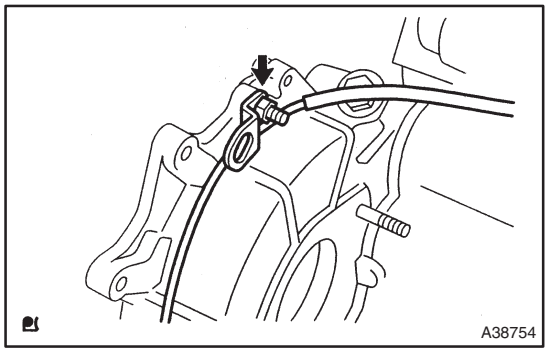


(c) Remove the oil pan sub–assy with SST.
SST 09032–00100

NOTICE:

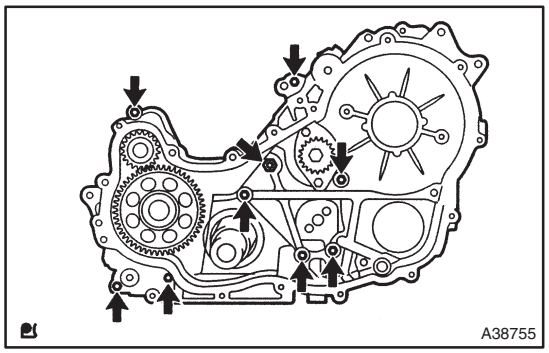
- **Do not use SST for the oil pump body side and rear oil seal retainer.**
- **Be careful not to damage the oil pan flange.**

(d) Remove the oil pan gasket.



56. REMOVE TIMING GEAR CASE ASSY

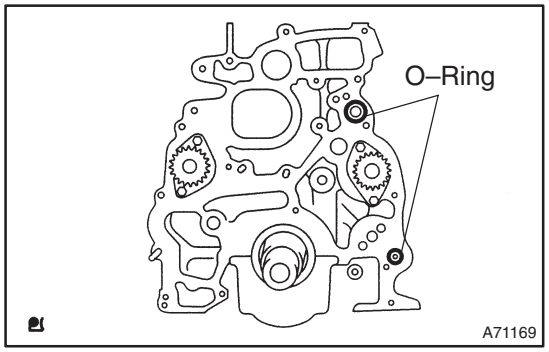
(a) Remove the nut, and remove the vacuum transmitting pipe No.1.



(b) Remove the 8 bolts and union bolt, and then remove the timing gear case and 2 O–rings.

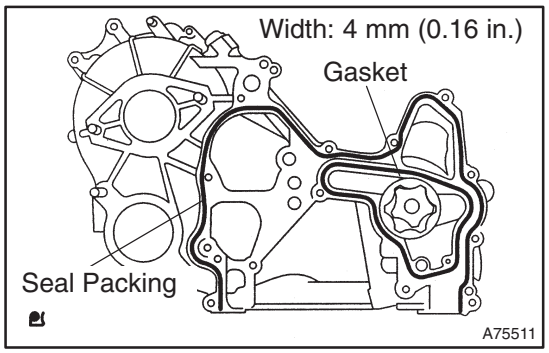
NOTICE:

Be careful not to the oil pump rotor.



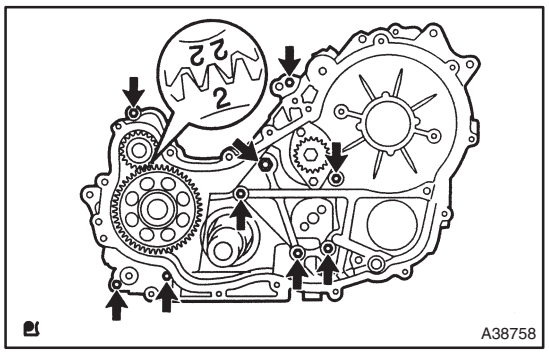
57. INSTALL TIMING GEAR CASE ASSY

(a) Set the 2 O–rings to the cylinder block.



(b) Remove old seal packing (FIPG) from the timing gear case and cylinder block.
(c) Set a new oil pump gasket to the timing gear case.
(d) Apply a seal packing to the specific places described in the illustration.
Seal packing: Part No. 08826–00080 or equivalent

NOTICE:
- **Install the timing gear case within 3 minutes and tighten the bolts within 15 minutes after applying FIPG is competed.**
- **Do not start the engine 2 hours after the installation.**



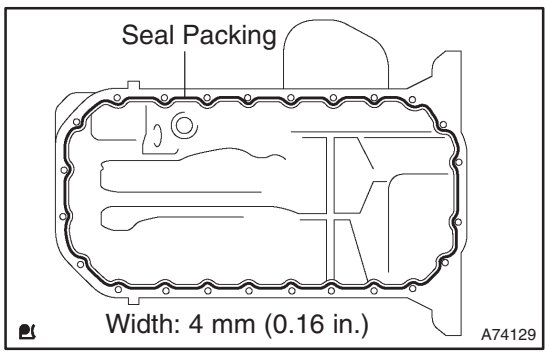
(e) Matching the matchmarks of the balanceshaft driven gear No.1 and oil pump drive gear, install the timing gear case to the cylinder block.
(f) Tighten the 8 bolts and union bolt.
Torque:
13 N·m (130 kgf·cm, 9 ft·lbf) for bolt
16 N·m (160 kgf·cm, 12 ft·lbf) for union bolt
(g) Make sure that the oil pump drive gear rotates smoothly.

NOTICE:
If this failed, loosen the 8 bolts and union bolt to release the oil pump drive gear, and retighten all these bolts again.

(h) Install the vacuum transmitting pipe No.1 with the nut.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

58. INSTALL OIL PAN SUB–ASSY

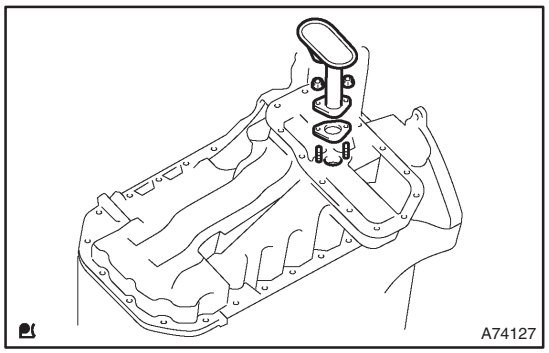
(a) Remove old seal packing (FIPG) from the oil pan sub–assy and cylinder block.



(b) Apply a seal packing to the specific places described in the illustration.
Seal pacing: Part No. 08826–00080 or equivalent

NOTICE:
- **Install the oil pan within 3 minutes and tighten its bolts within 15 minutes after applying FIPG is competed.**
- **Do not start the engine 2 hours after the installation.**

(c) Set a new oil pan gasket to the oil pan sub–assy.
(d) Install the oil pan with the 22 bolts and 2 nuts.
Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)
(e) Connect the engine oil level sensor connector.

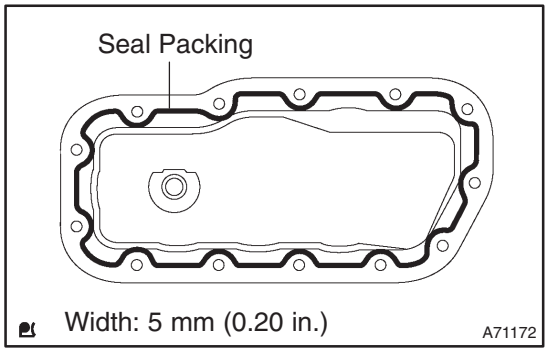


59. INSTALL OIL STRAINER SUB–ASSY

(a) Install a new gasket and oil strainer with the 2 nuts.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

60. INSTALL OIL PAN SUB–ASSY NO.2

(a) Remove old seal packing (FIPG) from the oil pan sub–assy No. 2.



(b) Apply a seal packing to the specific places described in the illustration.
Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

- **Install the oil pan No. 2 within 3 minutes and tighten its bolts and nuts within 15 minutes after applying FIPG is competed.**
- **Do not start the engine 2 hours after the installation.**

(c) Install the oil pan No. 2 with the 11 bolts and 2 nuts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

61. INSTALL OIL PAN COVER SUB–ASSY NO.1

(a) Install the oil pan cover sub–assy with the 4 bolts.
Torque: 9.0 N·m (92 kgf·cm, 80 in.·lbf)

62. INSTALL OIL COOLER OUTLET TUBE NO.1 (AUTOMATIC TRANSMISSION)

63. INSTALL OIL COOLER INLET TUBE NO.1 (AUTOMATIC TRANSMISSION)

64. INSTALL REAR END PLATE

(a) Install the rear end plate with the bolt.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

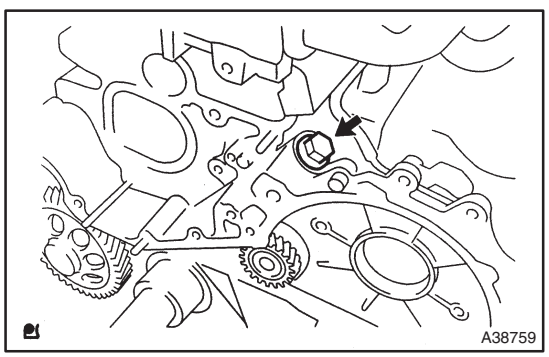
65. INSTALL FLYWHEEL SUB–ASSY (See pub. No. RM990E, 14–247)
SST 09213–58013, 09330–00021

66. INSTALL CLUTCH DISC ASSY (MANUAL TRANSMISSION) (See page 42–5)

67. INSTALL TRANSMISSION ASSY

HINT:
M/T TRANSMISSION (RA61F)... See page 41–26
A/T TRANSMISSION (A750F)... See page 40–38

68. INSTALL DIFFERENTIAL CARRIER ASSY FRONT (See pub. No. RM990E, 29–13)



69. ADD ENGINE OIL

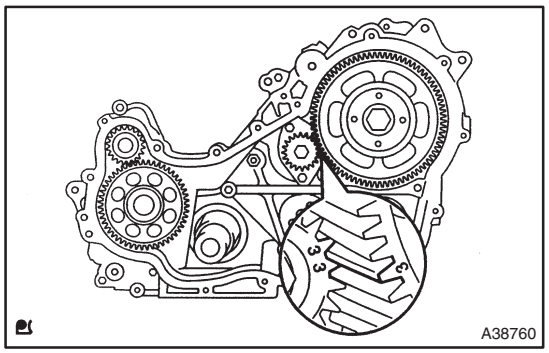
(a) Remove the plug shown in the illustration, and then pour 50 cc (3.05 cut in) of engine oil into there.

(b) Set a new gasket and reset the plug.
Torque: 44 N·m (449 kgf·cm, 33 ft·lbf)

70. INSTALL INJECTION OR SUPPLY PUMP ASSY

(a) Set a new O–ring to the supply pump.

(b) Install the supply pump with the 2 nuts.
Torque: 21 N·m (214 kgf·cm, 16 ft·lbf)



71. INSTALL INJECTION GEAR

(a) Matching the matchmarks of the injection gear and balanceshaft driven gear No. 2, install the injection gear.

NOTICE:

Fit the key (protrusion) of the supply pump to its key–slot of the injection gear.

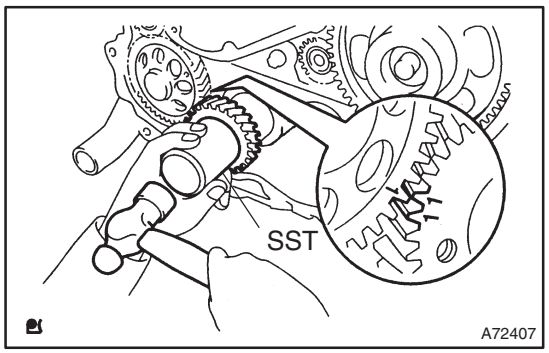
(b) Set a new O–ring, and then temporarily install the nut. Under this condition, check a thrust clearance for the supply pump drive shaft by pushing the injection gear back and forth by hand.

Thrust clearance:

0.15 to 0.55 mm (0.0059 to 0.0217 in.)

HINT:

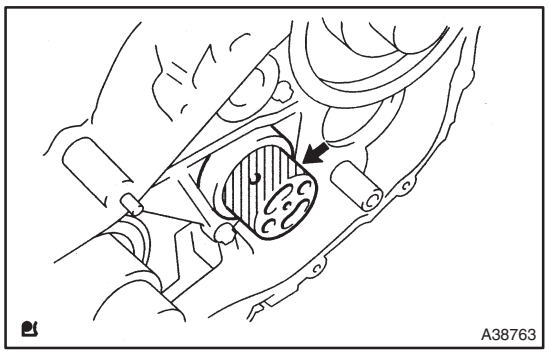
If there is no thrust clearance, remove the injection gear again and reinstall it.



72. INSTALL CRANKSHAFT TIMING GEAR OR SPROCKET

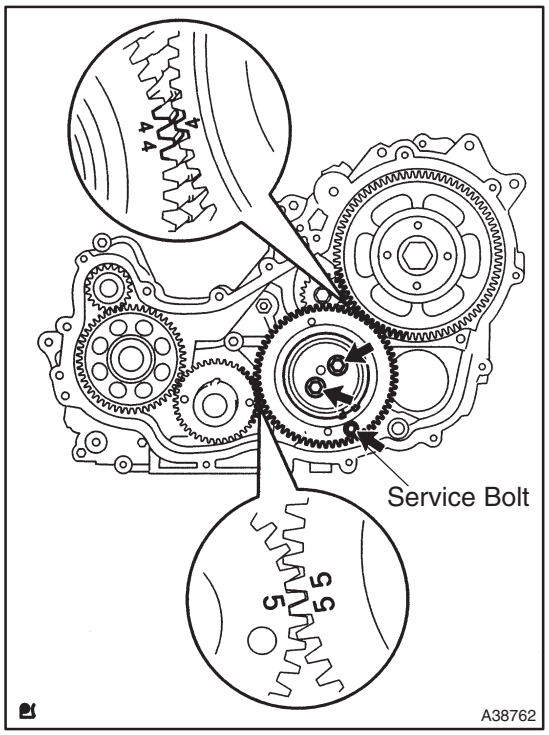
(a) Matching the matchmarks of the crankshaft timing gear and oil pump drive gear using SST, install the crankshaft timing gear.

SST 09223–00010



73. INSTALL IDLE GEAR NO.1

(a) Apply engine oil to the specific place described in the illustration, and install the idle gear shaft No.1 to the cylinder block.

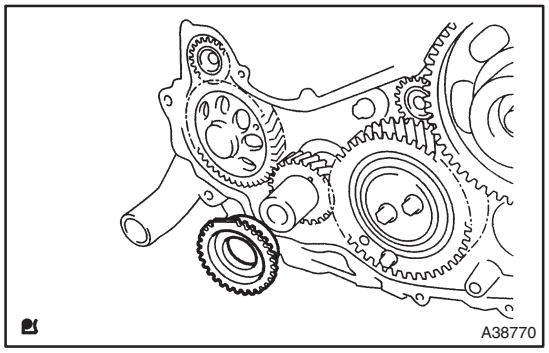


(b) Match the matchmarks of the idle gear No.1 with those of the crankshaft timing gear and injection gear respectively. Then install the idle gear No.1.

(c) Fix the idle gear No.1 with the idle gear thrust plate and 2 bolts.

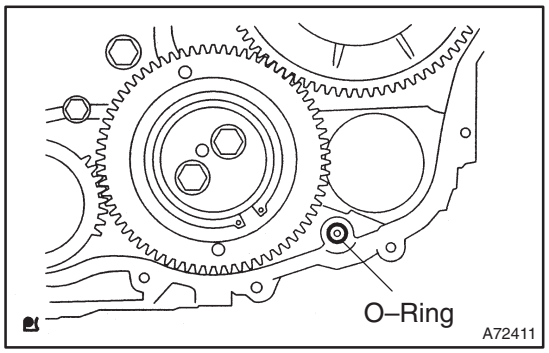
Torque: 50 N·m (510 kgf·cm, 37 ft·lbf)

(d) Remove the service bolt.



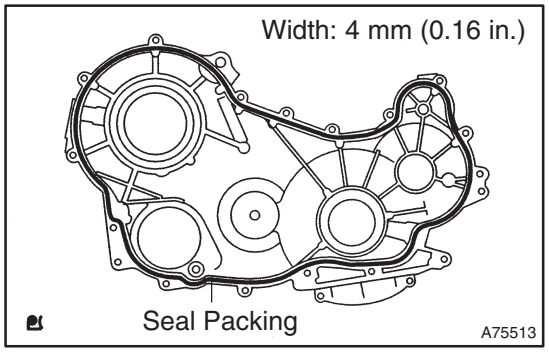
74. INSTALL CRANKSHAFT POSITION SENSOR PLATE NO.1

(a) Install the crank angle sensor plate No.1.



75. INSTALL TIMING GEAR CASE

(a) Set a new O–ring to the timing gear case.



(b) Remove old seal packing (FIPG) from the timing gear case.

(c) Apply seal packing to the specific places described in the illustration.

Seal packing: Part No. 08826–00080 or equivalent

NOTICE:

- **Install the timing case cover within 3 minutes and tighten its bolts and nuts within 15 minutes after applying FIPG is competed.**
- **Do not start the engine 2 hours after the installation.**

(d) Install the timing case cover with the 14 bolts and 2 nuts.
Torque: 13 N·m (133 kgf·cm, 10 ft·lbf)

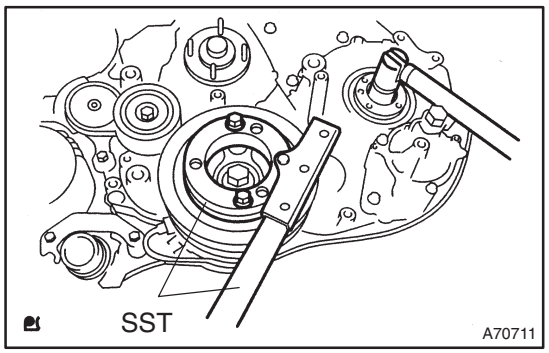
76. INSTALL CRANK POSITION NO.2 SENSOR

(a) Apply engine oil to the O–ring.
(b) Install the crank position sensor No. 2 with the bolt.
Torque: 8.5 N·m (87 kgf·cm, 75 in.·lbf)

77. INSTALL CRANK POSITION SENSOR

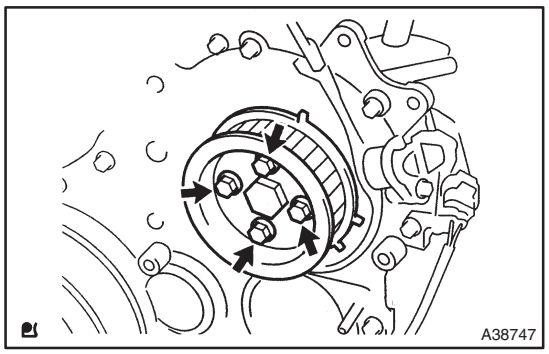
(a) Apply engine oil to the O–ring.
(b) Install the crank position sensor with the bolt.
Torque: 8.5 N·m (87 kgf·cm, 75 in.·lbf)

78. INSTALL CRANKSHAFT PULLEY (See pub. No. RM990E, 14–244)
SST 09213–58013, 09330–00021



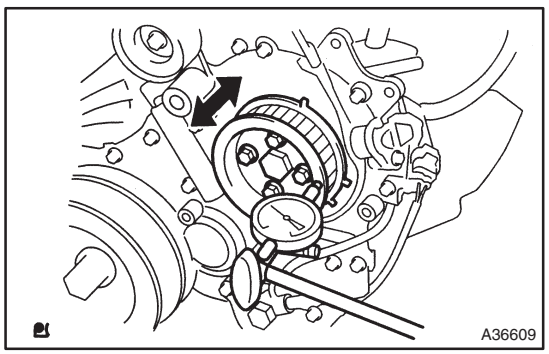
79. INSTALL SUPPLY PUMP GEAR SET NUT

(a) Hold the crankshaft with SST to tighten the nut.
SST 09213–58013, 09330–00021
Torque: 64 N·m (653 kgf·cm, 47 ft·lbf)



80. INSTALL PUMP DRIVE SHAFT PULLEY

(a) Install the camshaft timing pulley flange No. 2 and pump drive shaft pulley with the 4 bolts.
Torque: 31 N·m (316 kgf·cm, 23 ft·lbf)



81. CHECK PUMP DRIVE SHAFT THRUST CLEARANCE

(a) Check a thrust clearance for the supply pump drive shaft by pushing the camshaft timing pulley flange No. 2 back and forth by hand.
Thrust clearance: 0.15 to 0.55 mm (0.0059 to 0.0217)

NOTICE:
The notch of the crankshaft pulley must be located at 30 degree in counterclockwise direction from the TDC.

HINT:
If there is no thrust clearance, disassemble the parts to remove the timing gear case again, and reassemble them.

82. INSTALL VANE PUMP ASSY

(a) Set a new O–ring, and install the vane pump assy with the 2 nuts.
Torque: 39 N·m (398 kgf·cm, 29 ft·lbf)

83. INSTALL VANE PUMP OIL RESERVOIR ASSY

(a) Install the vane pump oil reservoir assy with the 3 bolts.
Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)

84. INSTALL VACUUM PUMP ASSY

(a) Set a new O–ring, and install the vacuum pump assy with the 2 nuts.
Torque: 21 N·m (214 kgf·cm, 16 ft·lbf)

(b) Connect the union to connector tube hose (w/o VSC).

(c) Connect the vacuum hose.

85. INSTALL WATER PUMP ASSY (See page 16–27)

86. INSTALL TIMING BELT NO.2 COVER (See page 14–218)

87. INSTALL TIMING BELT IDLER SUB–ASSY NO.1 (See page 14–218)

(a) Using a socket hexagon wrench, install the timing belt idler No.1.
SST 99999–60018
Torque: 35 N·m (355 kgf·cm, 26 ft·lbf)

88. INSTALL CAMSHAFT TIMING PULLEY (See page 14–218)

(a) Using a monkey wrench to hold the hexagonal part of the camshaft, install the installation bolt of the camshaft timing pulley.
Torque: 98 N·m (1000 kgf·cm, 72 ft·lbf)

89. INSTALL CYLINDER HEAD COVER SUB–ASSY (See page 11–52)

90. INSTALL FUEL INLET PIPE SUB–ASSY (See page 11–67)

NOTICE:

Replace the fuel inlet pipe with a new one when replacing the timing gear case assy.

SST 09023–12701

91. INSTALL INJECTION PIPE (See page 11–52)

SST 09023–12701

92. INSTALL CYLINDER HEAD COVER SUB–ASSY NO.2 (See page 14–218)

93. INSTALL GENERATOR BRACKET

(a) Temporarily install the generator bracket with the bolt.
Torque: 21 N·m (214 kgf·cm, 16 ft·lbf)

NOTICE:

Tighten the bolt after the generator assy installation.

94. INSTALL COMPRESSOR MOUNTING BRACKET NO.1 (See page 13–10)

95. INSTALL IDLE PULLEY ASSY (See page 13–10)

96. INSTALL GENERATOR ASSY (See pub. No. RM990E, 19–40)

97. INSTALL COMPRESSOR AND MAGNETIC CLUTCH (W/ AIR CONDITIONING)

(a) Install the cooler compressor assy w/ magnet clutch assy with the 4 bolts.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

98. INSTALL AIR CLEANER ASSY

(a) Install the air cleaner case sub–assy with the 3 bolts.
Torque: 12 N·m (122 kgf·cm, 9 ft·lbf)

(b) Install the air cleaner element.

(c) Install the air cleaner cap with air cleaner hose No.1.

(d) Connect the intake air flow meter S/A connector, and install the wire harness.

99. INSTALL DIESEL THROTTLE BODY ASSY (See page 10–22)

100. INSTALL INTERCOOLER ASSY (See page 13–18)

101. INSTALL INTERCOOLER PROTECTOR

(a) Install the intercooler protector with the 5 bolts.
Torque: 7.0 N·m (71 kgf·cm, 62 in.·lbf)

102. INSTALL TIMING BELT (See pub. No. RM990E, 14–214)

103. INSTALL TIMING BELT NO.1 COVER

(a) Install the timing belt cover No.1 with the 6 bolts.
Torque: 6.0 N·m (61 kgf·cm, 53 in.·lbf)

(b) Install the wire harness clamp.

(c) Install the water hose clamp with the bolt.
Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)

104. INSTALL FAN PULLEY

105. INSTALL FAN W/ FLUID COUPLING

(a) Install the fan w/ fluid coupling with the 4 nuts.
Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)

106. INSTALL FAN AND GENERATOR V BELT (See pub. No. RM990E, 14–189)

107. INSTALL FAN SHROUD

(a) Temporarily place the fan shroud at the correct location inside the engine room.

108. INSTALL RADIATOR ASSY (See pub. No. RM990E, 16–55)

109. ADD ENGINE OIL

110. ADD ENGINE COOLANT (See pub. No. RM990E, 16–50)

111. CHECK FOR ENGINE OIL LEAKS

112. CHECK FOR ENGINE COOLANT LEAKS (See pub. No. RM990E, 16–38)

113. CHECK FOR FUEL LEAKS (See page 11–46)

114. INSTALL ENGINE UNDER COVER ASSY REAR

(a) Install the engine under cover rear with the 4 bolts.
Torque: 29 N·m (296 kgf·cm, 21 ft·lbf)

115. INSTALL ENGINE UNDER COVER SUB–ASSY NO.1

(a) Install the engine under cover No.1 with the 4 bolts.
Torque: 29 N·m (296 kgf·cm, 21 ft·lbf)