1411S–01

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 ENGINE COOLANT (See page 16–50)

4. REMOVE AIR CLEANER ASSY

(a) Disconnect the mass air flow meter S/A connector, dad 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.

5. REMOVE RADIATOR SUPPORT SEAL UPPER

(a) Remove the 11 clips and radiator support seal upper.

6. REMOVE WIRE HARNESS (W/ COLD AREA)

(a) Remove the wire harness from the fan shroud.

7. REMOVE RADIATOR RESERVE TANK ASSY

(a) Remove the radiator reserve tank hose.

(b) Remove the 3 bolts and radiator reserve tank.

8. REMOVE RADIATOR HOSE NO.1

9. REMOVE FAN AND GENERATOR V BELT (See page 14–189)

HINT:

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

10. REMOVE FAN SHROUD

(a) Remove the oil cooler inlet hose and outlet hose from the hose clamp. (AT TRANSMISSION)

(b) Remove the 4 nuts for the fan with fluid coupling assy and 2 bolts for the fan shroud.

(c) Remove the fan with fluid coupling assy together with the fan shroud.

11. REMOVE FAN PULLEY

12. REMOVE INTERCOOLER PROTECTOR (See page 13–30)

13. REMOVE INTERCOOLER ASSY (See page 10–31)

14. REMOVE AIR HOSE NO.1

15. REMOVE INTAKE AIR CONNECTOR

(a) Loosen the hose clamp, and disconnect the intake air connector and remove the air hose No. 2.

16. REMOVE VACUUM SWITCHING VALVE ASSY NO.1 (See page 10–31)

17. REMOVE DIESEL THROTTLE BODY ASSY (See page 10–31)

18. REMOVE TIMING BELT NO.1 COVER (See page 14–214)

19. REMOVE TIMING BELT (See page 14–214)

20. REMOVE VISCOUS W/MAGNET CLUTCH HEATER ASSY (W/ COLD AREA)

(a) Remove the 2 hoses from the viscous heater assy.

(b) Remove the 2 bolts and viscous heater bracket No. 2.

(c) Remove the 2 bolts and the viscous heater assy.

21. REMOVE VISCOUS HEATER BRACKET SUB–ASSY (W/ COLD AREA)

(a) Disconnect the connector from cooler compressor.

(b) Remove the 4 bolts and cooler compressor assy.

HINT:

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

(c) Remove the 4 bolts and viscous heater bracket.

22. REMOVE VENTILATION PIPE

(a) Remove the bolt and ventilation pipe.

23. REMOVE OIL LEVEL GAGE GUIDE

(a) Remove the oil level gage first, and the oil level gage guide as well.

24. REMOVE TURBOCHARGER SUB–ASSY

(a) Remove the 4 bolts and exhaust manifold heat insulator.

(b) Remove the 3 nuts and exhaust manifold together with turbo charger.

25. REMOVE CYLINDER HEAD COVER SUB–ASSY NO.2 (See page 14–223)

26. REMOVE FUEL INLET PIPE SUB–ASSY (See page 11–122)

27. REMOVE INJECTION PIPE (See page 11–106)

28. REMOVE VANE PUMP OIL RESERVOIR ASSY

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

HINT:

It is necessary that remove the hose from the vane pump oil reservoir assy when you remove that assembly. Also, for your work in the rest of the following removal process, you may put and hang the removed oil reservoir assy with a rope to an appropriate location of the vehicle.

29. DISCONNECT FUEL HOSE

30. DISCONNECT WATER BY–PASS HOSE NO.3

31. REMOVE CYLINDER HEAD COVER SUB–ASSY (See page 14–214)

32. REMOVE CAMSHAFT TIMING PULLEY (See page 14–223)

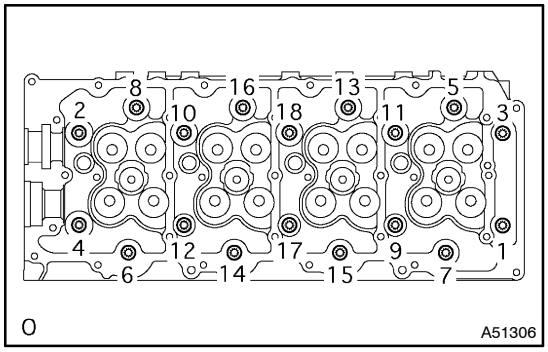
33. REMOVE TIMING BELT IDLER SUB–ASSY NO.1 (See page 14–223)

34. REMOVE TIMING BELT NO.2 COVER (See page 14–223)

35. DISCONNECT WIRE HARNESS

36. REMOVE INJECTOR ASSY (See page 11–106)

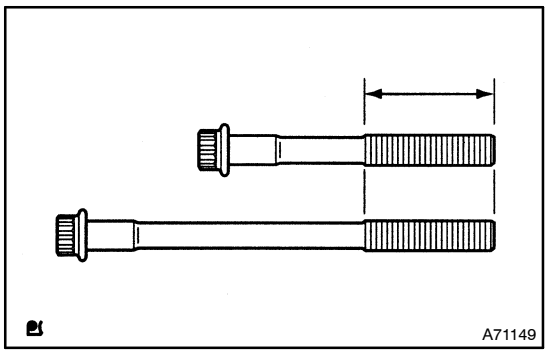
37. REMOVE CAMSHAFT (See page 14–223)



38. REMOVE CYLINDER HEAD SUB–ASSY

(a) Loosen the cylinder head bolts equally and gradually in the order shown in the illustration to remove them and its washers.

39. REMOVE CYLINDER HEAD GASKET



40. INSPECT CYLINDER HEAD SET BOLT

(a) Measure within the specific area shown in the illustration using a vernier caliper.

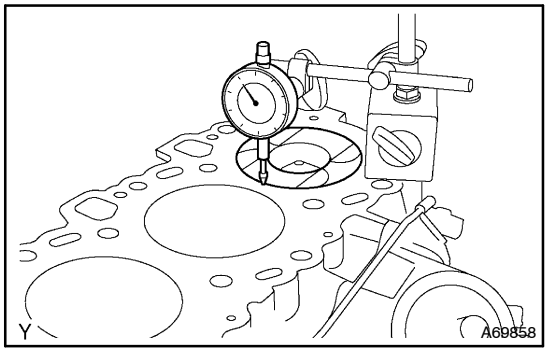
Standard outer diameter:

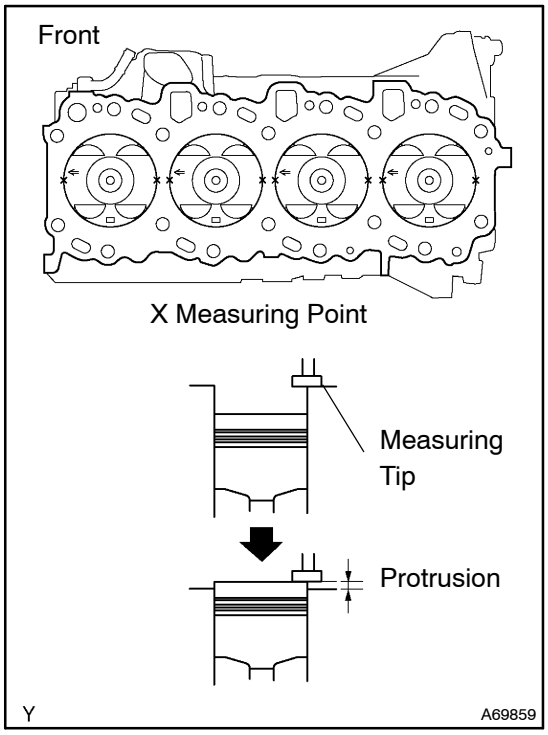
11.76 – 11.97 mm (0.463 – 0.471 in.)

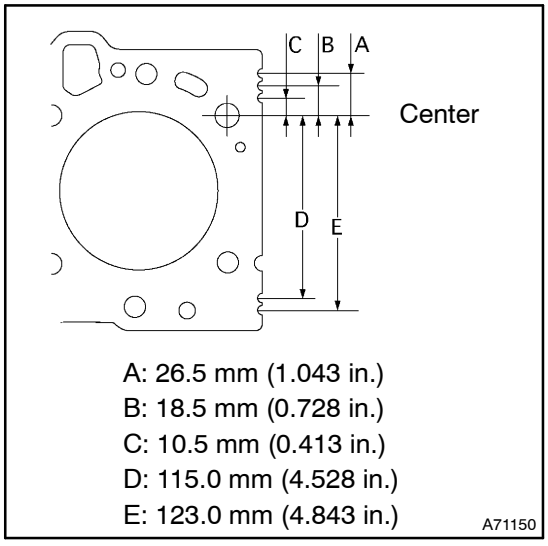
Minimum outer diameter: 11.60 mm (0.457 in.)

HINT:

Measure the diameter at several locations within the specified area, and replace the bolt to a new one if a result value would be less than the minimum diameter value.







41. INSTALL CYLINDER HEAD GASKET

(a) Checking the each piston head protrusion.

(1) Using a dial indicator, measure how length a piston head juts out from the top surface of the cylinder head.

NOTICE:

Set the dial indicator in an upright position to the cylinder block.

(2) Measure each cylinder at 2 places as shown in the illustration, making a total of 8 measurement.

(3) For the piston protrusion value of each cylinder, use the average of the 2 measurements of each cylinder.

Protrusion: 0.005 – 0.255 mm (0.00020 – 0.01004 in.)

HINT:

Measurement should be done at two locations, forward and backward, of each piston head.

(b) Selecting an appropriate cylinder head gasket.

HINT:

Each cylinder head gasket A to E has a unique notch position at its back–end, which helps you to identify an individual gasket.

(1) Find the maximum value among all the measurement piston head protrusion length to select an appropriate cylinder head gasket from A to E.

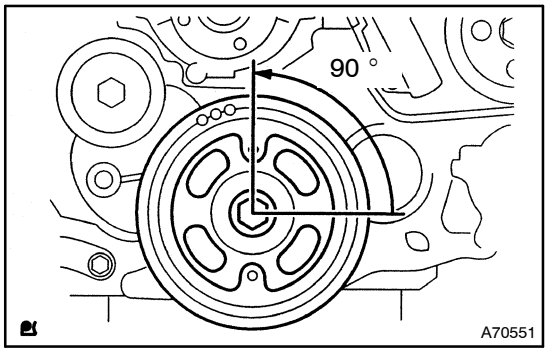
Gasket size	Piston protrusion mm (in.)
A	0.005 – 0.054 (0.0002 – 0.00213)
B	0.055 – 0.104 (0.00217 – 0.00409)
C	0.105 – 0.154 (0.00413 – 0.00606)
D	0.155 – 0.204 (0.00610 – 0.00803)
E	0.205 – 0.255 (0.00807 – 0.01004)

Cylinder head gasket thickness:

Gasket size	Gasket thickness mm (in.)
A	0.80 – 0.90 (0.0315 – 0.0354)
B	0.85 – 0.95 (0.0335 – 0.0374)
C	0.90 – 1.00 (0.0354 – 0.0394)
D	0.95 – 1.05 (0.0374 – 0.0413)
E	1.00 – 1.10 (0.0394 – 0.0433)

(2) Install the selected gasket to the cylinder block.

NOTICE:
Cleanse a top surface of the cylinder block and an underside of the cylinder head.



42. INSTALL CYLINDER HEAD SUB–ASSY

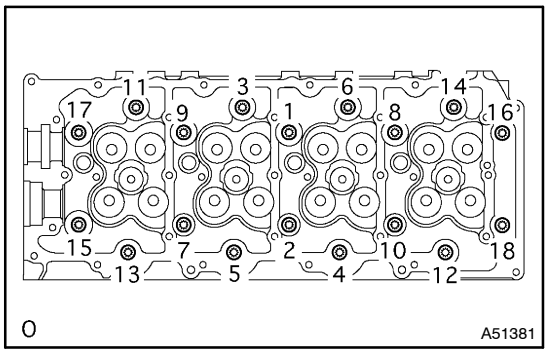
(a) Set the crankshaft at 90° position in a counterclockwise direction from TDC.

(b) Set a new cylinder head gasket and install the cylinder head.

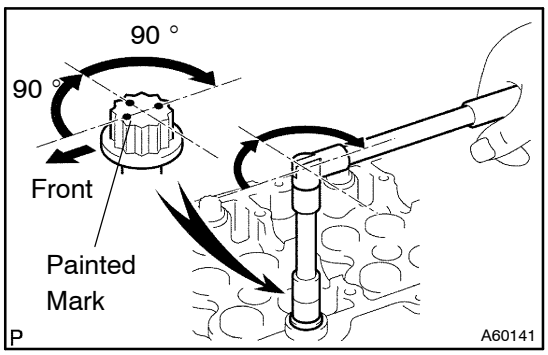
HINT:
Temporarily set the new gasket to the turbocharger before install the cylinder head.

(c) Apply a bit of the engine oil to the each cylinder head bolts screw, likewise, to each washer.

(d) Set the washers to the cylinder head bolts, and insert the bolts to the cylinder head.



(e) Tighten the cylinder head bolts equally in the specific order shown in the illustration in a few times, and then fasten them with the specified torque completely.
Torque: 85 N·m (867 kgf·cm, 63 ft·lbf)



(f) Mark a dot as paint mark on the top surface of the cylinder bolt head toward the engine front direction.

(g) Tighten each cylinder head bolt in 90°.

HINT:
The cylinder head bolts must be tightened in the specified order.

(h) Again, tighten the bolts in 90°.

(i) Make sure that all the paint marks toward the opposite side to the engine front direction.

43. INSTALL CAMSHAFT (See page 14–223)
44. INSTALL INJECTOR ASSY (See page 11–106)
45. INSPECT FUEL LEAK (See page 11–106)
46. CONNECT WIRE HARNESS
47. INSTALL TIMING BELT NO.2 COVER (See page 14–223)
48. INSTALL TIMING BELT IDLER SUB–ASSY NO.1 (See page 14–223)
49. INSTALL CAMSHAFT TIMING PULLEY (See page 14–223)
50. INSTALL CYLINDER HEAD COVER SUB–ASSY (See page 14–214)
51. INSTALL WATER BY–PASS HOSE NO.3
52. INSTALL FUEL HOSE

53. INSTALL VANE PUMP OIL RESERVOIR ASSY

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

54. INSTALL INJECTION PIPE (See page 11–106)

55. INSTALL FUEL INLET PIPE SUB–ASSY (See page 11–122)

NOTICE:
Replace the fuel inlet pipe assy to new when replacing the cylinder head gasket.

56. INSTALL CYLINDER HEAD COVER SUB–ASSY NO.2 (See page 14–223)

57. INSTALL TURBOCHARGER SUB–ASSY

(a) Set a new gasket, and install the exhaust manifold and turbocharger with its 3 nuts.
Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)

(b) Install the exhaust manifold heat insulator with its 4 bolts.
Torque: 12 N·m (122 kgf·cm, 9 ft·lbf)

58. INSTALL OIL LEVEL GAGE GUIDE

(a) Install a new O–ring to the oil level gage guide.

(b) Install the oil level gage guide with its bolt.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

59. INSTALL VENTILATION PIPE

(a) Install the ventilation pipe with its bolt.
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

60. INSTALL VISCOUS HEATER BRACKET SUB–ASSY (W/ COLD AREA)

(a) Install the viscous heater bracket with its 4 bolts.
Torque: 47 N·m (479 kgf·cm, 35 ft·lbf)

(b) Install the cooler compressor assy with its 4 bolts.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(c) Connect the connector to the cooler compressor assy.

61. INSTALL VISCOUS W/MAGNET CLUTCH HEATER ASSY (W/ COLD AREA)

(a) Install the viscous heater assy with its 2 bolt.
Torque: 45 N·m (459 kgf·cm, 33 ft·lbf)

(b) Install the viscous heater bracket No. 2 with its 2 bolts.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

62. INSTALL TIMING BELT (See page 14–214)

63. 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)

64. INSTALL DIESEL THROTTLE BODY ASSY (See page 10–31)

65. INSTALL VACUUM SWITCHING VALVE ASSY NO.1 (See page 10–31)

66. INSTALL INTAKE AIR CONNECTOR

(a) Connect the intake air connector, and install the new air hose No. 2.

(b) Fasten the hose clamp.

67. INSTALL AIR HOSE NO.1

68. INSTALL INTERCOOLER ASSY (See page 10–31)

69. INSTALL INTERCOOLER PROTECTOR

(a) Install the intercooler protector with the 5 bolts.
Torque: 6.0 N·m (61 kgf·cm, 53 in.·lbf)

70. INSTALL FAN PULLEY

71. INSTALL FAN SHROUD

(a) Temporarily place the fan shroud together with the fan with fluid coupling assy to the correct location inside the engine room first.

(b) Install the fan shroud to the radiator with its 2 bolts.
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

(c) Install the fan with fluid coupling assy to the water pump with its 4 nuts.
Torque: 18 N·m (184 kgf·cm, 13 ft·lbf)

(d) Install the oil cooler inlet hose and outlet hose to the hose clamp. (AT TRANSMISSION)

72. INSTALL FAN AND GENERATOR V BELT (See page 14–189)

73. INSTALL RADIATOR HOSE NO.1

74. INSTALL RADIATOR RESERVE TANK ASSY

(a) Install the radiator reserve tank with its 3 bolts.
Torque: 5 N·m (51 kgf·cm, 44 in.·lbf)

(b) Install the radiator reserve tank hose.

75. INSTALL WIRE HARNESS (W/ COLD AREA)

(a) Install the wire harness to the fan shroud.

76. INSTALL RADIATOR SUPPORT SEAL UPPER

(a) Install the radiator support seal upper with its 11 clips.

77. INSTALL AIR CLEANER ASSY

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

(b) Install the air cleaner filter element and air cleaner cap with air cleaner hose No. 1.

(c) Connect the mass air flow meter S/A and install the wire harness.

78. ADD ENGINE COOLANT (See page 16–50)

79. CHECK FOR ENGINE COOLANT LEAKS

80. CHECK FUEL LEAK (See page 11–101)

81. CHECK EXHAUST LEAKAGE

82. INSTALL ENGINE UNDER COVER ASSY REAR

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

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

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