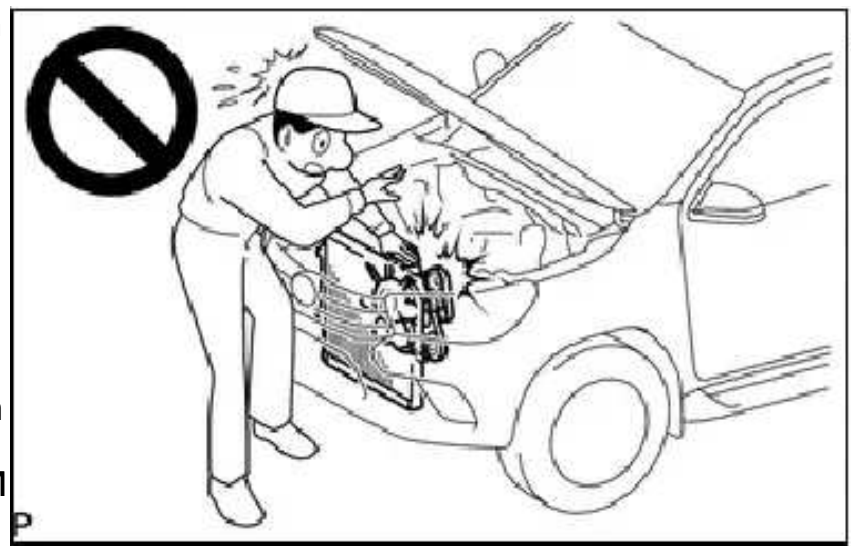
ENGINE > ON-VEHICLE INSPECTION

CAUTION:

To prevent injury due to contact with an operating fan and generator V belt or cooling fan, keep your hands and clothing away from the fan and generator V belt and cooling fans when working in the engine compartment with the engine running.

HINT:

The type of ignition switch used on this model differs according to the specifications of the vehicle. For the expressions listed in this section, refer to the "Ignition Switch Expressions" precaution.
Click here STARTING (2GD-FTV) > STARTING SYSTEM > PRECAUTION



A343690

1. INSPECT ENGINE COOLANT

Click here COOLING (2GD-FTV) > COOLING SYSTEM > ON-VEHICLE INSPECTION > INSPECT ENGINE COOLANT QUALITY

2. INSPECT ENGINE OIL

Click here LUBRICATION (2GD-FTV) > LUBRICATION SYSTEM > ON-VEHICLE INSPECTION > INSPECT OIL QUALITY

3. INSPECT BATTERY

Click here BATTERY / CHARGING (2GD-FTV) > CHARGING SYSTEM > ON-VEHICLE INSPECTION > CHECK BATTERY CONDITION

4. INSPECT V-RIBBED BELT TENSIONER ASSEMBLY

Click here ENGINE MECHANICAL (2GD-FTV) > DRIVE BELT > ON-VEHICLE INSPECTION > INSPECT V-RIBBED BELT TENSIONER ASSEMBLY

5. CHECK VALVE LASH ADJUSTER NOISE

a. Rev the engine several times. Check that the engine does not emit unusual noises.
If unusual noises occur, warm up the engine and idle it for more than 30 minutes. Then perform the inspection above again.
If any defects or problems are found during the inspection above, perform a valve lash adjuster inspection.

6. INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY

a. Remove the air cleaner filter element sub-assembly from the air cleaner case.

b. Check that the air cleaner filter element sub-assembly is not excessively dirty.
If the air cleaner filter element sub-assembly is excessively dirty, replace the air cleaner filter element sub-assembly.
If cleaning the air cleaner filter element sub-assembly. blow compressed air to clean it.
NOTICE:

- **Do not start the engine with the air cleaner filter element sub-assembly removed, as this may damage the engine.**

- **When using an air cleaner filter element sub-assembly that uses compressed air, wear safety glasses and a dust mask in order to protect your health.**

HINT:

When an excessive amount of dirt is present, replace the air cleaner filter element sub-assembly.

c. Reinstall the air cleaner filter element sub-assembly to the air cleaner case.

7. INSPECT ENGINE IDLE SPEED

a. Warm up and stop the engine.

b. When using the GTS:

HINT:

- **For more information about the GTS, refer to its operator's manual.**

- **If the GTS is not available, use a tachometer as a substitute.**

i. Connect the GTS to the DLC3.

ii. Start the engine and idle it.

iii. Enter the following menus: Powertrain / Engine and ECT / Data List / Engine Speed.

Powertrain > Engine and ECT > Data List

Tester Display
Engine Speed

Execute

c. When not using the GTS:

i. Connect a tester probe of a tachometer to terminal 9 (TAC) of the DLC3 with SST.

SST
09843-18040

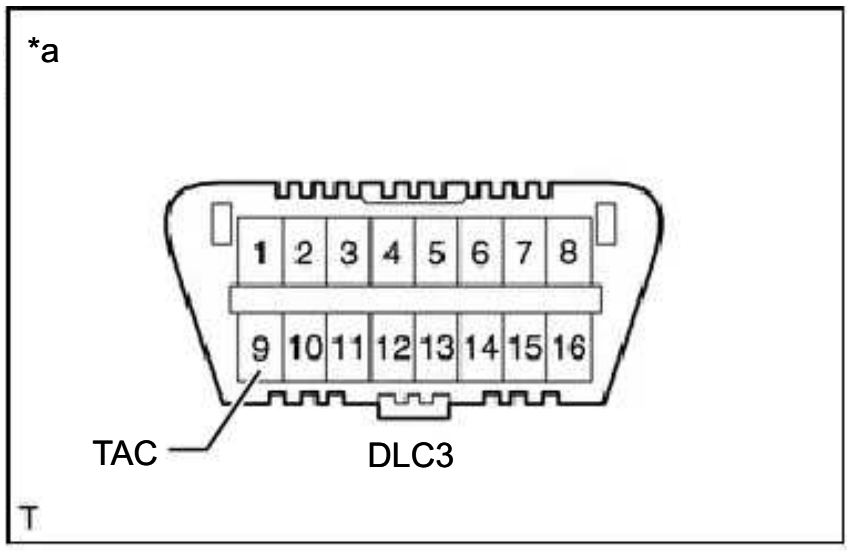
ii. Start the engine and idle it.

d. Inspect the engine idle speed.

Standard idle speed:
800 to 900 rpm

NOTICE:

- **Turn all the electrical systems and A/C off.**



H100769C25

*a	Front view of DLC3

- **When checking the idle speed, move the shift lever to neutral.**

e. Turn the ignition switch off.

f. Disconnect the GTS or tachometer tester probe from the DLC3.

8. INSPECT MAXIMUM ENGINE SPEED

a. Start the engine.

b. Fully depress the accelerator pedal.

c. Check the maximum engine speed.

Maximum engine speed:
4450 to 4750 rpm

9. INSPECT COMPRESSION

a. Warm up and stop the engine.

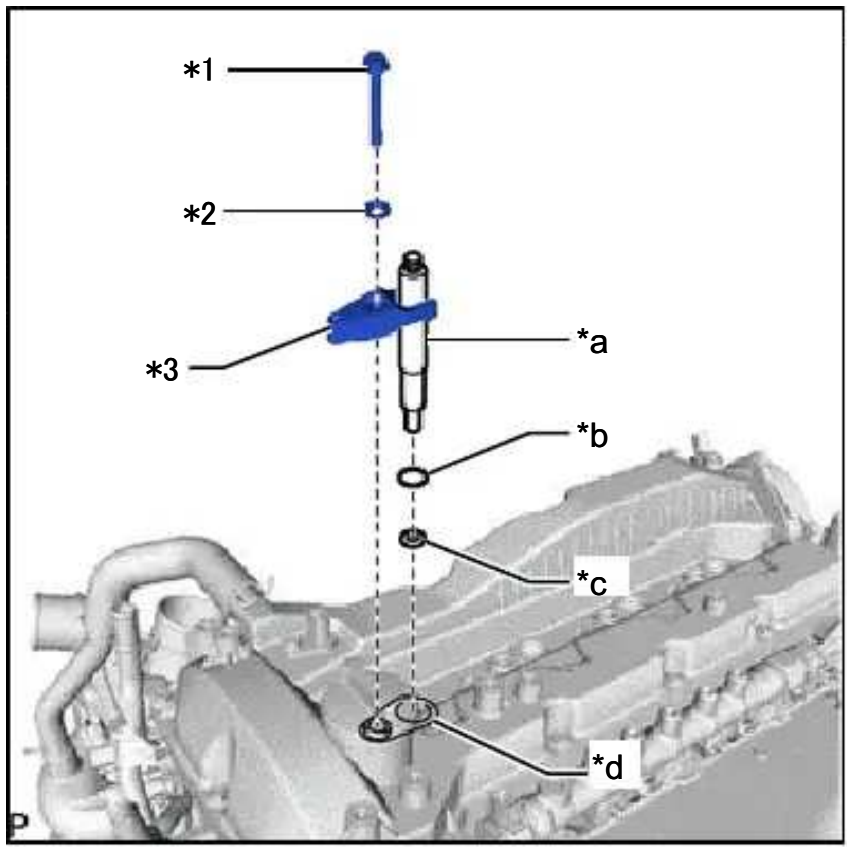
b. Remove the 4 injector assemblies.
Click here FUEL (2GD-FTV) > FUEL INJECTOR > REMOVAL

c. Inspect the cylinder compression pressure.

i. Install a new nozzle holder gasket, new injection nozzle seat, new O-ring, SST (attachment I), nozzle holder clamp and washer to the cylinder head cover sub-assembly with the bolt.

SST
09992-19015 (09992-10120)

Torque:
21 N*m (214 kgf*cm, 15 ft.*lbf)



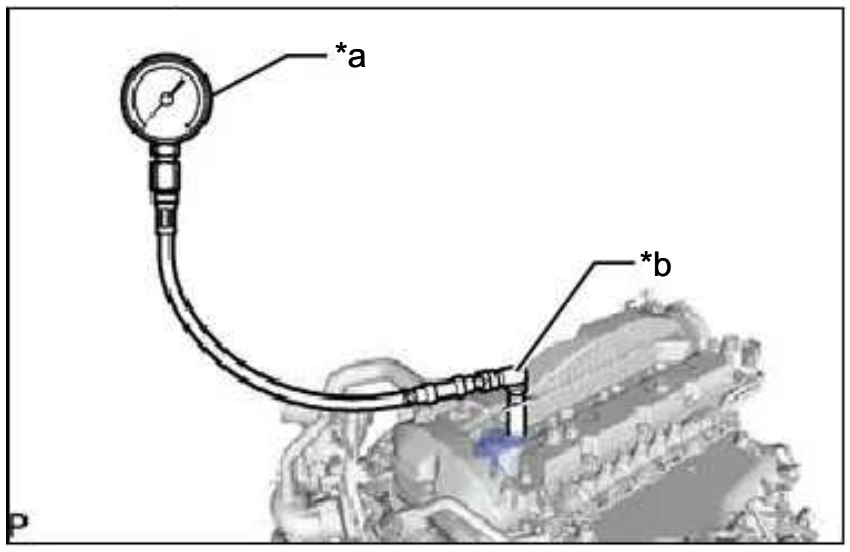
A340280C01

*1	Bolt
*2	Washer
*3	Nozzle Holder Clamp
*a	SST (Attachment I)
*b	New O-Ring
*c	New Injection Nozzle Seat
*d	New Nozzle Holder Gasket

ii. Connect SST (gauge assembly), SST (packing set) and SST (L-joint) to SST (attachment I).

SST

09992-19015 (09992-10010, 09992-10020, 09992-10030)



A340281C01

*a	SST (Compression Gauge)
*b	SST (Joint)

iii. While cranking the engine, measure the compression pressure.

Standard compression pressure:

2700 kPa (27.5 kgf/cm^2, 392 psi) or higher

Minimum pressure:

2200 kPa (22.4 kgf/cm^2, 319 psi)

Difference between each cylinder:

500 kPa (5.1 kgf/cm^2, 73 psi) or less

NOTICE:

- **Use a fully-charged battery so the engine speed can be increased to 280 rpm or more.**
- **Inspect the other cylinders in the same way.**
- **Measure the compression as quickly as possible.**

iv. If the cylinder compression is low, pour a small amount of engine oil into the cylinder through the injector holes, and then inspect it again.

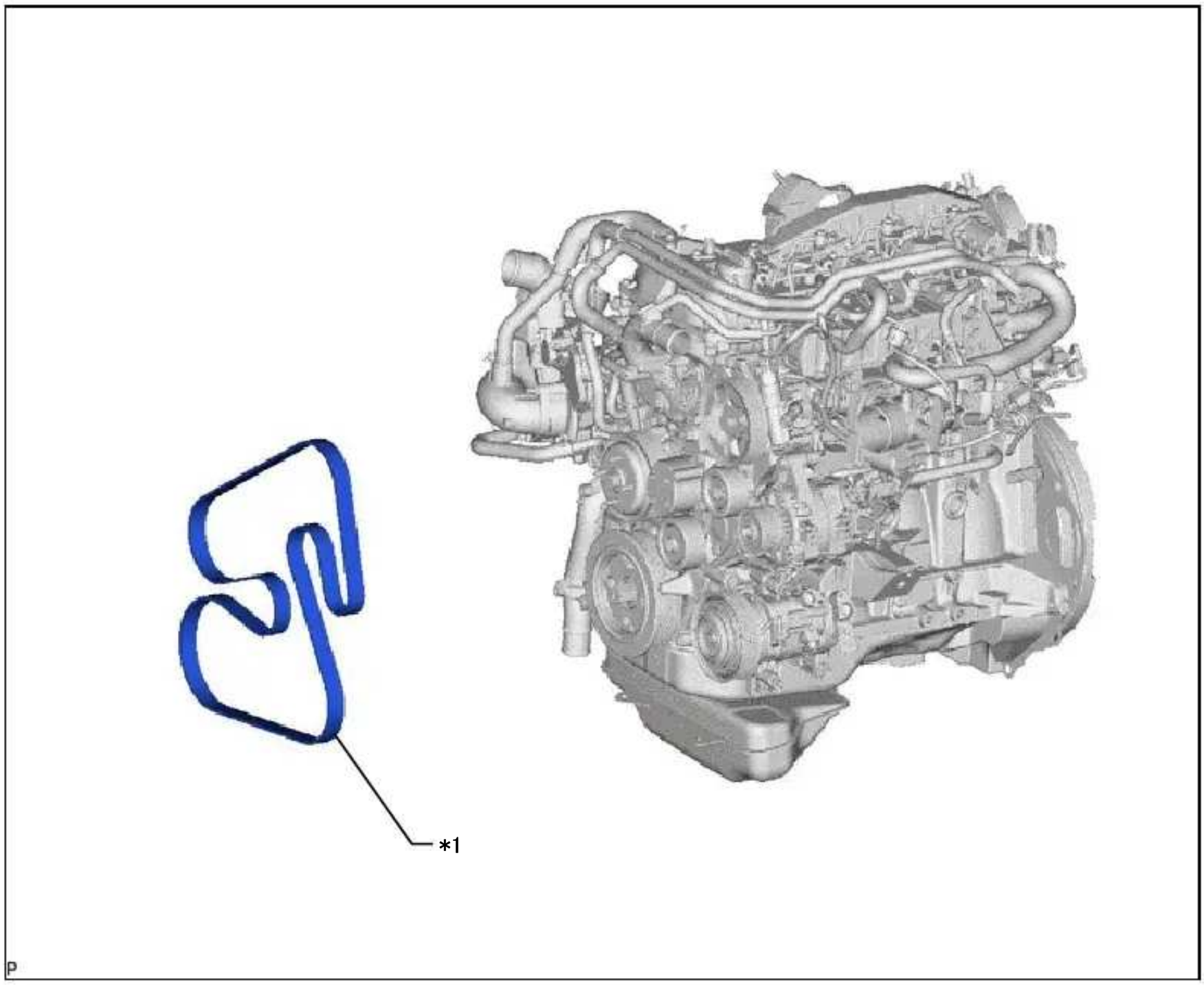
If adding oil increases the compression pressure, the piston rings and/or cylinder bore may be worn or damaged.

If the pressure stays low, the valve may be stuck or seated improperly, or there may be leakage from the gasket.

d. Remove SST.

e. Install the 4 injector assemblies.

Click here FUEL (2GD-FTV) > FUEL INJECTOR > INSTALLATION



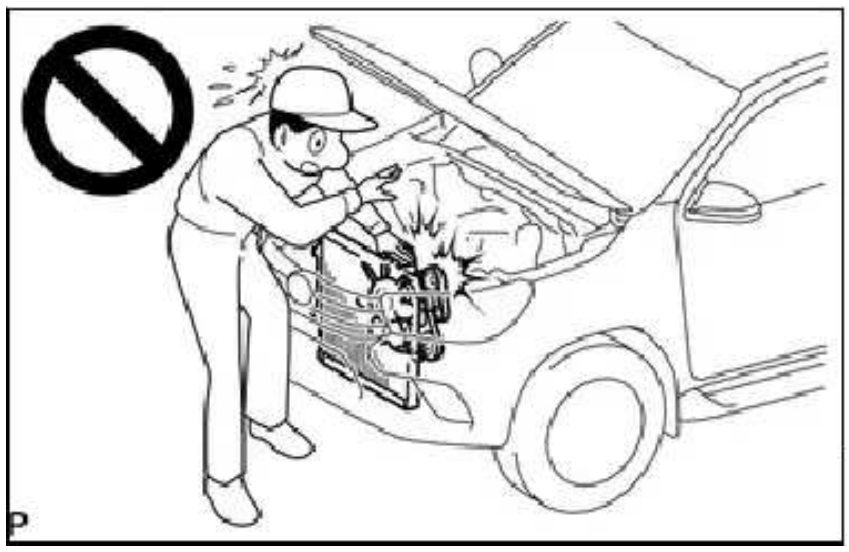
A343933C01

*1	FAN AND GENERATOR V BELT	-	-

DRIVE BELT > ON-VEHICLE INSPECTION

CAUTION:

To prevent injury due to contact with an operating fan and generator V belt or cooling fan, keep your hands and clothing away from the fan and generator V belt and cooling fans when working in the engine compartment with the engine running.



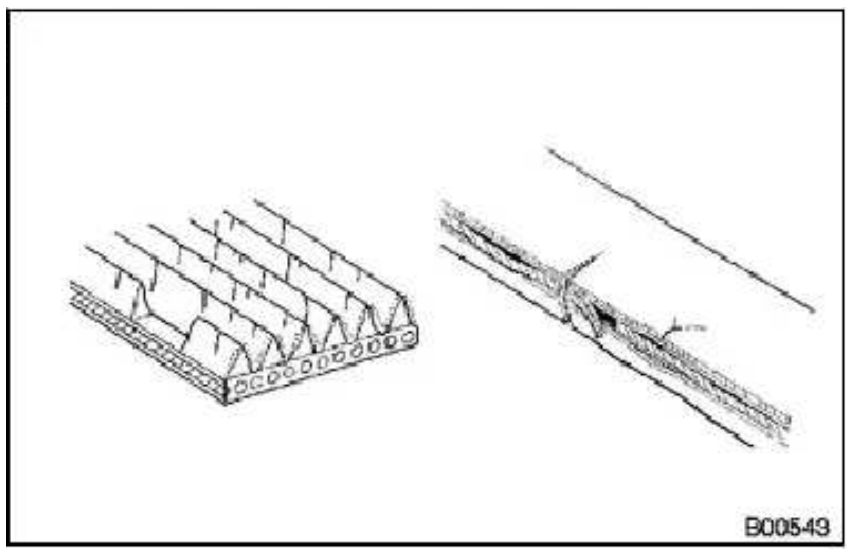
A343690

1. INSPECT FAN AND GENERATOR V BELT

a. Check the belt for wear, cracks or other signs of damage.

If any of the following defects is found, replace the fan and generator V belt.

- The fan and generator V belt is cracked.
- The fan and generator V belt is worn out to the extent that the cords are exposed.
- The fan and generator V belt has chunks missing from the ribs.

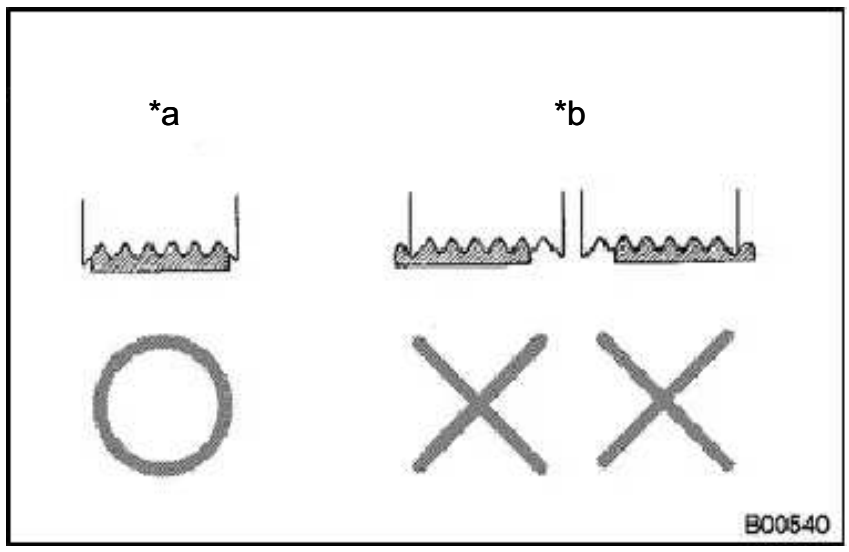


B000543

b. Check that the fan and generator V belt fits properly in the ribbed grooves.

HINT:

Check with your hand to confirm that the fan and generator V belt has not slipped out of the grooves on the bottom of the pulley. If it has slipped out, replace the fan and generator V belt. Install a new fan and generator V belt correctly.



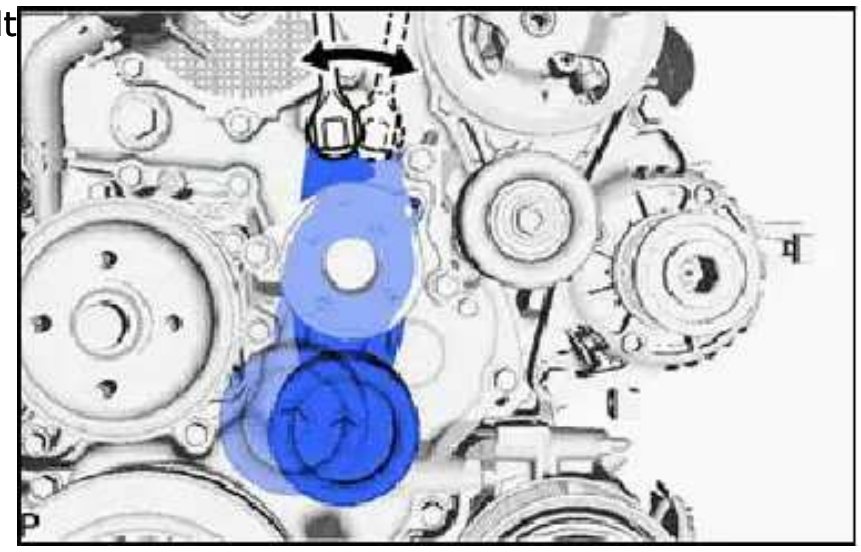
B000540C05

*a	CORRECT
*b	INCORRECT

2. INSPECT V-RIBBED BELT TENSIONER ASSEMBLY

a. Remove the fan and generator V belt.
Click here ENGINE MECHANICAL (2GD-FTV) > DRIVE BELT > REMOVAL

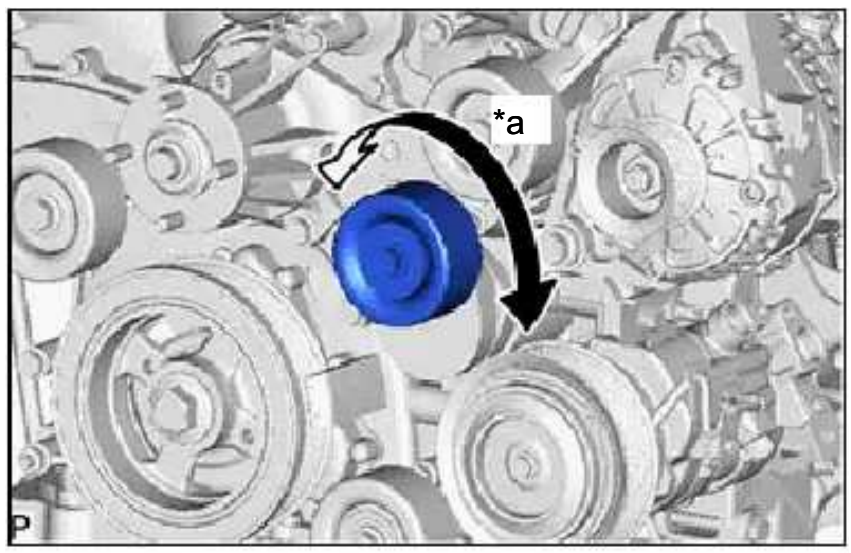
b. Check that nothing gets caught in the V-ribbed belt tensioner assembly by turning it clockwise and counterclockwise.
If a malfunction exists, replace the V-ribbed belt tensioner assembly.



A343931

c. Turn the pulley, and check that the tensioner bearing moves smoothly and quietly.
If necessary, replace the tensioner pulley.

d. Install the fan and generator V belt.
Click here ENGINE MECHANICAL (2GD-FTV) > DRIVE BELT > INSTALLATION



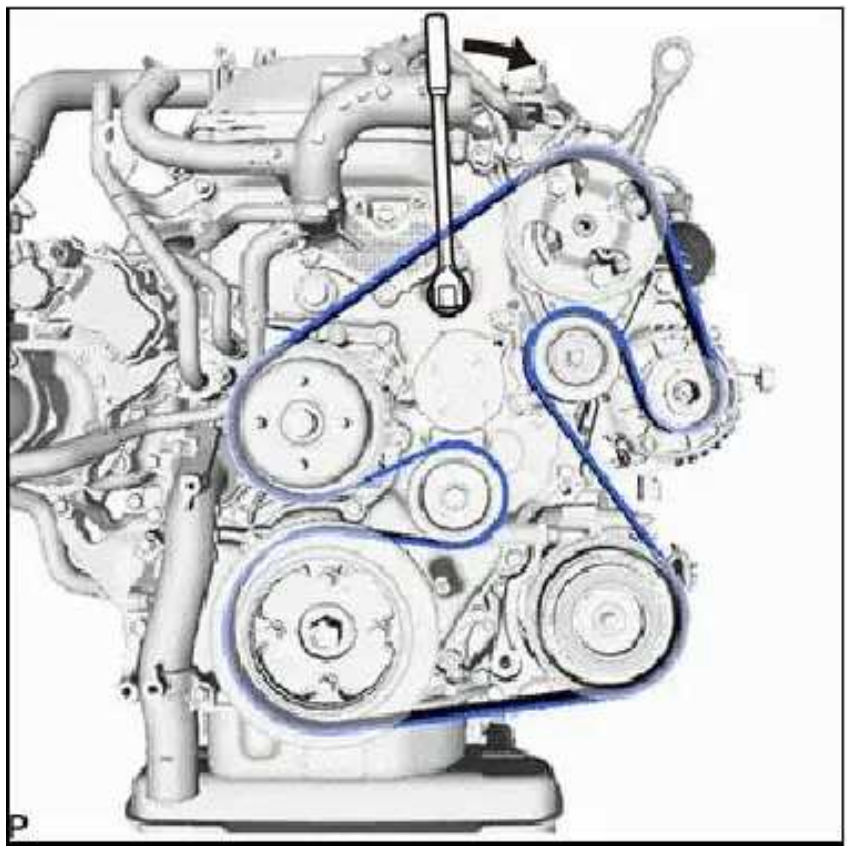
A349448C01

*a	Turn

DRIVE BELT > REMOVAL

1. REMOVE FAN AND GENERATOR V BELT

a. Rotate the tensioner pulley clockwise to loosen the fan and generator V belt and reduce the tension. Then remove the fan and generator V belt.



A343932

DRIVE BELT > INSTALLATION

1. INSTALL FAN AND GENERATOR V BELT

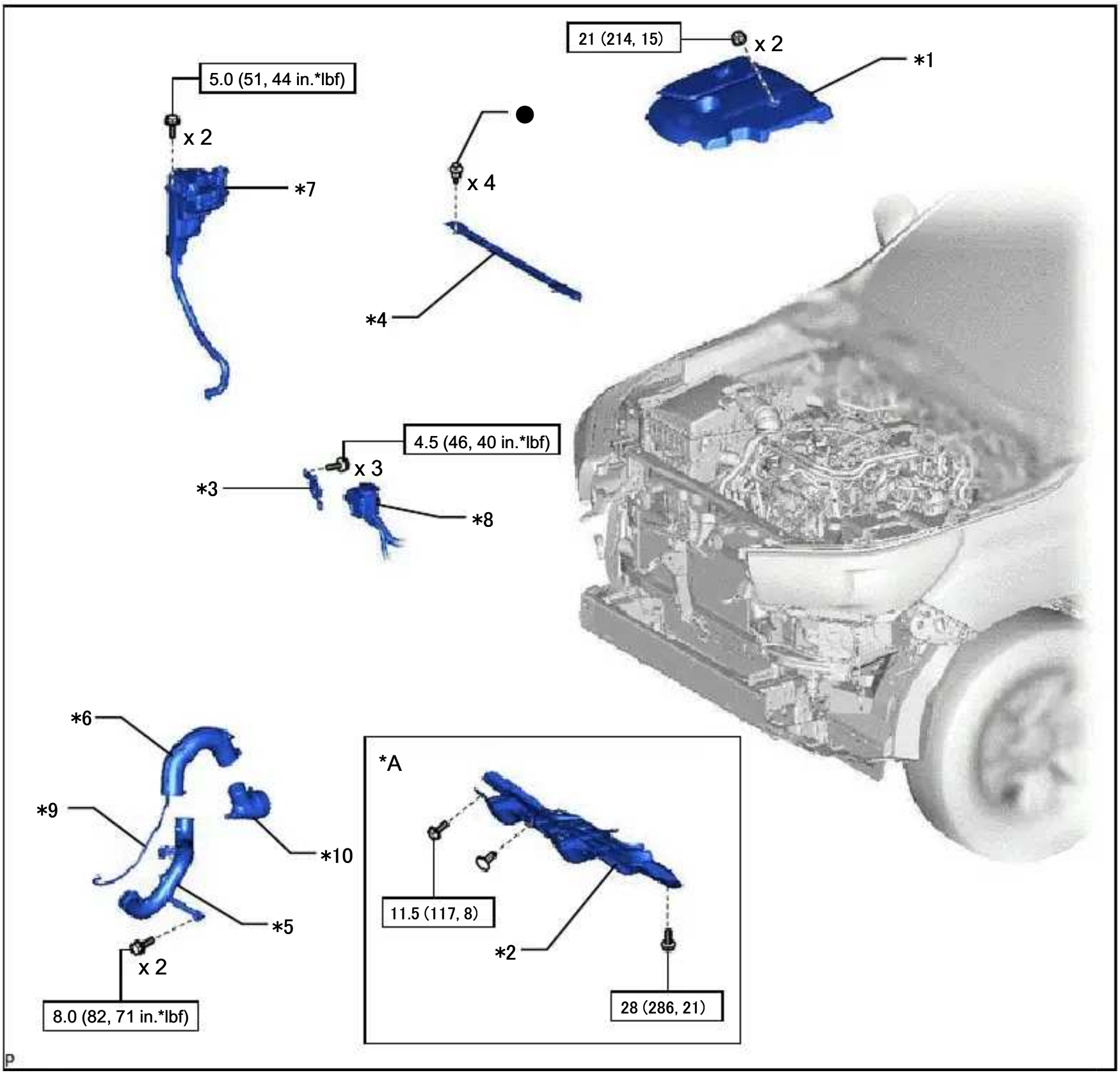
a. Rotate the pulley of the V-ribbed belt tensioner assembly clockwise, and then install the fan and generator V belt.

NOTICE:

Make sure that the fan and generator V belt is set properly on each pulley.

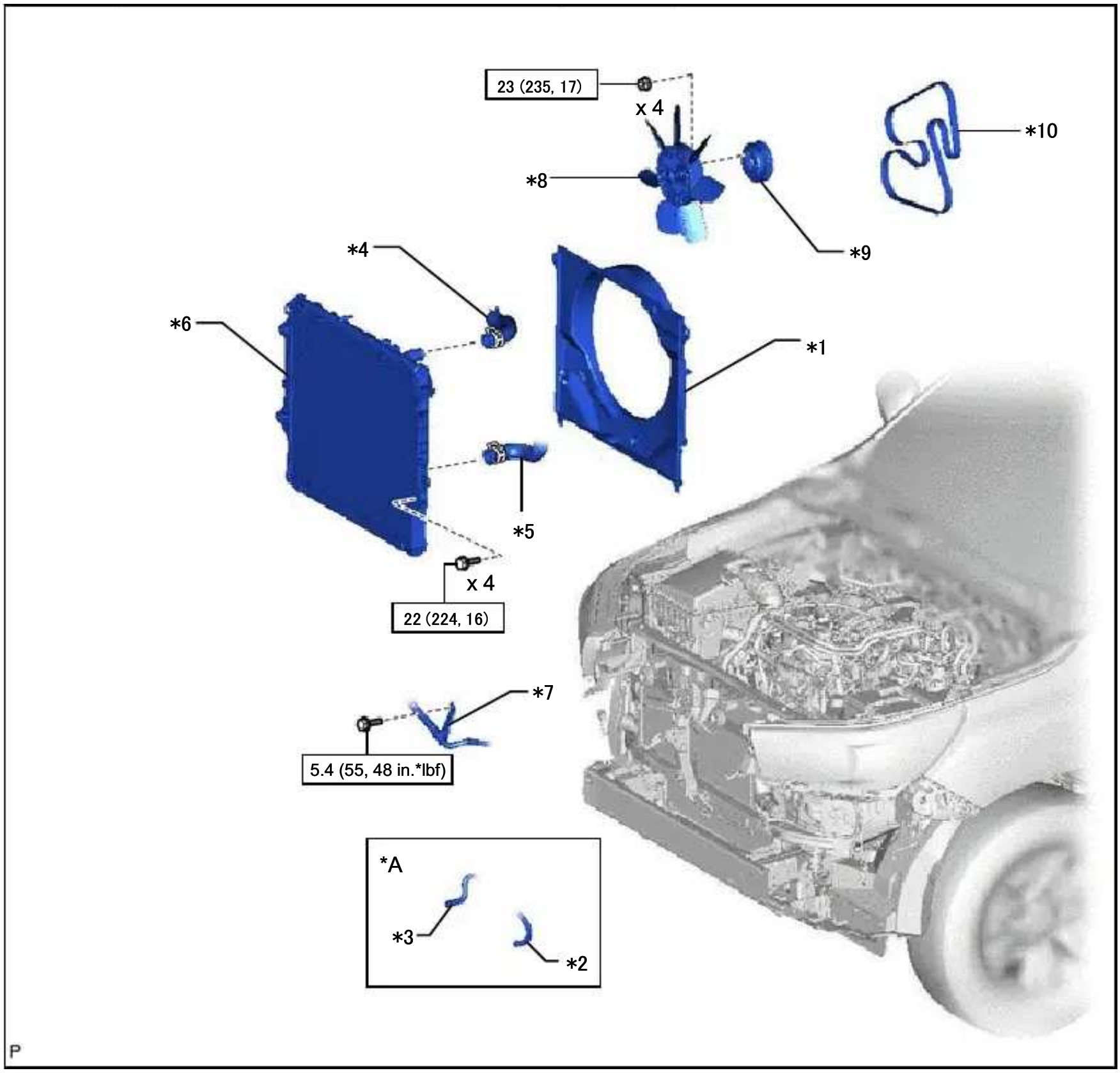
HINT:

When installing the fan and generator V belt, attach the fan and generator V belt to the No. 1 idler pulley sub-assembly last.



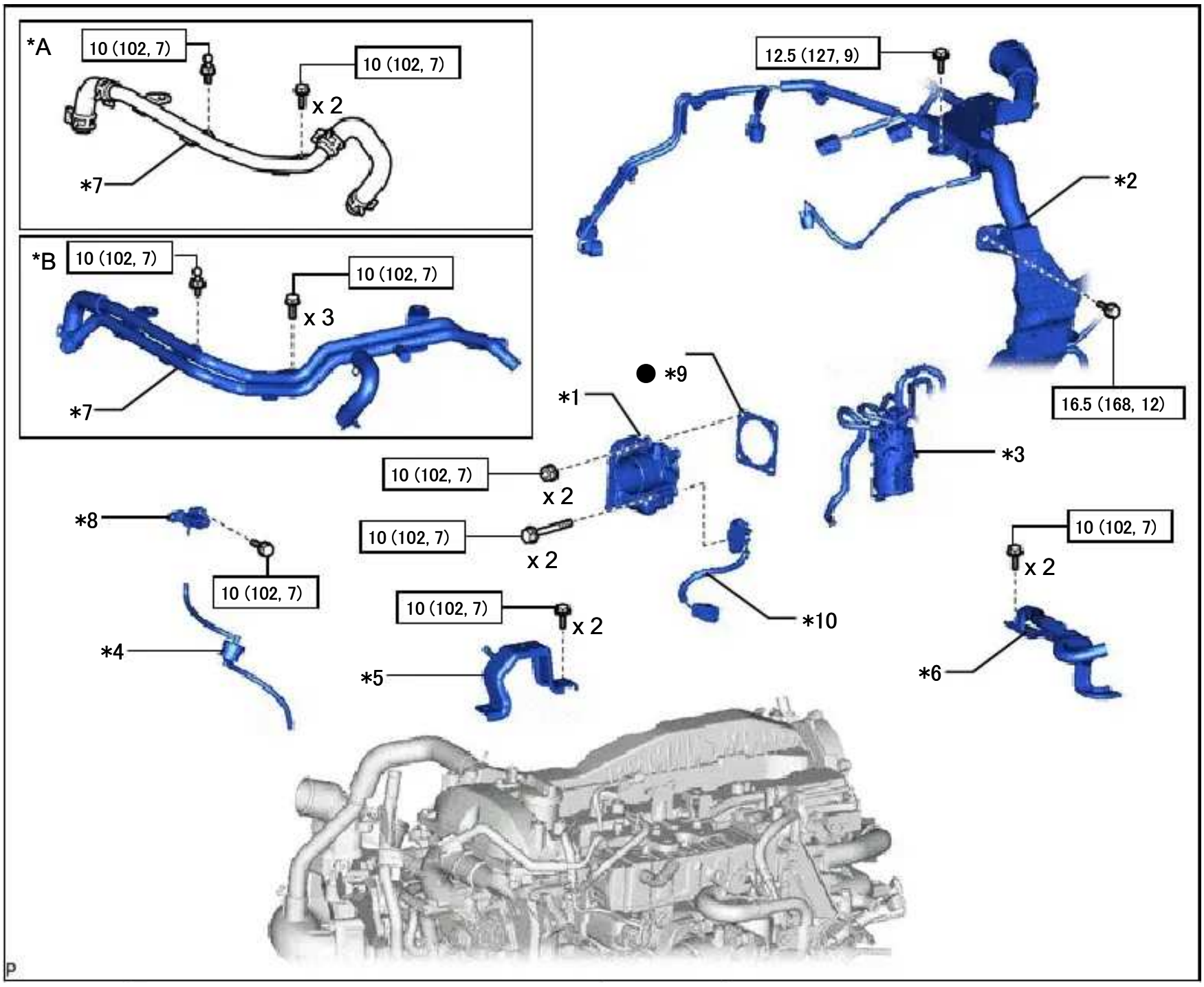
A349370C01

*A	for 4WD and Pre-Runner	-	-
*1	NO. 1 ENGINE COVER SUB-ASSEMBLY	*2	NO. 1 ENGINE UNDER COVER ASSEMBLY
*3	NO. 1 OIL RESERVOIR BRACKET	*4	NO. 1 RADIATOR AIR GUIDE
*5	NO. 2 AIR TUBE	*6	NO. 4 AIR HOSE
*7	RADIATOR RESERVE TANK ASSEMBLY	*8	VANE PUMP OIL RESERVOIR ASSEMBLY
*9	OIL RETURN HOSE	*10	NO. 3 AIR TUBE
□	N*m (kgf*cm, ft.*lbf): Specified torque	●	Non-reusable part



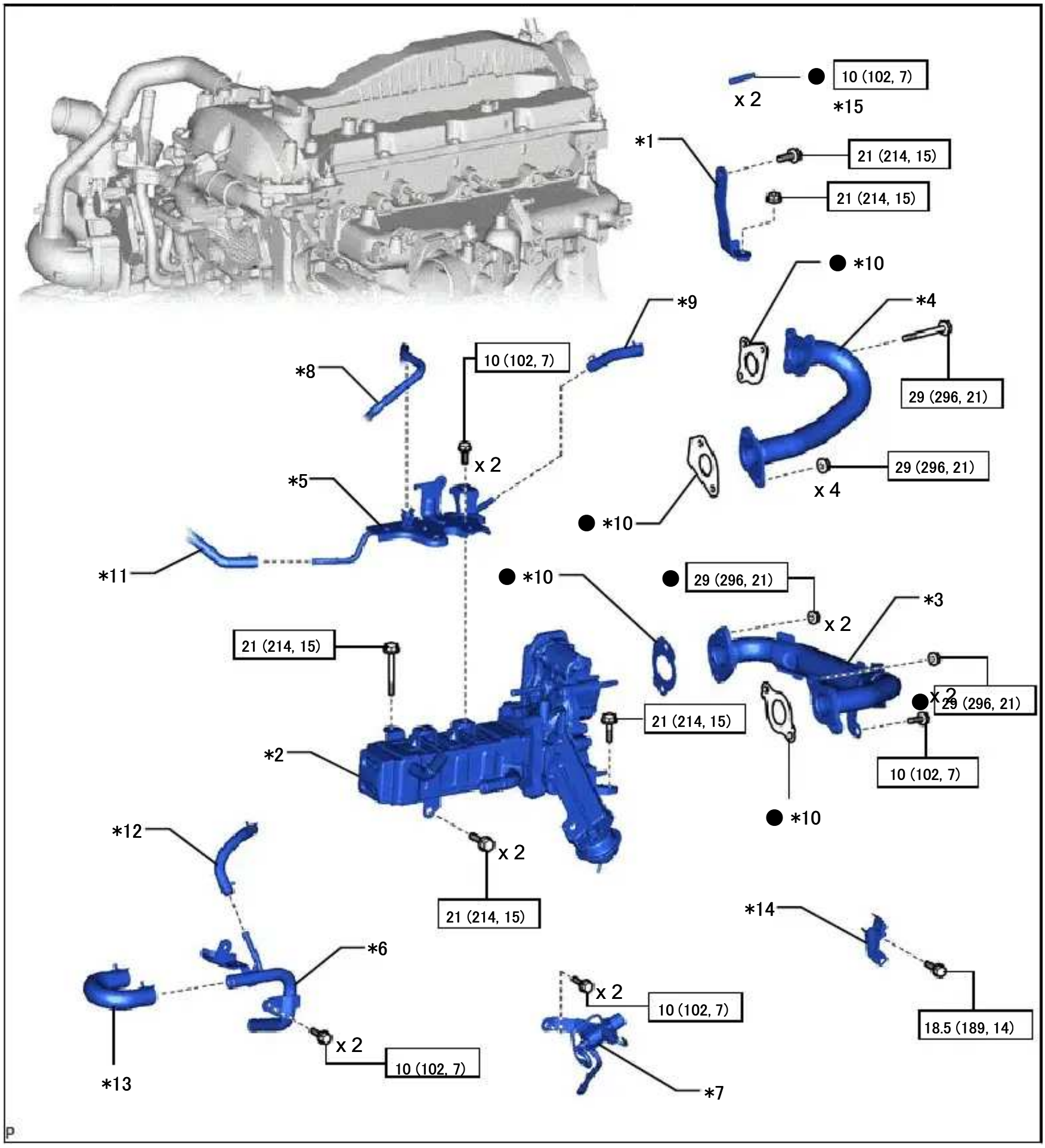
A349371C01

*A	for Automatic Transmission	-	-
*1	FAN SHROUD	*2	NO. 1 OIL COOLER INLET HOSE
*3	NO. 1 OIL COOLER OUTLET HOSE	*4	NO. 1 RADIATOR HOSE
*5	NO. 2 RADIATOR HOSE	*6	RADIATOR ASSEMBLY
*7	SUCTION HOSE SUB-ASSEMBLY	*8	FAN WITH FLUID COUPLING ASSEMBLY
*9	FAN PULLEY	*10	FAN AND GENERATOR V BELT
□	N*m (kgf*cm, ft.*lbf): Specified torque	-	-



A349372C01

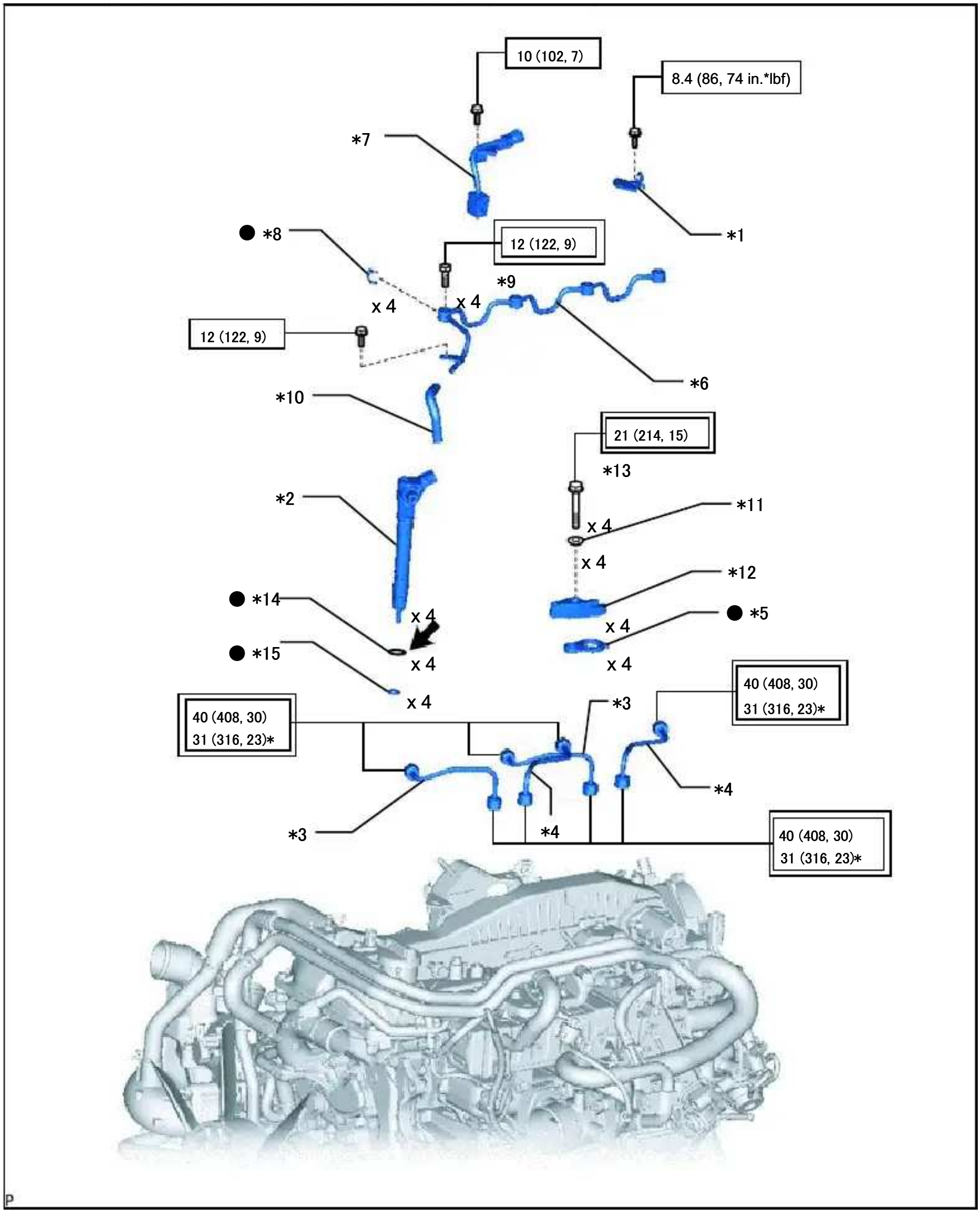
*A	w/o Heater	*B	w/ Heater
*1	DIESEL THROTTLE BODY ASSEMBLY	*2	ENGINE WIRE
*3	FUEL FILTER ASSEMBLY	*4	GAS FILTER
*5	NO. 2 ENGINE COVER BRACKET	*6	NO. 2 HOSE TO HOSE TUBE
*7	NO. 2 WATER BY-PASS PIPE	*8	TURBO PRESSURE SENSOR
*9	GASKET	*10	EMISSION CONTROL VALVE WIRE
□	N*m (kgf*cm, ft.*lbf): Specified torque	●	Non-reusable part



A343915C01

*1	EGR VALVE BRACKET	*2	NO. 1 EGR COOLER AND NO. 2 EGR VALVE ASSEMBLY WITH ELECTRIC EGR CONTROL VALVE ASSEMBLY
*3	NO. 1 EGR PIPE	*4	NO. 2 EGR PIPE
*5	NO. 3 WATER BY-PASS PIPE SUB-ASSEMBLY	*6	NO. 4 WATER BY-PASS PIPE SUB-ASSEMBLY
*7	VACUUM CONTROL VALVE SET	*8	NO. 4 FUEL HOSE
*9	NO. 9 WATER BY-PASS HOSE	*10	GASKET
*11	NO. 8 WATER BY-PASS HOSE	*12	WATER HOSE
*13	NO. 7 WATER BY-PASS HOSE	*14	ENGINE WIRE BRACKET

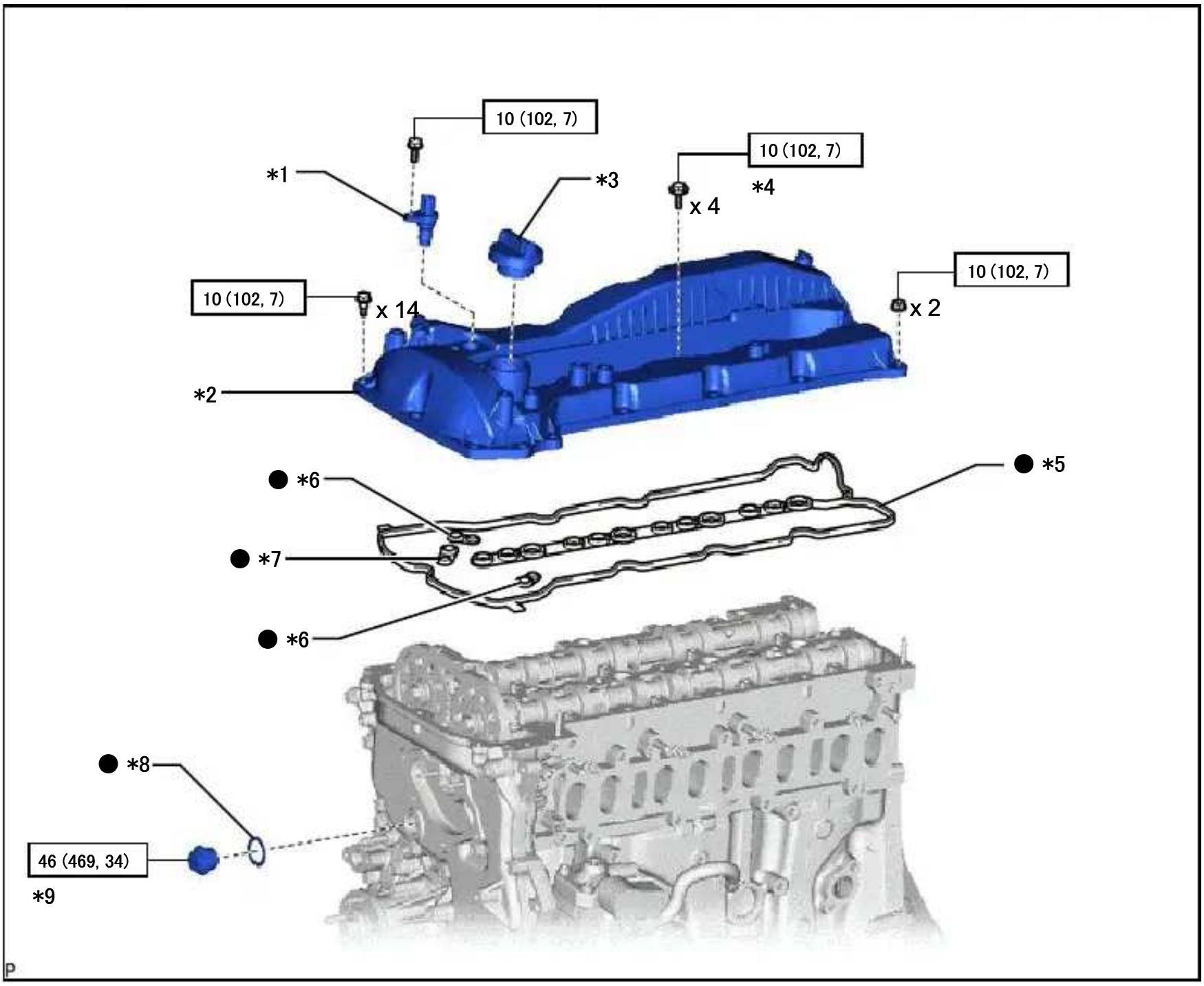
*15	STUD BOLT	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part



A339107C02

*1	HARNESS BRACKET	*2	INJECTOR ASSEMBLY
*3	NO. 1 INJECTION PIPE SUB-ASSEMBLY	*4	NO. 2 INJECTION PIPE SUB-ASSEMBLY
*5	NOZZLE HOLDER GASKET	*6	NOZZLE LEAKAGE PIPE ASSEMBLY
*7	WIRING HARNESS CLAMP BRACKET	*8	GASKET

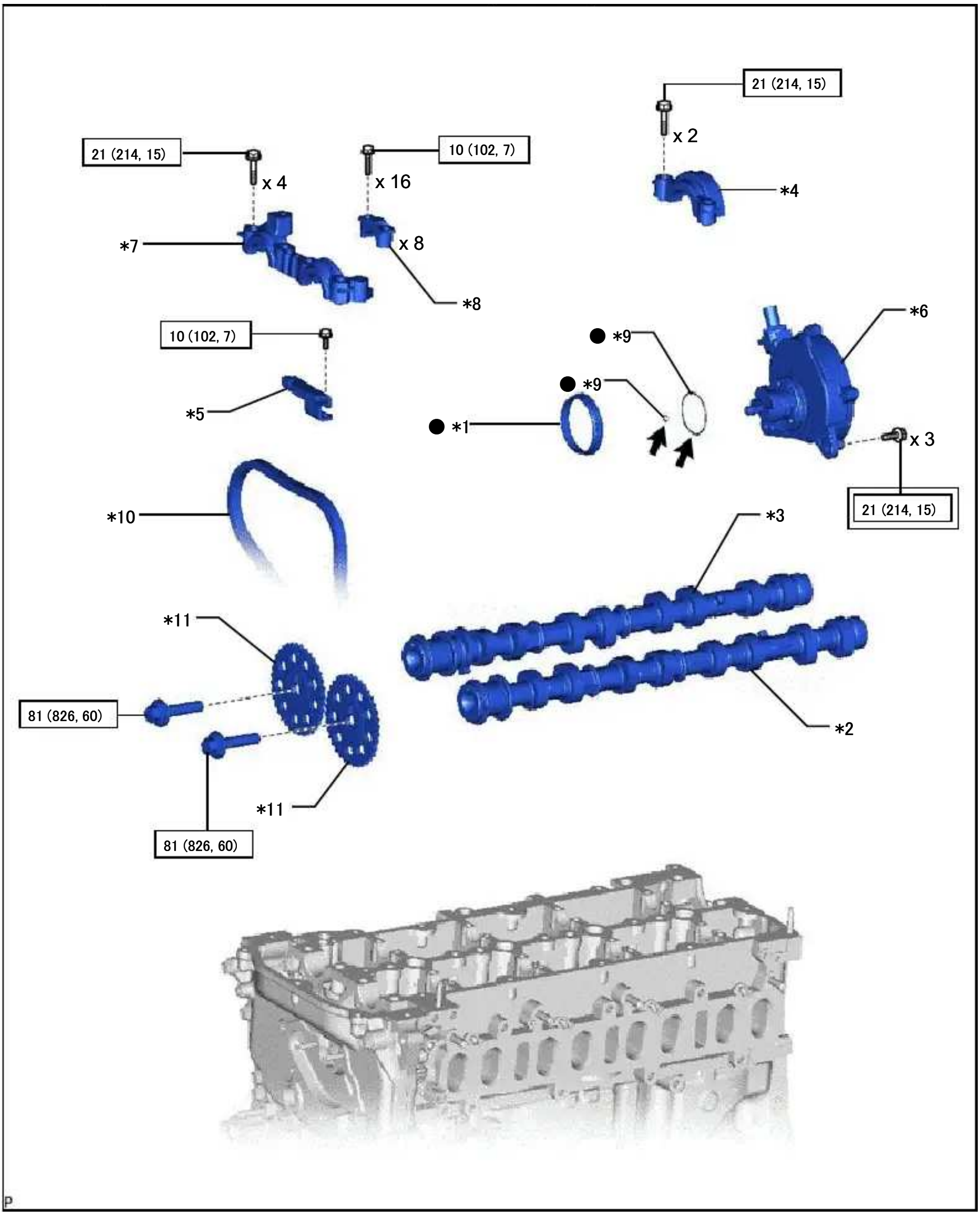
*9	UNION BOLT	*10	NO. 5 FUEL HOSE
*11	WASHER	*12	NOZZLE HOLDER CLAMP
*13	NOZZLE HOLDER CLAMP BOLT	*14	O-RING
*15	INJECTION NOZZLE SEAT	-	-
▭	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping" : N*m (kgf*cm, ft.*lbf)	▭	N*m (kgf*cm, ft.*lbf) : Specified torque
*	For use with SST	➡	Engine oil
●	Non-reusable part	-	-



A345777C01

*1	CAMSHAFT POSITION SENSOR	*2	CYLINDER HEAD COVER SUB-ASSEMBLY
*3	OIL FILLER CAP SUB-ASSEMBLY	*4	NOZZLE HOLDER CLAMP SEAT
*5	CYLINDER HEAD COVER GASKET	*6	CAMSHAFT BEARING CAP OIL HOLE GASKET
*7	NO. 2 CYLINDER HEAD COVER GASKET	*8	GASKET
*9	OIL PUMP RELIEF VALVE PLUG	-	-

▭	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part



A345778C01

*1	CAMSHAFT OIL SEAL RETAINER	*2	NO. 1 CAMSHAFT
*3	NO. 2 CAMSHAFT	*4	NO. 3 CAMSHAFT BEARING CAP
*5	TIMING CHAIN GUIDE	*6	VACUUM PUMP ASSEMBLY
*7	NO. 1 CAMSHAFT BEARING CAP	*8	NO. 2 CAMSHAFT BEARING CAP
*9	O-RING	*10	NO. 2 CHAIN SUB-ASSEMBLY
*11	CAMSHAFT TIMING SPROCKET	-	-
	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping" : N*m (kgf*cm, ft.*lbf)		N*m (kgf*cm, ft.*lbf): Specified torque
•	Non-reusable part		Engine oil

CAMSHAFT > REMOVAL

The necessary procedures (adjustment, calibration, initialization, or registration) that must be performed after parts are removed, installed, or replaced during the camshaft removal/installation are shown below.

Necessary Procedure After Parts Removed/Installed/Replaced

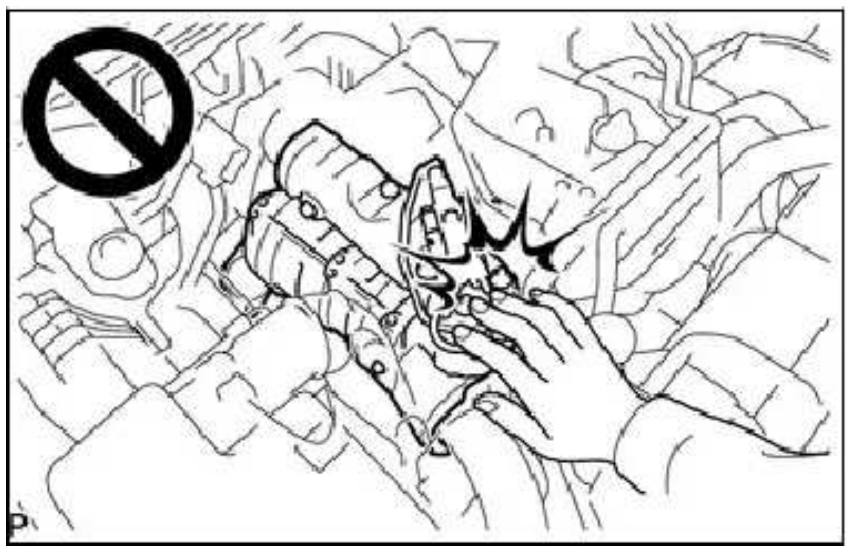
Replacement Part or Procedure	Necessary Procedures	Effects/Inoperative when not Performed	Link
w/ Stop and Start System: Battery terminal is disconnected/ reconnected	Drive the vehicle until stop and start control is permitted (approximately 5 to 40 minutes)	Stop and start system	STOP AND START > STOP AND START SYSTEM > PRECAUTION
Replacement of injector assembly	• Injector compensation code registration • Pilot quantity learning	Engine starting	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > REGISTRATION
• Replacement of diesel throttle body assembly • Replacement of electric EGR control valve assembly • Replacement of turbocharger sub-assembly • Replacement of turbocharger sub-assembly or turbocharger variable nozzle motor	Perform initialization	-	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > INITIALIZATION

CAUTION:

To prevent burns, do not touch the engine, exhaust manifold or other high temperature components while the engine is hot.

NOTICE:

- **When replacing the parts in the following chart (A), replace the No. 1 injection pipe sub-assembly, No. 2 injection pipe sub-assembly and/or fuel inlet pipe sub-assembly with new ones.**



A343692

Replaced Parts (A)	Pipes Requiring New Replacement

Injector assembly (including shuffling the injector assemblies between the cylinders)	• No. 1 injection pipe sub-assembly • No. 2 injection pipe sub-assembly
• Supply pump assembly • Common rail assembly • Cylinder block sub-assembly • Cylinder head sub-assembly • Cylinder head gasket • Timing chain case assembly	• No. 1 injection pipe sub-assembly • No. 2 injection pipe sub-assembly • Fuel inlet pipe sub-assembly

- **After removing the No. 1 injection pipe sub-assembly, No. 2 injection pipe sub-assembly and/or fuel inlet pipe sub-assembly, clean them with a brush and compressed air.**
- **The injector assembly is a precision instrument. Do not use the injector assembly if it is struck or dropped.**
- **Make sure foreign matter does not enter the fuel path.**

1. PRECAUTION

NOTICE:

After turning the ignition switch off, waiting time may be required before disconnecting the cable from the battery terminal. Therefore, make sure to read the disconnecting the cable from the battery terminal notice before proceeding with work.

Click here INTRODUCTION > REPAIR INSTRUCTION > PRECAUTION

2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected.

Click here INTRODUCTION > REPAIR INSTRUCTION > INITIALIZATION

3. REMOVE NO. 1 ENGINE UNDER COVER ASSEMBLY (for 4WD and Pre-Runner)

4. DRAIN ENGINE COOLANT

Click here COOLING (2GD-FTV) > COOLANT > REPLACEMENT > DRAIN ENGINE COOLANT

5. REMOVE FRONT BUMPER

Click here EXTERIOR PANELS / TRIM > FRONT BUMPER > REMOVAL

6. REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY

Click here ENGINE CONTROL (2GD-FTV) > DIESEL THROTTLE BODY > REMOVAL > REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY

7. REMOVE NO. 1 RADIATOR AIR GUIDE

Click here COOLING (2GD-FTV) > RADIATOR > REMOVAL > REMOVE NO. 1 RADIATOR AIR GUIDE

8. REMOVE NO. 4 AIR HOSE

Click here COOLING (2GD-FTV) > RADIATOR > REMOVAL > REMOVE NO. 4 AIR HOSE

9. REMOVE NO. 2 AIR TUBE

Click here COOLING (2GD-FTV) > RADIATOR > REMOVAL > REMOVE NO. 2 AIR TUBE

10. REMOVE NO. 1 RADIATOR HOSE

Click here COOLING (2GD-FTV) > RADIATOR > REMOVAL > REMOVE NO. 1 RADIATOR HOSE

11. DISCONNECT VANE PUMP OIL RESERVOIR ASSEMBLY

Click here COOLING (2GD-FTV) > RADIATOR > REMOVAL > DISCONNECT VANE PUMP OIL RESERVOIR ASSEMBLY

12. REMOVE NO. 1 OIL RESERVOIR BRACKET

Click here COOLING (2GD-FTV) > RADIATOR > REMOVAL > REMOVE NO. 1 OIL RESERVOIR BRACKET

13. REMOVE RADIATOR RESERVE TANK ASSEMBLY

Click here COOLING (2GD-FTV) > RADIATOR > REMOVAL > REMOVE RADIATOR RESERVOIR

14. DISCONNECT SUCTION HOSE SUB-ASSEMBLY (w/ Air Conditioning System)

Click here COOLING (2GD-FTV) > RADIATOR > REMOVAL > DISCONNECT SUCTION HOSE SUB-ASSEMBLY

15. DISCONNECT NO. 1 OIL COOLER OUTLET HOSE (for Automatic Transmission)

Click here COOLING (2GD-FTV) > RADIATOR > REMOVAL > DISCONNECT NO. 1 OIL COOLER OUTLET HOSE (for Automatic Transmission)

16. DISCONNECT NO. 1 OIL COOLER INLET HOSE (for Automatic Transmission)

Click here COOLING (2GD-FTV) > RADIATOR > REMOVAL > DISCONNECT NO. 1 OIL COOLER INLET HOSE (for Automatic Transmission)

17. REMOVE FAN SHROUD

Click here COOLING (2GD-FTV) > RADIATOR > REMOVAL > REMOVE FAN SHROUD

18. DISCONNECT NO. 2 RADIATOR HOSE

Click here COOLING (2GD-FTV) > RADIATOR > REMOVAL > DISCONNECT NO. 2 RADIATOR HOSE

19. REMOVE RADIATOR ASSEMBLY

Click here COOLING (2GD-FTV) > RADIATOR > REMOVAL > REMOVE RADIATOR ASSEMBLY

20. REMOVE NO. 4 AIR HOSE

Click here ENGINE CONTROL (2GD-FTV) > DIESEL THROTTLE BODY > REMOVAL > REMOVE NO. 4 AIR HOSE

21. REMOVE INTERCOOLER AIR TUBE

Click here ENGINE CONTROL (2GD-FTV) > DIESEL THROTTLE BODY > REMOVAL > REMOVE INTERCOOLER AIR TUBE

22. REMOVE DIESEL THROTTLE BODY ASSEMBLY

Click here ENGINE CONTROL (2GD-FTV) > DIESEL THROTTLE BODY > REMOVAL > REMOVE DIESEL THROTTLE BODY ASSEMBLY

23. REMOVE NO. 2 WATER BY-PASS PIPE

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > REMOVE NO. 2 WATER BY-PASS PIPE

24. REMOVE GAS FILTER

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > REMOVE GAS FILTER

25. REMOVE TURBO PRESSURE SENSOR

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > REMOVE TURBO PRESSURE SENSOR

26. REMOVE NO. 2 HOSE TO HOSE TUBE

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > REMOVE NO. 2 HOSE TO HOSE TUBE

27. REMOVE NO. 2 ENGINE COVER BRACKET

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > REMOVE NO. 2 ENGINE COVER BRACKET

28. DISCONNECT FUEL FILTER ASSEMBLY

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > DISCONNECT FUEL FILTER ASSEMBLY

29. DISCONNECT ENGINE WIRE

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > DISCONNECT ENGINE WIRE

30. REMOVE EGR VALVE BRACKET

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > REMOVE EGR VALVE BRACKET

31. REMOVE NO. 2 EGR PIPE

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > REMOVE NO. 2 EGR PIPE

32. DISCONNECT NO. 3 WATER BY-PASS PIPE SUB-ASSEMBLY

Click here EMISSION CONTROL (2GD-FTV) > EGR COOLER > REMOVAL > DISCONNECT NO. 3 WATER BY-PASS PIPE SUB-ASSEMBLY

33. REMOVE NO. 4 WATER BY-PASS PIPE SUB-ASSEMBLY

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > DISCONNECT NO. 4 WATER BY-PASS PIPE SUB-ASSEMBLY

34. REMOVE NO. 1 EGR PIPE

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > REMOVE NO. 1 EGR PIPE

35. REMOVE VACUUM CONTROL VALVE SET

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > REMOVE VACUUM CONTROL VALVE SET

36. REMOVE NO. 1 EGR COOLER AND NO. 2 EGR VALVE ASSEMBLY WITH ELECTRIC EGR CONTROL VALVE ASSEMBLY

Click here EMISSION CONTROL (2GD-FTV) > EGR COOLER > REMOVAL > REMOVE NO. 1 EGR COOLER AND NO. 2 EGR VALVE ASSEMBLY WITH ELECTRIC EGR CONTROL VALVE ASSEMBLY

37. REMOVE WIRING HARNESS CLAMP BRACKET

Click here FUEL (2GD-FTV) > FUEL INJECTOR > REMOVAL > REMOVE WIRING HARNESS CLAMP BRACKET

38. REMOVE HARNESS BRACKET

Click here FUEL (2GD-FTV) > FUEL INJECTOR > REMOVAL > REMOVE HARNESS BRACKET

39. REMOVE NOZZLE LEAKAGE PIPE ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL INJECTOR > REMOVAL > REMOVE NOZZLE LEAKAGE PIPE ASSEMBLY

40. REMOVE NO. 1 INJECTION PIPE SUB-ASSEMBLY AND NO. 2 INJECTION PIPE SUB-ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL INJECTOR > REMOVAL > REMOVE NO. 1 AND NO. 2 INJECTION PIPE SUB-ASSEMBLY

41. REMOVE INJECTOR ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL INJECTOR > REMOVAL > REMOVE INJECTOR ASSEMBLY

42. REMOVE NOZZLE HOLDER GASKET

Click here FUEL (2GD-FTV) > FUEL INJECTOR > REMOVAL > REMOVE NOZZLE HOLDER GASKET

43. REMOVE CAMSHAFT POSITION SENSOR

Click here ENGINE CONTROL (2GD-FTV) > CAMSHAFT POSITION SENSOR > REMOVAL > REMOVE CAMSHAFT POSITION SENSOR

44. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PUMP > REMOVAL > REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY

45. SET NO. 1 CYLINDER TO TDC/COMPRESSION

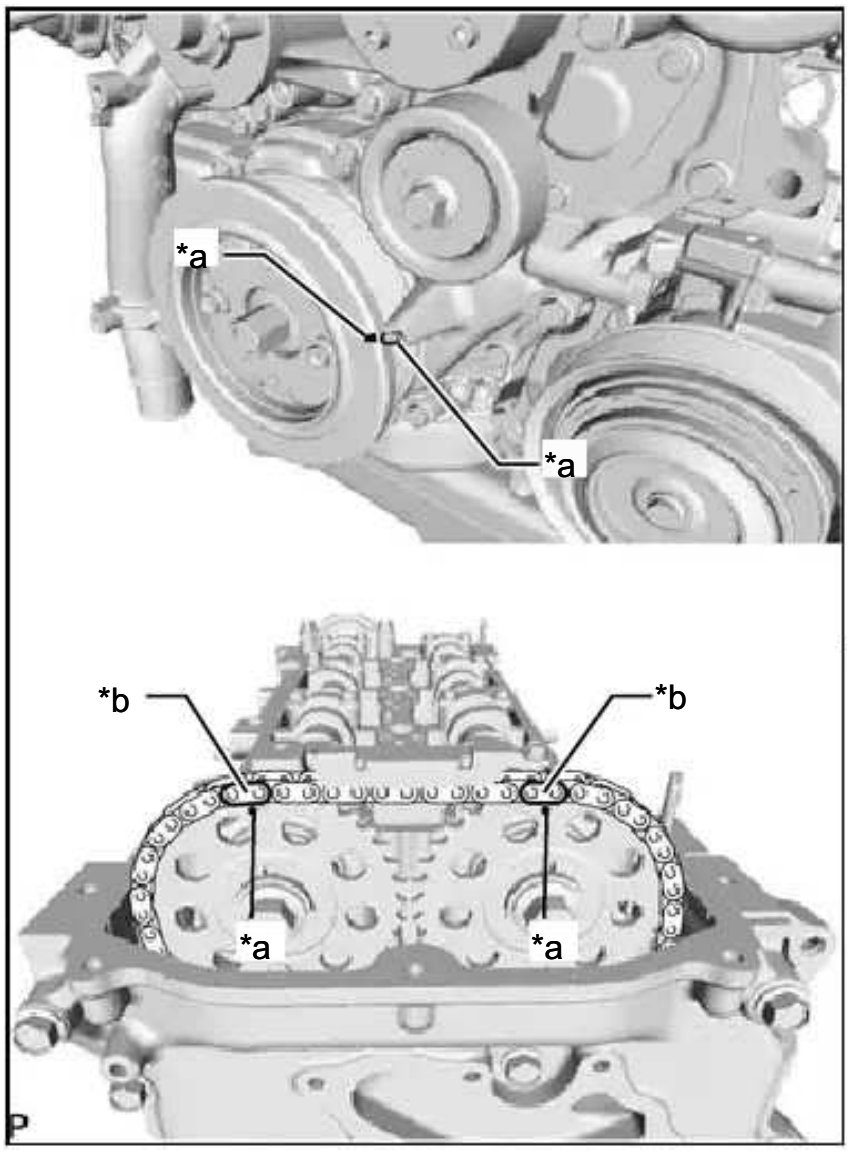
a. Align the timing mark of the crankshaft pulley and timing chain cover by rotating the crankshaft clockwise.

b. Make sure that the timing mark of the camshaft timing sprocket is at the top.

HINT:

If the timing mark is not at the top, turn the crankshaft pulley 1 revolution so that the timing mark is at the top (set the No. 1 piston to TDC/ compression).

c. Place paint marks on the No. 2 chain sub-assembly.

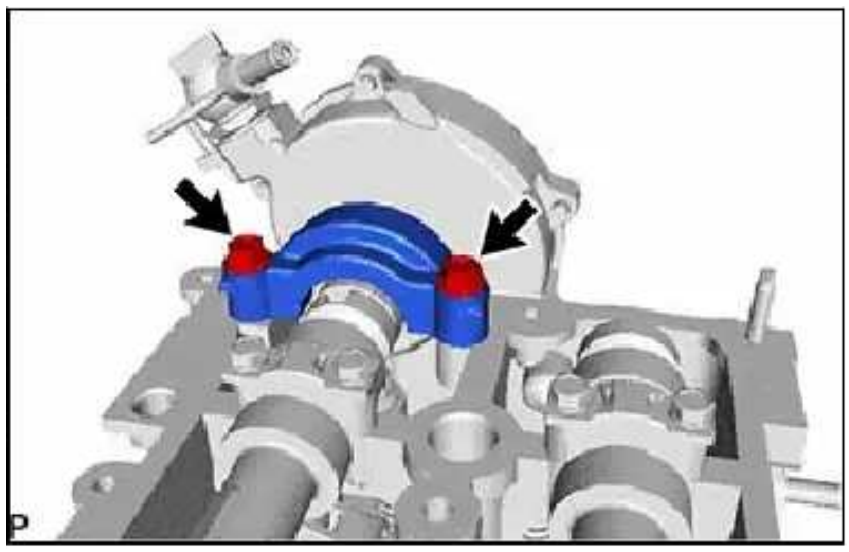


A345765C01

*a	Timing Mark
*b	Paint Mark

46. REMOVE NO. 3 CAMSHAFT BEARING CAP

a. Remove the 2 bolts and No. 3 camshaft bearing cap from the cylinder head sub-assembly.



A345780

47. REMOVE VACUUM PUMP ASSEMBLY

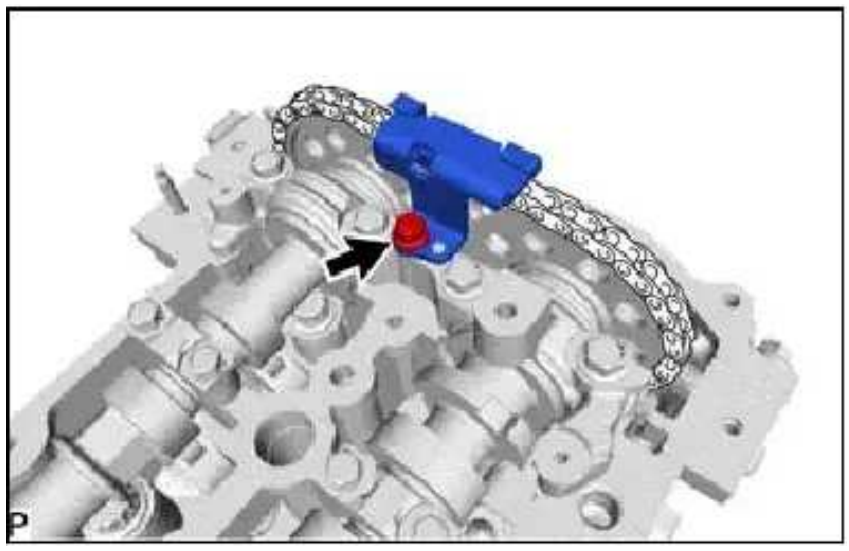
Click here BRAKE SYSTEM (OTHER) > VACUUM PUMP (for 1GD-FTV, 2GD-FTV) > REMOVAL > REMOVE VACUUM PUMP ASSEMBLY

48. REMOVE CAMSHAFT OIL SEAL RETAINER

Click here BRAKE SYSTEM (OTHER) > VACUUM PUMP (for 1GD-FTV, 2GD-FTV) > REMOVAL > REMOVE CAMSHAFT OIL SEAL RETAINER

49. REMOVE TIMING CHAIN GUIDE

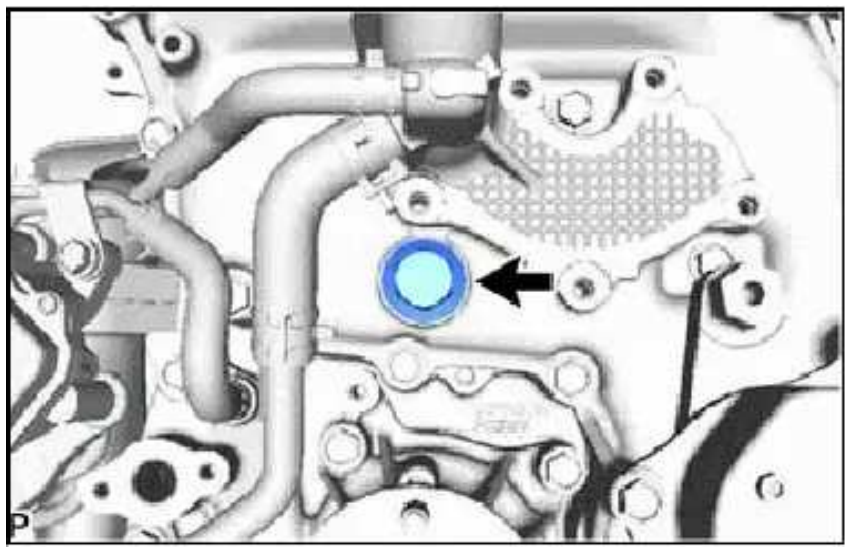
a. Remove the bolt and timing chain guide from the cylinder head sub-assembly.



A345766

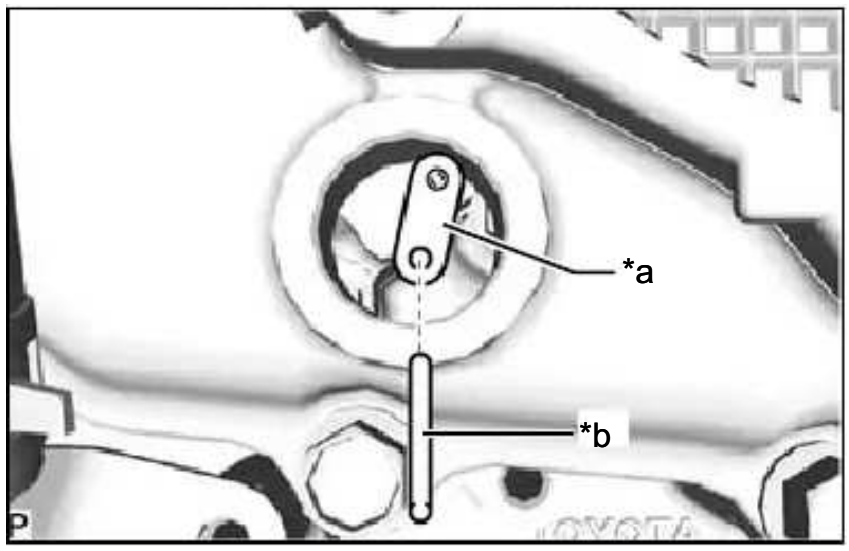
50. REMOVE CAMSHAFT

a. Remove the oil pump relief valve plug and gasket from timing chain cover.



A345767

b. Insert a pin into stopper plate hole of the No. 2 chain tensioner assembly and lock the No. 2 chain tensioner assembly.



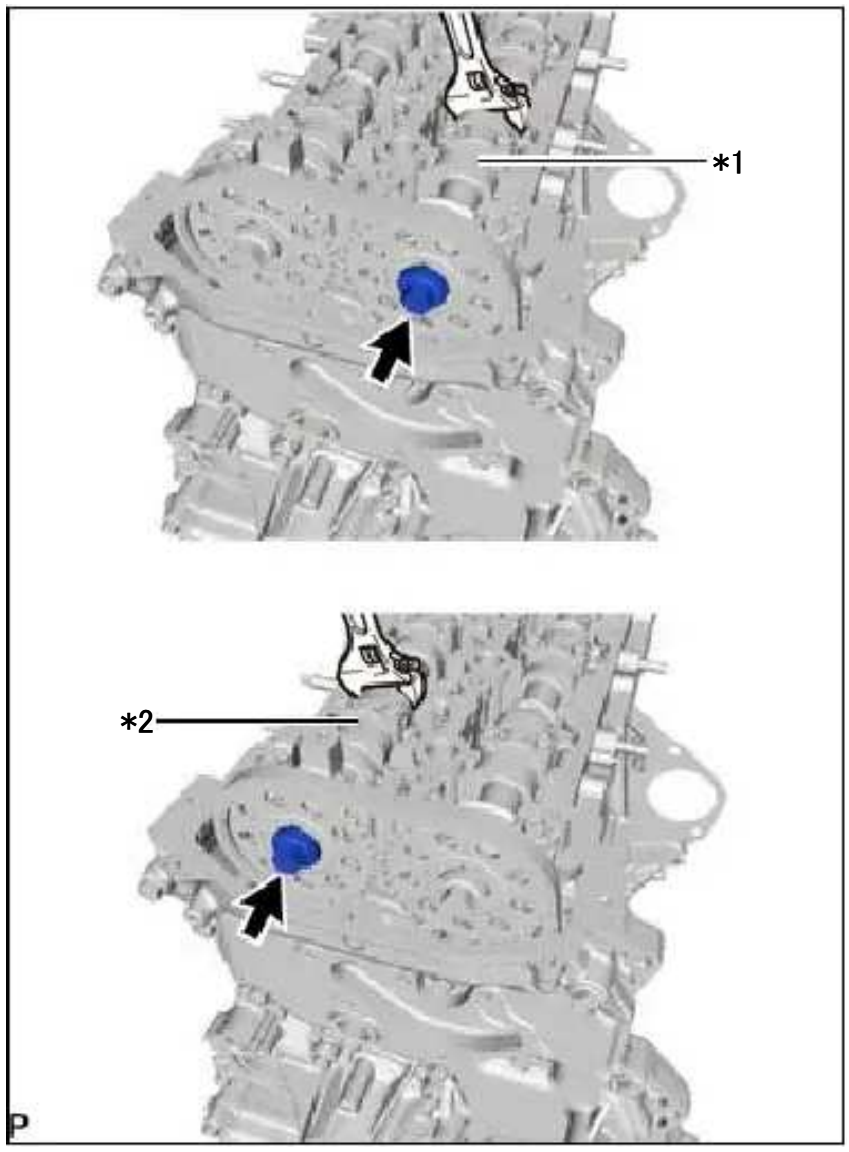
A345768C01

*a	Stopper Plate
*b	Pin

c. Hold the hexagonal portion of the camshaft with a wrench and loosen the 2 bolts from the No. 1 camshaft and No. 2 camshaft.

NOTICE:

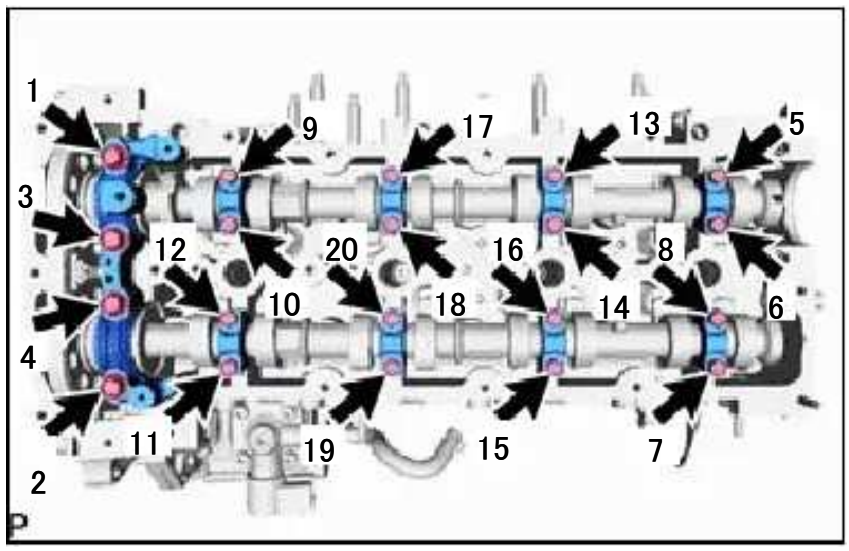
Be careful not to damage the cylinder head sub-assembly with the wrench.



A345769C01

*1	No. 1 Camshaft
*2	No. 2 Camshaft

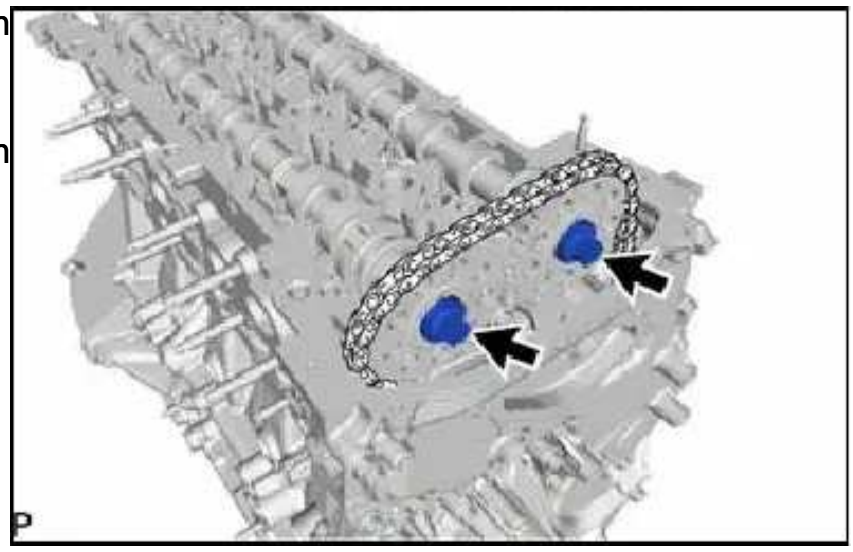
d. Using several steps, and remove the 20 bolt, No. 1 camshaft bearing cap and 8 No. 2 camshaft bearing caps from the cylinder head sub-assembly.



A345770N01

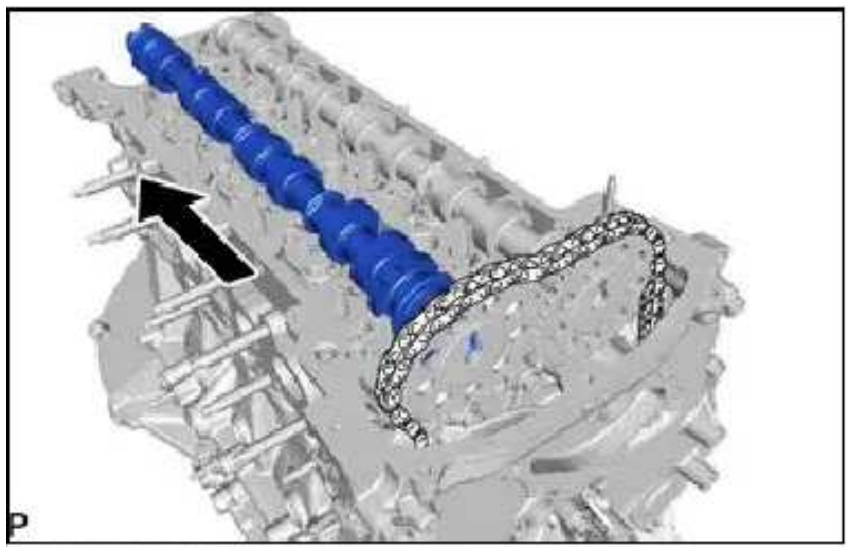
e. Raise the No. 1 camshaft and remove the bolt from the No. 1 camshaft.

f. Raise the No. 2 camshaft and remove the bolt from the No. 2 camshaft.



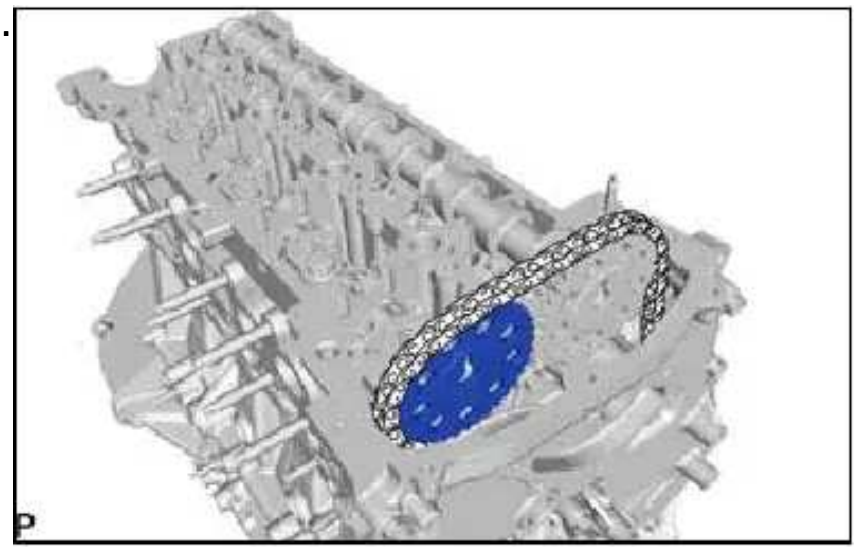
A345771

g. Remove the No. 2 camshaft from the camshaft timing sprocket.



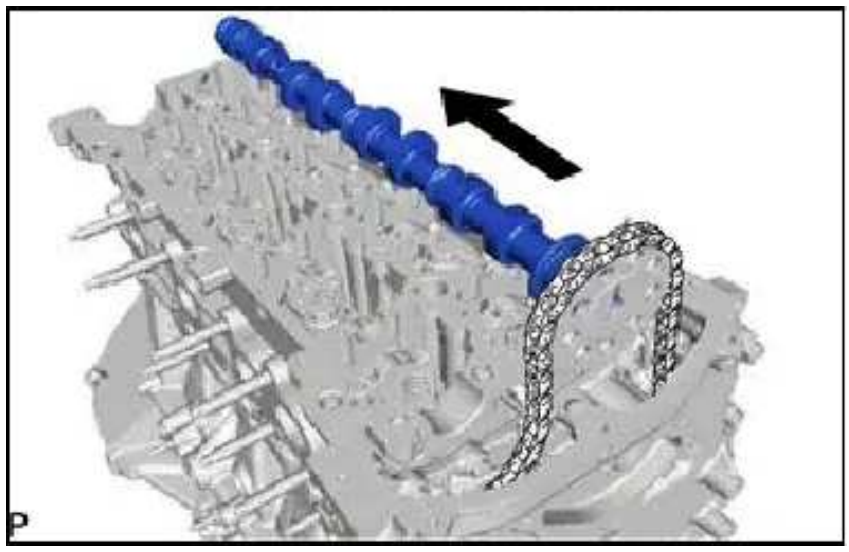
A345772

h. Remove the camshaft timing sprocket from the No. 2 chain sub-assembly.



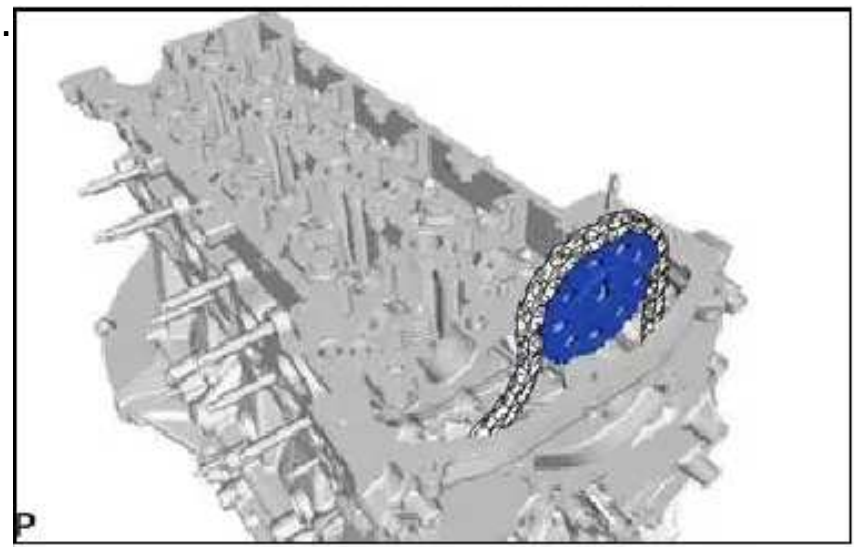
A345774

i. Remove the No. 1 camshaft from the camshaft timing sprocket.



A345773

j. Remove the camshaft timing sprocket from the No. 2 chain sub-assembly.

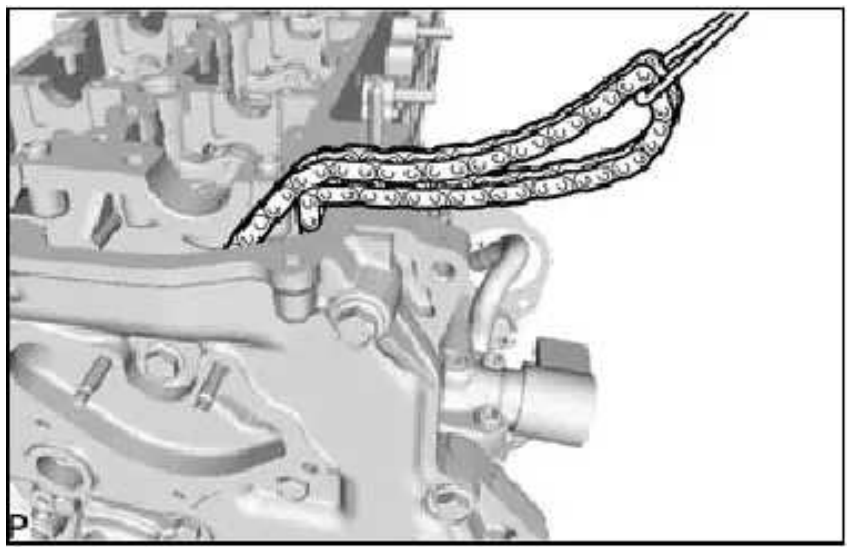


A345775

k. Suspend the No. 2 chain sub-assembly with a string or equivalent.

HINT:

Be careful not to drop the No. 2 chain sub-assembly inside the timing chain cover assembly.



A345776

CAMSHAFT > INSTALLATION

NOTICE:

- **When replacing the parts in the following chart (A), replace the No. 1 injection pipe sub-assembly, No. 2 injection pipe sub-assembly and/or fuel inlet pipe sub-assembly with new ones.**

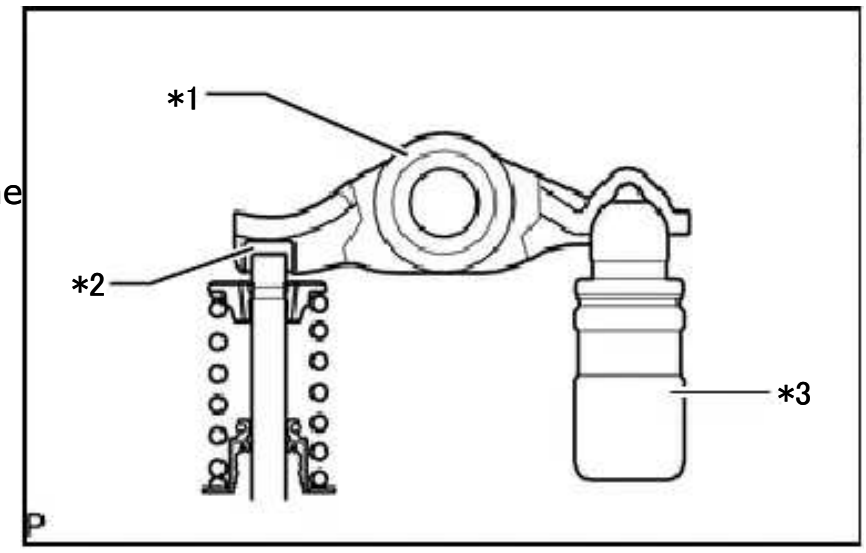
Replaced Parts (A)	Pipes Requiring New Replacement
Injector assembly (including shuffling the injector assemblies between the cylinders)	• No. 1 injection pipe sub-assembly • No. 2 injection pipe sub-assembly
• Supply pump assembly • Common rail assembly • Cylinder block sub-assembly • Cylinder head sub-assembly • Cylinder head gasket • Timing chain case assembly	• No. 1 injection pipe sub-assembly • No. 2 injection pipe sub-assembly • Fuel inlet pipe sub-assembly

- **After removing the No. 1 injection pipe sub-assembly, No. 2 injection pipe sub-assembly and/or fuel inlet pipe sub-assembly, clean them with a brush and compressed air.**
- **The injector assembly is a precision instrument. Do not use the injector assembly if it is struck or dropped.**
- **Make sure foreign matter does not enter the fuel path.**

1. INSTALL CAMSHAFT

a. Check that the valve rocker arm sub-assembly is firmly set to the valve lash adjuster assembly.

b. Apply a light coat of engine oil to the camshaft journals of the cylinder head sub-assembly and the thrust portion of the camshaft.



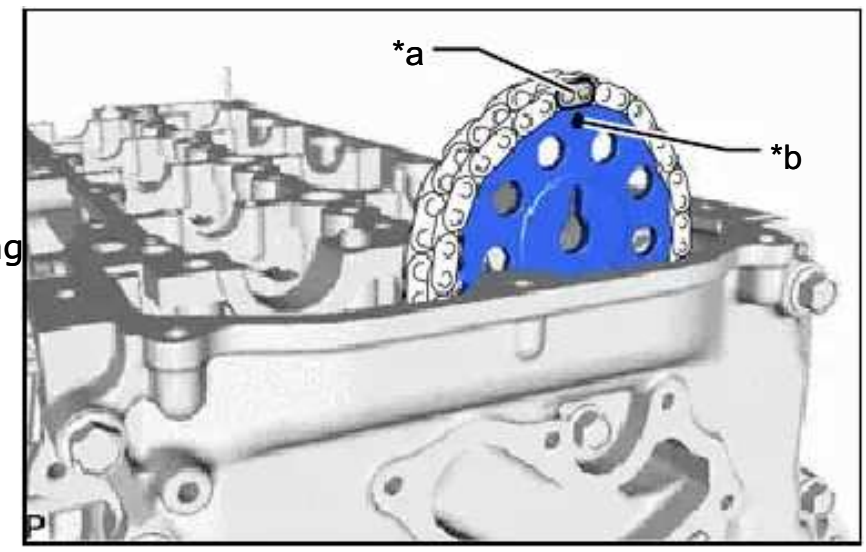
A346673C01

*1	Valve Rocker Arm Sub-assembly
*2	Valve Stem Cap
*3	Valve Lash adjuster assembly

c. Align the paint mark of the No. 2 chain sub-assembly and timing mark of the camshaft timing sprocket, and install the camshaft timing sprocket to the No. 2 chain sub-assembly.

HINT:

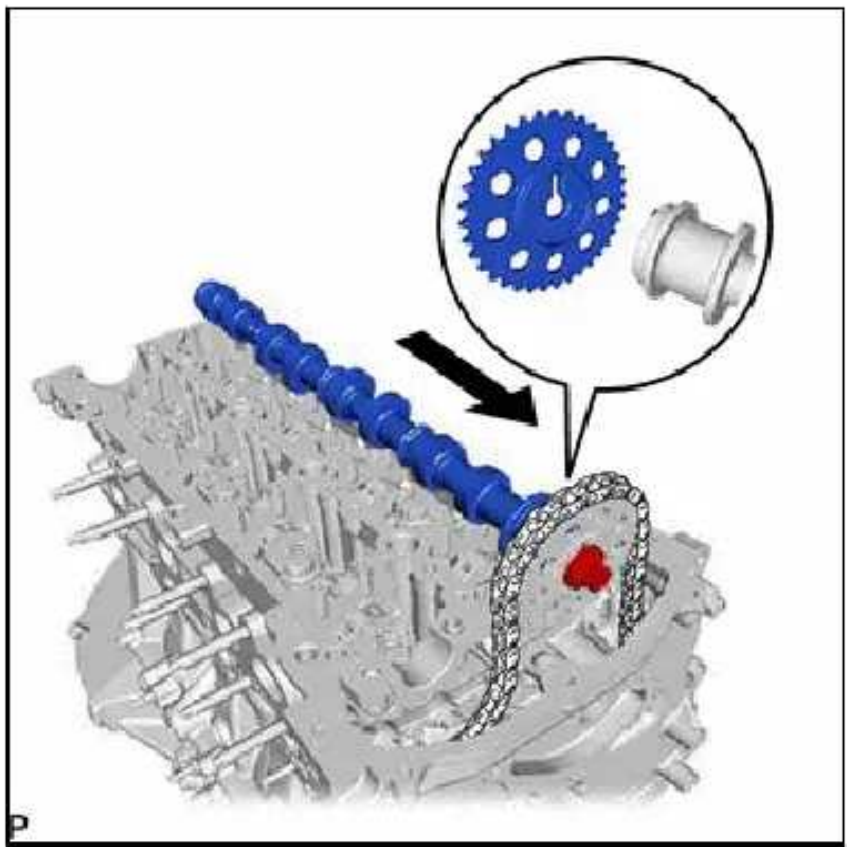
Make sure the timing mark of the camshaft timing sprocket face the front side.



A346674C01

*a	Paint Mark
*b	Timing Mark

d. Align the knock pin of the No. 1 camshaft to the groove of the sprocket and install the No. 1 camshaft to the camshaft timing sprocket, and set the bolt.

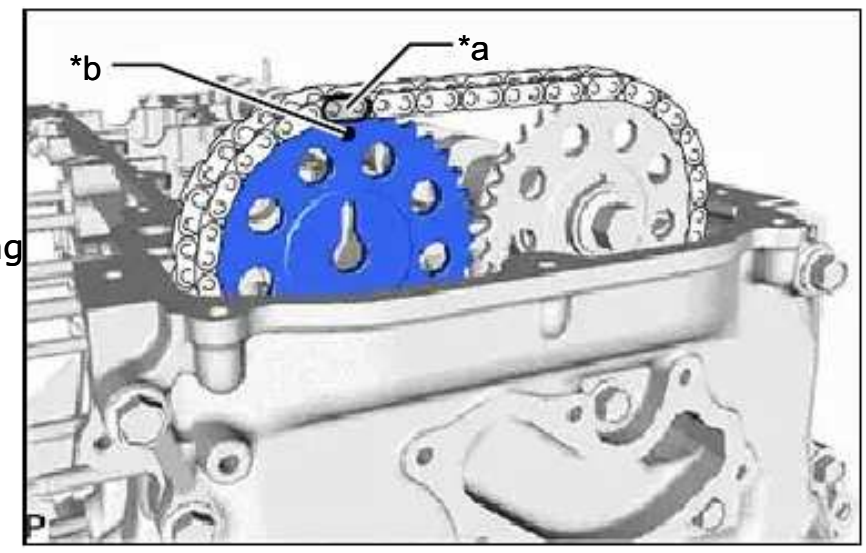


A349446

e. Align the paint mark of the No. 2 chain sub-assembly and timing mark of the camshaft timing sprocket, and install the camshaft timing sprocket to the No. 2 chain sub-assembly.

HINT:

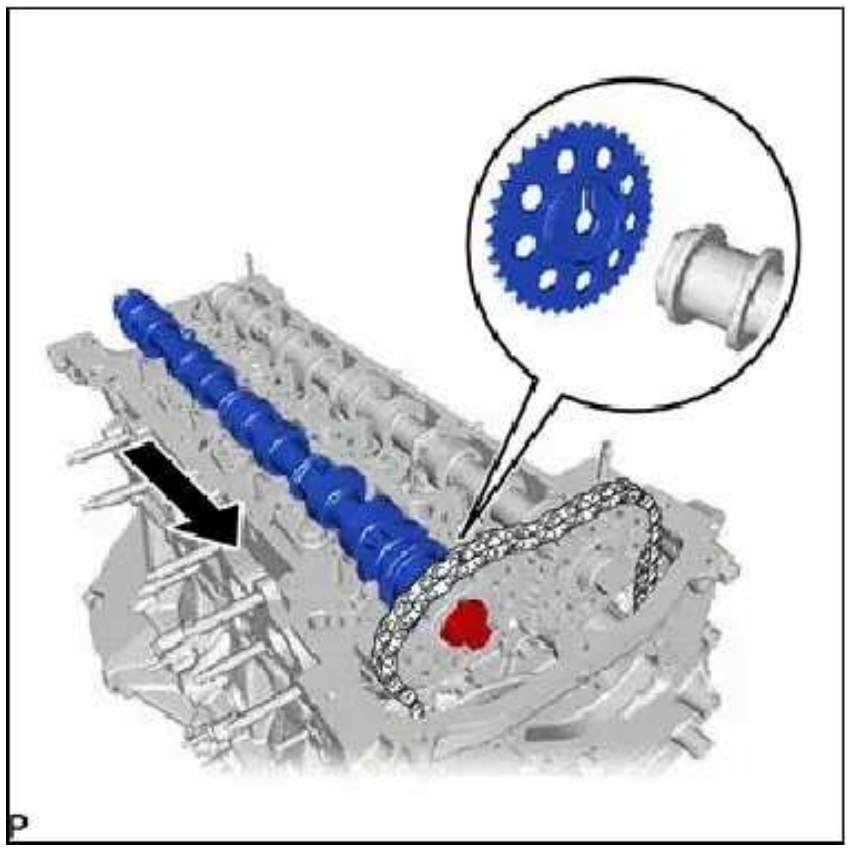
Make sure the timing mark of the camshaft timing sprocket face the front side.



A346675C01

*a	Paint Mark
*b	Timing Mark

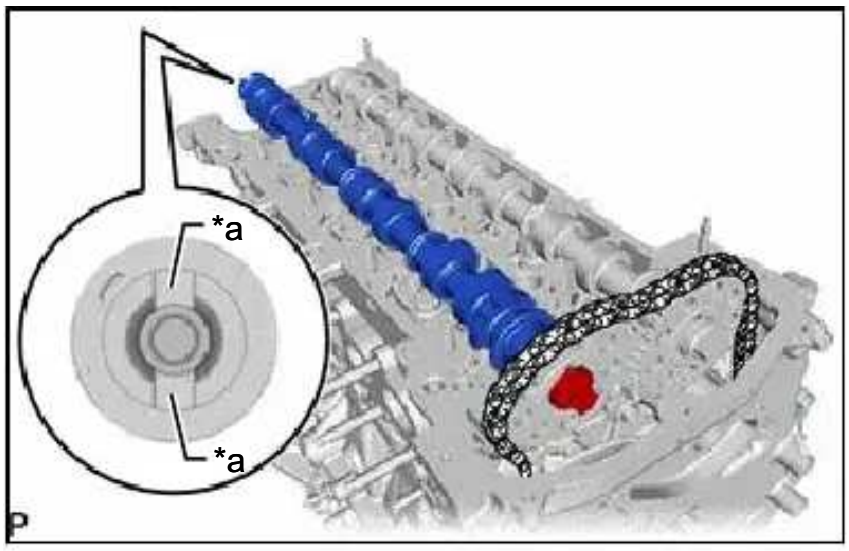
f. Align the knock pin of the No. 2 camshaft to the groove of the sprocket and install the No. 2 camshaft to the camshaft timing sprocket, and set the bolt.



A349447

HINT:

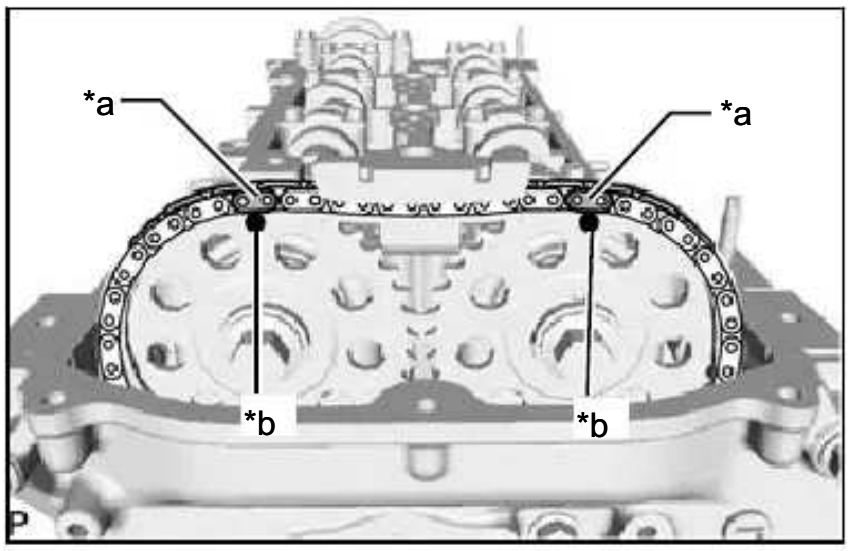
Glove is at the rear end of the No. 2 camshaft.



A344474C01

*a	Glove

g. Check the paint mark of the camshaft timing sprocket and mark plate of the No. 2 timing chain sub-assembly.



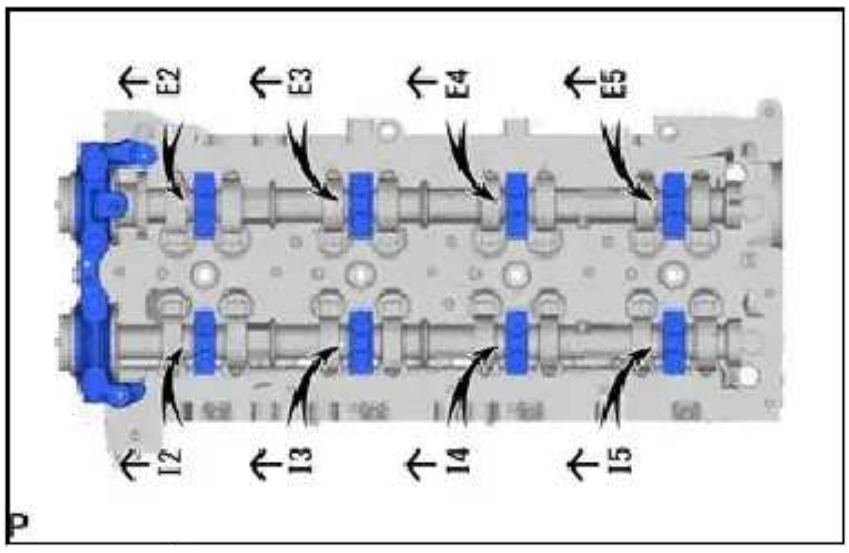
A344473C01

*a	Mark Plate (Orange)

*b	Paint Mark

h. Set the No. 1 camshaft bearing cap and 8 No. 2 camshaft bearing caps to the cylinder head sub-assembly as shown in the illustration.

i. Temporarily install the 20 bolts.

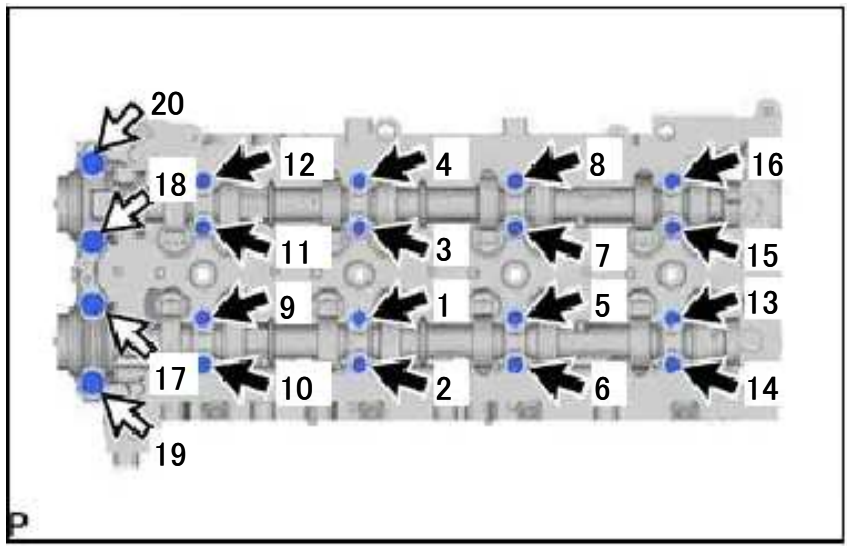


A344475

j. Uniformly tighten the 20 bolts in several steps in the order shown in the illustration.

Torque:
for bolt A
10 N*m (102 kgf*cm, 7 ft.*lbf)

for bolt B
21 N*m (214 kgf*cm, 15 ft.*lbf)



A344476C01

➡	Bolt A
⇨	Bolt B

k. Hold the hexagonal portion of the No. 1 camshaft and No. 2 camshaft with a wrench, and tighten the 2 bolts.

Torque:
81 N*m (826 kgf*cm, 60 ft.*lbf)

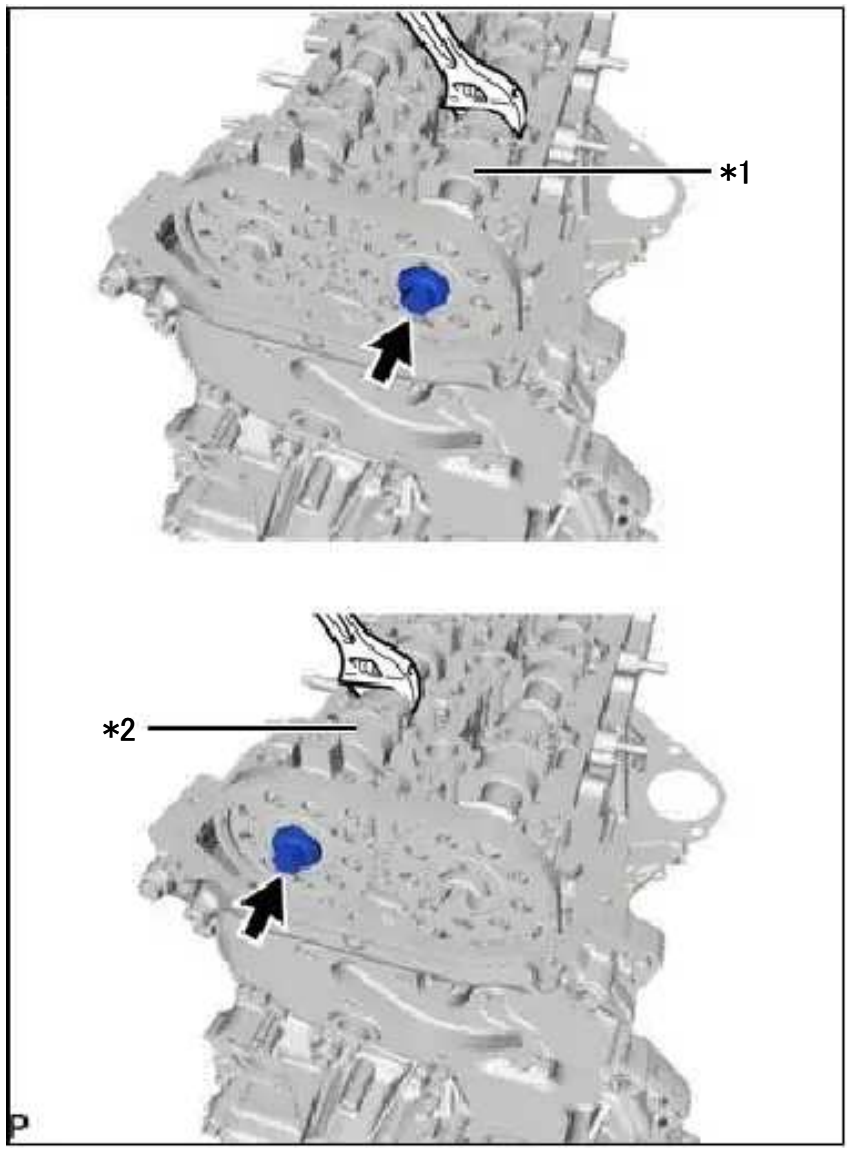
NOTICE:

Be careful not to damage the cylinder head sub-assembly with the wrench.

l. Remove the pin from the No. 2 chain tensioner assembly.

m. Install a new gasket and the oil pump relief valve plug to the timing chain cover.

Torque:
46 N*m (469 kgf*cm, 34 ft.*lbf)



A346684C01

*1	No. 1 Camshaft
*2	No. 2 Camshaft

2. INSTALL TIMING CHAIN GUIDE

a. Install the timing chain guide to the cylinder head sub-assembly with the bolt.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

3. INSTALL CAMSHAFT OIL SEAL RETAINER

Click here BRAKE SYSTEM (OTHER) > VACUUM PUMP (for 1GD-FTV, 2GD-FTV) > INSTALLATION > INSTALL CAMSHAFT OIL SEAL RETAINER

4. TEMPORARILY INSTALL VACUUM PUMP ASSEMBLY

Click here BRAKE SYSTEM (OTHER) > VACUUM PUMP (for 1GD-FTV, 2GD-FTV) > INSTALLATION > TEMPORARILY INSTALL VACUUM PUMP ASSEMBLY

5. INSTALL NO. 3 CAMSHAFT BEARING CAP

a. Clean and degrease the contact surfaces of the cylinder head sub-assembly and No. 3 camshaft bearing cap.

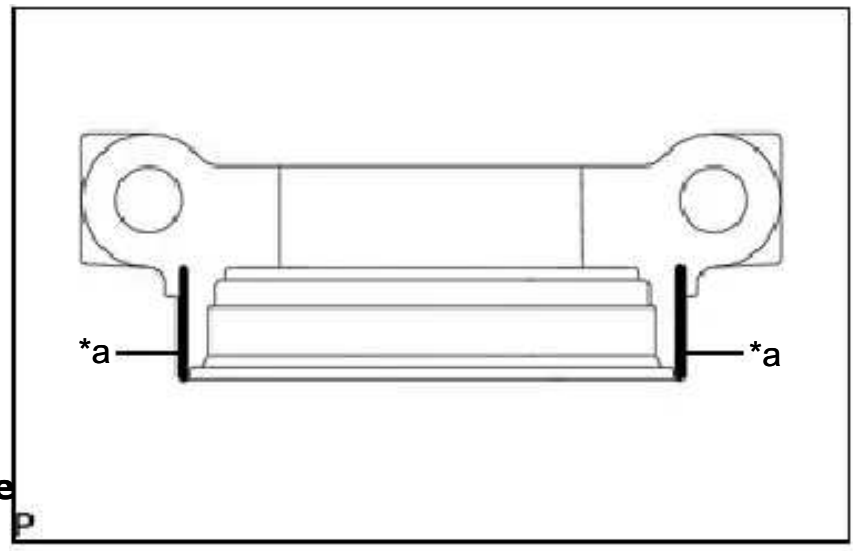
b. Apply seal packing to the specified areas as shown in the illustration.

Seal packing:
Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

Standard seal diameter:
3.0 mm (0.118 in.)

NOTICE:

- **Do not allow seal packing to contact the oil passage of the No. 3 camshaft bearing cap.**
- **After applying seal packing, install the No. 3 camshaft bearing cap within 3 minutes and tighten the bolts within 15 minutes.**
- **Do not start the engine for at least 2 hours after installation.**



A346676C01

*a	Seal Packing

c. Install the No. 3 camshaft bearing cap with the 2 bolts.

Torque:
21 N*m (214 kgf*cm, 15 ft.*lbf)

d. Wipe off excess seal packing from between No. 3 camshaft bearing cap and cylinder head sub-assembly.

6. INSTALL VACUUM PUMP ASSEMBLY

Click here BRAKE SYSTEM (OTHER) > VACUUM PUMP (for 1GD-FTV, 2GD-FTV) > INSTALLATION > INSTALL VACUUM PUMP ASSEMBLY

7. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PUMP > INSTALLATION > INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY

8. INSTALL NOZZLE HOLDER GASKET

Click here FUEL (2GD-FTV) > FUEL INJECTOR > INSTALLATION > INSTALL NOZZLE HOLDER GASKET

9. TEMPORARILY INSTALL INJECTOR ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL INJECTOR > INSTALLATION > TEMPORARILY INSTALL INJECTOR ASSEMBLY

10. TEMPORARILY INSTALL NO. 1 INJECTION PIPE SUB-ASSEMBLY AND NO. 2 INJECTION PIPE SUB-ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL INJECTOR > INSTALLATION > TEMPORARILY INSTALL NO. 1 AND NO. 2 INJECTION PIPE SUB-ASSEMBLY

11. TIGHTEN INJECTOR ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL INJECTOR > INSTALLATION > TIGHTEN INJECTOR ASSEMBLY

12. TIGHTEN NO. 1 INJECTION PIPE SUB-ASSEMBLY AND NO. 2 INJECTION PIPE SUB-ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL INJECTOR > INSTALLATION > TIGHTEN NO. 1 AND NO. 2 INJECTION PIPE SUB-ASSEMBLY

13. INSTALL NOZZLE LEAKAGE PIPE ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL INJECTOR > INSTALLATION > INSTALL NOZZLE LEAKAGE PIPE ASSEMBLY

14. INSTALL HARNESS BRACKET

Click here FUEL (2GD-FTV) > FUEL INJECTOR > INSTALLATION > INSTALL HARNESS BRACKET

15. INSTALL WIRING HARNESS CLAMP BRACKET

Click here FUEL (2GD-FTV) > FUEL INJECTOR > INSTALLATION > INSTALL WIRING HARNESS CLAMP BRACKET

16. INSTALL NO. 1 EGR COOLER AND NO. 2 EGR VALVE ASSEMBLY WITH ELECTRIC EGR CONTROL VALVE ASSEMBLY

Click here EMISSION CONTROL (2GD-FTV) > EGR COOLER > INSTALLATION > INSTALL NO. 1 EGR COOLER AND NO. 2 EGR VALVE ASSEMBLY WITH ELECTRIC EGR CONTROL VALVE ASSEMBLY

17. INSTALL VACUUM CONTROL VALVE SET

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > INSTALL VACUUM CONTROL VALVE SET

18. INSTALL NO. 1 EGR PIPE

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > INSTALL NO. 1 EGR PIPE

19. CONNECT NO. 4 WATER BY-PASS PIPE SUB-ASSEMBLY

Click here EMISSION CONTROL (2GD-FTV) > EGR COOLER > INSTALLATION > CONNECT NO. 4 WATER BY-PASS PIPE SUB-ASSEMBLY

20. INSTALL NO. 3 WATER BY-PASS PIPE SUB-ASSEMBLY

Click here EMISSION CONTROL (2GD-FTV) > EGR COOLER > INSTALLATION > INSTALL NO. 3 WATER BY-PASS PIPE SUB-ASSEMBLY

21. INSTALL NO. 2 EGR PIPE

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > INSTALL NO. 2 EGR PIPE

22. INSTALL EGR VALVE BRACKET

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > INSTALL EGR VALVE BRACKET

23. CONNECT ENGINE WIRE

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > CONNECT ENGINE WIRE

24. CONNECT FUEL FILTER ASSEMBLY

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > CONNECT FUEL FILTER ASSEMBLY

25. INSTALL NO. 2 ENGINE COVER BRACKET

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > INSTALL NO. 2 ENGINE COVER BRACKET

26. INSTALL NO. 2 HOSE TO HOSE TUBE

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > INSTALL NO. 2 HOSE TO HOSE TUBE

27. INSTALL TURBO PRESSURE SENSOR

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > INSTALL TURBO PRESSURE SENSOR

28. INSTALL GAS FILTER

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > INSTALL GAS FILTER

29. INSTALL NO. 2 WATER BY-PASS PIPE

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > INSTALL NO. 2 WATER BY-PASS PIPE

30. INSTALL DIESEL THROTTLE BODY ASSEMBLY

Click here ENGINE CONTROL (2GD-FTV) > DIESEL THROTTLE BODY > INSTALLATION > INSTALL DIESEL THROTTLE BODY ASSEMBLY

31. INSTALL INTERCOOLER AIR TUBE

Click here ENGINE CONTROL (2GD-FTV) > DIESEL THROTTLE BODY > INSTALLATION > INSTALL INTERCOOLER AIR TUBE

32. INSTALL NO. 4 AIR HOSE

Click here ENGINE CONTROL (2GD-FTV) > DIESEL THROTTLE BODY > INSTALLATION > INSTALL NO. 4 AIR HOSE

33. INSTALL RADIATOR ASSEMBLY

Click here COOLING (2GD-FTV) > RADIATOR > INSTALLATION > INSTALL RADIATOR ASSEMBLY

34. CONNECT NO. 2 RADIATOR HOSE

Click here COOLING (2GD-FTV) > RADIATOR > INSTALLATION > CONNECT NO. 2 RADIATOR HOSE

35. INSTALL FAN SHROUD

Click here COOLING (2GD-FTV) > RADIATOR > INSTALLATION > INSTALL FAN SHROUD

36. CONNECT NO. 1 OIL COOLER INLET HOSE (for Automatic Transmission)

Click here COOLING (2GD-FTV) > RADIATOR > INSTALLATION > CONNECT NO. 1 OIL COOLER INLET HOSE (for Automatic Transmission)

37. CONNECT NO. 1 OIL COOLER OUTLET HOSE (for Automatic Transmission)

Click here COOLING (2GD-FTV) > RADIATOR > INSTALLATION > CONNECT NO. 1 OIL COOLER OUTLET HOSE (for Automatic Transmission)

38. CONNECT SUCTION HOSE SUB-ASSEMBLY (w/ Air Conditioning System)

Click here COOLING (2GD-FTV) > RADIATOR > INSTALLATION > CONNECT SUCTION HOSE SUB-ASSEMBLY

39. INSTALL RADIATOR RESERVE TANK ASSEMBLY

Click here COOLING (2GD-FTV) > RADIATOR > INSTALLATION > INSTALL RADIATOR RESERVOIR

40. INSTALL NO. 1 OIL RESERVOIR BRACKET

Click here COOLING (2GD-FTV) > RADIATOR > INSTALLATION > INSTALL NO. 1 OIL RESERVOIR BRACKET

41. CONNECT VANE PUMP OIL RESERVOIR ASSEMBLY

Click here COOLING (2GD-FTV) > RADIATOR > INSTALLATION > CONNECT VANE PUMP OIL RESERVOIR ASSEMBLY

42. INSTALL NO. 1 RADIATOR HOSE

Click here COOLING (2GD-FTV) > RADIATOR > INSTALLATION > INSTALL NO. 1 RADIATOR HOSE

43. INSTALL NO. 2 AIR TUBE

Click here COOLING (2GD-FTV) > RADIATOR > INSTALLATION > INSTALL NO. 2 AIR TUBE

44. INSTALL NO. 4 AIR HOSE

Click here COOLING (2GD-FTV) > RADIATOR > INSTALLATION > INSTALL NO. 4 AIR HOSE

45. INSTALL NO. 1 RADIATOR AIR GUIDE

Click here COOLING (2GD-FTV) > RADIATOR > INSTALLATION > INSTALL NO. 1 RADIATOR AIR GUIDE

46. INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY

Click here ENGINE CONTROL (2GD-FTV) > DIESEL THROTTLE BODY > INSTALLATION > INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY

47. INSTALL FRONT BUMPER

Click here EXTERIOR PANELS / TRIM > FRONT BUMPER > INSTALLATION

48. INSTALL NO. 1 ENGINE UNDER COVER ASSEMBLY (for 4WD and Pre-Runner)

Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE ASSEMBLY > INSTALLATION > INSTALL NO. 2 ENGINE UNDER COVER (for 4WD and Pre-Runner)

49. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected.
Click here INTRODUCTION > REPAIR INSTRUCTION > INITIALIZATION

50. ADD ENGINE COOLANT

Click here COOLING (2GD-FTV) > COOLANT > REPLACEMENT > ADD ENGINE COOLANT

51. INSPECT FOR COOLANT LEAK

Click here COOLING (2GD-FTV) > COOLING SYSTEM > ON-VEHICLE INSPECTION > INSPECT FOR COOLANT LEAK

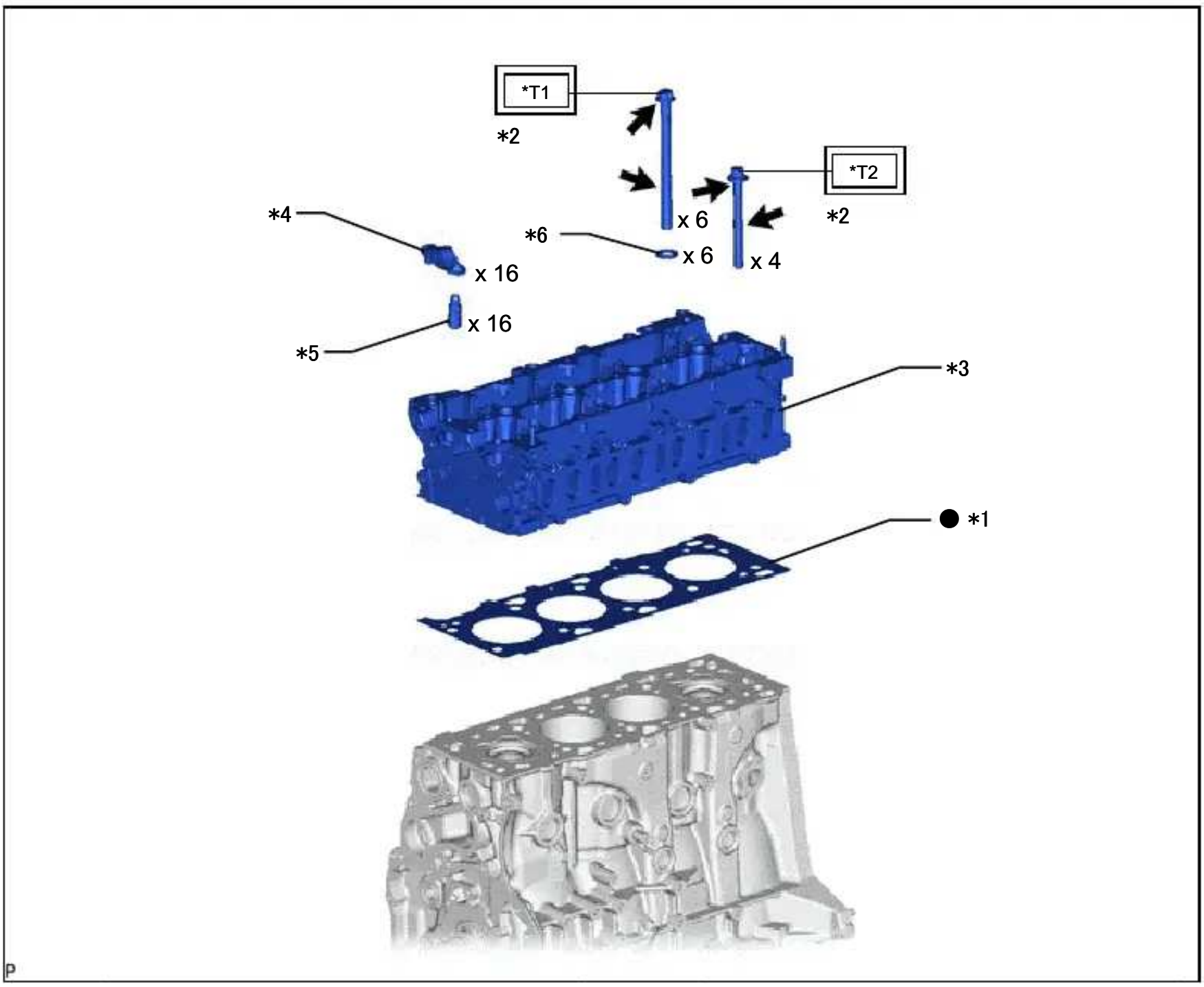
52. BLEED AIR FROM FUEL SYSTEM

Click here FUEL (2GD-FTV) > FUEL SYSTEM > ON-VEHICLE INSPECTION > BLEED AIR FROM FUEL SYSTEM

53. INSPECT FOR FUEL LEAK

Click here FUEL (2GD-FTV) > FUEL SYSTEM > ON-VEHICLE INSPECTION > INSPECT FOR FUEL LEAK

2GD-FTV ENGINE MECHANICAL > CYLINDER HEAD GASKET



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*1	CYLINDER HEAD GASKET	*2	CYLINDER HEAD SET BOLT
*3	CYLINDER HEAD SUB-ASSEMBLY	*4	NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY
*5	VALVE LASH ADJUSTER ASSEMBLY	*6	CYLINDER HEAD SET BOLT SPACER
▭	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping" : N*m (kgf*cm, ft.*lbf)	▭	N*m (kgf*cm, ft.*lbf): Specified torque
●	Non-reusable part	➡	Engine oil
*T1	1st: 150 (1530, 111) 2nd: Turn 90° 3rd: Turn 90°	*T2	85 (867, 63) 2nd: Turn 90° 3rd: Turn 90°

CYLINDER HEAD GASKET > REMOVAL

The necessary procedures (adjustment, calibration, initialization, or registration) that must be performed after parts are removed, installed, or replaced during the cylinder head gasekt removal/installation are shown below.

Necessary Procedure After Parts Removed/Installed/Replaced

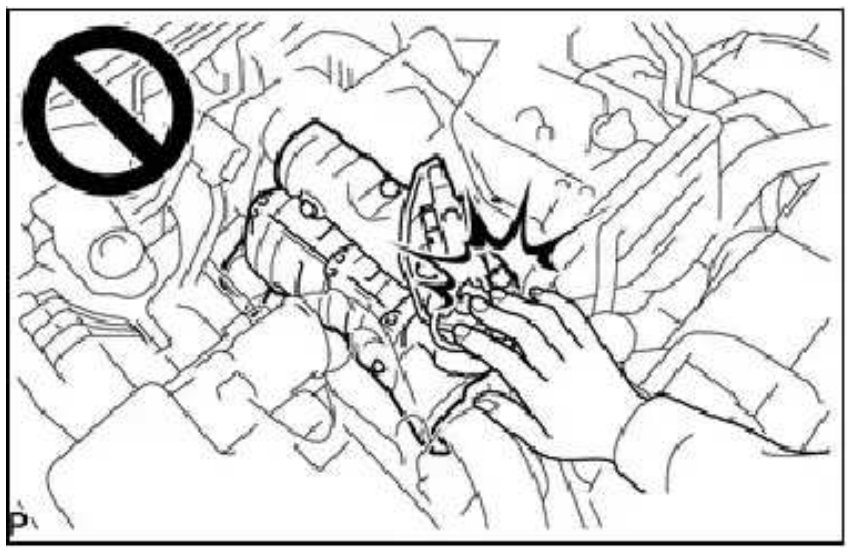
Replacement Part or Procedure	Necessary Procedures	Effects/Inoperative when not Performed	Link
w/ Stop and Start System: Battery terminal is disconnected/ reconnected	Drive the vehicle until stop and start control is permitted (approximately 5 to 40 minutes)	Stop and start system	STOP AND START > STOP AND START SYSTEM > PRECAUTION
Replacement of ECM	• Learning values save • Learning values write	Engine starting	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > REGISTRATION
	for RC60: Performing iMT installation information reset	• iMT system • DTCs are output	MANUAL TRANSMISSION / TRANSAXLE (RC60 / RC61) > MANUAL TRANSMISSION SYSTEM > INITIALIZATION
	Code registration (Immobiliser system)	Engine start function	See the Service Bulletin for the registration method.
Replacement of engine assembly	• Injector compensation code registration • Pilot quantity learning	Engine starting	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > REGISTRATION
	Clear Crank Time Compensation Data	Engine starting	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > INITIALIZATION
Replacement of crankshaft position sensor plate	Clear Crank Time Compensation Data	Crank time compensation data compensation amount is same as before replacement, affecting crank time compensation data	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > INITIALIZATION
Replacement of injector assembly	• Injector compensation code registration • Pilot quantity learning	Engine starting	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > REGISTRATION

• Replacement of diesel throttle body assembly • Replacement of electric EGR control valve assembly • Replacement of turbocharger sub-assembly • Replacement of turbocharger sub-assembly or turbocharger variable nozzle motor	Perform initialization	-	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > INITIALIZATION
w/ Stop and Start System: Replacement of starter assembly **NOTICE:** When the starter assembly is replaced, "ST NO. 1 relay" and "ST NO. 2 relay" must be also replaced.	Clear the number of starter operations	Stop and start system	STOP AND START > STOP AND START SYSTEM > PRECAUTION
w/ Stop and Start System: Replacement of flywheel sub-assembly	Total number of engine starts reset		
for AC60E: Replacement of automatic transmission assembly	Reset memory	• Large shift shock • Engine overruns	AUTOMATIC TRANSMISSION / TRANSAXLE (AC60E) > AUTOMATIC TRANSMISSION SYSTEM (for 2GD-FTV) > INITIALIZATION
for AC60E: Replacement of automatic transmission fluid	ATF thermal degradation estimate reset	The value of the Data List item "ATF Thermal Degradation Estimate" is not estimated correctly	
for AC60F: Replacement of automatic transmission assembly	Reset memory	• Large shift shock • Engine overruns	AUTOMATIC TRANSMISSION / TRANSAXLE (AC60F) > AUTOMATIC TRANSMISSION SYSTEM > INITIALIZATION
for AC60F: Replacement of automatic transmission fluid	ATF thermal degradation estimate reset	The value of the Data List item "ATF Thermal Degradation Estimate" is not estimated correctly	
w/ Automatic Headlight Beam Level Control System: The vehicle height changes due to replacement of suspension components or after performing such operations as removal and reinstallation	Headlight leveling ECU assembly initialization	Headlight leveling function	LIGHTING (EXT) > AUTOMATIC HEADLIGHT BEAM LEVEL CONTROL SYSTEM > INITIALIZATION

for 4WD: Front wheel alignment adjustment	• Clearing zero point calibration data • Yaw rate and acceleration sensor zero point calibration	VSC malfunctioning	BRAKE CONTROL / DYNAMIC CONTROL SYSTEMS > VEHICLE STABILITY CONTROL SYSTEM > CALIBRATION

CAUTION:

To prevent burns, do not touch the engine, exhaust manifold or other high temperature components while the engine is hot.



A343692

NOTICE:

- **When replacing the parts in the following chart (A), replace the No. 1 injection pipe sub-assembly, No. 2 injection pipe sub-assembly and/or fuel inlet pipe sub-assembly with new ones.**

Replaced Parts (A)	Pipes Requiring New Replacement
Injector assembly (including shuffling the injector assemblies between the cylinders)	• No. 1 injection pipe sub-assembly • No. 2 injection pipe sub-assembly
• Supply pump assembly • Common rail assembly • Cylinder block sub-assembly • Cylinder head sub-assembly • Cylinder head gasket • Timing chain case assembly	• No. 1 injection pipe sub-assembly • No. 2 injection pipe sub-assembly • Fuel inlet pipe sub-assembly

- **After removing the No. 1 injection pipe sub-assembly, No. 2 injection pipe sub-assembly and/or fuel inlet pipe sub-assembly, clean them with a brush and compressed air.**
- **The injector assembly is a precision instrument. Do not use the injector assembly if it is struck or dropped.**
- **The supply pump assembly is a precision instrument. Do not use the supply pump assembly if it is struck or dropped.**
- **Hold the supply pump assembly itself during removal and installation. Do not hold the pre-stroke control valve or fuel pipe, etc.**
- **Make sure foreign matter does not enter the fuel path.**

1. REMOVE CAMSHAFT

Click here ENGINE MECHANICAL (2GD-FTV) > CAMSHAFT > REMOVAL

2. REMOVE TIMING CHAIN COVER ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PUMP > REMOVAL

3. REMOVE NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE UNIT > DISASSEMBLY > REMOVE NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

4. REMOVE VALVE LASH ADJUSTER ASSEMBLY

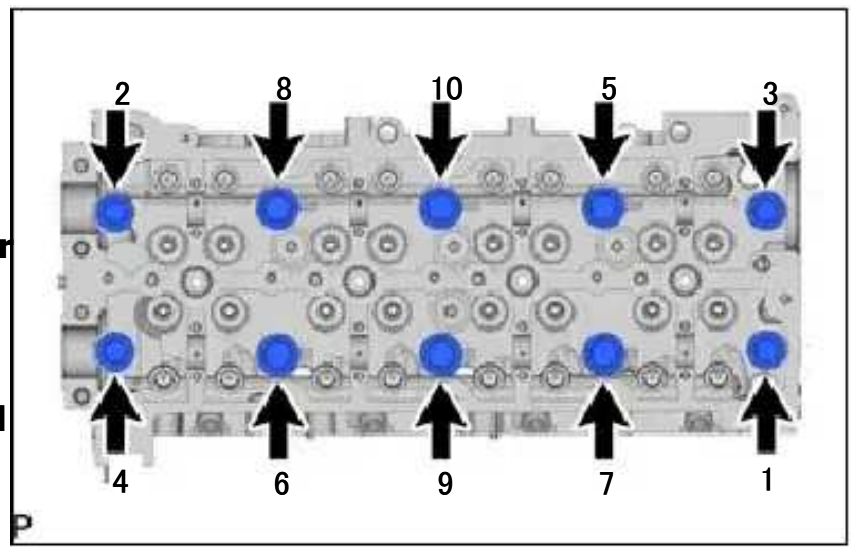
Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE UNIT > DISASSEMBLY > REMOVE VALVE LASH ADJUSTER ASSEMBLY

5. REMOVE CYLINDER HEAD SUB-ASSEMBLY

a. Uniformly loosen the 10 cylinder head set bolts in several passes in the sequence shown in the illustration. Then remove the 10 cylinder head set bolts and 6 cylinder head set bolt spacers.

NOTICE:

- **Cylinder head sub-assembly warpage or cracking could result from removing bolts in the incorrect order.**
- **Be careful not to drop the cylinder head set bolt spacers into the cylinder head sub-assembly.**



A344477N01

b. Lift the cylinder head sub-assembly from the ring pins on the cylinder block sub-assembly, and place the cylinder head sub-assembly on wooden blocks on a bench.

NOTICE:

Be careful not to damage the contact surfaces of the cylinder head sub-assembly and cylinder block sub-assembly.

HINT:

If the cylinder head sub-assembly is difficult to lift, use a screwdriver to pry between the cylinder head sub-assembly and cylinder block sub-assembly.

6. REMOVE CYLINDER HEAD GASKET

7. INSPECT CYLINDER HEAD SET BOLT

Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE UNIT > INSPECTION > INSPECT CYLINDER HEAD SET BOLT

CYLINDER HEAD GASKET > INSTALLATION

NOTICE:

- **When replacing the parts in the following chart (A), replace the No. 1 injection pipe sub-assembly, No. 2 injection pipe sub-assembly and/or fuel inlet pipe sub-assembly with new ones.**

Replaced Parts (A)	Pipes Requiring New Replacement
Injector assembly (including shuffling the injector assemblies between the cylinders)	• No. 1 injection pipe sub-assembly • No. 2 injection pipe sub-assembly
• Supply pump assembly • Common rail assembly • Cylinder block sub-assembly • Cylinder head sub-assembly • Cylinder head gasket • Timing chain case assembly	• No. 1 injection pipe sub-assembly • No. 2 injection pipe sub-assembly • Fuel inlet pipe sub-assembly

- **After removing the No. 1 injection pipe sub-assembly, No. 2 injection pipe sub-assembly and/or fuel inlet pipe sub-assembly, clean them with a brush and compressed air.**
- **The injector assembly is a precision instrument. Do not use the injector assembly if it is struck or dropped.**
- **The supply pump assembly is a precision instrument. Do not use the supply pump assembly if it is struck or dropped.**
- **Hold the supply pump assembly itself during removal and installation. Do not hold the pre-stroke control valve or fuel pipe, etc.**
- **Make sure foreign matter does not enter the fuel path.**

1. INSTALL CYLINDER HEAD GASKET

a. Check the piston protrusions for each cylinder.

i. Clean the cylinder block sub-assembly with solvent.

ii. Set the piston of the cylinder to be measured to slightly before TDC.

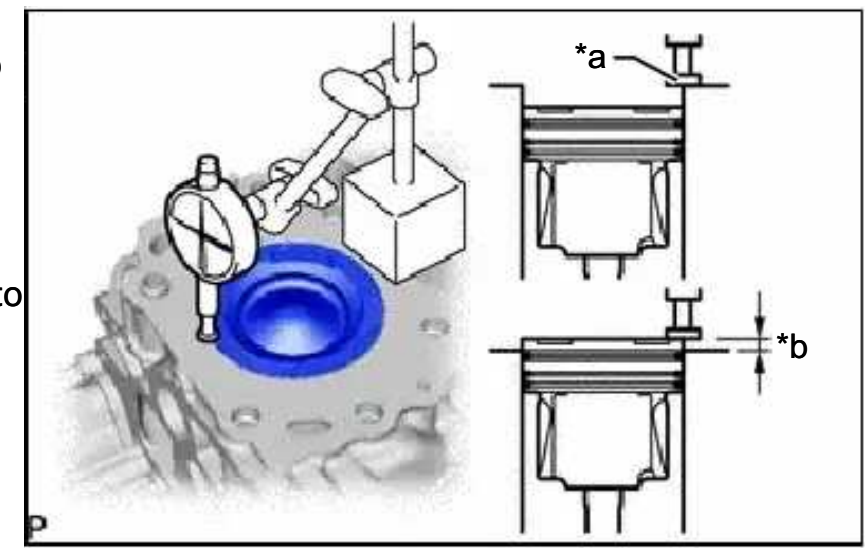
iii. Place a dial indicator on the cylinder block sub-assembly, and position the measuring tip as shown in the illustration.

iv. Set the dial indicator at 0 mm (0 in.)

HINT:

Make sure that the measuring tip is square to the cylinder block gasket surface and piston head when taking the measurements.

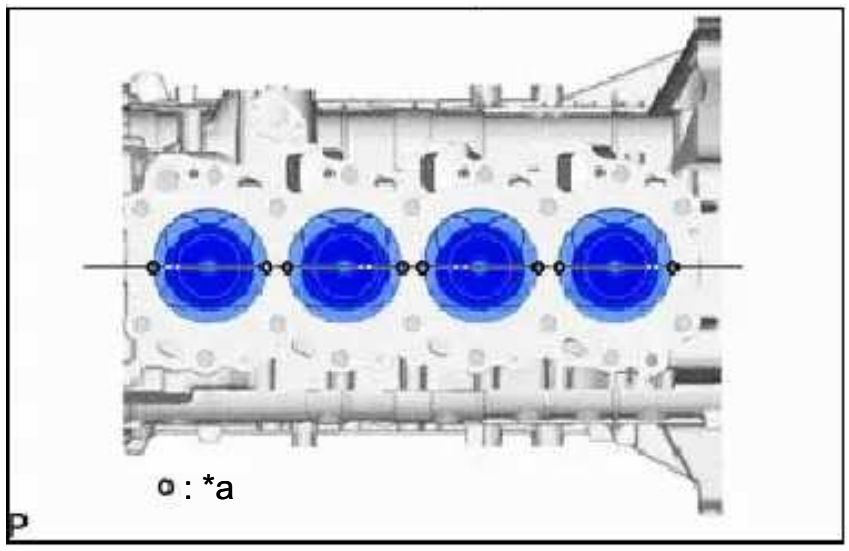
b. Find where the piston head protrudes most by slowly turning the crankshaft clockwise and counterclockwise.



A344480C01

*a	Measuring Tip
*b	Protrusion

c. Measure the piston protrusion of each cylinder at the 2 points shown in the illustration.



A344481C01

*a	Measuring Point

d. For the piston protrusion value of each cylinder, use the average of the 2 measurements of each cylinder.

Standard piston protrusion:
0.355 to 0.605 mm (0.0140 to 0.0238 in.)

HINT:
When installing the piston and connecting rod assembly, if the protrusion is not as specified, remove the piston and connecting rod assembly and reinstall them.

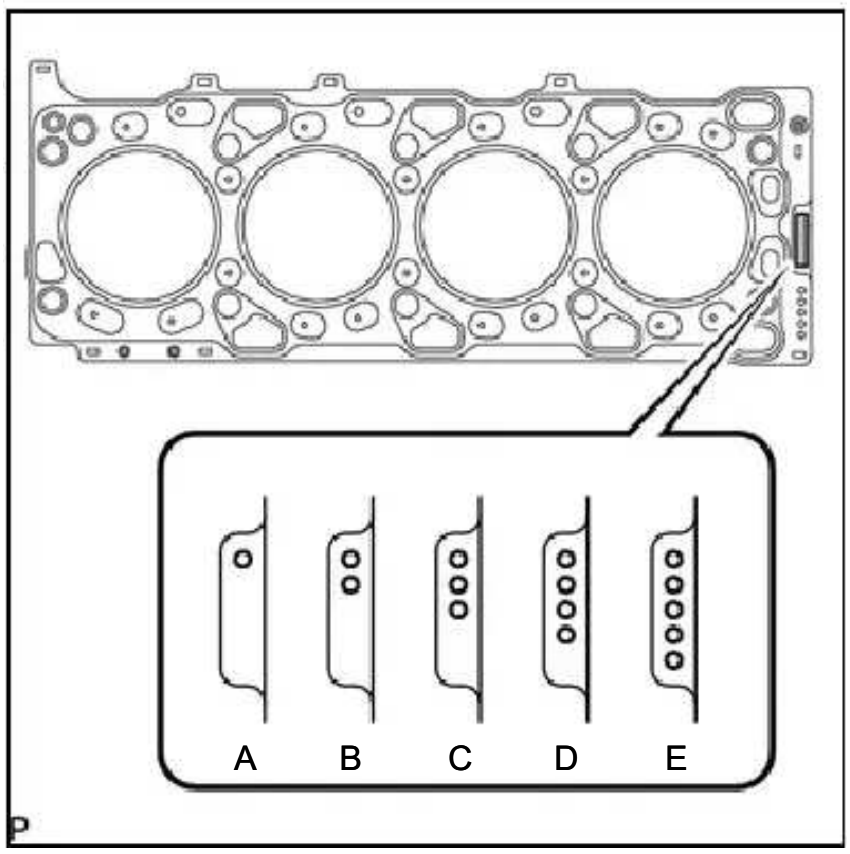
e. Select a new cylinder head gasket.

HINT:

New cylinder head gaskets are available in 5 sizes, and are marked A, B, C, D or E.

New Cylinder Head Gasket Thickness

Mark	Specified Condition
A	1.15 to 1.25 mm (0.0453 to 0.0492 in.)
B	1.20 to 1.30 mm (0.0472 to 0.0512 in.)
C	1.25 to 1.35 mm (0.0492 to 0.0531 in.)
D	1.30 to 1.40 mm (0.0512 to 0.0551 in.)
E	1.35 to 1.45 mm (0.0531 to 0.0571 in.)



A344482N01

i. Select the largest piston protrusion value from the measurements made. Then select a new appropriate cylinder head gasket according to the table below.

Gasket Size

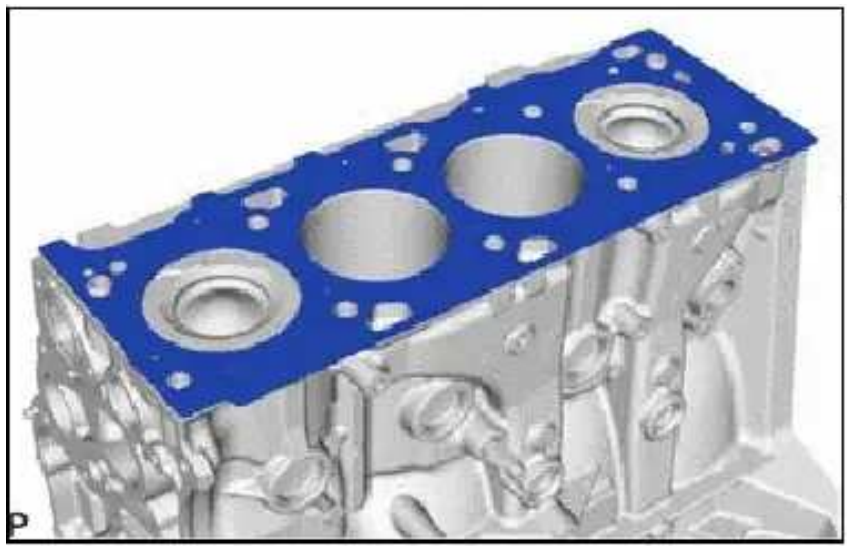
Item	Specified Condition				
Piston protrusion	0.355 to 0.405 mm (0.0140 to 0.0159 in.)	0.405 to 0.455 mm (0.0159 to 0.0179 in.)	0.455 to 0.505 mm (0.0179 to 0.0199 in.)	0.505 to 0.555 mm (0.0199 to 0.0219 in.)	0.555 to 0.605 mm (0.0219 to 0.0238 in.)
Gasket to be used	A	B	C	D	E

f. Clean and degrease the contact surfaces of the cylinder head sub-assembly and cylinder block sub-assembly.

g. Place the cylinder head gasket on the cylinder block sub-assembly.

NOTICE:

Make sure the cylinder head gasket is installed facing the proper direction.



A344478

2. INSTALL CYLINDER HEAD SUB-ASSEMBLY

HINT:

- **If any cylinder head set bolt is broken or deformed, replace the cylinder head set bolt and cylinder head set bolt spacer.**
- **The cylinder head set bolts are tightened in 3 progressive steps.**

a. Clean and degrease the contact surfaces of the cylinder head sub-assembly and cylinder block sub-assembly.

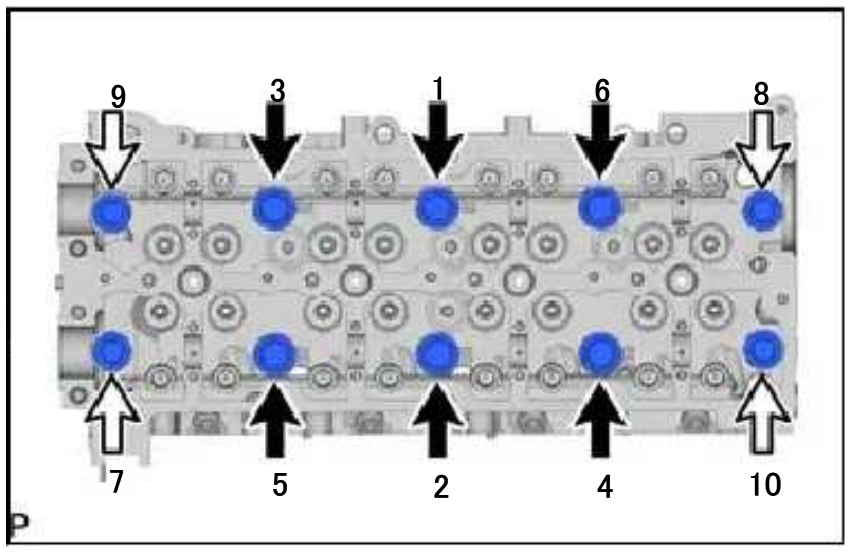
b. Place the cylinder head sub-assembly on the cylinder head gasket.

c. Apply a light coat of engine oil to the threads and under the heads of the cylinder head set bolts.

d. Install and uniformly tighten the 10 cylinder head set bolts and 6 cylinder head set bolt spacers in several passes in the sequence shown in the illustration.

Torque:
for bolt A
150 N*m (1530 kgf*cm, 111 ft.*lbf)

for bolt B
85 N*m (867 kgf*cm, 63 ft.*lbf)



A344479C01

➡	Bolt A
⇨	Bolt B

Standard Bolt Length

Item	Specified Condition
Bolt A	180 mm (7.09 in.)
Bolt B	127 mm (5.00 in.)

If any of the cylinder head set bolts does not meet the specification, replace it.

e. Mark the front of each cylinder head set bolt with paint.

f. Further tighten the cylinder head set bolts by 90° in the sequence shown in the illustration above.

g. Finally, tighten the cylinder head set bolts by an additional 90°.

h. Check that the painted marks are now facing rearward.

3. INSTALL VALVE LASH ADJUSTER ASSEMBLY

Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE UNIT > REASSEMBLY > INSTALL VALVE LASH ADJUSTER ASSEMBLY

4. INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE UNIT > REASSEMBLY > INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

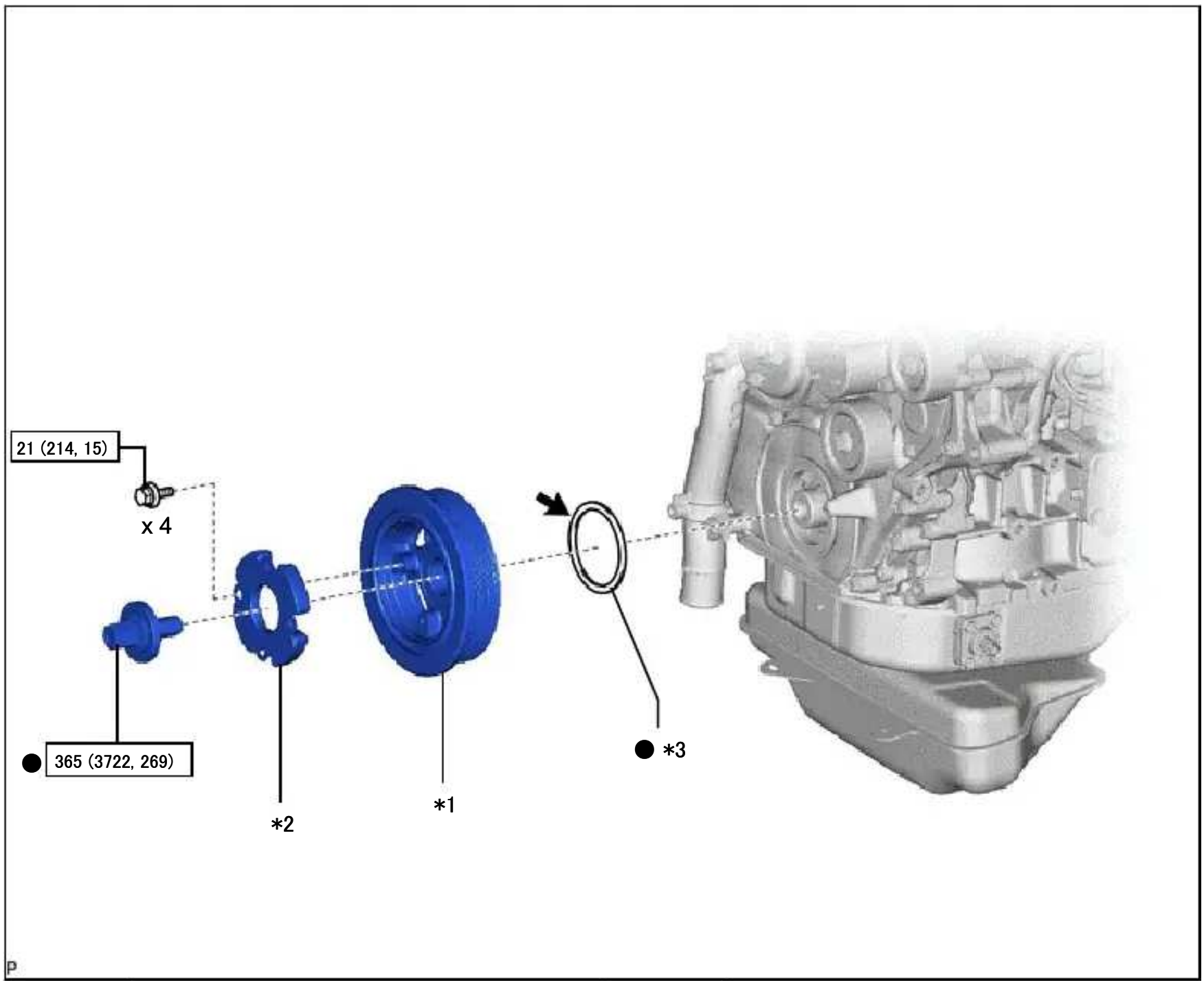
5. INSTALL TIMING CHAIN COVER ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PUMP > INSTALLATION

6. INSTALL CAMSHAFT

Click here ENGINE MECHANICAL (2GD-FTV) > CAMSHAFT > INSTALLATION

2GD-FTV ENGINE MECHANICAL > FRONT CRANKSHAFT OIL SEAL



A340288C01

*1	CRANKSHAFT PULLEY	*2	CRANKSHAFT PULLY COVER
*3	FRONT CRANKSHAFT OIL SEAL	-	-
□	N*m (kgf*cm, ft.*lbf): Specified torque	●	Non-reusable part
➡	MP grease	-	-

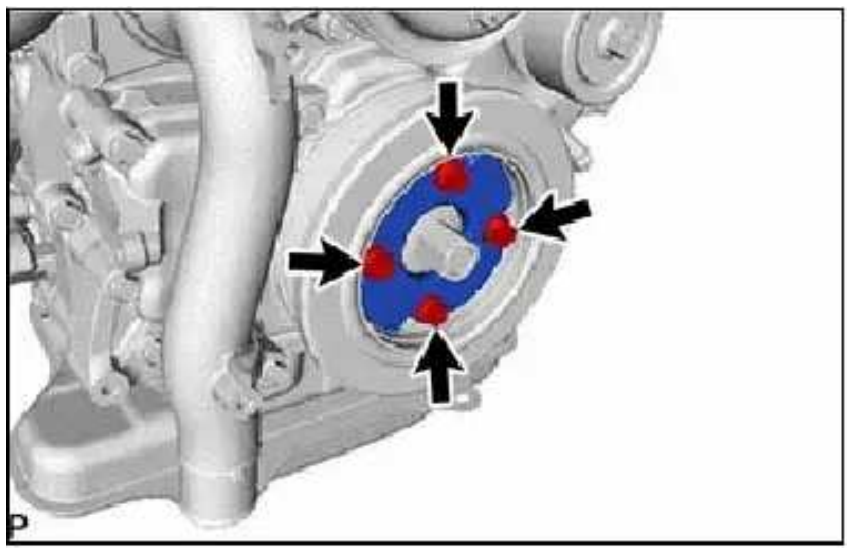
FRONT CRANKSHAFT OIL SEAL > REMOVAL

1. REMOVE RADIATOR ASSEMBLY

Click here COOLING (2GD-FTV) > RADIATOR > REMOVAL

2. REMOVE CRANKSHAFT PULLY COVER

a. Remove the 4 bolts and crankshaft pulley cover from the crankshaft pulley.



A343925

3. REMOVE CRANKSHAFT PULLEY

a. Using SST, hold the crankshaft pulley and loosen the pulley bolt.

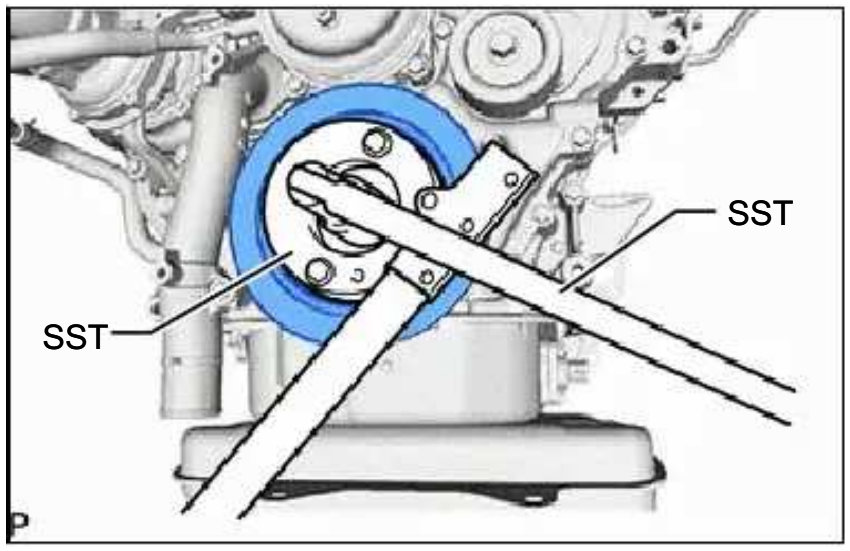
SST

09213-58014 (91551-80840)

09330-00021

HINT:

Make sure to leave the pulley bolt screwed into the crankshaft by 2 or 3 threads.

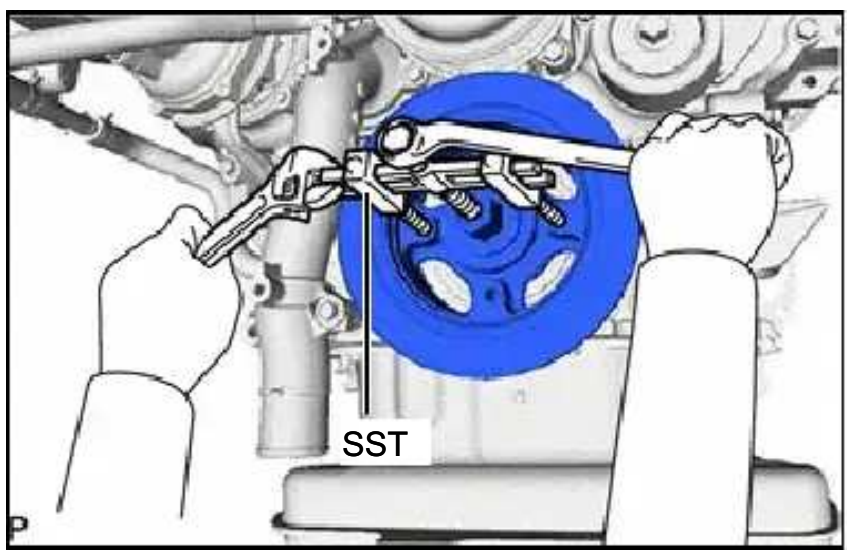


A343926N01

b. Using SST, remove the pulley bolt and crankshaft pulley from the crankshaft.

SST

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



A343927N01

4. REMOVE FRONT CRANKSHAFT OIL SEAL

a. Using SST, remove the front crankshaft oil seal from the timing chain cover assembly.

SST

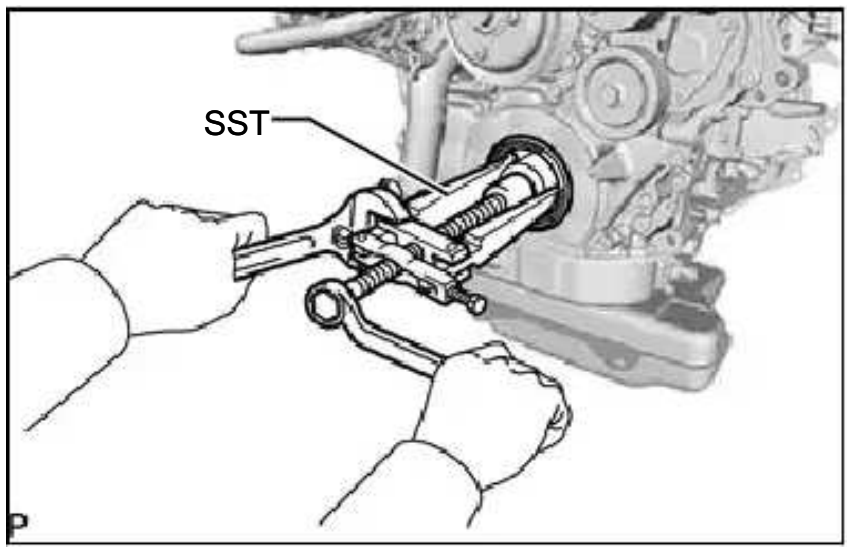
09308-10010

09950-40011 (09957-04010)

09950-60010 (09951-00350)

HINT:

After removal, check the crankshaft for damage. If damaged, smooth the surface with #400 sandpaper.



A343928N01

FRONT CRANKSHAFT OIL SEAL > INSTALLATION

1. INSTALL FRONT CRANKSHAFT OIL SEAL

a. Apply MP grease to the lip of a new front crankshaft oil seal.

NOTICE:

- **Keep the lip free of foreign matter.**
- **Do not allow MP grease to contact the dust seal.**

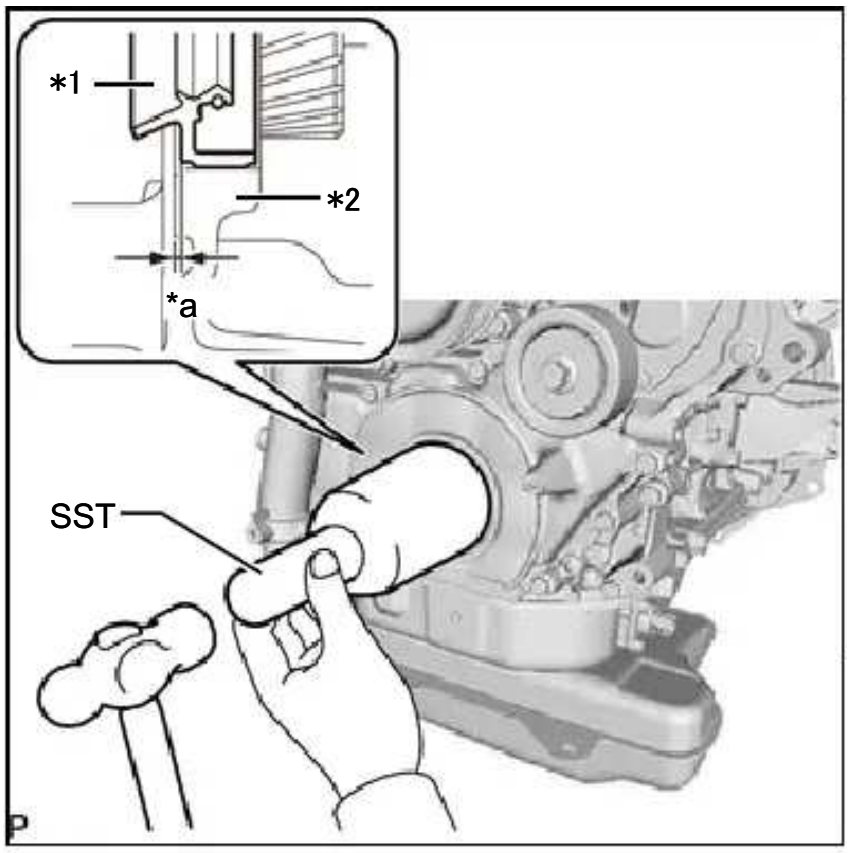
b. Using SST and a hammer, tap in the front crankshaft oil seal.

SST

09214-76011

NOTICE:

- **The acceptable depth from the top of the timing chain cover assembly is 0 to 1.0 mm (0 to 0.0394 in.)**
- **Keep the lip free from foreign matter.**
- **Do not tap the front crankshaft oil seal at an angle.**
- **Make sure that the front crankshaft oil seal is properly installed.**



A343929C01

*1	Front Crankshaft Oil Seal
*2	Timing Chain Cover Assembly
*a	0 to 1.0 mm (0 to 0.0394 in.)

2. INSTALL CRANKSHAFT PULLEY

a. Align the keyway of the crankshaft pulley with the key located on the crankshaft, and then slide the crankshaft pulley into place to install it.

b. Using SST, install a new pulley bolt.

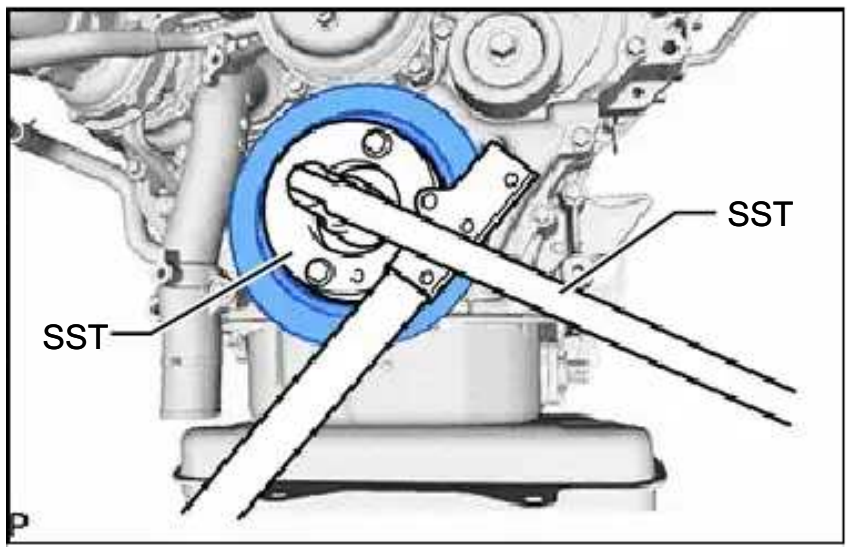
SST

09213-58014 (91551-80840)

09330-00021

Torque:

365 N*m (3722 kgf*cm, 269 ft.*lbf)



A343926N01

3. INSTALL CRANKSHAFT PULLY COVER

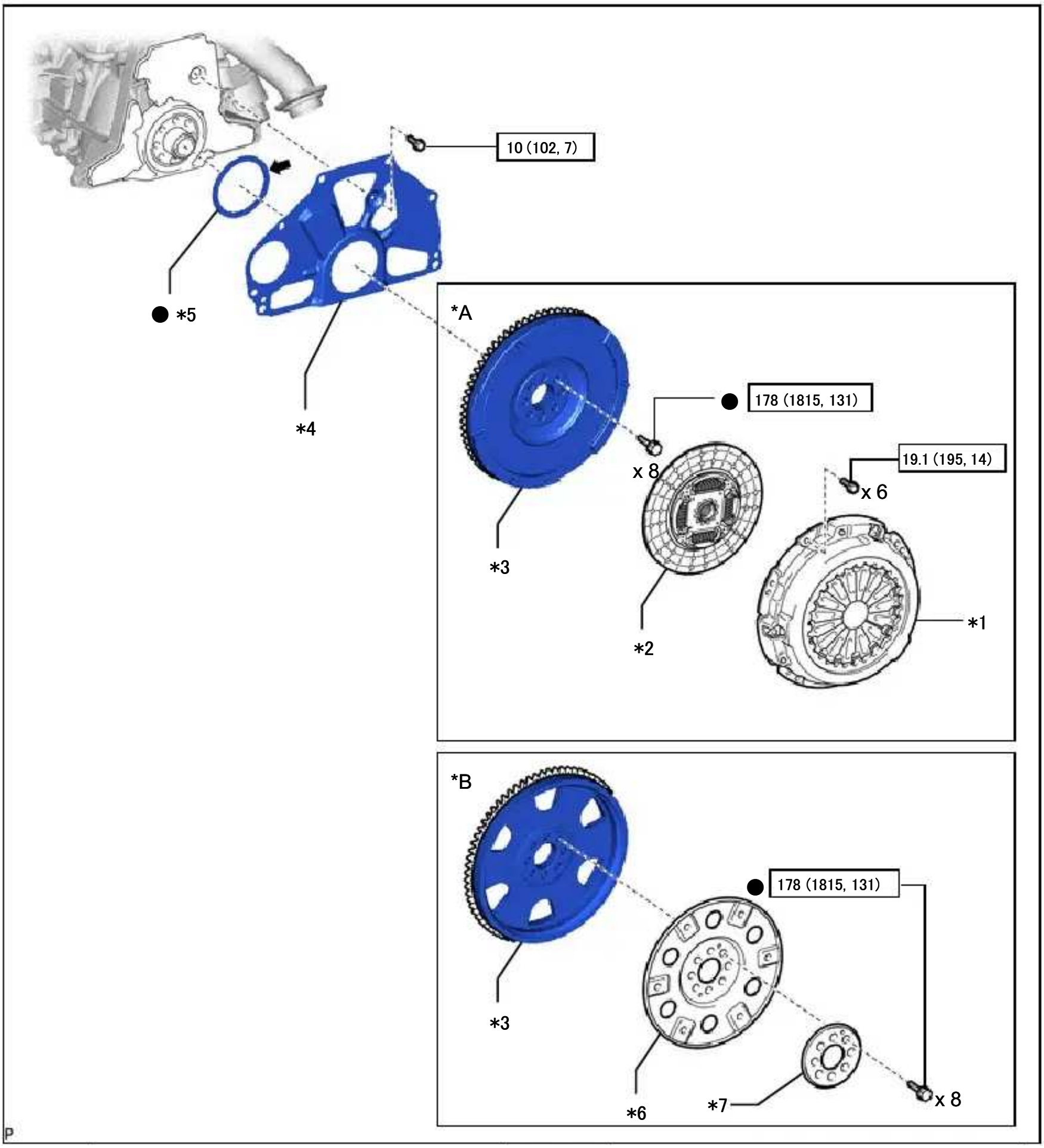
a. Install the crankshaft pulley cover to the crankshaft pulley with the 4 bolts.

Torque:
21 N*m (214 kgf*cm, 15 ft.*lbf)

4. INSTALL RADIATOR ASSEMBLY

Click here COOLING (2GD-FTV) > RADIATOR > INSTALLATION

2GD-FTV ENGINE MECHANICAL > REAR CRANKSHAFT OIL SEAL



A340244C01

*A	for Manual Transmission	*B	for Automatic Transmission
*1	CLUTCH COVER ASSEMBLY	*2	CLUTCH DISC ASSEMBLY
*3	FLYWHEEL SUB-ASSEMBLY	*4	REAR END PLATE
*5	REAR ENGINE OIL SEAL	*6	PUMP IMPELLER DRIVE PLATE
*7	REAR DRIVE PLATE SPACER	-	-

	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part
	MP grease	-	-

REAR CRANKSHAFT OIL SEAL > REMOVAL

The necessary procedures (adjustment, calibration, initialization, or registration) that must be performed after parts are removed, installed, or replaced during the rear crankshaft oil seal removal/installation are shown below.

Necessary Procedure After Parts Removed/Installed/Replaced

Replacement Part or Procedure	Necessary Procedures	Effects/Inoperative when not Performed	Link
w/ Stop and Start System: Battery terminal is disconnected/ reconnected	Drive the vehicle until stop and start control is permitted (approximately 5 to 40 minutes)	Stop and start system	STOP AND START > STOP AND START SYSTEM > PRECAUTION
Replacement of ECM	• Learning values save • Learning values write	Engine starting	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > REGISTRATION
	for RC60: Performing iMT installation information reset	• iMT system • DTCs are output	MANUAL TRANSMISSION / TRANSAXLE (RC60 / RC61) > MANUAL TRANSMISSION SYSTEM > INITIALIZATION
	Code registration (Immobiliser system)	Engine start function	See the Service Bulletin for the registration method.
Replacement of engine assembly	• Injector compensation code registration • Pilot quantity learning	Engine starting	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > REGISTRATION
	Clear Crank Time Compensation Data	Engine starting	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > INITIALIZATION
w/ Stop and Start System: Replacement of starter assembly **NOTICE:** When the starter assembly is replaced, "ST NO. 1 relay" and "ST NO. 2 relay" must be also replaced.	Clear the number of starter operations	Stop and start system	STOP AND START > STOP AND START SYSTEM > PRECAUTION
w/ Stop and Start System: Replacement of flywheel sub-assembly	Total number of engine starts reset		

for AC60E: Replacement of automatic transmission assembly	Reset memory	• Large shift shock • Engine overruns	AUTOMATIC TRANSMISSION / TRANSAXLE (AC60E) > AUTOMATIC TRANSMISSION SYSTEM (for 2GD-FTV) > INITIALIZATION
for AC60E: Replacement of automatic transmission fluid	ATF thermal degradation estimate reset	The value of the Data List item "ATF Thermal Degradation Estimate" is not estimated correctly	
for AC60F: Replacement of automatic transmission assembly	Reset memory	• Large shift shock • Engine overruns	AUTOMATIC TRANSMISSION / TRANSAXLE (AC60F) > AUTOMATIC TRANSMISSION SYSTEM > INITIALIZATION
for AC60F: Replacement of automatic transmission fluid	ATF thermal degradation estimate reset	The value of the Data List item "ATF Thermal Degradation Estimate" is not estimated correctly	
w/ Automatic Headlight Beam Level Control System: The vehicle height changes due to replacement of suspension components or after performing such operations as removal and reinstallation	Headlight leveling ECU assembly initialization	Headlight leveling function	LIGHTING (EXT) > AUTOMATIC HEADLIGHT BEAM LEVEL CONTROL SYSTEM > INITIALIZATION
for 4WD: Front wheel alignment adjustment	• Clearing zero point calibration data • Yaw rate and acceleration sensor zero point calibration	VSC malfunctioning	BRAKE CONTROL / DYNAMIC CONTROL SYSTEMS > VEHICLE STABILITY CONTROL SYSTEM > CALIBRATION

1. REMOVE MANUAL TRANSMISSION UNIT ASSEMBLY (for Manual Transmission)

- for R151:
  Click here MANUAL TRANSMISSION / TRANSAXLE (R151) > MANUAL TRANSMISSION ASSEMBLY > REMOVAL

- for RC60:
  Click here MANUAL TRANSMISSION / TRANSAXLE (RC60 / RC61) > MANUAL TRANSMISSION ASSEMBLY > REMOVAL

2. REMOVE AUTOMATIC TRANSMISSION ASSEMBLY (for Automatic Transmission)

- for AC60E:
  Click here AUTOMATIC TRANSMISSION / TRANSAXLE (AC60E) > AUTOMATIC TRANSMISSION ASSEMBLY (for 1GD-FTV, 2GD-FTV) > REMOVAL

- for AC60F:
  Click here AUTOMATIC TRANSMISSION / TRANSAXLE (AC60F) > AUTOMATIC TRANSMISSION ASSEMBLY > REMOVAL

3. REMOVE CLUTCH COVER ASSEMBLY (for Manual Transmission)

- for R151:
  Click here CLUTCH > CLUTCH UNIT (for R151) > REMOVAL > REMOVE CLUTCH COVER ASSEMBLY

- for RC60:
  Click here CLUTCH > CLUTCH UNIT (for RC60, RC61) > REMOVAL > REMOVE CLUTCH COVER ASSEMBLY

4. REMOVE CLUTCH DISC ASSEMBLY (for Manual Transmission)

- for R151:
  Click here CLUTCH > CLUTCH UNIT (for R151) > REMOVAL > REMOVE CLUTCH DISC ASSEMBLY

- for RC60:
  Click here CLUTCH > CLUTCH UNIT (for RC60, RC61) > REMOVAL > REMOVE CLUTCH DISC ASSEMBLY

5. REMOVE FLYWHEEL SUB-ASSEMBLY

Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE ASSEMBLY > REMOVAL > REMOVE FLYWHEEL SUB-ASSEMBLY

6. REMOVE REAR END PLATE

Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE ASSEMBLY > REMOVAL > REMOVE REAR END PLATE

7. REMOVE REAR ENGINE OIL SEAL

a. Using a knife, cut off the lip of the rear engine oil seal.

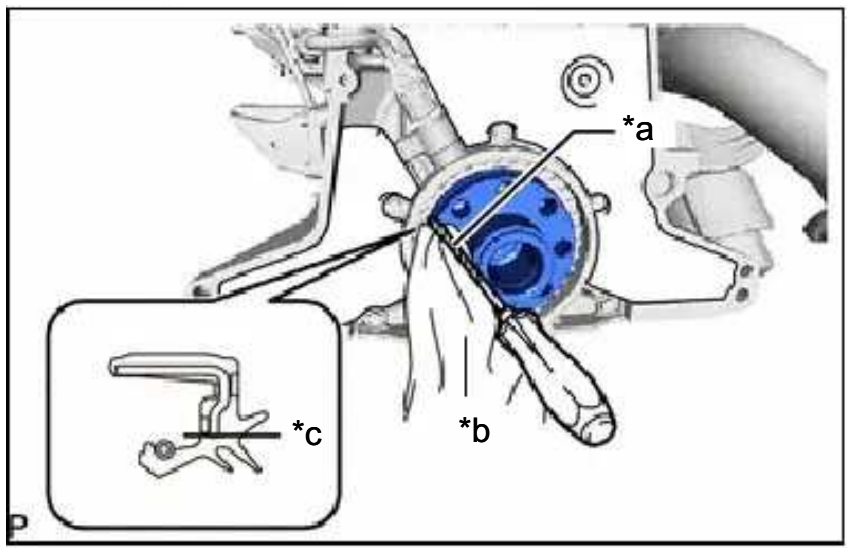
b. Using a cloth and screwdriver, pry out the rear engine oil seal from the rear engine oil seal retainer.

NOTICE:

Be careful not to damage the crankshaft and rear engine oil seal retainer.

HINT:

- **After removal, check the crankshaft for damage. If damaged, smooth the surface with #400 sandpaper.**
- **Tape the screwdriver tip before use.**



A340242C01

*a	Protective Tape
*b	Cloth
*c	Cut

REAR CRANKSHAFT OIL SEAL > INSTALLATION

1. INSTALL REAR ENGINE OIL SEAL

a. Apply MP grease to the lip of a new rear engine oil seal.

NOTICE:

- **Keep the lip free of foreign matter.**
- **Do not allow MP grease to contact the dust seal.**

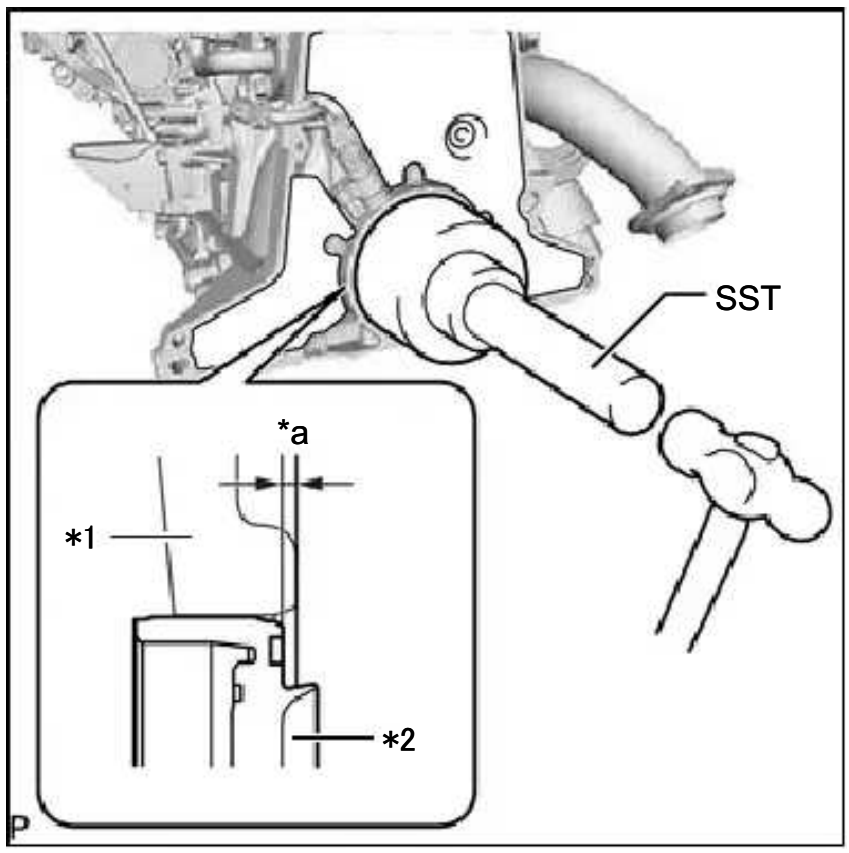
b. Using SST and a hammer, tap in the rear engine oil seal to the rear engine oil seal retainer edge.

SST

09351-40010 (09351-04010, 09351-04020)

NOTICE:

- **The acceptable depth from the top of the rear engine oil seal retainer is 0 to 1.0 mm (0 to 0.0394 in.)**
- **Keep the lip free from foreign matter.**
- **Do not tap the rear engine oil seal at an angle.**
- **Make sure that the rear engine oil seal is properly installed.**



A340243C01

*1	Rear Oil Seal Retainer
*2	Rear Engine Oil Seal
*a	0 to 1.0 mm (0 to 0.0394 in.)

2. INSTALL REAR END PLATE

Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE ASSEMBLY > INSTALLATION > INSTALL REAR END PLATE

3. INSTALL FLYWHEEL SUB-ASSEMBLY

Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE ASSEMBLY > INSTALLATION > INSTALL FLYWHEEL SUB-ASSEMBLY

4. INSTALL CLUTCH DISC ASSEMBLY (for Manual Transmission)

- for R151:
  Click here CLUTCH > CLUTCH UNIT (for R151) > INSTALLATION > INSTALL CLUTCH DISC ASSEMBLY

- for RC60:
  Click here CLUTCH > CLUTCH UNIT (for RC60, RC61) > INSTALLATION > INSTALL CLUTCH DISC ASSEMBLY

5. INSTALL CLUTCH COVER ASSEMBLY (for Manual Transmission)

- for R151:
  Click here CLUTCH > CLUTCH UNIT (for R151) > INSTALLATION > INSTALL CLUTCH COVER ASSEMBLY
- for RC60:
  Click here CLUTCH > CLUTCH UNIT (for RC60, RC61) > INSTALLATION > INSTALL CLUTCH COVER ASSEMBLY

6. INSPECT AND ADJUST CLUTCH COVER ASSEMBLY (for Manual Transmission)

- for R151:
  Click here CLUTCH > CLUTCH UNIT (for R151) > INSTALLATION > INSPECT AND ADJUST CLUTCH COVER ASSEMBLY

- for RC60:
  Click here CLUTCH > CLUTCH UNIT (for RC60, RC61) > INSTALLATION > INSPECT AND ADJUST CLUTCH COVER ASSEMBLY

7. INSTALL AUTOMATIC TRANSMISSION ASSEMBLY (for Automatic Transmission)

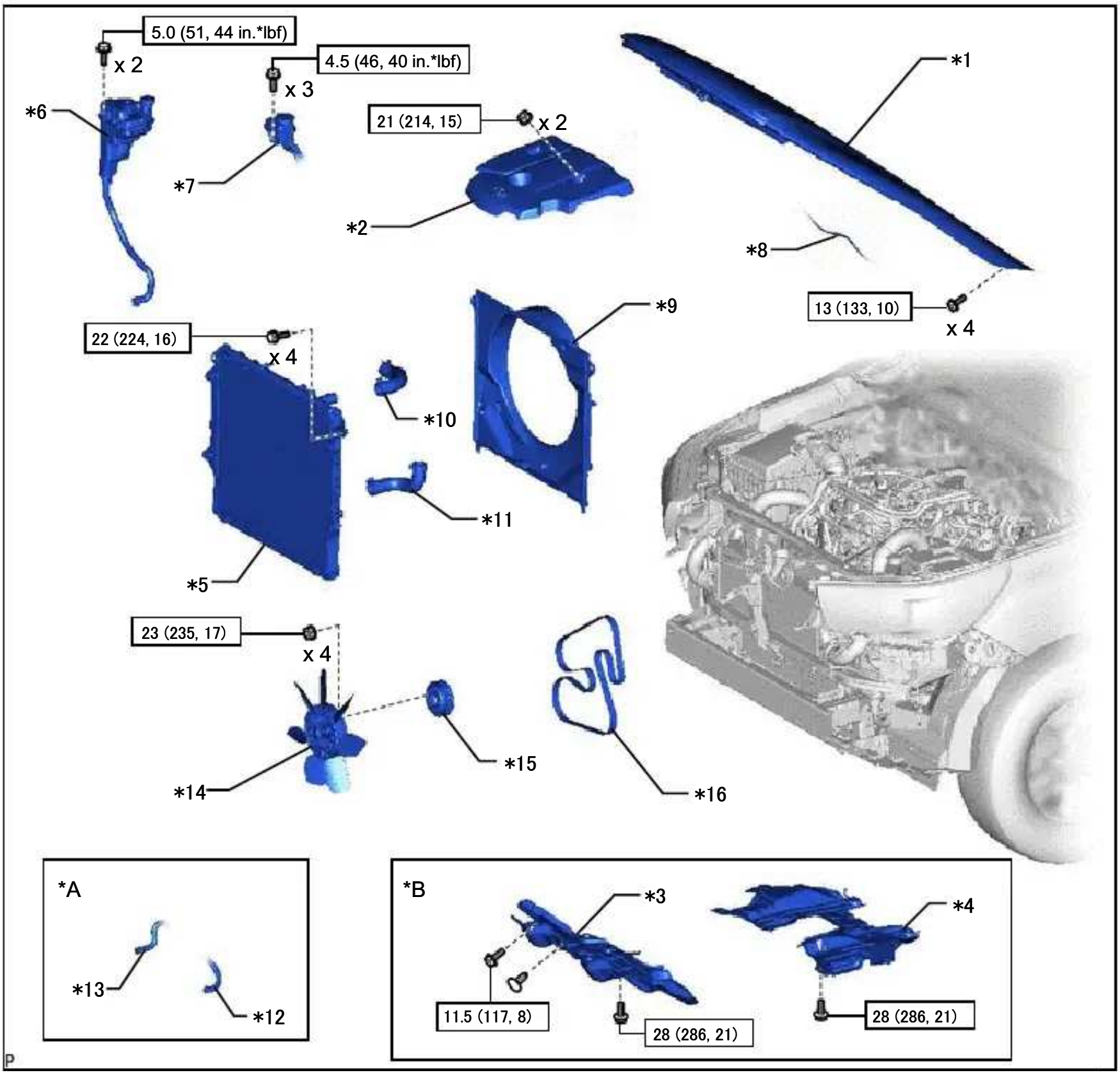
- for AC60E:
  Click here AUTOMATIC TRANSMISSION / TRANSAXLE (AC60E) > AUTOMATIC TRANSMISSION ASSEMBLY (for 1GD-FTV, 2GD-FTV) > INSTALLATION

- for AC60F:
  Click here AUTOMATIC TRANSMISSION / TRANSAXLE (AC60F) > AUTOMATIC TRANSMISSION ASSEMBLY > INSTALLATION

8. INSTALL MANUAL TRANSMISSION UNIT ASSEMBLY (for Manual Transmission)

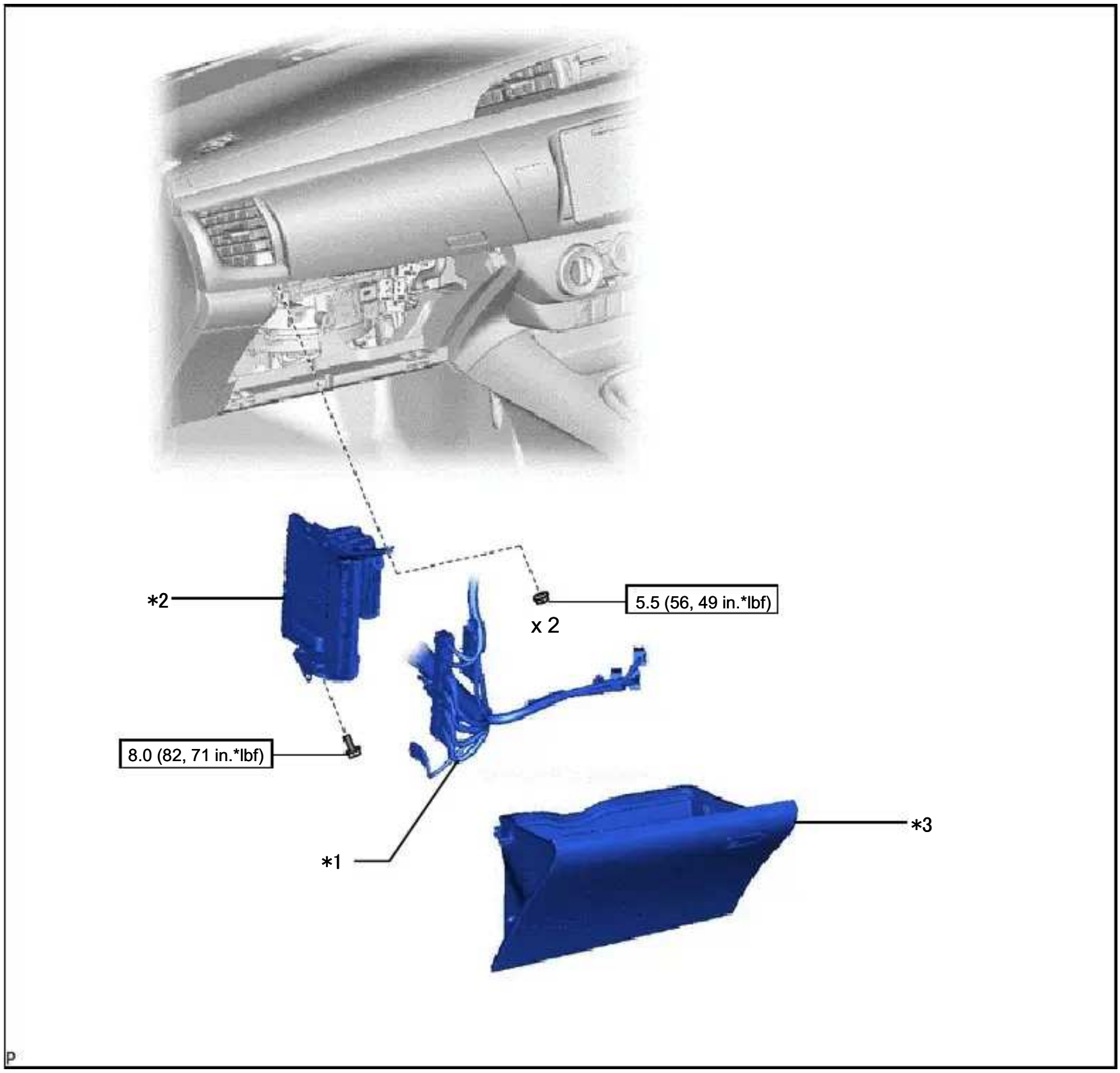
- for R151:
  Click here MANUAL TRANSMISSION / TRANSAXLE (R151) > MANUAL TRANSMISSION ASSEMBLY > INSTALLATION

- for RC60:
  Click here MANUAL TRANSMISSION / TRANSAXLE (RC60 / RC61) > MANUAL TRANSMISSION ASSEMBLY > INSTALLATION



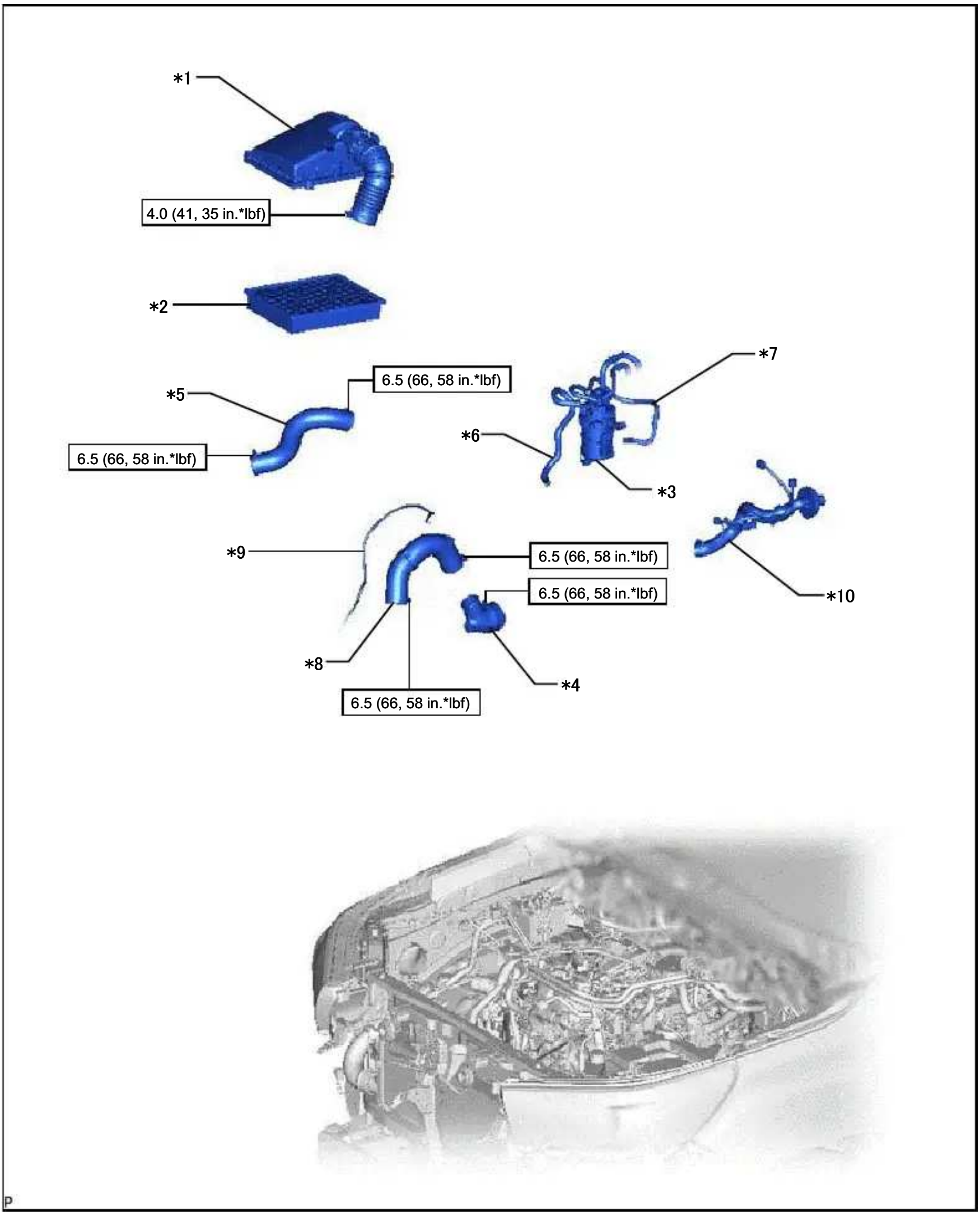
A340274C01

*A	for Automatic Transmission	*B	for 4WD and Pre-Runner
*1	HOOD SUB-ASSEMBLY	*2	NO. 1 ENGINE COVER SUB-ASSEMBLY
*3	NO. 1 ENGINE UNDER COVER ASSEMBLY	*4	NO. 2 ENGINE UNDER COVER
*5	RADIATOR ASSEMBLY	*6	RADIATOR RESERVE TANK ASSEMBLY
*7	VANE PUMP OIL RESERVOIR ASSEMBLY	*8	WASHER HOSE
*9	FAN SHROUD	*10	NO. 1 RADIATOR HOSE
*11	NO. 2 RADIATOR HOSE	*12	NO. 1 OIL COOLER INLET TUBE
*13	NO. 1 OIL COOLER OUTLET TUBE	*14	FAN WITH FLUID COUPLING ASSEMBLY
*15	FAN PULLEY	*16	FAN AND GENERATOR V BELT
□	N*m (kgf*cm, ft.*lbf): Specified torque	-	-



A340275C01

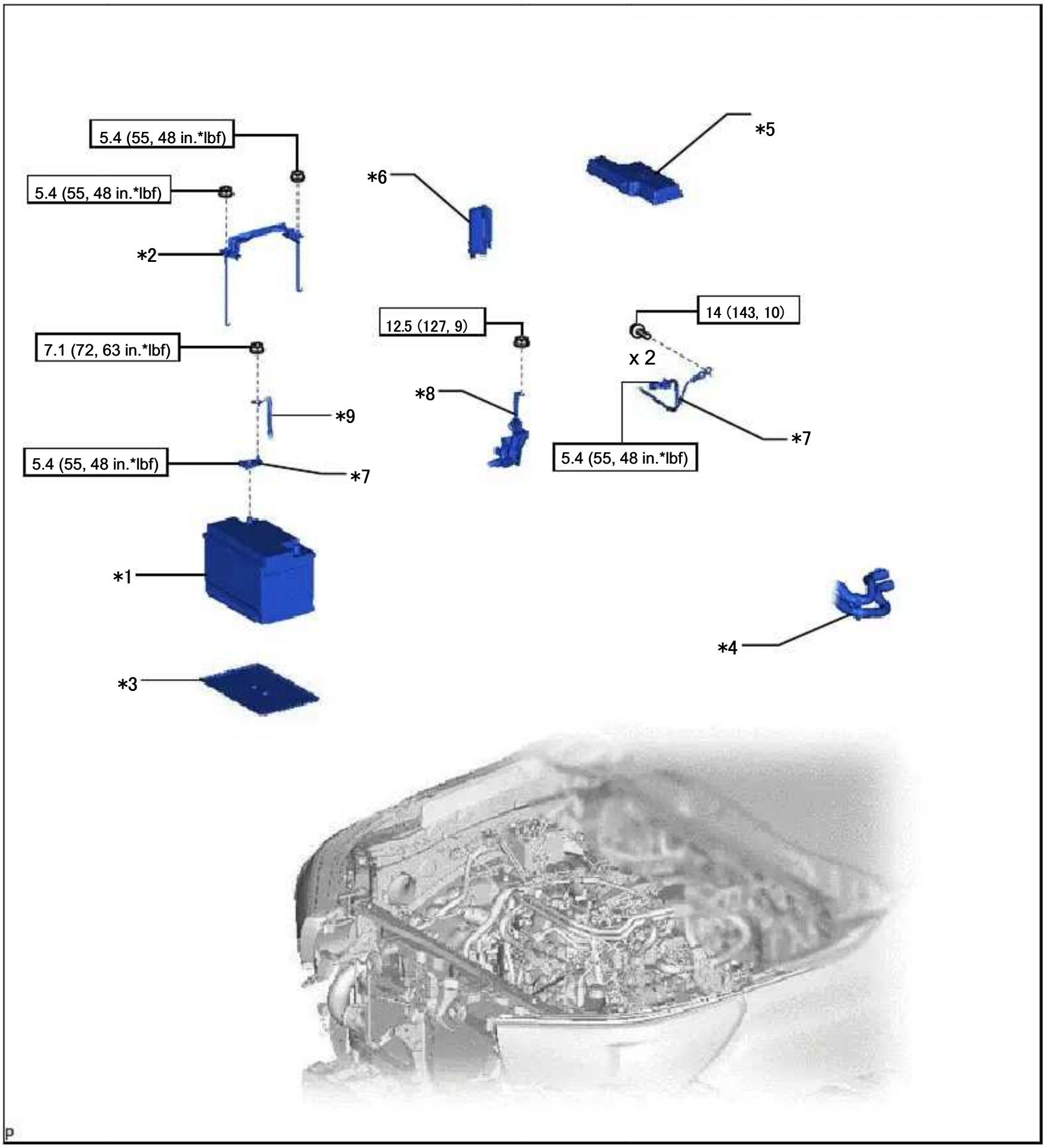
*1 *3	ENGINE WIRE GLOVE COMPARTMENT DOOR ASSEMBLY	*2 -	ECM -
	N*m (kgf*cm, ft.*lbf): Specified torque	-	-



A340276C01

*1	AIR CLEANER CAP AND HOSE	*2	AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY
*3	FUEL FILTER ASSEMBLY	*4	INTERCOOLER AIR TUBE
*5	NO. 1 AIR HOSE	*6	NO. 1 FUEL HOSE

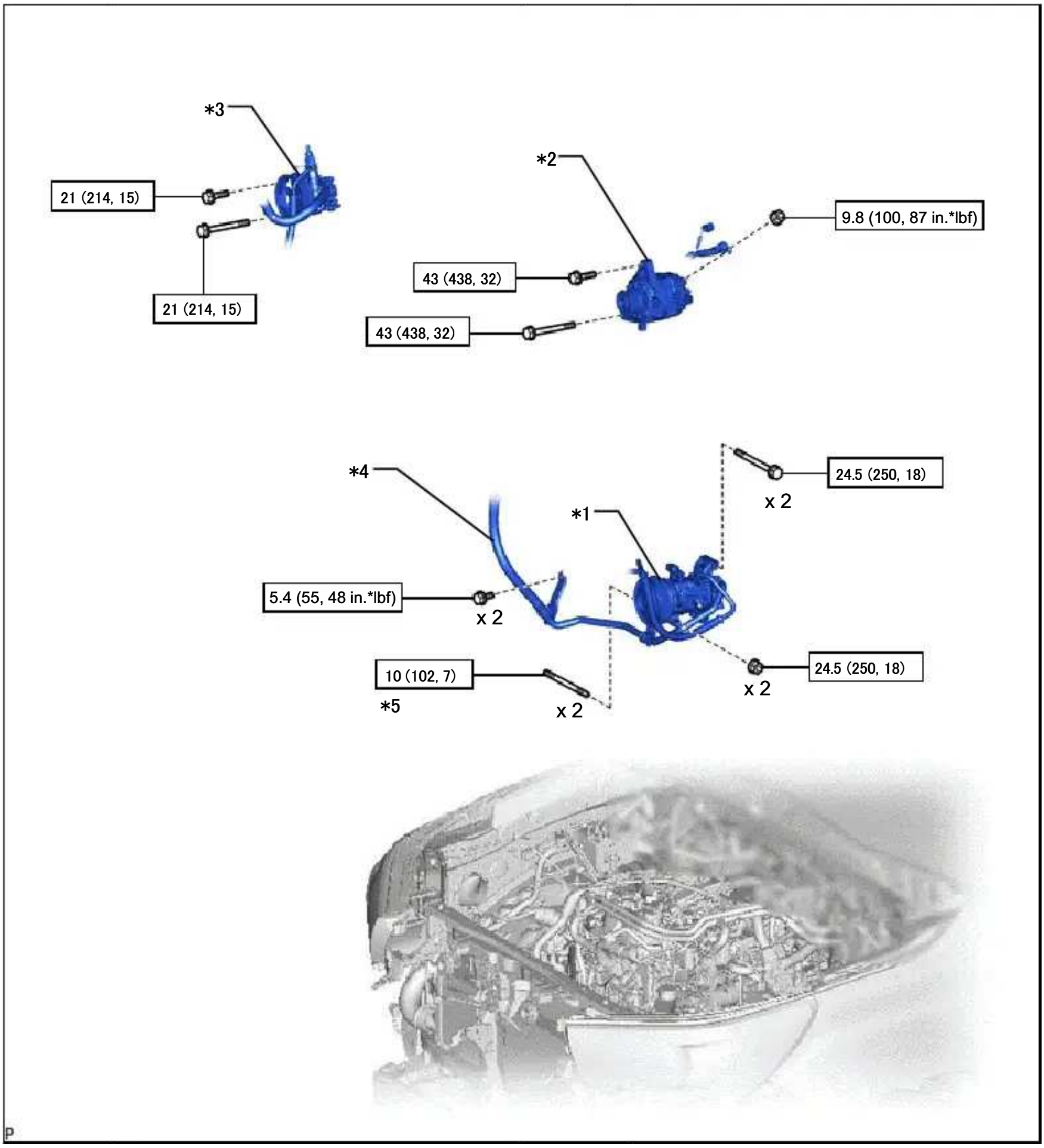
*7	NO. 2 FUEL HOSE	*8	NO. 4 AIR HOSE
*9	OIL RETURN HOSE	*10	ENGINE WIRE
☐	N*m (kgf*cm, ft.*lbf): Specified torque	-	-



A340277C01

*1	BATTERY	*2	BATTERY CLAMP SUB-ASSEMBLY
*3	BATTERY TRAY	*4	WATER HOSE SUB-ASSEMBLY
*5	NO. 1 RELAY BLOCK UPPER	*6	NO. 1 RELAY BLOCK SIDE

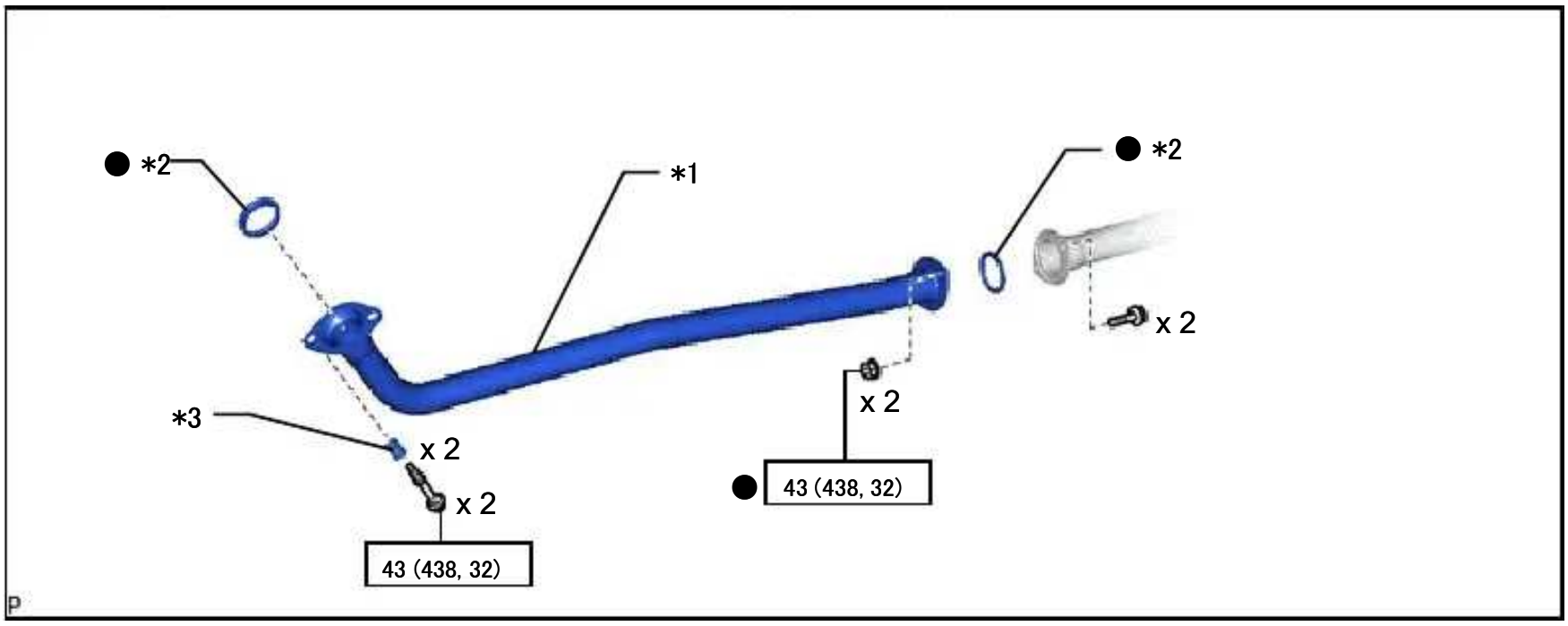
*7	NO. 2 ENGINE WIRE	*8	WIRE TO WIRE
*9	ENGINE ROOM MAIN WIRE	-	-
☐	N*m (kgf*cm, ft.*lbf): Specified torque	-	-



A340278C01

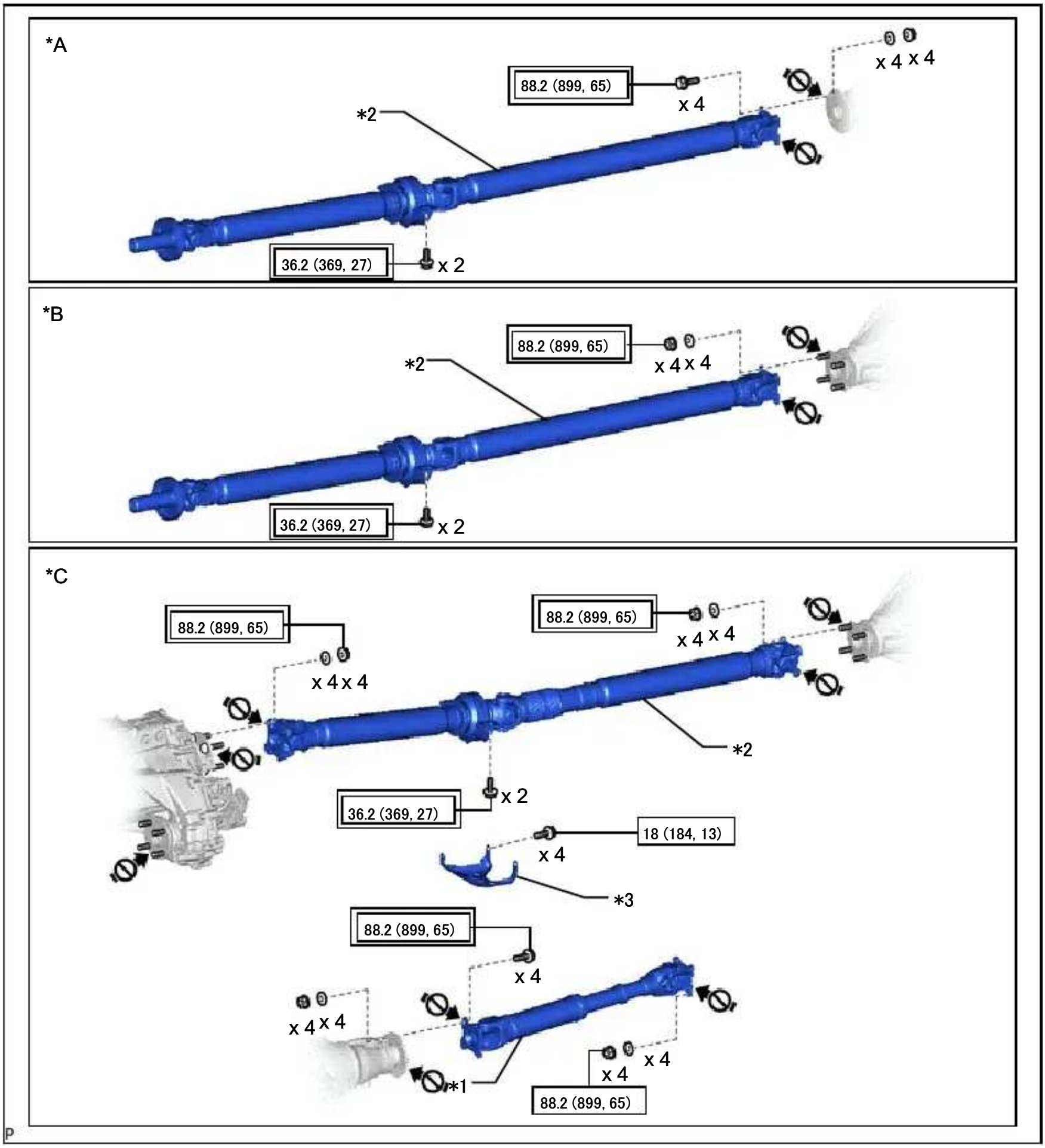
*1	COOLER COMPRESSOR ASSEMBLY	*2	GENERATOR ASSEMBLY
*3	VANE PUMP ASSEMBLY	*4	SUCTION HOSE SUB-ASSEMBLY
*5	STUD BOLT	-	-

	N*m (kgf*cm, ft.*lbf): Specified torque	-	-



A352179C01

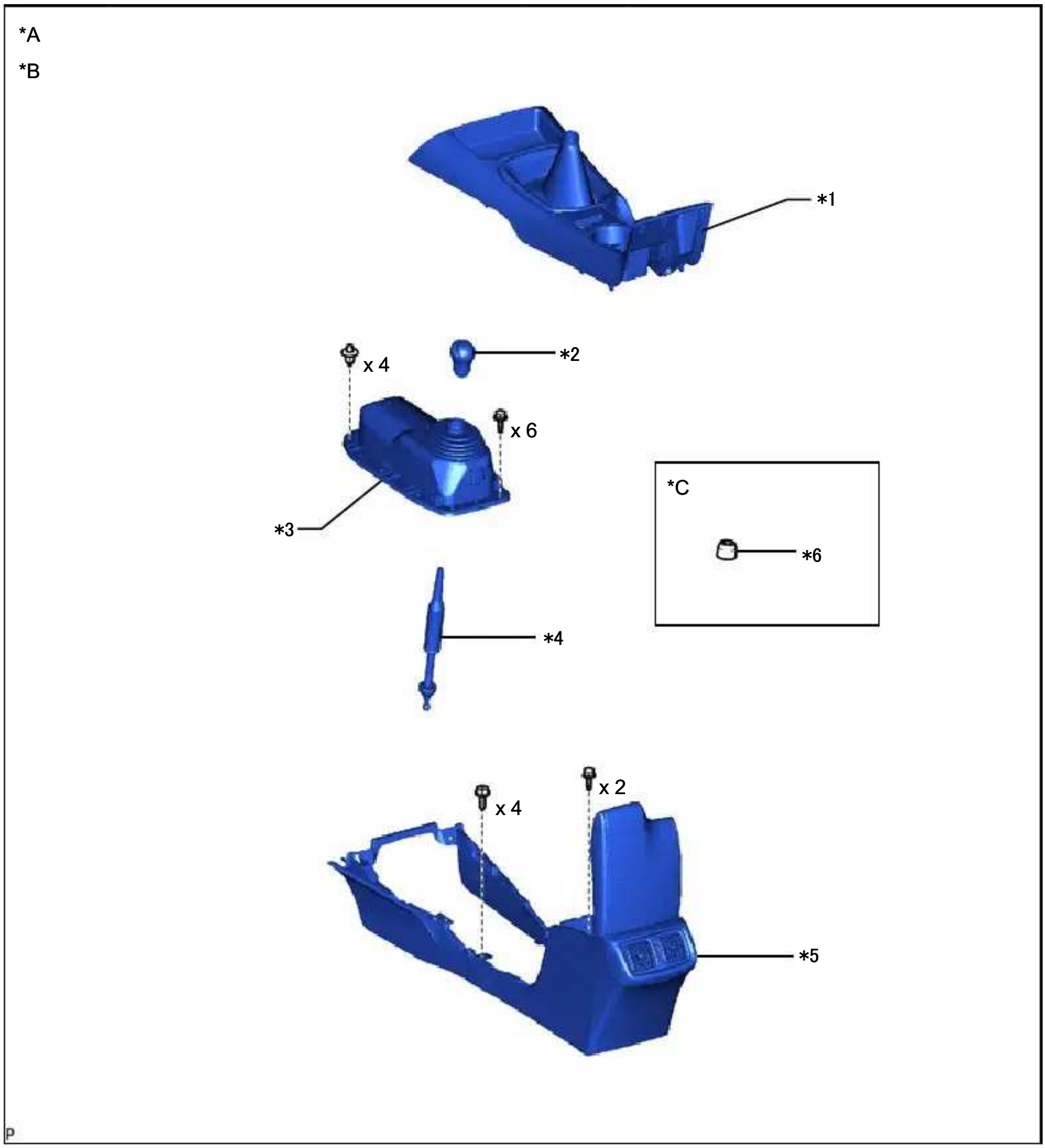
*1	FRONT EXHAUST PIPE ASSEMBLY	*2	GASKET
*3	COMPRESSION SPRING	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part



A346663C01

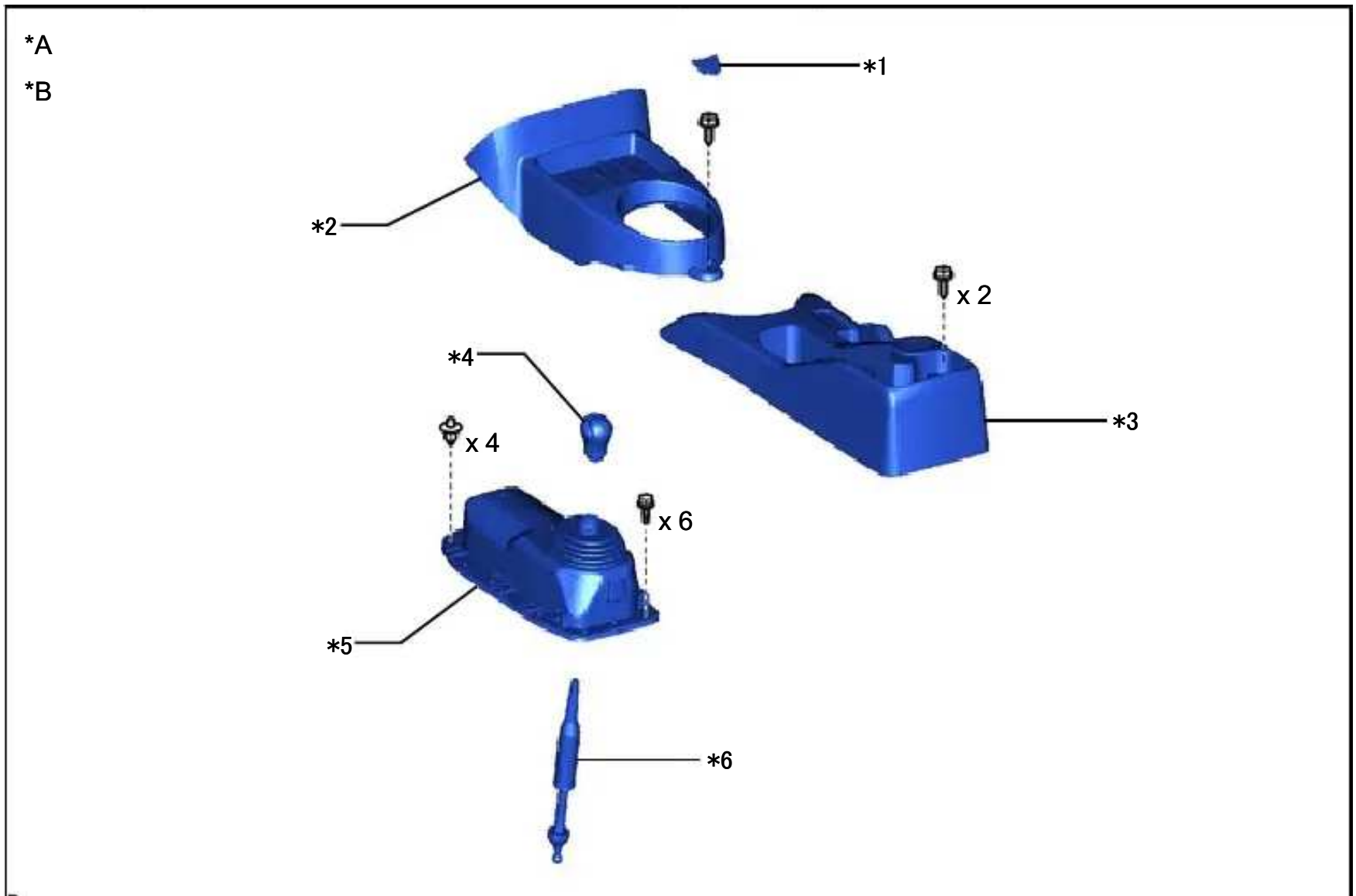
*A	for 2WD	*B	for Pre-Runner
*C	for 4WD	-	-
*1	FRONT PROPELLER SHAFT ASSEMBLY	*2	PROPELLER WITH CENTER BEARING SHAFT ASSEMBLY
*3	TRANSFER CASE PROTECTOR LOWER	-	-
▭	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping" : N*m (kgf*cm, ft.*lbf)	▭	N*m (kgf*cm, ft.*lbf): Specified torque

	Do not apply lubricants	-	-



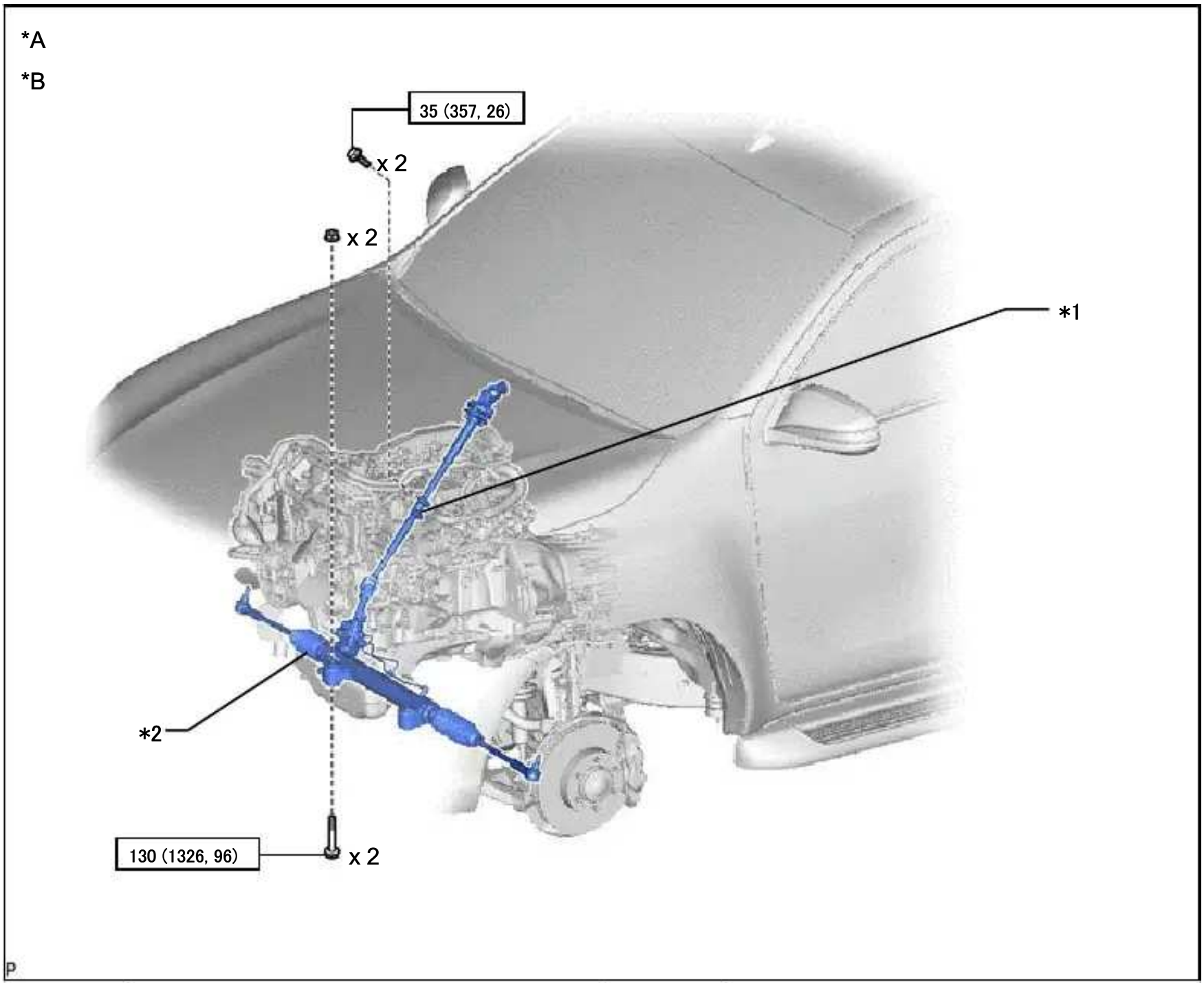
A346664C01

*A	for Manual Transmission	*B	w/ Console Box Lid
*C	for R151	-	-
*1	UPPER CONSOLE PANEL ASSEMBLY	*2	SHIFT LEVER KNOB SUB-ASSEMBLY
*3	SHIFT LEVER BOOT ASSEMBLY	*4	FLOOR SHIFT LEVER ASSEMBLY
*5	CONSOLE BOX ASSEMBLY	*6	FLOOR SHIFT SHIFT LEVER PLATE SEAT



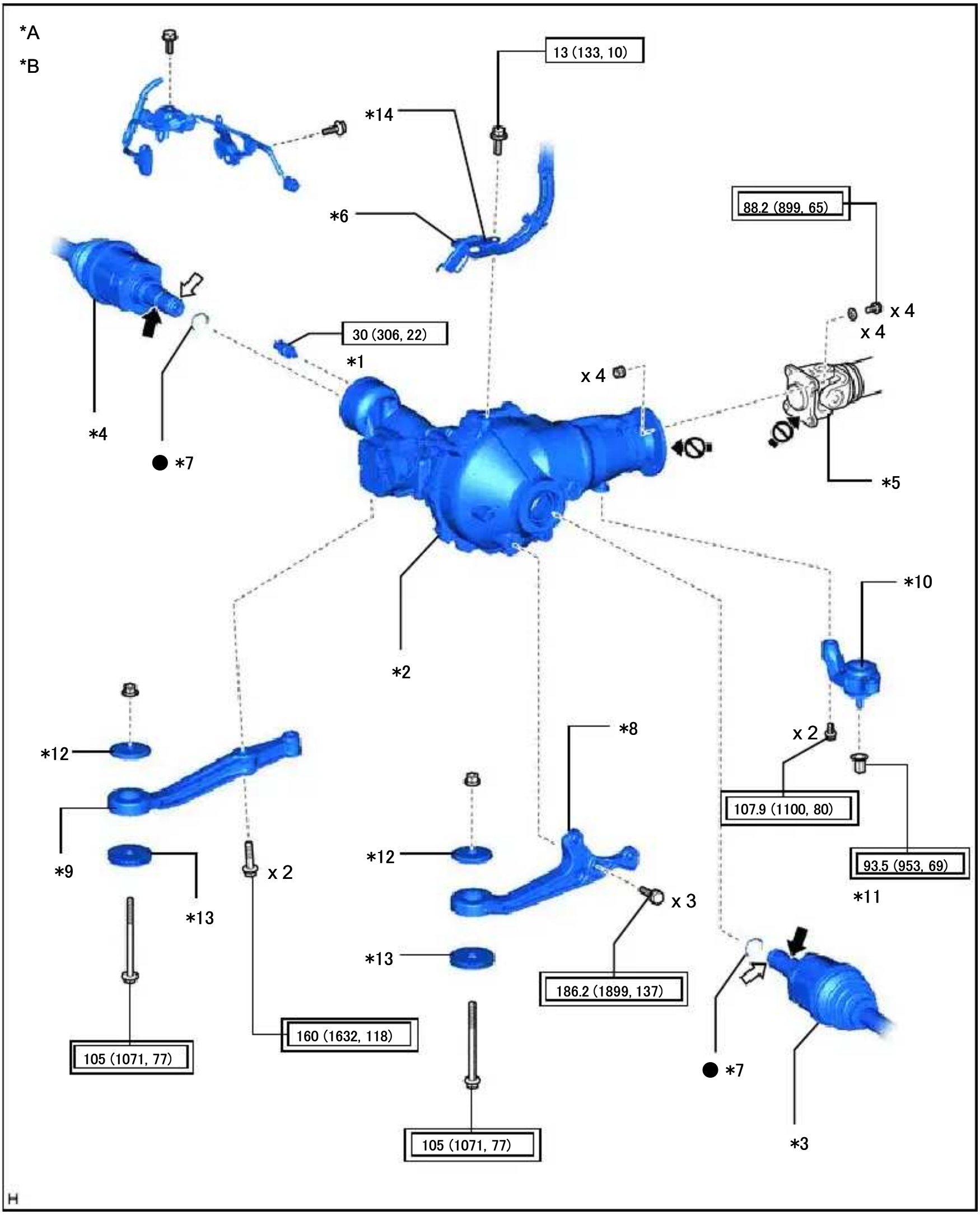
A346679C01

*A	for Manual Transmission	*B	w/o Console Box Lid
*1	FRONT CONSOLE BOX COVER	*2	FRONT CONSOLE BOX
*3	REAR CONSOLE BOX SUB-ASSEMBLY	*4	SHIFT LEVER KNOB SUB-ASSEMBLY
*5	SHIFT LEVER BOOT ASSEMBLY	*6	FLOOR SHIFT LEVER ASSEMBLY



A349445C01

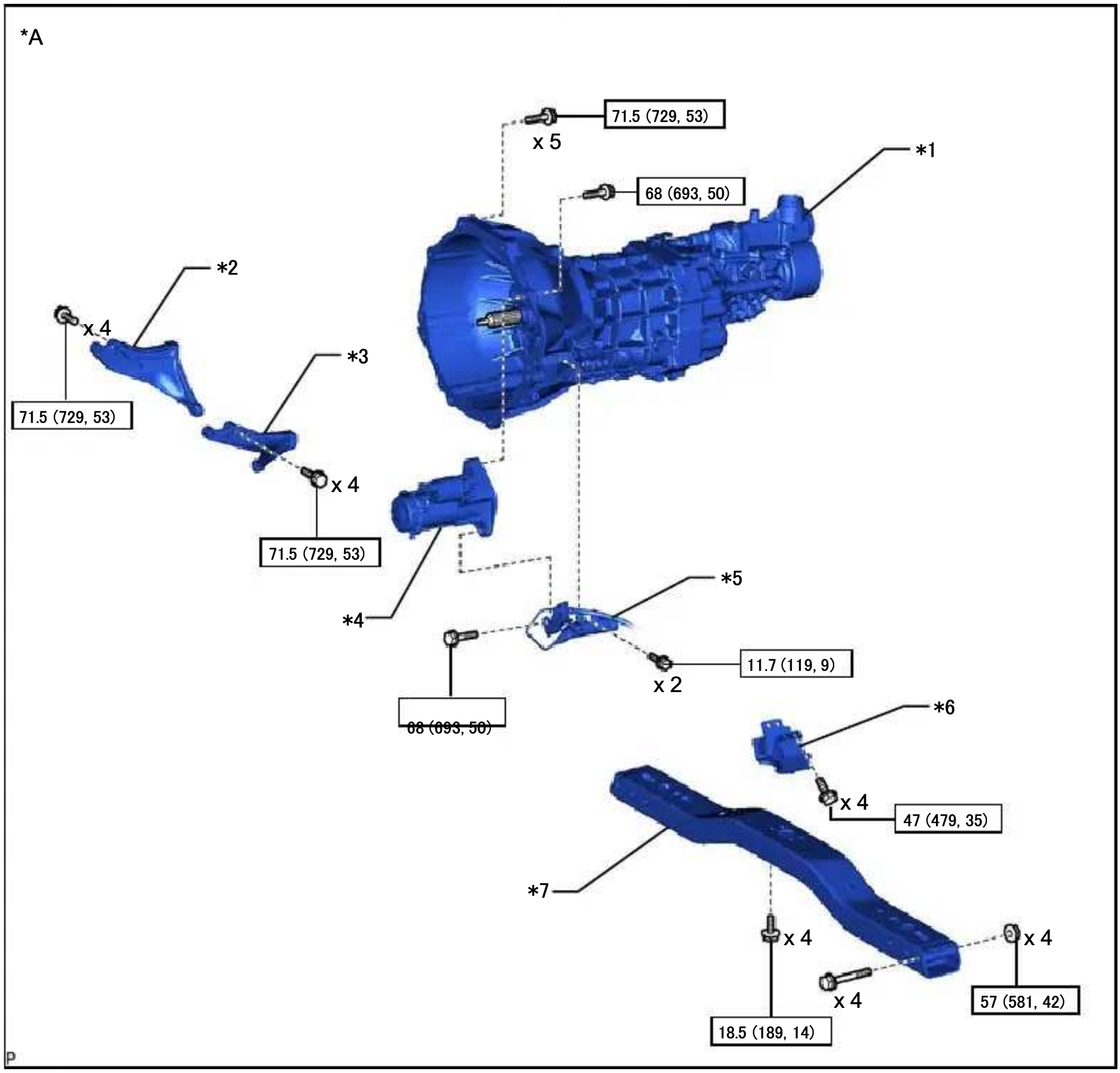
*A	for Manual Transmission	*B	for 4WD
*1	STEERING SLIDING YOKE	*2	POWER STEERING LINK ASSEMBLY
□	N*m (kgf*cm, ft.*lbf) : Specified torque	-	-



C323467C02

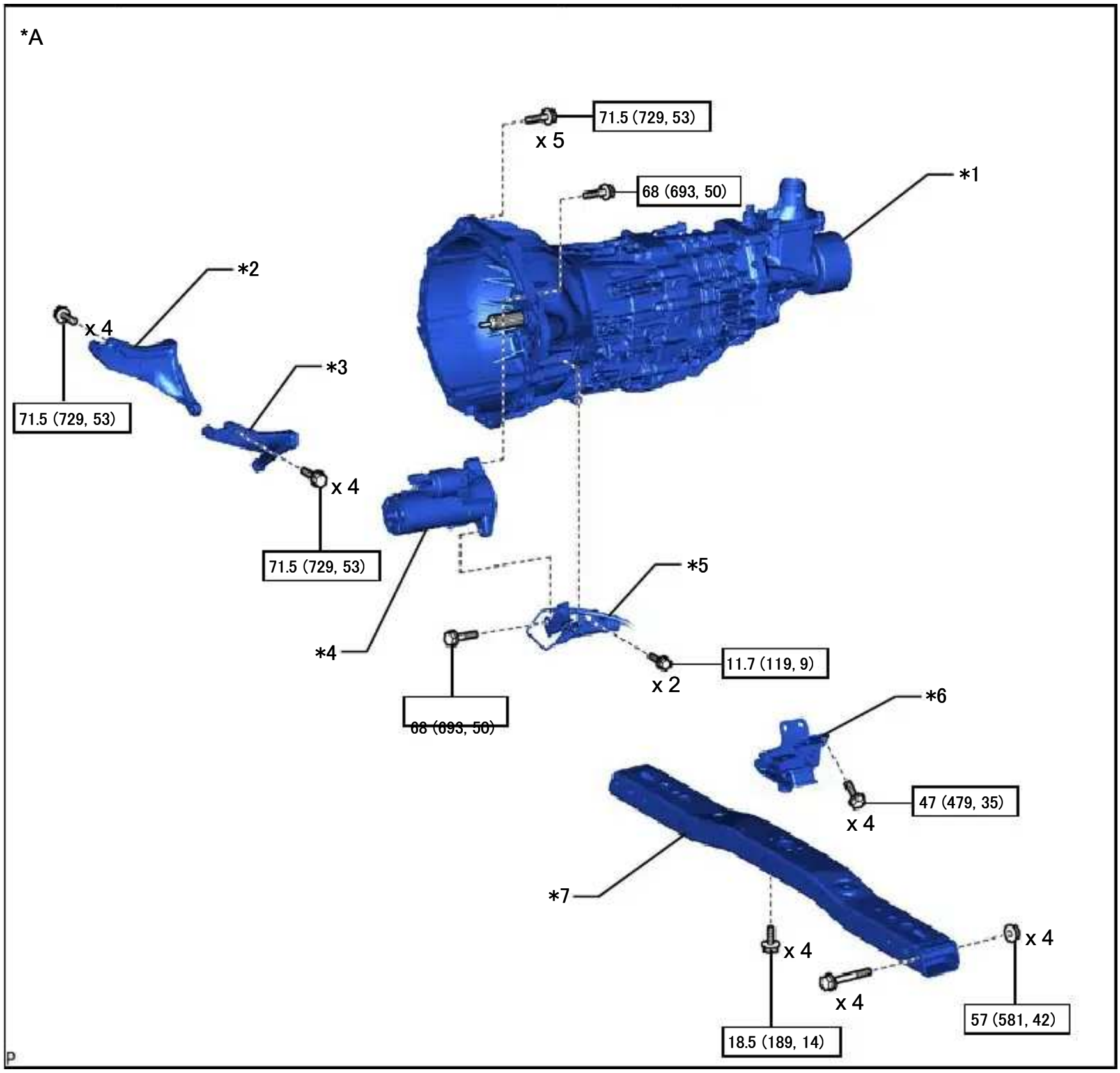
*A	for Manual Transmission	*B	for 4WD
*1	DIFFERENTIAL OIL TEMPERATURE SENSOR	*2	FRONT DIFFERENTIAL CARRIER ASSEMBLY
*3	FRONT DRIVE SHAFT ASSEMBLY LH	*4	FRONT DRIVE SHAFT ASSEMBLY RH

*5	FRONT PROPELLER SHAFT ASSEMBLY	*6	FRONT DIFFERENTIAL BREATHER HOSE
*7	FRONT DRIVE SHAFT HOLE SNAP RING	*8	FRONT NO. 1 DIFFERENTIAL SUPPORT
*9	FRONT NO. 2 DIFFERENTIAL SUPPORT	*10	FRONT NO. 3 DIFFERENTIAL SUPPORT
*11	DIFFERENTIAL MOUNT NUT	*12	UPPER DIFFERENTIAL MOUNT STOPPER
*13	LOWER DIFFERENTIAL MOUNT STOPPER	*14	DIFFERENTIAL BREATHER TUBE BRACKET
	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping" : N*m (kgf*cm, ft.*lbf)		N*m (kgf*cm, ft.*lbf) : Specified torque
•	Non-reusable part		Differential oil
	Do not apply lubricants	-	-



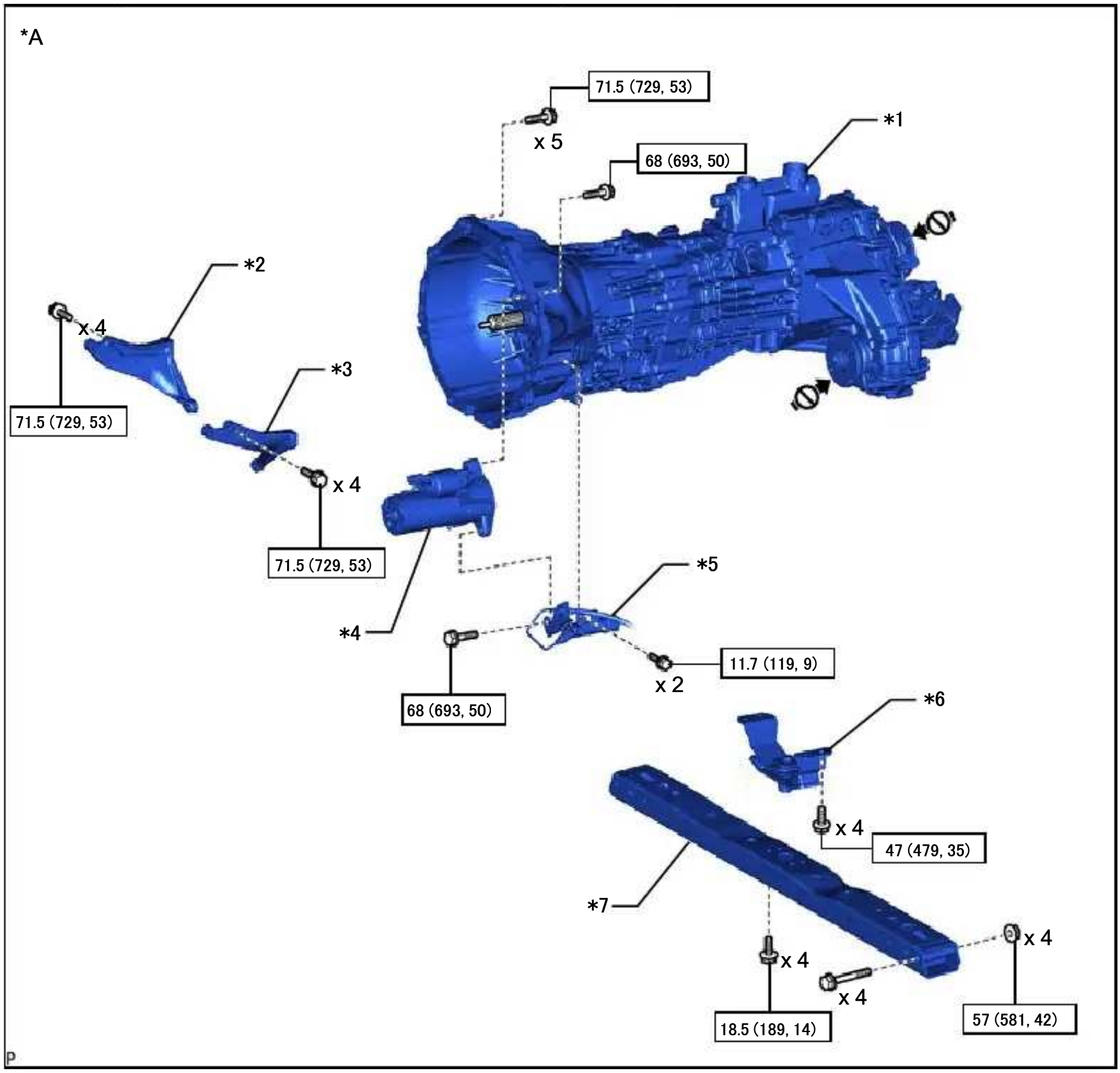
A346667C01

*A	for R151	-	-
*1	MANUAL TRANSMISSION UNIT ASSEMBLY	*2	STIFFENER PLATE RH
*3	STIFFENER PLATE LH	*4	STARTER ASSEMBLY
*5	CLUTCH RELEASE CYLINDER ASSEMBLY	*6	REAR ENGINE MOUNTING INSULATOR
*7	NO. 3 FRAME CROSSMEMBER SUB-ASSEMBLY	-	-
□	N*m (kgf*cm, ft.*lbf): Specified torque	-	-



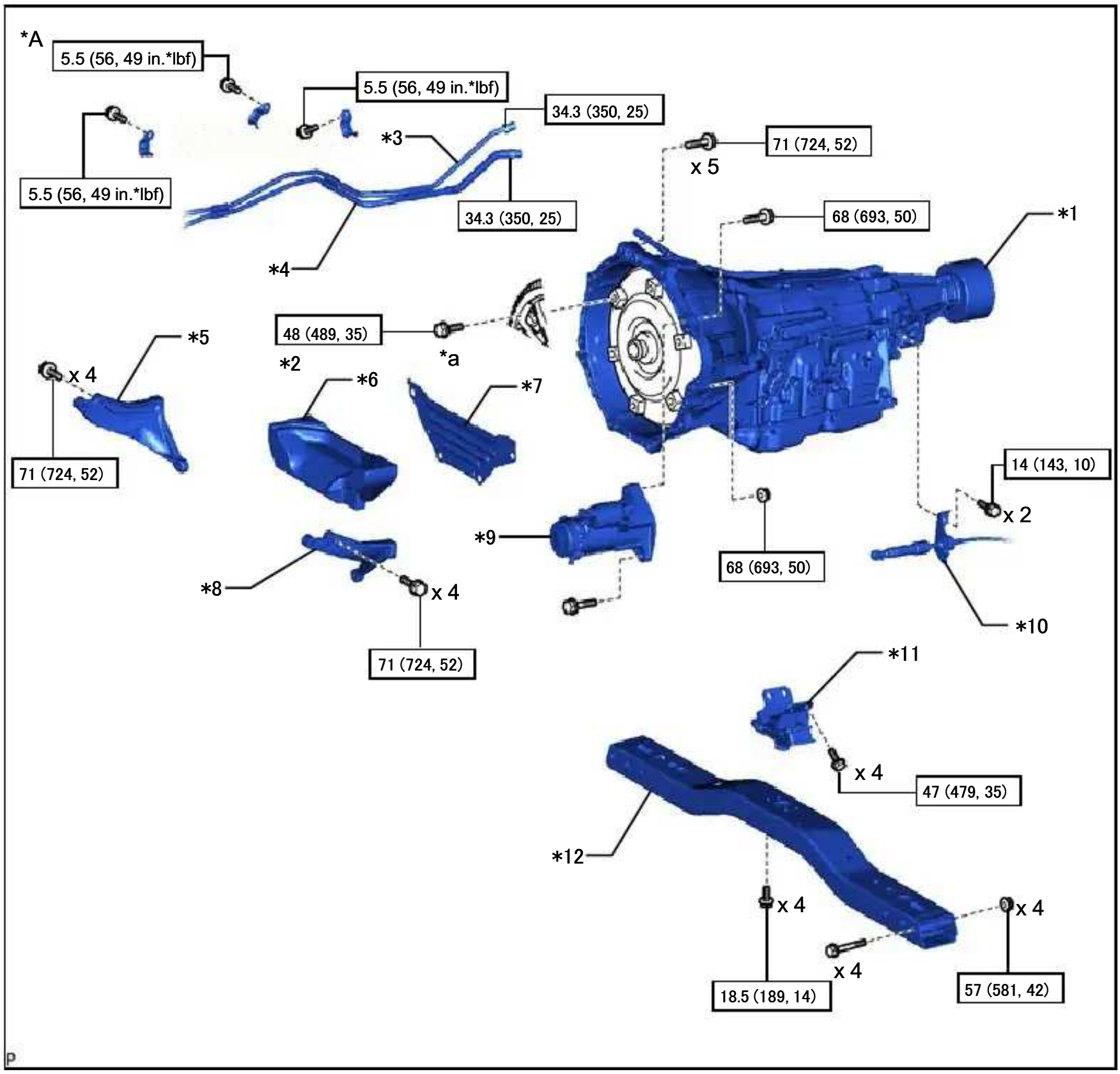
A346665C01

*A	for RC60	-	-
*1	MANUAL TRANSMISSION UNIT ASSEMBLY	*2	STIFFENER PLATE RH
*3	STIFFENER PLATE LH	*4	STARTER ASSEMBLY
*5	CLUTCH RELEASE CYLINDER ASSEMBLY	*6	REAR ENGINE MOUNTING INSULATOR
*7	NO. 3 FRAME CROSSMEMBER SUB-ASSEMBLY	-	-
□	N*m (kgf*cm, ft.*lbf): Specified torque	-	-



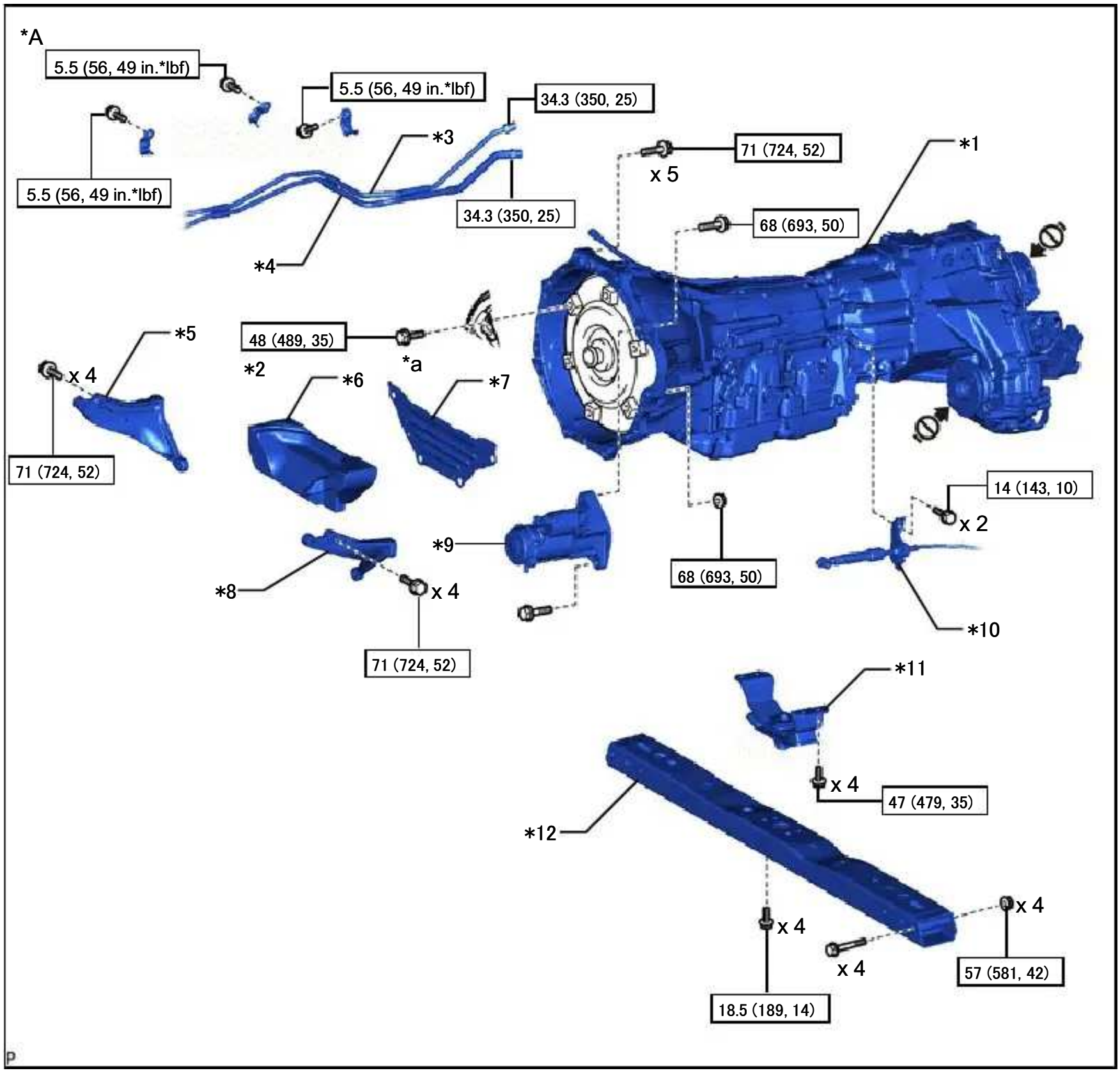
A346666C01

*A	for RC60F	-	-
*1	MANUAL TRANSMISSION UNIT ASSEMBLY	*2	STIFFENER PLATE RH
*3	STIFFENER PLATE LH	*4	STARTER ASSEMBLY
*5	CLUTCH RELEASE CYLINDER ASSEMBLY	*6	REAR ENGINE MOUNTING INSULATOR
*7	NO. 3 FRAME CROSSMEMBER SUB-ASSEMBLY	-	-
□	N*m (kgf*cm, ft.*lbf): Specified torque	⊘	Do not apply lubricants to the threads



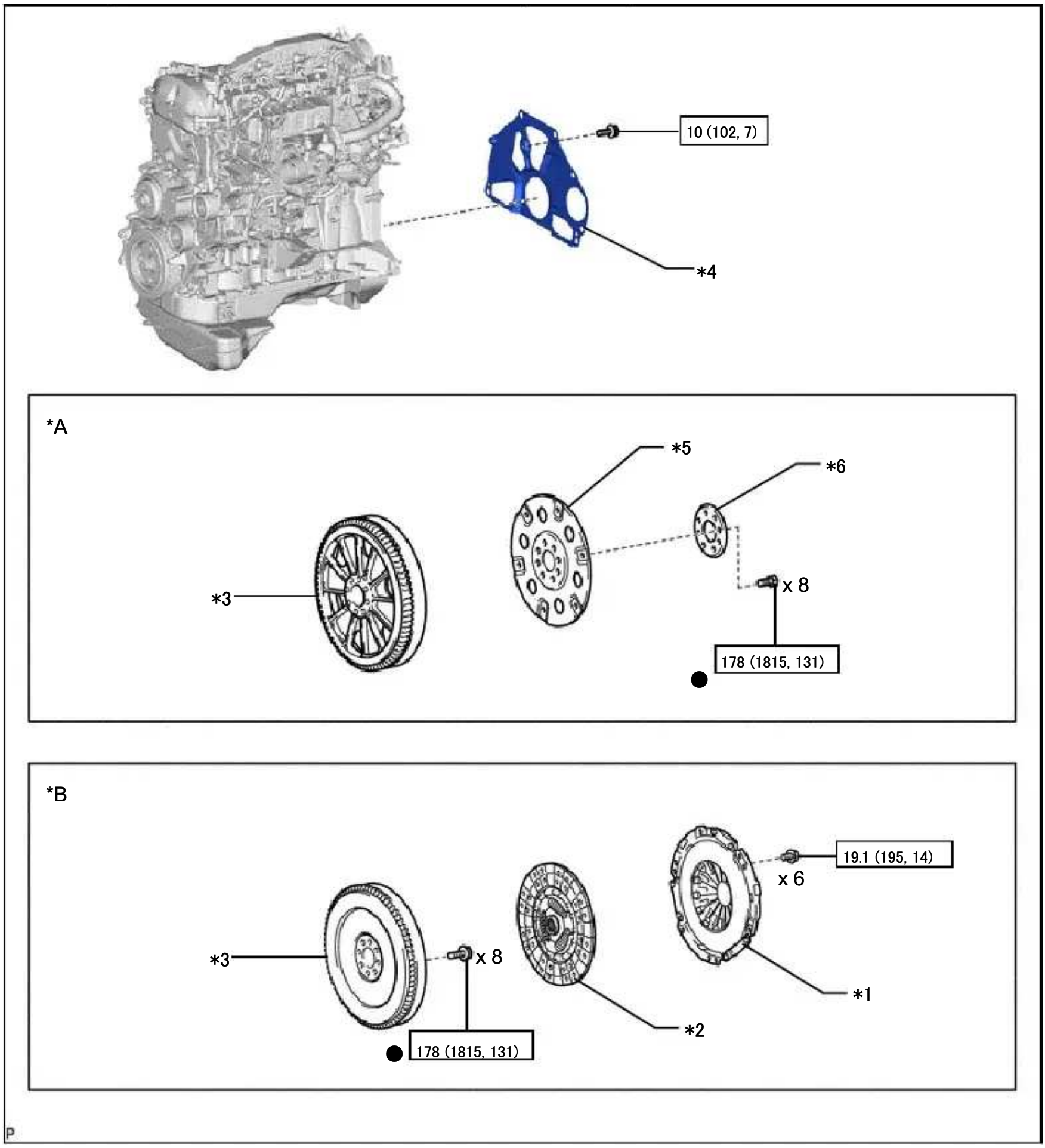
A346669C01

*A	for AC60E	-	-
*1	AUTOMATIC TRANSMISSION ASSEMBLY	*2	DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT
*3	OUTLET OIL COOLER TUBE	*4	INLET OIL COOLER TUBE
*5	STIFFENER PLATE RH	*6	NO. 4 CYLINDER BLOCK INSULATOR
*7	NO. 2 END PLATE	*8	STIFFENER PLATE LH
*9	STARTER ASSEMBLY	*10	TRANSMISSION CONTROL CABLE BRACKET
*11	REAR ENGINE MOUNTING INSULATOR	*12	NO. 3 FRAME CROSSMEMBER SUB-ASSEMBLY
*a	BLACK: x 1 SILVER: x 5	-	-
□	N*m (kgf*cm, ft.*lbf): Specified torque	-	-



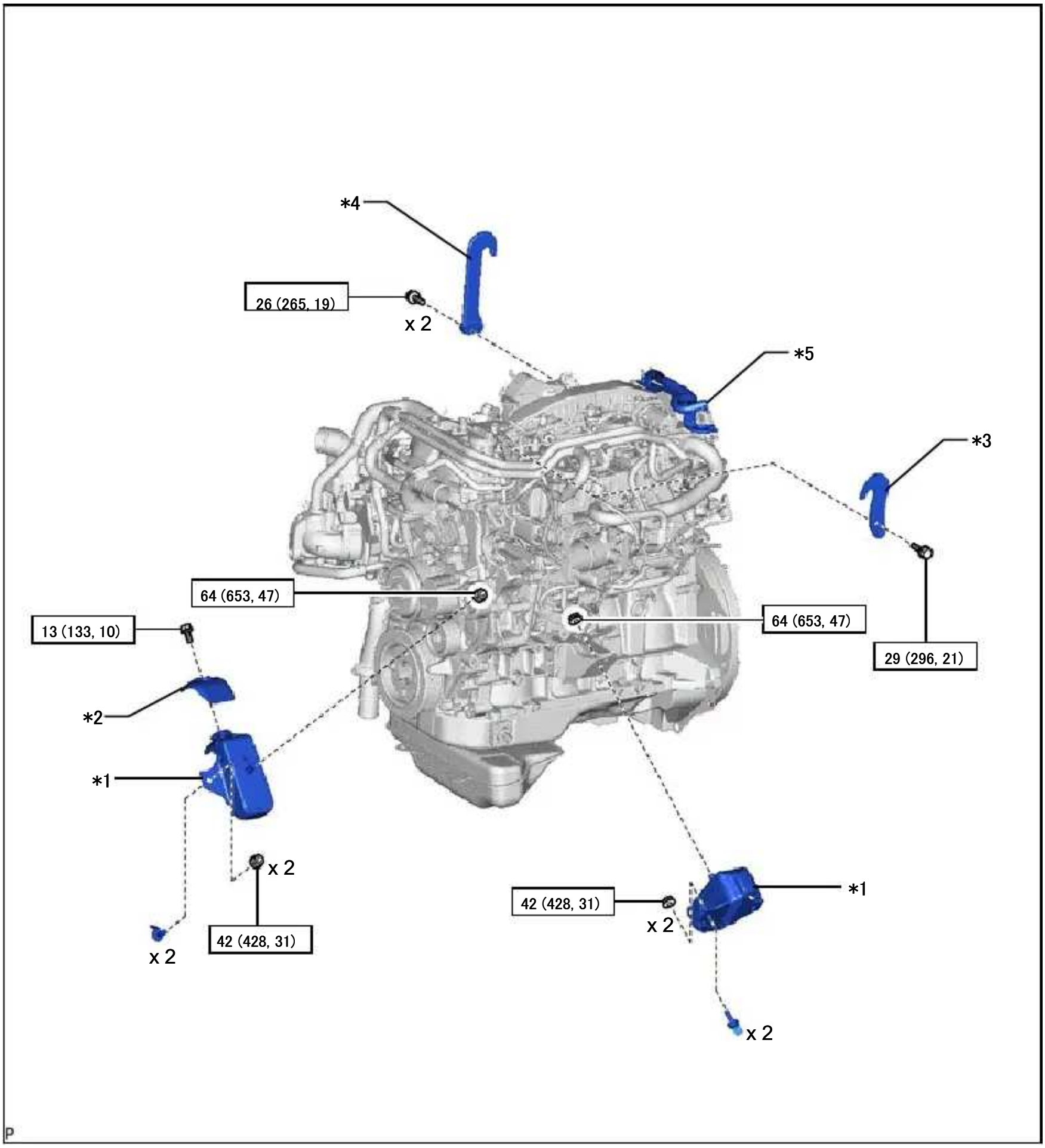
A346670C01

*A	for AC60F	-	-
*1	AUTOMATIC TRANSMISSION ASSEMBLY	*2	DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT
*3	OUTLET OIL COOLER TUBE	*4	INLET OIL COOLER TUBE
*5	STIFFENER PLATE RH	*6	NO. 4 CYLINDER BLOCK INSULATOR
*7	NO. 2 END PLATE	*8	STIFFENER PLATE LH
*9	STARTER ASSEMBLY	*10	TRANSMISSION CONTROL CABLE BRACKET
*11	REAR ENGINE MOUNTING INSULATOR	*12	NO. 3 FRAME CROSSMEMBER SUB-ASSEMBLY
*a	BLACK: x 1 SILVER: x 5	-	-
□	N*m (kgf*cm, ft.*lbf): Specified torque		Do not apply lubricants to the threads



A346702C01

*A	for Automatic Transmission	*B	for Manual Transmission
*1	CLUTCH COVER ASSEMBLY	*2	CLUTCH DISC ASSEMBLY
*3	FLYWHEEL SUB-ASSEMBLY	*4	REAR END PLATE
*5	PUMP IMPELLER DRIVE PLATE	*6	REAR DRIVE PLATE SPACER
□	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part



A340279C01

*1	FRONT ENGINE MOUNTING INSULATOR	*2	FRONT ENGINE MOUNTING INSULATOR RH
*3	NO. 1 ENGINE HANGER UPPER	*4	NO. 2 ENGINE HANGER
*5	UNION TO CONNECTOR TUBE HOSE	-	-
□	N*m (kgf*cm, ft.*lbf): Specified torque	-	-

ENGINE ASSEMBLY > REMOVAL

The necessary procedures (adjustment, calibration, initialization, or registration) that must be performed after parts are removed, installed, or replaced during the engine assembly removal/installation are shown below.

Necessary Procedure After Parts Removed/Installed/Replaced

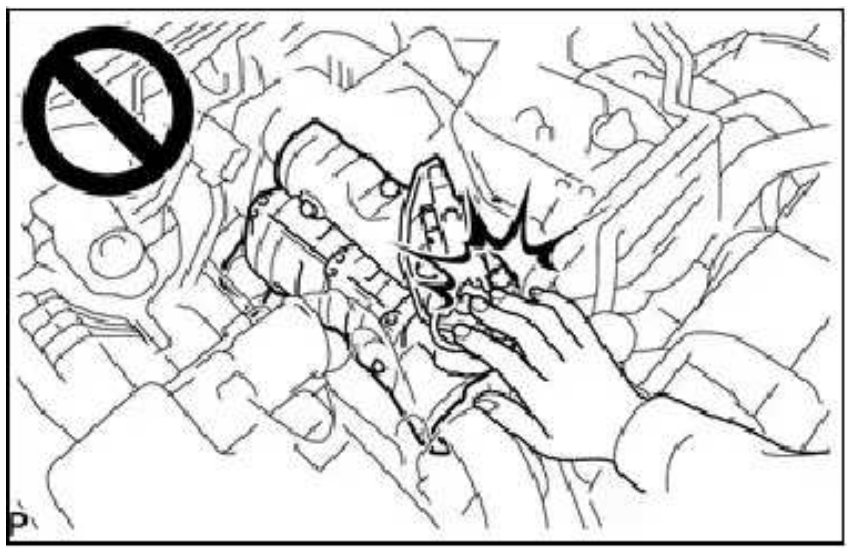
Replacement Part or Procedure	Necessary Procedures	Effects/Inoperative when not Performed	Link
w/ Stop and Start System: Battery terminal is disconnected/ reconnected	Drive the vehicle until stop and start control is permitted (approximately 5 to 40 minutes)	Stop and start system	STOP AND START > STOP AND START SYSTEM > PRECAUTION
Replacement of ECM	• Learning values save • Learning values write	Engine starting	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > REGISTRATION
	for RC60: Performing iMT installation information reset	• iMT system • DTCs are output	MANUAL TRANSMISSION / TRANSAXLE (RC60 / RC61) > MANUAL TRANSMISSION SYSTEM > INITIALIZATION
	Code registration (Immobiliser system)	Engine start function	See the Service Bulletin for the registration method.
Replacement of engine assembly	• Injector compensation code registration • Pilot quantity learning	Engine starting	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > REGISTRATION
	Clear Crank Time Compensation Data	Engine starting	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > INITIALIZATION
Replacement of crankshaft position sensor plate	Clear Crank Time Compensation Data	Crank time compensation data compensation amount is same as before replacement, affecting crank time compensation data	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > INITIALIZATION
Replacement of injector assembly	• Injector compensation code registration • Pilot quantity learning	Engine starting	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > REGISTRATION

• Replacement of diesel throttle body assembly • Replacement of electric EGR control valve assembly • Replacement of turbocharger sub-assembly • Replacement of turbocharger sub-assembly or turbocharger variable nozzle motor	Perform initialization	-	ENGINE CONTROL (2GD-FTV) > ECD SYSTEM > INITIALIZATION
w/ Stop and Start System: Replacement of starter assembly **NOTICE:** When the starter assembly is replaced, "ST NO. 1 relay" and "ST NO. 2 relay" must be also replaced.	Clear the number of starter operations	Stop and start system	STOP AND START > STOP AND START SYSTEM > PRECAUTION
w/ Stop and Start System: Replacement of flywheel sub-assembly	Total number of engine starts reset		
for AC60E: Replacement of automatic transmission assembly	Reset memory	• Large shift shock • Engine overruns	AUTOMATIC TRANSMISSION / TRANSAXLE (AC60E) > AUTOMATIC TRANSMISSION SYSTEM (for 2GD-FTV) > INITIALIZATION
for AC60E: Replacement of automatic transmission fluid	ATF thermal degradation estimate reset	The value of the Data List item "ATF Thermal Degradation Estimate" is not estimated correctly	
for AC60F: Replacement of automatic transmission assembly	Reset memory	• Large shift shock • Engine overruns	AUTOMATIC TRANSMISSION / TRANSAXLE (AC60F) > AUTOMATIC TRANSMISSION SYSTEM > INITIALIZATION
for AC60F: Replacement of automatic transmission fluid	ATF thermal degradation estimate reset	The value of the Data List item "ATF Thermal Degradation Estimate" is not estimated correctly	
w/ Automatic Headlight Beam Level Control System: The vehicle height changes due to replacement of suspension components or after performing such operations as removal and reinstallation	Headlight leveling ECU assembly initialization	Headlight leveling function	LIGHTING (EXT) > AUTOMATIC HEADLIGHT BEAM LEVEL CONTROL SYSTEM > INITIALIZATION

for 4WD: Front wheel alignment adjustment	• Clearing zero point calibration data • Yaw rate and acceleration sensor zero point calibration	VSC malfunctioning	BRAKE CONTROL / DYNAMIC CONTROL SYSTEMS > VEHICLE STABILITY CONTROL SYSTEM > CALIBRATION

CAUTION:

To prevent burns, do not touch the engine, exhaust manifold or other high temperature components while the engine is hot.



A343692

1. PRECAUTION

NOTICE:

After turning the ignition switch off, waiting time may be required before disconnecting the cable from the battery terminal. Therefore, make sure to read the disconnecting the cable from the battery terminal notice before proceeding with work.

Click here INTRODUCTION > REPAIR INSTRUCTION > PRECAUTION

2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected.

Click here INTRODUCTION > REPAIR INSTRUCTION > INITIALIZATION

3. REMOVE NO. 1 ENGINE UNDER COVER ASSEMBLY (for 4WD and Pre-Runner)

4. REMOVE NO. 2 ENGINE UNDER COVER (for 4WD and Pre-Runner)

5. DRAIN ENGINE OIL

Click here LUBRICATION (2GD-FTV) > OIL AND OIL FILTER > REPLACEMENT > DRAIN ENGINE OIL

6. DRAIN ENGINE COOLANT

Click here COOLING (2GD-FTV) > COOLANT > REPLACEMENT > DRAIN ENGINE COOLANT

7. DRAIN MANUAL TRANSMISSION OIL (for Manual Transmission)

- for R151:
  Click here MANUAL TRANSMISSION / TRANSAXLE (R151) > MANUAL TRANSMISSION OIL > REPLACEMENT > DRAIN MANUAL TRANSMISSION OIL

- for RC60:
  Click here MANUAL TRANSMISSION / TRANSAXLE (RC60 / RC61) > MANUAL TRANSMISSION OIL > REPLACEMENT > DRAIN MANUAL TRANSMISSION OIL

8. DRAIN AUTOMATIC TRANSMISSION FLUID (for Automatic Transmission)

- for AC60:
  Click here AUTOMATIC TRANSMISSION / TRANSAXLE (AC60E) > TRANSMISSION WIRE > REMOVAL > DRAIN AUTOMATIC TRANSMISSION FLUID

- for AC60F:
  Click here AUTOMATIC TRANSMISSION / TRANSAXLE (AC60F) > TRANSMISSION WIRE > REMOVAL > DRAIN AUTOMATIC TRANSMISSION FLUID

9. REMOVE HOOD SUB-ASSEMBLY

a. Disconnect the washer nozzle hose from the hood sub-assembly.

b. Remove the 4 bolts and hood sub-assembly from the 2 hood hinge assemblies.

10. REMOVE RADIATOR ASSEMBLY

Click here COOLING (2GD-FTV) > RADIATOR > REMOVAL

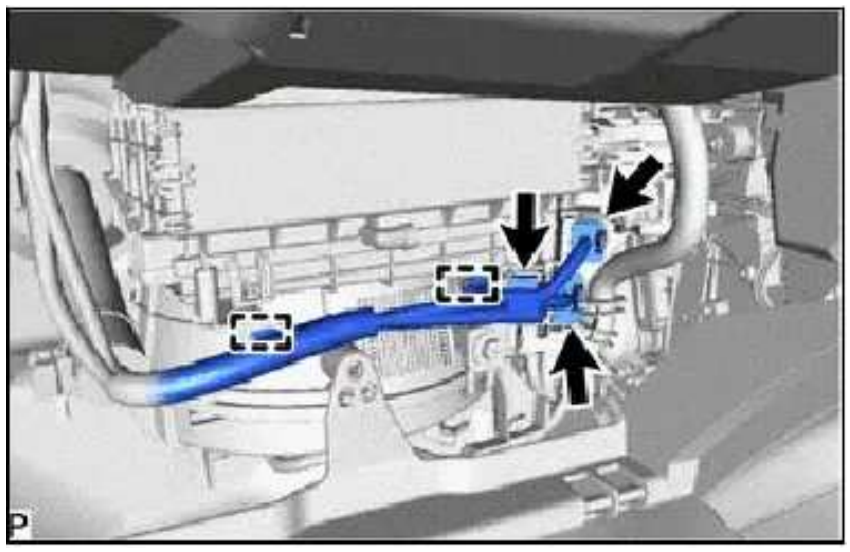
11. REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY

Click here ENGINE CONTROL (2GD-FTV) > DIESEL THROTTLE BODY > REMOVAL > REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY

12. DISCONNECT ENGINE WIRE

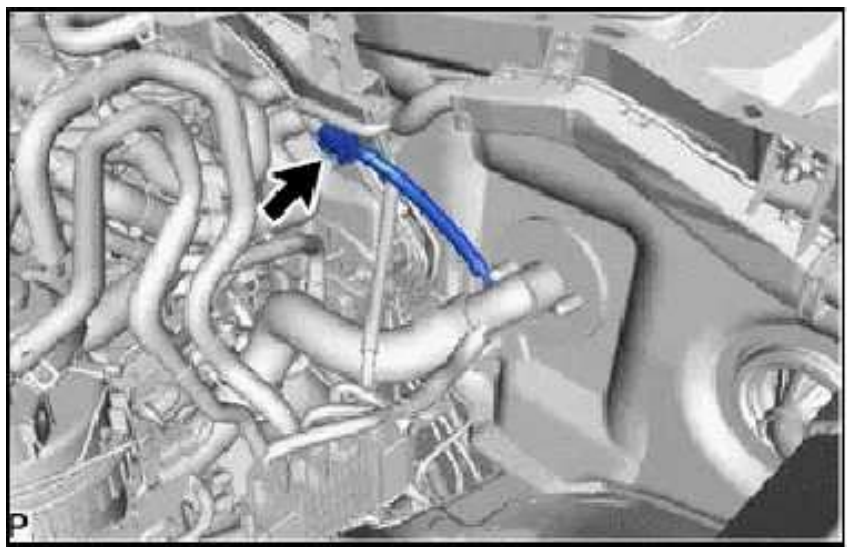
a. Remove the ECM.
Click here ENGINE CONTROL (2GD-FTV) > ECM > REMOVAL

b. Detach the 2 clamps and disconnect the 3 connectors from the instrument panel wire.



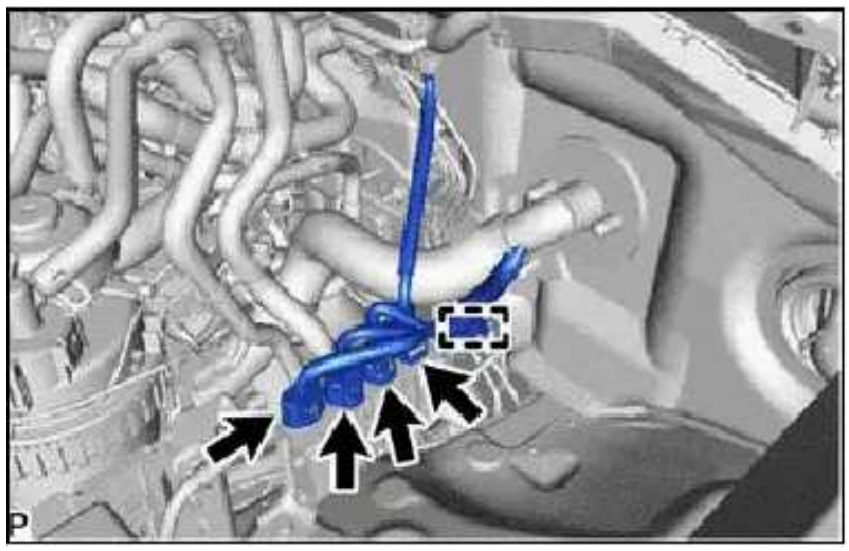
A340245

c. Disconnect the connector from the engine room main wire.



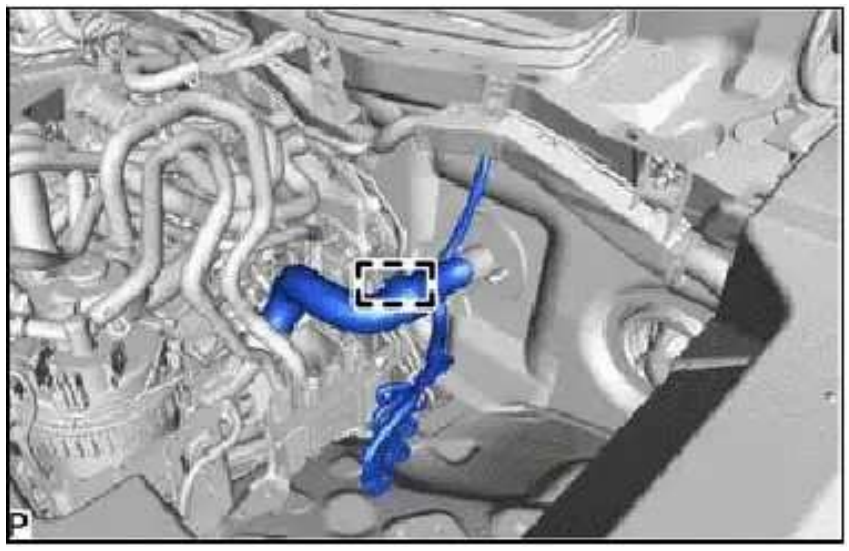
A340246

d. Detach the clamp and disconnect the 4 connectors from the glow plug controller.



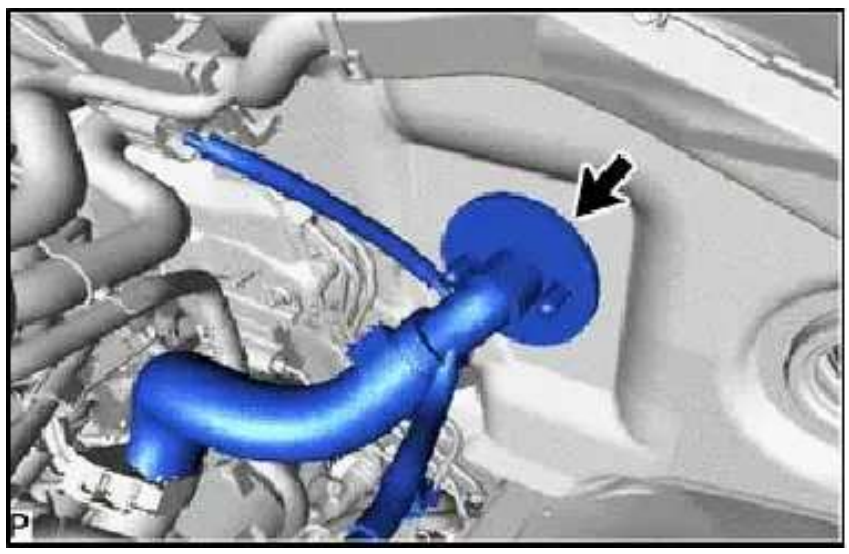
A340247

e. Detach the clamp and disconnect the engine wire from the bracket.



A340249

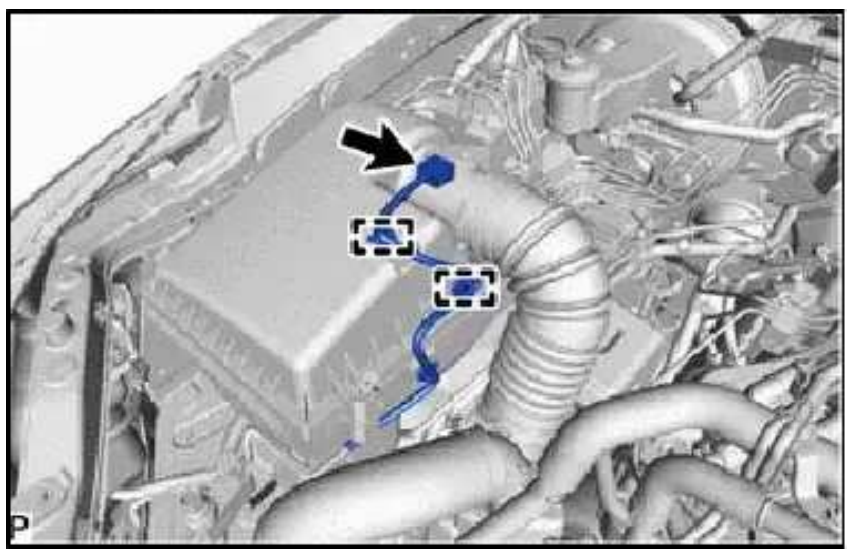
f. Detach the grommet and pull out the engine wire from the cabin.



A340250

13. REMOVE AIR CLEANER CAP AND HOSE

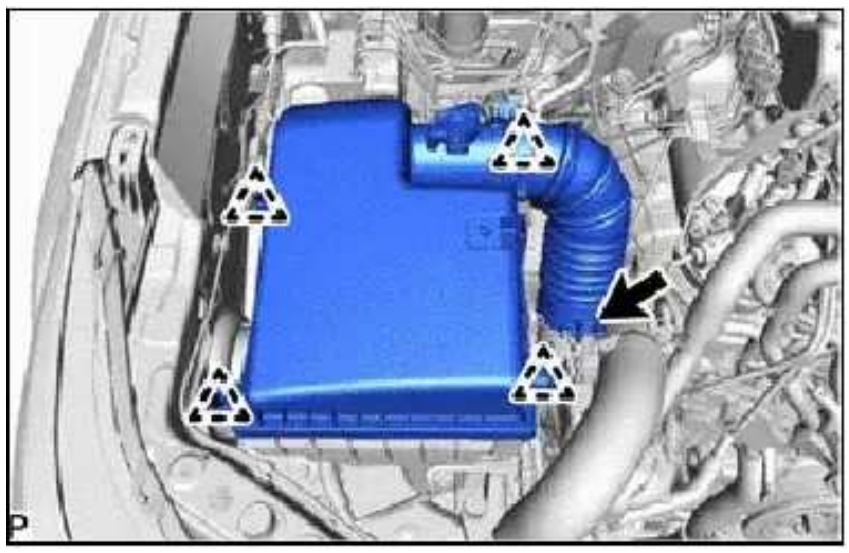
a. Detach the 2 clamps and disconnect the connector from the mass air flow meter.



A340251

b. Loosen the hose clamp.

c. Detach the 4 clips and remove the air cleaner cap and hose.

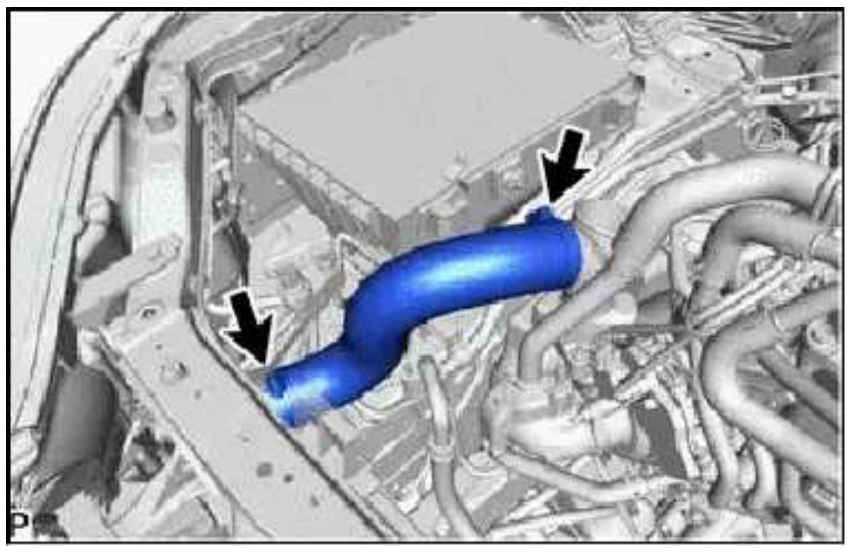


A340252

14. REMOVE AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY

15. REMOVE NO. 1 AIR HOSE

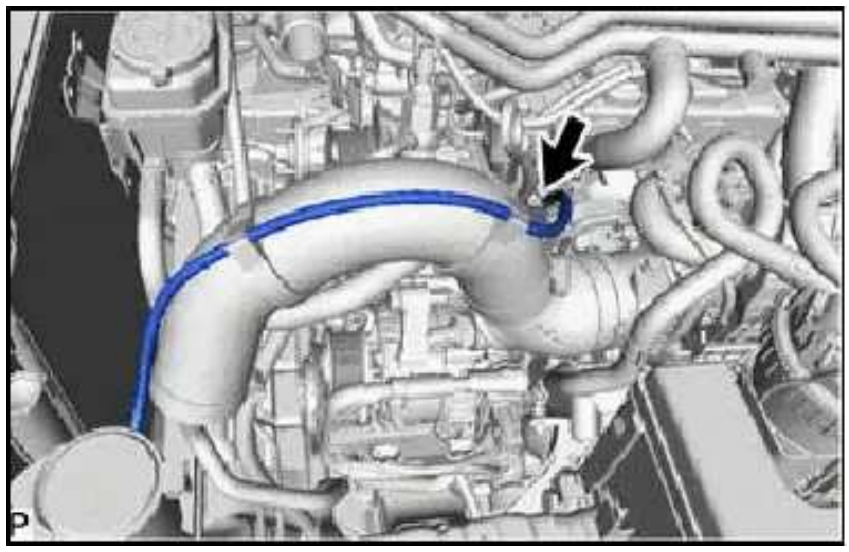
a. Slide the 2 clamps and remove the No. 1 air hose from the compressor outlet elbow and air tube.



A340253

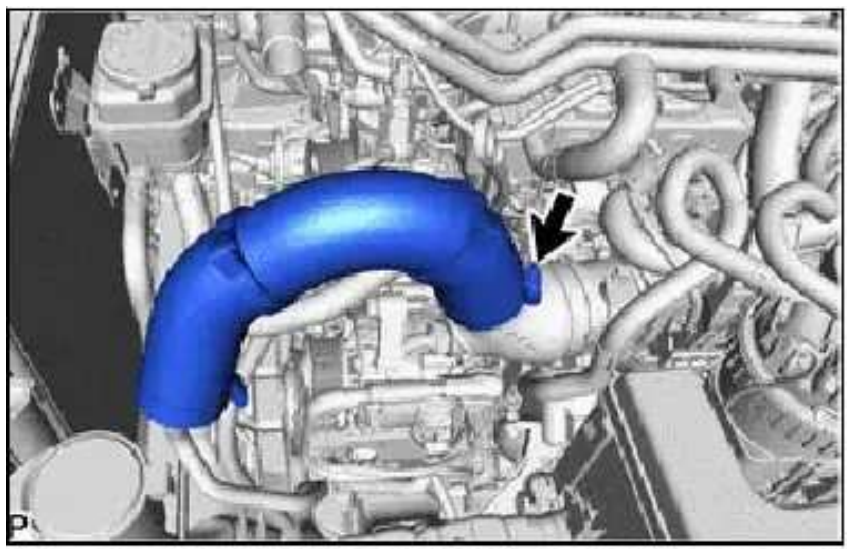
16. REMOVE NO. 4 AIR HOSE

a. Slide the clamp and disconnect the oil return hose from the engine oil level dipstick guide assembly.



A340255

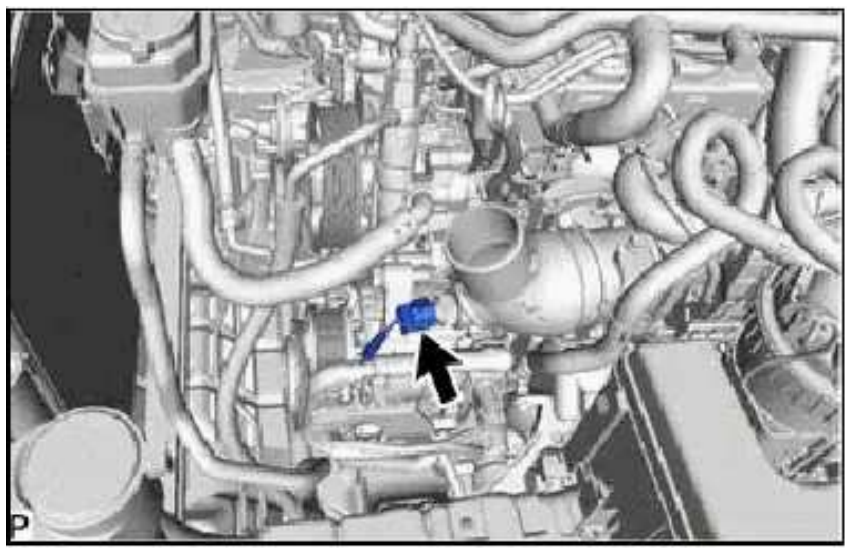
b. Slide the 2 clamps and remove the No. 4 air hose from the No. 2 air tube and intercooler air tube.



A340256

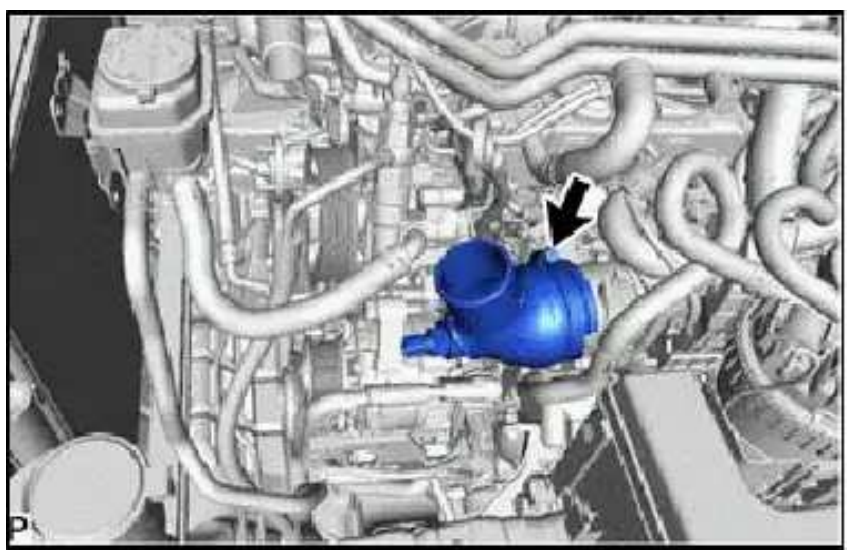
17. REMOVE INTERCOOLER AIR TUBE

a. Disconnect the connector from the intake air temperature sensor.



A340254

b. Slide the clamp and remove intercooler air tube from the diesel throttle body assembly.



A346660

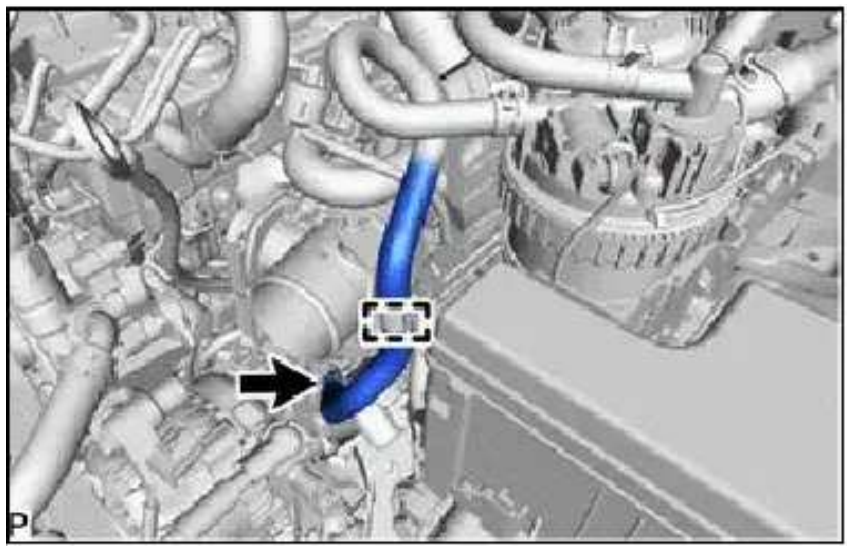
18. REMOVE FUEL FILTER ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL FILTER > REPLACEMENT > REMOVE FUEL FILTER ELEMENT ASSEMBLY

19. REMOVE NO. 1 FUEL HOSE

a. Detach the clamp from the No. 1 fuel hose.

b. Slide the clamp and disconnect the No. 1 fuel hose from the No. 2 fuel pipe.

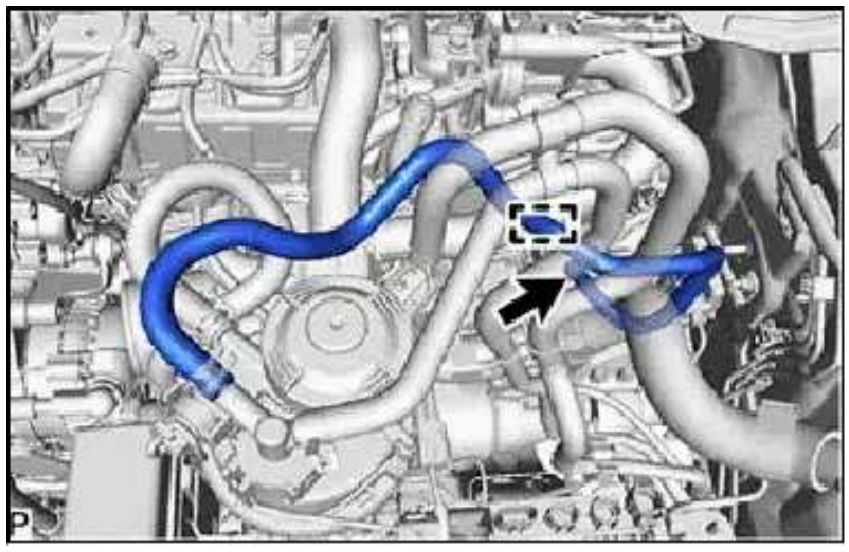


A340258

20. REMOVE NO. 2 FUEL HOSE

a. Detach the clamp from the No. 2 fuel hose.

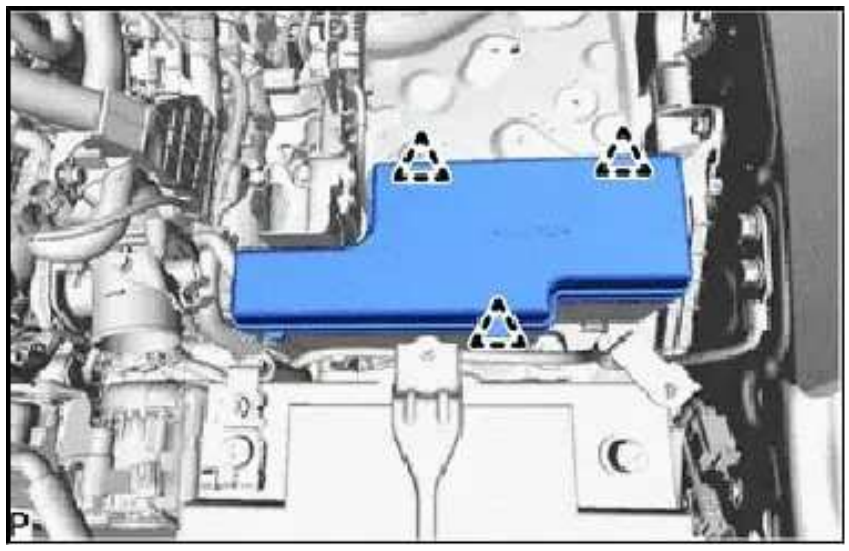
b. Slide the clamp and disconnect the No. 2 fuel hose from the No. 3 nozzle leakage pipe assembly.



A340257

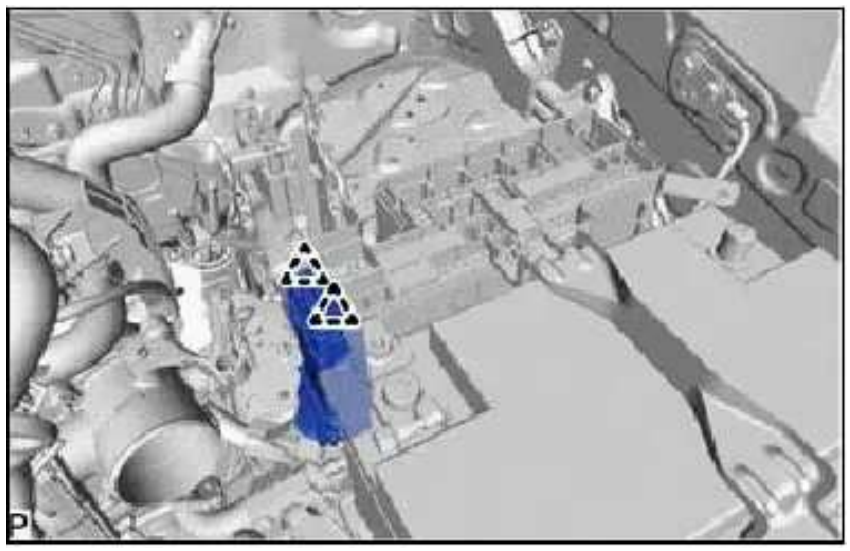
21. DISCONNECT WIRE HARNESS

a. Detach the 3 clips and remove the No. 1 relay block cover upper from the engine room relay block.



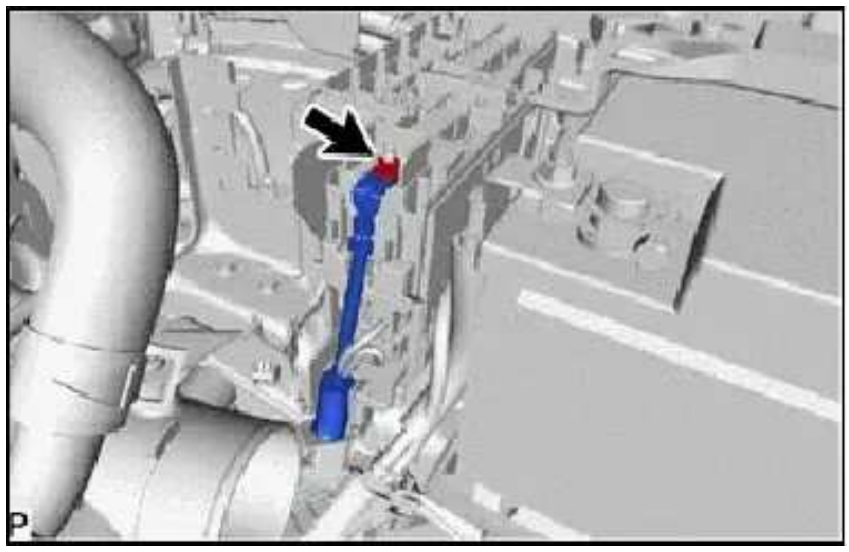
A340259

b. Detach the 2 clips and remove the No. 1 relay block cover side from the engine room relay block sub-assembly.



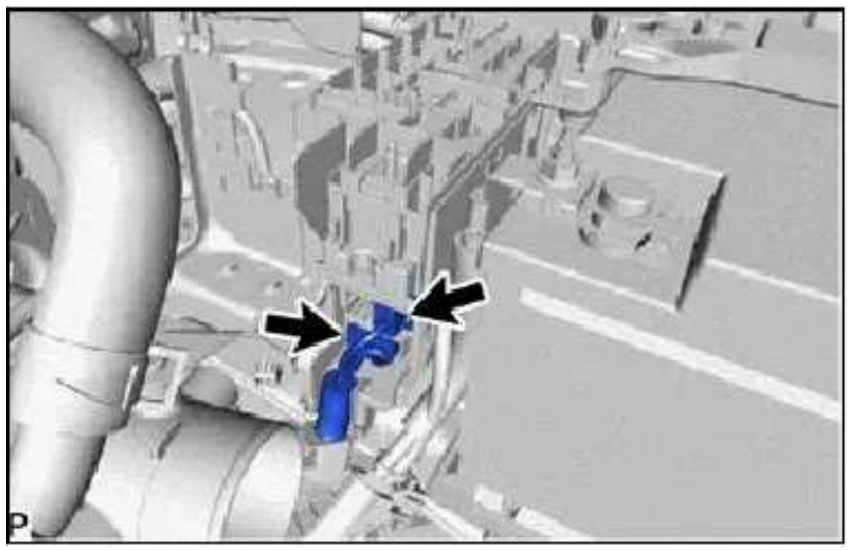
A340260

c. Remove the nut and disconnect the wire to wire from the engine room relay block sub-assembly.



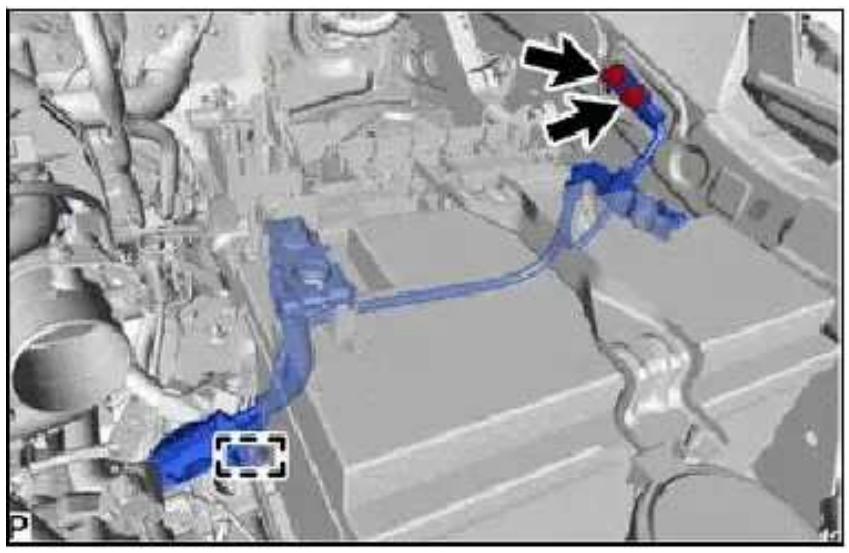
A340261

d. Disconnect the 2 connectors from the engine room relay block sub-assembly.



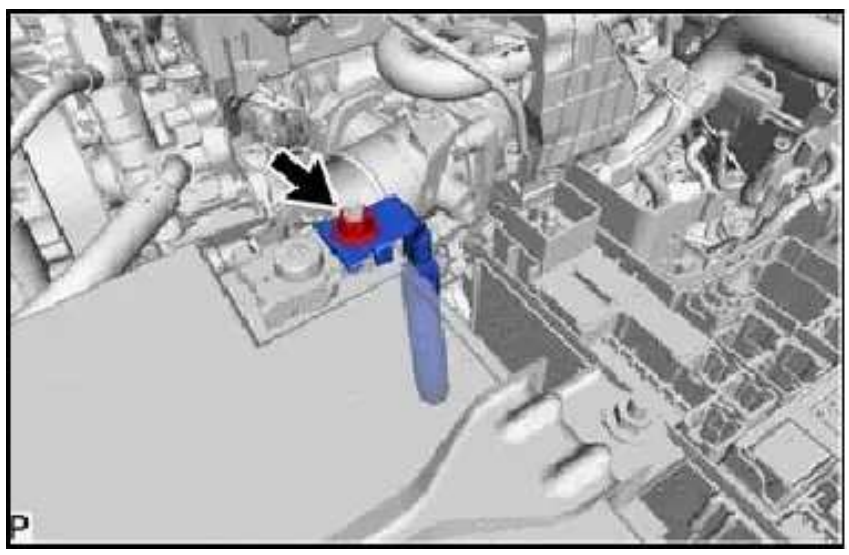
A340262

e. Detach the clamp and remove the 2 bolts and disconnect the No. 2 engine wire.



A340263

f. Remove the nut and disconnect the engine room main wire from the battery positive cable.



A340264

22. REMOVE BATTERY CLAMP SUB-ASSEMBLY

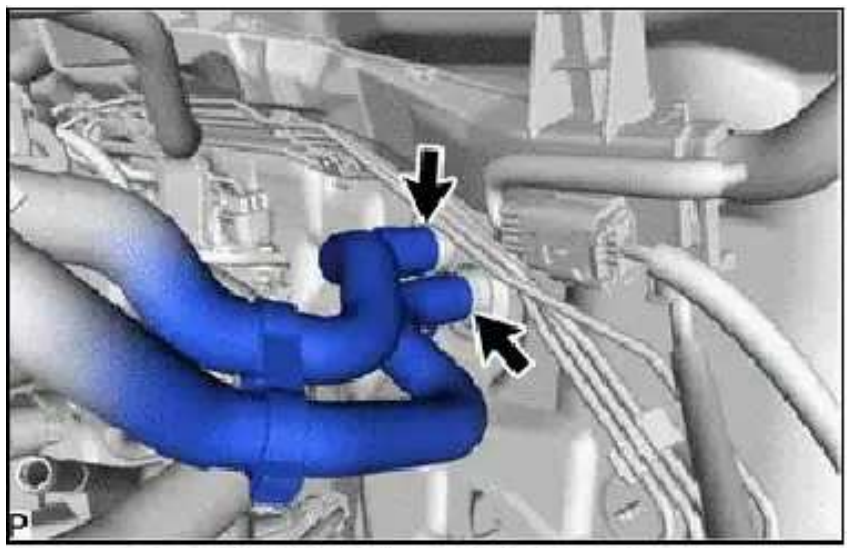
a. Loosen the 2 nuts and remove the battery clamp sub-assembly from the battery.

23. REMOVE BATTERY

24. REMOVE BATTERY TRAY

25. DISCONNECT WATER HOSE SUB-ASSEMBLY

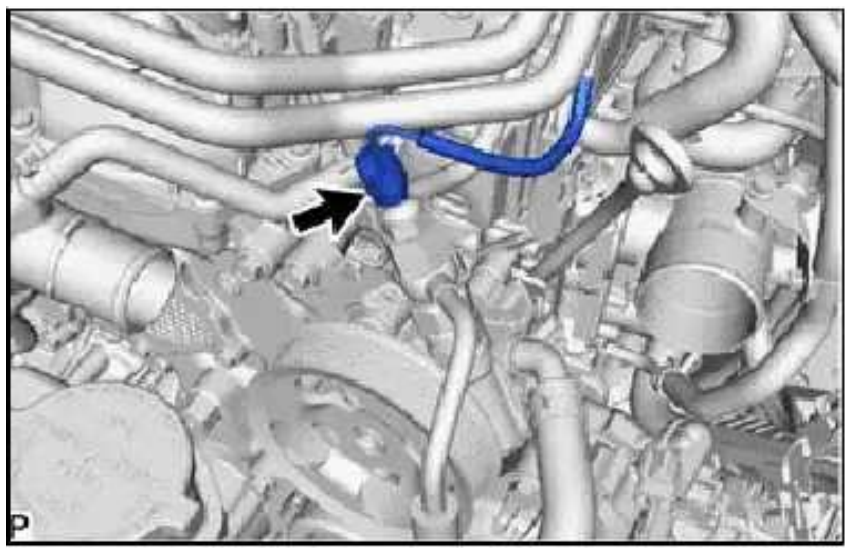
a. Slide the 2 clamps and disconnect the water hose sub-assembly from the air conditioning unit assembly.



A346659

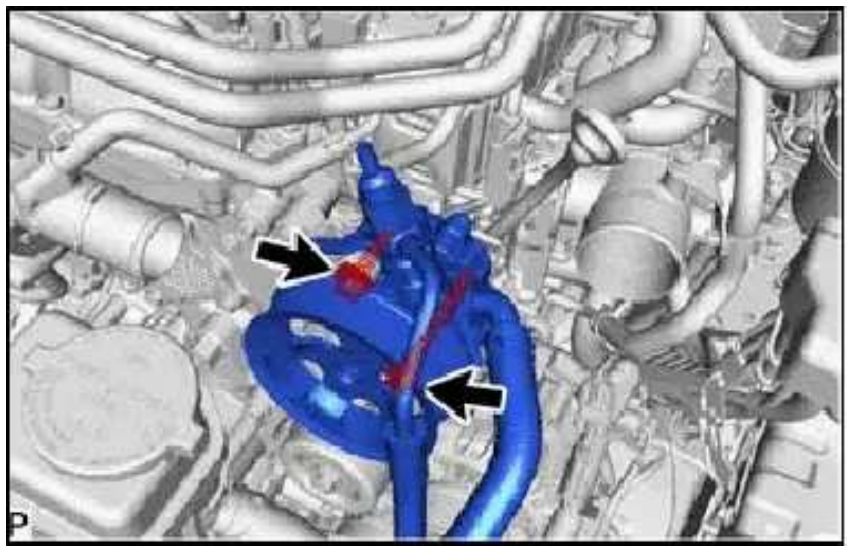
26. DISCONNECT VANE PUMP ASSEMBLY

a. Disconnect the connector from the power steering oil pressure switch.



A340265

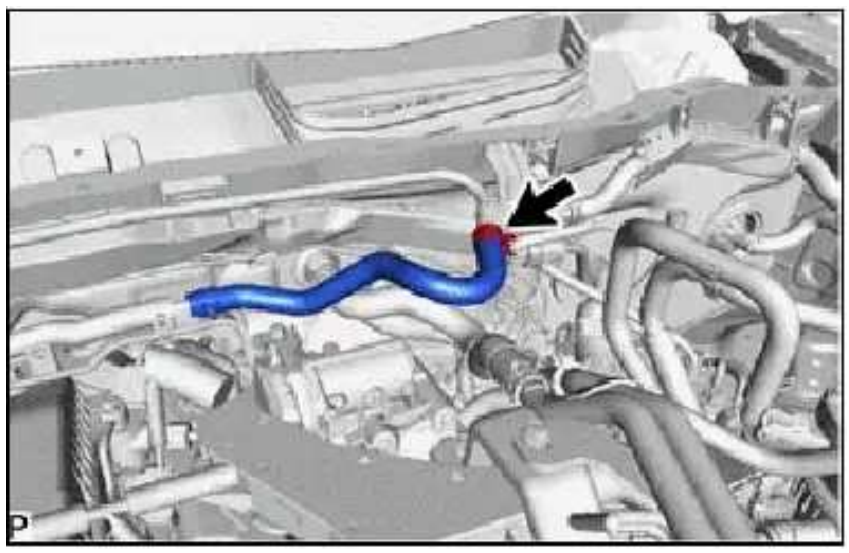
b. Remove the 2 bolt and disconnect the vane pump assembly from the generator bracket.



A340266

27. DISCONNECT UNION TO CONNECTOR TUBE HOSE

a. Slide the clamp and disconnect the union to connector tube hose from the No. 1 hose to hose tube.



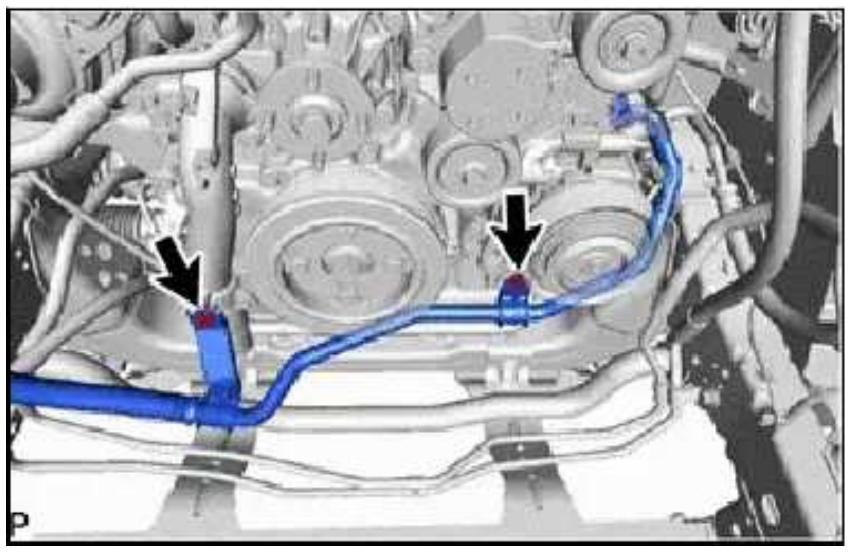
A340270

28. REMOVE GENERATOR ASSEMBLY

Click here BATTERY / CHARGING (2GD-FTV) > GENERATOR (for 80A Type) > REMOVAL

29. DISCONNECT COOLER COMPRESSOR ASSEMBLY

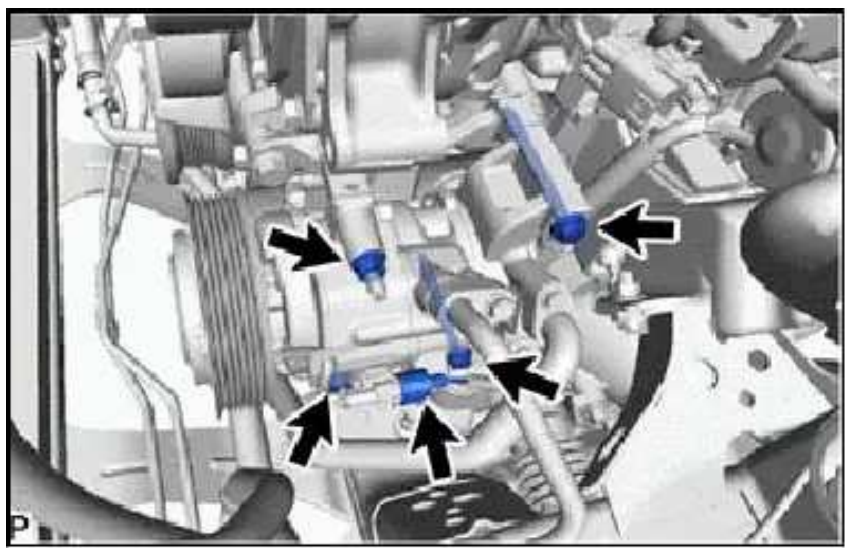
a. Remove the 2 bolts and disconnect the suction hose sub-assembly from the water inlet and timing chain cover.



A340267

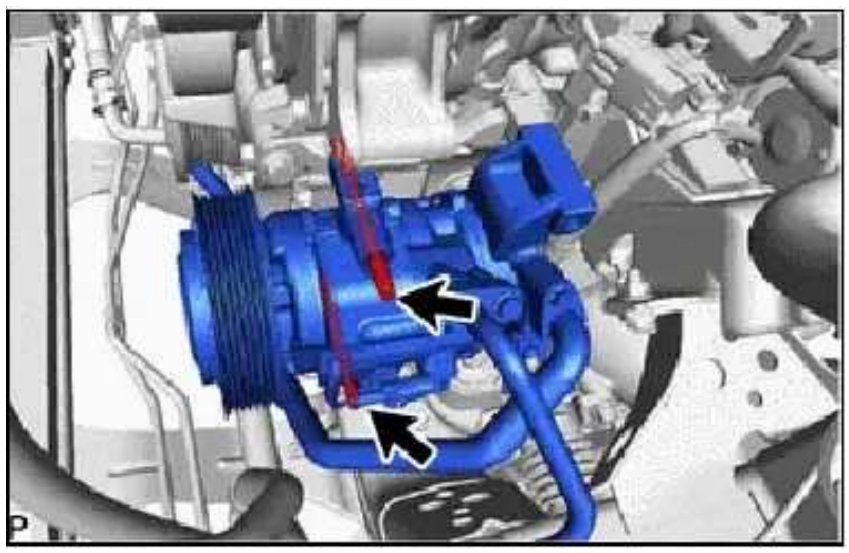
b. Disconnect the connector from the cooler compressor assembly.

c. Remove the 2 bolt and 2 nuts.



A340268

d. Using an E8 "TORX" socket wrench, remove the 2 stud bolts and disconnect the cooler compressor assembly from the compressor mounting bracket.



A352182

30. REMOVE FRONT EXHAUST PIPE ASSEMBLY

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST PIPE > REMOVAL

31. REMOVE FRONT PROPELLER SHAFT ASSEMBLY (for 4WD)

Click here DRIVE SHAFT / PROPELLER SHAFT > FRONT PROPELLER SHAFT ASSEMBLY > REMOVAL

32. REMOVE PROPELLER WITH CENTER BEARING SHAFT ASSEMBLY

Click here DRIVE SHAFT / PROPELLER SHAFT > PROPELLER SHAFT ASSEMBLY > REMOVAL

33. REMOVE MANUAL TRANSMISSION UNIT ASSEMBLY (for Manual Transmission)

- for R151:
  Click here MANUAL TRANSMISSION / TRANSAXLE (R151) > MANUAL TRANSMISSION ASSEMBLY > REMOVAL

- for RC60:
  Click here MANUAL TRANSMISSION / TRANSAXLE (RC60 / RC61) > MANUAL TRANSMISSION ASSEMBLY > REMOVAL

34. REMOVE DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT (for Automatic Transmission)

- AC60E:
  Click here AUTOMATIC TRANSMISSION / TRANSAXLE (AC60E) > AUTOMATIC TRANSMISSION ASSEMBLY (for 1GD-FTV, 2GD-FTV) > REMOVAL > REMOVE DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT

- AC60F:
  Click here AUTOMATIC TRANSMISSION / TRANSAXLE (AC60F) > AUTOMATIC TRANSMISSION ASSEMBLY > REMOVAL > REMOVE DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT

35. REMOVE AUTOMATIC TRANSMISSION ASSEMBLY (for Automatic Transmission)

- for AC60E:
  Click here AUTOMATIC TRANSMISSION / TRANSAXLE (AC60E) > AUTOMATIC TRANSMISSION ASSEMBLY (for 1GD-FTV, 2GD-FTV) > REMOVAL

- for AC60F:
  Click here AUTOMATIC TRANSMISSION / TRANSAXLE (AC60F) > AUTOMATIC TRANSMISSION ASSEMBLY > REMOVAL

36. REMOVE CLUTCH COVER ASSEMBLY (for Manual Transmission)

- for R151:
  Click here CLUTCH > CLUTCH UNIT (for R151) > REMOVAL > REMOVE CLUTCH COVER ASSEMBLY

- for RC60:
  Click here CLUTCH > CLUTCH UNIT (for RC60, RC61) > REMOVAL > REMOVE CLUTCH COVER ASSEMBLY

37. REMOVE CLUTCH DISC ASSEMBLY (for Manual Transmission)

- for R151:
  Click here CLUTCH > CLUTCH UNIT (for R151) > REMOVAL > REMOVE CLUTCH DISC ASSEMBLY

- for RC60:
  Click here CLUTCH > CLUTCH UNIT (for RC60, RC61) > REMOVAL > REMOVE CLUTCH DISC ASSEMBLY

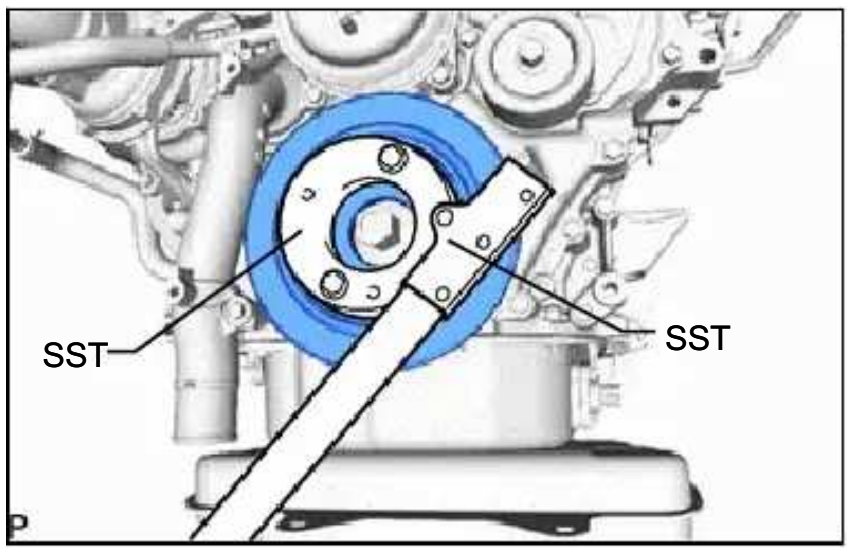
38. REMOVE FLYWHEEL SUB-ASSEMBLY

a. Using SST, hold the crankshaft pulley.

SST

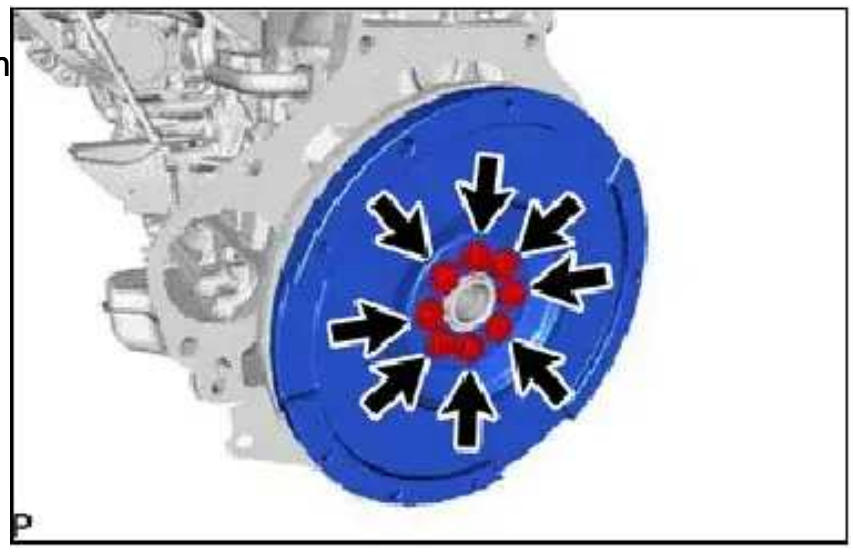
09213-58014 (91551-80840)

09330-00021



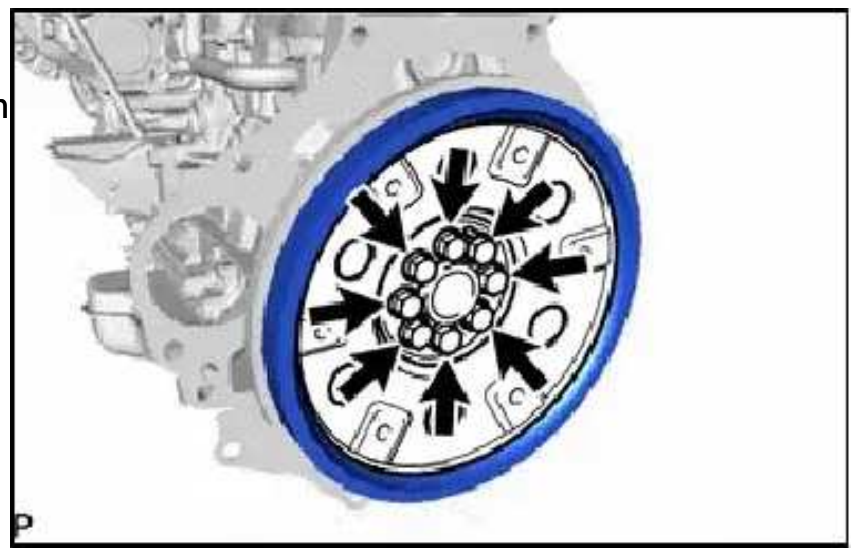
A349457N01

b. for Manual Transmission:
Remove the 8 bolts and flywheel sub-assembly from the crankshaft.



A344483

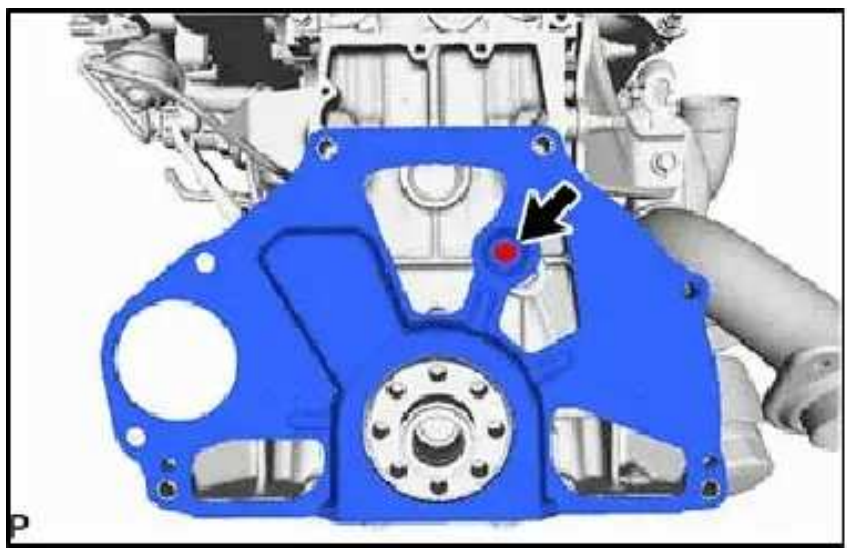
c. for Automatic Transmission:
Remove the 8 bolts, rear drive plate spacer, pump impeller drive plate and flywheel sub-assembly from the crankshaft.



A344484

39. REMOVE REAR END PLATE

a. Remove the bolt and rear end plate from the cylinder block sub-assembly.



A340241

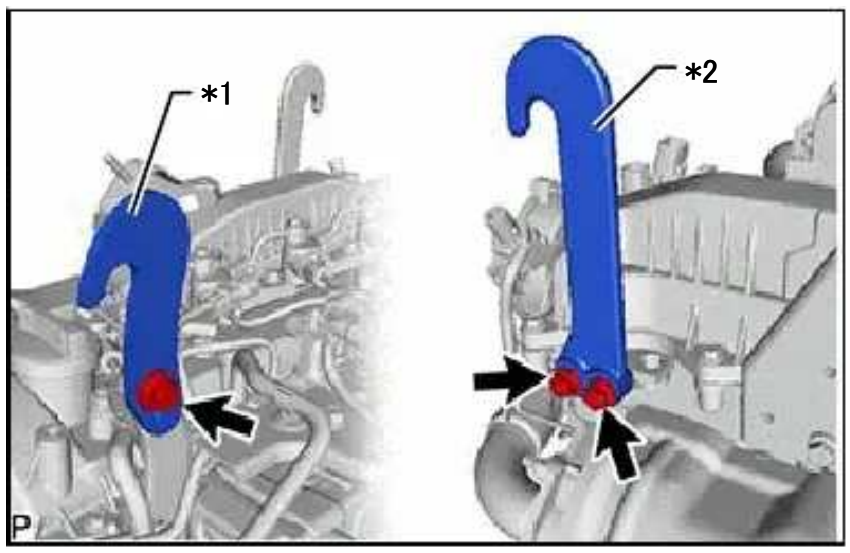
40. INSTALL ENGINE HANGER

a. Install the No. 1 engine hanger upper and No. 2 engine hanger with the 3 bolts as shown in the illustration.

Torque:
for No. 1 engine hanger upper
29 N*m (296 kgf*cm, 21 ft.*lbf)

for No. 2 engine hanger
26 N*m (265 kgf*cm, 19 ft.*lbf)

HINT:



A343930C01

*1	No. 1 Engine Hanger Upper
*2	No. 2 Engine Hanger

No. 1 Engine Hanger Upper	12284-11010 or 12284-11020
No. 2 Engine Hanger	12282-11080 or 12282-11090
Bolt	90119-T0073 or 91552-81025 and 90119-T0219 or, 91672-80835

41. REMOVE ENGINE ASSEMBLY

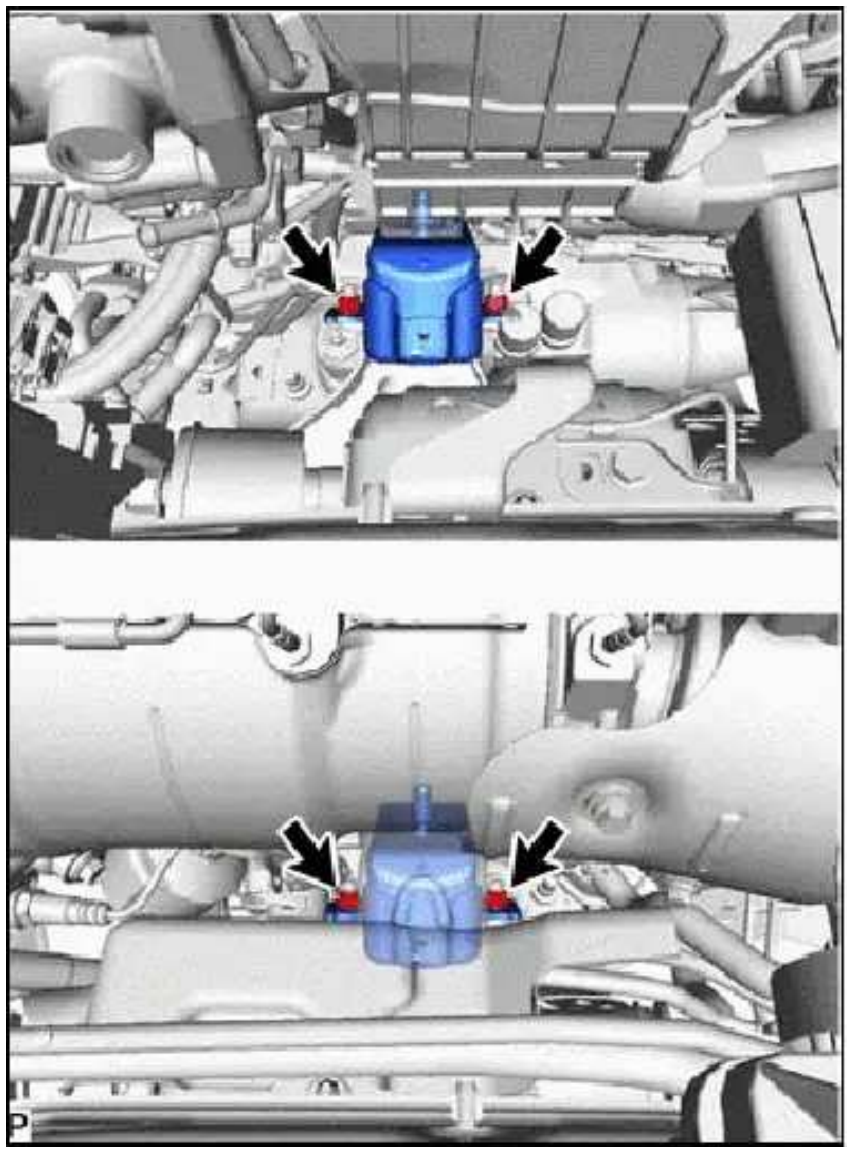
a. Attach an engine sling device and hang the engine assembly with a chain block.

b. Remove the 4 bolts and 4 nuts from the body.

c. Remove the engine assembly by operating the engine sling device and chain block.

NOTICE:

- **Make sure that the engine assembly is clear of all wiring and hoses.**
- **While lowering the engine assembly from the vehicle, do not allow it to contact the vehicle.**



A340269

42. INSTALL ENGINE ASSEMBLY TO ENGINE STAND

NOTICE:

- **Pay attention to the angle of the sling device as the engine assembly or engine hangers may be damaged or deformed if the angle is incorrect.**
- **With the exception of installing the engine assembly to an engine stand or removing the engine assembly from an engine stand, do not perform any work on the engine assembly while it is suspended, as doing so is dangerous.**

a. Install the engine assembly to engine stand with the bolts.

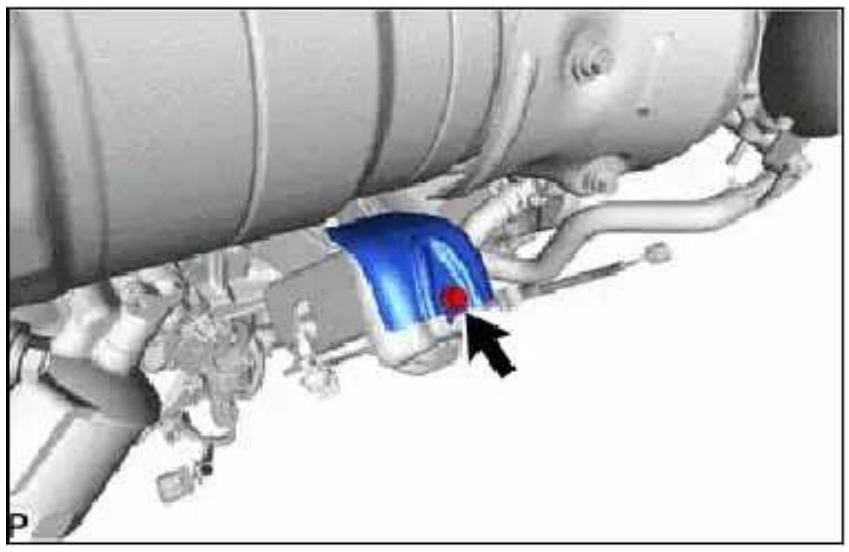
b. Remove the 3 bolts, No. 1 engine hanger upper and No. 2 engine hanger.

43. REMOVE ENGINE WIRE

a. Remove the engine wire from the engine assembly.

44. REMOVE FRONT ENGINE MOUNTING INSULATOR RH

a. Remove the bolt and front engine mounting insulator RH from the front engine mounting insulator.



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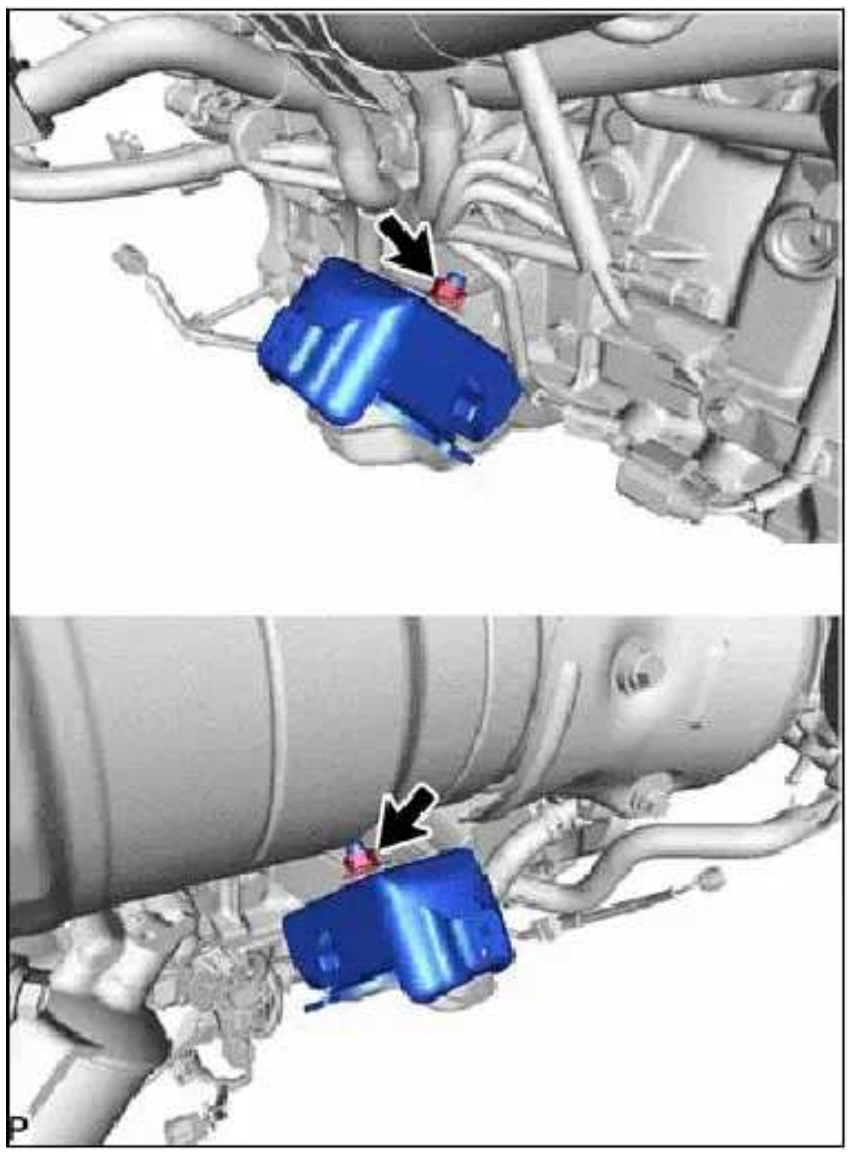
45. REMOVE FRONT ENGINE MOUNTING INSULATOR

a. Remove the 2 nuts and 2 front engine mounting insulators from the 2 front engine mounting brackets.



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ENGINE ASSEMBLY > INSTALLATION

1. INSTALL FRONT ENGINE MOUNTING INSULATOR

a. Install the 2 front engine mounting insulators to the 2 front engine mounting brackets with the 2 bolts.

Torque:
64 N*m (653 kgf*cm, 47 ft.*lbf)

2. INSTALL FRONT ENGINE MOUNTING INSULATOR RH

a. Install the front engine mounting insulator RH to the front engine mounting insulator sub-assembly with the bolt.

Torque:
13 N*m (133 kgf*cm, 10 ft.*lbf)

3. INSTALL ENGINE WIRE

a. Install the engine wire to the engine assembly.

4. INSTALL ENGINE HANGER

Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE ASSEMBLY > REMOVAL > INSTALL ENGINE HANGER

5. REMOVE ENGINE ASSEMBLY TO ENGINE STAND

NOTICE:

- **Pay attention to the angle of the sling device as the engine assembly or engine hangers may be damaged or deformed if the angle is incorrect.**
- **With the exception of installing the engine assembly to an engine stand or removing the engine assembly from an engine stand, do not perform any work on the engine assembly while it is suspended, as doing so is dangerous.**

a. Attach the engine sling device and hang the engine assembly with the chain block.

b. Remove the engine assembly from the engine stand.

6. INSTALL ENGINE ASSEMBLY

a. Slowly lower the engine assembly into the engine compartment.

b. Install the engine assembly to the body with the 4 bolt and 4 nuts.

Torque:
42 N*m (428 kgf*cm, 31 ft.*lbf)

c. Remove the 3 bolts, No. 1 engine hanger upper and No. 2 engine hanger.

7. INSTALL REAR END PLATE

a. Install the rear end plate to the cylinder block with the bolt.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

8. INSTALL FLYWHEEL SUB-ASSEMBLY

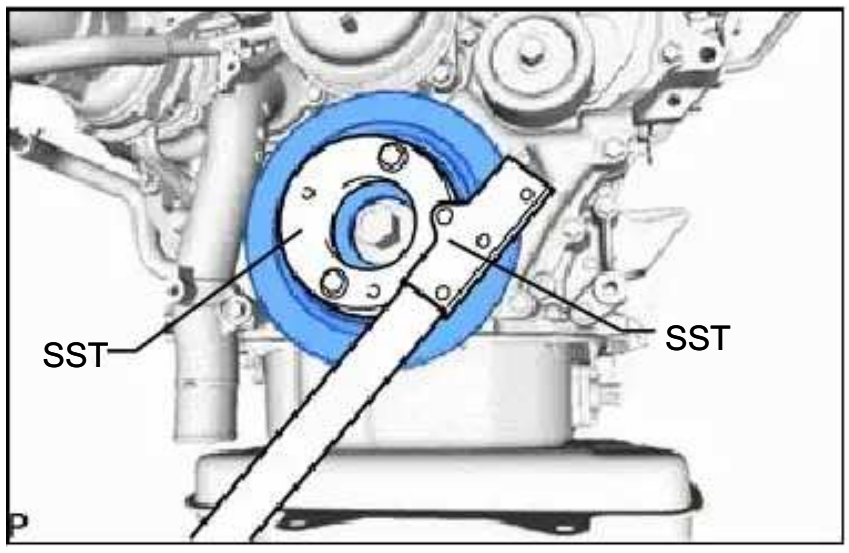
a. Clean the bolt holes.

b. Using SST, hold the crankshaft pulley.
SST
09213-58014 (91551-80840)

09330-00021

c. for Manual Transmission:
Install the flywheel sub-assembly to the crankshaft with 8 new bolts.

Torque:
178 N*m (1815 kgf*cm, 131 ft.*lbf)



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NOTICE:
Do not start the engine for at least 1 hour after installation.

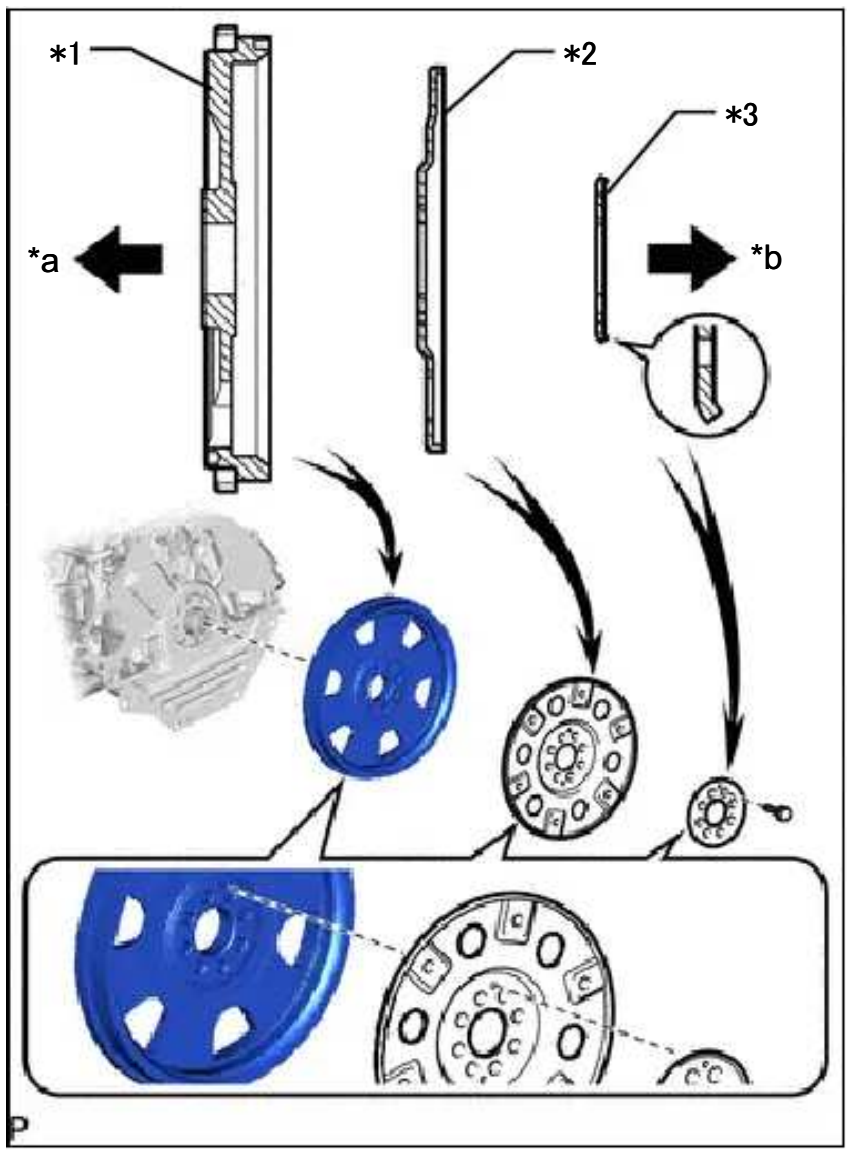
d. for Automatic Transmission:
Install the flywheel sub-assembly, the pump impeller drive plate and the rear drive plate spacer to the crankshaft with 8 new bolts.

NOTICE:

- **Align either hole in the pump impeller drive plate and either hole in the rear drive plate spacer with the knock pin of the flywheel sub-assembly, and then install the flywheel sub-assembly, the pump impeller drive plate and the rear drive plate spacer to the crankshaft.**
- **Do not start the engine for at least 1 hour after installation.**

HINT:

As the rear drive plate spacer and pump impeller drive plate are not reversible, be sure to install them in the direction shown in the illustration.



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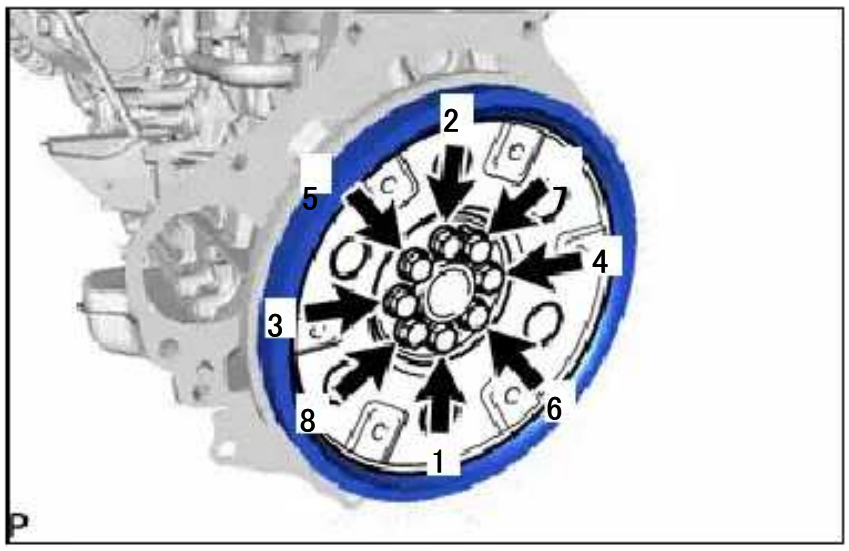
*1	Flywheel Sub-assembly
*2	Pump Impeller Drive Plate
*3	Rear Drive Plate Spacer
*a	Engine Side
*b	Transmission Side

e. for Automatic Transmission:
Install and uniformly tighten and tighten the 8 bolts in several steps in the sequence shown in the illustration.

Torque:
178 N*m (1815 kgf*cm, 131 ft.*lbf)



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9. INSTALL CLUTCH DISC ASSEMBLY (for Manual Transmission)

- for R151:
  Click here CLUTCH > CLUTCH UNIT (for R151) > INSTALLATION > INSTALL CLUTCH DISC ASSEMBLY

- for RC60:
  Click here CLUTCH > CLUTCH UNIT (for RC60, RC61) > INSTALLATION > INSTALL CLUTCH DISC ASSEMBLY

10. INSTALL CLUTCH COVER ASSEMBLY (for Manual Transmission)

- for R151:
  Click here CLUTCH > CLUTCH UNIT (for R151) > INSTALLATION > INSTALL CLUTCH COVER ASSEMBLY

- for RC60:
  Click here CLUTCH > CLUTCH UNIT (for RC60, RC61) > INSTALLATION > INSTALL CLUTCH COVER ASSEMBLY

11. INSPECT AND ADJUST CLUTCH COVER ASSEMBLY (for Manual Transmission)

- for R151:
  Click here CLUTCH > CLUTCH UNIT (for R151) > INSTALLATION > INSPECT AND ADJUST CLUTCH COVER ASSEMBLY

- for RC60:
  Click here CLUTCH > CLUTCH UNIT (for RC60, RC61) > INSTALLATION > INSPECT AND ADJUST CLUTCH COVER ASSEMBLY

12. INSTALL AUTOMATIC TRANSMISSION ASSEMBLY (for Automatic Transmission)

- for AC60E:
  Click here AUTOMATIC TRANSMISSION / TRANSAXLE (AC60E) > AUTOMATIC TRANSMISSION ASSEMBLY (for 1GD-FTV, 2GD-FTV) > INSTALLATION

- for AC60F:
  Click here AUTOMATIC TRANSMISSION / TRANSAXLE (AC60F) > AUTOMATIC TRANSMISSION ASSEMBLY > INSTALLATION

13. INSTALL DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT (for Automatic Transmission)

- for AC60E:
  Click here AUTOMATIC TRANSMISSION / TRANSAXLE (AC60E) > AUTOMATIC TRANSMISSION ASSEMBLY (for 1GD-FTV, 2GD-FTV) > INSTALLATION > INSTALL DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT

- for AC60F:
  Click here AUTOMATIC TRANSMISSION / TRANSAXLE (AC60F) > AUTOMATIC TRANSMISSION ASSEMBLY > INSTALLATION > INSTALL DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT

14. INSTALL MANUAL TRANSMISSION UNIT ASSEMBLY (for Manual Transmission)

- for R151:
  Click here MANUAL TRANSMISSION / TRANSAXLE (R151) > MANUAL TRANSMISSION ASSEMBLY > INSTALLATION

- for RC60:
  Click here MANUAL TRANSMISSION / TRANSAXLE (RC60 / RC61) > MANUAL TRANSMISSION ASSEMBLY > INSTALLATION

15. INSTALL PROPELLER WITH CENTER BEARING SHAFT ASSEMBLY

Click here DRIVE SHAFT / PROPELLER SHAFT > PROPELLER SHAFT ASSEMBLY > INSTALLATION

16. INSTALL FRONT PROPELLER SHAFT ASSEMBLY (for 4WD)

Click here DRIVE SHAFT / PROPELLER SHAFT > FRONT PROPELLER SHAFT ASSEMBLY > INSTALLATION

17. INSTALL FRONT EXHAUST PIPE ASSEMBLY

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST PIPE > INSTALLATION

18. CONNECT COOLER COMPRESSOR ASSEMBLY

a. Temporarily install the cooler compressor assembly to the compressor mounting bracket with the 2 stud bolts.

b. Using an E8 "TORX" socket wrench, tighten the 2 stud bolts.

Torque:

10 N*m (102 kgf*cm, 7 ft.*lbf)

c. Install the 2 bolts and 2 nuts.

Torque:
24.5 N*m (250 kgf*cm, 18 ft.*lbf)

d. Connect the connector to the cooler compressor assembly.

e. Connect the suction hose sub-assembly to the water inlet and timing chain cover with the 2 bolts.

Torque:
5.4 N*m (55 kgf*cm, 48 in.*lbf)

19. INSTALL GENERATOR ASSEMBLY

Click here BATTERY / CHARGING (2GD-FTV) > GENERATOR (for 80A Type) > INSTALLATION

20. CONNECT UNION TO CONNECTOR TUBE HOSE

a. Connect the union to connector tube hose to the No. 1 hose to hose tube, and slide the clamp to secure the hose.

21. CONNECT VANE PUMP ASSEMBLY

a. Connect the vane pump assembly to the generator bracket with the 2 bolts.

Torque:
21 N*m (214 kgf*cm, 15 ft.*lbf)

b. Connect the connector to the power steering oil pressure switch.

22. CONNECT WATER HOSE SUB-ASSEMBLY

a. Connect the water hose sub-assembly to the air conditioning unit assembly, slide the 2 clamps secure the 2 hoses.

23. INSTALL BATTERY TRAY

24. INSTALL BATTERY

25. INSTALL BATTERY CLAMP SUB-ASSEMBLY

a. Install the battery clamp sub-assembly to the battery with the 2 nuts.

Torque:
5.4 N*m (55 kgf*cm, 48 in.*lbf)

26. CONNECT WIRE HARNESS

a. Connect the engine room main wire to the battery positive cable with the nut.

Torque:
7.1 N*m (72 kgf*cm, 63 in.*lbf)

b. Attach the clamp and connect the No. 2 engine wire with the 2 bolts.

Torque:
14 N*m (143 kgf*cm, 10 ft.*lbf)

c. Connect the 2 connectors to the engine room relay block sub-assembly.

d. Connect the wire to wire to the engine room relay block sub-assembly with the nut.

Torque:
12.5 N*m (127 kgf*cm, 9 ft.*lbf)

e. Attach the 2 clips and install the No. 1 relay block cover side to the engine room relay block sub-assembly.

f. Attach the 3 clips and install the No. 1 relay block cover upper to the engine room relay block sub-assembly.

27. CONNECT NO. 2 FUEL HOSE

a. Connect the No. 2 fuel hose to the No. 3 nozzle leakage pipe assembly, and slide the clamp to secure the hose.

b. Attach the clamp to the No. 2 fuel hose.

28. CONNECT NO. 1 FUEL HOSE

a. Connect the No. 1 fuel hose to the No. 2 fuel pipe, and slide the clamp to secure the hose.

b. Attach the clamp to the No. 1 fuel hose.

29. INSTALL FUEL FILTER ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL FILTER > REPLACEMENT > INSTALL FUEL FILTER ELEMENT ASSEMBLY

30. INSTALL INTERCOOLER AIR TUBE

a. Install the intercooler air tube to the diesel throttle body assembly, and slide the clamp to secure the hose.

Torque:
6.5 N*m (66 kgf*cm, 58 in.*lbf)

b. Connect the connector to the intake air temperature sensor.

31. INSTALL NO. 4 AIR TUBE

a. Install the No. 4 air hose to the No. 2 air tube and intercooler air tube, and slide the 2 clamps to secure the hose.

Torque:

6.5 N*m (66 kgf*cm, 58 in.*lbf)

b. Connect the oil return hose to the engine oil level dipstick guide assembly, and slide the clamp to secure the hose.

32. INSTALL NO. 1 AIR HOSE

a. Install the No. 1 air hose to the compressor outlet elbow and No. 1 air tube, and slide the 2 clamps to secure the 2 hoses.

Torque:
6.5 N*m (66 kgf*cm, 58 in.*lbf)

33. INSTALL AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY

34. INSTALL AIR CLEANER CAP AND HOSE

a. Attach the 4 clips and install the air cleaner cap and hose.

b. Tighten the hose clamp.

Torque:
4.0 N*m (41 kgf*cm, 35 in.*lbf)

c. Attach the 2 clamp and connect the connector to the mass air flow meter.

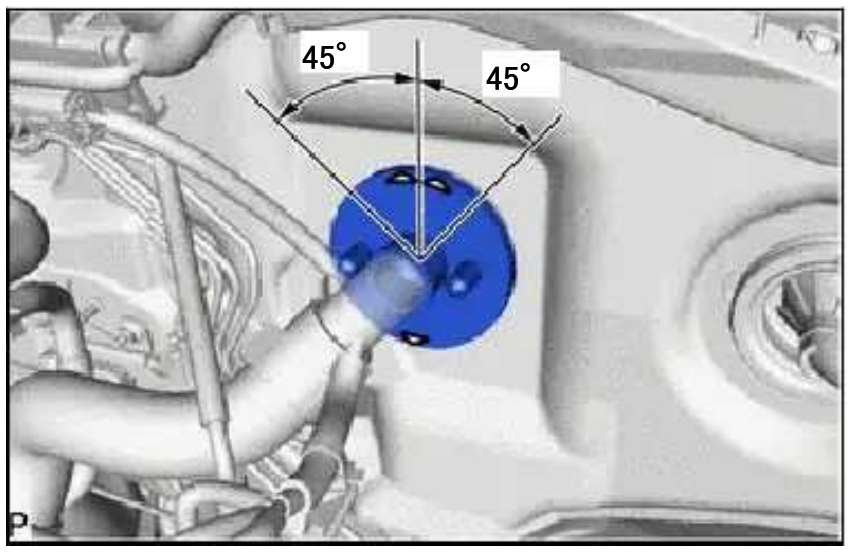
35. CONNECT ENGINE WIRE

a. Pass the engine wire into the cabin.

b. Attach the grommet to the body.

HINT:

Make sure the direction of grommet is shown in the illustration.



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c. Attach the clamp to connect the engine wire to the bracket.

d. Attach the clamp and connect the 4 connectors to the glow plug controller.

e. Connect the connector to the engine room main wire.

f. Attach the 2 clamps and connect the 3 connectors to the instrument panel wire.

g. Install the ECM.

Click here ENGINE CONTROL (2GD-FTV) > ECM > INSTALLATION

36. INSTALL RADIATOR ASSEMBLY

Click here COOLING (2GD-FTV) > RADIATOR > INSTALLATION

37. INSTALL HOOD SUB-ASSEMBLY

a. Install the hood sub-assembly to the 2 hood hinge assemblies with the 4 bolts.

Torque:
13 N*m (133 kgf*cm, 10 ft.*lbf)

b. Connect the washer nozzle hose to the hood sub-assembly.

38. ADD ENGINE OIL

Click here LUBRICATION (2GD-FTV) > OIL AND OIL FILTER > REPLACEMENT > ADD ENGINE OIL

39. ADD MANUAL TRANSMISSION OIL (for Manual Transmission)

- for R151:
  Click here MANUAL TRANSMISSION / TRANSAXLE (R151) > MANUAL TRANSMISSION OIL > REPLACEMENT > ADD MANUAL TRANSMISSION OIL

- for RC60:
  Click here MANUAL TRANSMISSION / TRANSAXLE (RC60 / RC61) > MANUAL TRANSMISSION OIL > REPLACEMENT > ADD MANUAL TRANSMISSION OIL

40. ADD AUTOMATIC TRANSMISSION FLUID (for Automatic Transmission)

- for AC60E:
  Click here AUTOMATIC TRANSMISSION / TRANSAXLE (AC60E) > AUTOMATIC TRANSMISSION FLUID > ADJUSTMENT

- for AC60F:
  Click here AUTOMATIC TRANSMISSION / TRANSAXLE (AC60F) > AUTOMATIC TRANSMISSION FLUID > ADJUSTMENT

41. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected.
Click here INTRODUCTION > REPAIR INSTRUCTION > INITIALIZATION

42. BLEED AIR FROM FUEL SYSTEM

Click here FUEL (2GD-FTV) > FUEL SYSTEM > ON-VEHICLE INSPECTION > BLEED AIR FROM FUEL SYSTEM

43. ADD ENGINE COOLANT

Click here COOLING (2GD-FTV) > COOLANT > REPLACEMENT > ADD ENGINE COOLANT

44. INSPECT FOR COOLANT LEAK

Click here COOLING (2GD-FTV) > COOLING SYSTEM > ON-VEHICLE INSPECTION > INSPECT FOR COOLANT LEAK

45. INSPECT ENGINE OIL LEVEL

Click here LUBRICATION (2GD-FTV) > LUBRICATION SYSTEM > ON-VEHICLE INSPECTION > INSPECT ENGINE OIL LEVEL

46. INSPECT ENGINE IDLE SPEED AND MAXIMUM SPEED

Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE > ON-VEHICLE INSPECTION > INSPECT ENGINE IDLE SPEED

47. PERFORM REGISTRATION (w/ Stop And Start System)

Click here STOP AND START > STOP AND START SYSTEM > REGISTRATION

48. INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY

49. INSTALL NO. 2 ENGINE UNDER COVER (for 4WD and Pre-Runner)

Torque:
28 N*m (286 kgf*cm, 21 ft.*lbf)

50. INSTALL NO. 1 ENGINE UNDER COVER ASSEMBLY (for 4WD and Pre-Runner)

Torque:
for M6 bolt
11.5 N*m (117 kgf*cm, 8 ft.*lbf)

for M8 bolt
28 N*m (286 kgf*cm, 21 ft.*lbf)

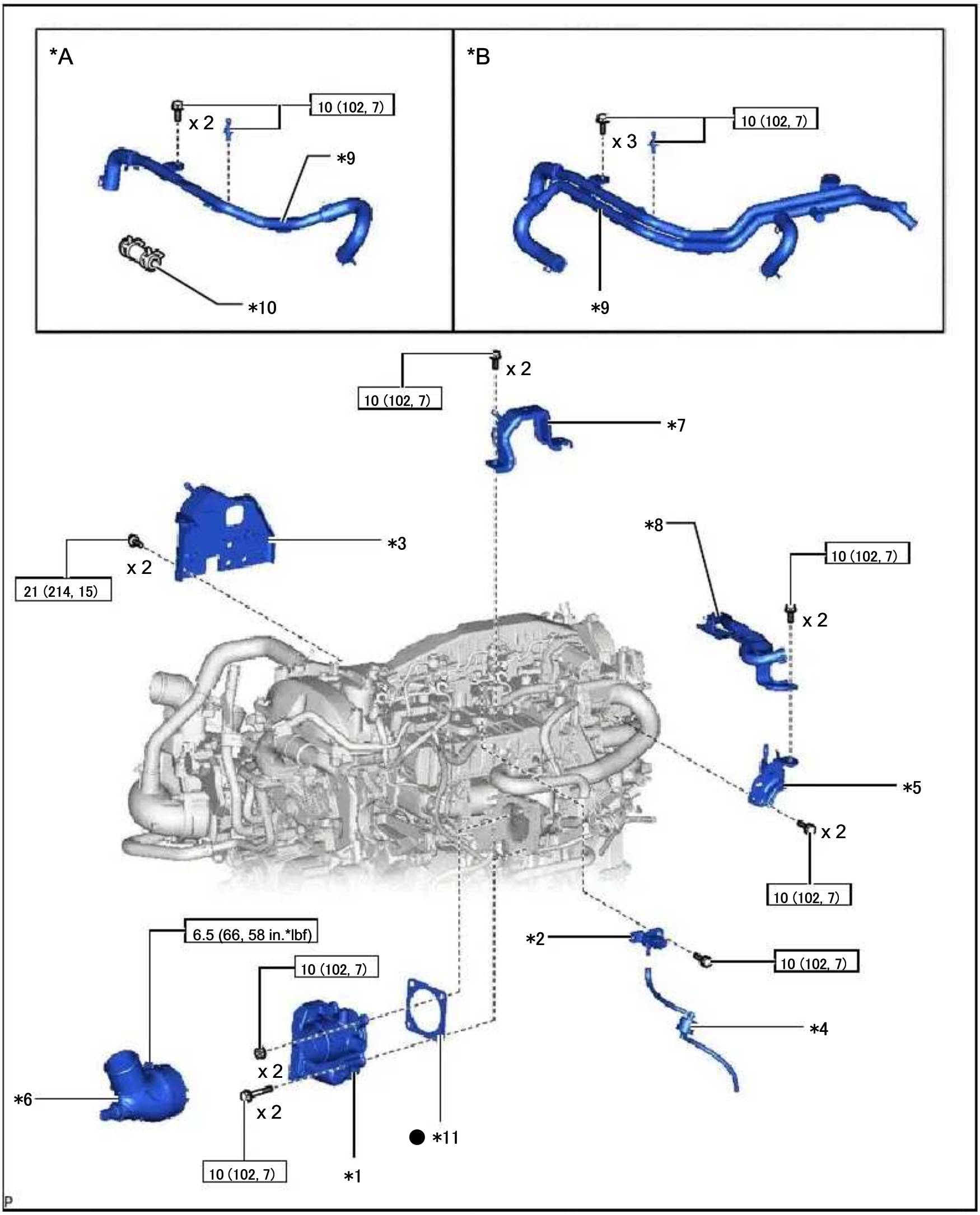
ENGINE UNIT > PRECAUTION

HINT:

- **Any digits beyond the 0.01 mm (1/1000 in.) place for standard, minimum and maximum values should be used as a reference only.**

- **When both standard and maximum or minimum values are listed for an inspection, use the standard value as a reference only and base any judgments on the maximum and minimum values.**

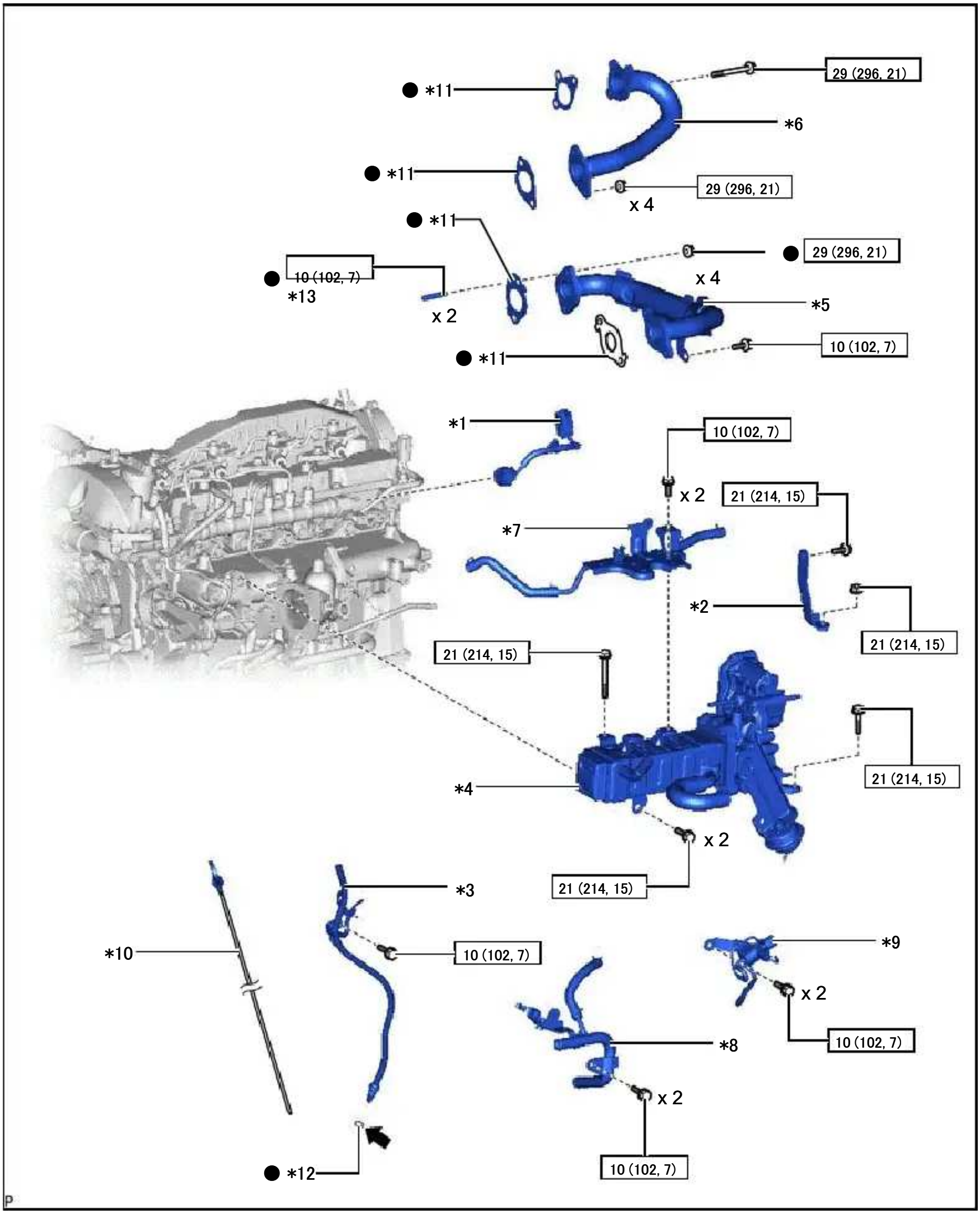
2GD-FTV ENGINE MECHANICAL > ENGINE UNIT



A343486C01

*A	w/o Heater	*B	w/ Heater
*1	DIESEL THROTTLE BODY ASSEMBLY	*2	DIESEL TURBO PRESSURE SENSOR

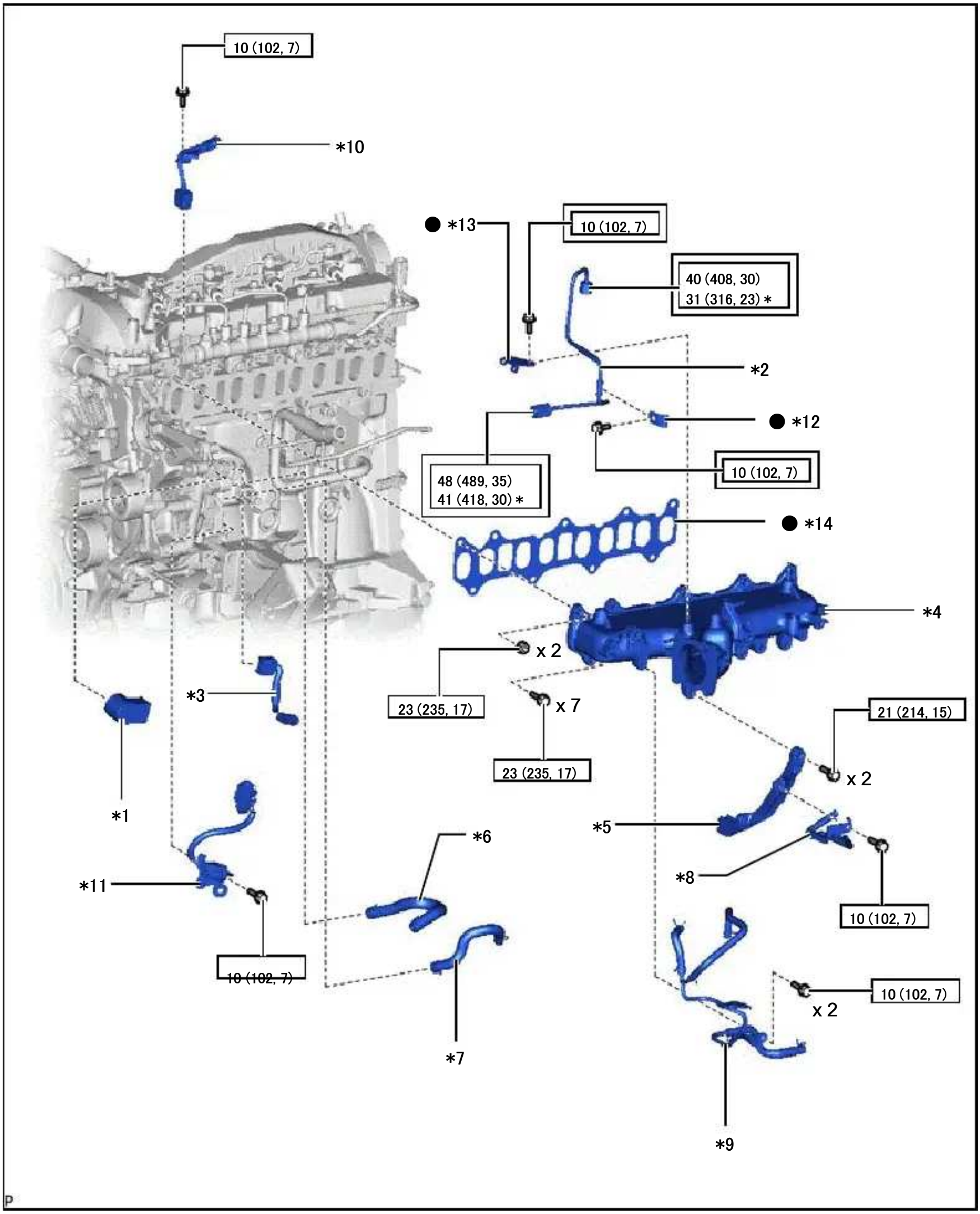
*3	ENGINE COVER BRACKET	*4	GAS FILTER
*5	HOSE BRACKET	*6	INTERCOOLER AIR TUBE
*7	NO. 2 ENGINE COVER BRACKET	*8	NO. 2 HOSE TO HOSE TUBE
*9	NO. 2 WATER BY-PASS PIPE	*10	WATER BY-PASS PLUG
*11	GASKET	-	-
□	N*m (kgf*cm, ft.*lbf): Specified torque	●	Non-reusable part



A343487C01

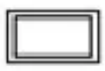
*1	CONNECTING WIRE	*2	EGR VALVE BRACKET
*3	ENGINE OIL LEVEL DIPSTICK GUIDE	*4	NO. 1 EGR COOLER AND NO. 2 EGR VALVE ASSEMBLY WITH ELECTRIC EGR CONTROL VALVE ASSEMBLY

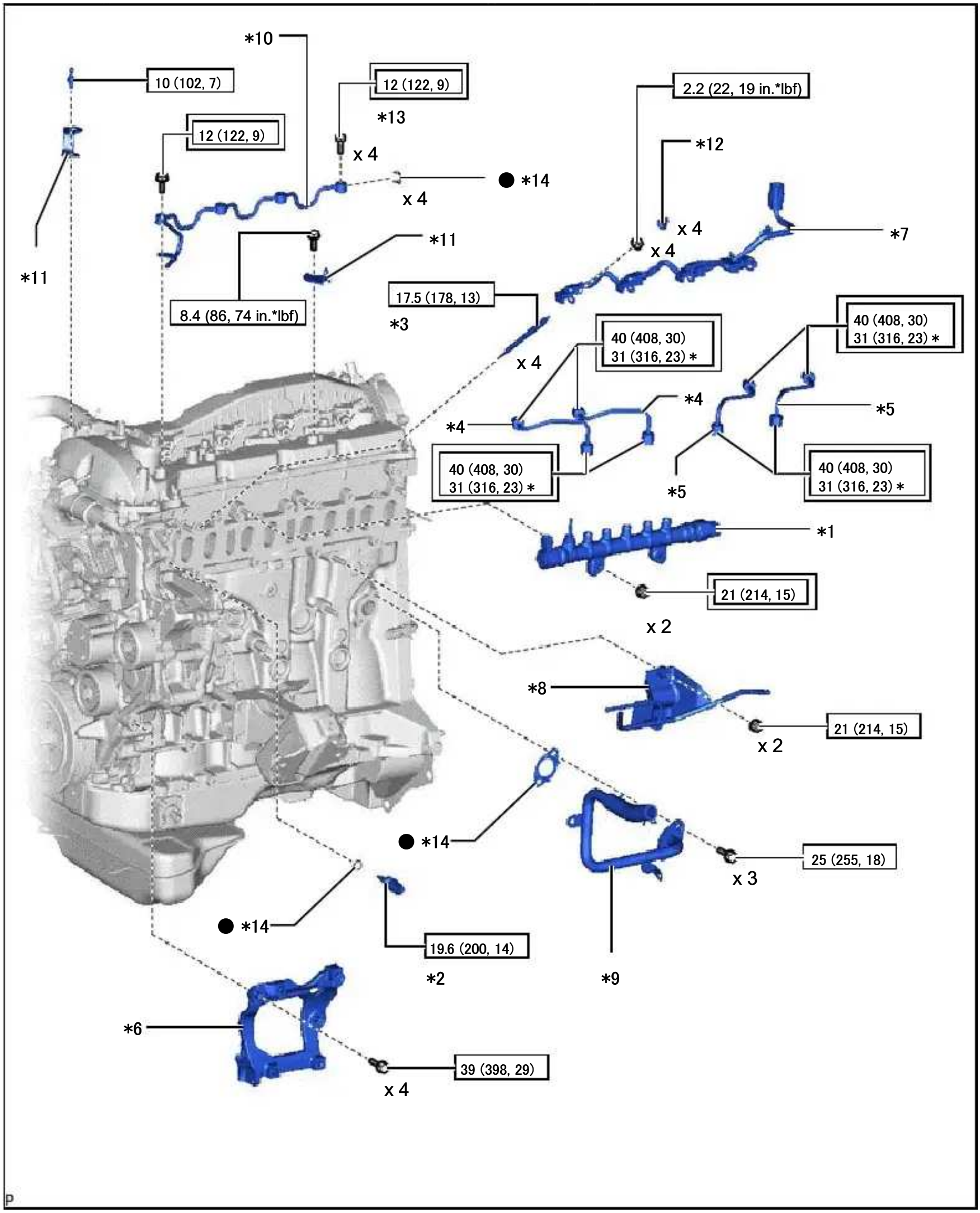
*5	NO. 1 EGR PIPE	*6	NO. 2 EGR PIPE
*7	NO. 3 WATER BY-PASS PIPE SUB-ASSEMBLY	*8	NO. 4 WATER BY-PASS PIPE SUB-ASSEMBLY
*9	VACUUM CONTROL VALVE SET	*10	ENGINE OIL LEVEL DIPSTICK
*11	GASKET	*12	O-RING
*13	STUD BOLT	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part
	Engine oil	-	-



A343488C01

*1	FUEL INJECTION PUMP COVER SUB-ASSEMBLY	*2	FUEL INLET PIPE SUB-ASSEMBLY
*3	FUEL PUMP MOTOR WIRE	*4	INTAKE MANIFOLD
*5	MANIFOLD STAY	*6	NO. 1 FUEL HOSE

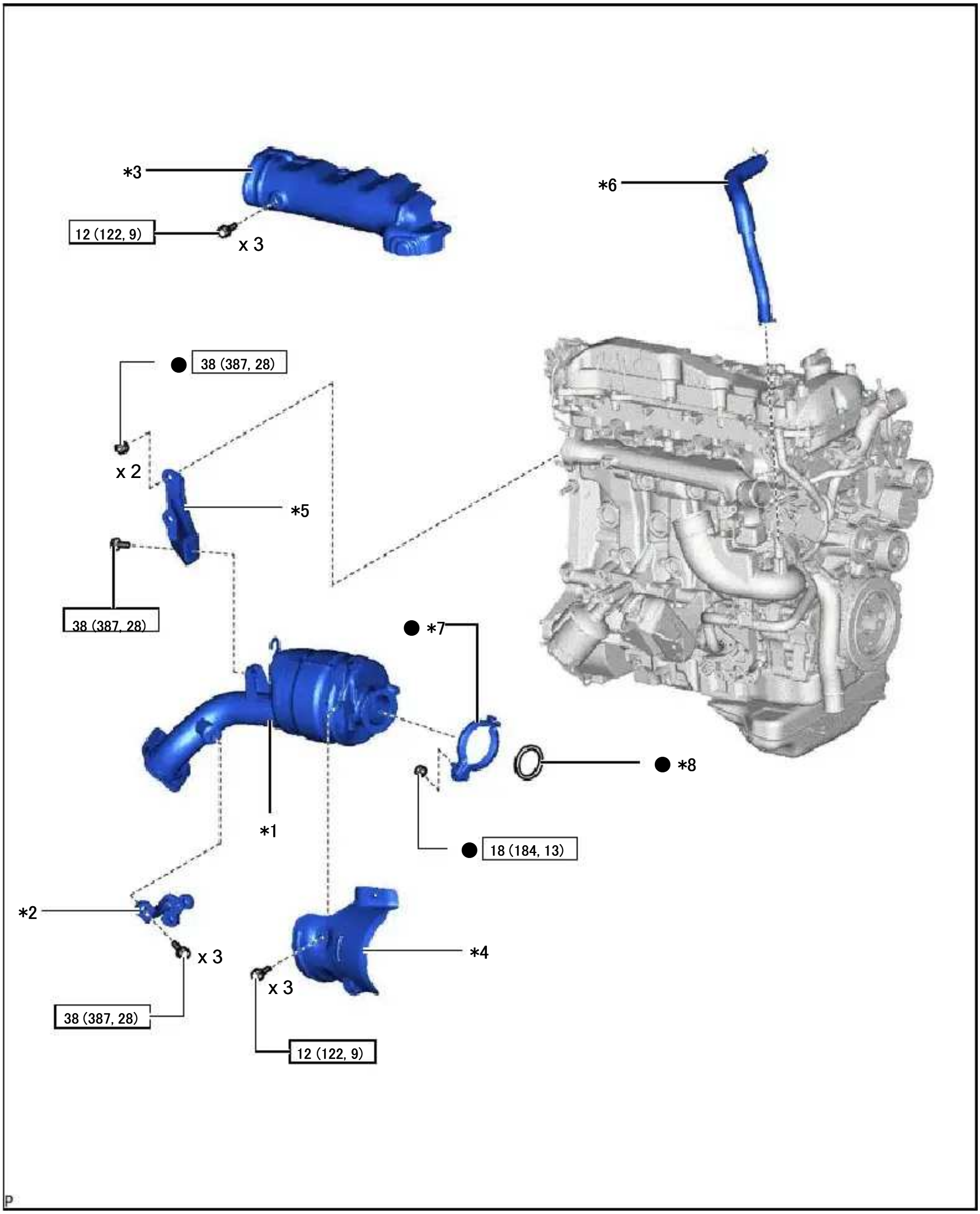
*7	NO. 2 FUEL HOSE	*8	NO. 2 FUEL PIPE
*9	NO. 2 NOZZLE LEAKAGE PIPE ASSEMBLY	*10	WIRING HARNESS CLAMP BRACKET
*11	WIRING HARNESS CLAMP BRACKET	*12	INJECTION PIPE CLAMP
*13	NO. 2 INJECTION PIPE CLAMP	*14	GASKET
	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping" : N*m (kgf*cm, ft.*lbf)		N*m (kgf*cm, ft.*lbf): Specified torque
*	For use with union nut wrench	●	Non-reusable part



A343489C01

*1	COMMON RAIL ASSEMBLY	*2	ENGINE COOLANT TEMPERATURE SENSOR
*3	GLOW PLUG ASSEMBLY	*4	NO. 1 INJECTION PIPE SUB-ASSEMBLY

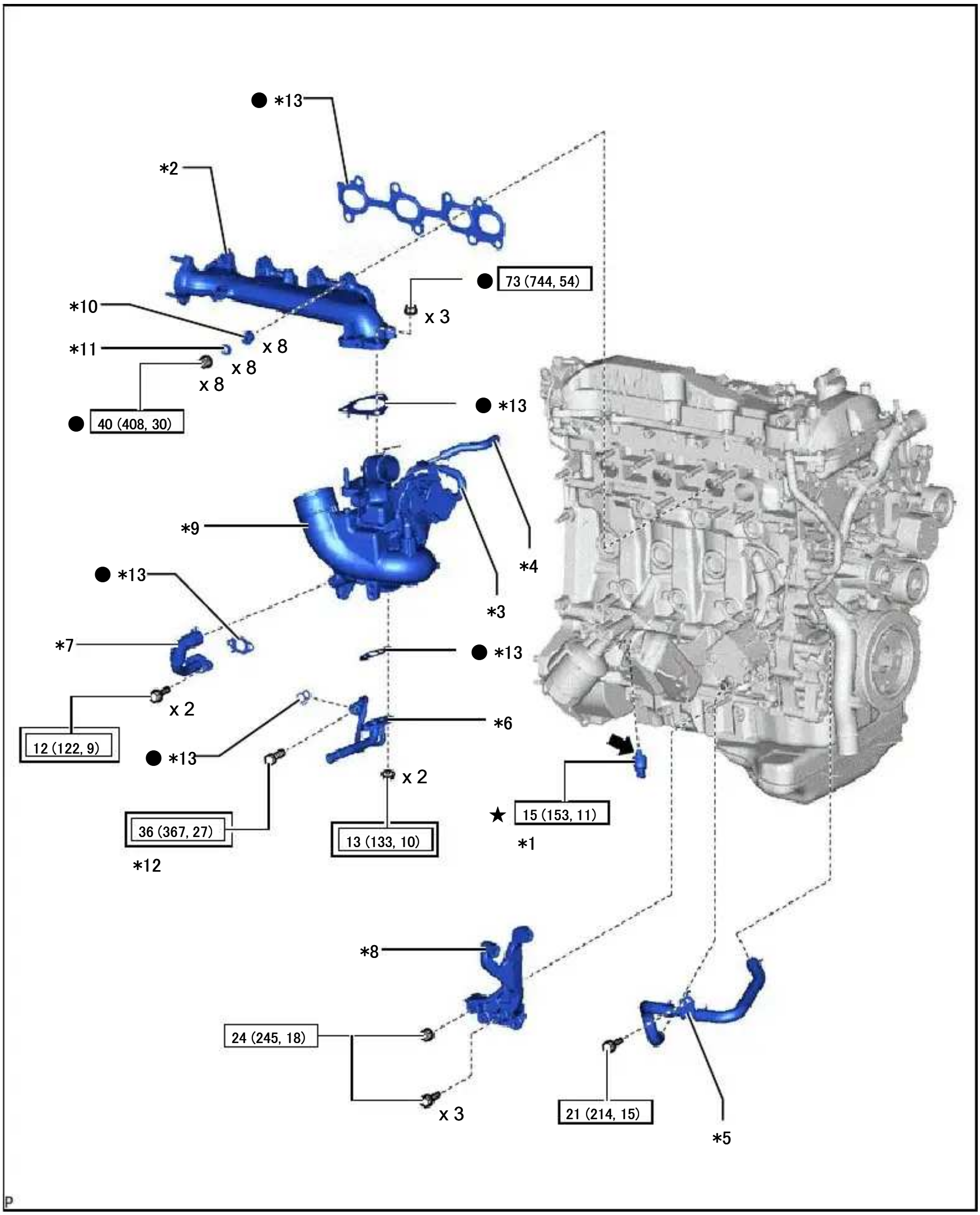
*5	NO. 2 INJECTION PIPE SUB-ASSEMBLY	*6	NO. 1 COMPRESSOR MOUNTING BRACKET
*7	NO. 1 GLOW PLUG CONNECTOR	*8	NO. 3 NOZZLE LEAKAGE PIPE
*9	NO. 5 WATER BY-PASS PIPE SUB-ASSEMBLY	*10	NOZZLE LEAKAGE PIPE ASSEMBLY
*11	WIRING HARNESS CLAMP BRACKET	*12	SCREW GROMMET
*13	UNION BOLT	*14	GASKET
▣	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping" : N*m (kgf*cm, ft.*lbf)	□	N*m (kgf*cm, ft.*lbf): Specified torque
*	For use with SST or union nut wrench	●	Non-reusable part



A343490C01

*1	EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY	*2	EXHAUST PIPE SUPPORT STAY
*3	NO. 1 EXHAUST MANIFOLD HEAT INSULATOR	*4	NO. 1 TURBO INSULATOR

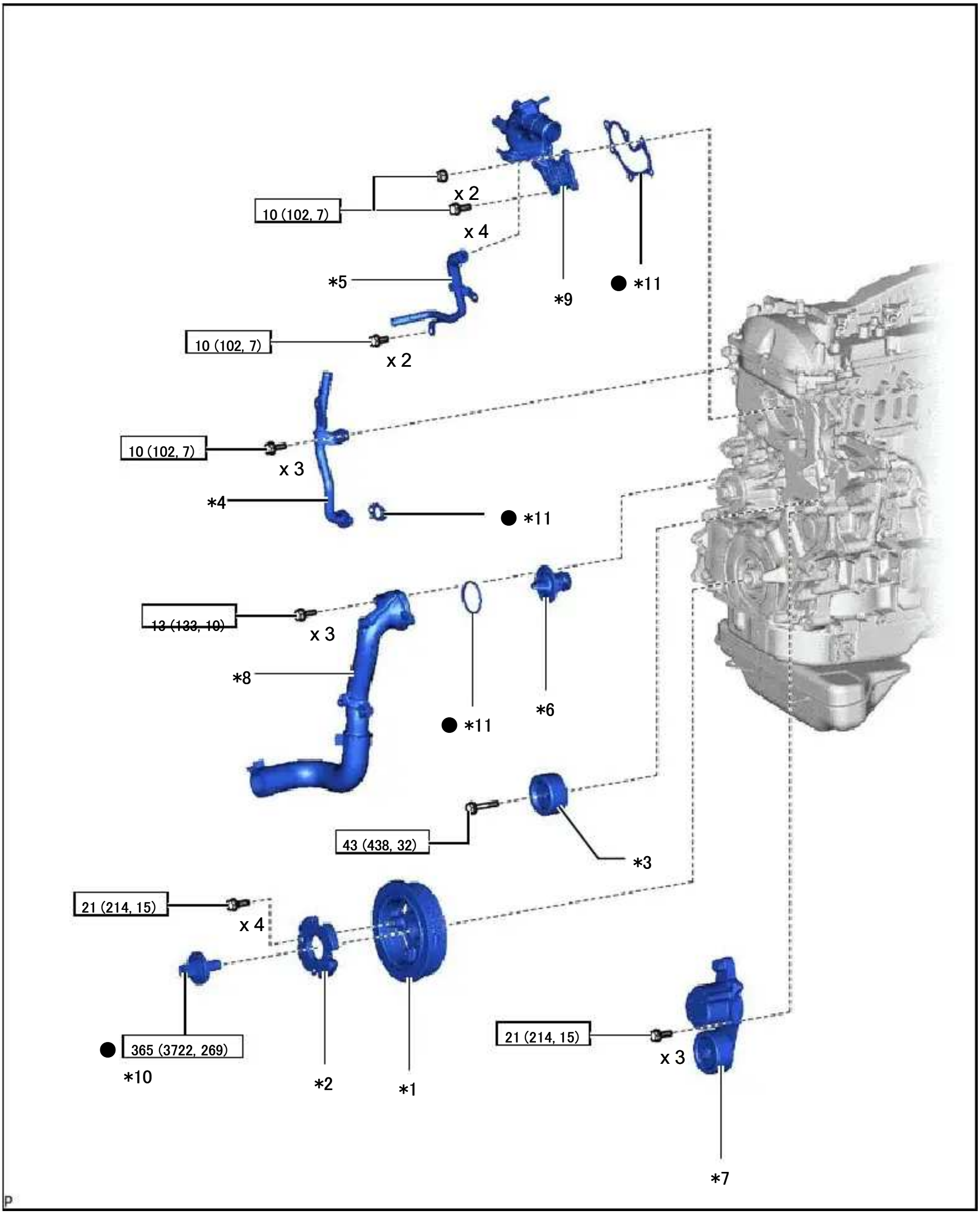
*5	NO. 2 EXHAUST PIPE SUPPORT STAY	*6	PCV HOSE
*7	EXHAUST PIPE CLAMP	*8	GASKET
□	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part



A343491C01

*1	ENGINE OIL PRESSURE SWITCH ASSEMBLY	*2	EXHAUST MANIFOLD
*3	NO. 1 TURBO WATER HOSE	*4	NO. 2 TURBO WATER HOSE
*5	NO. 3 WATER BY-PASS PIPE	*6	TURBO OIL INLET PIPE SUB-ASSEMBLY

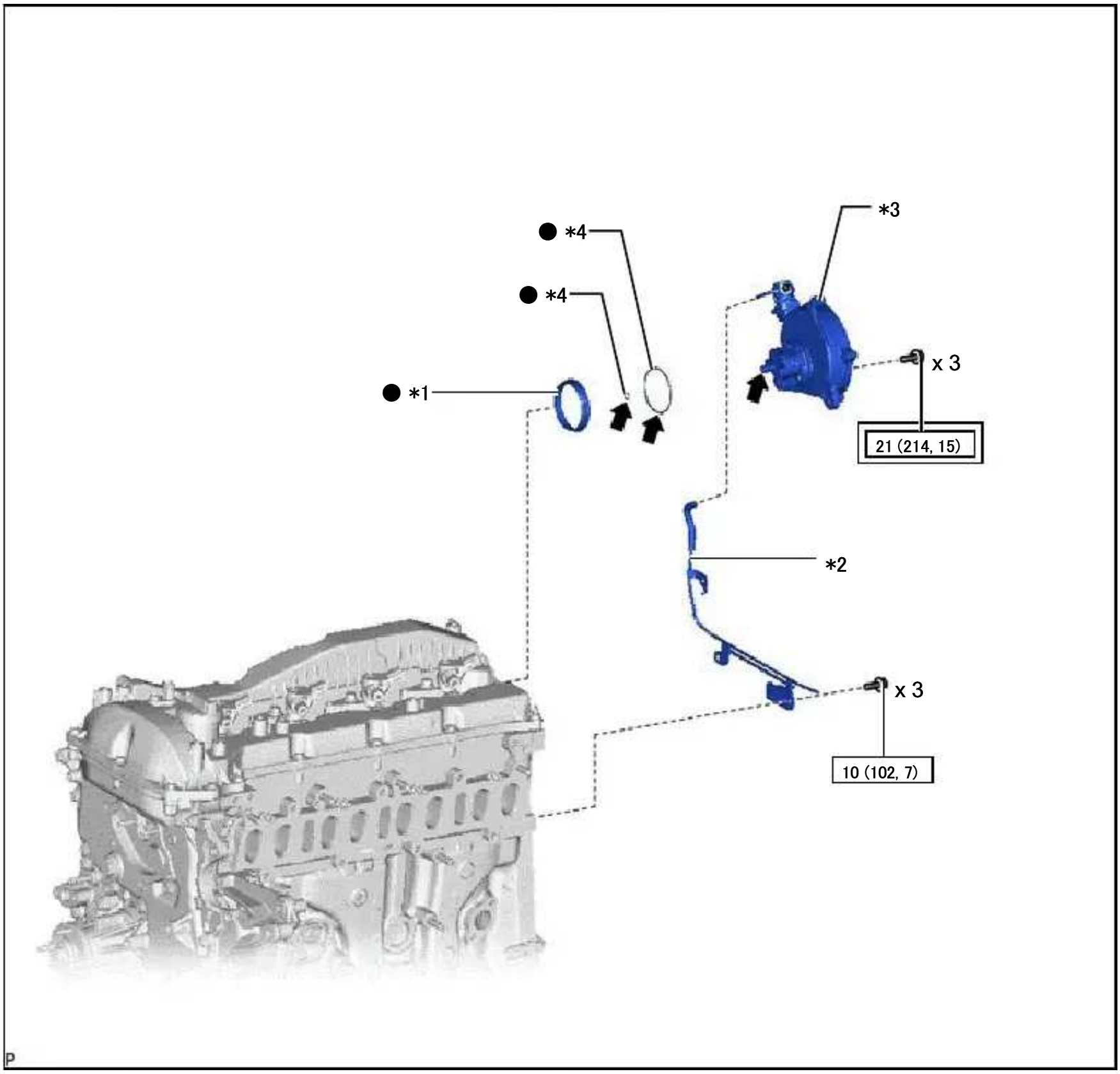
*7	TURBO OIL OUTLET PIPE	*8	TURBOCHARGER STAY
*9	TURBOCHARGER SUB-ASSEMBLY	*10	COLLAR
*11	SPACER	*12	UNION BOLT
*13	GASKET	-	-
	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping" : N*m (kgf*cm, ft.*lbf)		N*m (kgf*cm, ft.*lbf): Specified torque
•	Non-reusable part		Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent
★	Precoated part	-	-



A343492C01

*1	CRANKSHAFT PULLEY	*2	CRANKSHAFT PULLEY COVER
*3	NO. 1 IDLER PULLEY SUB-ASSEMBLY	*4	NO. 1 WATER BY-PASS PIPE
*5	NO. 2 WATER BY-PASS PIPE SUB-ASSEMBLY	*6	THERMOSTAT

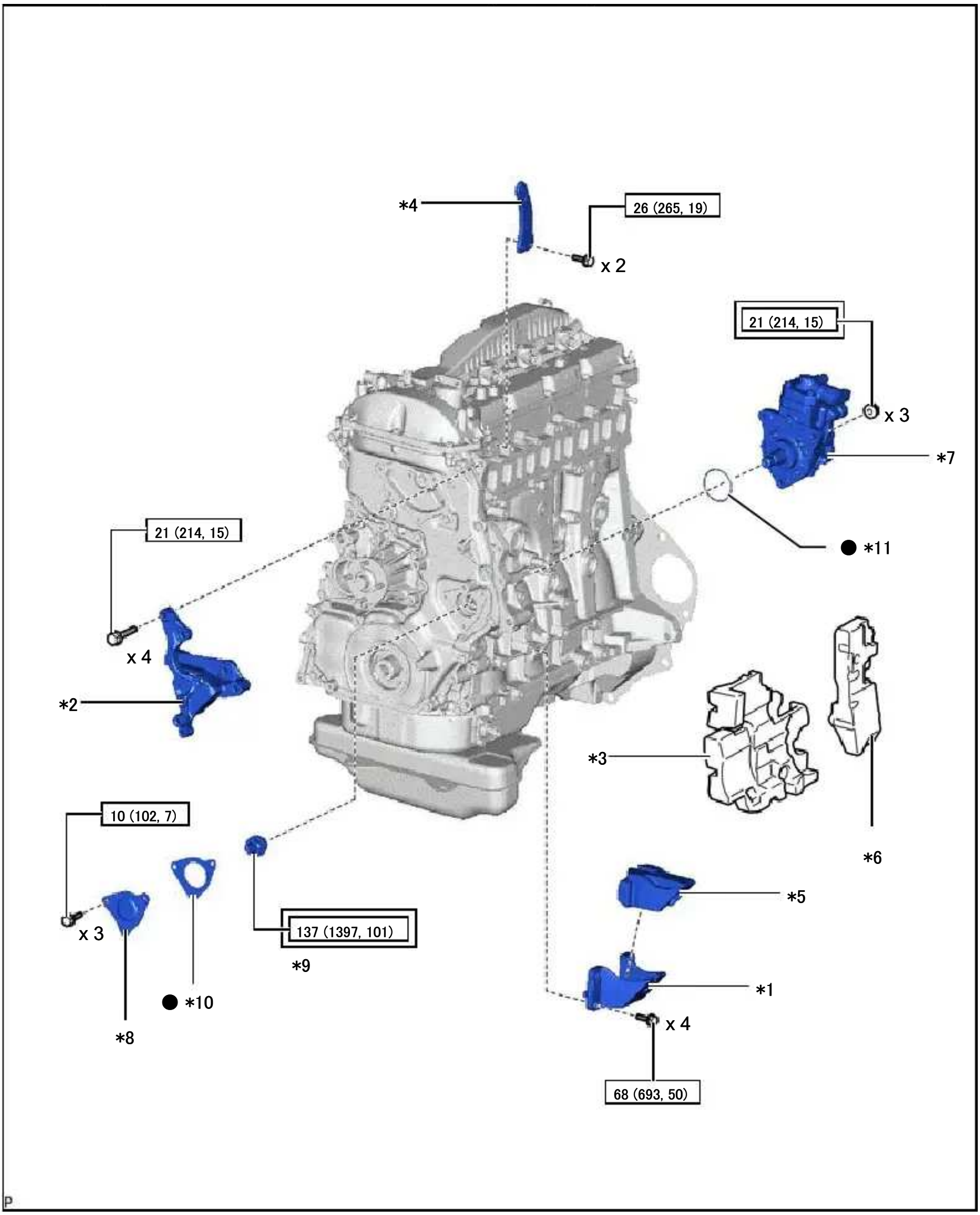
*7	V-RIBBED BELT TENSIONER ASSEMBLY	*8	WATER INLET
*9	WATER OUTLET SUB-ASSEMBLY	*10	CRANKSHAFT PULLEY SET BOLT
*11	GASKET	-	-
□	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part



A343493C01

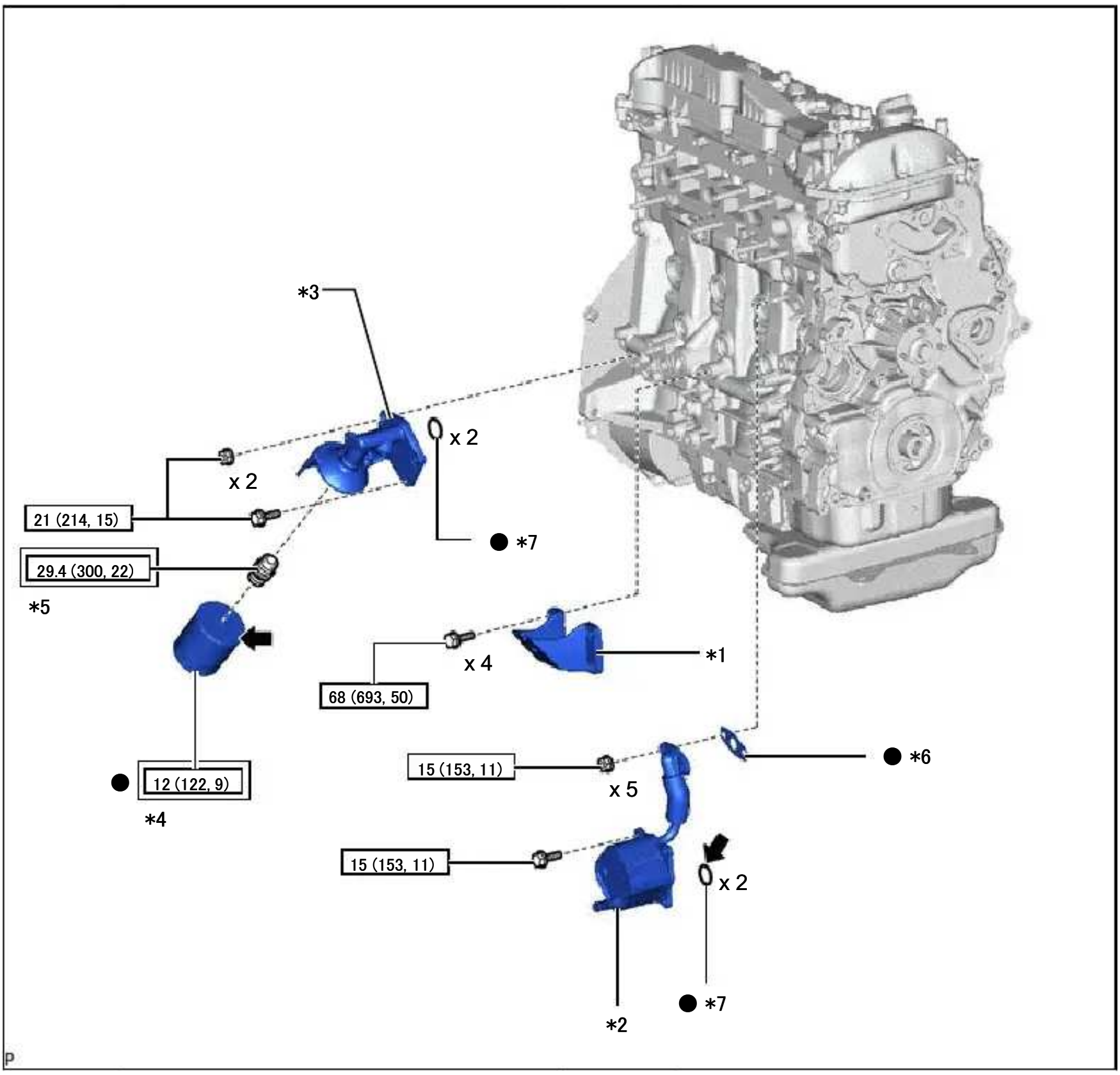
*1	CAMSHAFT OIL SEAL RETAINER	*2	NO. 1 VACUUM TRANSMITTING PIPE SUB-ASSEMBLY
*3	VACUUM PUMP ASSEMBLY	*4	O-RING
▣	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping" : N*m (kgf*cm, ft.*lbf)	□	N*m (kgf*cm, ft.*lbf): Specified torque

●	Non-reusable part	➡	Engine oil



A343574C01

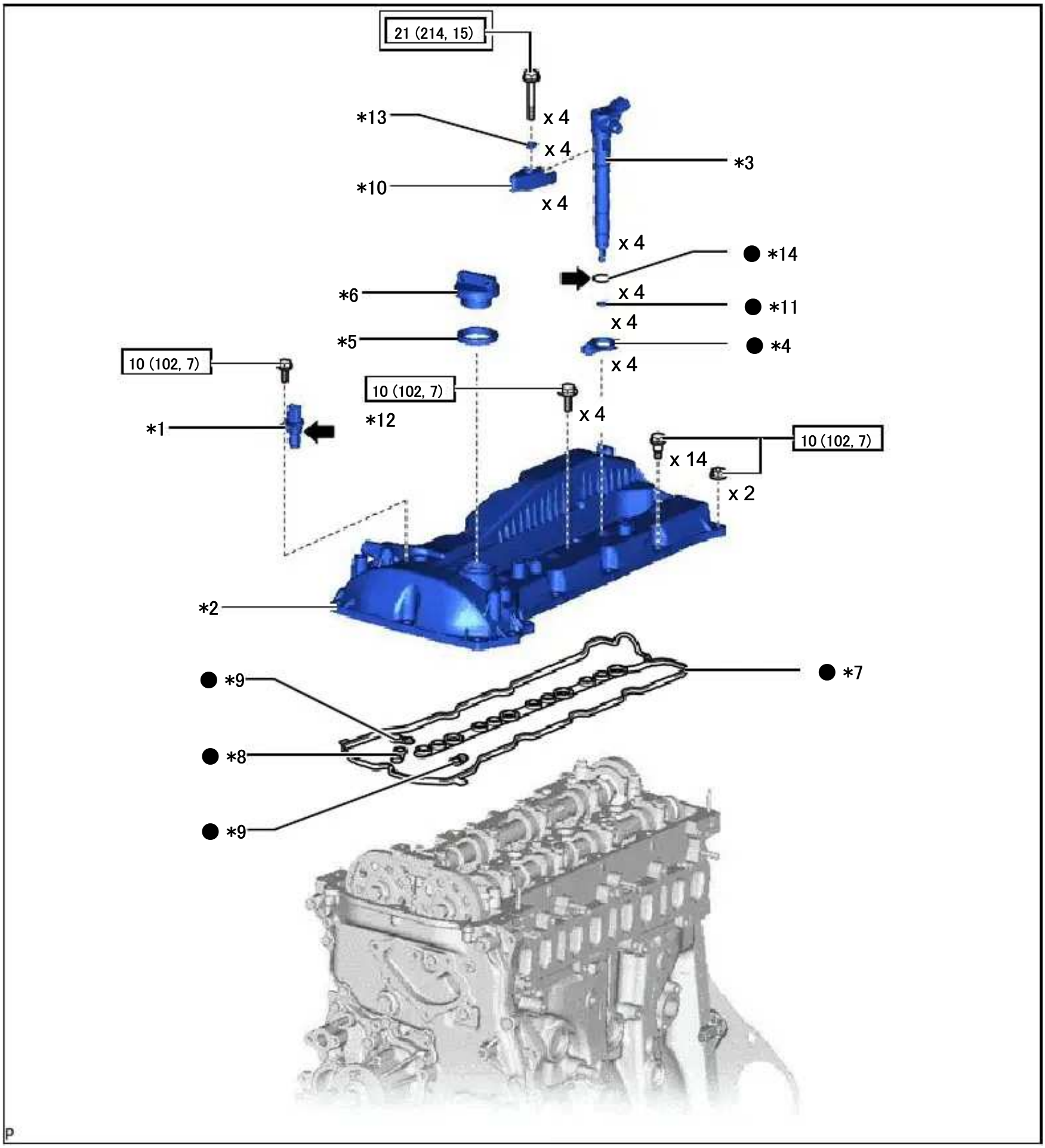
*1	FRONT NO. 1 ENGINE MOUNTING BRACKET LH	*2	GENERATOR BRACKET SUB-ASSEMBLY
*3	INJECTION PUMP INSULATOR	*4	NO. 1 ENGINE HANGER
*5	NO. 2 CYLINDER BLOCK INSULATOR	*6	NO. 3 CYLINDER BLOCK INSULATOR
*7	SUPPLY PUMP ASSEMBLY	*8	TIMING CHAIN COVER PLATE
*9	SUPPLY PUMP SHAFT NUT	*10	GASKET
*11	O-RING	-	-
□	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping" : N*m (kgf*cm, ft.*lbf)	□	N*m (kgf*cm, ft.*lbf): Specified torque
●	Non-reusable part	-	-



A343575C01

*1	FRONT NO. 1 ENGINE MOUNTING BRACKET RH	*2	OIL COOLER ASSEMBLY

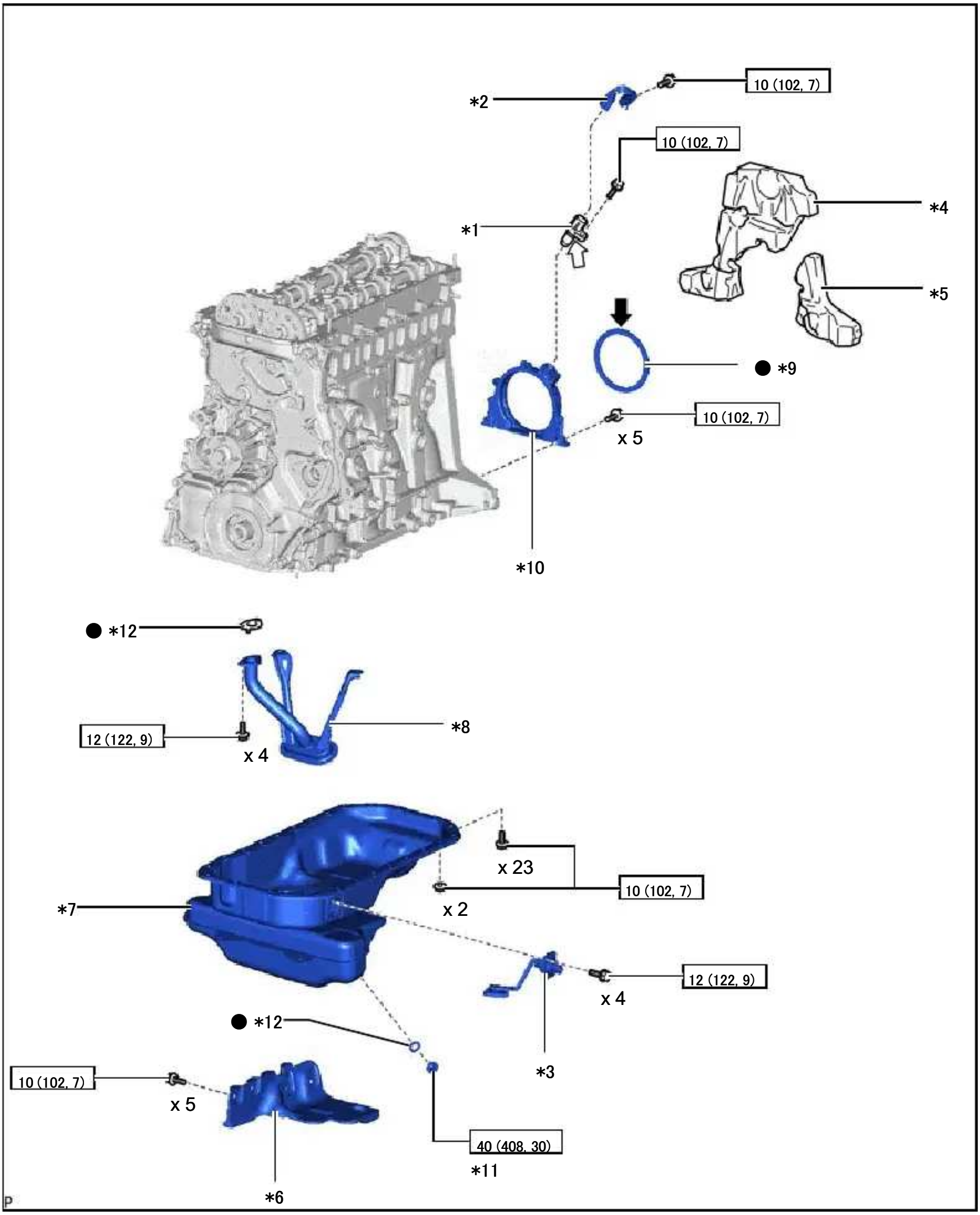
*3	OIL FILTER BRACKET	*4	OIL FILTER SUB-ASSEMBLY
*5	OIL FILTER UNION	*6	WATER OUTLET PIPE GASKET
*7	O-RING	-	-
	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping" : N*m (kgf*cm, ft.*lbf)		N*m (kgf*cm, ft.*lbf): Specified torque
•	Non-reusable part		Engine oil



A343576C01

*1	CAMSHAFT POSITION SENSOR	*2	CYLINDER HEAD COVER SUB-ASSEMBLY
*3	INJECTOR ASSEMBLY	*4	NOZZLE HOLDER GASKET
*5	OIL FILLER CAP GASKET	*6	OIL FILLER CAP SUB-ASSEMBLY
*7	CYLINDER HEAD COVER GASKET	*8	NO. 2 CYLINDER HEAD COVER GASKET
*9	CAMSHAFT BEARING CAP OIL HOLE GASKET	*10	NOZZLE HOLDER CLAMP
*11	INJECTION NOZZLE SEAT	*12	NOZZLE HOLDER CLAMP SEAT
*13	WASHER	*14	O-RING

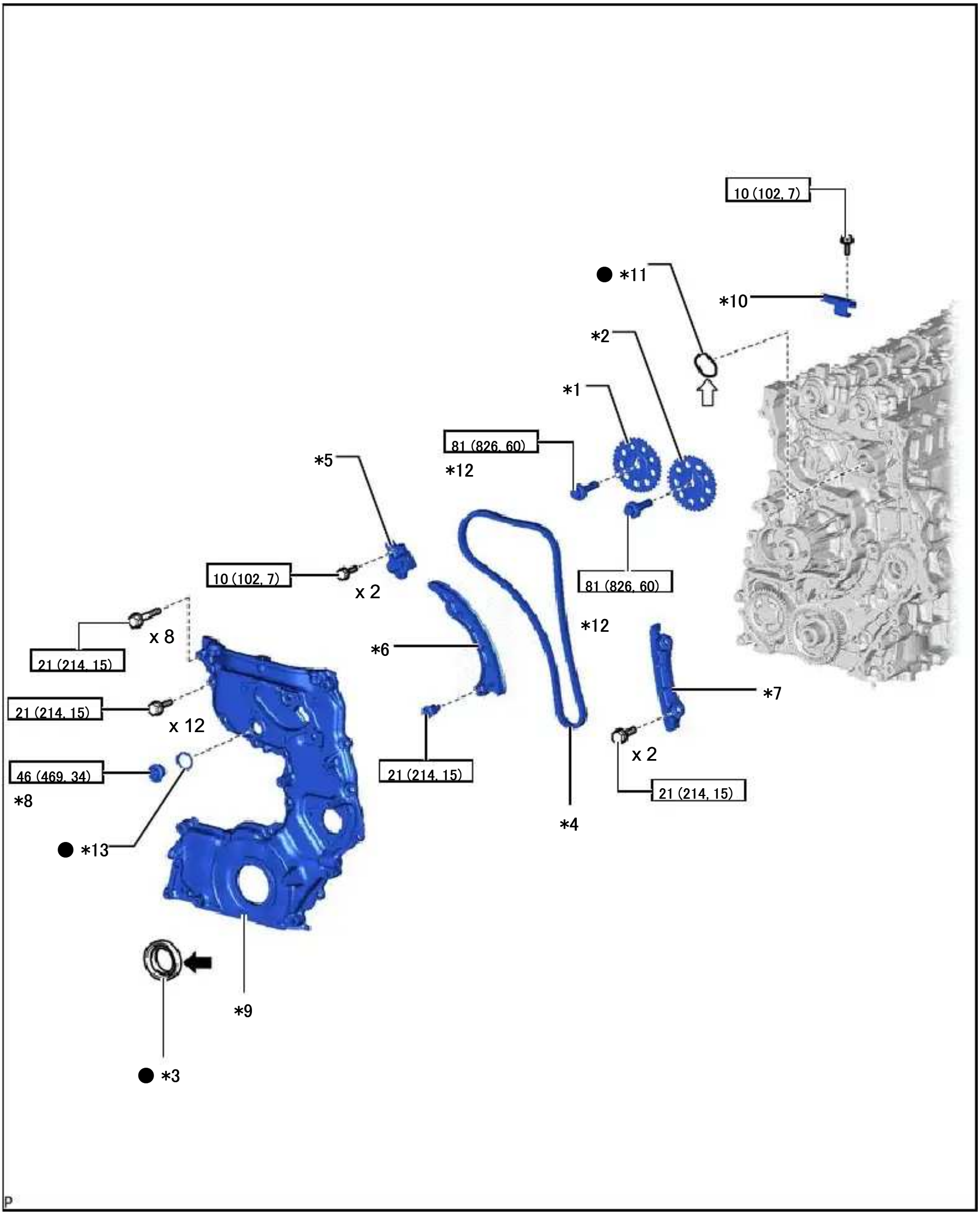
	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping" : N*m (kgf*cm, ft.*lbf)		N*m (kgf*cm, ft.*lbf): Specified torque
•	Non-reusable part		Engine oil



A343577C01

*1	CRANKSHAFT POSITION SENSOR	*2	CRANKSHAFT POSITION SENSOR HARNESS BRACKET
*3	ENGINE OIL LEVEL SENSOR	*4	NO. 1 CYLINDER BLOCK INSULATOR
*5	NO. 5 CYLINDER BLOCK INSULATOR	*6	OIL PAN COVER SILENCER

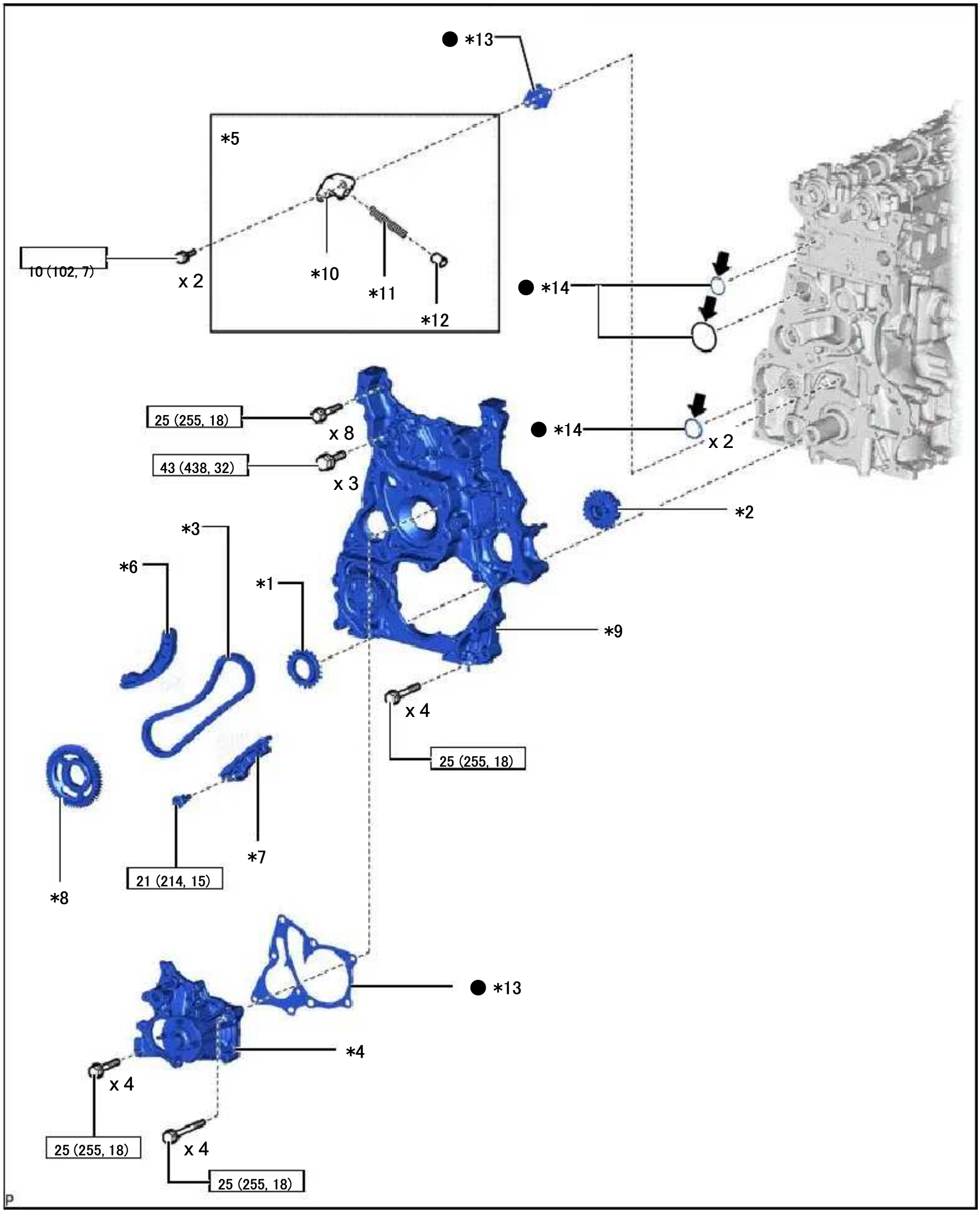
*7	OIL PAN SUB-ASSEMBLY	*8	OIL STRAINER SUB-ASSEMBLY
*9	REAR ENGINE OIL SEAL	*10	REAR ENGINE OIL SEAL RETAINER
*11	OIL PAN DRAIN PLUG	*12	GASKET
	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part
	MP grease		Engine oil



A343578C01

*1	CAMSHAFT TIMING SPROCKET (for Exhaust Side)	*2	CAMSHAFT TIMING SPROCKET (for Intake Side)
*3	FRONT CRANKSHAFT OIL SEAL	*4	NO. 2 CHAIN SUB-ASSEMBLY
*5	NO. 2 CHAIN TENSIONER ASSEMBLY	*6	NO. 2 CHAIN TENSIONER SLIPPER

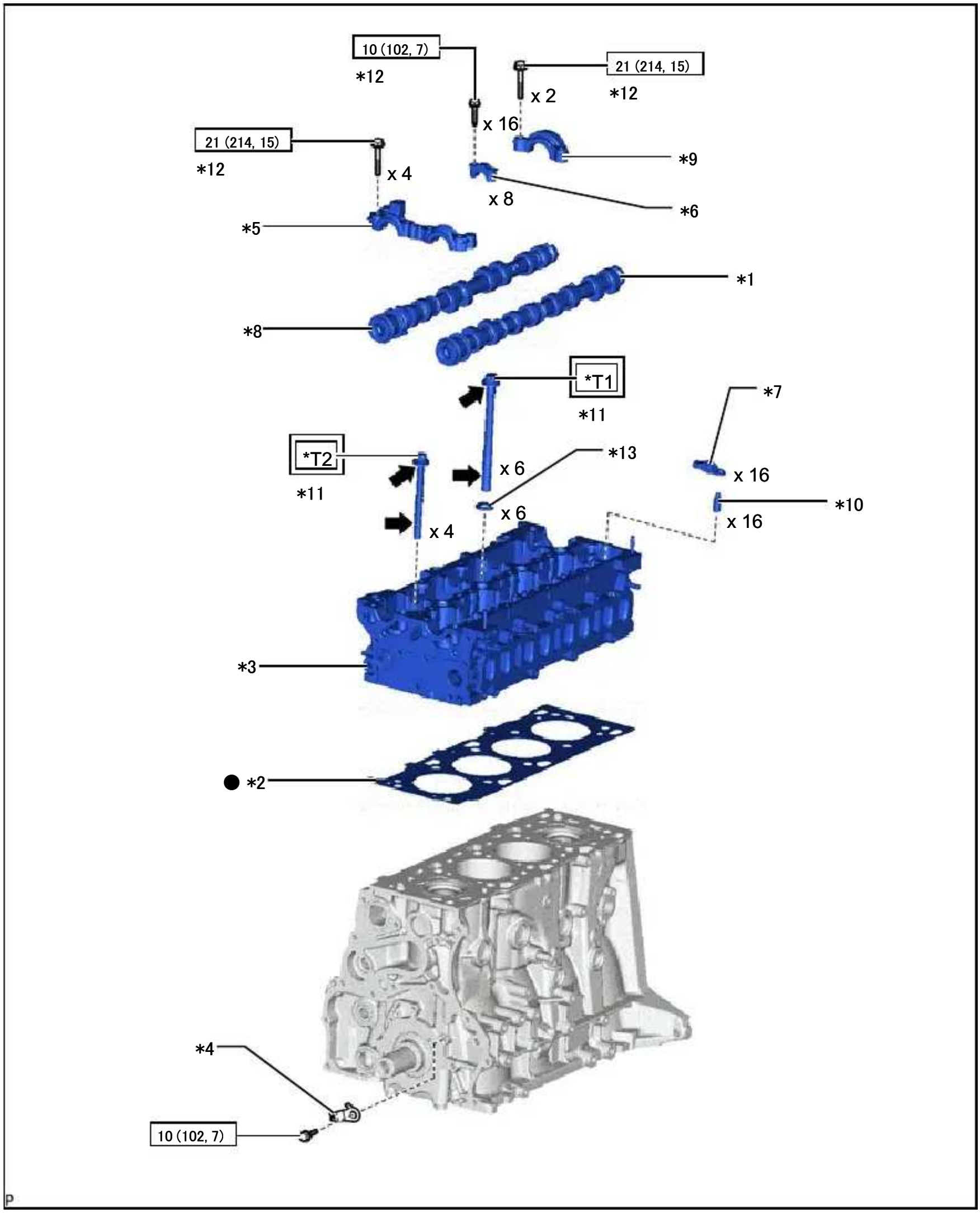
*7	NO. 2 CHAIN VIBRATION DAMPER	*8	OIL PUMP RELIEF VALVE PLUG
*9	TIMING CHAIN COVER SUB-ASSEMBLY	*10	TIMING CHAIN GUIDE
*11	TIMING CHAIN CASE GASKET	*12	CAMSHAFT TIMING SPROCKET BOLT
*13	GASKET	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part
	MP grease		Engine oil



A343579C01

*1	CRANKSHAFT TIMING SPROCKET	*2	INJECTION PUMP DRIVE GEAR
*3	NO. 1 CHAIN SUB-ASSEMBLY	*4	ENGINE WATER PUMP ASSEMBLY
*5	NO. 1 CHAIN TENSIONER ASSEMBLY	*6	NO. 1 CHAIN TENSIONER SLIPPER
*7	NO. 1 CHAIN VIBRATION DAMPER	*8	OIL PUMP DRIVE GEAR

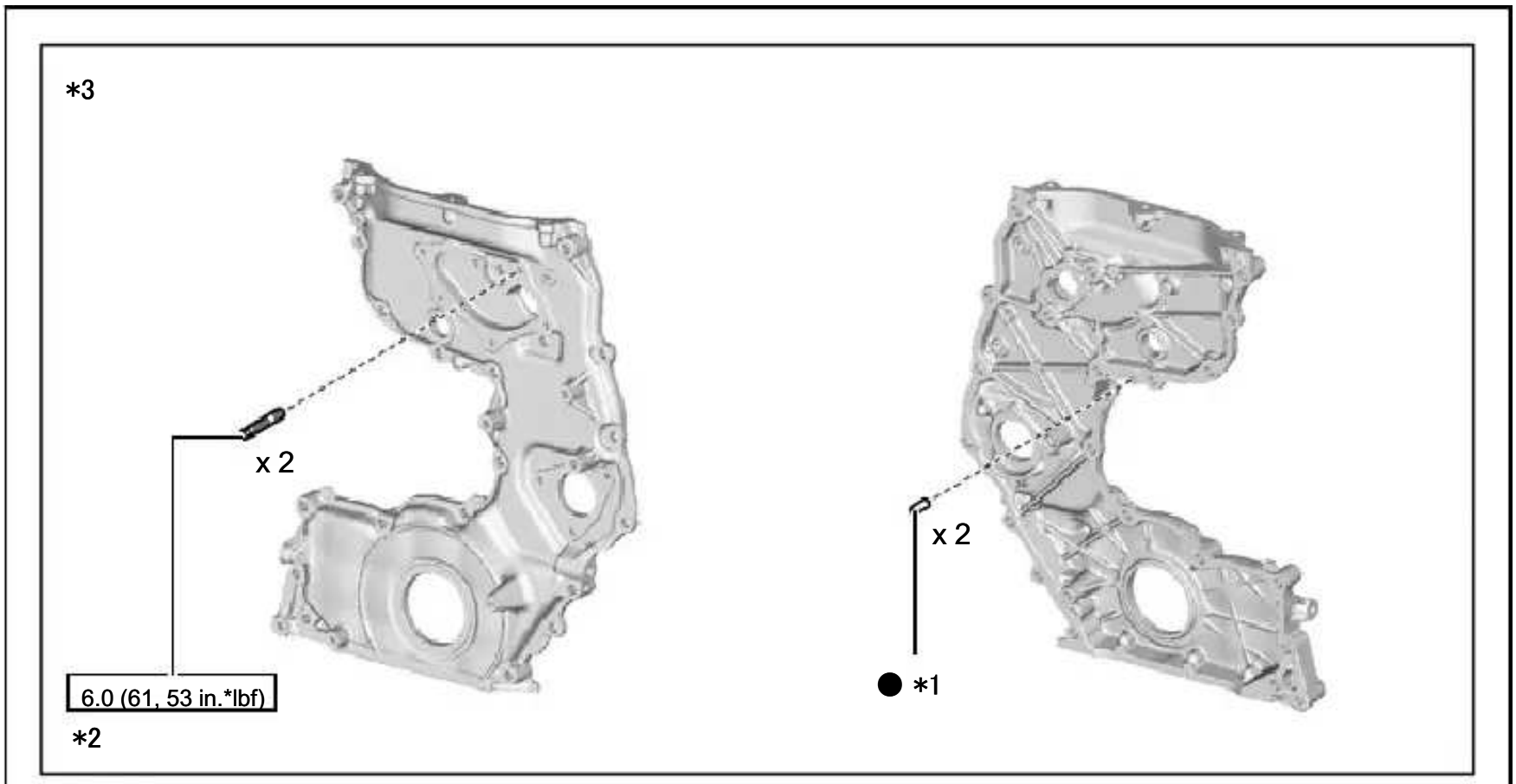
*9	TIMING CHAIN CASE ASSEMBLY	*10	NO. 1 CHAIN TENSIONER ASSEMBLY BODY
*11	SPRING	*12	PLUNGER
*13	GASKET	*14	O-RING
	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part
	Engine oil	-	-



A343580C01

*1	CAMSHAFT	*2	CYLINDER HEAD GASKET
*3	CYLINDER HEAD SUB-ASSEMBLY	*4	LOCK PLATE
*5	NO. 1 CAMSHAFT BEARING CAP	*6	NO. 2 CAMSHAFT BEARING CAP

*7	NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY	*8	NO. 2 CAMSHAFT
*9	NO. 3 CAMSHAFT BEARING CAP	*10	VALVE LASH ADJUSTER ASSEMBLY
*11	CYLINDER HEAD SET BOLT	*12	CAMSHAFT BEARING CAP BOLT
*13	CYLINDER HEAD SET BOLT SPACER	-	-
	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping" : N*m (kgf*cm, ft.*lbf)		N*m (kgf*cm, ft.*lbf): Specified torque
●	Non-reusable part		Engine oil
*T1	1st: 150 (1530, 111) 2nd: Turn 90° 3rd: Turn 90°	*T2	1st: 85 (867, 63) 2nd: Turn 90° 3rd: Turn 90°



A343581C01

*1	STRAIGHT PIN	*2	STUD BOLT
*3	TIMING CHAIN COVER SUB-ASSEMBLY	*4	TIMING CHAIN CASE ASSEMBLY
□	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part

ENGINE UNIT > REMOVAL

NOTICE:

- **When replacing the parts in the following chart (A), replace the No. 1 injection pipe sub-assembly, No. 2 injection pipe sub-assembly and/or fuel inlet pipe sub-assembly with new ones.**

Replaced Parts (A)	Pipes Requiring New Replacement
Injector assembly (including shuffling the injector assemblies between the cylinders)	• No. 1 injection pipe sub-assembly • No. 2 injection pipe sub-assembly
• Supply pump assembly • Common rail assembly • Cylinder block sub-assembly • Cylinder head sub-assembly • Cylinder head gasket • Timing chain case assembly	• No. 1 injection pipe sub-assembly • No. 2 injection pipe sub-assembly • Fuel inlet pipe sub-assembly

- **After removing the No. 1 injection pipe sub-assembly, No. 2 injection pipe sub-assembly and/or fuel inlet pipe sub-assembly, clean them with a brush and compressed air.**

- **The injector assembly is a precision instrument. Do not use the injector assembly if it is struck or dropped.**

- **The supply pump assembly is a precision instrument. Do not use the supply pump assembly if it is struck or dropped.**

- **The common rail assembly is a precision instrument. Do not use the common rail assembly if it is struck or dropped.**

- **Hold the supply pump assembly itself during removal and installation. Do not hold the pre-stroke control valve or fuel pipe, etc.**

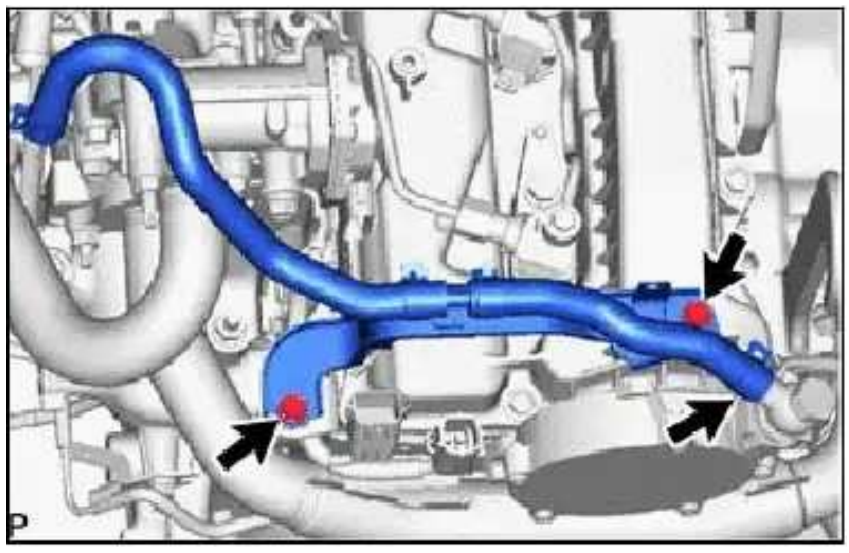
- **Hold the common rail assembly itself during removal and installation. Do not hold the pressure discharge valve or fuel pressure sensor, etc.**

- **Make sure foreign matter does not enter the fuel path.**

1. REMOVE NO. 2 HOSE TO HOSE TUBE

a. Slide the clamp and disconnect the union to check valve hose from the vacuum pump assembly.

b. Remove the 2 bolts and No. 2 hose to hose tube from the cylinder head cover sub-assembly and hose bracket.



A343494

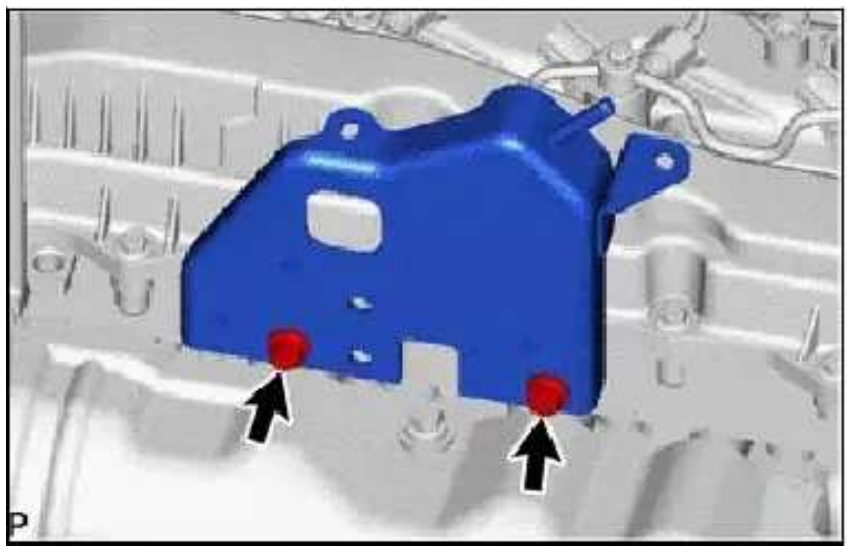
2. REMOVE NO. 2 ENGINE COVER BRACKET

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > REMOVE NO. 2 ENGINE COVER BRACKET

3. REMOVE ENGINE WIRE

4. REMOVE ENGINE COVER BRACKET

a. Remove the 2 bolts and engine cover bracket from the cylinder head sub-assembly.



A343495

5. REMOVE INTERCOOLER AIR TUBE

Click here ENGINE CONTROL (2GD-FTV) > DIESEL THROTTLE BODY > REMOVAL > REMOVE INTERCOOLER AIR TUBE

6. REMOVE DIESEL THROTTLE BODY ASSEMBLY

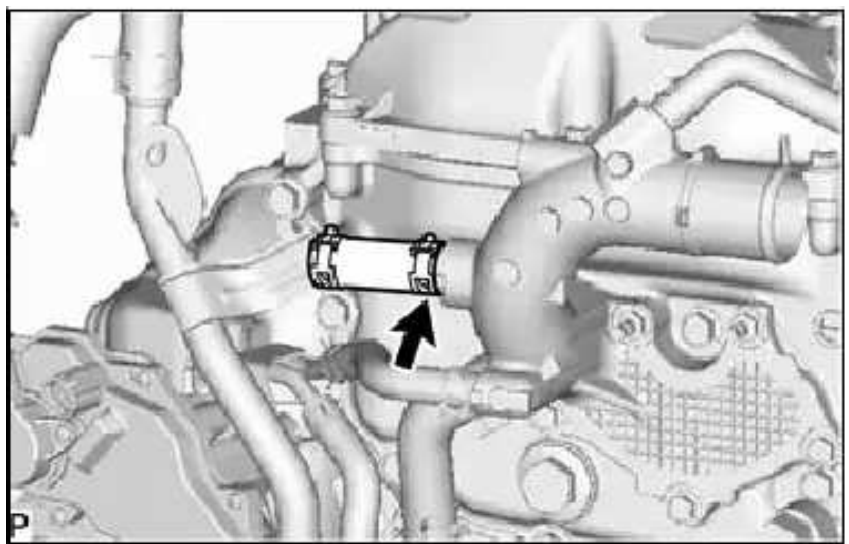
Click here ENGINE CONTROL (2GD-FTV) > DIESEL THROTTLE BODY > REMOVAL > REMOVE DIESEL THROTTLE BODY ASSEMBLY

7. REMOVE NO. 2 WATER BY-PASS PIPE

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > REMOVE NO. 2 WATER BY-PASS PIPE

8. REMOVE WATER BY-PASS PLUG (w/o Heater)

a. Slide the clamp and remove the water by-pass plug from the water outlet sub-assembly.



A343496

9. REMOVE GAS FILTER

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > REMOVE GAS FILTER

10. REMOVE DIESEL TURBO PRESSURE SENSOR

Click here ENGINE CONTROL (2GD-FTV) > MANIFOLD ABSOLUTE PRESSURE SENSOR > REMOVAL > REMOVE DIESEL TURBO PRESSURE SENSOR

11. REMOVE EGR VALVE BRACKET

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > REMOVE EGR VALVE BRACKET

12. REMOVE NO. 2 EGR PIPE

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > REMOVE NO. 2 EGR PIPE

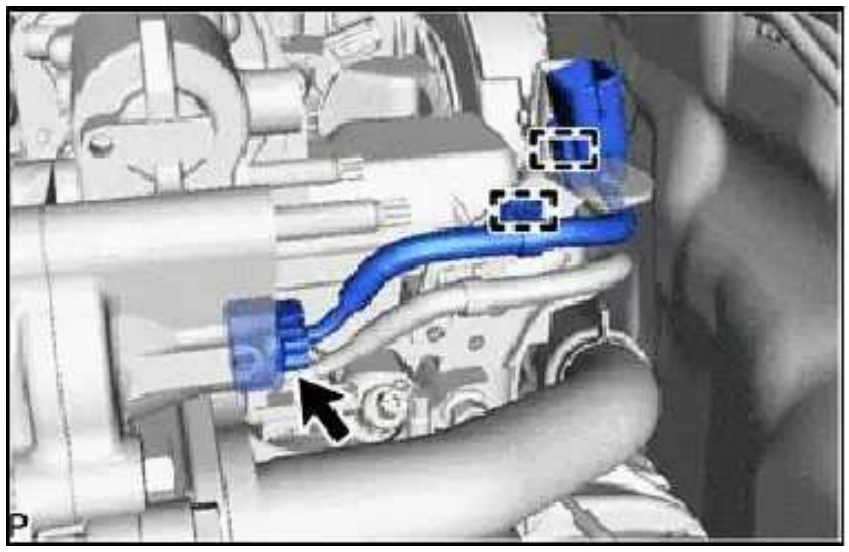
13. REMOVE NO. 3 WATER BY-PASS PIPE SUB-ASSEMBLY

Click here EMISSION CONTROL (2GD-FTV) > EGR COOLER > REMOVAL > DISCONNECT NO. 3 WATER BY-PASS PIPE SUB-ASSEMBLY

14. REMOVE CONNECTING WIRE

a. Disconnect the connector from the common rail assembly.

b. Detach the 2 clamps and remove the connecting wire from the hose bracket.

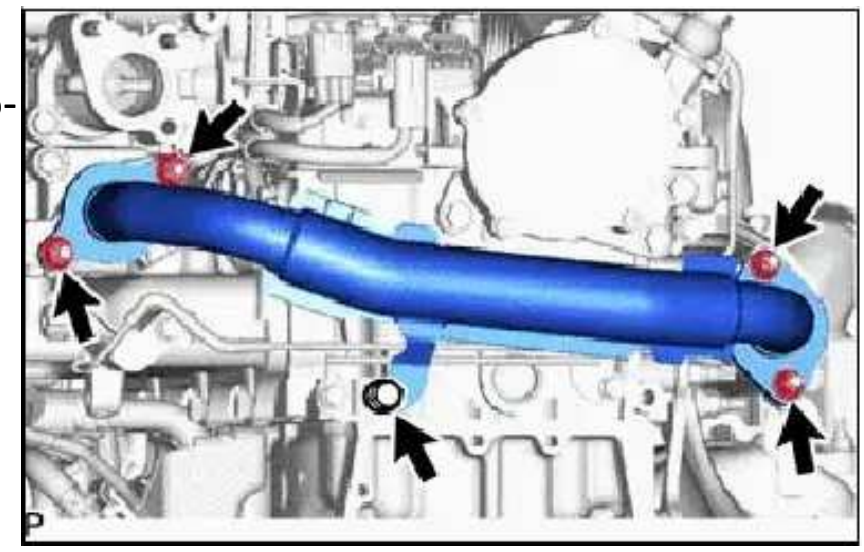


A343587

15. REMOVE NO. 1 EGR PIPE

a. Remove the 4 nuts, bolt and No. 1 EGR pipe from the exhaust manifold, electric EGR control valve assembly and No. 1 vacuum transmitting pipe sub-assembly.

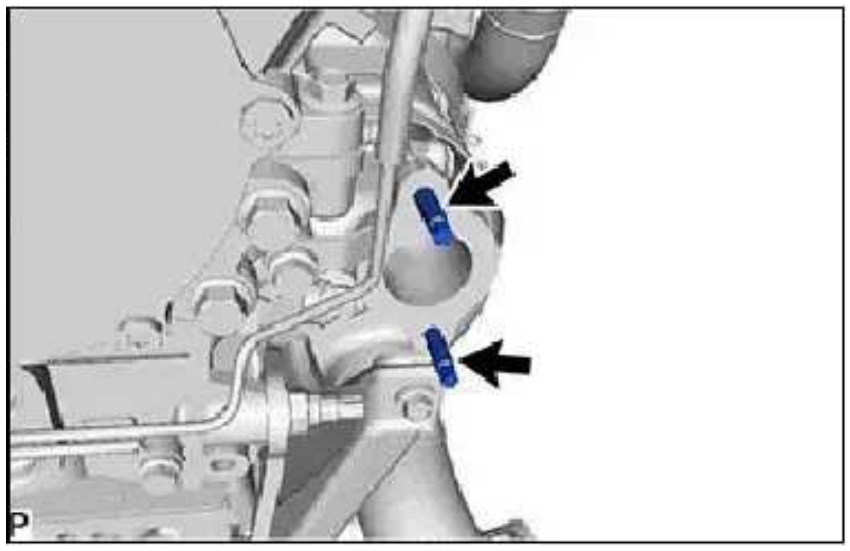
b. Remove the 2 gaskets from the exhaust manifold and electric EGR control valve assembly.



A343497

A343497

c. Using an E8 "TORX" socket wrench, remove the 2 stud bolts from the exhaust manifold.



A352178

16. REMOVE VACUUM CONTROL VALVE SET

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > REMOVAL > REMOVE VACUUM CONTROL VALVE SET

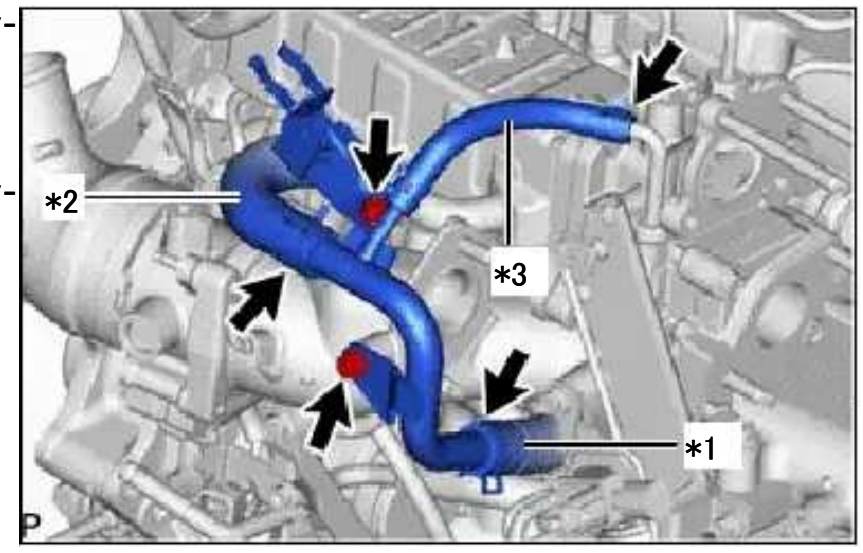
17. REMOVE NO. 4 WATER BY-PASS PIPE SUB-ASSEMBLY

a. Slide the clamp and disconnect the No. 6 water by-pass hose from the No. 4 water by-pass pipe sub-assembly.

b. Slide the clamp and disconnect the No. 7 water by-pass hose from the No. 4 water by-pass pipe sub-assembly.

c. Slide the clamp and disconnect the water hose from the No. 2 EGR valve assembly.

d. Remove the 2 bolts and No. 4 water by-pass pipe sub-assembly from the intake manifold.



A343498C01

*1	No. 6 Water By-pass Hose
*2	No. 7 Water By-pass Hose
*3	Water Hose

18. REMOVE NO. 1 EGR COOLER AND NO. 2 EGR VALVE ASSEMBLY WITH ELECTRIC EGR CONTROL VALVE ASSEMBLY

Click here EMISSION CONTROL (2GD-FTV) > EGR COOLER > REMOVAL > REMOVE NO. 1 EGR COOLER AND NO. 2 EGR VALVE ASSEMBLY WITH ELECTRIC EGR CONTROL VALVE ASSEMBLY

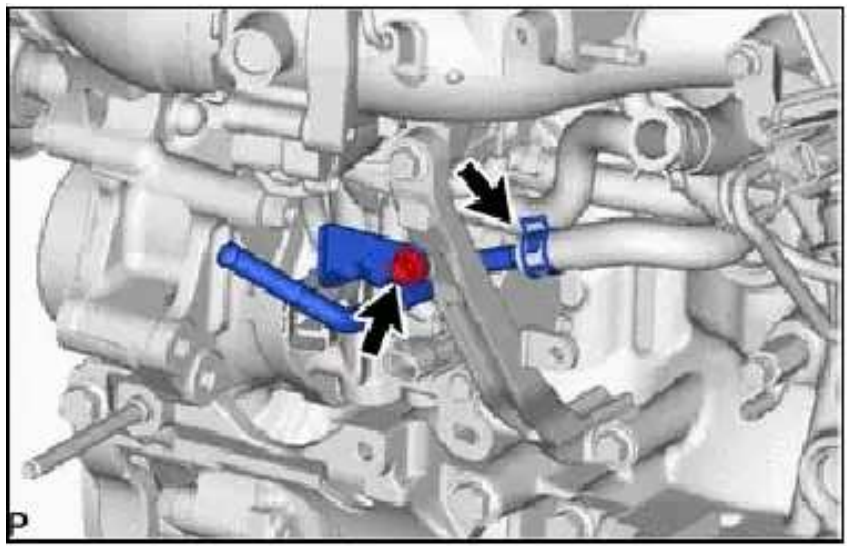
19. REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE

Click here INTAKE / EXHAUST (2GD-FTV) > INTAKE MANIFOLD > REMOVAL > REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE

20. REMOVE NO. 2 FUEL PIPE

a. Slide the clamp and disconnect the No. 1 fuel hose from the No. 2 fuel pipe.

b. Remove the bolt and No. 2 fuel pipe from the manifold stay.



A343499

21. REMOVE WIRING HARNESS CLAMP BRACKET

Click here INTAKE / EXHAUST (2GD-FTV) > INTAKE MANIFOLD > REMOVAL > REMOVE WIRING HARNESS CLAMP BRACKET

22. REMOVE MANIFOLD STAY

Click here INTAKE / EXHAUST (2GD-FTV) > INTAKE MANIFOLD > REMOVAL > REMOVE MANIFOLD STAY

23. REMOVE FUEL INJECTION PUMP COVER SUB-ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL SUPPLY PUMP > REMOVAL > REMOVE FUEL INJECTION PUMP COVER SUB-ASSEMBLY

24. REMOVE FUEL PUMP MOTOR WIRE

Click here FUEL (2GD-FTV) > FUEL SUPPLY PUMP > REMOVAL > REMOVE FUEL PUMP MOTOR WIRE

25. REMOVE NO. 2 FUEL HOSE

Click here FUEL (2GD-FTV) > FUEL SUPPLY PUMP > REMOVAL > REMOVE NO. 2 FUEL HOSE

26. REMOVE NO. 1 FUEL HOSE

Click here FUEL (2GD-FTV) > FUEL SUPPLY PUMP > REMOVAL > REMOVE NO. 1 FUEL HOSE

27. REMOVE FUEL INLET PIPE SUB-ASSEMBLY

Click here INTAKE / EXHAUST (2GD-FTV) > INTAKE MANIFOLD > REMOVAL > REMOVE FUEL INLET PIPE SUB-ASSEMBLY

28. REMOVE NO. 2 NOZZLE LEAKAGE PIPE ASSEMBLY

Click here INTAKE / EXHAUST (2GD-FTV) > INTAKE MANIFOLD > REMOVAL > REMOVE NO. 2 NOZZLE LEAKAGE PIPE ASSEMBLY

29. REMOVE INTAKE MANIFOLD

Click here INTAKE / EXHAUST (2GD-FTV) > INTAKE MANIFOLD > REMOVAL > REMOVE INTAKE MANIFOLD

30. REMOVE WIRING HARNESS CLAMP BRACKET

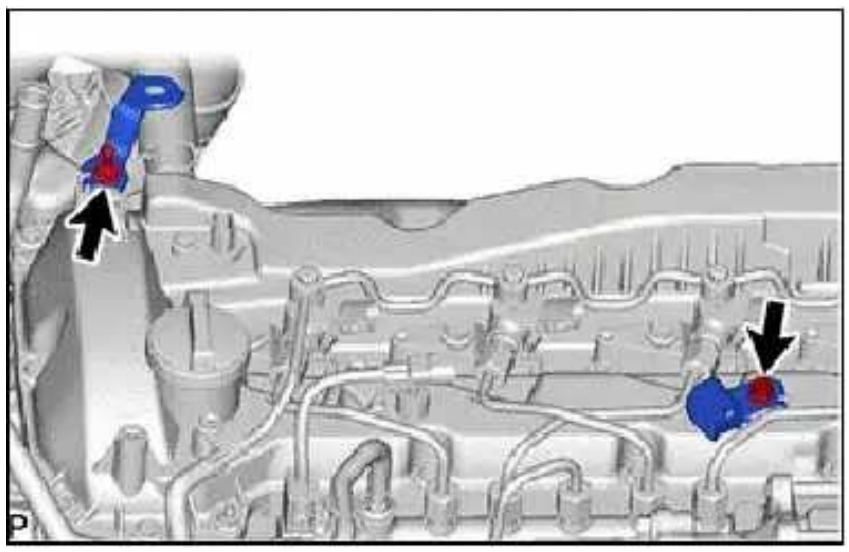
Click here FUEL (2GD-FTV) > FUEL INJECTOR > REMOVAL > REMOVE WIRING HARNESS CLAMP BRACKET

31. REMOVE NOZZLE LEAKAGE PIPE ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL INJECTOR > REMOVAL > REMOVE NOZZLE LEAKAGE PIPE ASSEMBLY

32. REMOVE WIRING HARNESS CLAMP BRACKET

a. Remove the 2 bolts and 2 wiring harness clamp brackets from the cylinder head cover sub-assembly.



A343500

33. REMOVE NO. 1 AND NO. 2 INJECTION PIPE SUB-ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL INJECTOR > REMOVAL > REMOVE NO. 1 AND NO. 2 INJECTION PIPE SUB-ASSEMBLY

34. REMOVE COMMON RAIL ASSEMBLY

Click here FUEL (2GD-FTV) > COMMON RAIL > REMOVAL > REMOVE COMMON RAIL ASSEMBLY

35. REMOVE NO. 1 GLOW PLUG CONNECTOR

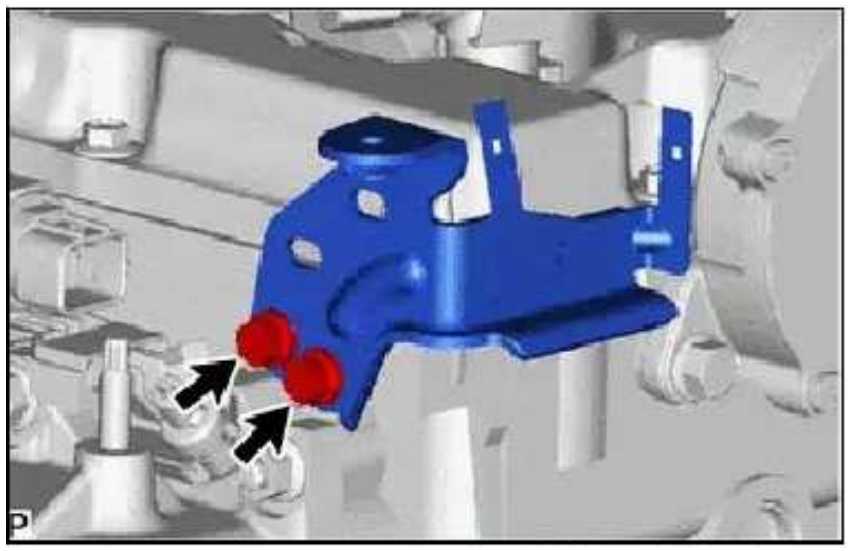
Click here STARTING (2GD-FTV) > GLOW PLUG > REMOVAL > REMOVE NO. 1 GLOW PLUG CONNECTOR

36. REMOVE GLOW PLUG ASSEMBLY

Click here STARTING (2GD-FTV) > GLOW PLUG > REMOVAL > REMOVE GLOW PLUG ASSEMBLY

37. REMOVE HOSE BRACKET

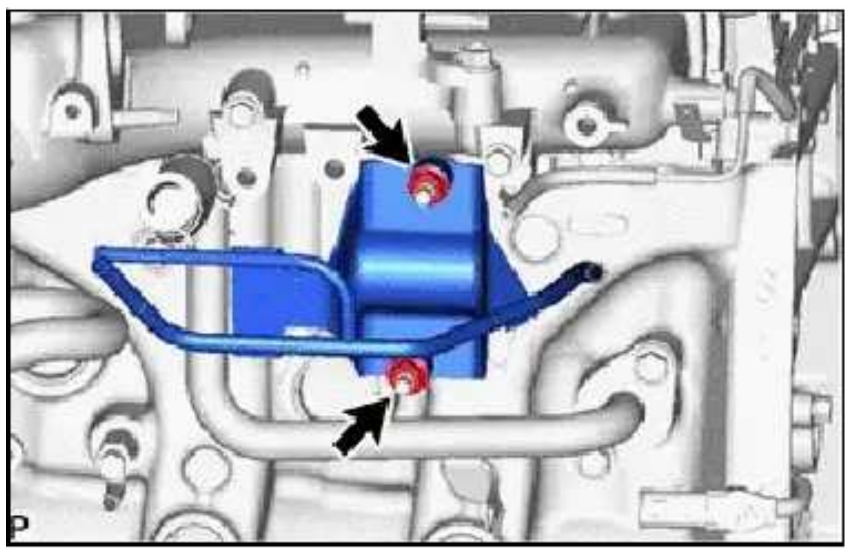
a. Remove the 2 bolts and hose bracket from the cylinder head sub-assembly.



A343501

38. REMOVE NO. 3 NOZZLE LEAKAGE PIPE

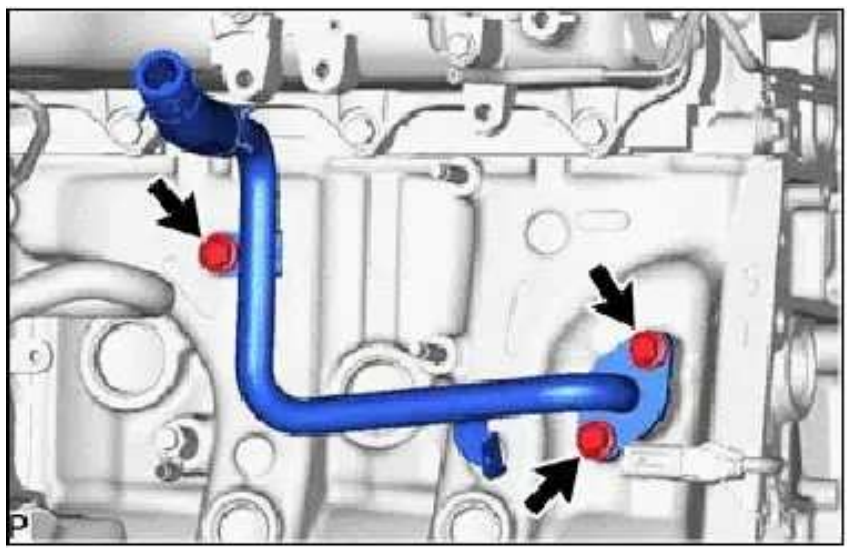
a. Remove the 2 nuts and No. 3 nozzle leakage pipe from the cylinder block sub-assembly.



A343502

39. REMOVE NO. 5 WATER BY-PASS PIPE SUB-ASSEMBLY

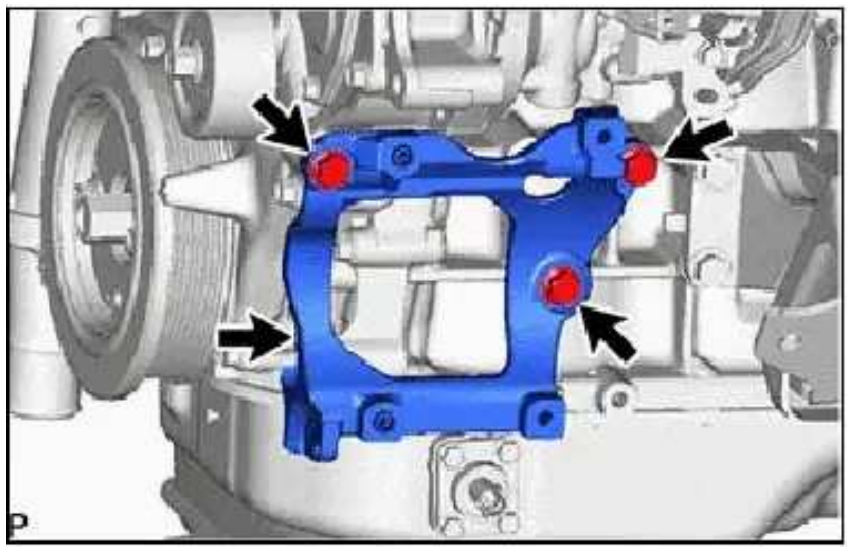
a. Remove the 3 bolts, No. 5 water by-pass pipe sub-assembly and gasket from the cylinder block sub-assembly.



A343503

40. REMOVE NO. 1 COMPRESSOR MOUNTING BRACKET

a. Remove the 4 bolts and No. 1 compressor mounting bracket from the cylinder block sub-assembly, timing chain case assembly and timing chain cover sub-assembly.



A343504

41. REMOVE ENGINE COOLANT TEMPERATURE SENSOR

Click here ENGINE CONTROL (2GD-FTV) > ENGINE COOLANT TEMPERATURE SENSOR > REMOVAL > REMOVE ENGINE COOLANT TEMPERATURE SENSOR

42. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

Click here EMISSION CONTROL (2GD-FTV) > MONOLITHIC CONVERTER > REMOVAL > REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

43. REMOVE NO. 1 TURBO INSULATOR

Click here EMISSION CONTROL (2GD-FTV) > MONOLITHIC CONVERTER > REMOVAL > REMOVE NO. 1 TURBO INSULATOR

44. REMOVE NO. 2 EXHAUST PIPE SUPPORT STAY

Click here EMISSION CONTROL (2GD-FTV) > MONOLITHIC CONVERTER > REMOVAL > REMOVE NO. 2 EXHAUST PIPE SUPPORT STAY

45. REMOVE EXHAUST PIPE SUPPORT STAY

Click here EMISSION CONTROL (2GD-FTV) > MONOLITHIC CONVERTER > REMOVAL > REMOVE EXHAUST PIPE SUPPORT STAY

46. REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY

Click here EMISSION CONTROL (2GD-FTV) > MONOLITHIC CONVERTER > REMOVAL > REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY

47. REMOVE PCV HOSE

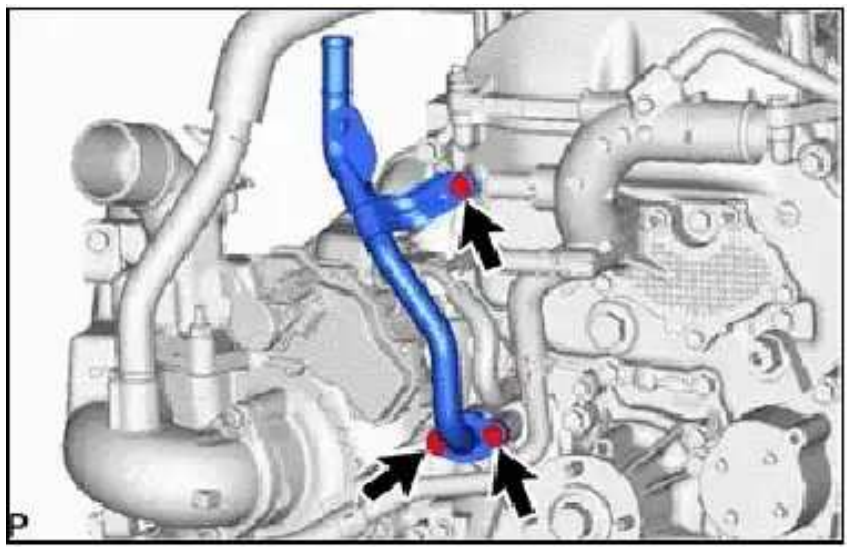
Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > REMOVAL > REMOVE PCV HOSE

48. REMOVE NO. 3 WATER BY-PASS PIPE

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > REMOVAL > REMOVE NO. 3 WATER BY-PASS PIPE

49. REMOVE NO. 1 WATER BY-PASS PIPE

a. Remove the 3 bolts, No. 1 water by-pass pipe and gasket from the timing chain cover sub-assembly.



A343505

50. DISCONNECT NO. 1 AND NO. 2 TURBO WATER HOSE

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > REMOVAL > DISCONNECT TURBO WATER HOSE

51. REMOVE TURBOCHARGER STAY

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > REMOVAL > REMOVE TURBOCHARGER STAY

52. REMOVE TURBO OIL OUTLET PIPE

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > REMOVAL > REMOVE TURBO OIL OUTLET PIPE

53. REMOVE TURBO OIL INLET PIPE SUB-ASSEMBLY

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > REMOVAL > REMOVE TURBO OIL INLET PIPE SUB-ASSEMBLY

54. REMOVE TURBOCHARGER SUB-ASSEMBLY

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > REMOVAL > REMOVE TURBOCHARGER SUB-ASSEMBLY

55. REMOVE EXHAUST MANIFOLD

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > REMOVAL > REMOVE EXHAUST MANIFOLD

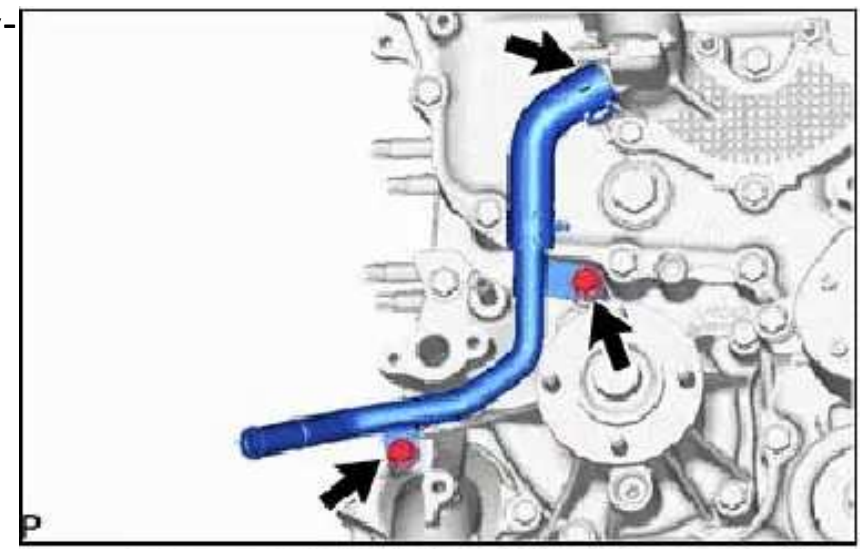
56. REMOVE ENGINE OIL PRESSURE SWITCH ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PRESSURE SWITCH > REMOVAL > REMOVE ENGINE OIL PRESSURE SWITCH ASSEMBLY

57. REMOVE NO. 2 WATER BY-PASS PIPE SUB-ASSEMBLY

a. Slide the clamp and disconnect the No. 3 water by-pass hose from the water outlet sub-assembly.

b. Remove the 2 bolts and No. 2 water by-pass pipe sub-assembly from the engine water pump assembly and water inlet.

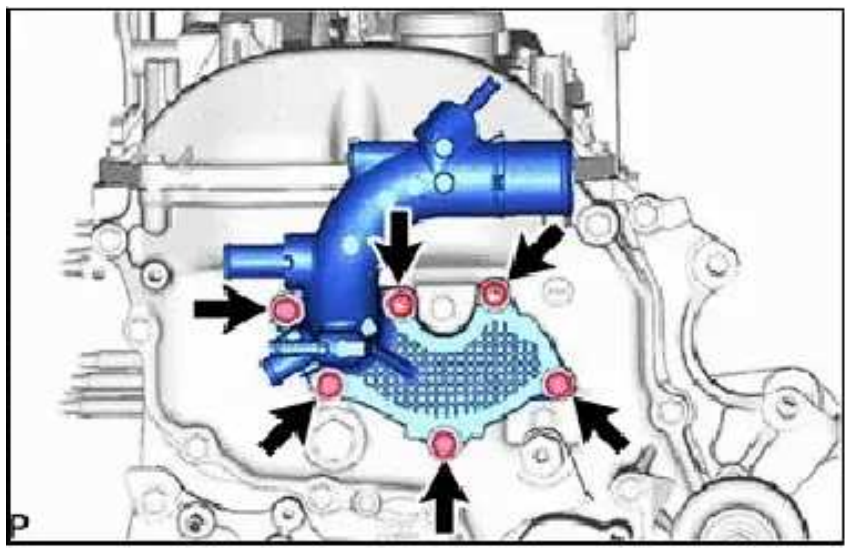


A343506

58. REMOVE WATER OUTLET SUB-ASSEMBLY

a. Remove the 4 bolts, 2 nuts and water outlet sub-assembly from the timing chain cover sub-assembly.

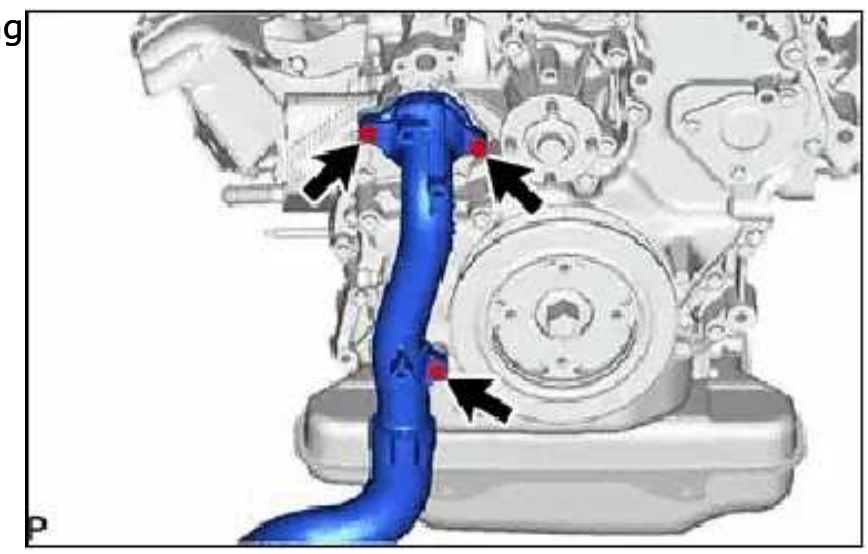
b. Remove the gasket from the timing chain cover sub-assembly.



A343507

59. REMOVE WATER INLET

a. Remove the 3 bolts and water inlet from the timing chain cover sub-assembly.



A343508

60. REMOVE THERMOSTAT

Click here COOLING (2GD-FTV) > THERMOSTAT > REMOVAL > REMOVE THERMOSTAT

61. REMOVE NO. 1 IDLER PULLEY SUB-ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PUMP > REMOVAL > REMOVE NO. 1 IDLER PULLEY SUB-ASSEMBLY

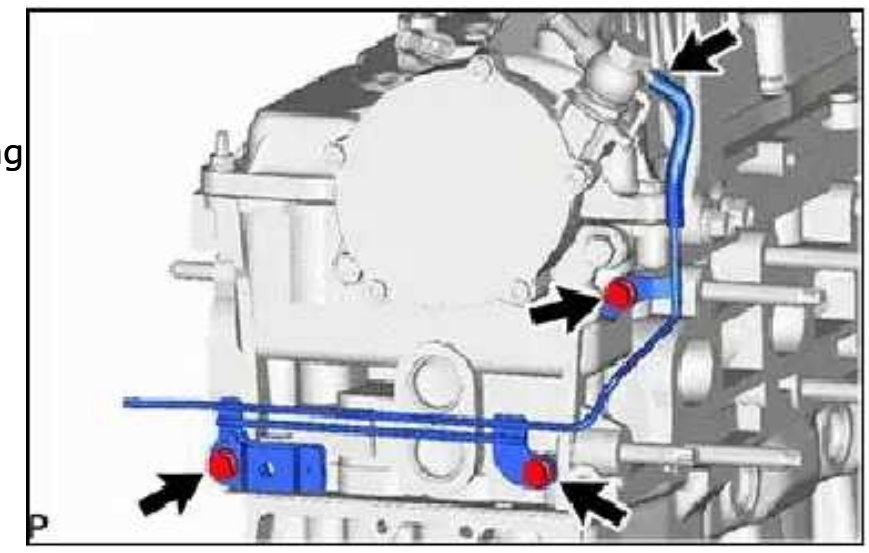
62. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PUMP > REMOVAL > REMOVE V-RIBBED BELT TENSIONER ASSEMBLY

63. REMOVE NO. 1 VACUUM TRANSMITTING PIPE SUB-ASSEMBLY

a. Disconnect the No. 1 vacuum transmitting hose from the vacuum pump assembly.

b. Remove the 3 bolts and No. 1 vacuum transmitting pipe sub-assembly from the cylinder head sub-assembly.

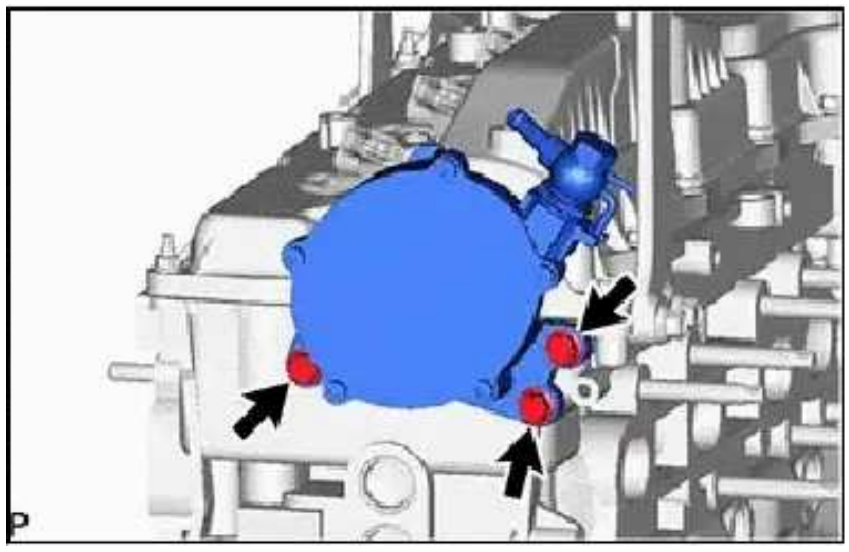


A343509

64. REMOVE VACUUM PUMP ASSEMBLY

a. Remove the 3 bolts and vacuum pump assembly from the cylinder head sub-assembly.

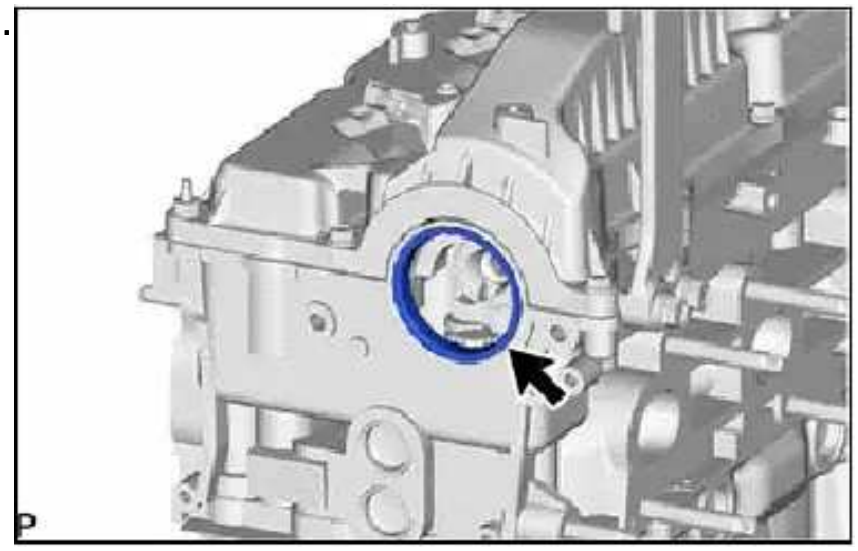
b. Remove the 2 O-rings from the vacuum pump assembly.



A343510

65. REMOVE CAMSHAFT OIL SEAL RETAINER

a. Remove the camshaft oil seal retainer from the No. 3 camshaft bearing cap and cylinder head sub-assembly.



A343511

66. REMOVE CRANKSHAFT PULLEY COVER

Click here ENGINE MECHANICAL (2GD-FTV) > FRONT CRANKSHAFT OIL SEAL > REMOVAL > REMOVE CRANKSHAFT PULLY COVER

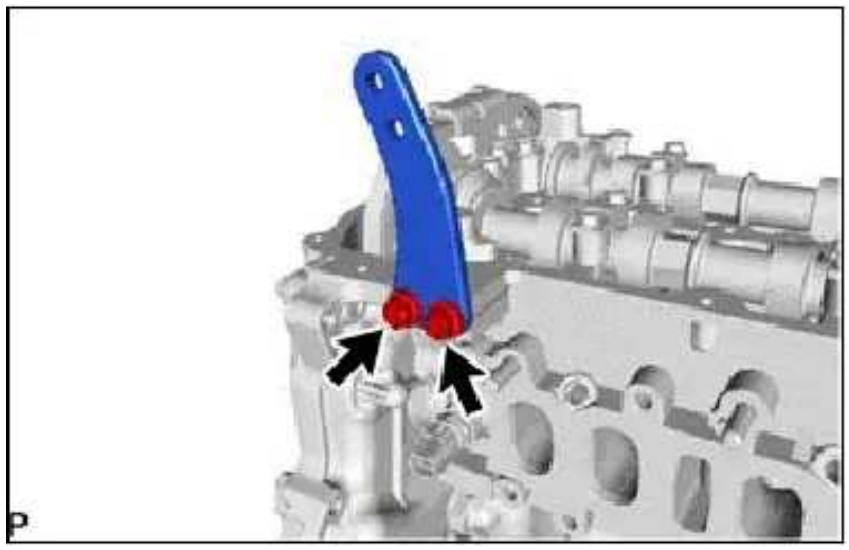
67. REMOVE CRANKSHAFT PULLEY

Click here ENGINE MECHANICAL (2GD-FTV) > FRONT CRANKSHAFT OIL SEAL > REMOVAL > REMOVE CRANKSHAFT PULLEY

ENGINE UNIT > DISASSEMBLY

1. REMOVE NO. 1 ENGINE HANGER

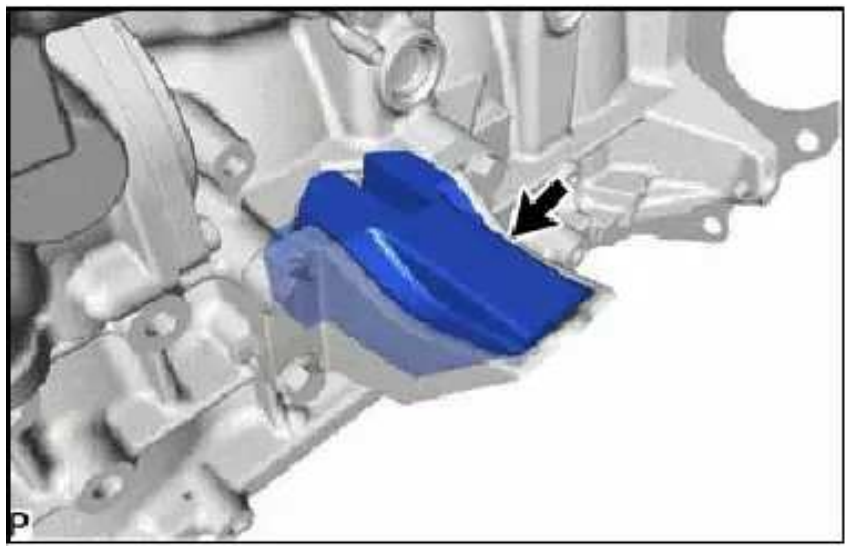
a. Remove the 2 bolts and No. 1 engine hanger from the cylinder head sub-assembly.



A343515

2. REMOVE NO. 2 CYLINDER BLOCK INSULATOR

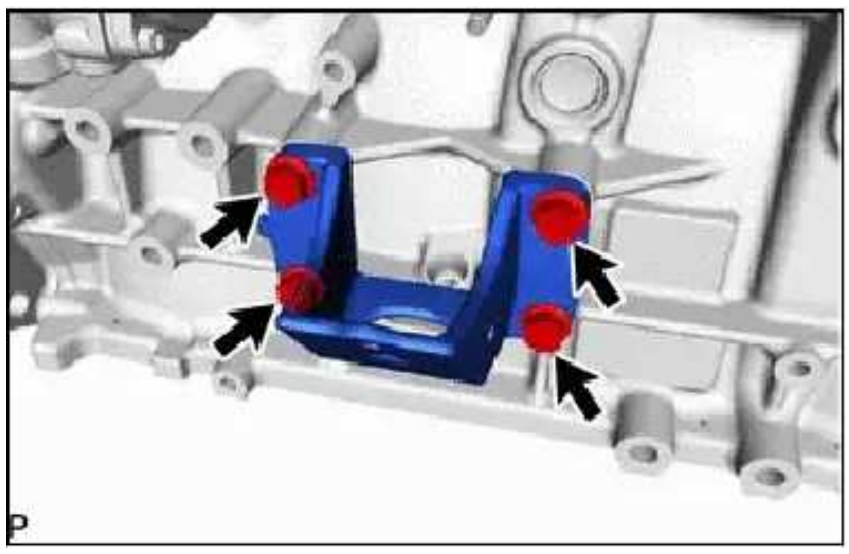
a. Remove the No. 2 cylinder block insulator from the front No. 1 engine mounting bracket LH.



A343516

3. REMOVE FRONT NO. 1 ENGINE MOUNTING BRACKET LH

a. Remove the 4 bolts and front No. 1 engine mounting bracket LH from the cylinder block sub-assembly.

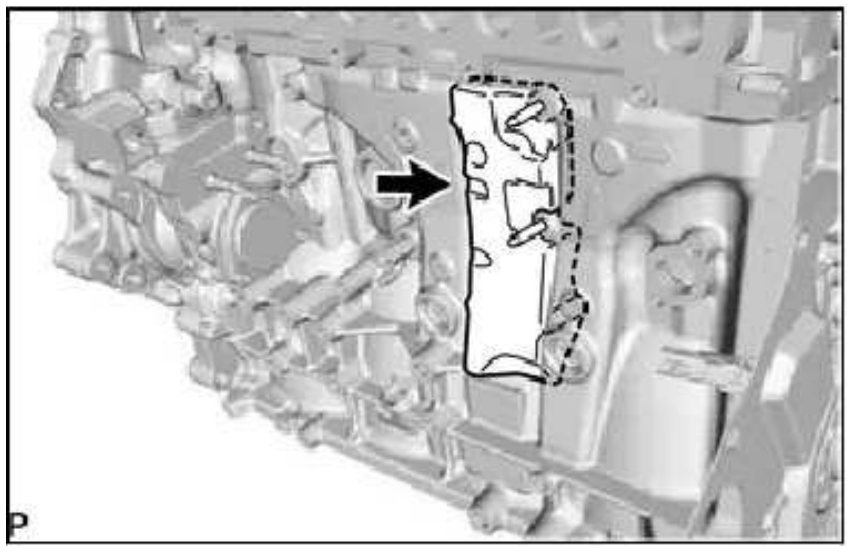


A343517

A343517

4. REMOVE NO. 3 CYLINDER BLOCK INSULATOR

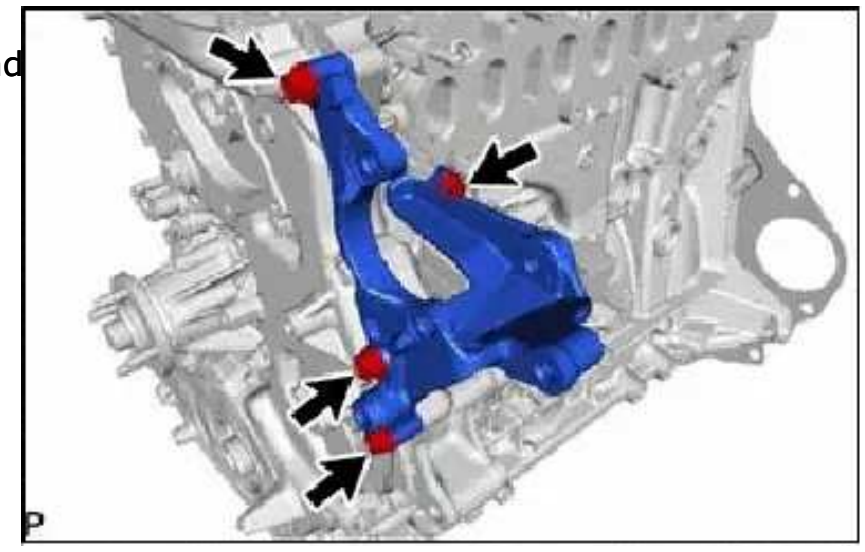
a. Remove the No. 3 cylinder block insulator from the cylinder block sub-assembly.



A343518

5. REMOVE GENERATOR BRACKET SUB-ASSEMBLY

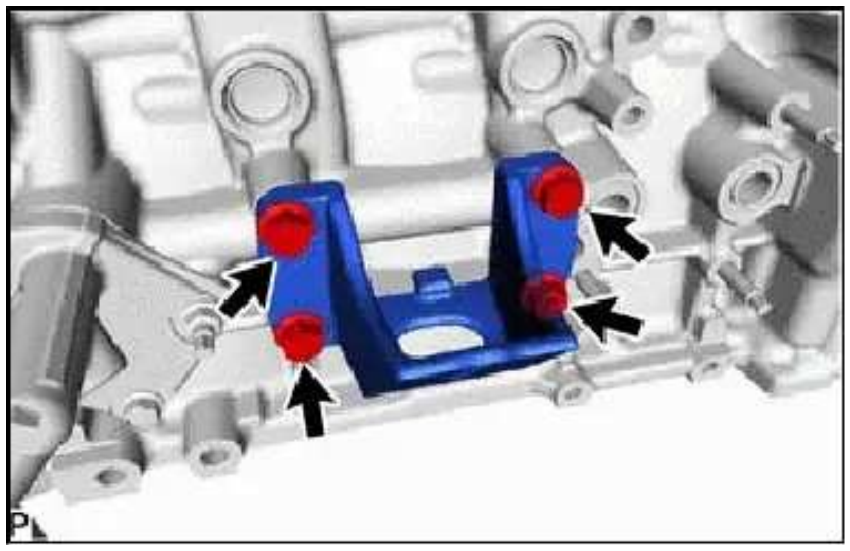
a. Remove the 4 bolts and generator bracket sub-assembly from the cylinder head sub-assembly and timing chain case assembly.



A343519

6. REMOVE FRONT NO. 1 ENGINE MOUNTING BRACKET RH

a. Remove the 4 bolts and front No. 1 engine mounting bracket RH from the cylinder block sub-assembly.



A343520

7. REMOVE OIL COOLER ASSEMBLY

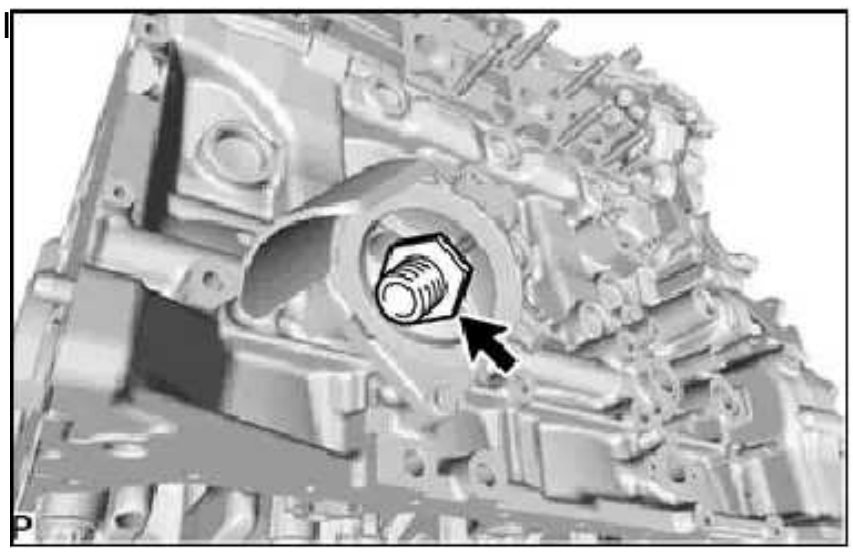
Click here LUBRICATION (2GD-FTV) > ENGINE OIL COOLER > REMOVAL > REMOVE OIL COOLER ASSEMBLY

8. REMOVE OIL FILTER SUB-ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL AND OIL FILTER > REPLACEMENT > REMOVE OIL FILTER SUB-ASSEMBLY

9. REMOVE OIL FILTER UNION

a. Using a 27 mm deep socket wrench, remove the oil filter union from the oil filter bracket.

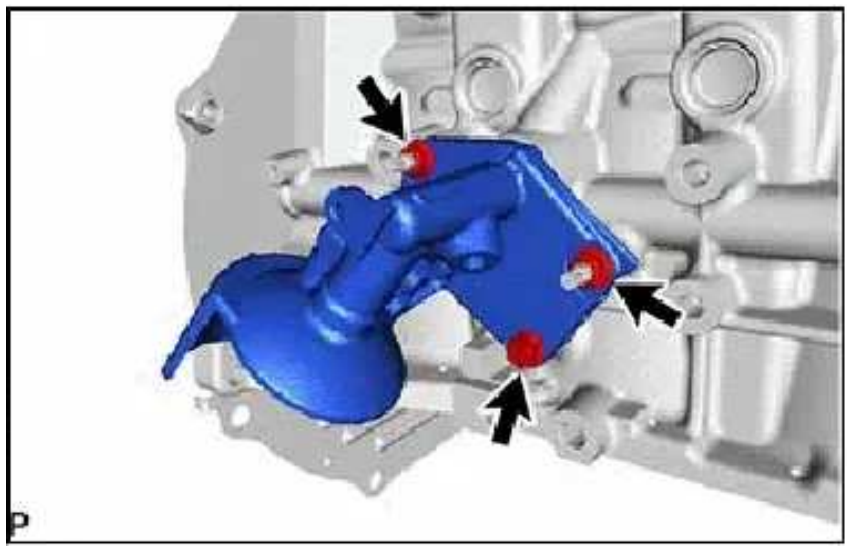


A343521

10. REMOVE OIL FILTER BRACKET

a. Remove the bolt, 2 nuts and oil filter bracket from the cylinder block sub-assembly.

b. Remove the 2 O-rings from the cylinder block sub-assembly.



A343522

11. REMOVE INJECTOR ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL INJECTOR > REMOVAL > REMOVE INJECTOR ASSEMBLY

12. REMOVE NOZZLE HOLDER GASKET

Click here FUEL (2GD-FTV) > FUEL INJECTOR > REMOVAL > REMOVE NOZZLE HOLDER GASKET

13. REMOVE CAMSHAFT POSITION SENSOR

Click here ENGINE CONTROL (2GD-FTV) > CAMSHAFT POSITION SENSOR > REMOVAL > REMOVE CAMSHAFT POSITION SENSOR

14. REMOVE OIL FILLER CAP SUB-ASSEMBLY

a. Remove the oil filler cap sub-assembly from the cylinder head cover sub-assembly.

15. REMOVE OIL FILLER CAP GASKET

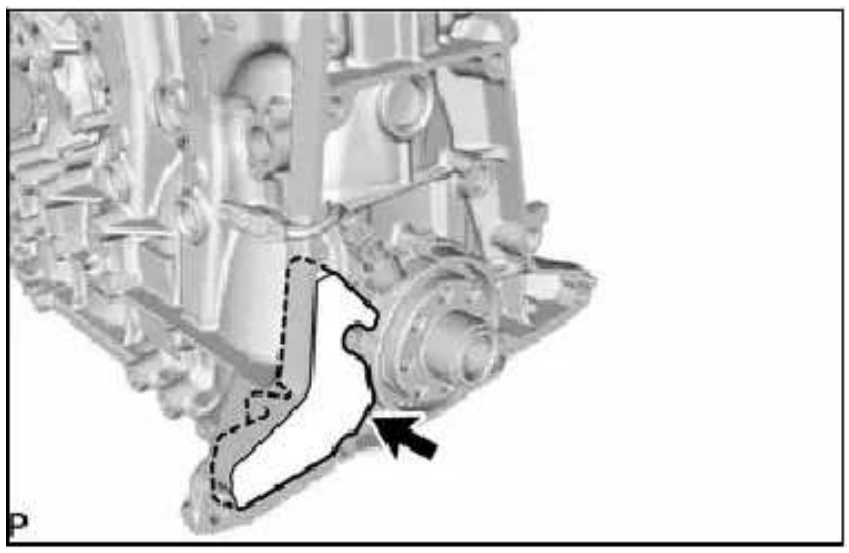
a. Remove the oil filler cap gasket from the oil filler cap sub-assembly.

16. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PUMP > REMOVAL > REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY

17. REMOVE NO. 5 CYLINDER BLOCK INSULATOR

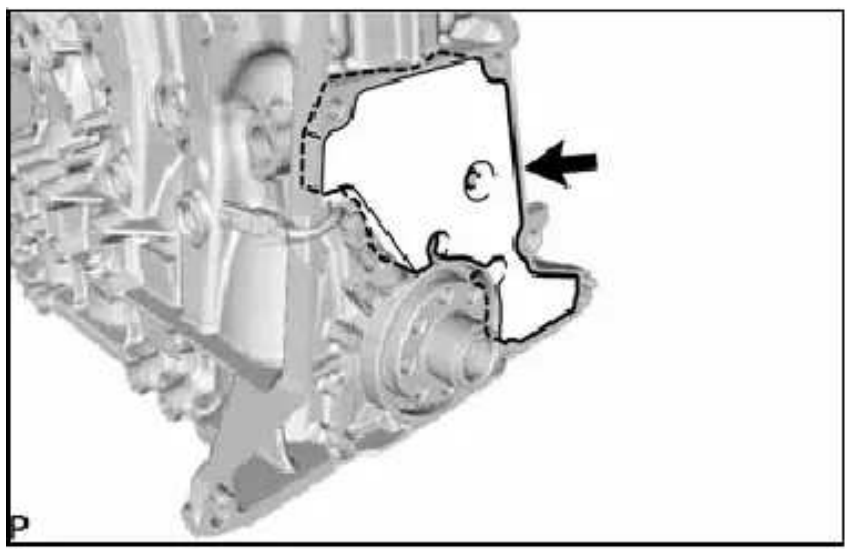
a. Remove the No. 5 cylinder block insulator from the cylinder block sub-assembly.



A343523

18. REMOVE NO. 1 CYLINDER BLOCK INSULATOR

a. Remove the No. 1 cylinder block insulator from the cylinder block sub-assembly.

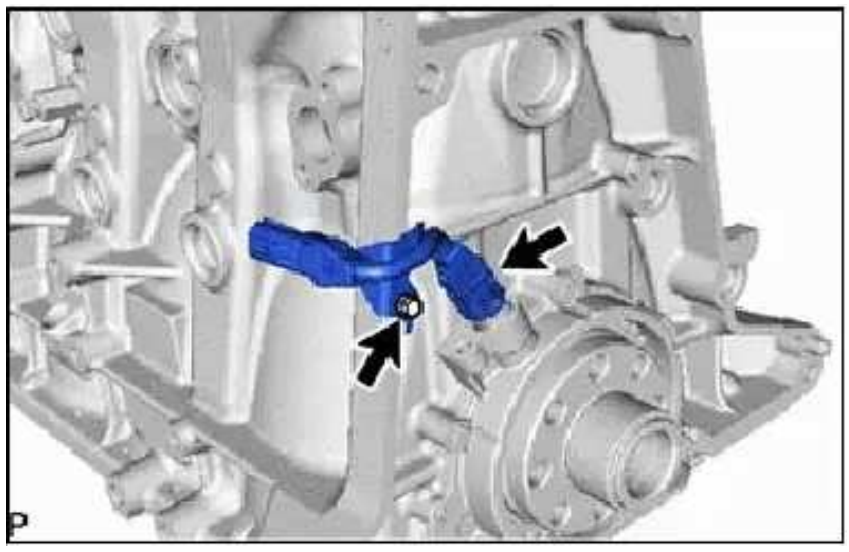


A343524

19. REMOVE CRANKSHAFT POSITION SENSOR HARNESS BRACKET

a. Disconnect the crankshaft position sensor connector.

b. Remove the bolt and crankshaft position sensor harness bracket from the cylinder block sub-assembly.



A343525

20. REMOVE CRANKSHAFT POSITION SENSOR

Click here ENGINE CONTROL (2GD-FTV) > CRANKSHAFT POSITION SENSOR > REMOVAL > REMOVE CRANKSHAFT POSITION SENSOR

21. REMOVE OIL PAN COVER SILENCER

Click here LUBRICATION (2GD-FTV) > OIL PUMP > REMOVAL > REMOVE OIL PAN COVER SILENCER

22. REMOVE ENGINE OIL LEVEL SENSOR

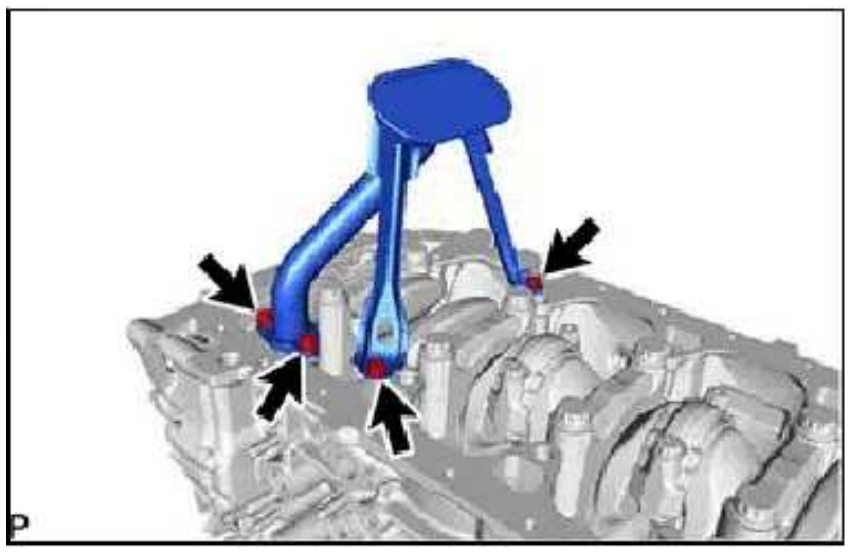
Click here LUBRICATION (2GD-FTV) > OIL LEVEL SENSOR > REMOVAL > REMOVE ENGINE OIL LEVEL SENSOR

23. REMOVE OIL PAN SUB-ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PUMP > REMOVAL > REMOVE OIL PAN SUB-ASSEMBLY

24. REMOVE OIL STRAINER SUB-ASSEMBLY

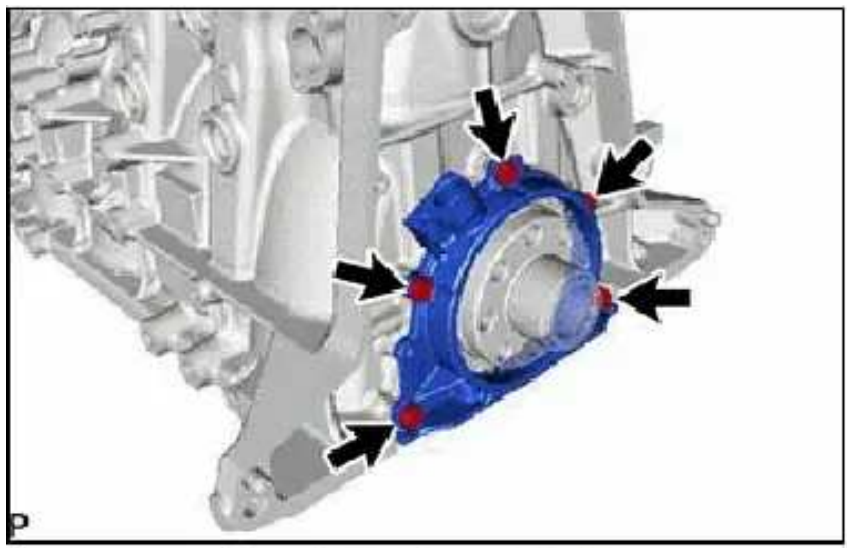
a. Remove the 4 bolts, oil strainer sub-assembly and gasket from the cylinder block sub-assembly.



A343526

25. REMOVE REAR ENGINE OIL SEAL RETAINER

a. Remove the 5 bolts.



A343527

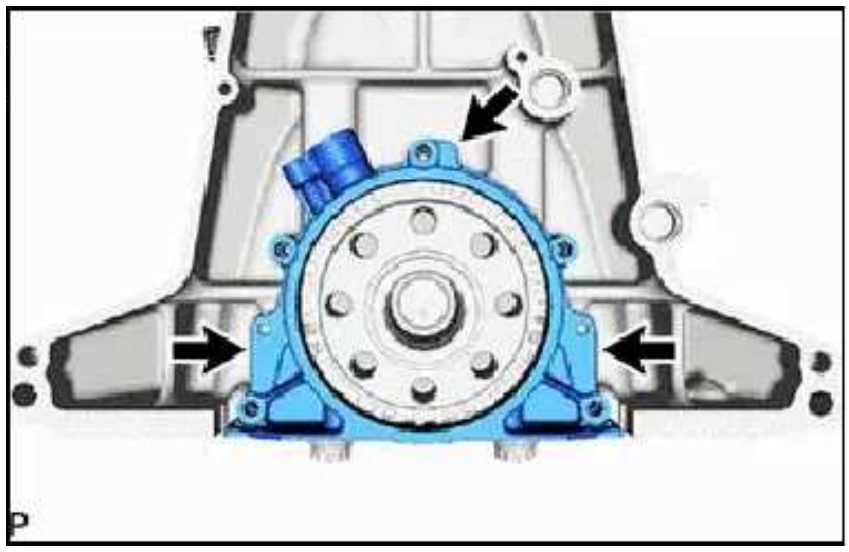
b. Remove the rear engine oil seal retainer by prying between the rear engine oil seal retainer and cylinder block sub-assembly with a screwdriver.

NOTICE:

Be careful not to damage the contact surfaces of the cylinder block sub-assembly.

HINT:

Tape the screwdriver tip before use.



A343528

26. REMOVE REAR ENGINE OIL SEAL

a. Place the rear engine oil seal retainer on wooden blocks.

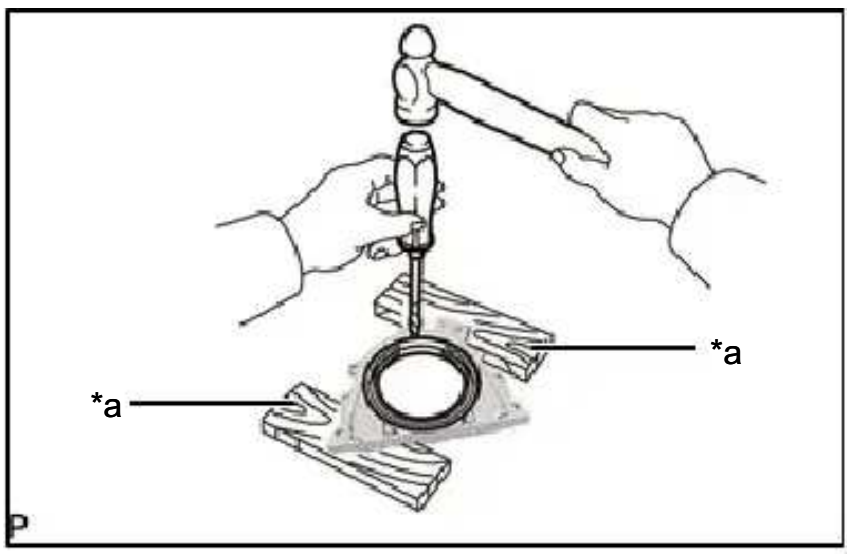
b. Using a screwdriver, tap out the rear engine oil seal from the rear engine oil seal retainer.

NOTICE:

Do not damage the surface of the rear engine oil seal press fit hole.

HINT:

Tape the screwdriver tip before use.



A343529C01

*a	Wooden Block

27. REMOVE ENGINE WATER PUMP ASSEMBLY

Click here COOLING (2GD-FTV) > WATER PUMP > REMOVAL > REMOVE ENGINE WATER PUMP ASSEMBLY

28. SET NO. 1 CYLINDER TO TDC/COMPRESSION

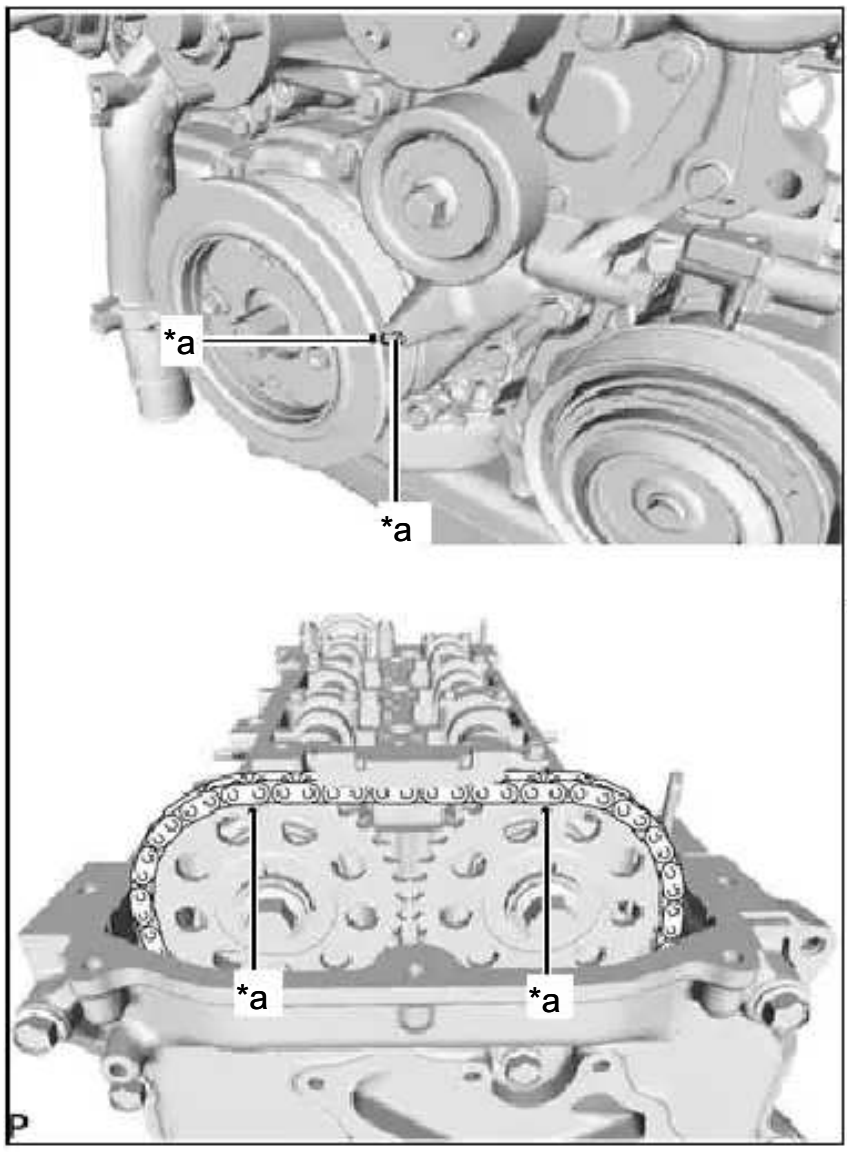
a. Temporarily install the crankshaft pulley and crankshaft pulley set bolt to the crankshaft.

b. Align the timing mark of the crankshaft pulley and timing chain cover sub-assembly by rotating the crankshaft clockwise.

c. Make sure that the timing mark of the camshaft timing sprocket is at the top.

HINT:

If the timing mark is not at the top, turn the crankshaft pulley 1 revolution so that the timing mark is at the top (set the No. 1 piston to TDC/ compression).



A347371C01

*a	Timing Mark

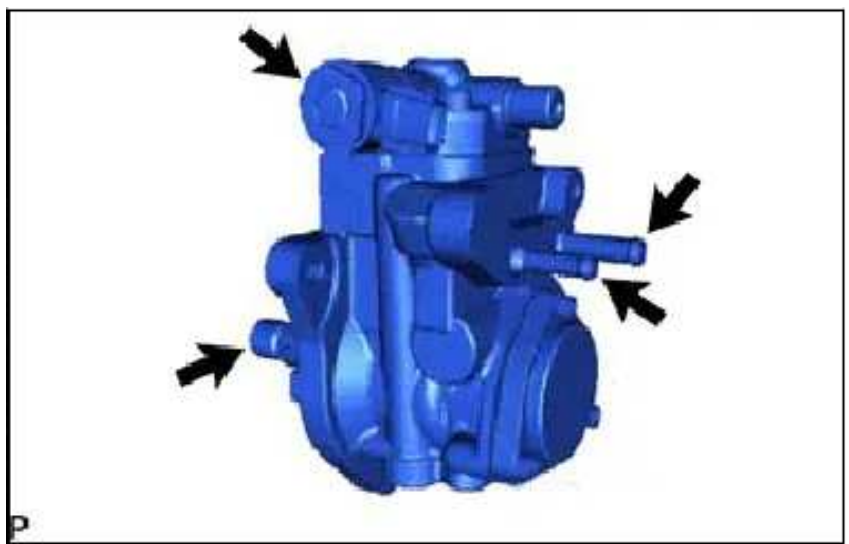
29. REMOVE TIMING CHAIN COVER PLATE

Click here FUEL (2GD-FTV) > FUEL SUPPLY PUMP > REMOVAL > REMOVE TIMING CHAIN COVER PLATE

30. REMOVE SUPPLY PUMP ASSEMBLY

NOTICE:

Do not hold the supply pump assembly by the parts indicated by the arrows in the illustration.



A347307

a. Using SST, hold the crankshaft pulley and loosen the supply pump shaft nut.

SST

09213-58014 (91551-80840)

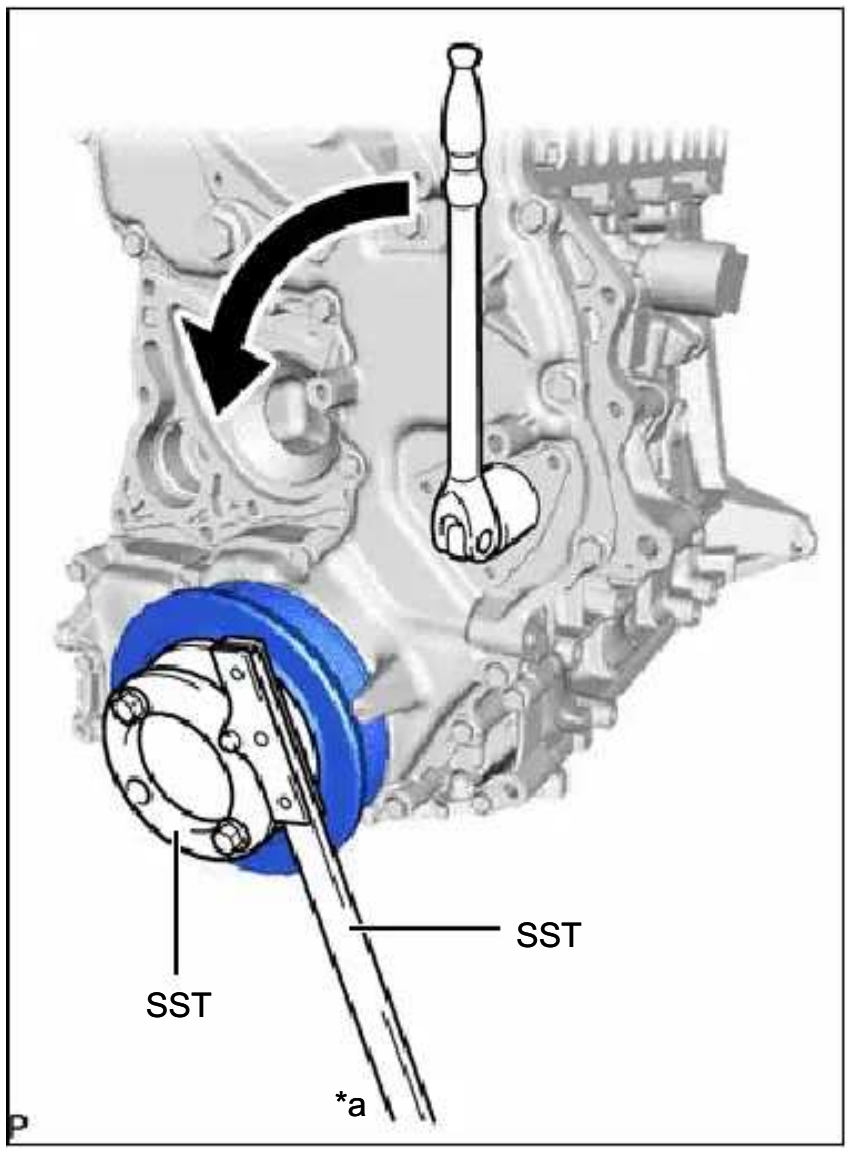
09330-00021

NOTICE:

Do not excessively loosen the supply pump shaft nut, otherwise SST cannot be installed.

HINT:

Rotate the supply pump shaft nut once to loosen it.



A343530C01

*a	Hold
➡	Turn

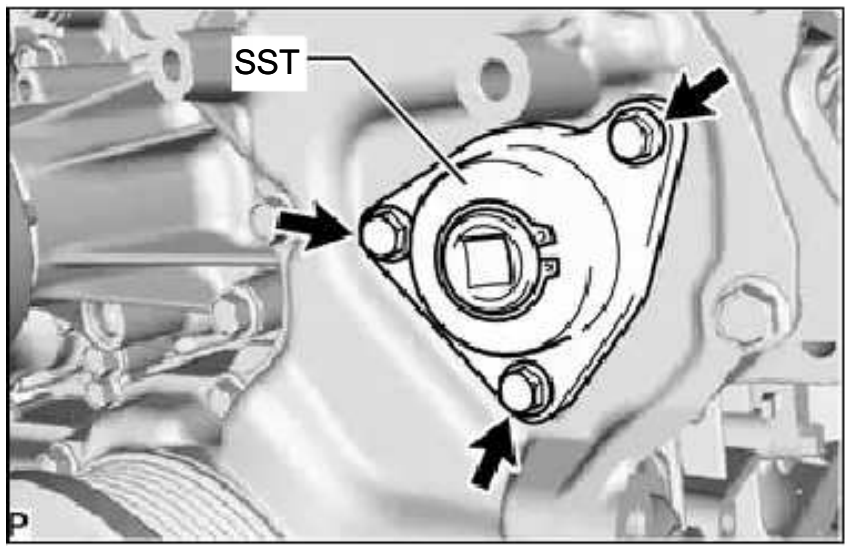
b. Install SST with the 3 bolts to the timing chain cover sub-assembly.

SST

09241-11010

Torque:

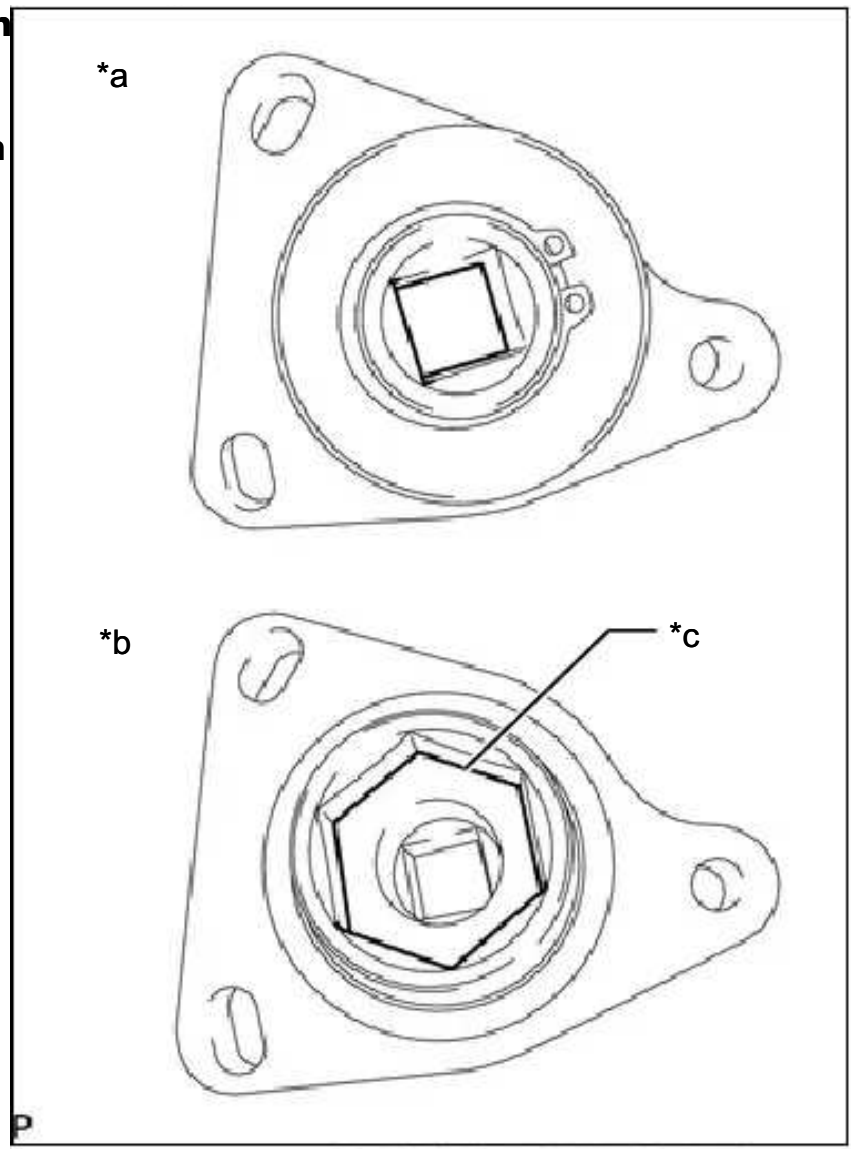
10 N*m (102 kgf*cm, 7 ft.*lbf)



A344938N01

HINT:

- **Make sure that the installation direction of SST is as shown in the illustration.**
- **Align the hexagonal portion of SST with the supply pump shaft nut to install SST.**



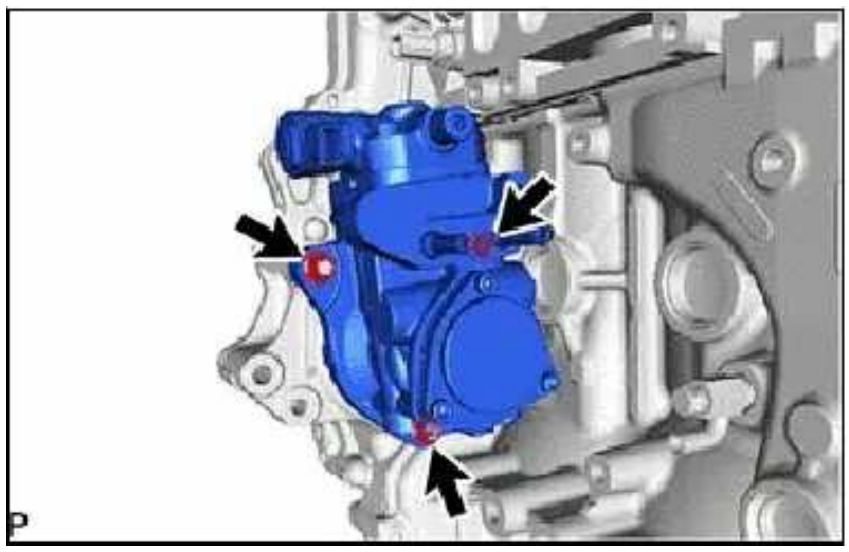
A347063C02

*a	Engine Front Side
*b	Engine Rear Side
*c	Hexagonal Portion

c. Loosen the 3 nuts to the ends of the stud bolts.

NOTICE:

Do not completely remove the nuts. Otherwise, the supply pump assembly may fall off.



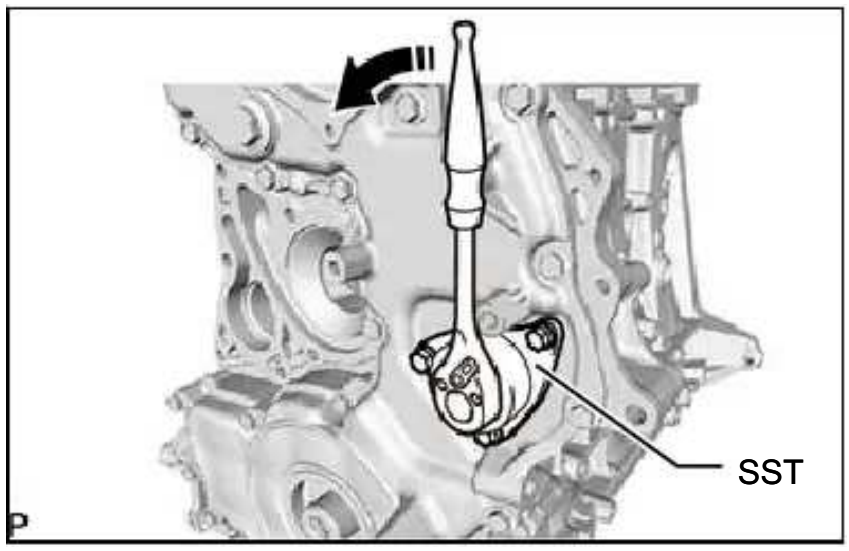
A343531

d. Using SST, loosen the supply pump shaft nut and detach the supply pump assembly and injection pump drive gear.

e. Remove the 3 nuts from the stud bolts.

f. Remove the O-ring from the supply pump assembly.

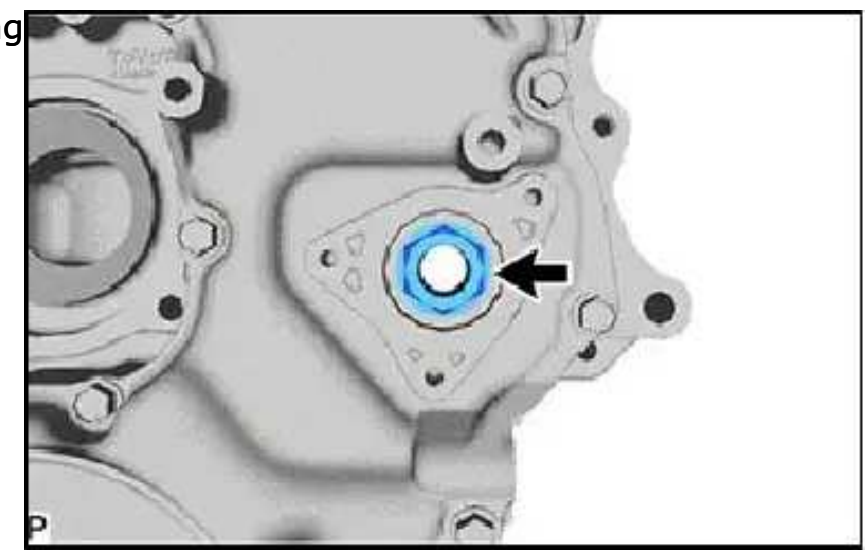
g. Remove SST from the timing chain cover sub-assembly.



A343532N01

h. Remove the supply pump shaft nut from the timing chain cover sub-assembly service hole.

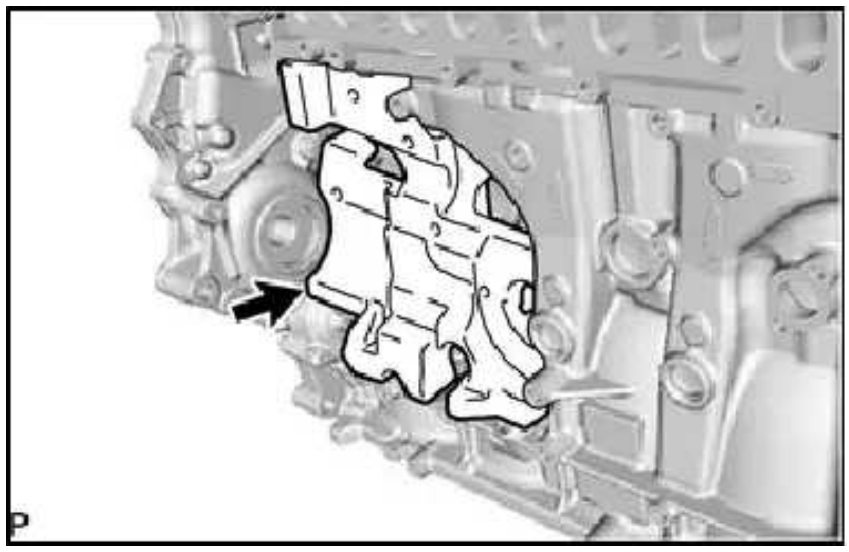
i. Remove the crankshaft pulley set bolt and crankshaft pulley from the crankshaft.



A343534

31. REMOVE INJECTION PUMP INSULATOR

a. Remove the injection pump insulator from the cylinder block sub-assembly.



A343533

32. REMOVE TIMING CHAIN COVER SUB-ASSEMBLY

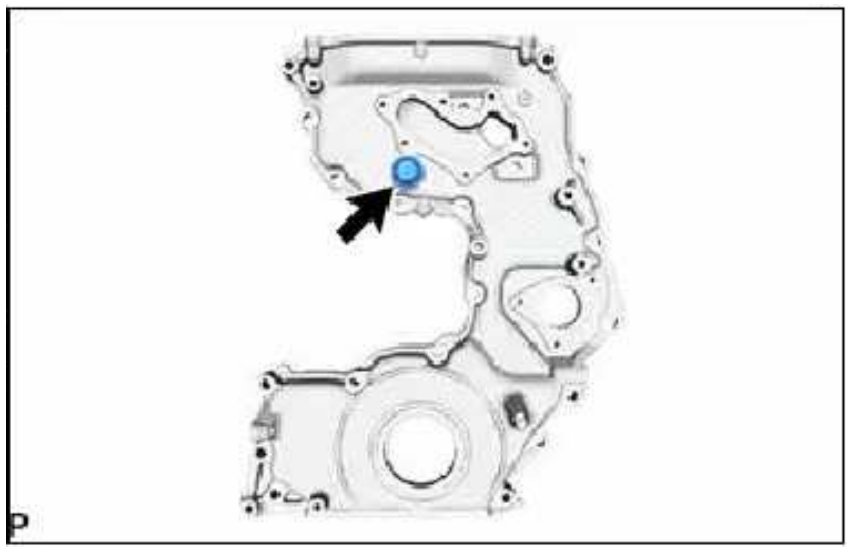
Click here LUBRICATION (2GD-FTV) > OIL PUMP > REMOVAL > REMOVE TIMING CHAIN COVER SUB-ASSEMBLY

33. REMOVE FRONT CRANKSHAFT OIL SEAL

Click here LUBRICATION (2GD-FTV) > OIL PUMP > REMOVAL > REMOVE FRONT CRANKSHAFT OIL SEAL

34. REMOVE OIL PUMP RELIEF VALVE PLUG

a. Remove the oil pump relief valve plug and gasket from the timing chain cover sub-assembly.



A343535

35. INSPECT BACKLASH OF OIL PUMP GEAR TO OIL PUMP DRIVE GEAR

Click here LUBRICATION (2GD-FTV) > OIL PUMP > REMOVAL > INSPECT BACKLASH OF OIL PUMP GEAR TO OIL PUMP DRIVE GEAR

36. REMOVE OIL PUMP DRIVE GEAR

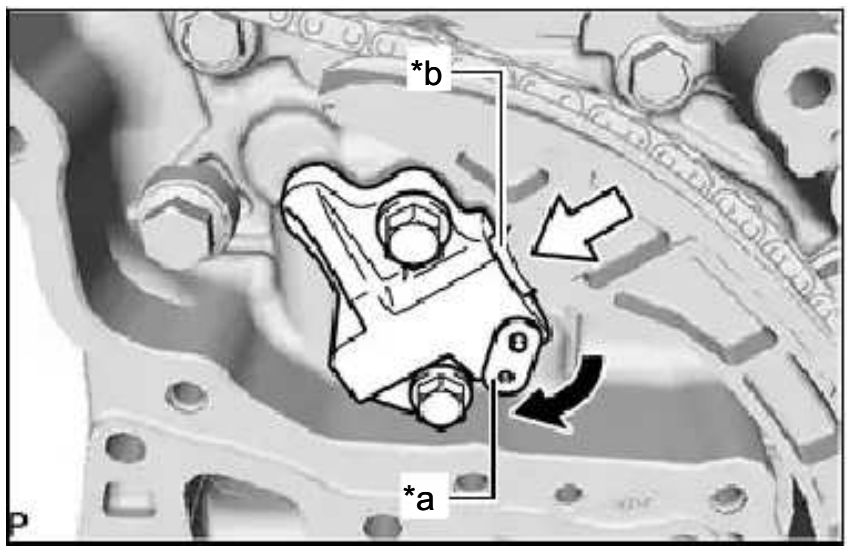
Click here LUBRICATION (2GD-FTV) > OIL PUMP > REMOVAL > REMOVE OIL PUMP DRIVE GEAR

37. REMOVE TIMING CHAIN GUIDE

Click here ENGINE MECHANICAL (2GD-FTV) > CAMSHAFT > REMOVAL > REMOVE TIMING CHAIN GUIDE

38. REMOVE NO. 2 CHAIN TENSIONER ASSEMBLY

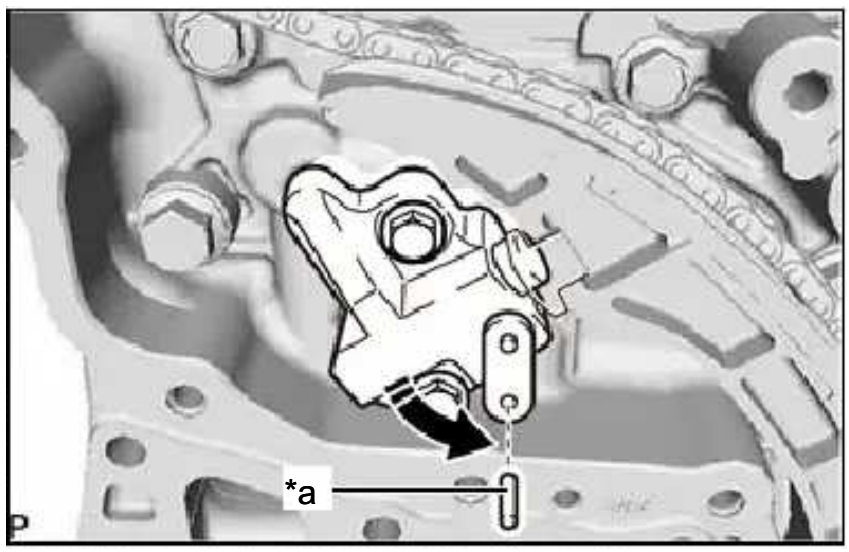
a. Allow the plunger to extend slightly, and then rotate the stopper plate clockwise to release the lock. Once the lock is released, push the plunger into the No. 2 chain tensioner assembly.



A343536C01

*a	Stopper Plate
*b	Plunger

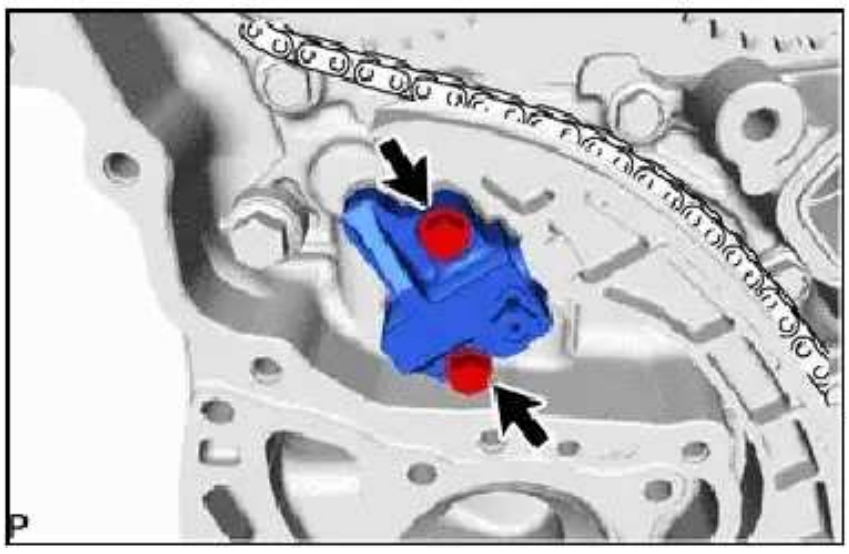
b. Move the stopper plate counterclockwise to set the lock, and then insert a pin into the stopper plate hole.



A343537C01

*a	Pin

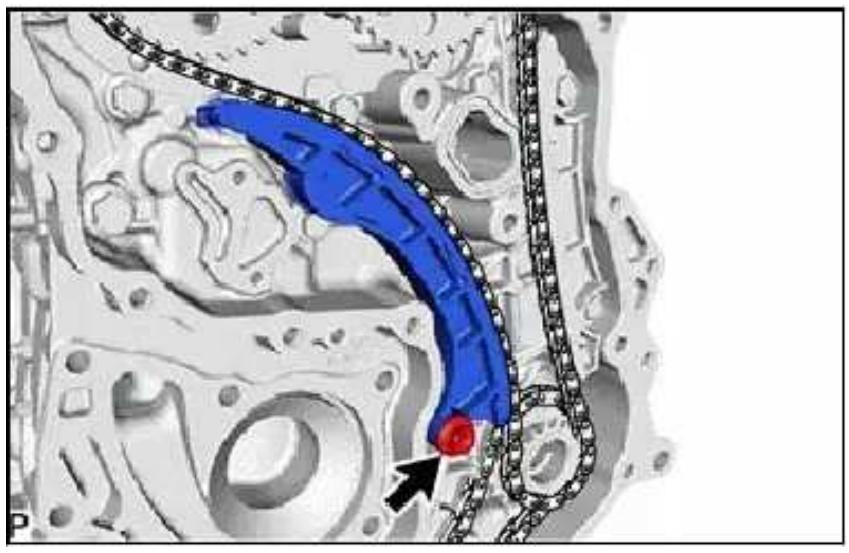
c. Remove the 2 bolts and No. 2 chain tensioner assembly from the timing chain case assembly.



A343538

39. REMOVE NO. 2 CHAIN TENSIONER SLIPPER

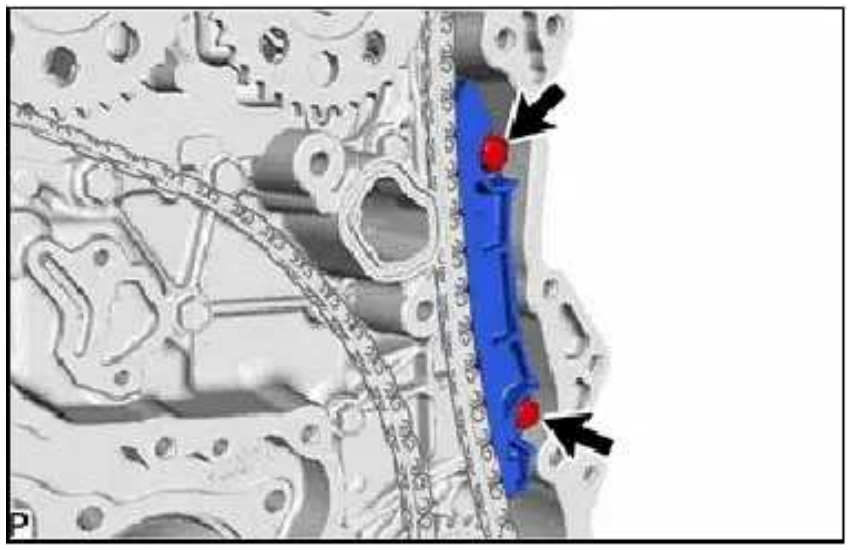
a. Remove the bolt and No. 2 chain tensioner slipper from the timing chain case assembly.



A343539

40. REMOVE NO. 2 CHAIN VIBRATION DAMPER

a. Remove the 2 bolts and No. 2 chain vibration damper from the timing chain case assembly.



A343540

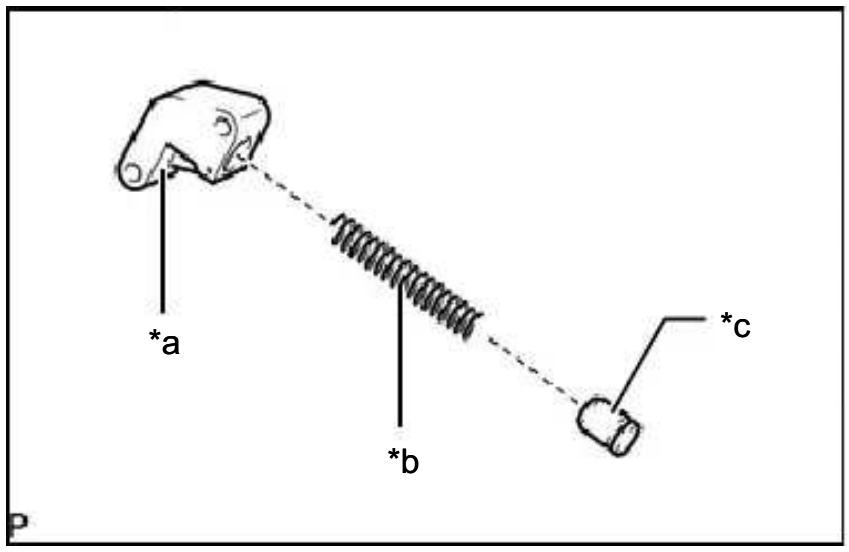
41. REMOVE NO. 2 CHAIN SUB-ASSEMBLY

a. Remove the No. 2 chain sub-assembly from the camshaft timing sprockets and injection pump drive gear.

42. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY

NOTICE:

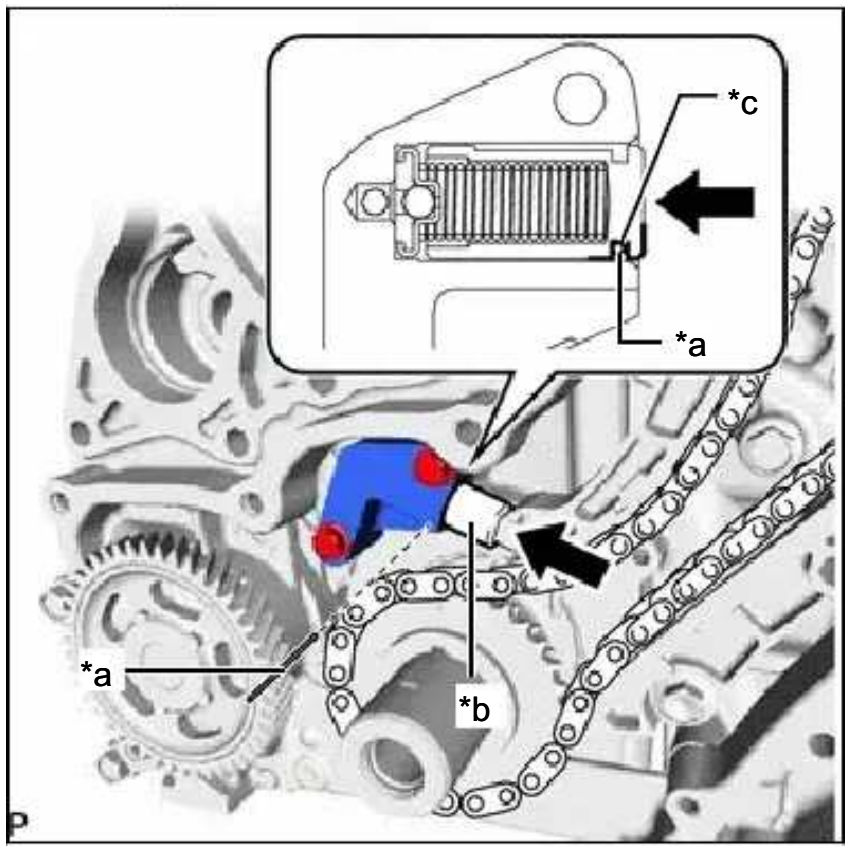
- **When the pin is removed from the No. 1 chain tensioner assembly, the plunger and spring may come off of the No. 1 chain tensioner assembly body, but this is not a malfunction.**
- **Before installing the plunger and spring to the No. 1 chain tensioner assembly body, check that they are free of foreign matter and not damaged.**



A347238C01

*a	No. 1 Chain Tensioner Assembly Body
*b	Spring
*c	Plunger

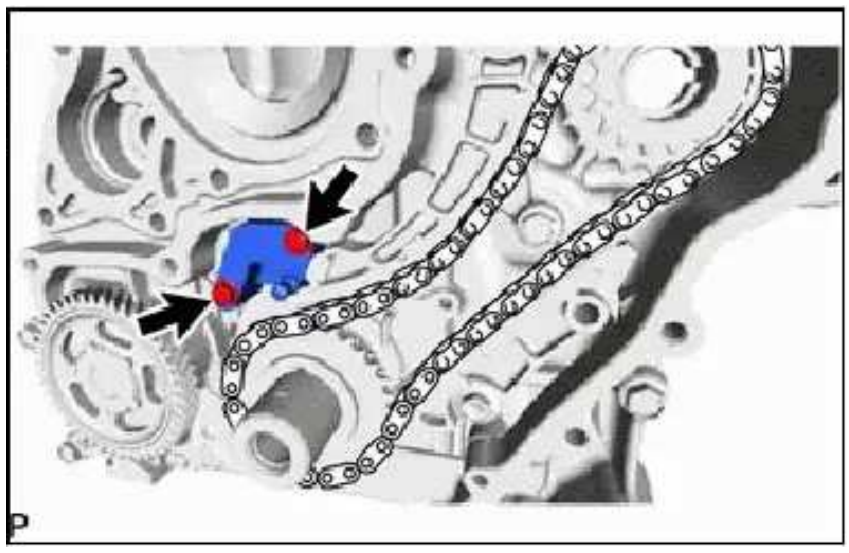
a. Fully insert the plunger, align the No. 1 chain tensioner assembly body hole with the plunger groove and insert the pin as shown in the illustration.



A343541C01

*a	Pin
*b	Plunger
*c	Plunger Groove

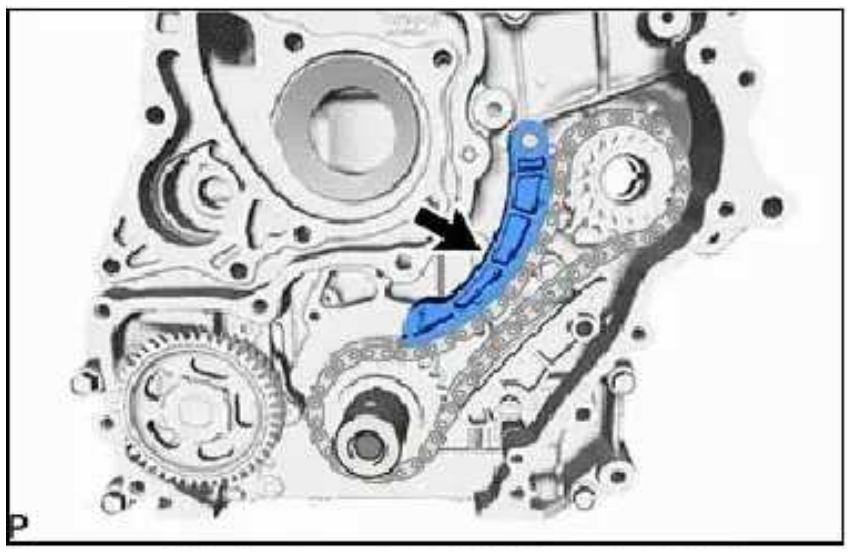
b. Remove the 2 bolts, No. 1 chain tensioner assembly and gasket from the cylinder block sub-assembly.



A343542

43. REMOVE NO. 1 CHAIN TENSIONER SLIPPER

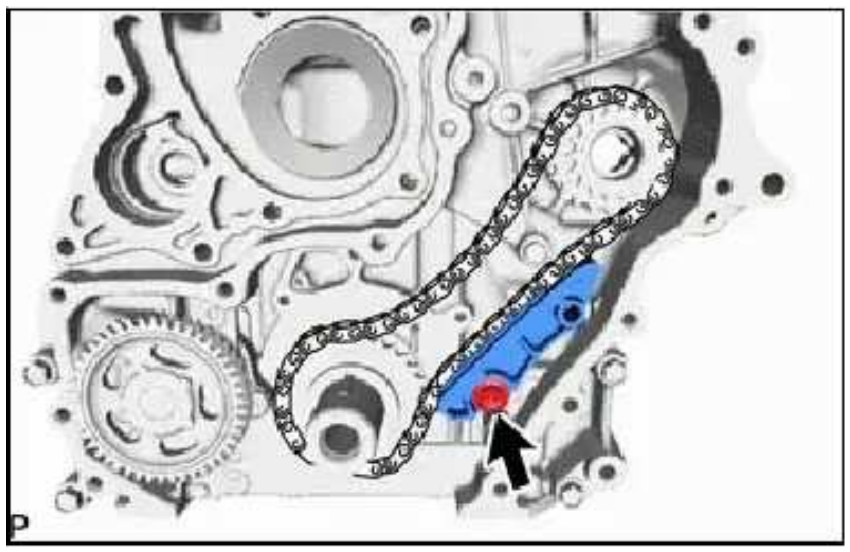
a. Remove the No. 1 chain tensioner slipper from the straight pin.



A343543

44. REMOVE NO. 1 CHAIN VIBRATION DAMPER

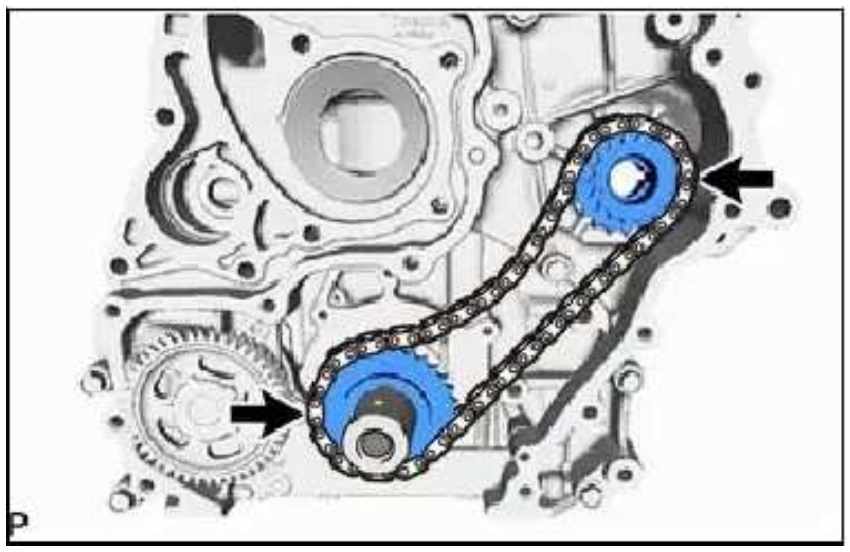
a. Remove the bolt and No. 1 chain vibration damper from the cylinder block sub-assembly.



A343544

45. REMOVE CRANKSHAFT TIMING SPROCKET, INJECTION PUMP DRIVE GEAR WITH NO. 1 CHAIN SUB-ASSEMBLY

a. Remove the crankshaft timing sprocket, injection pump drive gear with No. 1 chain sub-assembly from the crankshaft and supply pump shaft.



A343545

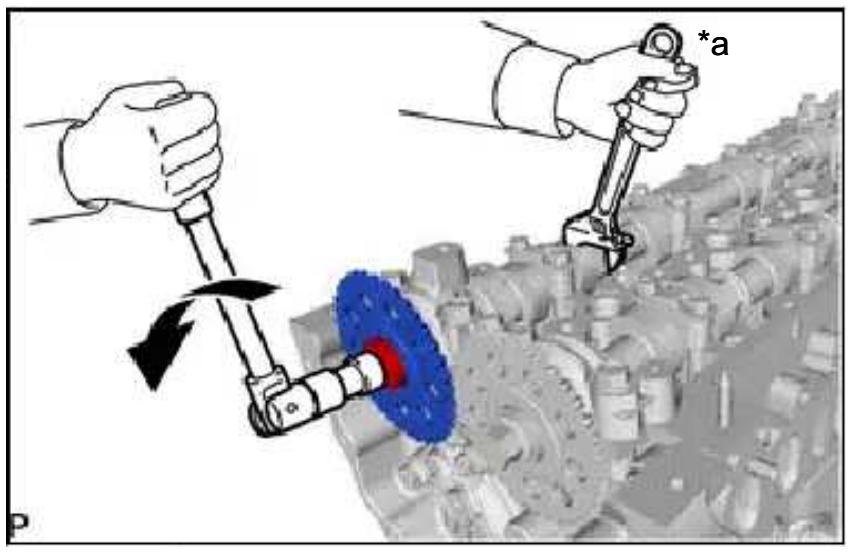
46. REMOVE CAMSHAFT TIMING SPROCKET

a. for Exhaust Side:

i. Hold hexagonal portion of the No. 2 camshaft with a wrench and remove the camshaft timing sprocket bolt and camshaft timing sprocket from the No. 2 camshaft.

NOTICE:

Be careful not to damage the No. 2 camshaft or cylinder head sub-assembly with the wrench.



A343546C01

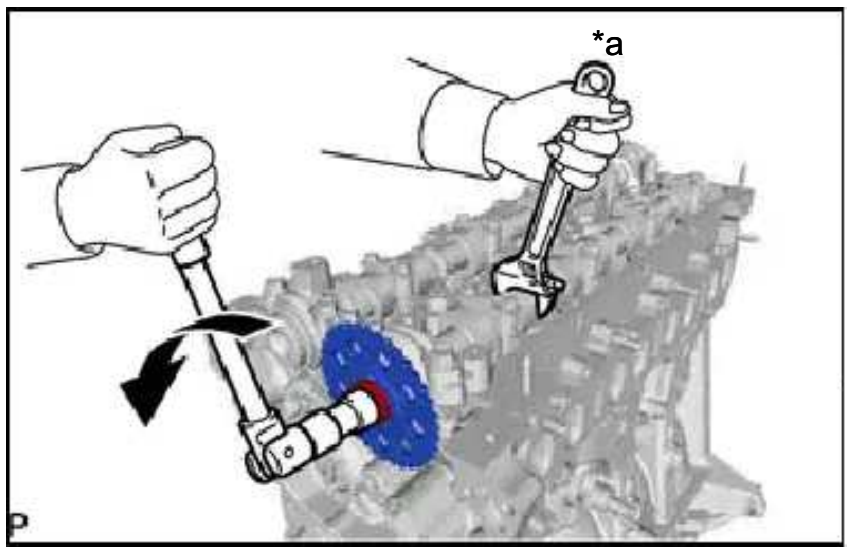
*a	Hold
➡	Turn

b. for Intake Side:

i. Hold hexagonal portion of the camshaft with a wrench and remove the camshaft timing sprocket bolt and camshaft timing sprocket from the camshaft.

NOTICE:

Be careful not to damage the camshaft or cylinder head sub-assembly with the wrench.



*a	Hold
➡	Turn

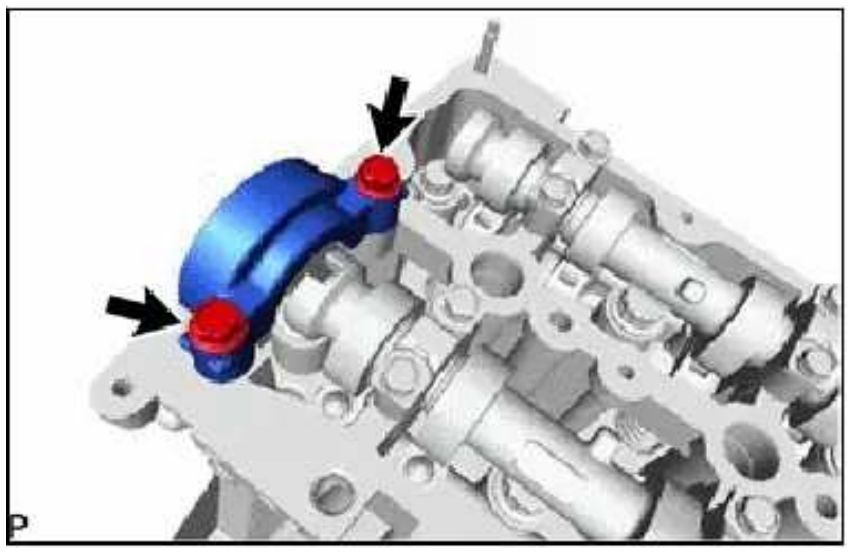
A343547C01

47. REMOVE TIMING CHAIN CASE ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PUMP > REMOVAL > REMOVE TIMING CHAIN CASE ASSEMBLY

48. REMOVE NO. 3 CAMSHAFT BEARING CAP

a. Remove the 2 camshaft bearing cap bolts and No. 3 camshaft bearing cap from the cylinder head sub-assembly.



A343548

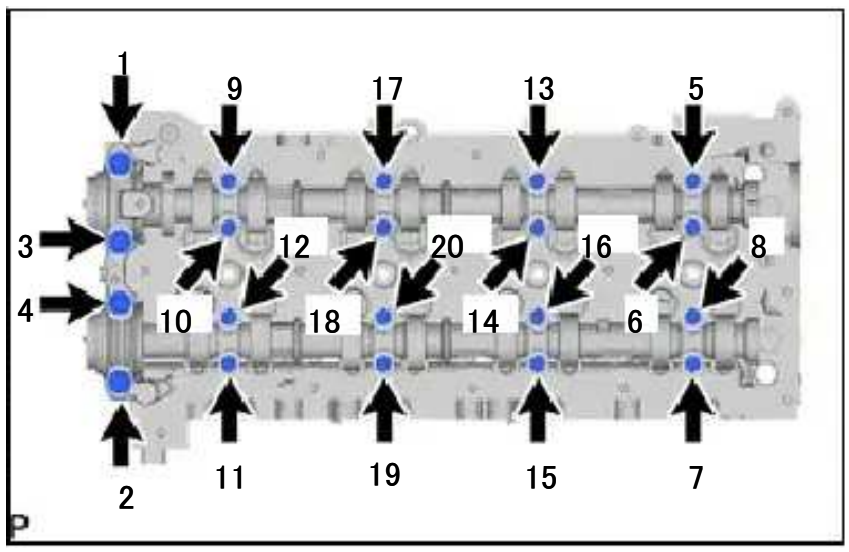
49. REMOVE NO. 1 AND NO. 2 CAMSHAFT BEARING CAP

a. Remove the 20 camshaft bearing cap bolts in the sequence shown in the illustration.

b. Remove the No. 1 camshaft bearing cap and 8 No. 2 camshaft bearing caps from the cylinder head sub-assembly.

HINT:

Arrange the removed parts in the correct order.



A347240N01

50. REMOVE CAMSHAFT

a. Remove the camshaft from the cylinder head sub-assembly.

51. REMOVE NO. 2 CAMSHAFT

a. Remove the No. 2 camshaft from the cylinder head sub-assembly.

52. REMOVE NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

a. Remove the 16 No. 1 valve rocker arm sub-assemblies from the 16 valve lash adjuster assemblies.

53. REMOVE VALVE LASH ADJUSTER ASSEMBLY

a. Remove the 16 valve lash adjuster assemblies from the cylinder head sub-assembly.

54. REMOVE CYLINDER HEAD SUB-ASSEMBLY

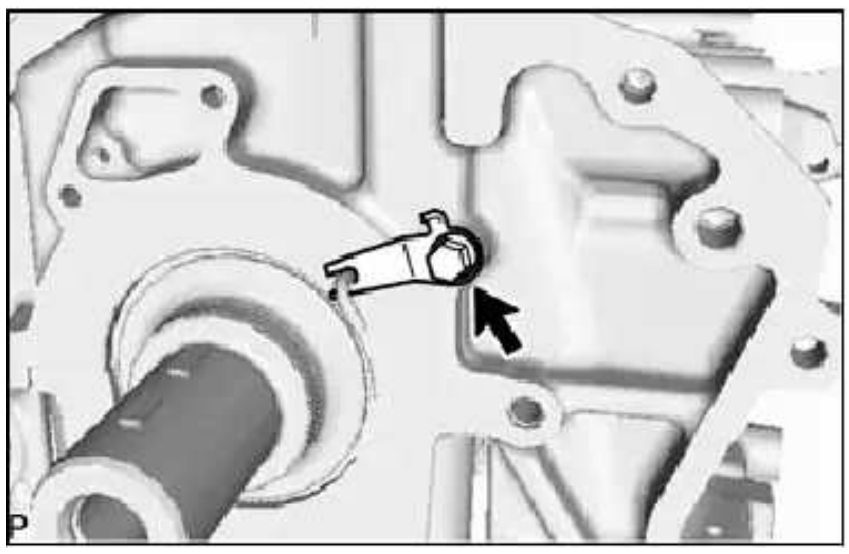
Click here ENGINE MECHANICAL (2GD-FTV) > CYLINDER HEAD GASKET > REMOVAL > REMOVE CYLINDER HEAD SUB-ASSEMBLY

55. REMOVE CYLINDER HEAD GASKET

Click here ENGINE MECHANICAL (2GD-FTV) > CYLINDER HEAD GASKET > REMOVAL > REMOVE CYLINDER HEAD GASKET

56. REMOVE LOCK PLATE

a. Remove the bolt and lock plate from the cylinder block sub-assembly.



A343549

57. REMOVE STUD BOLT

NOTICE:

If a stud bolt is deformed or its threads are damaged, replace it.

58. REMOVE STRAIGHT PIN

NOTICE:

It is not necessary to remove the straight pin unless it is being replaced.

ENGINE UNIT > INSPECTION

1. INSPECT NO. 1 CHAIN SUB-ASSEMBLY

a. Using a spring scale, pull the No. 1 chain sub-assembly with a force of 147 N (15 kgf, 33.0 lbf) as shown in the illustration.

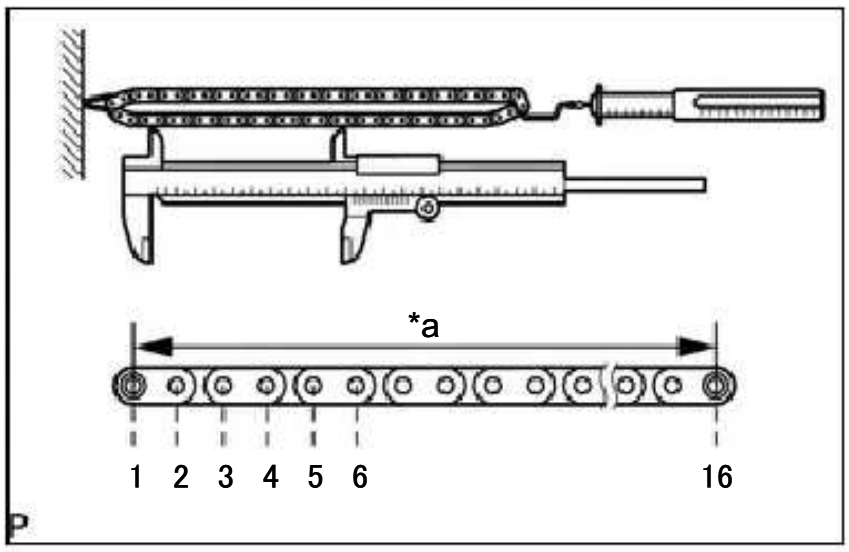
b. Using a vernier caliper, measure the length of 16 pins.

Maximum chain elongation:
144.7 mm (5.70 in.)

HINT:

Perform the measurement at 3 random places.

If the elongation is more than the maximum, replace the No. 1 chain sub-assembly.



A345790C01

*a	Measuring Point

2. INSPECT NO. 2 CHAIN SUB-ASSEMBLY

a. Using a spring scale, pull the No. 2 chain sub-assembly with a force of 147 N (15 kgf, 33.0 lbf) as shown in the illustration.

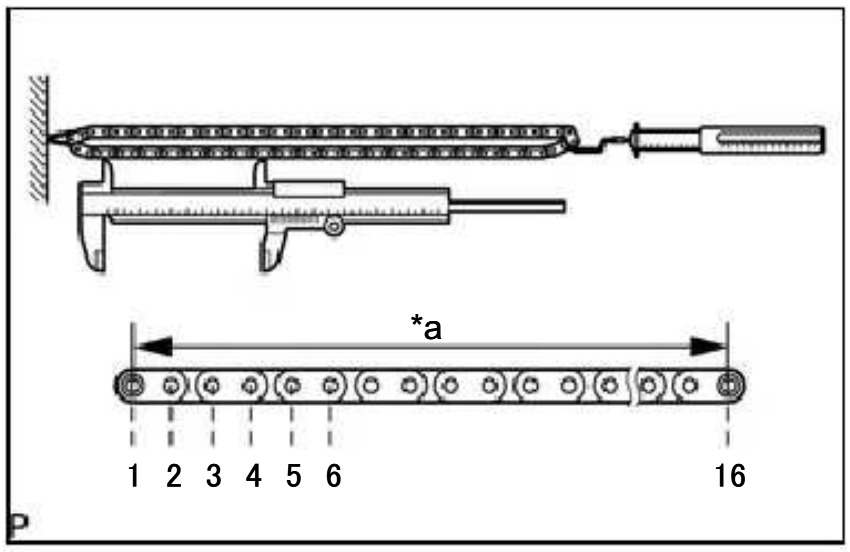
b. Using a vernier caliper, measure the length of 16 pins.

Maximum chain elongation:
121.6 mm (4.79 in.)

HINT:

Perform the measurement at 3 random places.

If the elongation is more than the maximum, replace the No. 2 chain sub-assembly.



A345791C01

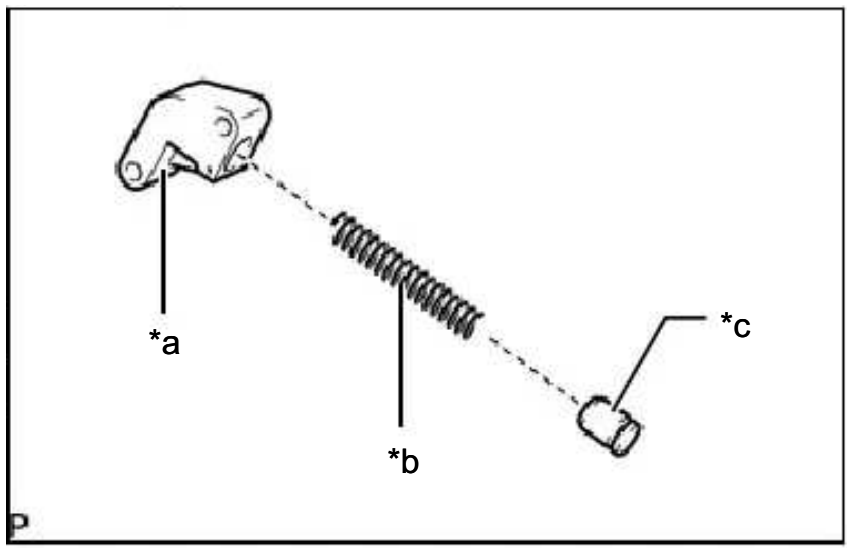
*a	Measuring Point

3. INSPECT NO. 1 CHAIN TENSIONER ASSEMBLY

NOTICE:

- **When the pin is removed from the No. 1 chain tensioner assembly, the plunger and spring may come off of the No. 1 chain tensioner assembly body, but this is not a malfunction.**

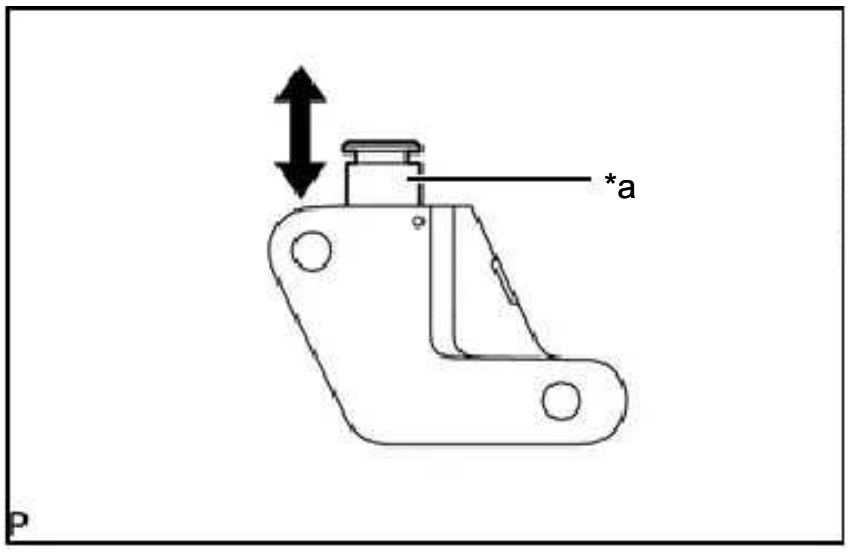
- **Before installing the plunger and spring to the No. 1 chain tensioner assembly body, check that they are free of foreign matter and not damaged.**



A347238C01

*a	No. 1 Chain Tensioner Assembly Body
*b	Spring
*c	Plunger

a. Push the plunger and check that it moves smoothly.
If necessary, replace the No. 1 chain tensioner assembly.

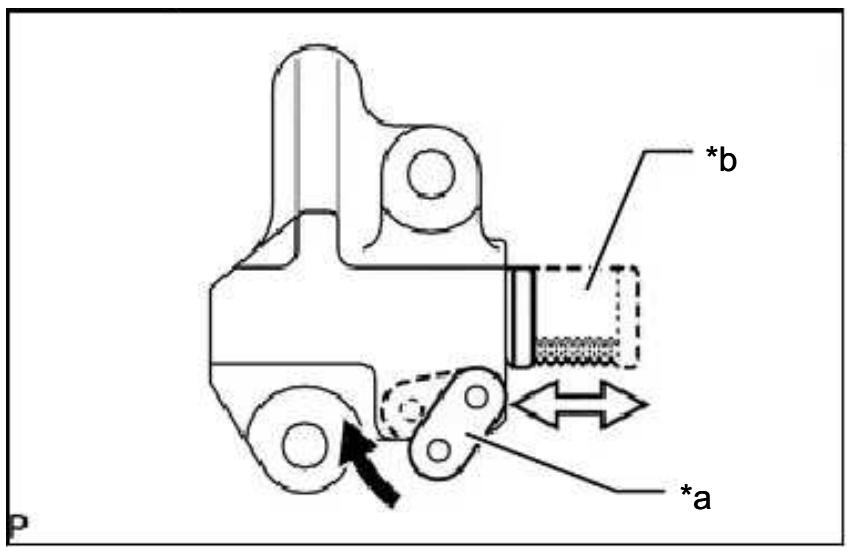


A346658C01

*a	Plunger

4. INSPECT NO. 2 CHAIN TENSIONER ASSEMBLY

a. Move the stopper plate upward to release the lock. Push the plunger and check that it moves smoothly.
If necessary, replace the No. 2 chain tensioner assembly.



A345792C01

*a	Stopper Plate
*b	Plunger

b	Plunger

5. INSPECT CAMSHAFT TIMING SPROCKET

a. Wrap the No. 2 chain sub-assembly around the camshaft timing sprocket.

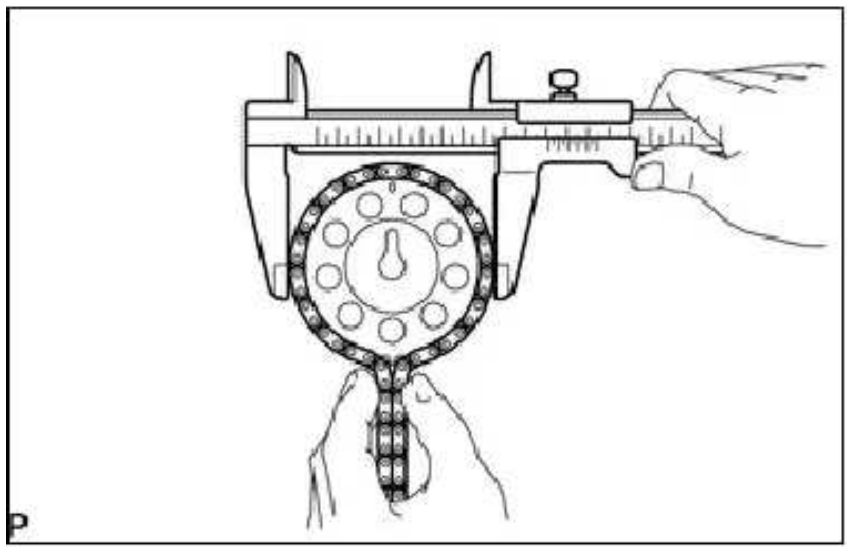
b. Using a vernier caliper, measure the camshaft timing sprocket diameter with the No. 2 chain sub-assembly.

Minimum sprocket with chain diameter:
97.79 mm (3.85 in.)

If the diameter is less than the minimum, replace the No. 2 chain sub-assembly and camshaft timing sprocket.

HINT:

The vernier caliper must contact the No. 2 chain sub-assembly rollers for the measurement.



A345793

6. INSPECT CRANKSHAFT TIMING SPROCKET

a. Wrap the No. 1 chain sub-assembly around the crankshaft timing sprocket.

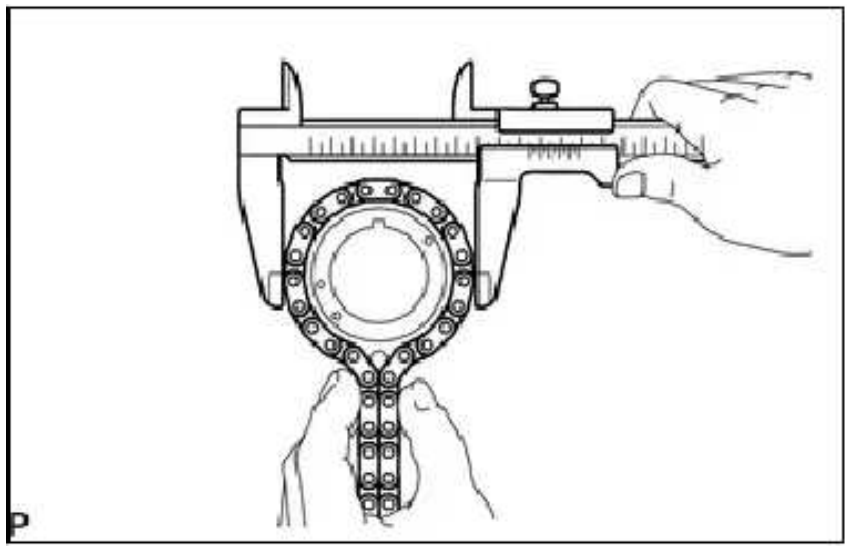
b. Using a vernier caliper, measure the crankshaft timing sprocket diameter with the No. 1 chain sub-assembly.

Minimum sprocket with chain diameter:
71.26 mm (2.81 in.)

If the diameter is less than the minimum, replace the No. 1 chain sub-assembly and crankshaft timing sprocket.

HINT:

The vernier caliper must contact the No. 1 chain sub-assembly rollers for the measurement.



A345794

7. INSPECT INJECTION PUMP DRIVE GEAR

a. for No. 1 Chain Sub-assembly Side:

i. Wrap the No. 1 chain sub-assembly around the injection pump drive gear.

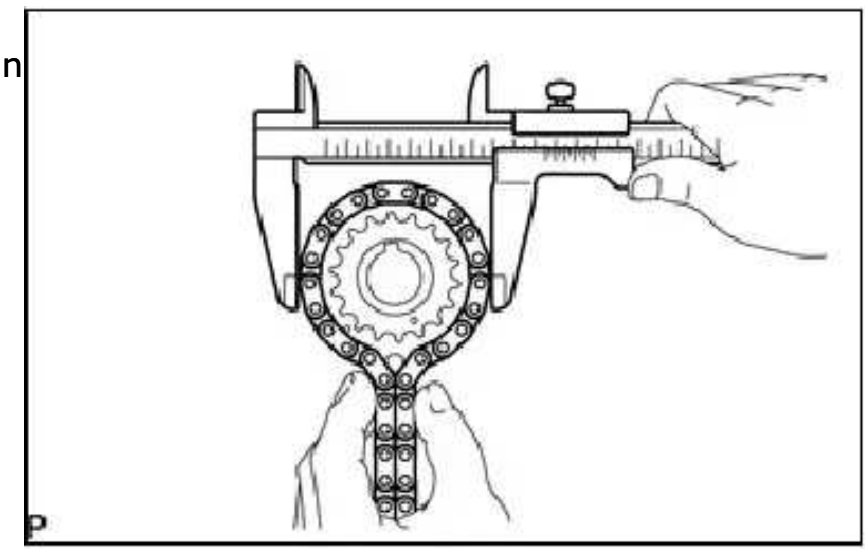
ii. Using a vernier caliper, measure the injection pump drive gear diameter with the No. 1 chain sub-assembly.

Minimum gear with chain diameter:
71.26 mm (2.81 in.)

If the diameter is less than the minimum, replace the No. 1 chain sub-assembly and injection pump drive gear.

HINT:

The vernier caliper must contact the No. 1 chain sub-assembly rollers for the measurement.



A345796

b. for No. 2 Chain Sub-assembly Side:

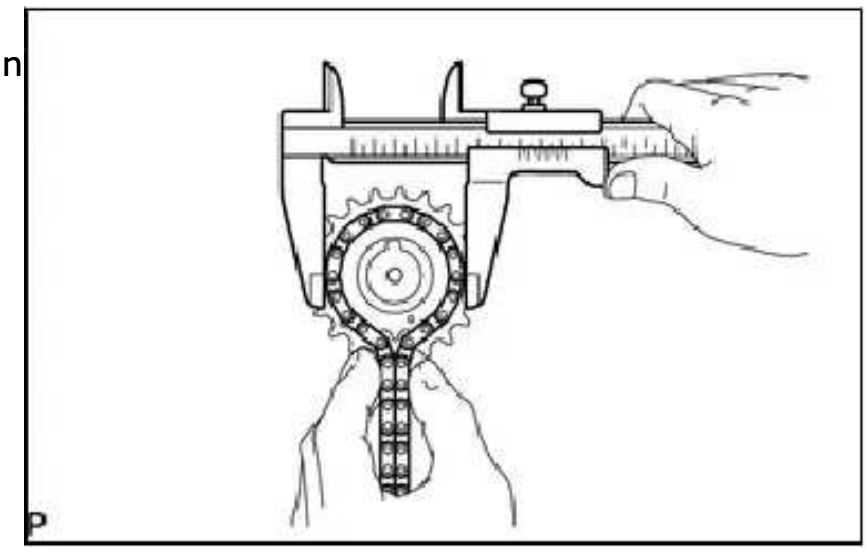
ii. Using a vernier caliper, measure the injection pump drive gear diameter with the No. 2 chain sub-assembly.

Minimum gear with chain diameter:
52.32 mm (2.06 in.)

If the diameter is less than the minimum, replace the No. 2 chain sub-assembly and injection pump drive gear.

HINT:

The vernier caliper must contact the No. 2 chain sub-assembly rollers for the measurement.



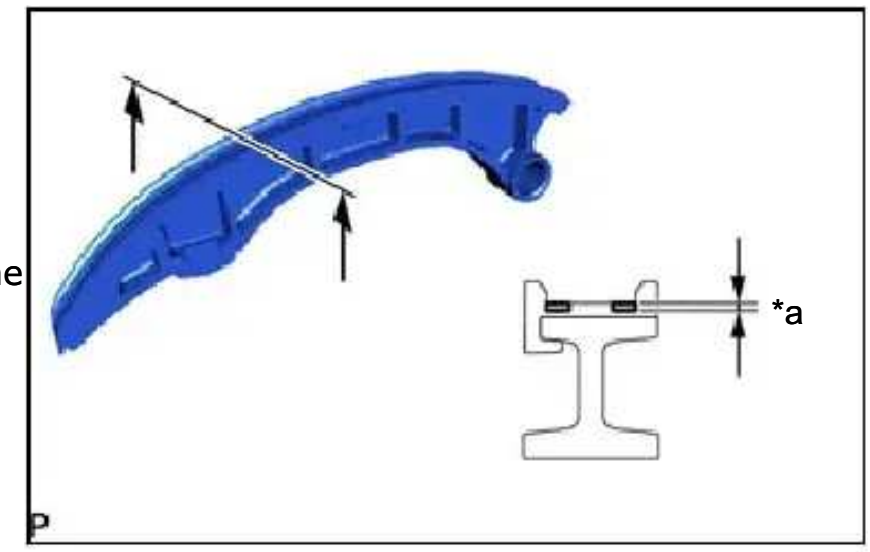
A345795

8. INSPECT NO. 1 CHAIN TENSIONER SLIPPER

a. Measure the depth of wear of the No. 1 chain tensioner slipper.

Maximum depth:
1.0 mm (0.0394 in.)

If the depth is more than the maximum, replace the No. 1 chain tensioner slipper.



A345797C01

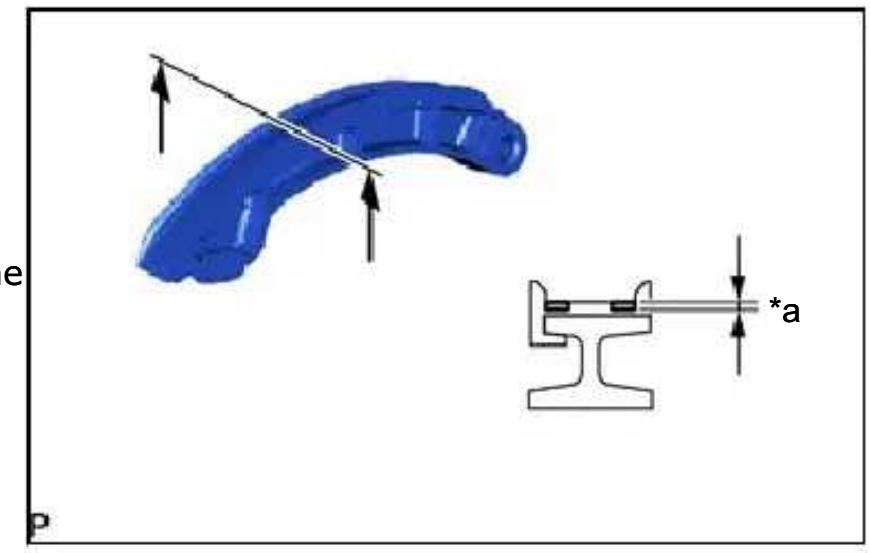
*a	Depth

9. INSPECT NO. 2 CHAIN TENSIONER SLIPPER

a. Measure the depth of wear of the No. 2 chain tensioner slipper.

Maximum depth:
1.0 mm (0.0394 in.)

If the depth is more than the maximum, replace the No. 2 chain tensioner slipper.



A345798C01

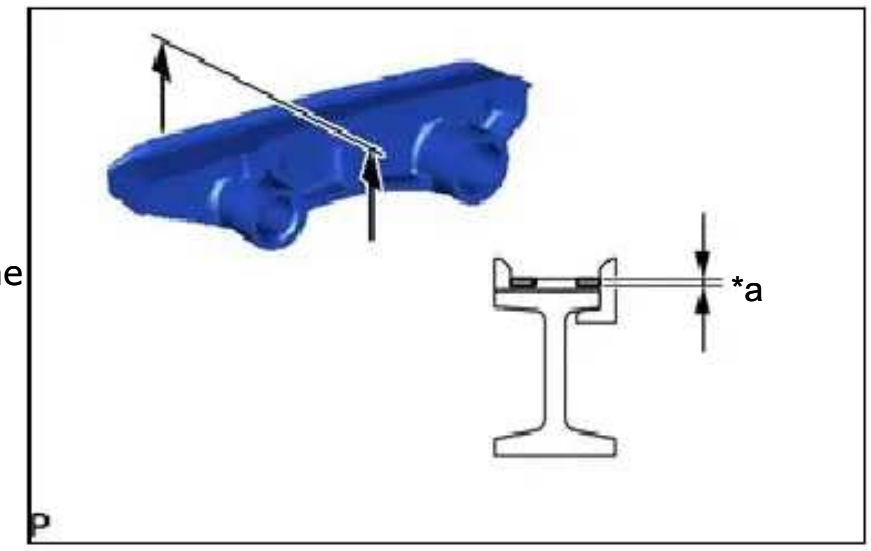
*a	Depth

10. INSPECT NO. 1 CHAIN VIBRATION DAMPER

a. Measure the depth of wear of the No. 1 chain vibration damper.

Maximum depth:
1.0 mm (0.0394 in.)

If the depth is more than the maximum, replace the No. 1 chain vibration damper.



A345799C01

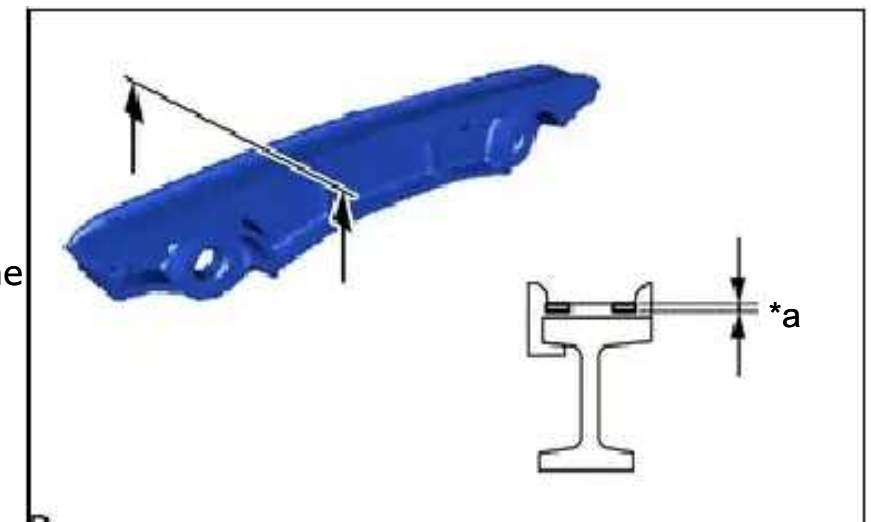
*a	Depth

11. INSPECT NO. 2 CHAIN VIBRATION DAMPER

a. Measure the depth of wear of the No. 2 chain vibration damper.

Maximum depth:
1.0 mm (0.0394 in.)

If the depth is more than the maximum, replace the No. 2 chain vibration damper.



A345800C01

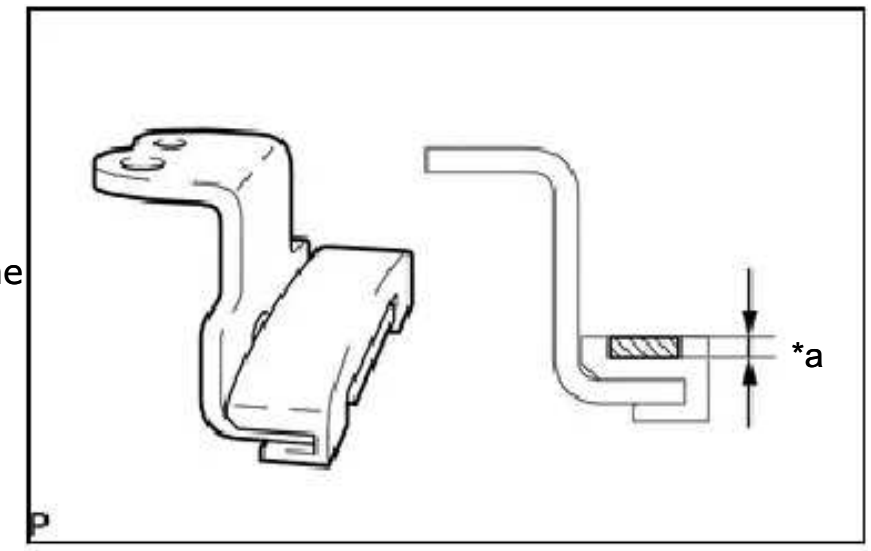
*a	Depth

12. INSPECT TIMING CHAIN GUIDE

a. Measure the depth of wear of the timing chain guide.

Maximum depth:
1.0 mm (0.0394 in.)

If the depth is more than the maximum, replace the timing chain guide.



A343586C01

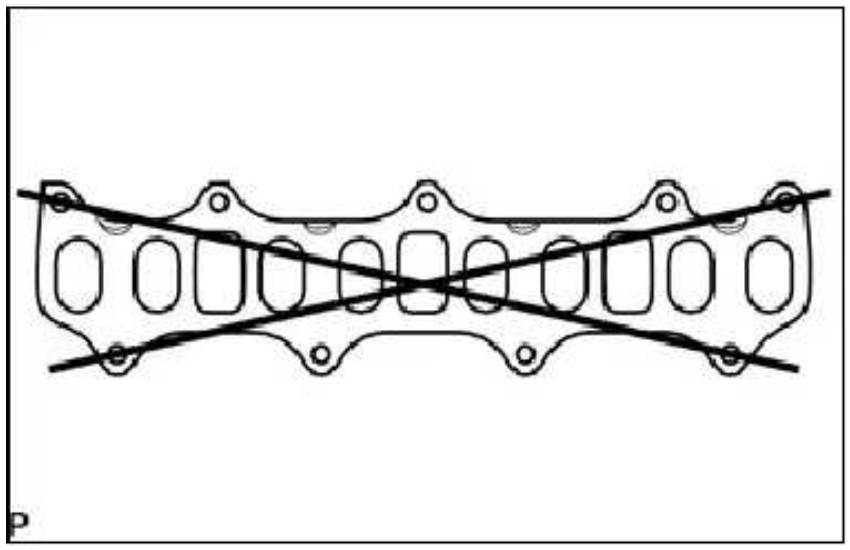
*a	Depth

13. INSPECT INTAKE MANIFOLD

a. Using a precision straightedge and feeler gauge, measure the warpage of the surface where the intake manifold contacts the cylinder head sub-assembly.

Maximum warpage:
0.10 mm (0.00394 in.)

If the warpage is more than the maximum, replace the intake manifold.



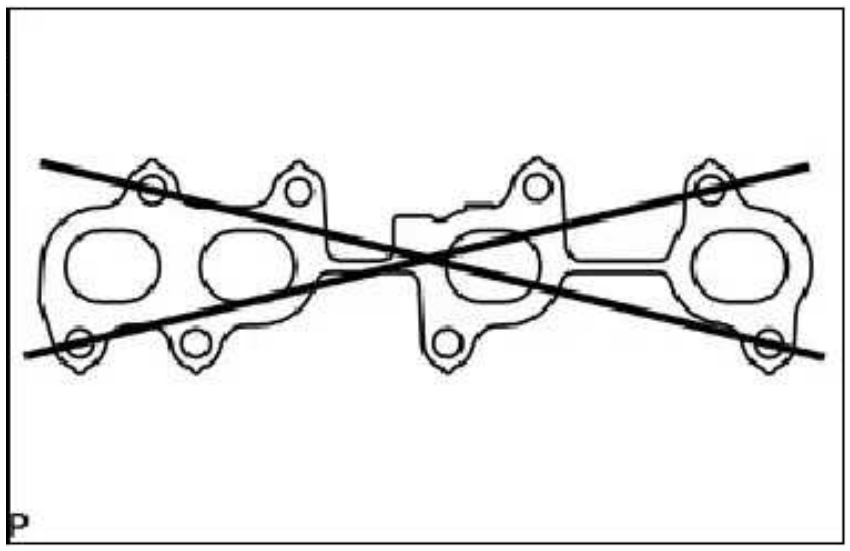
A345801

14. INSPECT EXHAUST MANIFOLD

a. Using a precision straightedge and feeler gauge, measure the warpage of the surface where the exhaust manifold contacts the cylinder head sub-assembly.

Maximum warpage:
0.10 mm (0.00394 in.)

If the warpage is more than the maximum, replace the exhaust manifold.



15. INSPECT CAMSHAFT

a. Inspect the camshaft runout.

i. Place the camshaft on V-blocks.

ii. Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:
0.03 mm (0.00118 in.)

If the circle runout is more than the maximum, replace the camshaft.

HINT:

Check the oil clearance after replacing the camshaft.

b. Inspect the cam lobes.

i. Using a micrometer, measure the cam lobe height.

Standard cam lobe height:
41.425 to 41.525 mm (1.631 to 1.635 in.)

Minimum cam lobe height:
41.375 mm (1.629 in.)

If the cam lobe height is less than the minimum, replace the camshaft.

c. Inspect the camshaft journals.

i. Using a micrometer, measure the journal diameter.

Standard Journal Diameter:

Item	Specified Condition
No. 1 journal	34.449 to 34.465 mm (1.356 to 1.357 in.)
Other journals	22.990 to 23.007 mm (0.905 to 0.906 in.)

If the journal diameter is not as specified, check the oil clearance.

16. INSPECT NO. 2 CAMSHAFT

a. Inspect the No. 2 camshaft runout.

i. Place the No. 2 camshaft on V-blocks.

ii. Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:
0.03 mm (0.00118 in.)

If the circle runout is more than the maximum, replace the No. 2 camshaft.

HINT:

Check the oil clearance after replacing the No. 2 camshaft.

b. Inspect the cam lobes.

i. Using a micrometer, measure the cam lobe height.

Standard cam lobe height:
41.694 to 41.794 mm (1.641 to 1.645 in.)

Minimum cam lobe height:
41.644 mm (1.640 in.)

If the cam lobe height is less than the minimum, replace the No. 2 camshaft.

c. Inspect the No. 2 camshaft journals.

i. Using a micrometer, measure the journal diameter.

Standard Journal Diameter:

Item	Specified Condition
No. 1 journal	34.449 to 34.465 mm (1.356 to 1.357 in.)
Other journals	22.990 to 23.007 mm (0.905 to 0.906 in.)

If the journal diameter is not as specified, check the oil clearance.

17. INSPECT CAMSHAFT OIL CLEARANCE

a. Clean the No. 1 camshaft bearing cap, No. 2 camshaft bearing caps, camshaft journals and No. 2 camshaft journals.

b. Place the camshaft and No. 2 camshaft on the cylinder head sub-assembly.

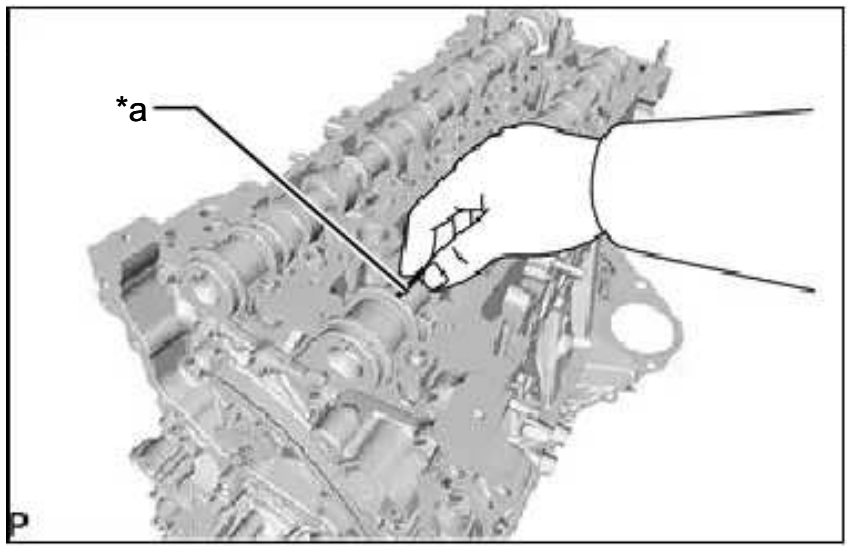
c. Lay a strip of Plastigage across each of the camshaft journals.

d. Install the No. 1 camshaft bearing cap and No. 2 camshaft bearing caps to the cylinder head sub-assembly.

Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE UNIT > REASSEMBLY > INSTALL NO. 1 AND NO. 2 CAMSHAFT BEARING CAP

NOTICE:

Do not turn the camshaft and No. 2 camshaft.



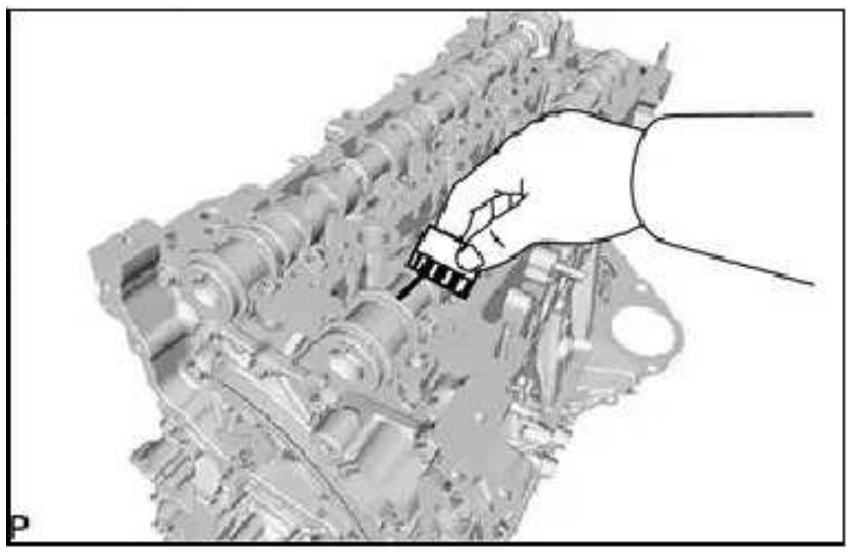
A347311C01

*a	Plastigage

e. Remove the No. 1 camshaft bearing cap and No. 2 camshaft bearing caps from the cylinder head sub-assembly.

Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE UNIT > DISASSEMBLY > REMOVE NO. 1 AND NO. 2 CAMSHAFT BEARING CAP

f. Measure the Plastigage at its widest point.



A347310

Standard Oil Clearance:

Item	Specified Condition
No. 1 journal	0.040 to 0.077 mm (0.00157 to 0.00303 in.)
Other journals	0.025 to 0.062 mm (0.000984 to 0.00244 in.)

Maximum Oil Clearance:

Item	Specified Condition
No. 1 journal	0.117 mm (0.00461 in.)
Other journals	0.102 mm (0.00402 in.)

If the camshaft oil clearance is more than the maximum, replace the camshaft. If necessary, replace the cylinder head sub-assembly.

g. Completely remove the Plastigage from the camshaft journals.

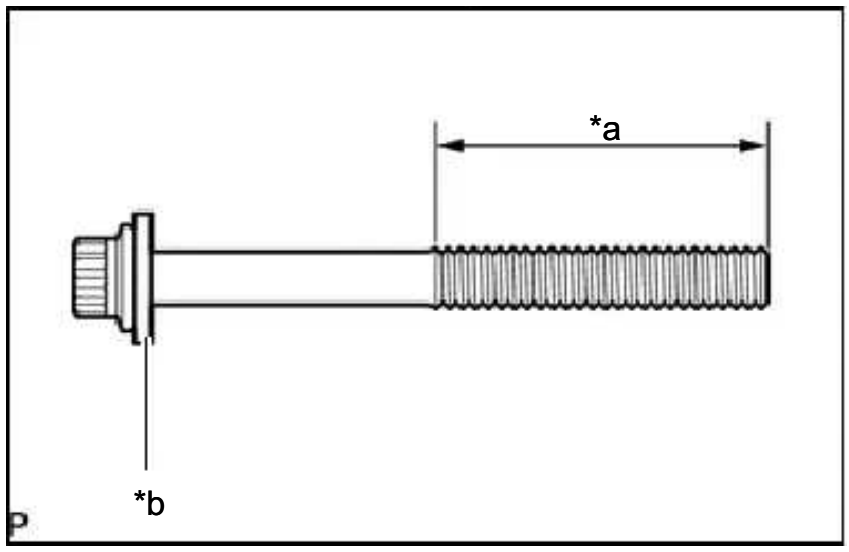
18. INSPECT CYLINDER HEAD SET BOLT

a. w/ Washer:

i. Using a vernier caliper, measure the thread outside diameter of the cylinder head set bolt.

Minimum diameter:
11.4 mm (0.449 in.)

If the diameter is less than the minimum, replace the cylinder head set bolt.



A345806C01

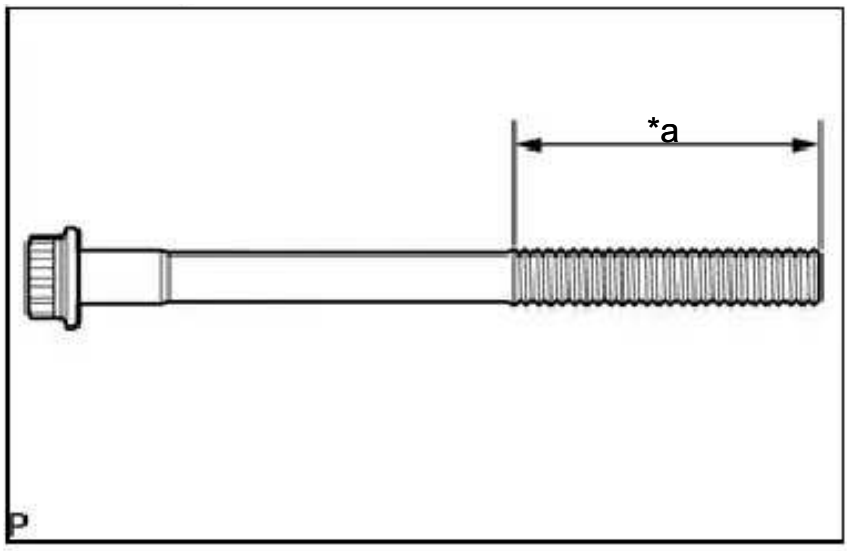
*a	Measuring Area
*b	Washer

b. w/o Washer:

i. Using a vernier caliper, measure the thread outside diameter of the cylinder head set bolt.

Minimum diameter:
12.8 mm (0.504 in.)

If the diameter is less than the minimum, replace the cylinder head set bolt and cylinder head set bolt spacer.



A345805C01

*a	Measuring Area

19. INSPECT NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

a. Turn the roller by hand and check that it turns smoothly.

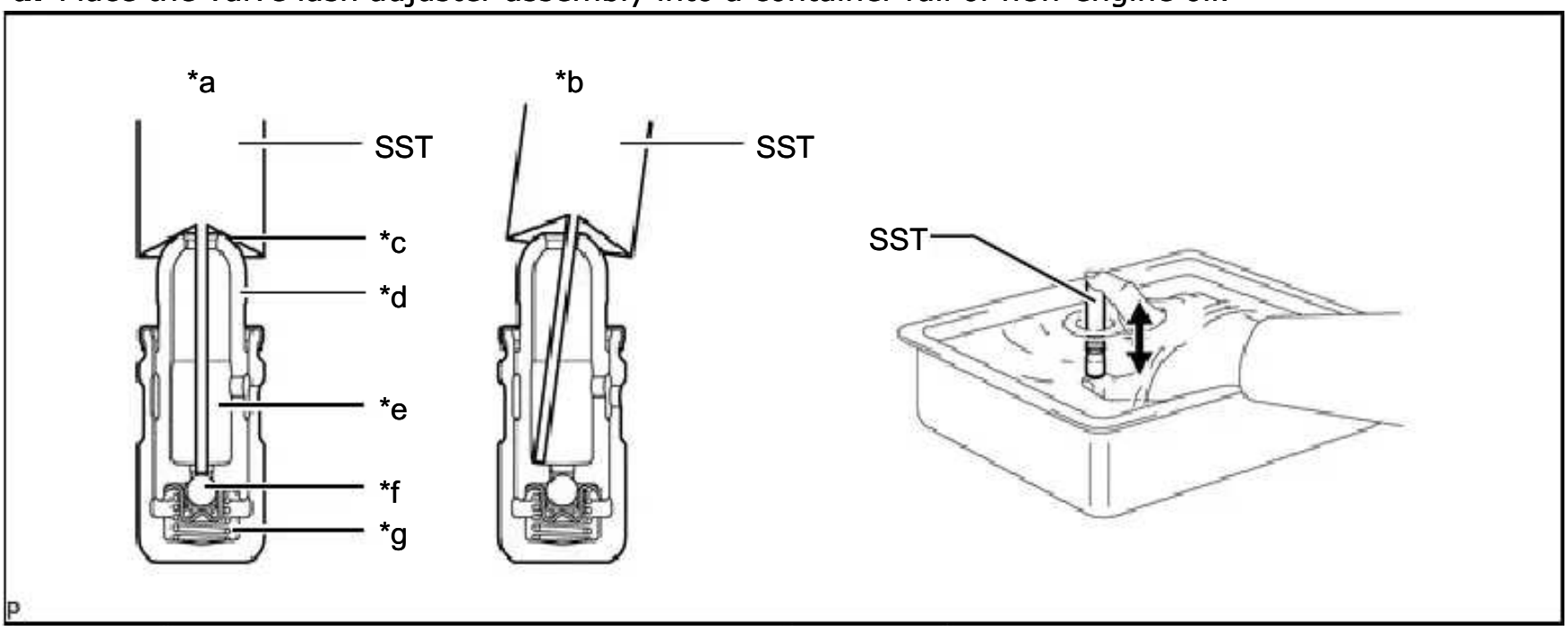
If the roller does not turn smoothly, replace the No. 1 valve rocker arm sub-assembly.

20. INSPECT VALVE LASH ADJUSTER ASSEMBLY

NOTICE:

- **Keep the adjuster free from dirt and foreign matter.**
- **Use only clean engine oil.**

a. Place the valve lash adjuster assembly into a container full of new engine oil.



A345808C01

*a	CORRECT	*b	INCORRECT
*c	Taper Part	*d	Plunger
*e	Low Pressure Chamber	*f	Check Ball
*g	High Pressure Chamber	-	-

b. Insert the tip of SST into the plunger and use the tip to press down on the check ball inside the plunger.

SST
09276-75010

c. Squeeze SST and the valve lash adjuster assembly together to move the plunger up and down 5 to 6 times.

d. Check the movement of the plunger and bleed air.

OK:

Plunger moves up and down.

NOTICE:

When bleeding high-pressure air from the compression chamber, make sure that the tip of SST is actually pressing the check ball as shown in the illustration. If the check ball is not pressed, air will not bleed.

e. After bleeding the air, remove SST. Then try to quickly and firmly press the plunger with your fingers.

OK:

Plunger is very difficult to move.

If the result is not as specified, replace the valve lash adjuster assembly.

ENGINE UNIT > REASSEMBLY

1. INSTALL STRAIGHT PIN

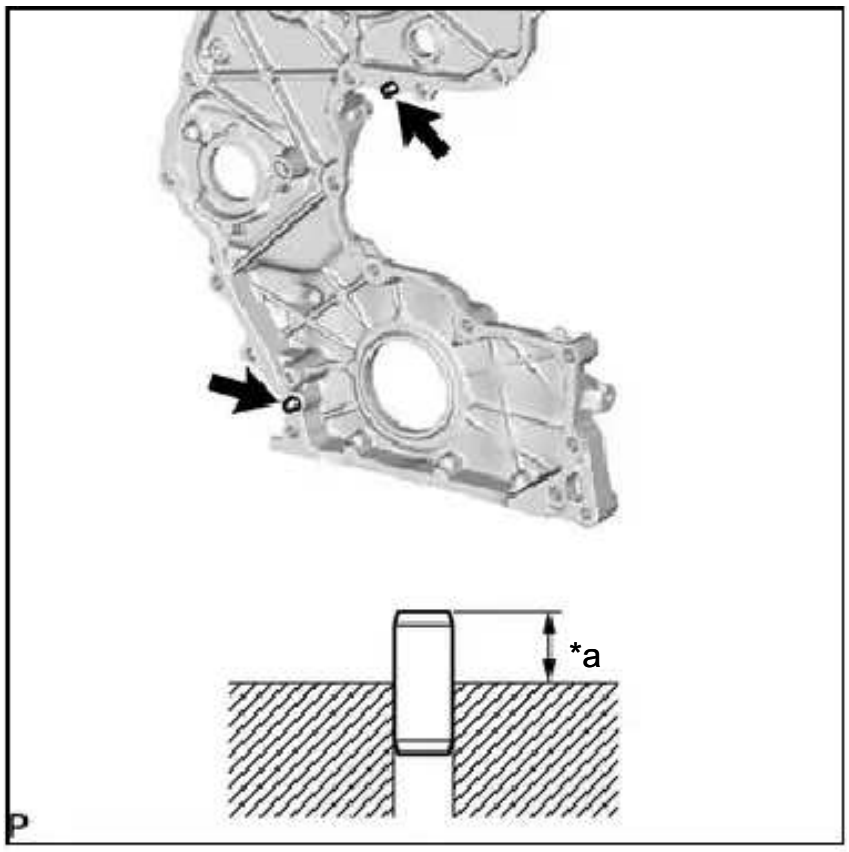
NOTICE:

It is not necessary to remove the straight pin unless it is being replaced.

a. for Timing Chain Cover Sub-assembly Side:

i. Using a plastic-faced hammer, tap in 2 new straight pins to the timing chain cover sub-assembly.

Standard protrusion height:
5.0 to 7.0 mm (0.197 to 0.276 in.)



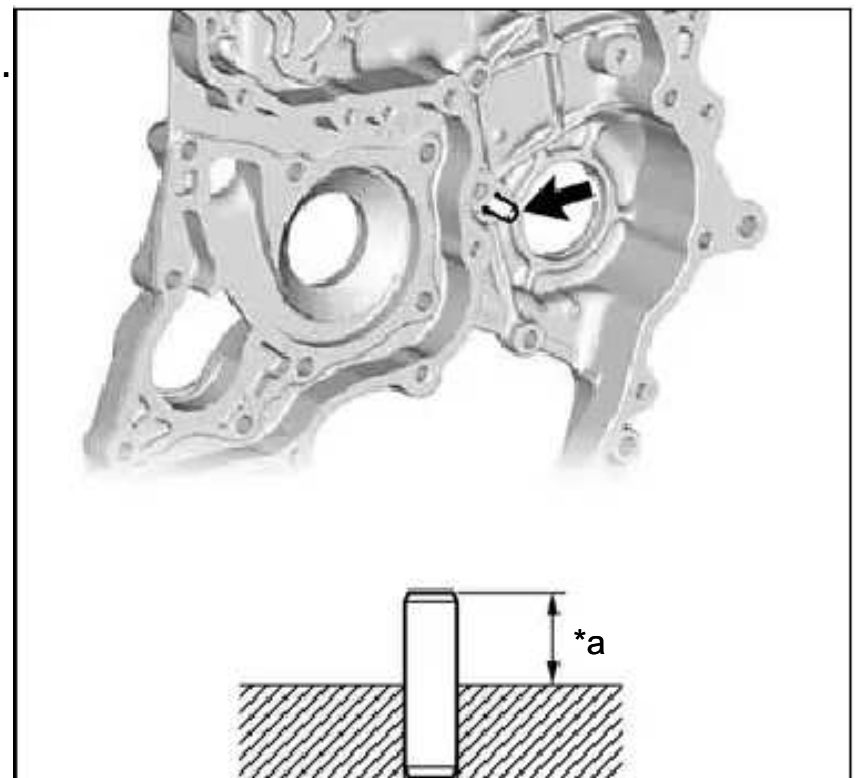
A343571C01

*a	Protrusion Height

b. for Timing Chain Case Assembly Side:

i. Using a plastic-faced hammer, tap in a new straight pin to the timing chain case assembly.

Standard protrusion height:
18 to 20 mm (0.709 to 0.787 in.)



A343556C01

*a	Protrusion Height

2. INSTALL STUD BOLT

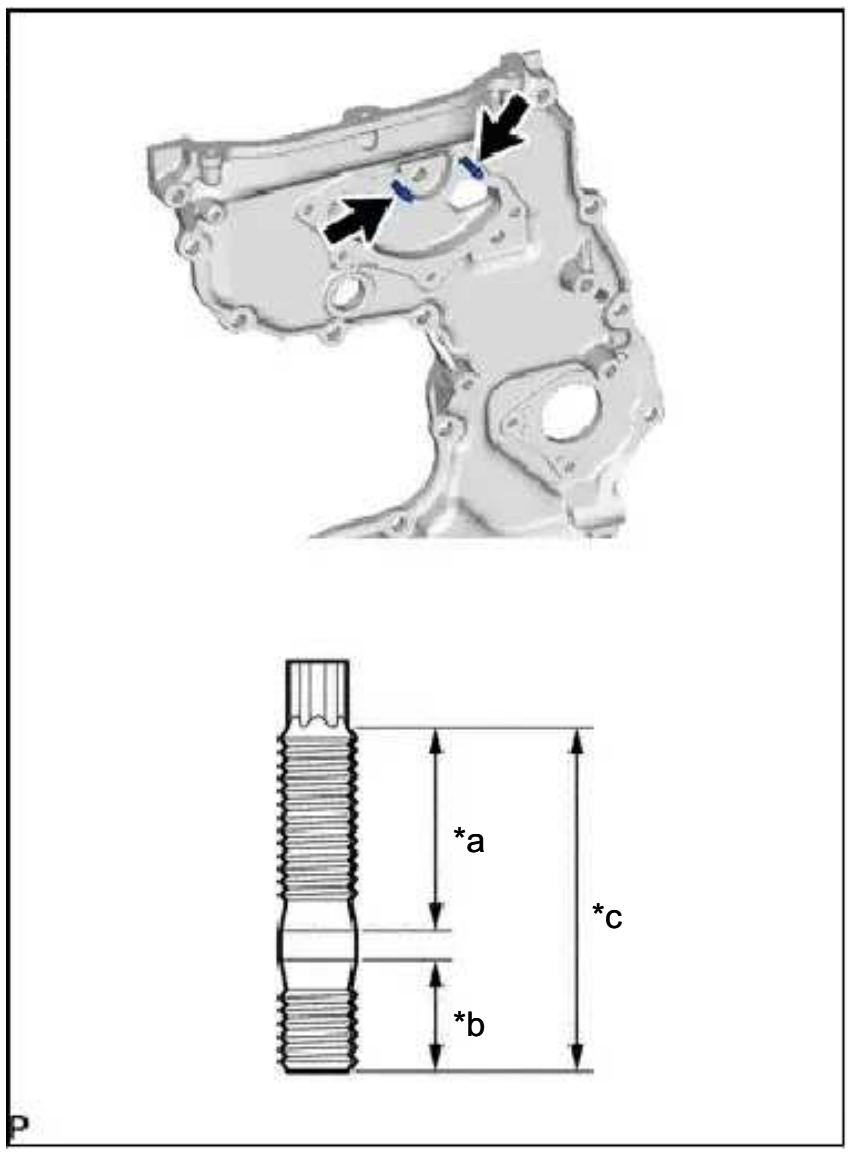
NOTICE:

If a stud bolt is deformed or its threads are damaged, replace it.

a. for Timing Chain Cover Sub-assembly Side:

i. Using an E6 "TORX" socket wrench, install the stud bolts to the timing chain cover sub-assembly.

Torque:
6.0 N*m (61 kgf*cm, 53 in.*lbf)



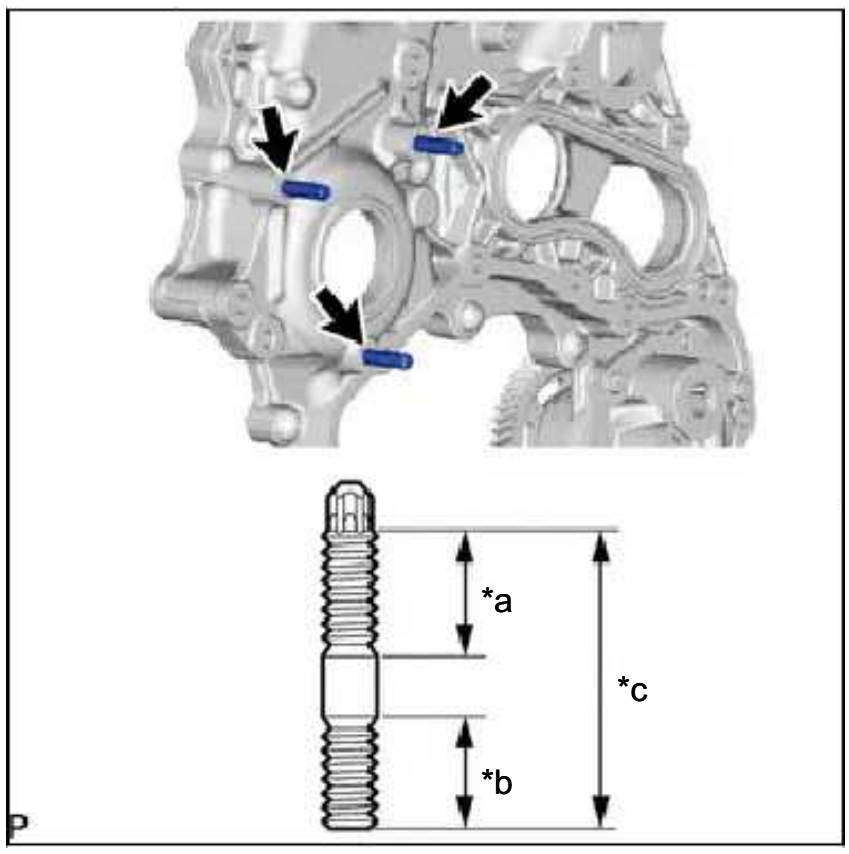
A343572C01

*a	16 mm (0.630 in.)
*b	9.0 mm (0.354 in.)
*c	27 mm (1.06 in.)

b. for Timing Chain Case Assembly Side:

i. Using an E8 "TORX" socket wrench, install the stud bolts to the timing chain case assembly.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)



A343557C01

*a	19 mm (0.748 in.)
*b	16 mm (0.630 in.)
*c	44 mm (1.73 in.)

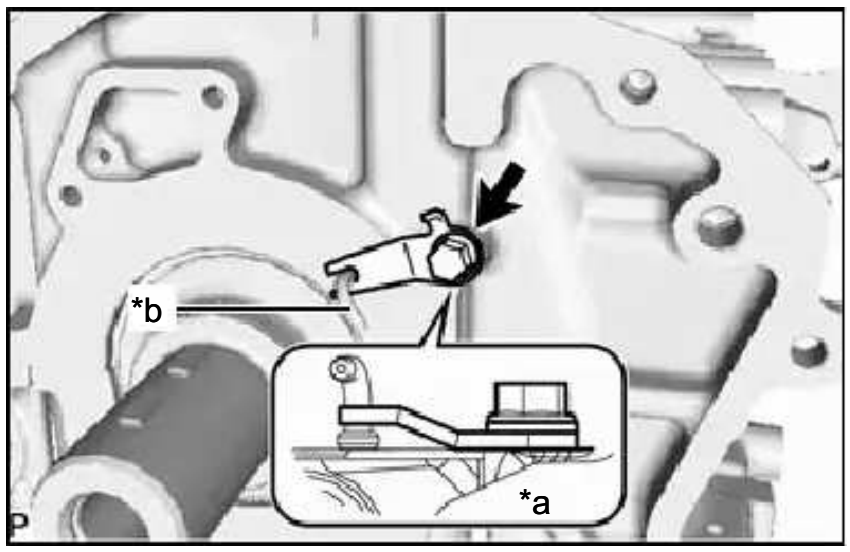
3. INSTALL LOCK PLATE

a. Install the lock plate with the bolt to the cylinder block sub-assembly.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

HINT:

- **Make sure the lock plate is facing the direction shown in the illustration.**
- **Make sure the end of the lock plate is holding the oil jet as shown in the illustration.**



A343552C01

*a	Cylinder Block Sub-assembly Side
*b	Oil Jet

4. INSTALL CYLINDER HEAD GASKET

Click here ENGINE MECHANICAL (2GD-FTV) > CYLINDER HEAD GASKET > INSTALLATION > INSTALL CYLINDER HEAD GASKET

5. INSTALL CYLINDER HEAD SUB-ASSEMBLY

Click here ENGINE MECHANICAL (2GD-FTV) > CYLINDER HEAD GASKET > INSTALLATION > INSTALL

6. INSTALL VALVE LASH ADJUSTER ASSEMBLY

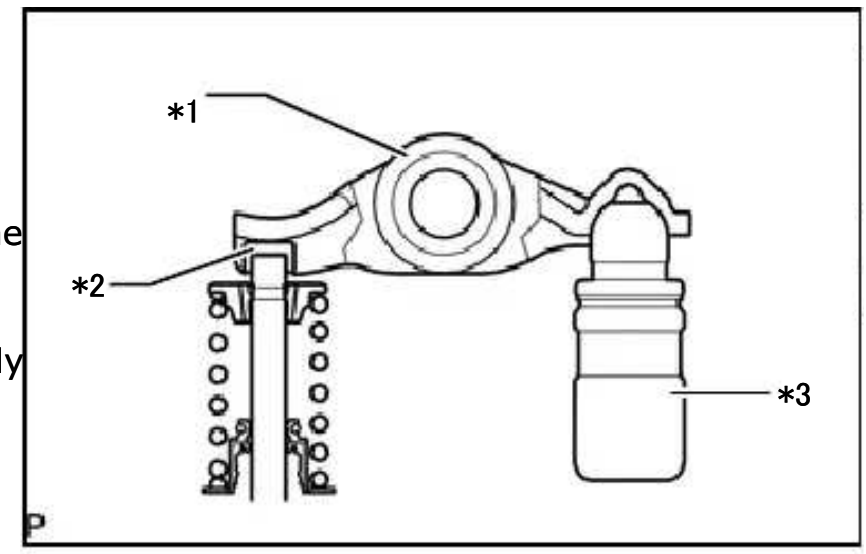
a. Install the 16 valve lash adjuster assemblies to the cylinder head sub-assembly.

7. INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

a. Check that the No. 1 valve rocker arm sub-assembly is firmly set to the valve lash adjuster assembly.

b. Apply a light coat of engine oil to the camshaft journals of the cylinder head sub-assembly and the thrust portion of the camshaft.

c. Install the 16 No. 1 valve rocker arm sub-assembly to the 16 valve lash adjuster assemblies.



A346673C01

*1	No. 1 Valve Rocker Arm Sub-assembly
*2	Valve Stem Cap
*3	Valve Lash adjuster assembly

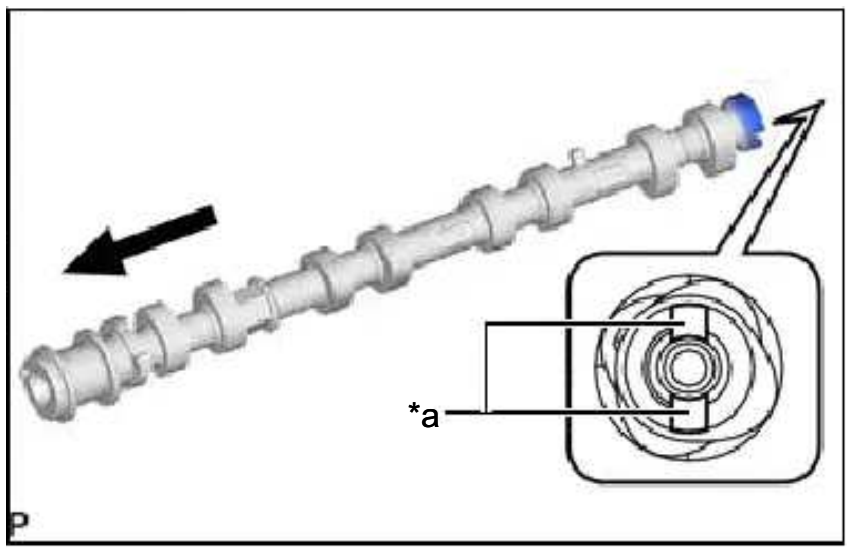
8. INSTALL NO. 2 CAMSHAFT

HINT:

Glove is at the rear end of the No. 2 camshaft.

a. Clean the No. 2 camshaft journals.

b. Apply a light coat of engine oil to the No. 2 camshaft journals of the cylinder head sub-assembly and the thrust portion of the No. 2 camshaft.



A343553C01

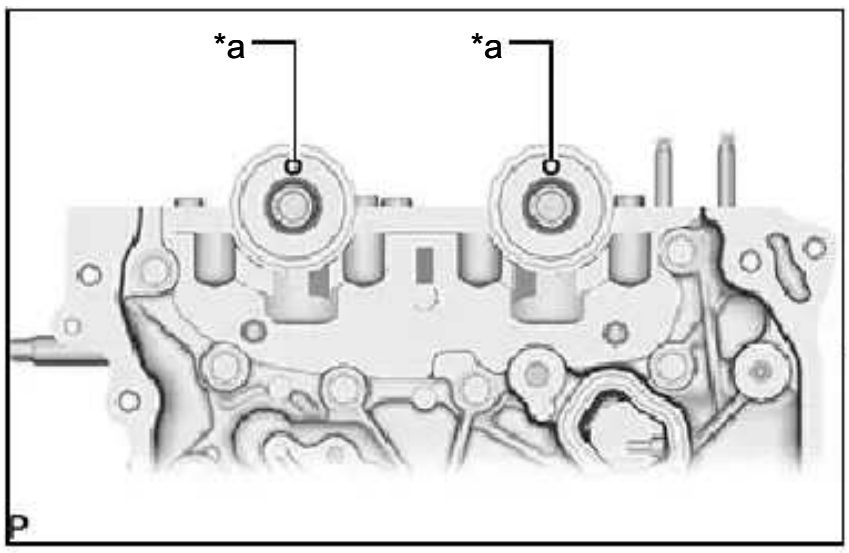
*a	Glove
➡	Engine Front Side

9. INSTALL CAMSHAFT

a. Clean the camshaft journals.

b. Apply a light coat of engine oil to the camshaft journals of the cylinder head sub-assembly and the thrust portion of the camshaft.

c. Make sure the knock pins of the camshaft and No. 2 camshaft are facing the direction shown in the illustration.



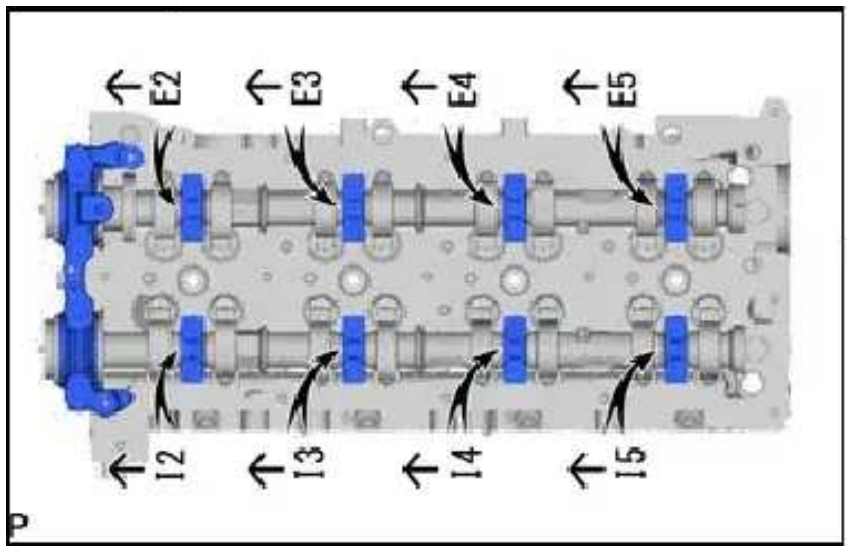
A343554C01

*a	Knock Pin

10. INSTALL NO. 1 AND NO. 2 CAMSHAFT BEARING CAP

a. Set the No. 1 camshaft bearing cap and 8 No. 2 camshaft bearing caps to the cylinder head sub-assembly as shown in the illustration.

b. Temporarily install the 20 camshaft bearing cap bolts.

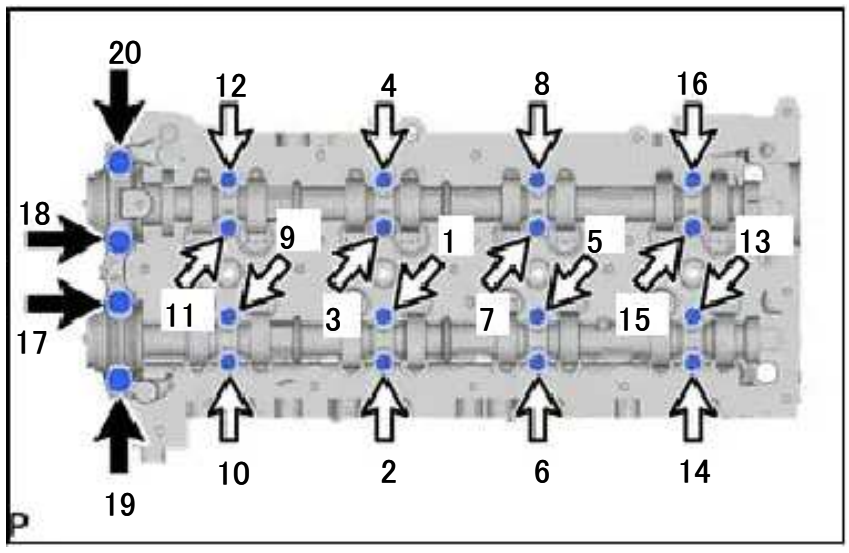


A347239

c. Uniformly tighten the 20 camshaft bearing cap bolts in several step in the order shown in the illustration.

Torque:
for camshaft bearing cap bolt A (No. 1 camshaft bearing)
21 N*m (214 kgf*cm, 15 ft.*lbf)

for camshaft bearing cap bolt B (No. 2 camshaft bearing)
10 N*m (102 kgf*cm, 7 ft.*lbf)



A347241C01

➡	Camshaft Bearing Cap Bolt A

⇨	Camshaft Bearing Cap Bolt B

11. INSTALL NO. 3 CAMSHAFT BEARING CAP

a. Clean and degrease the contact surfaces of the No. 3 camshaft bearing cap and cylinder head sub-assembly.

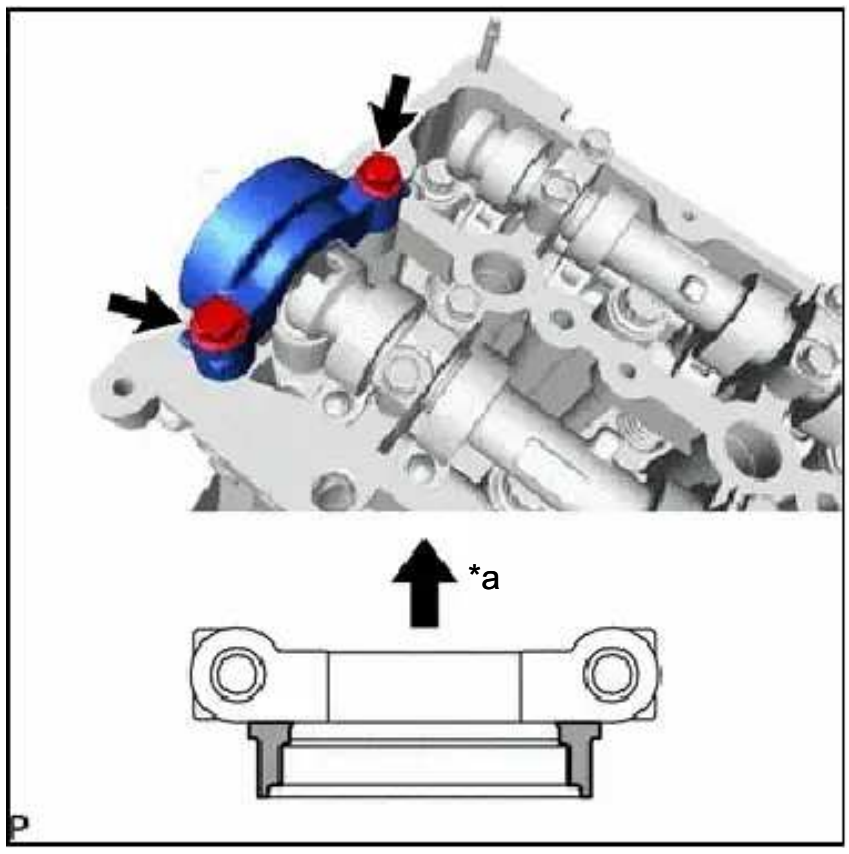
b. Apply seal packing to the No. 3 camshaft bearing cap in the areas indicated in the illustration.

Seal packing:
Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

Standard seal diameter:
3.0 mm (0.118 in.)

NOTICE:

- **Install the No. 3 camshaft bearing cap within 3 minutes and tighten the camshaft bearing cap bolts within 15 minutes after applying seal packing.**
- **Do not add engine oil within 2 hours of installation.**
- **Do not start the engine for at least 2 hours after the installation.**



A343555C01

*a	Engine Front Side
▭	Seal Packing Application Area

c. Install the No. 3 camshaft bearing cap with the 2 camshaft bearing cap bolts to the cylinder head sub-assembly.

Torque:
21 N*m (214 kgf*cm, 15 ft.*lbf)

d. Wipe off excess seal packing from between No. 3 camshaft bearing cap and cylinder head sub-assembly.

12. INSTALL TIMING CHAIN CASE ASSEMBLY AND ENGINE WATER PUMP ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PUMP > INSTALLATION > INSTALL TIMING CHAIN CASE ASSEMBLY AND ENGINE WATER PUMP ASSEMBLY

13. INSTALL INJECTION PUMP INSULATOR

a. Install the injection pump insulator to the cylinder block sub-assembly.

14. INSTALL SUPPLY PUMP ASSEMBLY

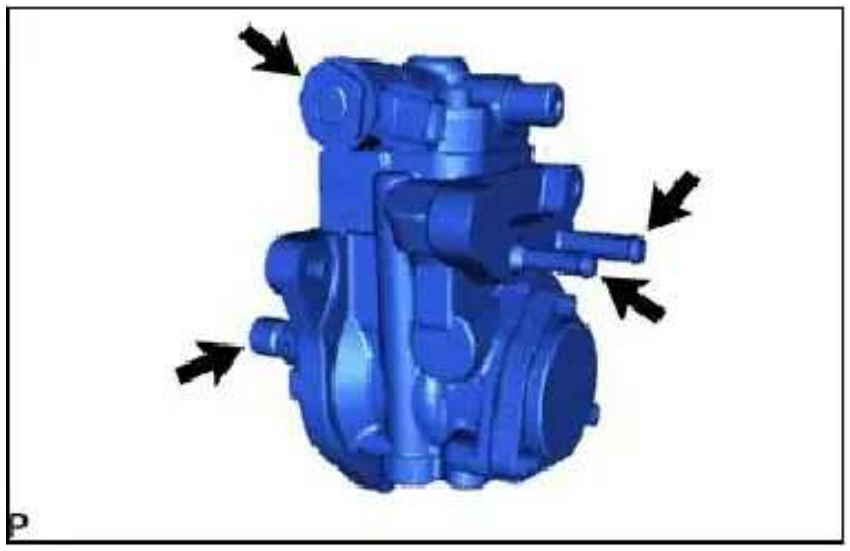
NOTICE:

Do not hold the supply pump assembly by the parts indicated by the arrows in the illustration.

a. Install a new O-ring to the supply pump assembly.

b. Install the supply pump assembly with the 3 nuts to the timing chain case assembly.

Torque:
21 N*m (214 kgf*cm, 15 ft.*lbf)



A347307

15. INSTALL NO. 1 CHAIN TENSIONER SLIPPER

a. Install the No. 1 chain tensioner slipper to the straight pin.

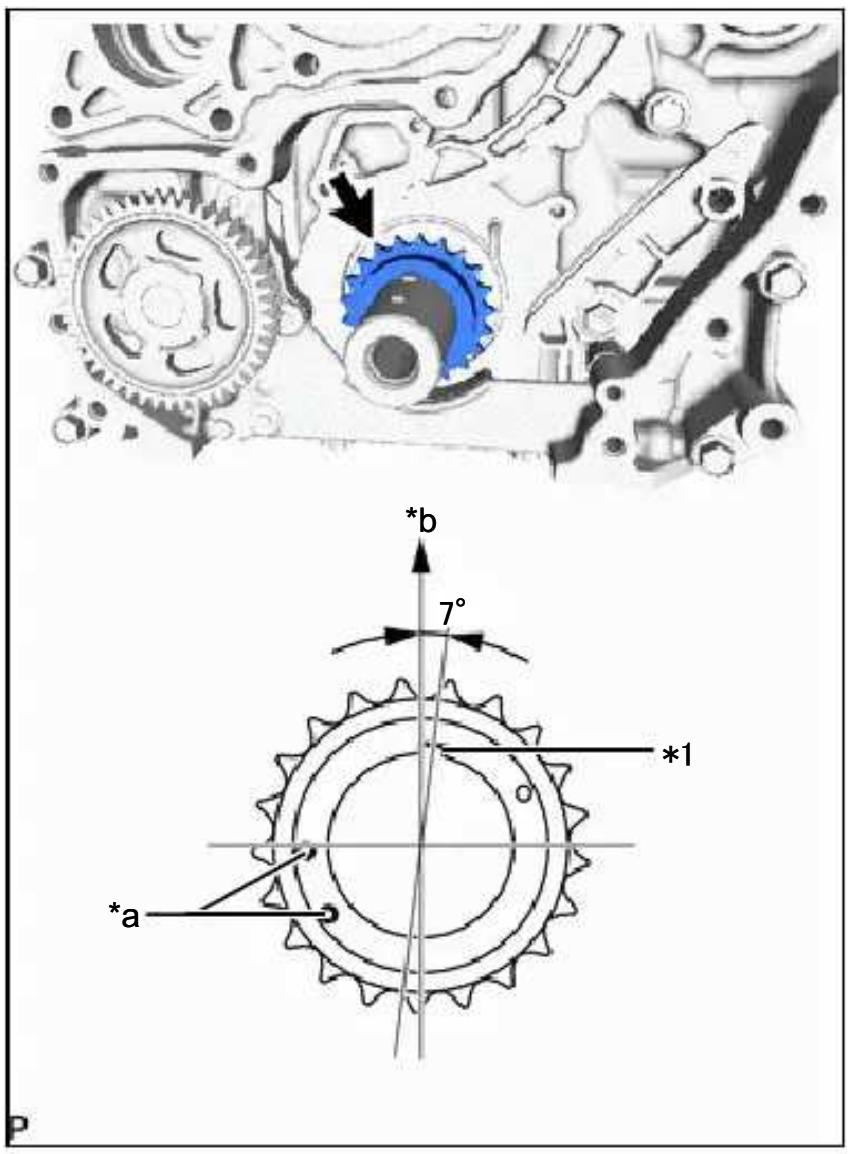
16. TEMPORARILY INSTALL NO. 1 CHAIN VIBRATION DAMPER

a. Temporarily install the No. 1 chain vibration damper with the bolt to the cylinder block sub-assembly.

17. INSTALL CRANKSHAFT TIMING SPROCKET, INJECTION PUMP DRIVE GEAR WITH NO. 1 CHAIN SUB-ASSEMBLY

a. Install the crankshaft timing sprocket to the crankshaft.

b. Align the crankshaft pulley set key as shown in the illustration.

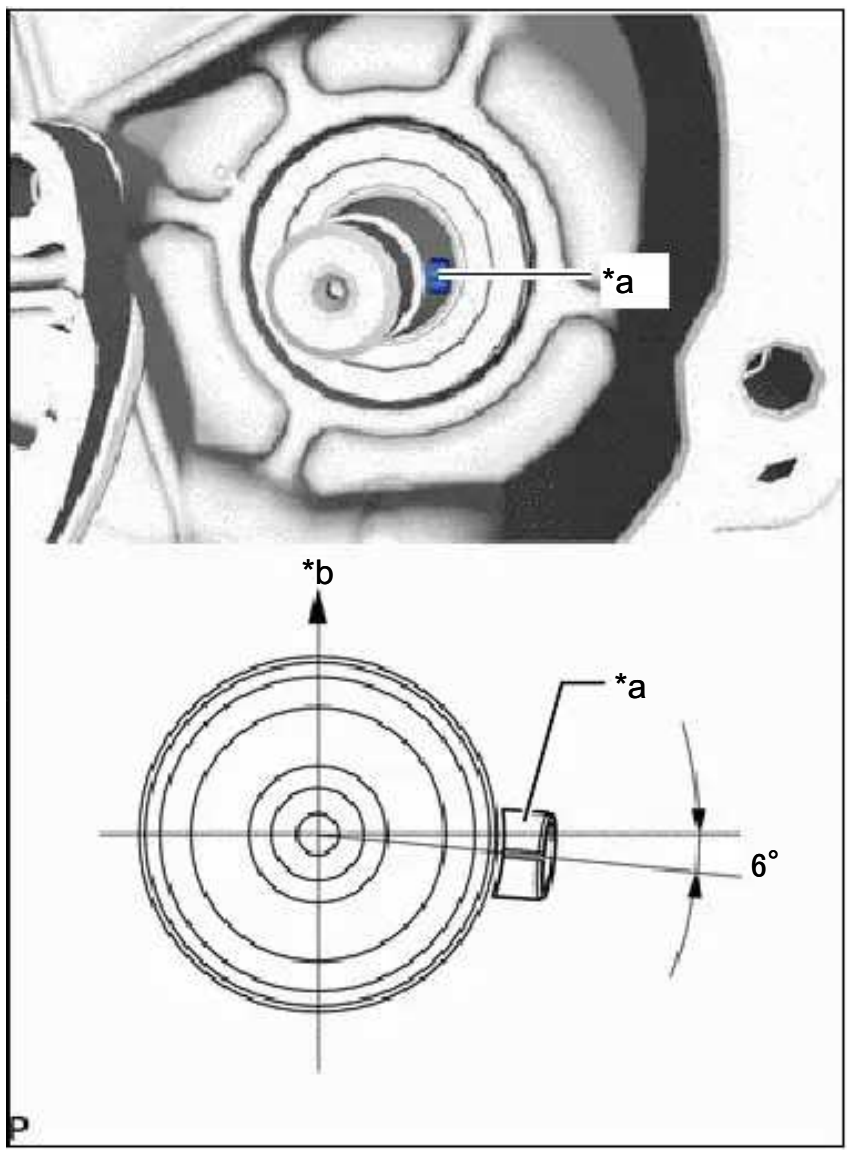


A343558C01

*1	Crankshaft Pulley Set Key
*a	Timing Mark
*b	Upper Side

c. Align the supply pump shaft key as shown in the illustration.

d. Remove the crankshaft timing sprocket from the crankshaft.



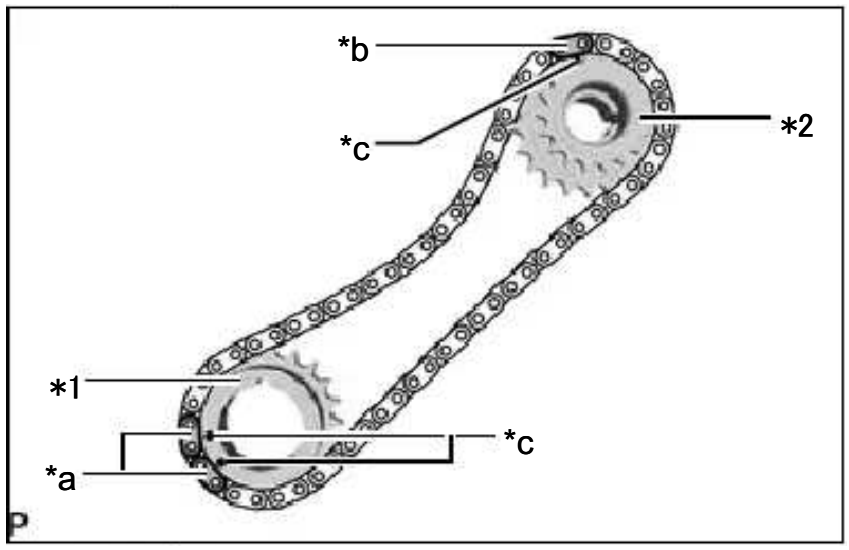
A343559C01

*a	Supply Pump Shaft Key
*b	Upper Side

e. Align the 2 mark plates (pink) of the No. 1 chain sub-assembly with the 2 timing marks of the crankshaft timing sprocket and install the No. 1 chain sub-assembly to the crankshaft timing sprocket as shown in the illustration.

f. Align the mark plate (yellow) of the No. 1 chain sub-assembly with the timing mark of the injection pump drive gear and install the No. 1 chain sub-assembly to the injection pump drive gear as shown in the illustration.

g. Install the crankshaft timing sprocket, injection pump drive gear and No. 1 chain sub-assembly to the crankshaft and supply pump shaft together.



A343560C01

*1	Crankshaft Timing Sprocket
*2	Injection Pump Drive Gear
*a	Mark Plate (Pink)
*b	Mark Plate (Yellow)
*c	Timing Mark

18. TIGHTEN NO. 1 CHAIN VIBRATION DAMPER

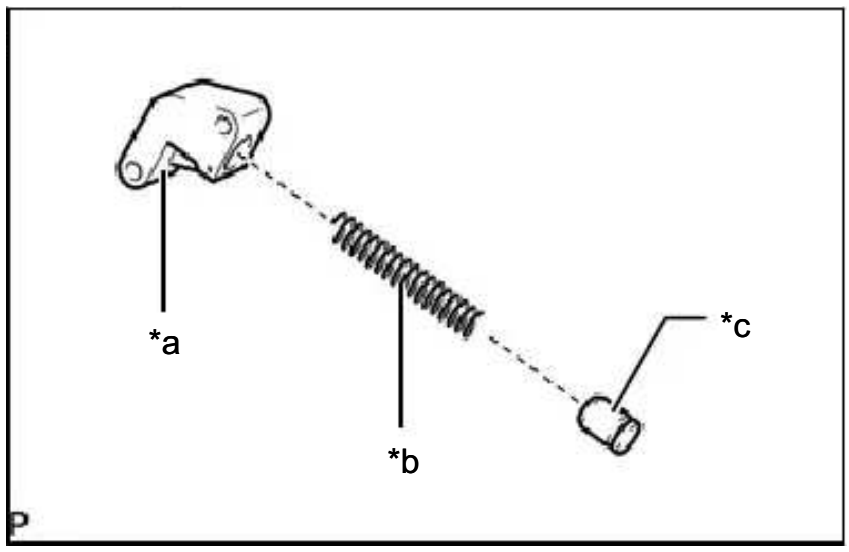
a. Tighten the No. 1 chain vibration damper with the bolt to the cylinder block sub-assembly.

Torque:
21 N*m (214 kgf*cm, 15 ft.*lbf)

19. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY

NOTICE:

- **When the pin is removed from the No. 1 chain tensioner assembly, the plunger and spring may come off of the No. 1 chain tensioner assembly body, but this is not a malfunction.**
- **Before installing the plunger and spring to the No. 1 chain tensioner assembly body, check that they are free of foreign matter and not damaged.**



A347238C01

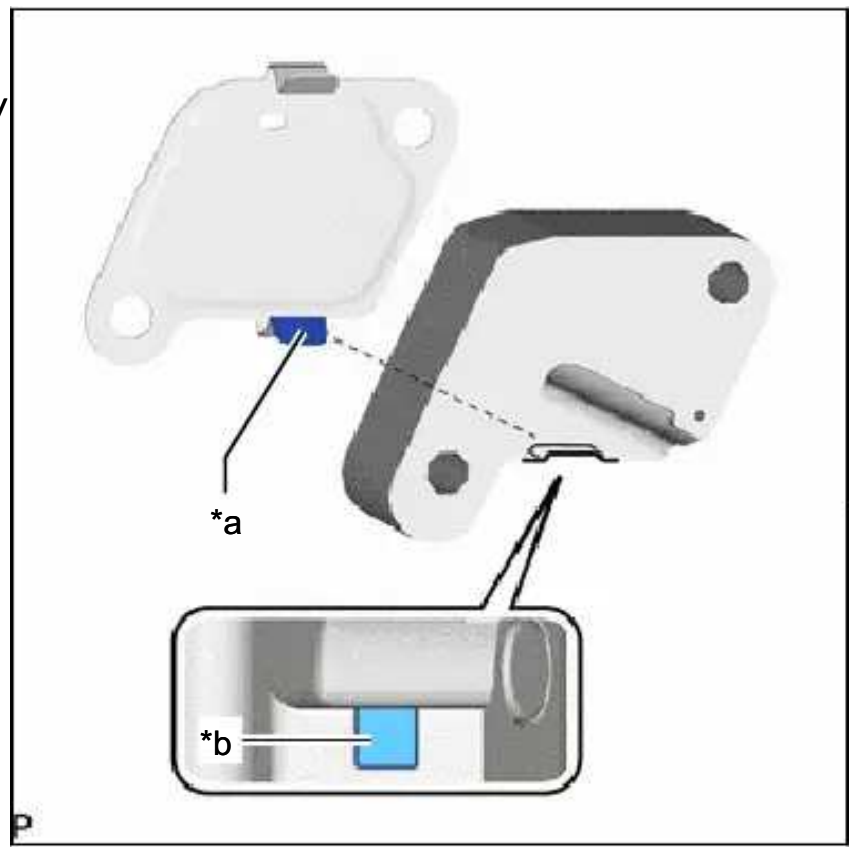
*a	No. 1 Chain Tensioner Assembly Body
*b	Spring
*c	Plunger

a. Install a new gasket and No. 1 chain tensioner assembly with the 2 bolts to the cylinder block sub-assembly.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

HINT:

Align the claw (lower side) of the gasket with the groove of the No. 1 chain tensioner assembly body to install the No. 1 chain tensioner assembly as shown in the illustration.



A343561C01

*a	Claw (Lower Side)
*b	Groove

20. INSTALL SUPPLY PUMP SHAFT NUT

a. Temporarily install the crankshaft pulley and crankshaft pulley set bolt to the crankshaft.

b. Using SST, hold the crankshaft pulley and install the supply pump shaft nut to the supply pump shaft.

SST

09213-58014 (91551-80840)

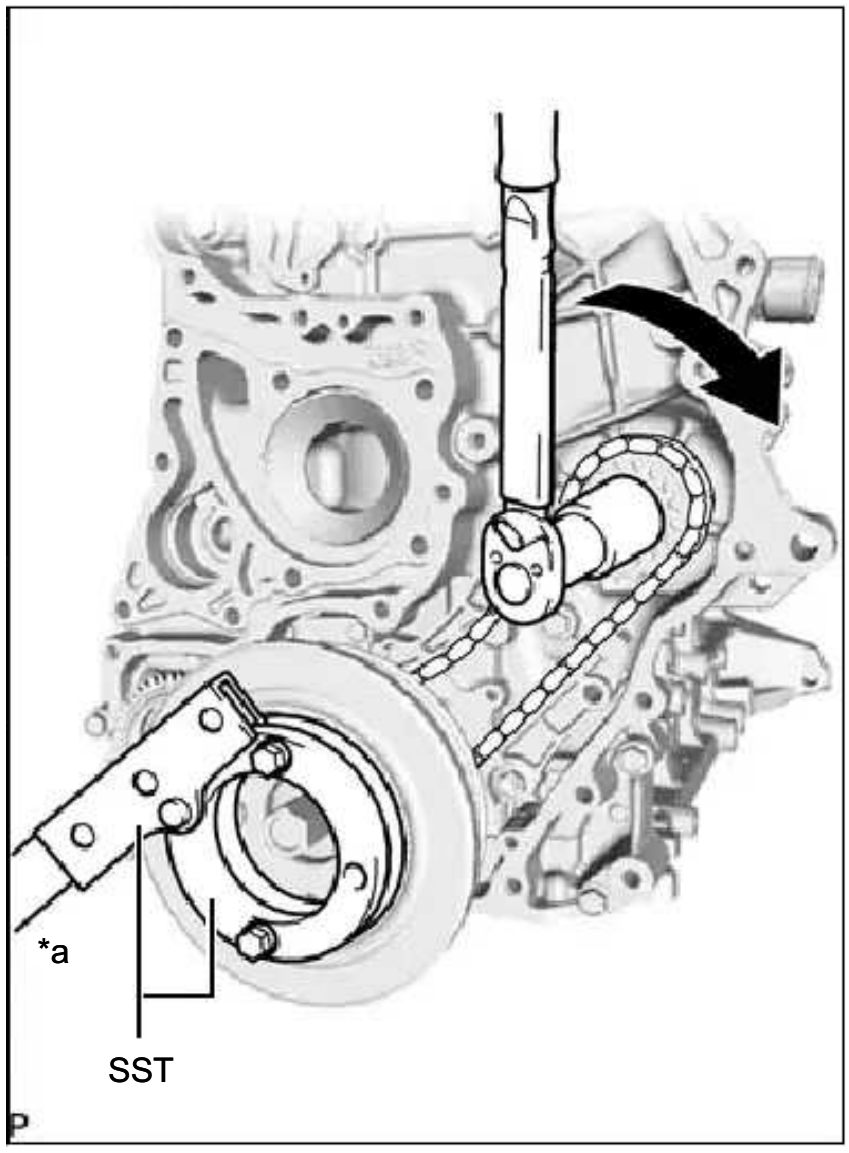
09330-00021

Torque:

137 N*m (1397 kgf*cm, 101 ft.*lbf)

NOTICE:

If the supply pump shaft nut is tightened with torque higher than the specified torque, the No. 1 chain sub-assembly may break.



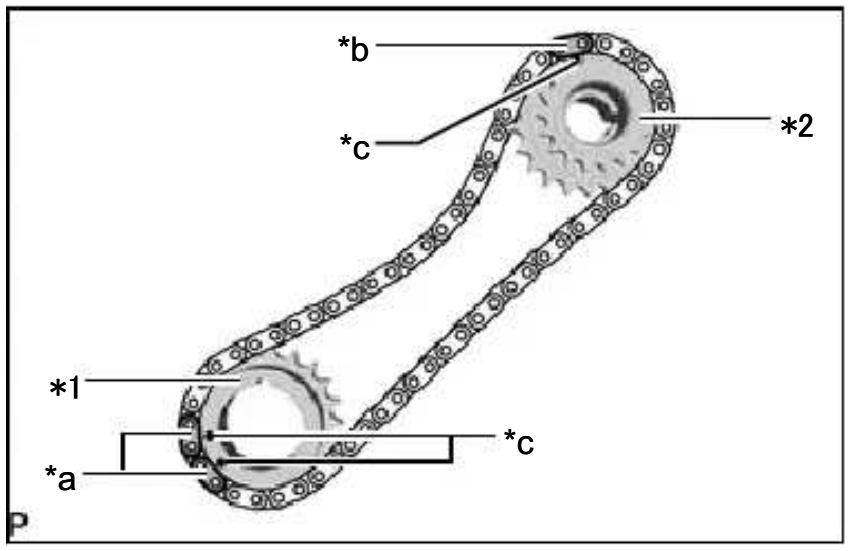
A343562C01

*a	Hold
➡	Turn

c. Remove the crankshaft pulley set bolt and crankshaft pulley from the crankshaft.

d. Make sure that the timing marks of the crankshaft timing sprocket and injection pump drive gear are aligned with the mark plates of the No. 1 chain sub-assembly as shown in the illustration.

e. Remove the pin from the No. 1 chain tensioner assembly.



A343560C01

*1	Crankshaft Timing Sprocket
*2	Injection Pump Drive Gear
*a	Mark Plate (Pink)
*b	Mark Plate (Yellow)

*c	Timing Mark

21. INSTALL CAMSHAFT TIMING SPROCKET

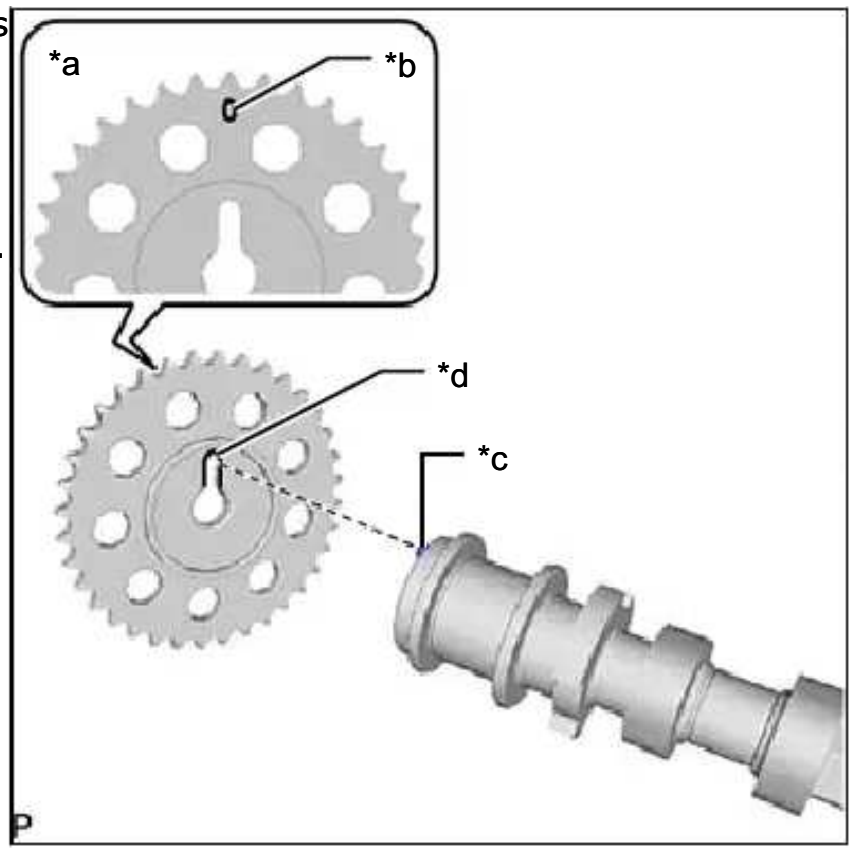
a. Temporarily install the 2 camshaft timing sprockets with the 2 camshaft timing sprocket bolts to the camshaft and No. 2 camshaft.

NOTICE:

Make sure that the timing mark of the camshaft timing sprocket faces the front side of the engine.

HINT:

Align the knock pins of the camshaft and No. 2 camshaft with the cutout of the camshaft timing sprocket to install the camshaft timing sprocket.



A343564C01

*a	Engine Front Side
*b	Timing Mark
*c	Knock Pin
*d	Cutout

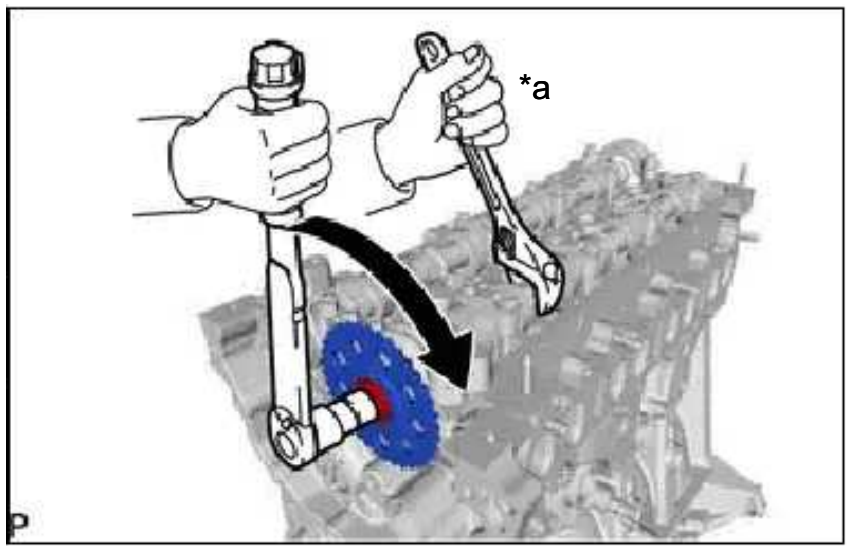
b. for Intake Side:

i. Use a wrench to hold the hexagonal portion of the camshaft, install the camshaft timing sprocket bolt to the camshaft.

Torque:
81 N*m (826 kgf*cm, 60 ft.*lbf)

NOTICE:

Be careful not to damage the camshaft or cylinder head sub-assembly with the wrench.



A343565C01

*a	Hold
➡	Turn

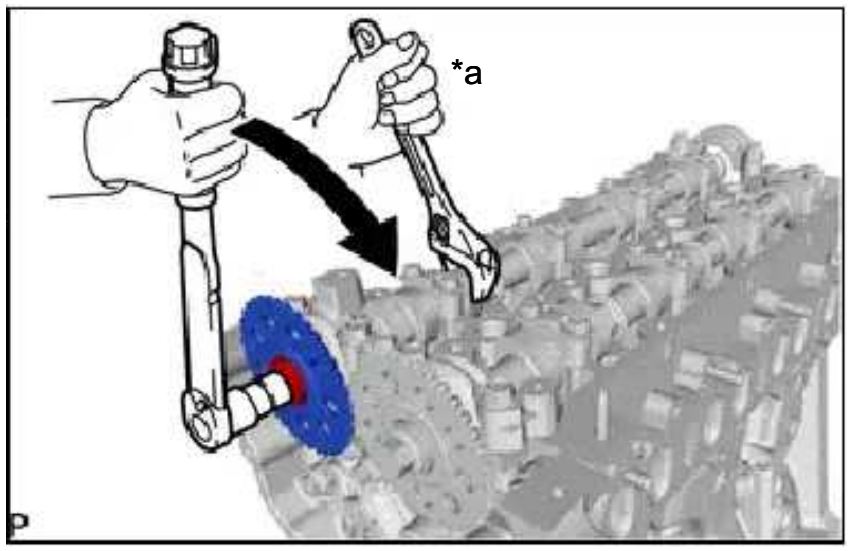
c. for Exhaust Side:

i. Use a wrench to hold the hexagonal portion of the No. 2 camshaft, install the camshaft timing sprocket bolt to the No. 2 camshaft.

Torque:
81 N*m (826 kgf*cm, 60 ft.*lbf)

NOTICE:

Be careful not to damage the No. 2 camshaft or cylinder head sub-assembly with the wrench.



A343566C01

*a	Hold
➡	Turn

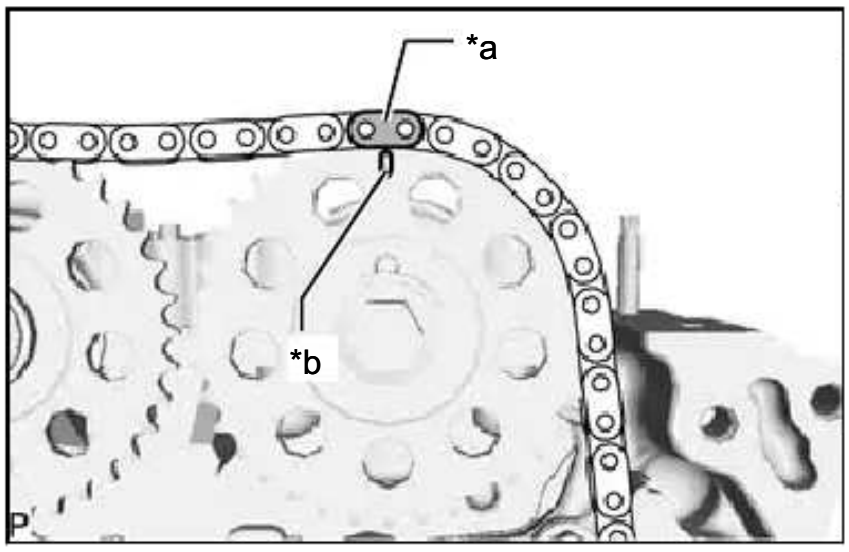
22. INSTALL NO. 2 CHAIN VIBRATION DAMPER

a. Install the No. 2 chain vibration damper with the 2 bolts to the timing chain case assembly.

Torque:
21 N*m (214 kgf*cm, 15 ft.*lbf)

23. INSTALL NO. 2 CHAIN SUB-ASSEMBLY

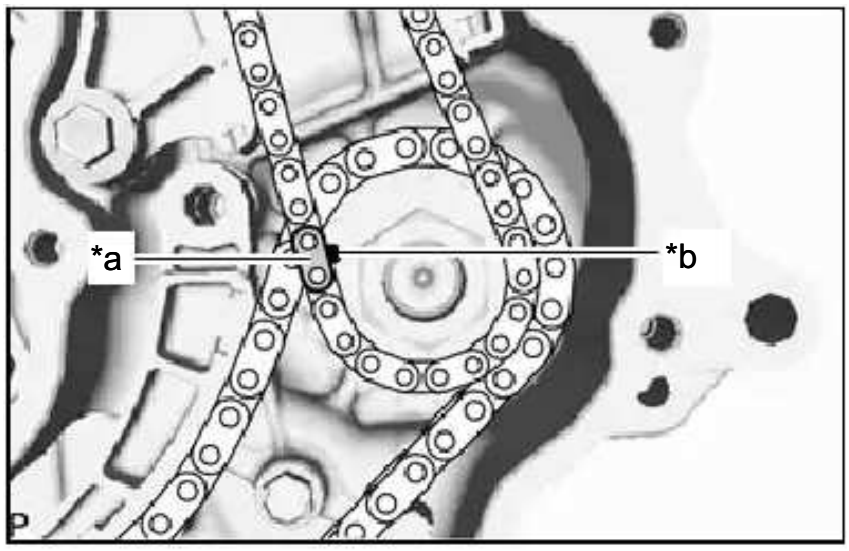
a. Align the mark plate (orange) of the No. 2 chain sub-assembly with the timing mark of the camshaft timing sprocket (intake side) and install the No. 2 chain sub-assembly to the camshaft timing sprocket (intake side) as shown in the illustration.



A343567C01

*a	Mark Plate (Orange)
*b	Timing Mark

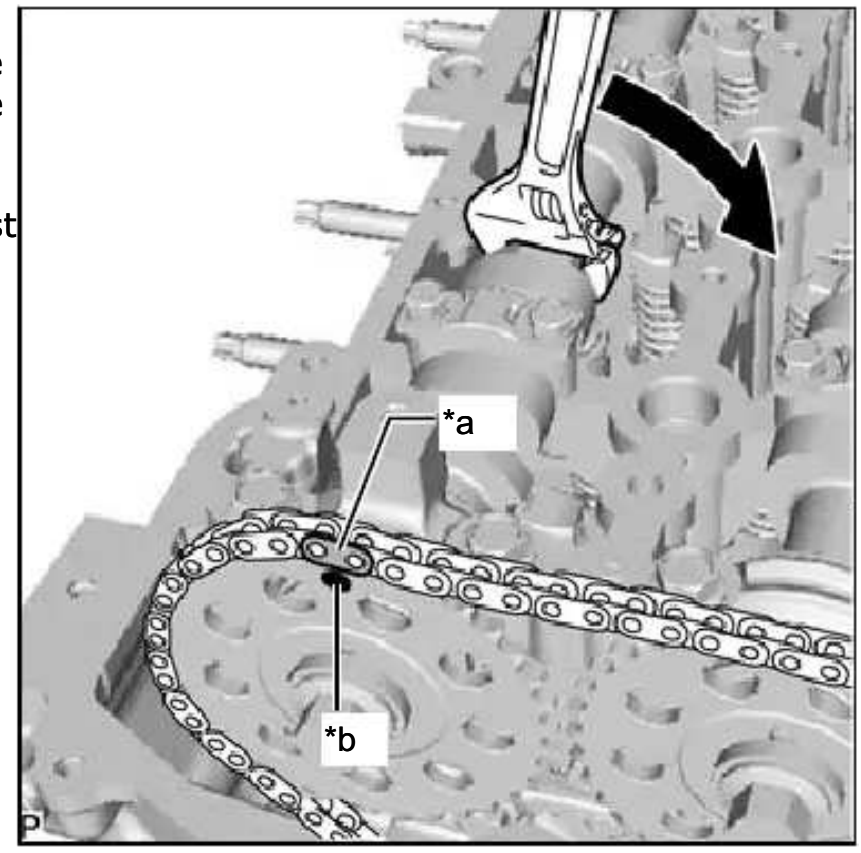
b. Align the mark plate (yellow) of the No. 2 chain sub-assembly with the timing mark of the injection pump drive gear and install the No. 2 chain sub-assembly to the injection pump drive gear as shown in the illustration.



A343568C01

*a	Mark Plate (Yellow)
*b	Timing Mark

c. Using a wrench, turn the hexagonal portion of the No. 2 camshaft clockwise and align the mark plate (orange) of the No. 2 chain sub-assembly with the timing mark of the camshaft timing sprocket (exhaust side) to install the No. 2 chain sub-assembly to the camshaft timing sprocket (exhaust side).



A343569C01

*a	Mark Plate (Orange)
*b	Timing Mark
➡	Turn

24. INSTALL NO. 2 CHAIN TENSIONER SLIPPER

a. Install the No. 2 chain tensioner slipper with the bolt to the timing chain case assembly.

Torque:

21 N*m (214 kgf*cm, 15 ft.*lbf)

25. INSTALL NO. 2 CHAIN TENSIONER ASSEMBLY

a. Install the No. 2 chain tensioner assembly with the 2 bolts to the timing chain case assembly.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

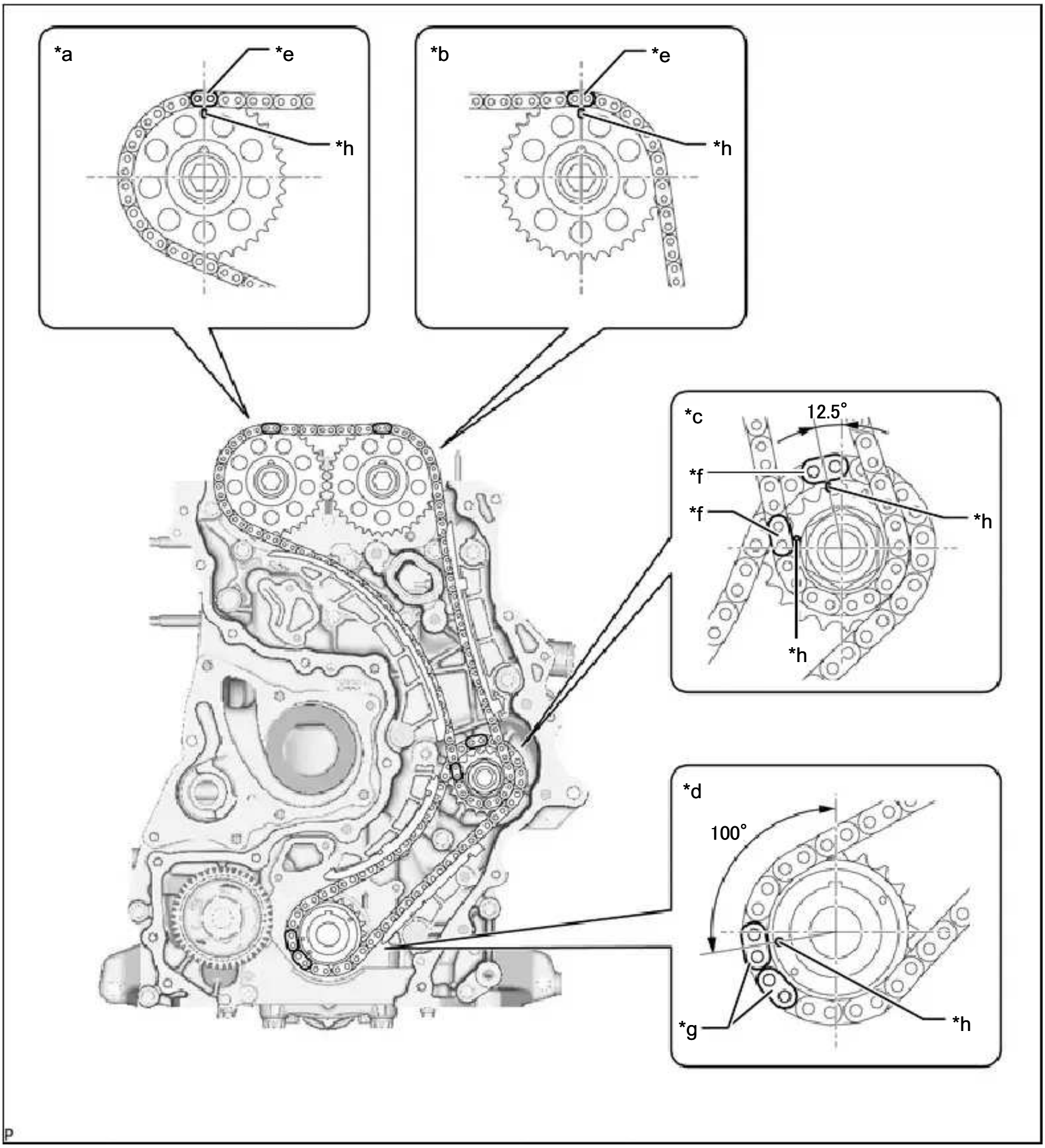
b. Remove the pin from the No. 2 chain tensioner assembly.

26. INSTALL TIMING CHAIN GUIDE

Click here ENGINE MECHANICAL (2GD-FTV) > CAMSHAFT > INSTALLATION > INSTALL TIMING CHAIN GUIDE

27. CHECK NO. 1 CYLINDER TO TDC/COMPRESSION

a. Make sure that the timing marks of the camshaft timing sprocket (exhaust side), camshaft timing sprocket (intake side), injection pump drive gear and crankshaft timing sprocket are at the positions shown in the illustration.



A343570C01

*a	Camshaft Timing Sprocket (Exhaust Side)	*b	Camshaft Timing Sprocket (Intake Side)
*c	Injection Pump Drive Gear	*d	Crankshaft Timing Sprocket
*e	Mark Plate (Orange)	*f	Mark Plate (Yellow)
*g	Mark Plate (Pink)	*h	Timing Mark

28. INSTALL OIL PUMP DRIVE GEAR

Click here LUBRICATION (2GD-FTV) > OIL PUMP > INSTALLATION > INSTALL OIL PUMP DRIVE GEAR

29. INSTALL OIL PUMP RELIEF VALVE PLUG

a. Install a new gasket and oil pump relief valve plug to the timing chain cover sub-assembly.

Torque:
46 N*m (469 kgf*cm, 34 ft.*lbf)

30. INSTALL TIMING CHAIN COVER PLATE

Click here FUEL (2GD-FTV) > FUEL SUPPLY PUMP > INSTALLATION > INSTALL TIMING CHAIN COVER PLATE

31. INSTALL TIMING CHAIN COVER SUB-ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PUMP > INSTALLATION > INSTALL TIMING CHAIN COVER SUB-ASSEMBLY

32. INSTALL FRONT CRANKSHAFT OIL SEAL

Click here ENGINE MECHANICAL (2GD-FTV) > FRONT CRANKSHAFT OIL SEAL > INSTALLATION > INSTALL FRONT CRANKSHAFT OIL SEAL

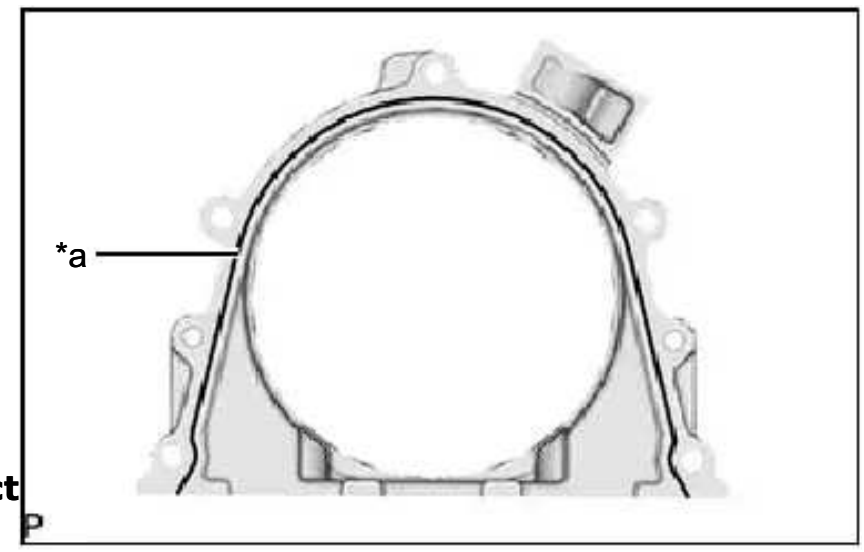
33. INSTALL REAR ENGINE OIL SEAL RETAINER

a. Clean and degrease the contact surfaces of the rear engine oil seal retainer and cylinder block sub-assembly.

b. Apply seal packing to the rear engine oil seal retainer in the areas indicated in the illustration.

Seal packing:
Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

Standard seal diameter:
3.0 to 4.0 mm (0.118 to 0.157 in.)



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*a	Seal Packing

NOTICE:

- **Remove any engine oil from the contact surface.**
- **Install the rear engine oil seal retainer within 3 minutes and tighten the bolts within 10 minutes after applying seal packing.**
- **Do not add engine oil within 2 hours of installation.**
- **Do not start the engine for at least 2 hours after the installation.**

c. Install the rear engine oil seal retainer to the cylinder block sub-assembly, and then install the 5 bolts.

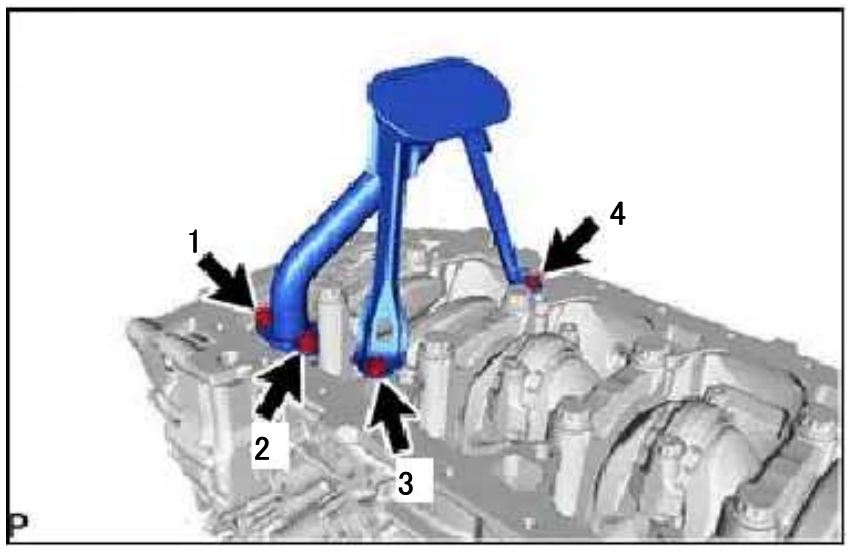
Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

34. INSTALL REAR ENGINE OIL SEAL

Click here ENGINE MECHANICAL (2GD-FTV) > REAR CRANKSHAFT OIL SEAL > INSTALLATION > INSTALL REAR ENGINE OIL SEAL

35. INSTALL OIL STRAINER SUB-ASSEMBLY

a. Install a new gasket and oil strainer sub-assembly with the 4 bolts to the cylinder block sub-assembly in several steps in the sequence shown in the illustration.



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Torque:
12 N*m (122 kgf*cm, 9 ft.*lbf)

HINT:

Make sure that the claw of the gasket faces the oil strainer sub-assembly.

36. INSTALL OIL PAN SUB-ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PUMP > INSTALLATION > INSTALL OIL PAN SUB-ASSEMBLY

37. INSTALL ENGINE OIL LEVEL SENSOR

Click here LUBRICATION (2GD-FTV) > OIL LEVEL SENSOR > INSTALLATION > INSTALL ENGINE OIL LEVEL SENSOR

38. INSTALL OIL PAN COVER SILENCER

Click here LUBRICATION (2GD-FTV) > OIL PUMP > INSTALLATION > INSTALL OIL PAN COVER SILENCER

39. INSTALL CRANKSHAFT POSITION SENSOR

Click here ENGINE CONTROL (2GD-FTV) > CRANKSHAFT POSITION SENSOR > INSTALLATION > INSTALL CRANKSHAFT POSITION SENSOR

40. INSTALL CRANKSHAFT POSITION SENSOR HARNESS BRACKET

a. Install the crankshaft position sensor harness bracket with the bolt to the cylinder block sub-assembly.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

b. Connect the crankshaft position sensor connector.

41. INSTALL NO. 1 CYLINDER BLOCK INSULATOR

a. Install the No. 1 cylinder block insulator to the cylinder block sub-assembly.

42. INSTALL NO. 5 CYLINDER BLOCK INSULATOR

a. Install the No. 5 cylinder block insulator to the cylinder block sub-assembly.

43. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PUMP > INSTALLATION > INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY

44. INSTALL OIL FILLER CAP GASKET

a. Install the oil filler cap gasket to the oil filler cap sub-assembly.

45. INSTALL OIL FILLER CAP SUB-ASSEMBLY

a. Install the oil filler cap sub-assembly to the cylinder head cover sub-assembly.

46. INSTALL NOZZLE HOLDER GASKET

Click here FUEL (2GD-FTV) > FUEL INJECTOR > INSTALLATION > INSTALL NOZZLE HOLDER GASKET

47. TEMPORARILY INSTALL INJECTOR ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL INJECTOR > INSTALLATION > TEMPORARILY INSTALL INJECTOR ASSEMBLY

48. INSTALL OIL FILTER BRACKET

a. Install 2 new O-rings to the cylinder block sub-assembly.

b. Install the oil filter bracket with the 2 nuts and bolt to the cylinder block sub-assembly.

Torque:
21 N*m (214 kgf*cm, 15 ft.*lbf)

49. INSTALL OIL FILTER UNION

a. Using a 27 mm deep socket wrench, install the oil filter union to the oil filter bracket.

Torque:
29.4 N*m (300 kgf*cm, 22 ft.*lbf)

50. INSTALL OIL FILTER SUB-ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL AND OIL FILTER > REPLACEMENT > INSTALL OIL FILTER SUB-ASSEMBLY

51. INSTALL OIL COOLER ASSEMBLY

52. INSTALL FRONT NO. 1 ENGINE MOUNTING BRACKET RH

a. Install the front No. 1 engine mounting bracket RH with the 4 bolts to the cylinder block sub-assembly.

Torque:
68 N*m (693 kgf*cm, 50 ft.*lbf)

53. INSTALL GENERATOR BRACKET SUB-ASSEMBLY

a. Install the generator bracket sub-assembly with the 4 bolts to the cylinder head sub-assembly and timing chain case assembly.

Torque:
21 N*m (214 kgf*cm, 15 ft.*lbf)

54. INSTALL NO. 3 CYLINDER BLOCK INSULATOR

a. Install the No. 3 cylinder block insulator to the cylinder block sub-assembly.

55. INSTALL FRONT NO. 1 ENGINE MOUNTING BRACKET LH

a. Install the front No. 1 engine mounting bracket LH with the 4 bolts to the cylinder block sub-assembly.

Torque:
68 N*m (693 kgf*cm, 50 ft.*lbf)

56. INSTALL NO. 2 CYLINDER BLOCK INSULATOR

a. Install the No. 2 cylinder block insulator to the front No. 1 engine mounting bracket LH.

57. INSTALL NO. 1 ENGINE HANGER

a. Install the No. 1 engine hanger with the 2 bolts to the cylinder head sub-assembly.

Torque:
26 N*m (265 kgf*cm, 19 ft.*lbf)

ENGINE UNIT > INSTALLATION

NOTICE:

- **When replacing the parts in the following chart (A), replace the No. 1 injection pipe sub-assembly, No. 2 injection pipe sub-assembly and/or fuel inlet pipe sub-assembly with new ones.**

Replaced Parts (A)	Pipes Requiring New Replacement
Injector assembly (including shuffling the injector assemblies between the cylinders)	• No. 1 injection pipe sub-assembly • No. 2 injection pipe sub-assembly
• Supply pump assembly • Common rail assembly • Cylinder block sub-assembly • Cylinder head sub-assembly • Cylinder head gasket • Timing chain case assembly	• No. 1 injection pipe sub-assembly • No. 2 injection pipe sub-assembly • Fuel inlet pipe sub-assembly

- **After removing the No. 1 injection pipe sub-assembly, No. 2 injection pipe sub-assembly and/or fuel inlet pipe sub-assembly, clean them with a brush and compressed air.**

- **The injector assembly is a precision instrument. Do not use the injector assembly if it is struck or dropped.**

- **The supply pump assembly is a precision instrument. Do not use the supply pump assembly if it is struck or dropped.**

- **The common rail assembly is a precision instrument. Do not use the common rail assembly if it is struck or dropped.**

- **Hold the supply pump assembly itself during removal and installation. Do not hold the pre-stroke control valve or fuel pipe, etc.**

- **Hold the common rail assembly itself during removal and installation. Do not hold the pressure discharge valve or fuel pressure sensor, etc.**

- **Make sure foreign matter does not enter the fuel path.**

1. INSTALL CRANKSHAFT PULLEY

Click here ENGINE MECHANICAL (2GD-FTV) > FRONT CRANKSHAFT OIL SEAL > INSTALLATION > INSTALL CRANKSHAFT PULLEY

2. INSTALL CRANKSHAFT PULLEY COVER

Click here ENGINE MECHANICAL (2GD-FTV) > FRONT CRANKSHAFT OIL SEAL > INSTALLATION > INSTALL CRANKSHAFT PULLY COVER

3. INSTALL CAMSHAFT OIL SEAL RETAINER

NOTICE:

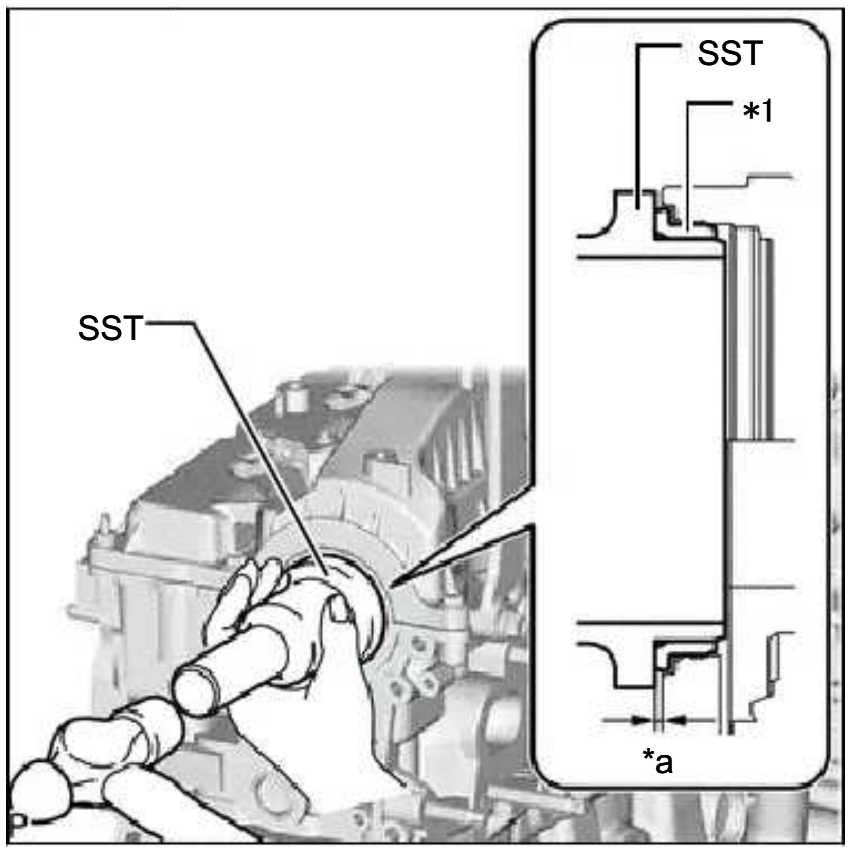
If the camshaft oil seal retainer is dropped, replace it with a new one.

a. Before installing a new camshaft oil seal retainer, clean the installation surface of the No. 3 camshaft bearing cap and cylinder head sub-assembly and remove any foreign matter.

b. Using SST and a hammer, tap in a new camshaft oil seal retainer to the No. 3 camshaft bearing cap and cylinder head sub-assembly as shown in the illustration.

SST
09223-46011

Standard depth:
0 to 0.8 mm (0 to 0.0315 in.)



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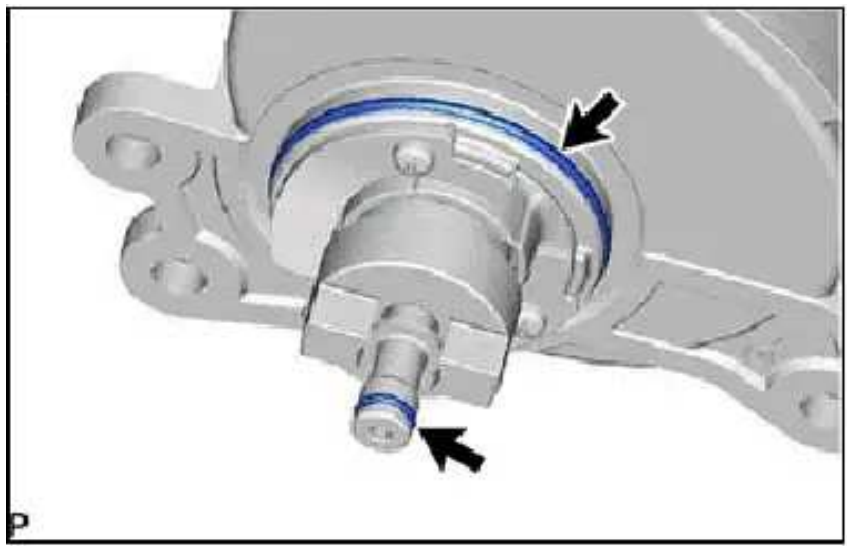
*1	Camshaft Oil Seal Retainer
*a	Depth

4. INSTALL VACUUM PUMP ASSEMBLY

a. Coat 2 new O-rings with engine oil, and install them to the vacuum pump assembly.



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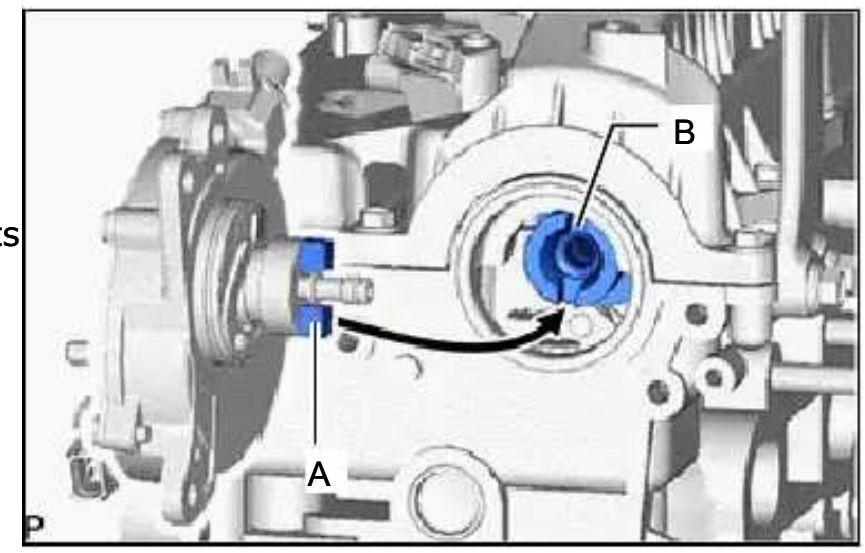
b. Install the vacuum pump assembly so that the coupling teeth of the vacuum pump assembly labeled A and the groove of the No. 2 camshaft labeled B can engage.

c. Install the vacuum pump assembly with the 3 bolts to the cylinder head sub-assembly.

Torque:
21 N*m (214 kgf*cm, 15 ft.*lbf)



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5. INSTALL NO. 1 VACUUM TRANSMITTING PIPE SUB-ASSEMBLY

a. Install the No. 1 vacuum transmitting pipe sub-assembly with the 3 bolts to the cylinder head sub-assembly.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

b. Connect the No. 1 vacuum transmitting hose to the vacuum pump assembly.

6. INSTALL V-RIBBED BELT TENSIONER ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PUMP > INSTALLATION > INSTALL V-RIBBED BELT TENSIONER ASSEMBLY

7. INSTALL NO. 1 IDLER PULLEY SUB-ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PUMP > INSTALLATION > INSTALL NO. 1 IDLER PULLEY SUB-ASSEMBLY

8. INSTALL THERMOSTAT

Click here COOLING (2GD-FTV) > THERMOSTAT > INSTALLATION > INSTALL THERMOSTAT

9. INSTALL WATER INLET

a. Install the water inlet with the 3 bolts to the timing chain cover sub-assembly.

Torque:
13 N*m (133 kgf*cm, 10 ft.*lbf)

10. INSTALL WATER OUTLET SUB-ASSEMBLY

a. Install a new gasket and the water outlet sub-assembly with the 4 bolts and 2 nuts to the timing chain cover sub-assembly.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

11. INSTALL NO. 2 WATER BY-PASS PIPE SUB-ASSEMBLY

a. Install the No. 2 water by-pass pipe sub-assembly with the 2 bolts to the engine water pump assembly and water inlet.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

b. Connect the No. 3 water by-pass hose to the water outlet sub-assembly, and slide the clamp to secure the hose.

12. INSTALL ENGINE OIL PRESSURE SWITCH ASSEMBLY

Click here LUBRICATION (2GD-FTV) > OIL PRESSURE SWITCH > INSTALLATION > INSTALL ENGINE OIL PRESSURE SWITCH ASSEMBLY

13. TEMPORARILY INSTALL TURBO OIL INLET PIPE SUB-ASSEMBLY

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > INSTALLATION > TEMPORARILY INSTALL TURBO OIL INLET PIPE SUB-ASSEMBLY

14. TEMPORARILY INSTALL EXHAUST MANIFOLD WITH TURBOCHARGER SUB-ASSEMBLY

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > INSTALLATION > TEMPORARILY INSTALL EXHAUST MANIFOLD WITH TURBOCHARGER SUB-ASSEMBLY

15. INSTALL TURBO OIL OUTLET PIPE

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > INSTALLATION > INSTALL TURBO OIL OUTLET PIPE

16. TEMPORARILY INSTALL TURBOCHARGER STAY

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > INSTALLATION > TEMPORARILY INSTALL TURBOCHARGER STAY

17. TIGHTEN EXHAUST MANIFOLD WITH TURBOCHARGER SUB-ASSEMBLY

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > INSTALLATION > TIGHTEN EXHAUST MANIFOLD WITH TURBOCHARGER SUB-ASSEMBLY

18. TIGHTEN TURBOCHARGER STAY

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > INSTALLATION > TIGHTEN TURBOCHARGER STAY

19. CONNECT NO. 1 AND NO. 2 TURBO WATER HOSE

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > INSTALLATION > CONNECT TURBO WATER HOSE

20. INSTALL NO. 1 WATER BY-PASS PIPE

a. Install a new gasket and the No. 1 water by-pass pipe with the 3 bolts to the timing chain cover sub-assembly.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

HINT:

Make sure that the claw of the gasket faces the No. 1 water by-pass pipe.

21. INSTALL NO. 3 WATER BY-PASS PIPE

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > INSTALLATION > INSTALL NO. 3 WATER BY-PASS PIPE

22. INSTALL PCV HOSE

Click here INTAKE / EXHAUST (2GD-FTV) > EXHAUST MANIFOLD W/ TURBOCHARGER > INSTALLATION > INSTALL PCV HOSE

23. INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY

Click here EMISSION CONTROL (2GD-FTV) > MONOLITHIC CONVERTER > INSTALLATION > INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY

24. INSTALL NO. 2 EXHAUST PIPE SUPPORT STAY

Click here EMISSION CONTROL (2GD-FTV) > MONOLITHIC CONVERTER > INSTALLATION > INSTALL NO. 2 EXHAUST PIPE SUPPORT STAY

25. INSTALL NO. 1 TURBO INSULATOR

Click here EMISSION CONTROL (2GD-FTV) > MONOLITHIC CONVERTER > INSTALLATION > INSTALL NO. 1 TURBO INSULATOR

26. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

Click here EMISSION CONTROL (2GD-FTV) > MONOLITHIC CONVERTER > INSTALLATION > INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

27. INSTALL ENGINE COOLANT TEMPERATURE SENSOR

Click here ENGINE CONTROL (2GD-FTV) > ENGINE COOLANT TEMPERATURE SENSOR > INSTALLATION > INSTALL ENGINE COOLANT TEMPERATURE SENSOR

28. INSTALL NO. 1 COMPRESSOR MOUNTING BRACKET

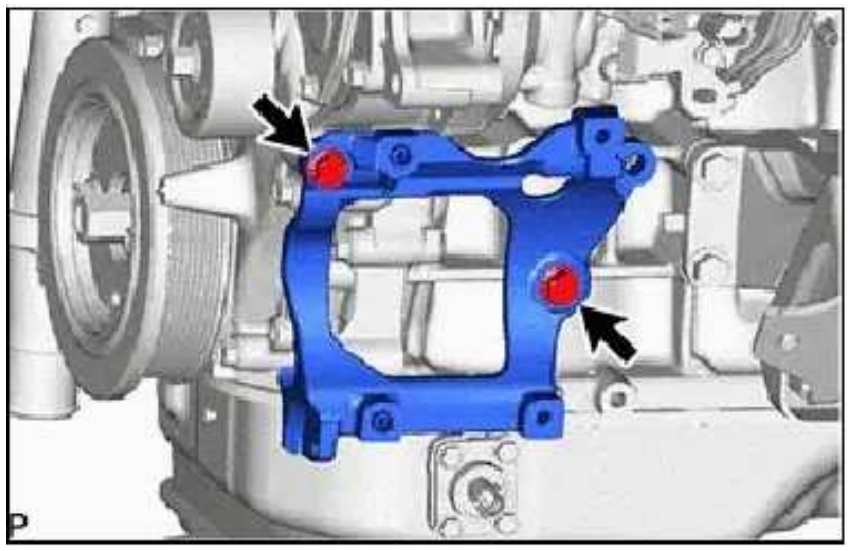
NOTICE:

Install the No. 1 compressor mounting bracket exactly as described in the procedures below to properly secure and prevent damage to the fan and generator V belt.

a. Temporarily install the No. 1 compressor mounting bracket with the 2 bolts to the cylinder block sub-assembly.

HINT:

Temporarily install the No. 1 compressor mounting bracket with the 2 bolts so that the No. 1 compressor mounting bracket can be moved by hand.



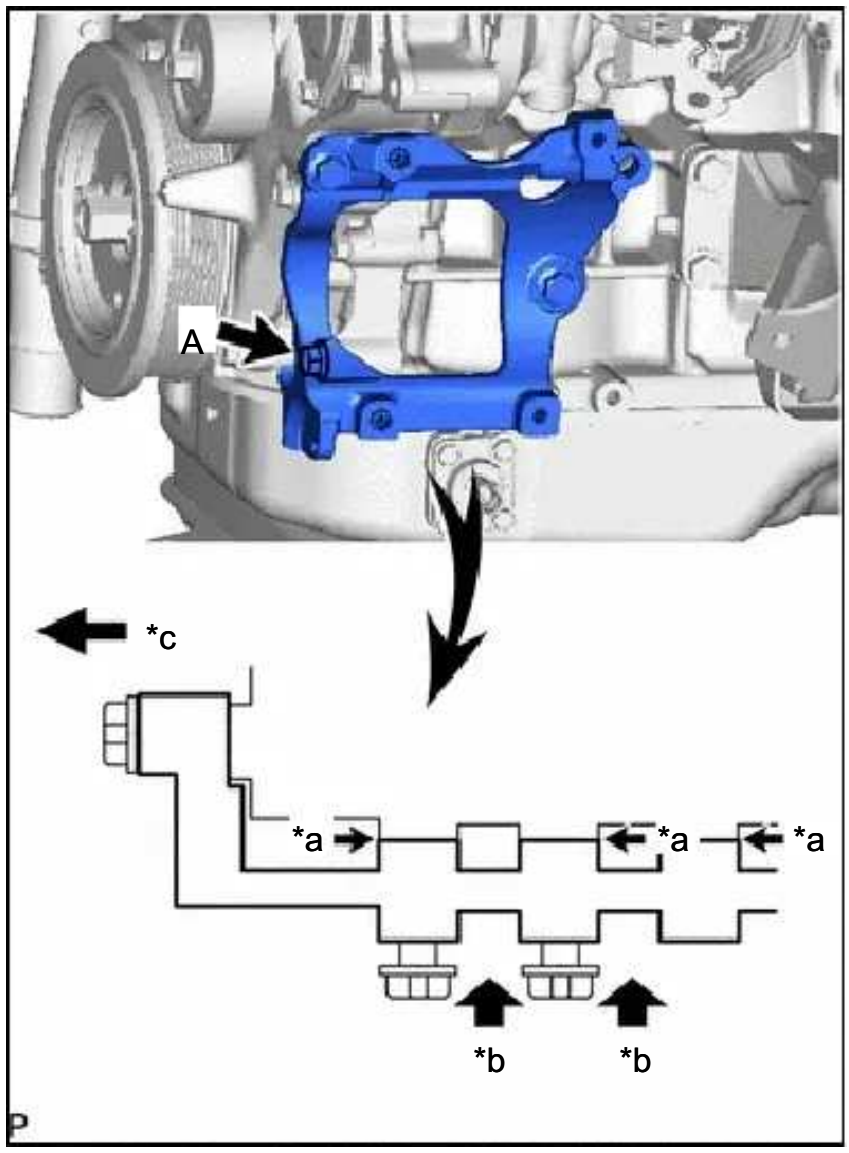
A354055

b. Push the No. 1 compressor mounting bracket toward the cylinder block sub-assembly as shown in the illustration and tighten bolt A.

Torque:
39 N*m (398 kgf*cm, 29 ft.*lbf)

HINT:

Make sure there is no clearance between the cylinder block sub-assembly and No. 1 compressor mounting bracket as shown in the illustration.



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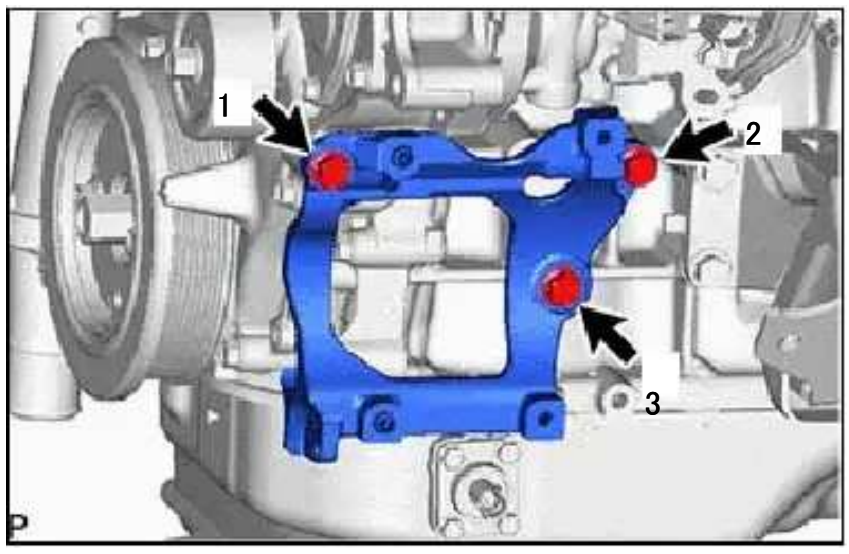
*a	No Clearance
*b	Push
*c	Front

c. Uniformly tighten the 3 bolts in the order shown in the illustration.

Torque:
39 N*m (398 kgf*cm, 29 ft.*lbf)



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29. INSTALL NO. 5 WATER BY-PASS PIPE SUB-ASSEMBLY

a. Install a new gasket and the No. 5 water by-pass pipe sub-assembly with the 3 bolts to the cylinder block sub-assembly.

Torque:
25 N*m (255 kgf*cm, 18 ft.*lbf)

HINT:
Make sure that the claw of the gasket faces the No. 5 water by-pass pipe sub-assembly.

30. INSTALL NO. 3 NOZZLE LEAKAGE PIPE

a. Install the No. 3 nozzle leakage pipe with the 2 nuts to the cylinder block sub-assembly.

Torque:
21 N*m (214 kgf*cm, 15 ft.*lbf)

31. INSTALL HOSE BRACKET

a. Install the hose bracket with the 2 bolts to the cylinder head sub-assembly.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

32. INSTALL GLOW PLUG ASSEMBLY

Click here STARTING (2GD-FTV) > GLOW PLUG > INSTALLATION > INSTALL GLOW PLUG ASSEMBLY

33. INSTALL NO. 1 GLOW PLUG CONNECTOR

Click here STARTING (2GD-FTV) > GLOW PLUG > INSTALLATION > INSTALL NO. 1 GLOW PLUG

CONNECTOR

34. INSTALL COMMON RAIL ASSEMBLY

Click here FUEL (2GD-FTV) > COMMON RAIL > INSTALLATION > INSTALL COMMON RAIL ASSEMBLY

35. TEMPORARILY INSTALL NO. 1 AND NO. 2 INJECTION PIPE SUB-ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL INJECTOR > INSTALLATION > TEMPORARILY INSTALL NO. 1 AND NO. 2 INJECTION PIPE SUB-ASSEMBLY

36. TIGHTEN INJECTOR ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL INJECTOR > INSTALLATION > TIGHTEN INJECTOR ASSEMBLY

37. TIGHTEN NO. 1 AND NO. 2 INJECTION PIPE SUB-ASSEMBLY

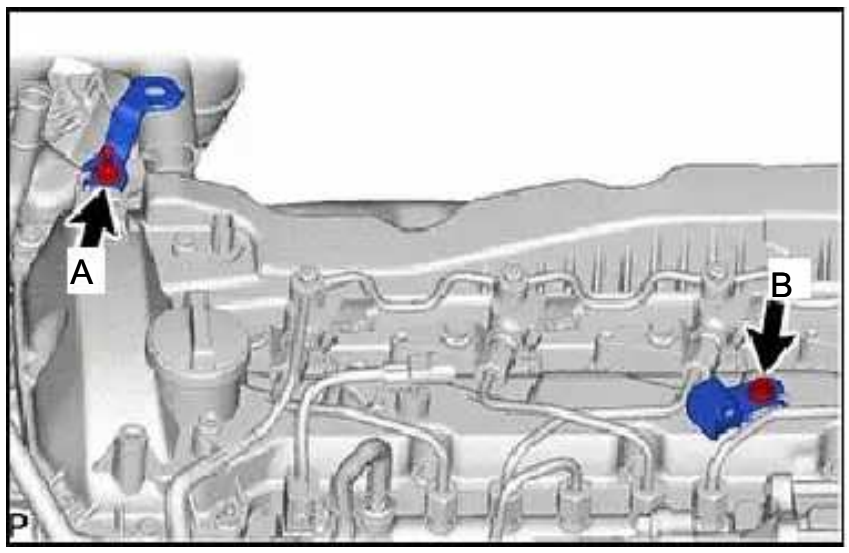
Click here FUEL (2GD-FTV) > FUEL INJECTOR > INSTALLATION > TIGHTEN NO. 1 AND NO. 2 INJECTION PIPE SUB-ASSEMBLY

38. INSTALL WIRING HARNESS CLAMP BRACKET

a. Install the 2 wiring harness clamp brackets with the 2 bolts to the cylinder head cover sub-assembly.

Torque:
for bolt A
10 N*m (102 kgf*cm, 7 ft.*lbf)

for bolt B
8.4 N*m (86 kgf*cm, 74 in.*lbf)



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39. INSTALL NOZZLE LEAKAGE PIPE ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL INJECTOR > INSTALLATION > INSTALL NOZZLE LEAKAGE PIPE ASSEMBLY

40. INSTALL WIRING HARNESS CLAMP BRACKET

Click here FUEL (2GD-FTV) > FUEL INJECTOR > INSTALLATION > INSTALL WIRING HARNESS CLAMP BRACKET

41. INSTALL INTAKE MANIFOLD

Click here INTAKE / EXHAUST (2GD-FTV) > INTAKE MANIFOLD > INSTALLATION > INSTALL INTAKE MANIFOLD

42. INSTALL NO. 2 NOZZLE LEAKAGE PIPE ASSEMBLY

Click here INTAKE / EXHAUST (2GD-FTV) > INTAKE MANIFOLD > INSTALLATION > INSTALL NO. 2 NOZZLE LEAKAGE PIPE ASSEMBLY

43. INSTALL FUEL INLET PIPE SUB-ASSEMBLY

Click here INTAKE / EXHAUST (2GD-FTV) > INTAKE MANIFOLD > INSTALLATION > INSTALL FUEL INLET PIPE SUB-ASSEMBLY

44. INSTALL NO. 1 FUEL HOSE

Click here FUEL (2GD-FTV) > FUEL SUPPLY PUMP > INSTALLATION > INSTALL NO. 1 FUEL HOSE

45. INSTALL NO. 2 FUEL HOSE

Click here FUEL (2GD-FTV) > FUEL SUPPLY PUMP > INSTALLATION > INSTALL NO. 2 FUEL HOSE

46. INSTALL FUEL PUMP MOTOR WIRE

Click here FUEL (2GD-FTV) > FUEL SUPPLY PUMP > INSTALLATION > INSTALL FUEL PUMP MOTOR WIRE

47. INSTALL FUEL INJECTION PUMP COVER SUB-ASSEMBLY

Click here FUEL (2GD-FTV) > FUEL SUPPLY PUMP > INSTALLATION > INSTALL FUEL INJECTION PUMP COVER SUB-ASSEMBLY

48. INSTALL MANIFOLD STAY

Click here INTAKE / EXHAUST (2GD-FTV) > INTAKE MANIFOLD > INSTALLATION > INSTALL MANIFOLD STAY

49. INSTALL WIRING HARNESS CLAMP BRACKET

Click here INTAKE / EXHAUST (2GD-FTV) > INTAKE MANIFOLD > INSTALLATION > INSTALL WIRING HARNESS CLAMP BRACKET

50. INSTALL NO. 2 FUEL PIPE

a. Install the No. 2 fuel pipe with the bolt to the manifold stay.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

b. Connect the No. 1 fuel hose to the No. 2 fuel pipe, and slide the clamp to secure the hose.

51. INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE

Click here INTAKE / EXHAUST (2GD-FTV) > INTAKE MANIFOLD > INSTALLATION > INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE

52. INSTALL NO. 1 EGR COOLER AND NO. 2 EGR VALVE ASSEMBLY WITH ELECTRIC EGR CONTROL VALVE ASSEMBLY

Click here EMISSION CONTROL (2GD-FTV) > EGR COOLER > INSTALLATION > INSTALL NO. 1 EGR COOLER AND NO. 2 EGR VALVE ASSEMBLY WITH ELECTRIC EGR CONTROL VALVE ASSEMBLY

53. INSTALL NO. 4 WATER BY-PASS PIPE SUB-ASSEMBLY

a. Install the No. 4 water by-pass pipe sub-assembly with the 2 bolts to the intake manifold.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

b. Connect the water hose to the No. 2 EGR valve assembly, and slide the clamp to secure the hose.

c. Connect the No. 7 water by-pass hose to the No. 4 water by-pass pipe sub-assembly, and slide the clamp to secure the hose.

d. Connect the No. 6 water by-pass hose to the No. 4 water by-pass pipe sub-assembly, and slide the clamp to secure the hose.

54. INSTALL VACUUM CONTROL VALVE SET

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > INSTALL VACUUM CONTROL VALVE SET

55. INSTALL NO. 1 EGR PIPE

a. Using an E8 "TORX" socket wrench, install 2 new stud bolts to the exhaust manifold.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

b. Install 2 new gaskets and the No. 1 EGR pipe with the bolt and 4 new nut to the exhaust manifold, electric EGR control valve assembly and No. 1 vacuum transmitting pipe sub-assembly.

Torque:
for bolt
10 N*m (102 kgf*cm, 7 ft.*lbf)

for nut
29 N*m (296 kgf*cm, 21 ft.*lbf)

56. INSTALL CONNECTING WIRE

a. Attach the 2 clamps and install the connecting wire to the hose bracket.

b. Connect the connector to the common rail assembly.

57. INSTALL NO. 3 WATER BY-PASS PIPE SUB-ASSEMBLY

Click here EMISSION CONTROL (2GD-FTV) > EGR COOLER > INSTALLATION > INSTALL NO. 3 WATER BY-PASS PIPE SUB-ASSEMBLY

58. INSTALL NO. 2 EGR PIPE

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > INSTALL NO. 2 EGR PIPE

59. INSTALL EGR VALVE BRACKET

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > INSTALL EGR VALVE

BRACKET

60. INSTALL DIESEL TURBO PRESSURE SENSOR

Click here ENGINE CONTROL (2GD-FTV) > MANIFOLD ABSOLUTE PRESSURE SENSOR > INSTALLATION > INSTALL DIESEL TURBO PRESSURE SENSOR

61. INSTALL GAS FILTER

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > INSTALL GAS FILTER

62. INSTALL WATER BY-PASS PLUG (w/o Heater)

a. Install the water by-pass plug to the water outlet sub-assembly, and slide the clamp to secure the plug.

63. INSTALL NO. 2 WATER BY-PASS PIPE

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > INSTALL NO. 2 WATER BY-PASS PIPE

64. INSTALL DIESEL THROTTLE BODY ASSEMBLY

Click here ENGINE CONTROL (2GD-FTV) > DIESEL THROTTLE BODY > INSTALLATION > INSTALL DIESEL THROTTLE BODY ASSEMBLY

65. INSTALL INTERCOOLER AIR TUBE

Click here ENGINE CONTROL (2GD-FTV) > DIESEL THROTTLE BODY > INSTALLATION > INSTALL INTERCOOLER AIR TUBE

66. INSTALL ENGINE COVER BRACKET

a. Install the engine cover bracket with the 2 bolts to the cylinder head cover sub-assembly and hose bracket.

Torque:
21 N*m (214 kgf*cm, 15 ft.*lbf)

67. INSTALL ENGINE WIRE

68. INSTALL NO. 2 ENGINE COVER BRACKET

Click here EMISSION CONTROL (2GD-FTV) > EGR VALVE > INSTALLATION > INSTALL NO. 2 ENGINE COVER BRACKET

69. INSTALL NO. 2 HOSE TO HOSE TUBE

a. Install the No. 2 hose to hose tube to the cylinder head cover sub-assembly and hose bracket with the 2 bolts.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

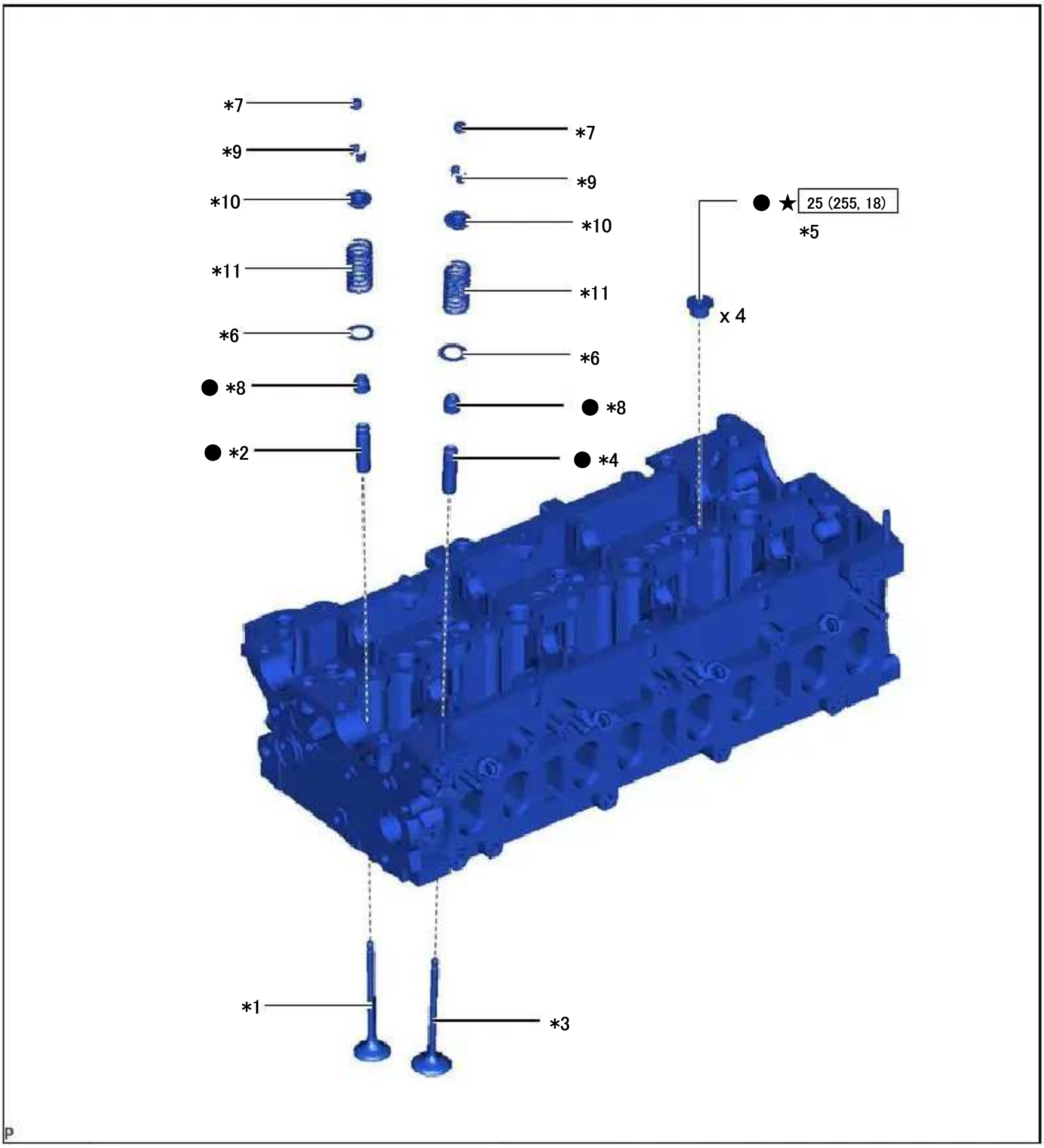
b. Connect the union to check valve hose to the vacuum pump assembly, and slide the clamp to secure the hose.

CYLINDER HEAD > PRECAUTION

HINT:

- **Any digits beyond the 0.01 mm (1/1000 in.) place for standard, minimum and maximum values should be used as a reference only.**
- **When both standard and maximum or minimum values are listed for an inspection, use the standard value as a reference only and base any judgments on the maximum and minimum values.**

2GD-FTV ENGINE MECHANICAL > CYLINDER HEAD

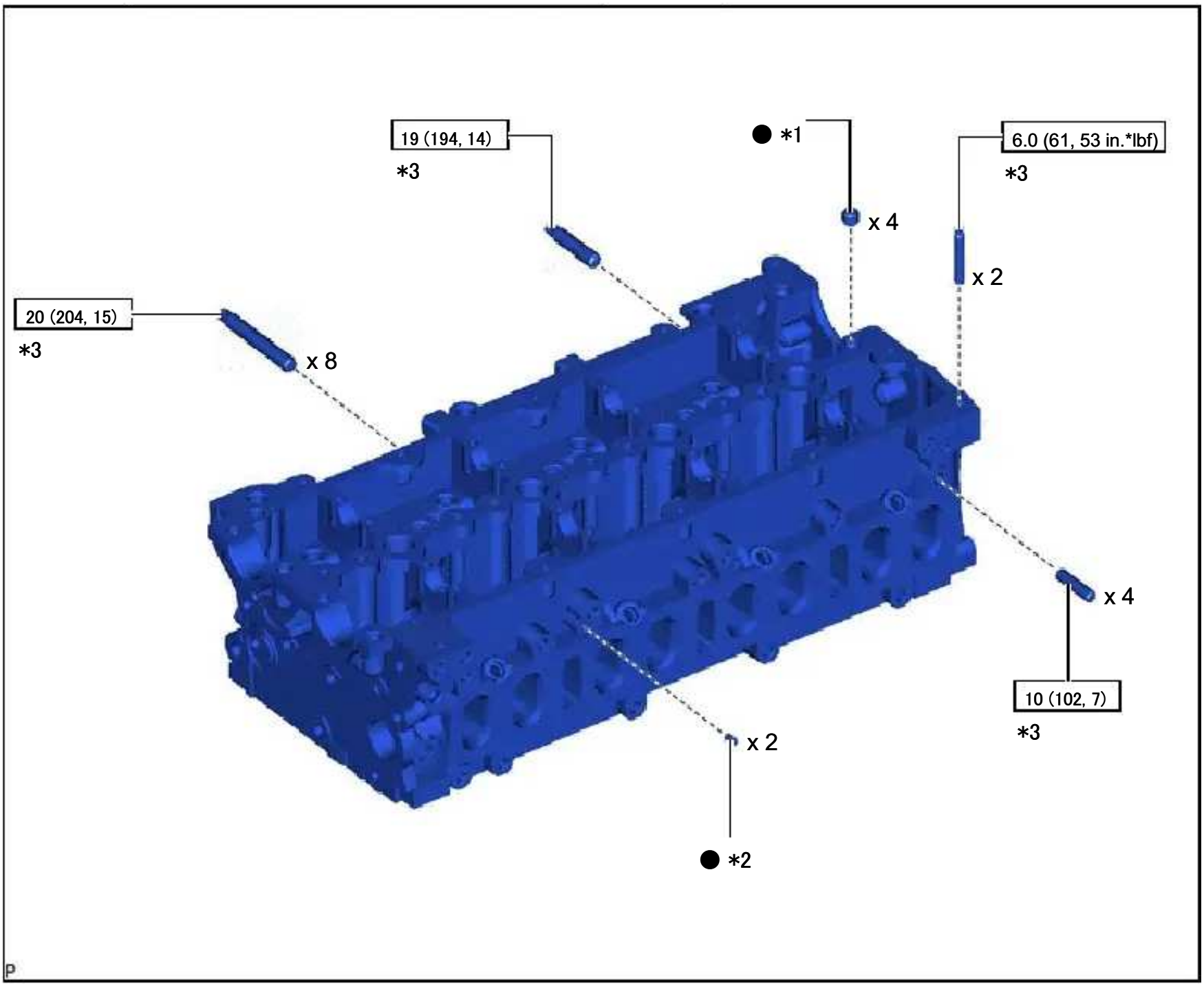


A337431C01

*1	EXHAUST VALVE	*2	EXHAUST VALVE GUIDE BUSH
*3	INTAKE VALVE	*4	INTAKE VALVE GUIDE BUSH
*5	NO. 1 STRAIGHT SCREW PLUG WITH HEAD	*6	VALVE SPRING SEAT
*7	VALVE STEM CAP	*8	VALVE STEM OIL SEAL
*9	VALVE SPRING RETAINER LOCK	*10	VALVE SPRING RETAINER

*11	VALVE COMPRESSION SPRING	-	-

▭	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part
★	Precoated part	-	-



A337432C01

*1	RING PIN	*2	STRAIGHT PIN
*3	STUD BOLT	-	-
▭	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part

CYLINDER HEAD > DISASSEMBLY

1. REMOVE VALVE STEM CAP

a. Remove the 16 valve stem caps from the cylinder head sub-assembly.

HINT:

Arrange the removed parts in the correct order.

2. REMOVE INTAKE VALVE

a. Using SST and wooden blocks, compress the valve compression spring and remove the valve spring retainer locks from the valve spring retainer.

SST

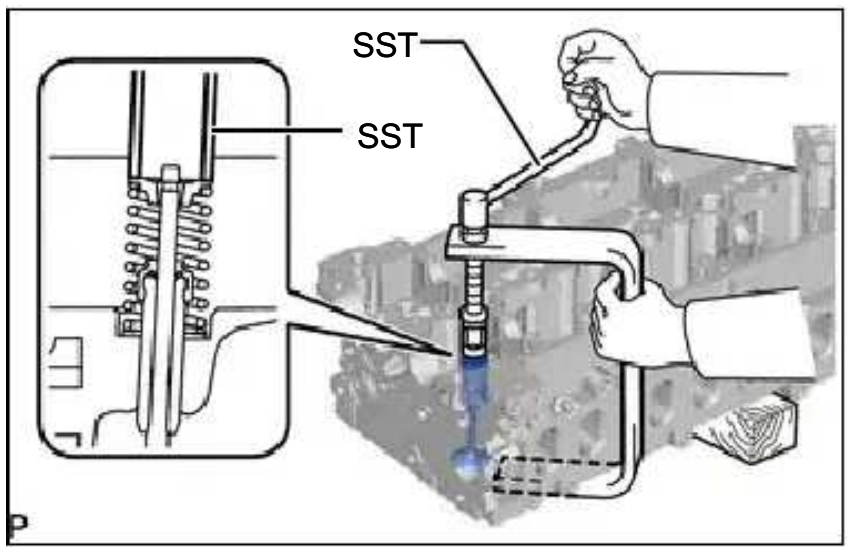
09202-70020

09202-00021

b. Remove the valve spring retainer, valve compression spring and intake valve from the cylinder head sub-assembly.

HINT:

Arrange the removed parts in the correct order.



A337433N01

3. REMOVE EXHAUST VALVE

a. Using SST and wooden blocks, compress the valve compression spring and remove the valve spring retainer locks from the valve spring retainer.

SST

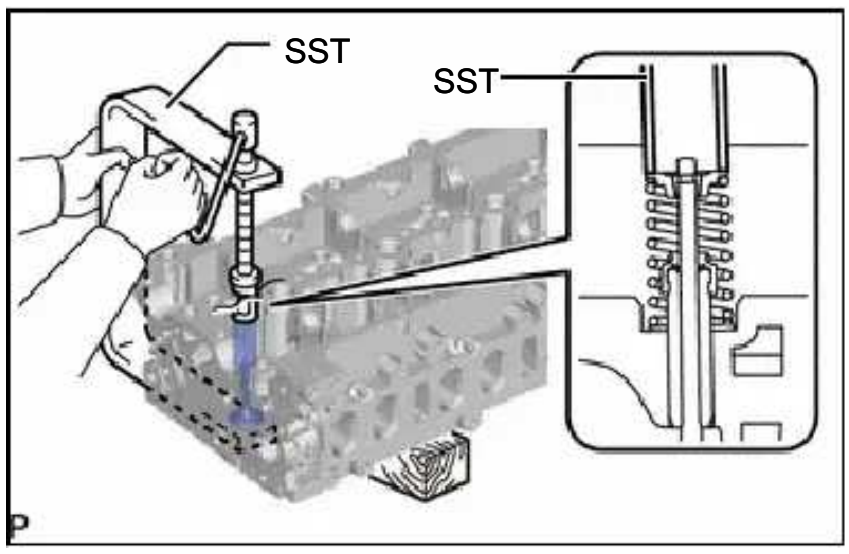
09202-70020

09202-00021

b. Remove the valve spring retainer, valve compression spring and exhaust valve from the cylinder head sub-assembly.

HINT:

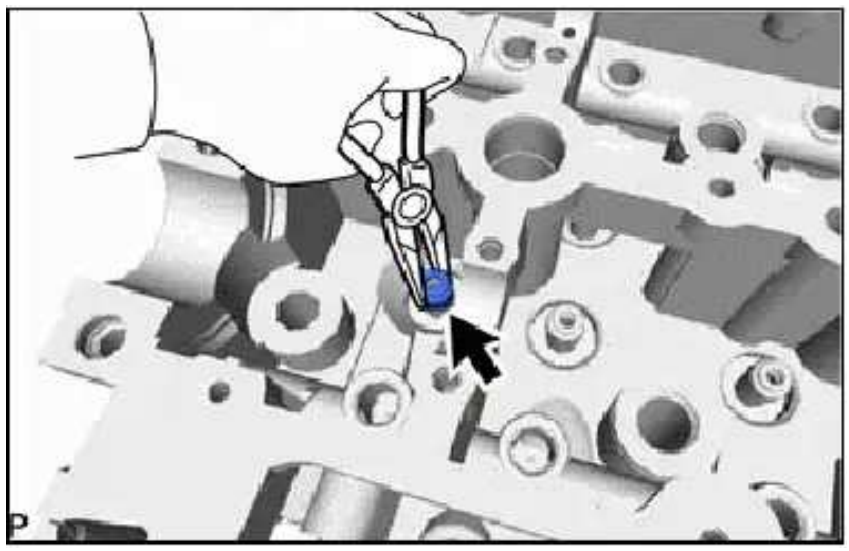
Arrange the removed parts in the correct order.



A337434N01

4. REMOVE VALVE STEM OIL SEAL

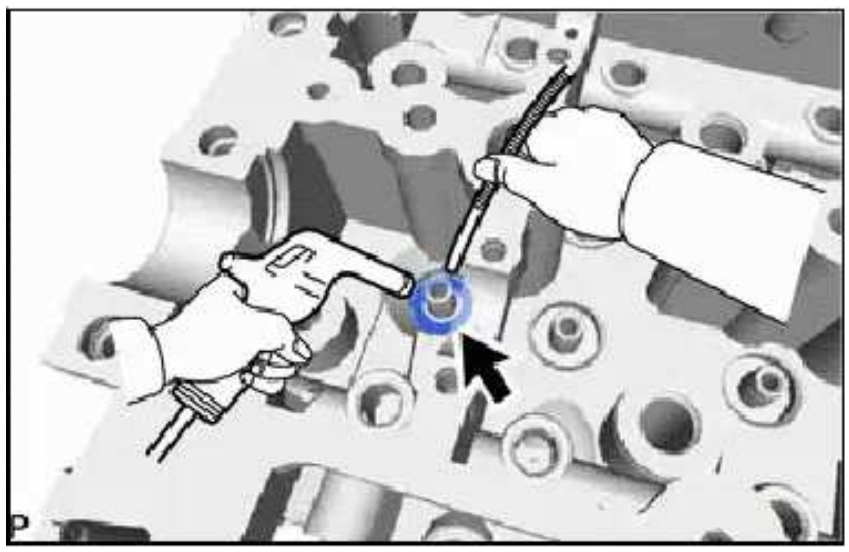
a. Using needle-nose pliers, remove the valve stem oil seals from the valve guide bush.



A337435

5. REMOVE VALVE SPRING SEAT

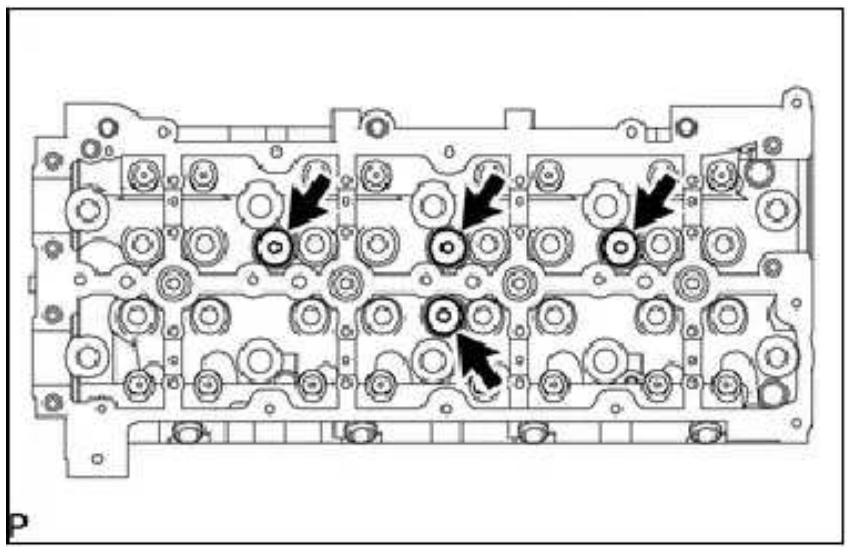
a. Using compressed air and a magnet hand, remove the valve spring seat from the cylinder head sub-assembly by blowing air onto it.



A337436

6. REMOVE NO. 1 STRAIGHT SCREW PLUG WITH HEAD

a. Using a 6 mm hexagon wrench, remove the 4 No. 1 straight screw plug with heads from the cylinder head sub-assembly.



A337437

7. REMOVE STUD BOLT

NOTICE:

If a stud bolt is deformed or its threads are damaged, replace it.

CYLINDER HEAD > INSPECTION

1. INSPECT CYLINDER HEAD SUB-ASSEMBLY

a. Using a precision straightedge and feeler gauge, measure the warpage of the surface where the cylinder head sub-assembly contacts the cylinder block sub-assembly, and the surfaces where the cylinder head sub-assembly contacts each manifold.

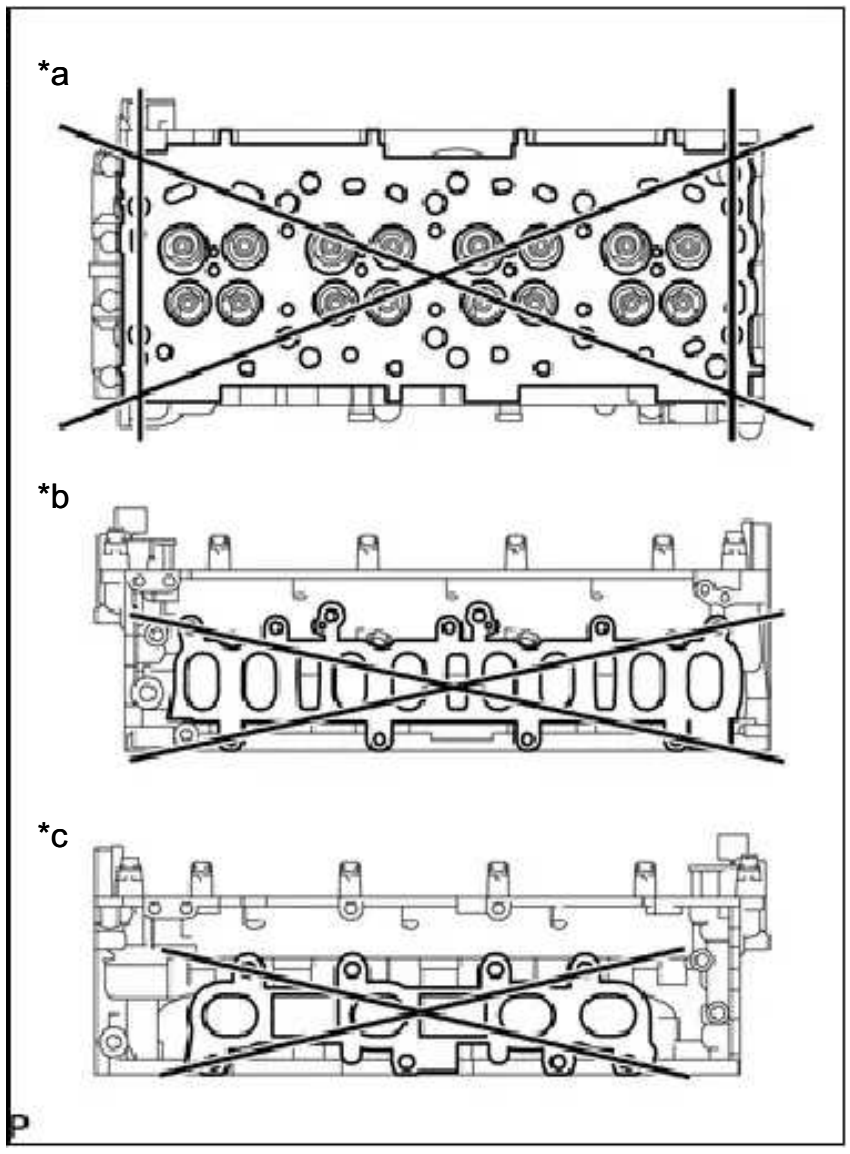
Maximum Warpage:

Item	Specified Condition
Cylinder Block Sub-assembly Side	0.05 mm (0.00197 in.)
Intake Manifold Side	0.10 mm (0.00394 in.)
Exhaust Manifold Side	0.10 mm (0.00394 in.)

If the warpage is more than the maximum, replace the cylinder head sub-assembly.

b. Using a dye penetrant, check the intake ports, exhaust ports and cylinder surface for cracks.

If there are cracks, replace the cylinder head sub-assembly.



A337442C01

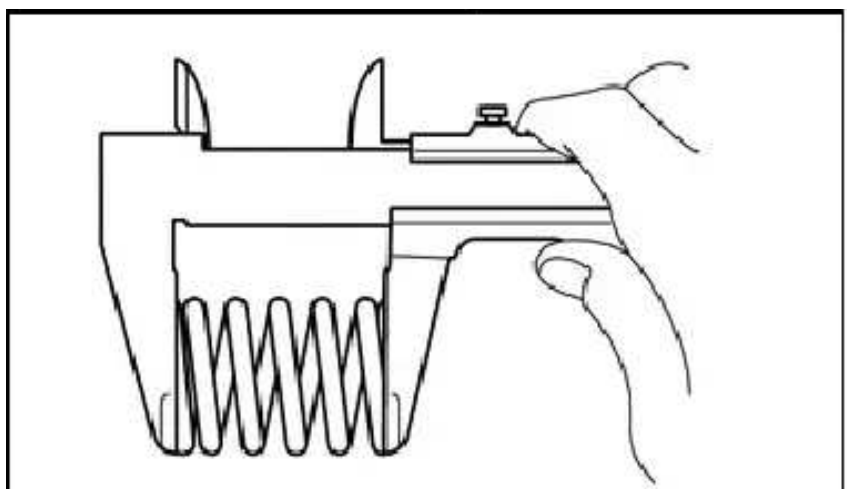
*a	Cylinder Block Sub-assembly Side
*b	Intake Manifold Side
*c	Exhaust Manifold Side

2. INSPECT VALVE COMPRESSION SPRING

a. Using a vernier caliper, measure the free length of the valve compression spring.

Standard free length:
52.4 mm (2.06 in.)

If the free length is not as specified, replace the valve compression spring.



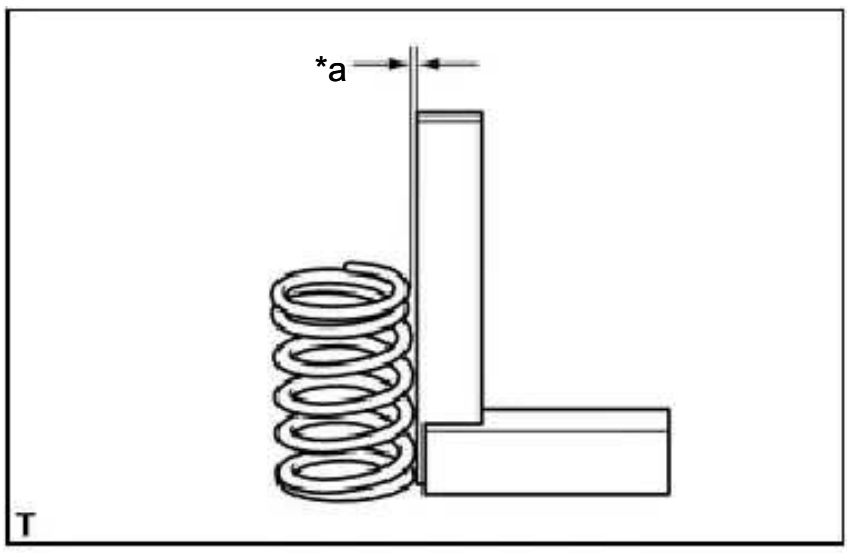
A101392

b. Using a steel square, measure the deviation of the valve compression spring.

Maximum deviation:
1.8 mm (0.0709 in.)

Maximum angle (reference):
2°

If the deviation is more than the maximum, replace the valve compression spring.



A101393C16

*a	Deviation

3. INSPECT INTAKE VALVE

a. Using a gasket scraper, chip off any carbon from the intake valve head.

NOTICE:

Be careful not to damage the intake valve face.

b. Using a wire brush, thoroughly clean the intake valve.

c. Using a vernier caliper, measure the overall length of the intake valve.

Standard overall length:
99.98 mm (3.94 in.)

Minimum overall length:
99.48 mm (3.92 in.)

If the length is less than the minimum, replace the intake valve.

d. Using a micrometer, measure the diameter of the intake valve stem.

Standard valve stem diameter:
5.970 to 5.985 mm (0.2350 to 0.2356 in.)

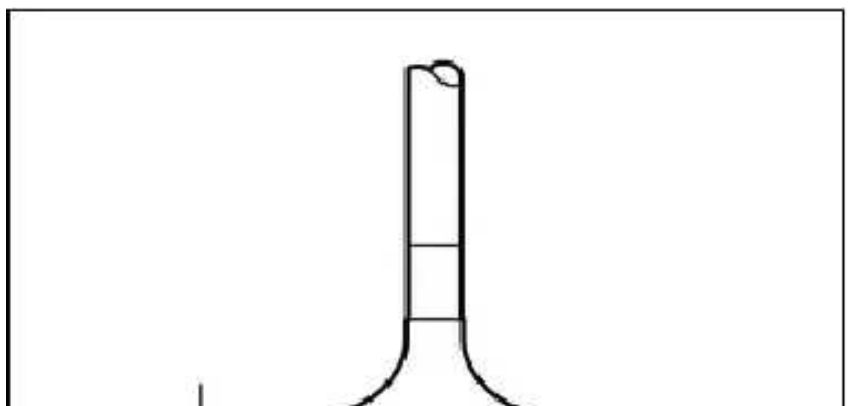
If the intake valve stem diameter is not as specified, check the oil clearance.

e. Using a vernier caliper, measure the intake valve head margin thickness.

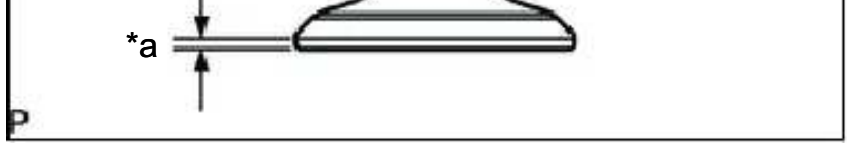
Standard margin thickness:
1.0 to 1.4 mm (0.0394 to 0.0551 in.)

Minimum margin thickness:
0.5 mm (0.0197 in.)

If the margin thickness is less than the minimum,



replace the intake valve.



A337443C01

*a	Margin Thickness

4. INSPECT EXHAUST VALVE

a. Using a gasket scraper, chip off any carbon from the exhaust valve head.

NOTICE:

Be careful not to damage the exhaust valve face.

b. Using a wire brush, thoroughly clean the exhaust valve.

c. Using a vernier caliper, measure the overall length of the exhaust valve.

Standard overall length:
99.39 mm (3.91 in.)

Minimum overall length:
98.89 mm (3.89 in.)

If the length is less than the minimum, replace the exhaust valve.

d. Using a micrometer, measure the diameter of the exhaust valve stem.

Standard valve stem diameter:
5.960 to 5.975 mm (0.2346 to 0.2352 in.)

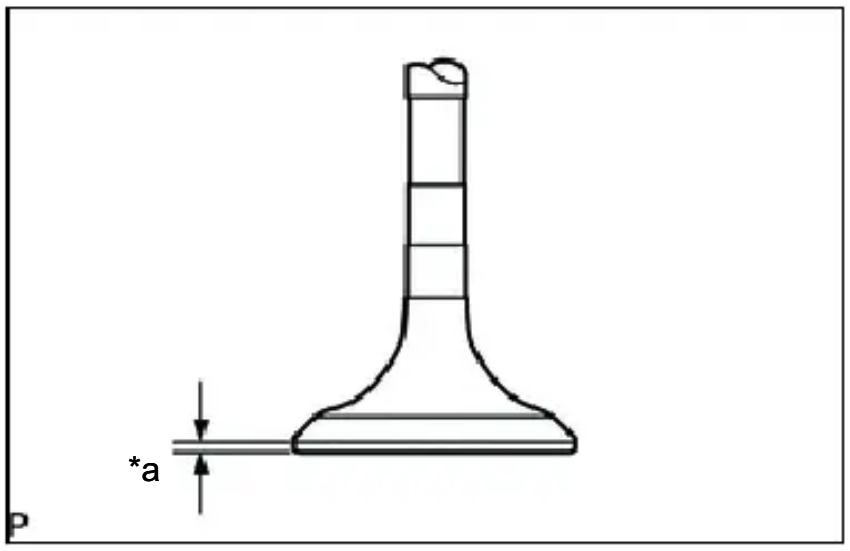
If the exhaust valve stem diameter is not as specified, check the oil clearance.

e. Using a vernier caliper, measure the exhaust valve head margin thickness.

Standard margin thickness:
1.0 to 1.4 mm (0.0394 to 0.0551 in.)

Minimum margin thickness:
0.5 mm (0.0197 in.)

If the margin thickness is less than the minimum, replace the exhaust valve.

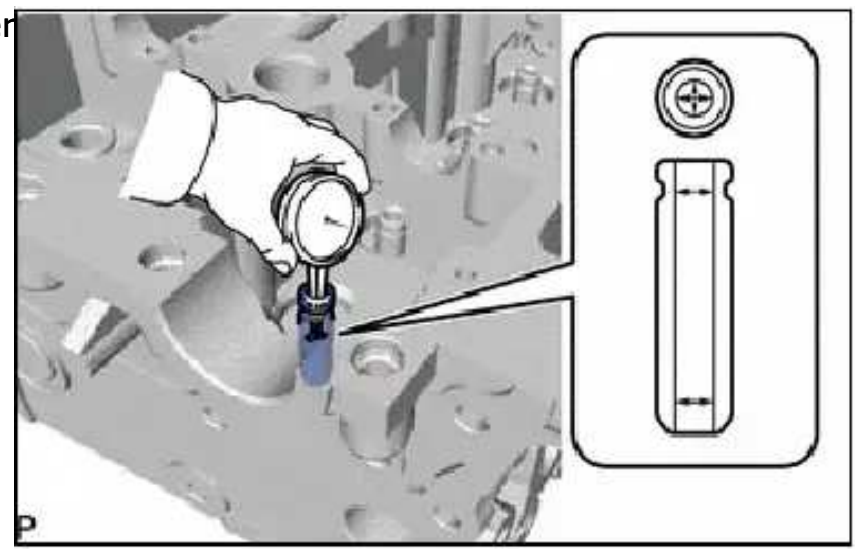


A337444C01

*a	Margin Thickness

5. INSPECT VALVE GUIDE BUSH OIL CLEARANCE

a. Using a caliper gauge, measure the inside diameter of the valve guide bush.



A337445

Standard valve guide bush inside diameter:
6.010 to 6.030 mm (0.2366 to 0.2374 in.)

b. Subtract the valve stem diameter measurement from the valve guide bush inside diameter measurement.

Standard Oil Clearance:

Item	Specified Condition
Intake Side	0.025 to 0.060 mm (0.000984 to 0.00236 in.)
Exhaust Side	0.035 to 0.070 mm (0.00138 to 0.00276 in.)

Maximum Oil Clearance:

Item	Specified Condition
Intake Side	0.11 mm (0.00433 in.)
Exhaust Side	0.12 mm (0.00472 in.)

If the clearance is more than the maximum, replace the valve and valve guide bush.

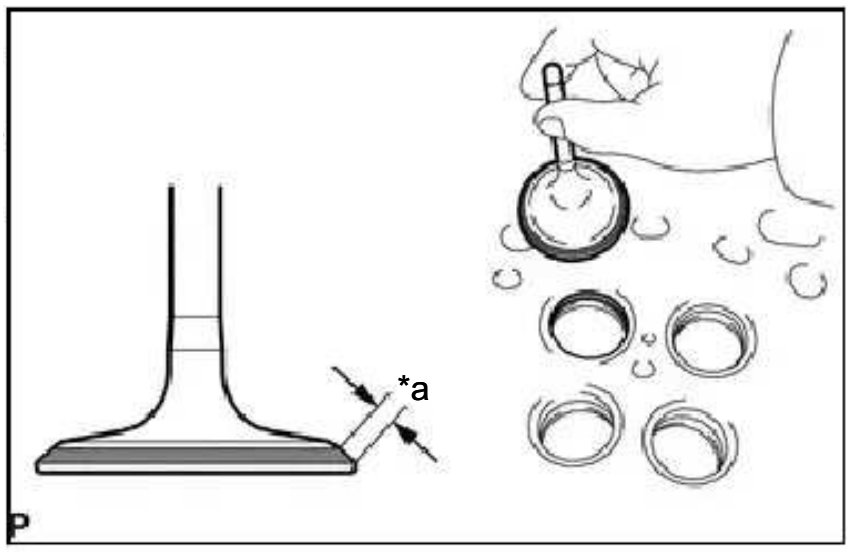
6. INSPECT INTAKE VALVE SEAT

a. Apply a light coat of Prussian blue to the intake valve face.

b. Lightly press the intake valve face against the intake valve seat.

HINT:

Do not rotate the intake valve while pressing the intake valve.



A337446C01

*a	Width

c. Check the intake valve face and intake valve seat.

i. Check that Prussian blue appears around the entire intake valve face and that the intake valve face is concentric. If not, replace the intake valve.

ii. Check that Prussian blue appears around the entire intake valve seat and that the guide and intake valve face are concentric. If not, resurface the intake valve seat.

iii. Check that the intake valve seat contacts the middle of the intake valve face with the width between 1.2 to 1.6 mm (0.0472 to 0.0630 in.).

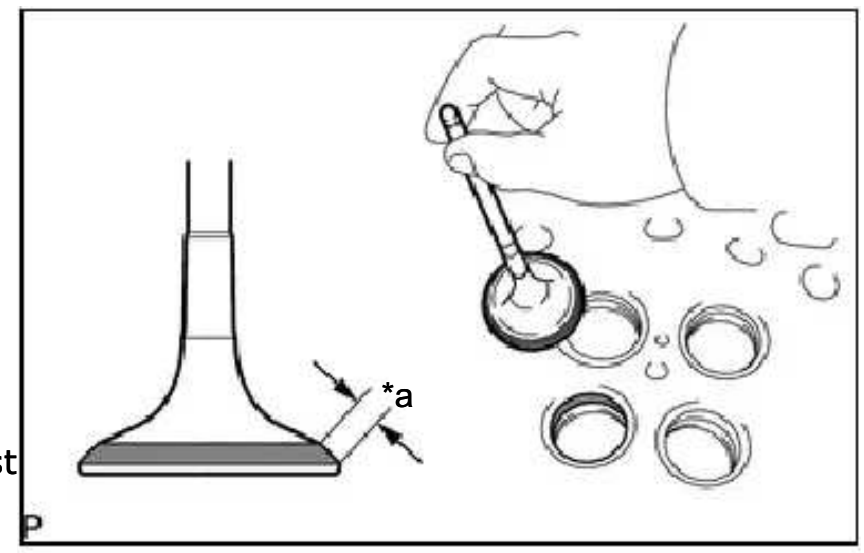
7. INSPECT EXHAUST VALVE SEAT

a. Apply a light coat of Prussian blue to the exhaust valve face.

b. Lightly press the exhaust valve face against the exhaust valve seat.

HINT:

Do not rotate the exhaust valve while pressing the exhaust valve.



A337447C01

*a	Width

c. Check the exhaust valve face and exhaust valve seat.

i. Check that Prussian blue appears around the entire exhaust valve face and that the exhaust valve face is concentric. If not, replace the exhaust valve.

ii. Check that Prussian blue appears around the entire exhaust valve seat and that the guide and exhaust valve face are concentric. If not, resurface the exhaust valve seat.

iii. Check that the exhaust valve seat contacts the middle of the exhaust valve face with the width between 1.6 to 2.0 mm (0.0630 to 0.0787 in.).

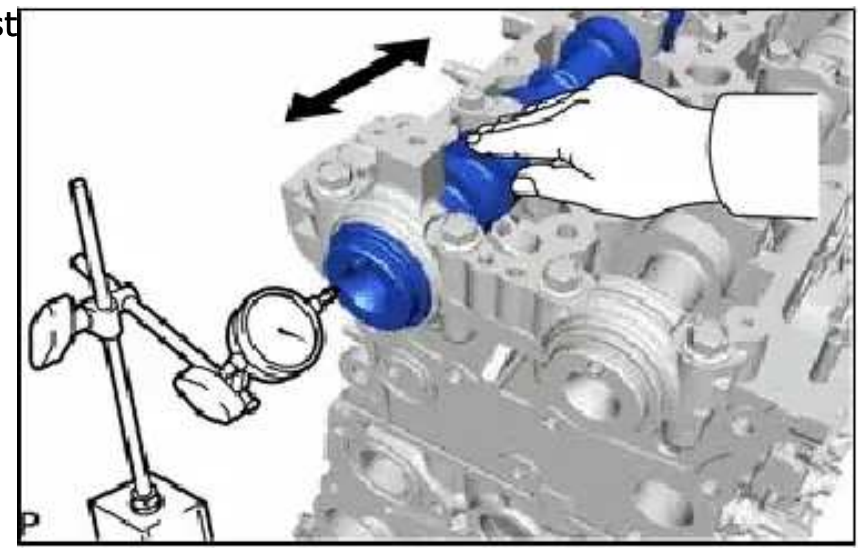
8. INSPECT CAMSHAFT THRUST CLEARANCE

a. Install the No. 2 camshaft and camshaft to the cylinder head sub-assembly.
Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE UNIT > REASSEMBLY > INSTALL NO. 2 CAMSHAFT

b. Using a dial indicator, measure the camshaft thrust clearance and No. 2 camshaft thrust clearance while moving the camshaft back and forth.

Standard thrust clearance:
0.060 to 0.200 mm (0.00236 to 0.00787 in.)

Maximum thrust clearance:
0.25 mm (0.00984 in.)



A337448

If the thrust clearance is more than the maximum, replace the cylinder head sub-assembly. If the thrust surface is damaged, replace the camshaft or No. 2 camshaft.

c. Remove the No. 2 camshaft and camshaft from the cylinder head sub-assembly.
Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE UNIT > DISASSEMBLY > REMOVE CAMSHAFT

9. INSPECT CAMSHAFT OIL CLEARANCE

Click here ENGINE MECHANICAL (2GD-FTV) > ENGINE UNIT > INSPECTION > INSPECT CAMSHAFT OIL CLEARANCE

CYLINDER HEAD > REPLACEMENT

1. REPLACE INTAKE VALVE GUIDE BUSH

a. Heat the cylinder head sub-assembly to approximately 80 to 100°C (176 to 212°F).

CAUTION:

Be sure to wear protective gloves.

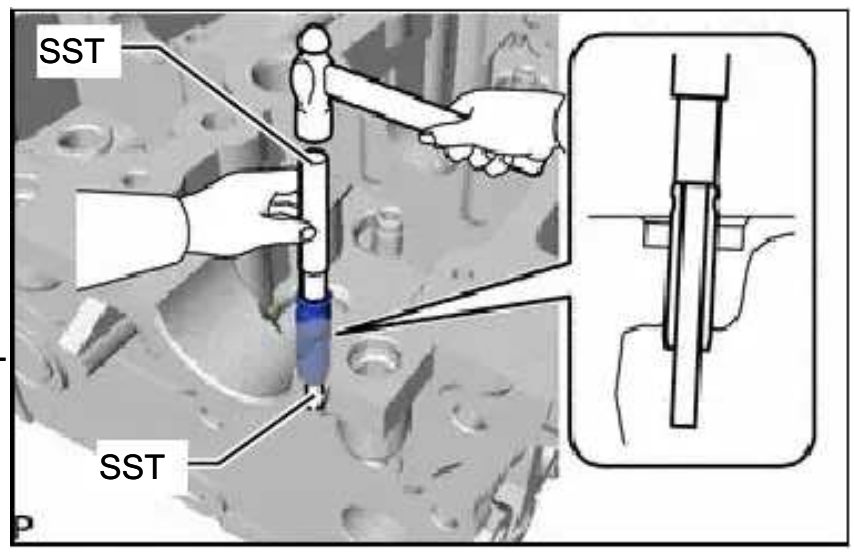
b. Place the cylinder head sub-assembly on wooden blocks.

c. Using SST and a hammer, tap out the intake valve guide bush from the cylinder head sub-assembly.

SST

09201-10000 (09201-01060)

09950-70010 (09951-07100)



A337449N01

d. Using a caliper gauge, measure the intake valve guide bush bore diameter of the cylinder head sub-assembly.

If the intake valve guide bush bore diameter of the cylinder head sub-assembly is more than 11.006 mm (0.433 in.), machine the intake valve guide bush bore diameter to between 11.035 and 11.056 mm (0.434 and 0.435 in.).

If the intake valve guide bush bore diameter of the cylinder head sub-assembly is more than 11.056 mm (0.435 in.), replace the cylinder head sub-assembly.

e. Select a new intake valve guide bush (STD or O/S 0.05).

Intake Valve Guide Bush:

Bush Size	Specified Condition
Use STD	11.033 to 11.044 mm (0.4344 to 0.4348 in.)
Use O/S 0.05	11.083 to 11.094 mm (0.4363 to 0.4368 in.)

f. Heat the cylinder head sub-assembly to approximately 80 to 100°C (176 to 212°F).

CAUTION:

Be sure to wear protective gloves.

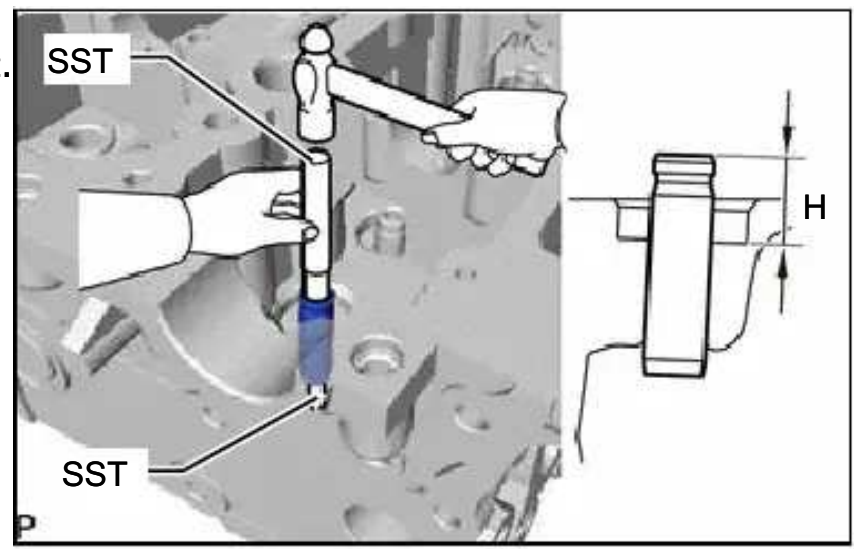
g. Place the cylinder head sub-assembly on wooden blocks.

h. Using SST and a hammer, tap in a new intake valve guide bush to the specified protrusion height.

SST
09201-10000 (09201-01060)

09950-70010 (09951-07100)

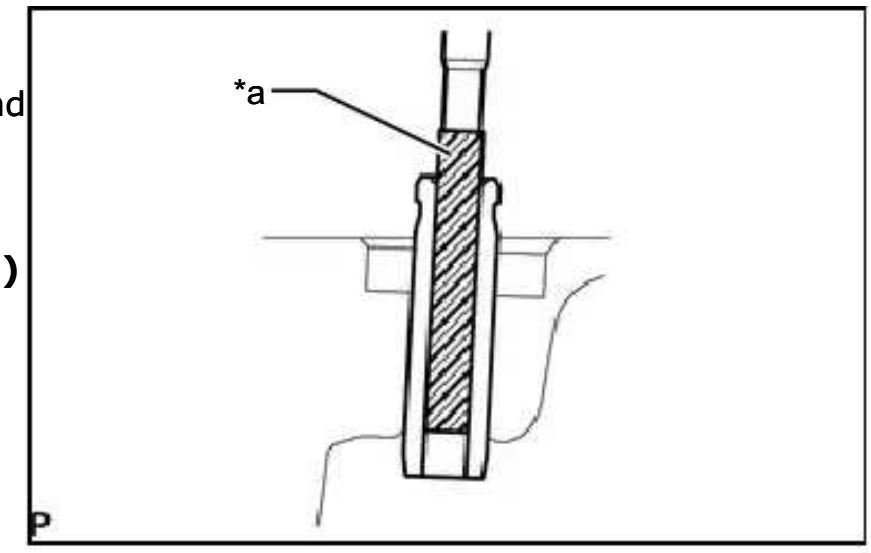
Standard protrusion height (H):
15.5 to 15.9 mm (0.610 to 0.626 in.)



A337450N01

i. Using a sharp 6.0 mm reamer, ream the intake valve guide bush to obtain the standard specified clearance between the intake valve guide bush and intake valve stem.

Standard oil clearance:
0.025 to 0.060 mm (0.000984 to 0.00236 in.)



A337451C01

*a	Sharp 6.0 mm Reamer

2. REPLACE EXHAUST VALVE GUIDE BUSH

a. Heat the cylinder head sub-assembly to approximately 80 to 100°C (176 to 212°F).

CAUTION:

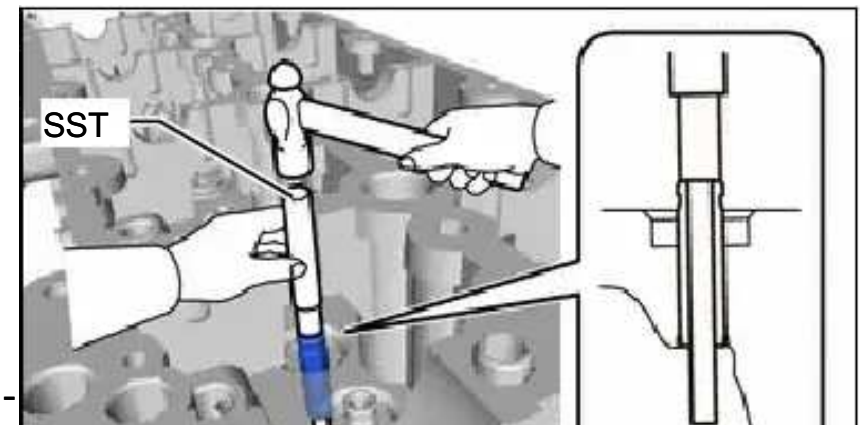
Be sure to wear protective gloves.

b. Place the cylinder head sub-assembly on wooden blocks.

c. Using SST and a hammer, tap out the exhaust valve guide bush from the cylinder head sub-assembly.

SST
09201-10000 (09201-01060)

09950-70010 (09951-07100)



d. Using a caliper gauge, measure the exhaust valve guide bush bore diameter of the cylinder head sub-

assembly.
If the exhaust valve guide bush bore diameter of the cylinder head sub-assembly is more than 11.006 mm (0.433 in.), machine the exhaust valve

A337452N01

guide bush bore diameter to between 11.035 and 11.056 mm (0.434 and 0.435 in.).
If the exhaust valve guide bush bore diameter of the cylinder head sub-assembly is more than 11.056 mm (0.435 in.), replace the cylinder head sub-assembly.

e. Select a new exhaust valve guide bush (STD or O/S 0.05).

Exhaust Valve Guide Bush:

Bush Size	Specified Condition
Use STD	11.033 to 11.044 mm (0.4344 to 0.4348 in.)
Use O/S 0.05	11.083 to 11.094 mm (0.4363 to 0.4368 in.)

f. Heat the cylinder head sub-assembly to approximately 80 to 100°C (176 to 212°F).

CAUTION:
Be sure to wear protective gloves.

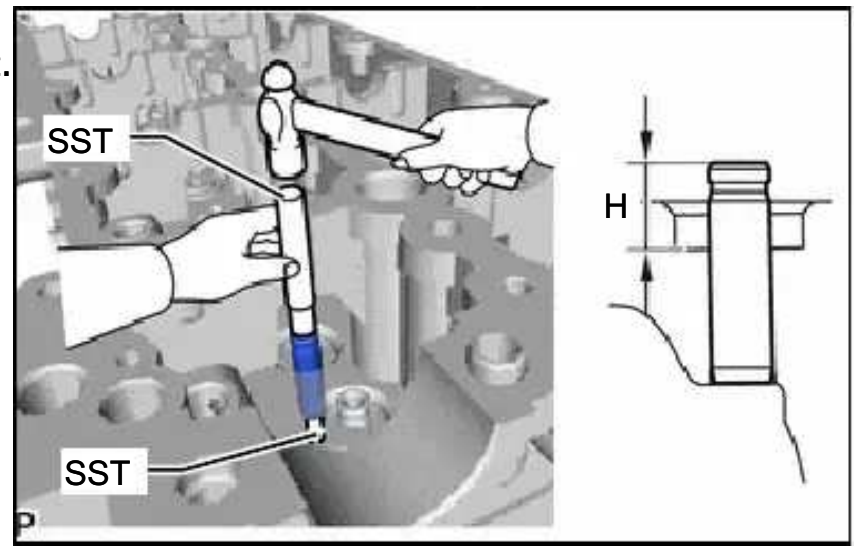
g. Place the cylinder head sub-assembly on wooden blocks.

h. Using SST and a hammer, tap in a new exhaust valve guide bush to the specified protrusion height.

SST
09201-10000 (09201-01060)

09950-70010 (09951-07100)

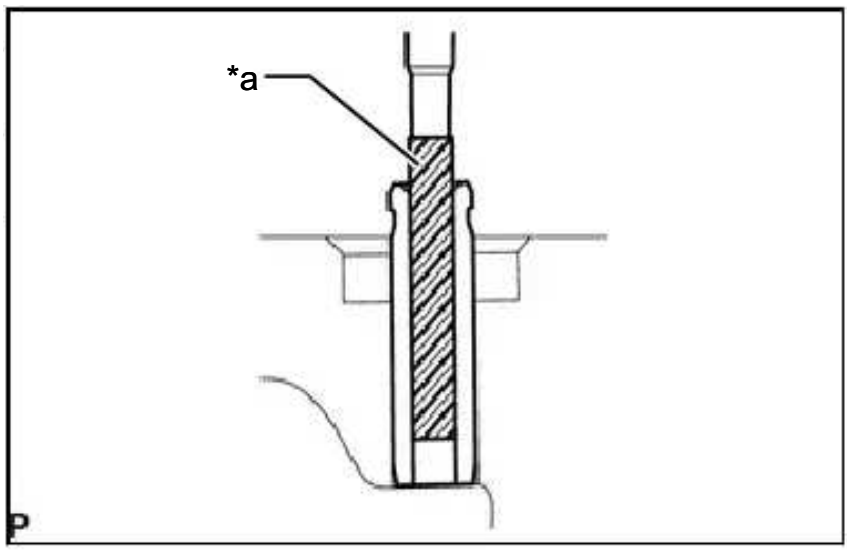
Standard protrusion height (H):
15.5 to 15.9 mm (0.610 to 0.626 in.)



A337453N01

i. Using a sharp 6.0 mm reamer, ream the exhaust valve guide bush to obtain the standard specified clearance between the exhaust valve guide bush and exhaust valve stem.

Standard oil clearance:
0.035 to 0.070 mm (0.00138 to 0.00276 in.)



A337454C01

*a	Sharp 6.0 mm Reamer

3. REPLACE RING PIN

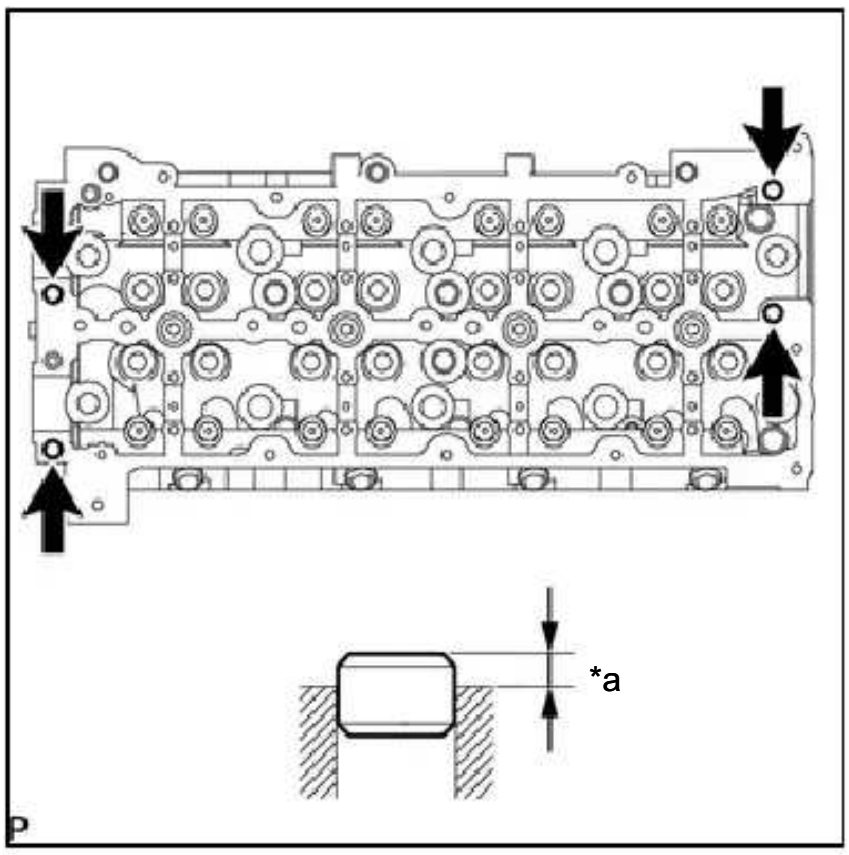
NOTICE:

It is not necessary to remove the ring pin unless it is being replaced.

a. Remove the ring pin from the cylinder head sub-assembly.

b. Using a plastic-faced hammer, tap in new ring pins to the cylinder head sub-assembly.

Standard protrusion height:
3.5 to 4.5 mm (0.138 to 0.177 in.)



A337455C01

*a	Protrusion Height

4. REPLACE STRAIGHT PIN

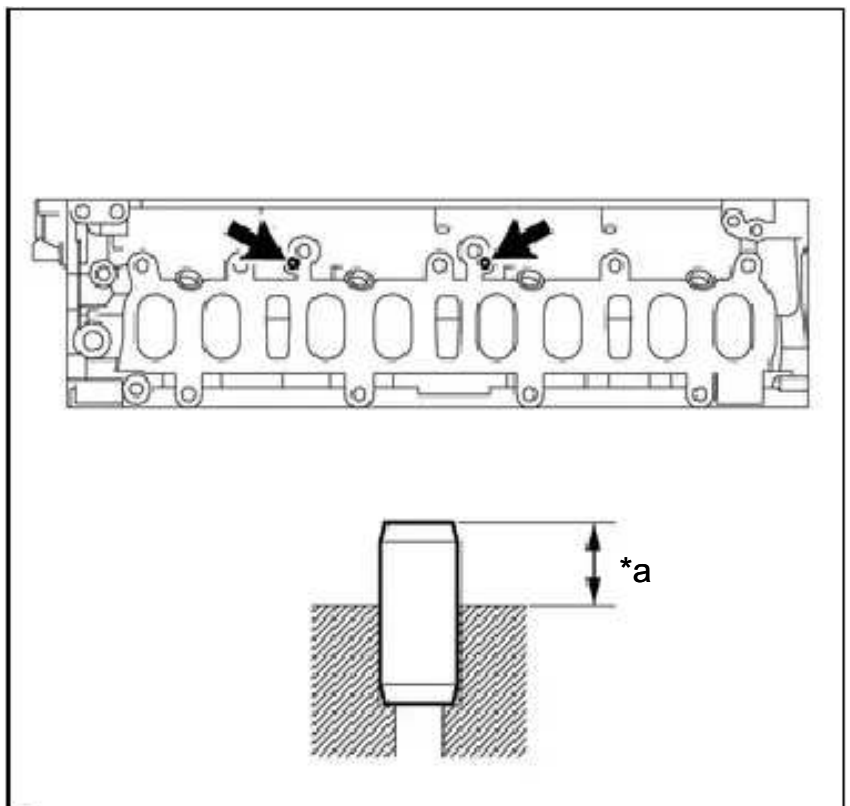
NOTICE:

It is not necessary to remove the straight pin unless it is being replaced.

a. Remove the straight pin from the cylinder head sub-assembly.

b. Using a plastic-faced hammer, tap in new straight pins to the cylinder head sub-assembly.

Standard protrusion height:
2.0 to 4.0 mm (0.0787 to 0.157 in.)



P	

A337456C01

*a	Protrusion Height

CYLINDER HEAD > REASSEMBLY

1. INSTALL STUD BOLT

NOTICE:

If a stud bolt is deformed or the threads are damaged, replace it.

a. Using an E6 "TORX" socket wrench, install the stud bolts labeled A to the cylinder head sub-assembly.

Torque:
for stud bolt A
6.0 N*m (61 kgf*cm, 53 in.*lbf)

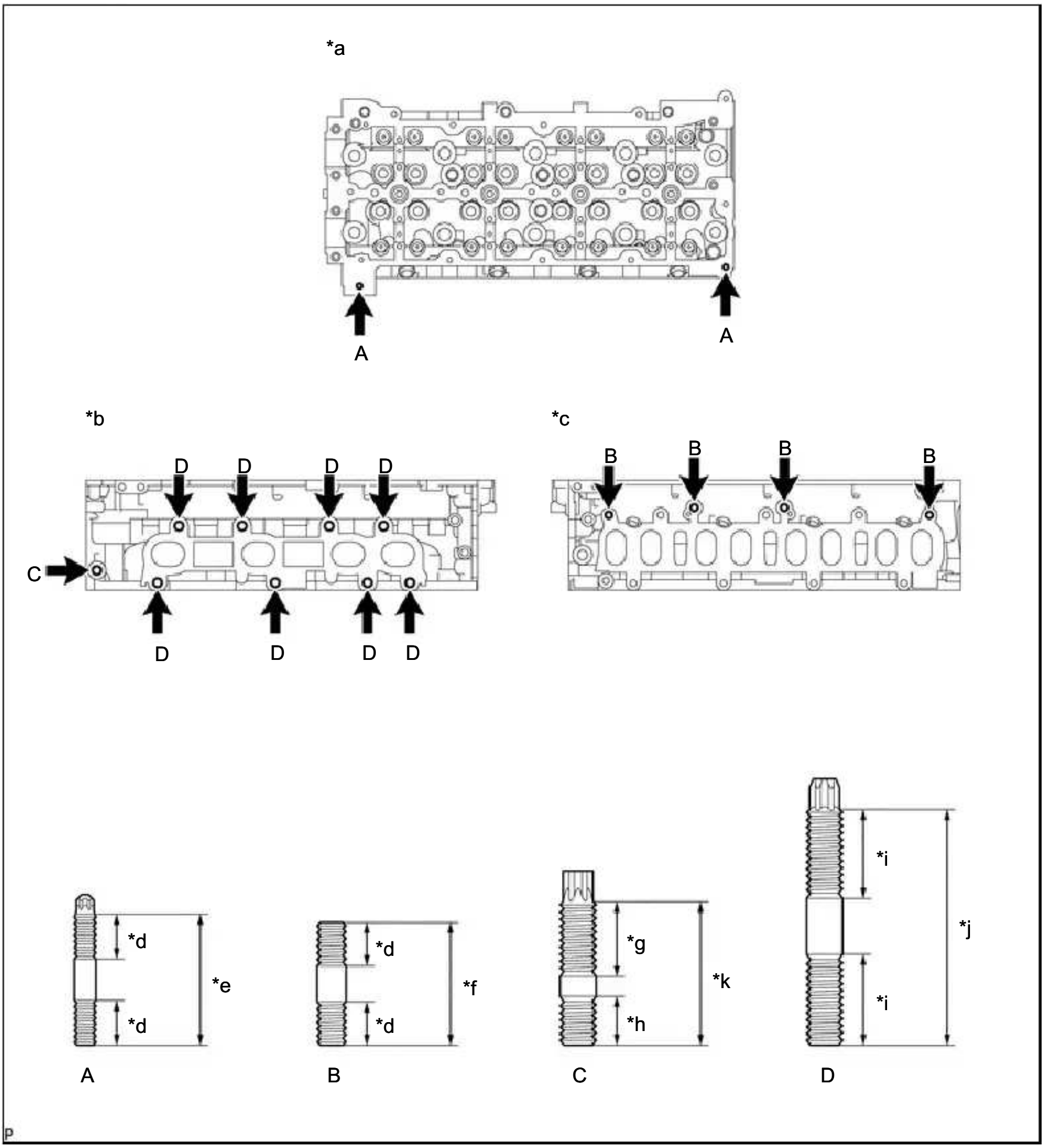
b. Install the stud bolts labeled B to the cylinder head sub-assembly.

Torque:
for stud bolt B
10 N*m (102 kgf*cm, 7 ft.*lbf)

c. Using an E10 "TORX" socket wrench, install the stud bolts labeled C and D to the cylinder head sub-assembly.

Torque:
for stud bolt C
19 N*m (194 kgf*cm, 14 ft.*lbf)

for stud bolt D
20 N*m (204 kgf*cm, 15 ft.*lbf)



A337438C01

*a	Cylinder Head Cover Sub-assembly Side	*b	Exhaust Manifold Side
*c	Intake Manifold Side	*d	12 mm (0.472 in.)
*e	37 mm (1.46 in.)	*f	34 mm (1.34 in.)
*g	23 mm (0.906 in.)	*h	15 mm (0.591 in.)
*i	25 mm (0.984 in.)	*j	65 mm (2.56 in.)
*k	40 mm (1.57 in.)	-	-

k	40 mm (1.57 in.)

2. INSTALL NO. 1 STRAIGHT SCREW PLUG WITH HEAD

a. Using a 6 mm hexagon wrench, install 4 new No. 1 straight screw plug with heads to the cylinder head sub-assembly.

Torque:
25 N*m (255 kgf*cm, 18 ft.*lbf)

3. INSTALL VALVE SPRING SEAT

a. Install the valve spring seats to the cylinder head sub-assembly.

4. INSTALL VALVE STEM OIL SEAL

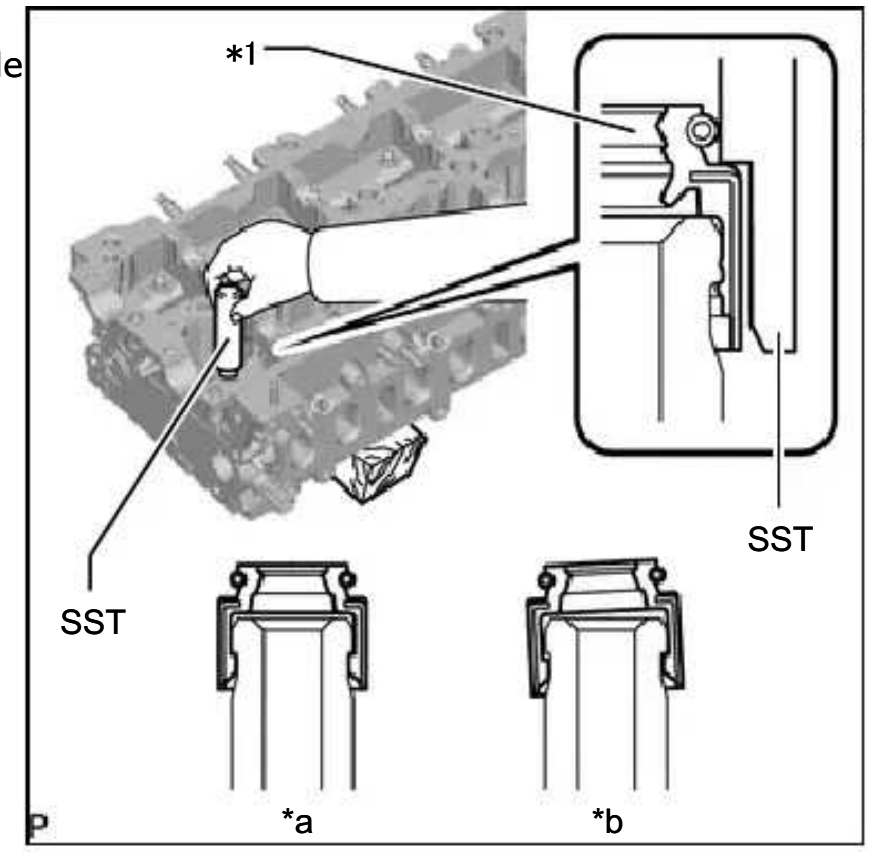
a. Apply a light coat of engine oil to a new valve stem oil seals.

b. Using SST, push in the intake valve stem oil seals and exhaust valve stem oil seals to the valve guide bush.

SST
09201-41020

NOTICE:

Failure to use SST will cause the valve stem oil seal to be damaged or improperly seated.



A337439C01

*1	Valve Stem Oil Seal
*a	CORRECT
*b	INCORRECT

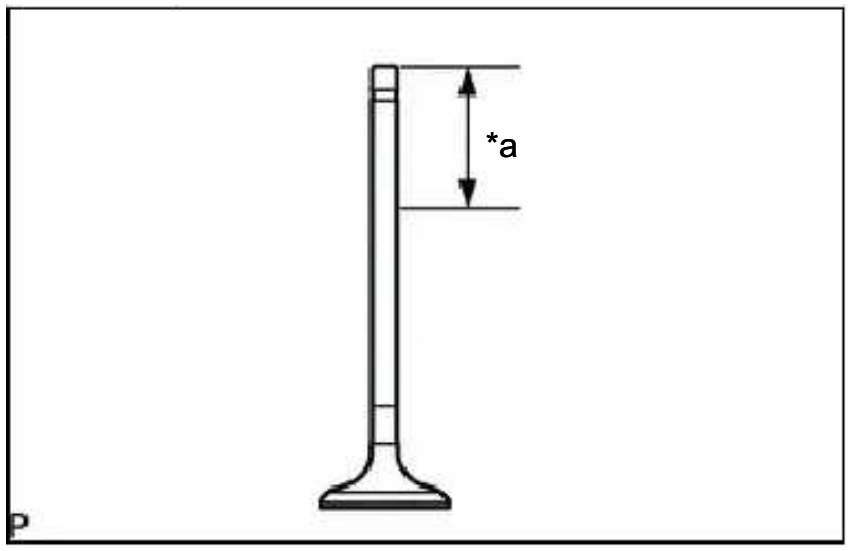
5. INSTALL INTAKE VALVE

a. Apply plenty of engine oil to the tip area of the intake valve shown in the illustration.

b. Install the intake valve, valve compression spring and valve spring retainer to the cylinder head sub-assembly.

NOTICE:

Install the same parts in the same combination to their original locations.



A337440C01

*a	30 mm (1.18 in.) or more

c. Using SST and wooden blocks, compress the valve compression spring and install the valve spring retainer locks to the valve spring retainer.

SST

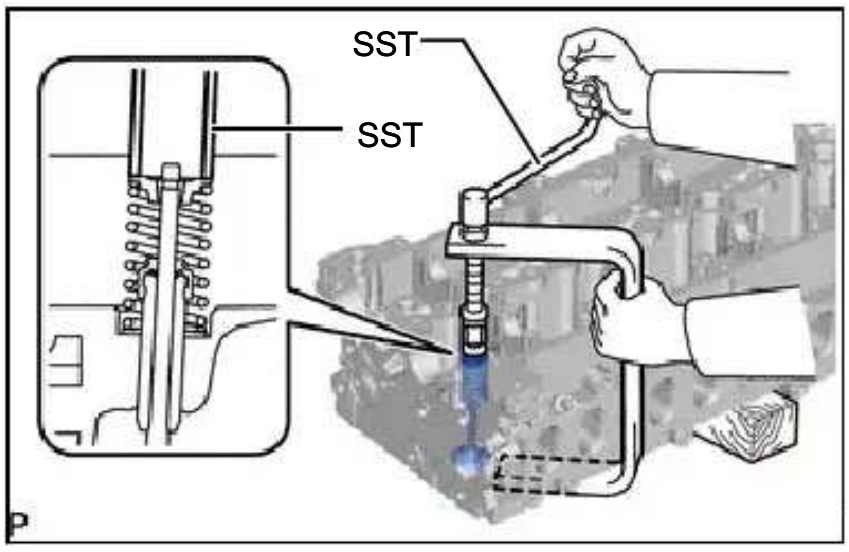
09202-70020

09202-00021

d. Using a plastic-faced hammer, lightly tap the intake valve stem tip to ensure a proper fit.

NOTICE:

Be careful not to damage the valve spring retainer.



A337433N01

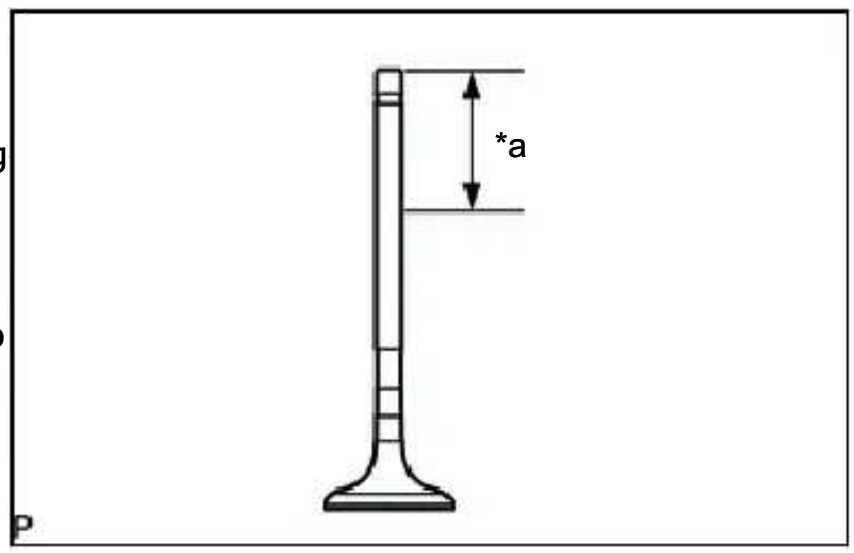
6. INSTALL EXHAUST VALVE

a. Apply plenty of engine oil to the tip area of the exhaust valve shown in the illustration.

b. Install the exhaust valve, valve compression spring and valve spring retainer to the cylinder head sub-assembly.

NOTICE:

Install the same parts in the same combination to their original locations.



A337441C01

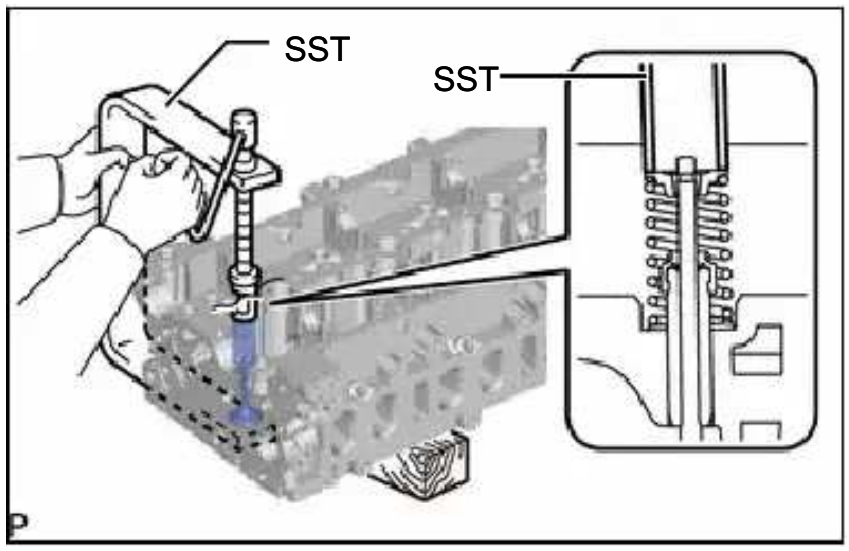
*a	30 mm (1.18 in.) or more

c. Using SST and wooden blocks, compress the valve compression spring and install the valve spring retainer locks to the valve spring retainer.

SST

09202-70020

09202-00021



A337434N01

d. Using a plastic-faced hammer, lightly tap the exhaust valve stem tip to ensure a proper fit.

NOTICE:

Be careful not to damage the valve spring retainer.

7. INSTALL VALVE STEM CAP

a. Apply a light coat of engine oil to the valve stem caps.

b. Install the 16 valve stem caps to the cylinder head sub-assembly.

NOTICE:

- **Install the valve stem cap at the same place it was removed from.**
- **Do not drop the valve stem caps into the cylinder head sub-assembly.**

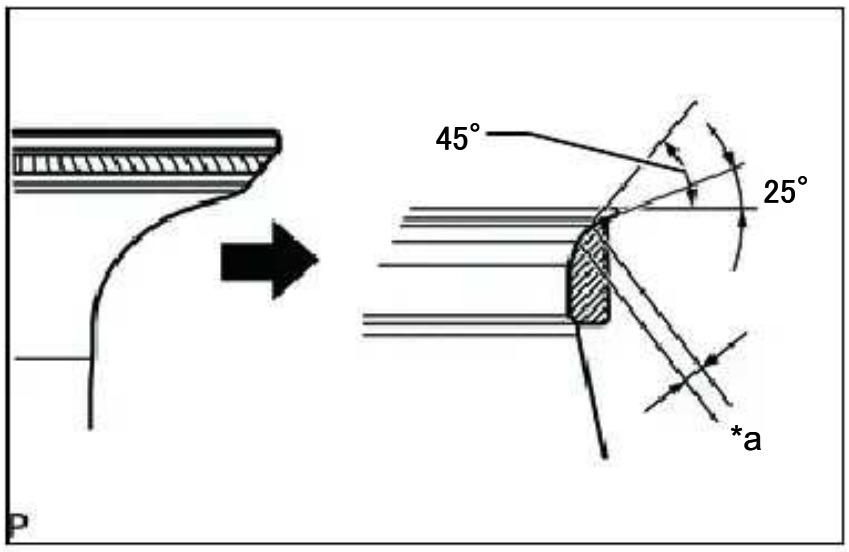
CYLINDER HEAD > REPAIR

1. REPAIR INTAKE VALVE SEAT

NOTICE:

- **Repair the seat while checking the seating position.**
- **Keep the lip free from foreign matter.**
- **Take off the cutter gradually to make the intake valve seat smooth.**

a. If the seating is too high on the intake valve face, use 25° and 45° cutters to correct the intake valve seat.



A337457C01

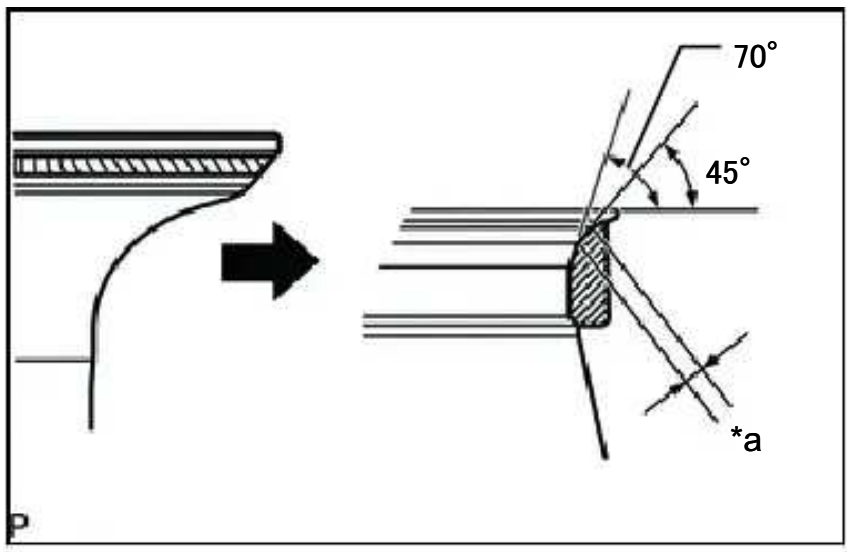
*a	Width

b. If the seating is too low on the intake valve face, use 70° and 45° cutters to correct the intake valve seat.

c. Check that the intake valve seat contact is in the middle of the intake valve face and has the following width.

Standard width:

1.2 to 1.6 mm (0.0472 to 0.0630 in.)



A337458C01

*a	Width

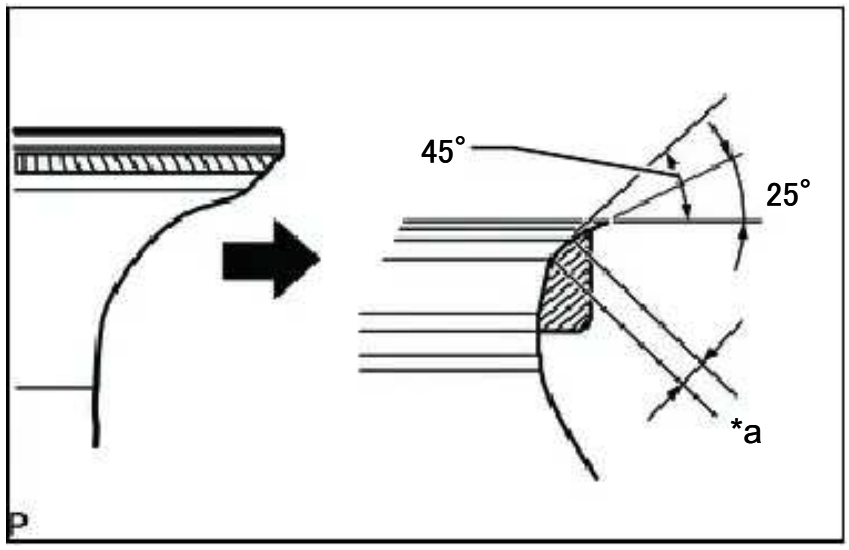
2. REPAIR EXHAUST VALVE SEAT

NOTICE:

- **Repair the seat while checking the seating position.**
- **Keep the lip free from foreign matter.**

- **Take off the cutter gradually to make the exhaust valve seat smooth.**

a. If the seating is too high on the exhaust valve face, use 25° and 45° cutters to correct the exhaust valve seat.



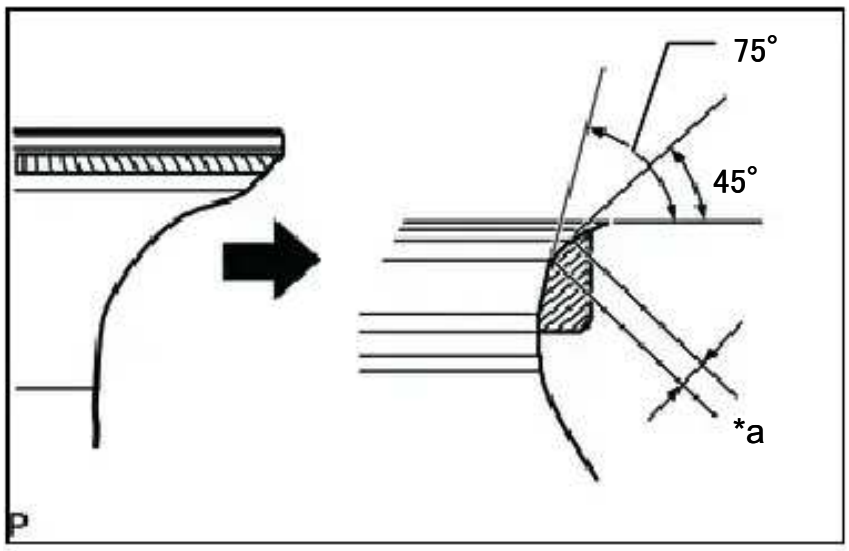
A337459C01

*a	Width

b. If the seating is too low on the exhaust valve face, use 75° and 45° cutters to correct the exhaust valve seat.

c. Check that the seat contact is in the middle of the exhaust valve face and has the following width.

Standard width:
1.6 to 2.0 mm (0.0630 to 0.0787 in.)



A337460C01

*a	Width

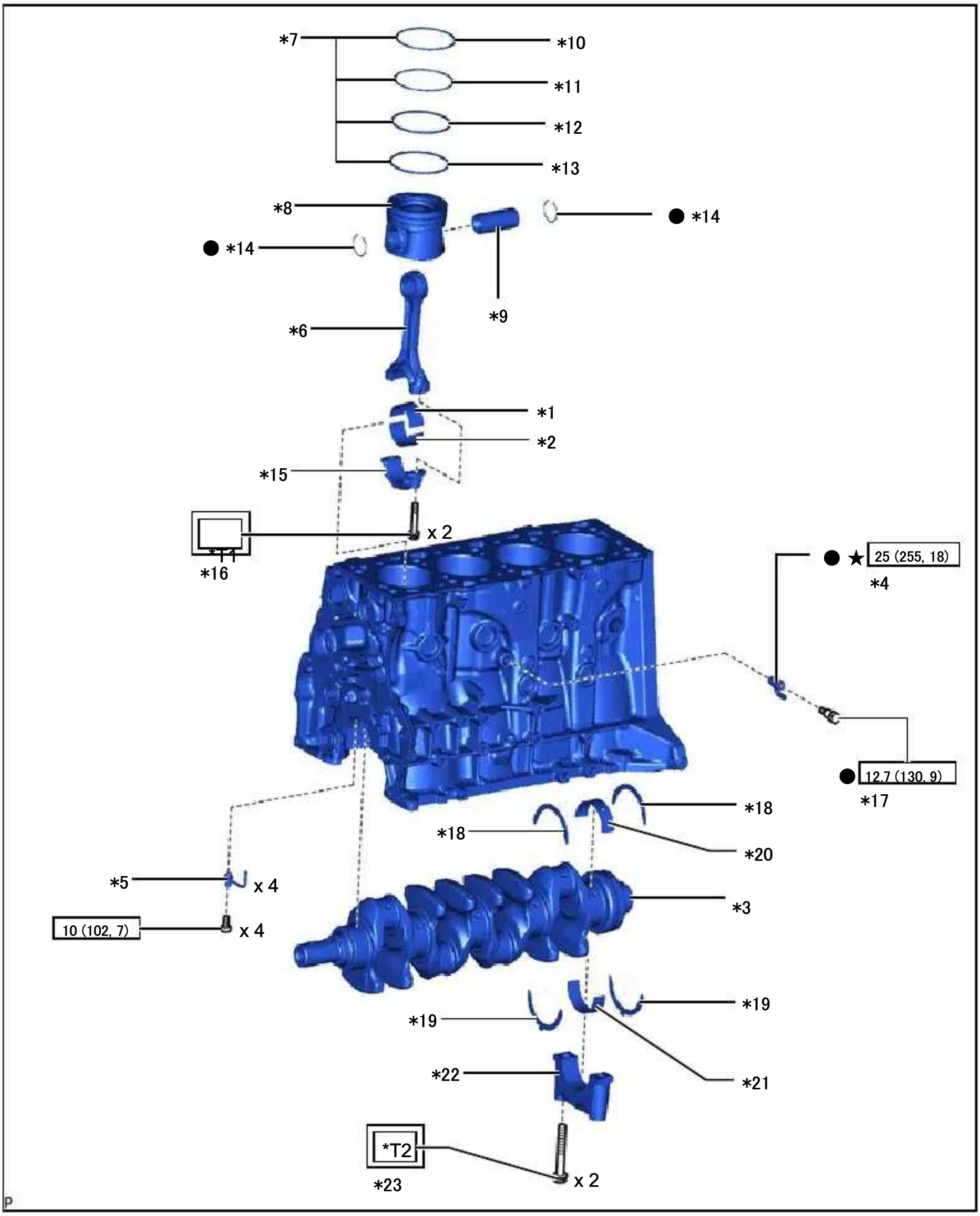
CYLINDER BLOCK > PRECAUTION

HINT:

- **Any digits beyond the 0.01 mm (1/1000 in.) place for standard, minimum and maximum values should be used as a reference only.**

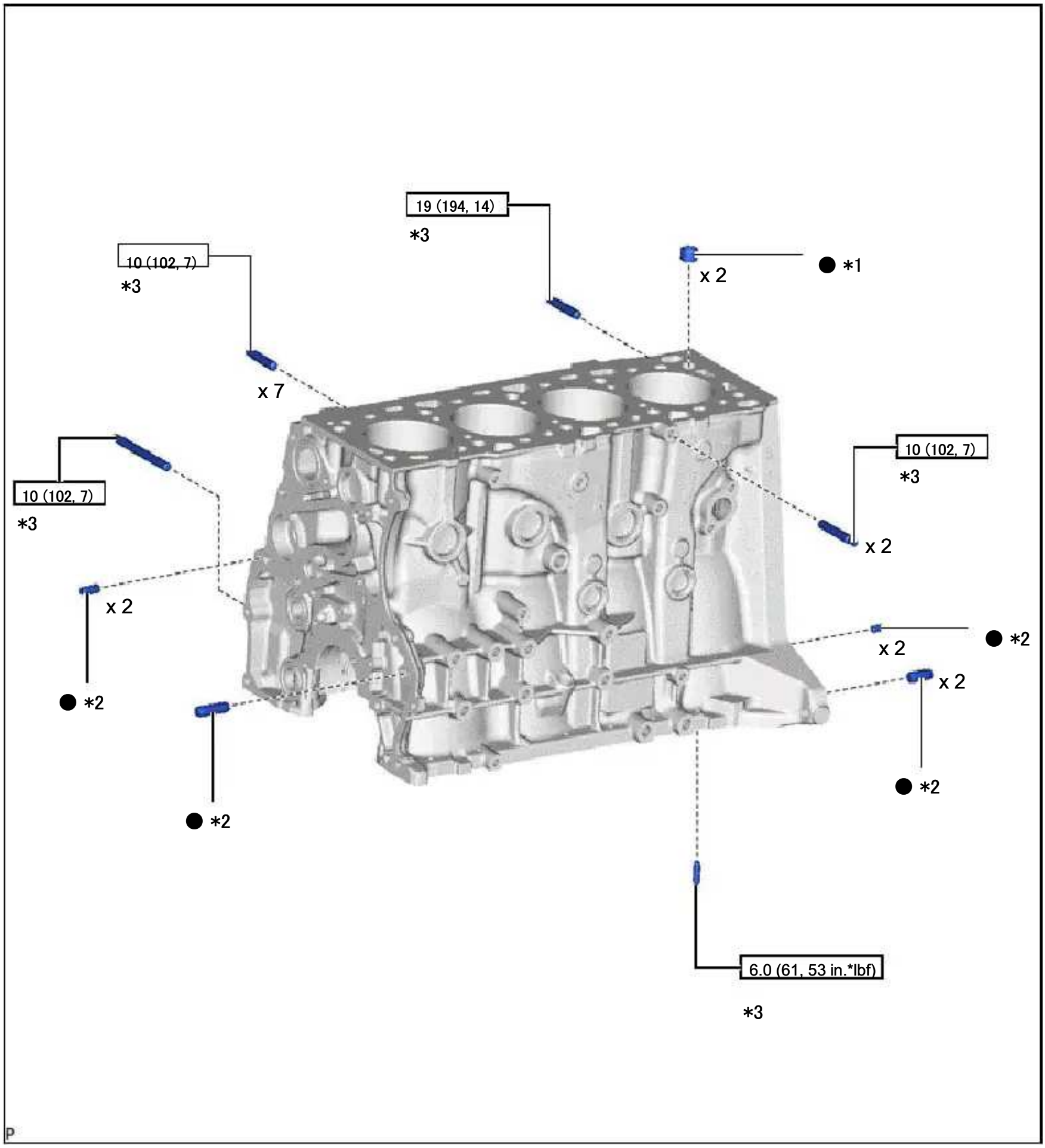
- **When both standard and maximum or minimum values are listed for an inspection, use the standard value as a reference only and base any judgments on the maximum and minimum values.**

2GD-FTV ENGINE MECHANICAL > CYLINDER BLOCK



*1	NO. 1 CONNECTING ROD BEARING	*2	NO. 2 CONNECTING ROD BEARING

*3	CRANKSHAFT	*4	CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY
*5	NO. 1 OIL NOZZLE SUB-ASSEMBLY	*6	CONNECTING ROD SUB-ASSEMBLY
*7	PISTON RING SET	*8	PISTON
*9	PISTON PIN	*10	NO. 1 COMPRESSION RING
*11	NO. 2 COMPRESSION RING	*12	OIL RING RAIL
*13	OIL RING EXPANDER	*14	PISTON PIN HOLE SNAP RING
*15	CONNECTING ROD CAP	*16	CONNECTING ROD BOLT
*17	CYLINDER BLOCK WATER DRAIN COCK PLUG	*18	UPPER CRANKSHAFT THRUST WASHER
*19	LOWER CRANKSHAFT THRUST WASHER	*20	NO. 1 CRANKSHAFT BEARING
*21	NO. 2 CRANKSHAFT BEARING	*22	CRANKSHAFT BEARING CAP
*23	CRANKSHAFT BEARING CAP SET BOLT	-	-
▭	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping" : N*m (kgf*cm, ft.*lbf)	▭	N*m (kgf*cm, ft.*lbf): Specified torque
●	Non-reusable part	★	Precoated part
*T1	1st: 40 (408, 30) 2nd: Turn 90°	*T2	1st: 95 (969, 70) 2nd: Turn 90°



A337463C01

*1	RING PIN	*2	STRAIGHT PIN
*3	STUD BOLT	-	-
□	N*m (kgf*cm, ft.*lbf): Specified torque	●	Non-reusable part

CYLINDER BLOCK > DISASSEMBLY

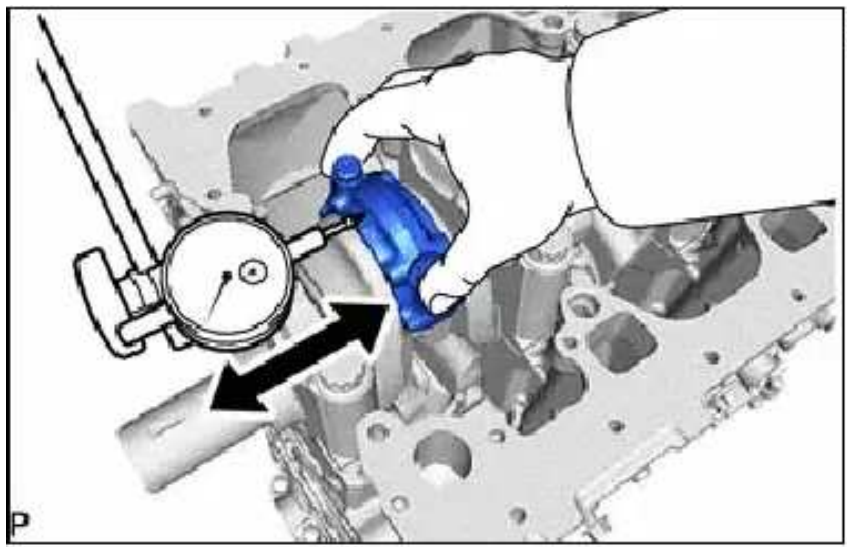
1. INSPECT CONNECTING ROD SUB-ASSEMBLY THRUST CLEARANCE

a. Using a dial indicator, measure the thrust clearance while moving the connecting rod sub-assembly back and forth.

Standard thrust clearance:
0.10 to 0.45 mm (0.00394 to 0.0177 in.)

Maximum thrust clearance:
0.45 mm (0.0177 in.)

If the thrust clearance is more than the maximum, replace the connecting rod sub-assembly. If necessary, replace the crankshaft.



A337464

2. INSPECT CONNECTING ROD SUB-ASSEMBLY OIL CLEARANCE

a. Remove the 2 connecting rod bolts.

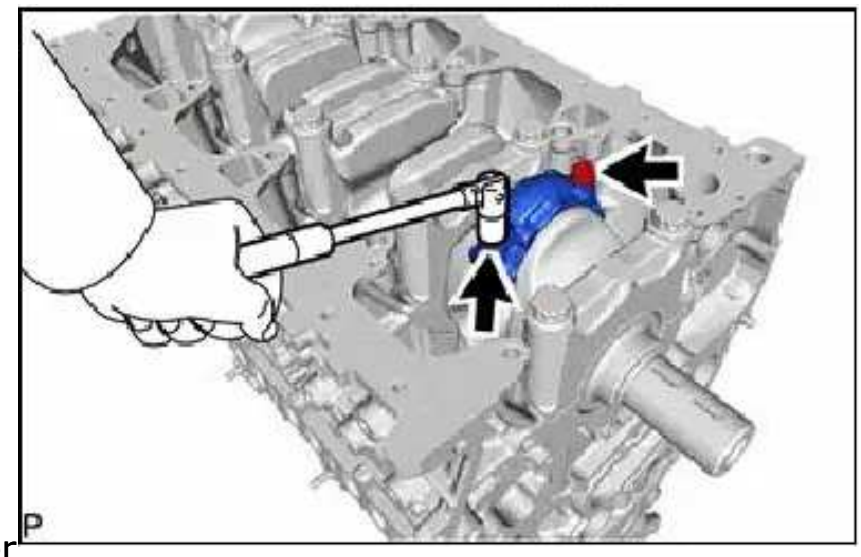
b. Using the 2 removed connecting rod bolts, move the connecting rod cap back and forth to remove the connecting rod cap from the connecting rod sub-assembly.

HINT:

Keep the connecting rod bearing and connecting rod cap together.

c. Clean the crank pin and connecting rod bearing.

d. Check the crank pin and connecting rod bearing for pitting and scratches.



A337465

If the crank pin or connecting rod bearing is damaged, replace the connecting rod bearings. If necessary, replace the crankshaft.

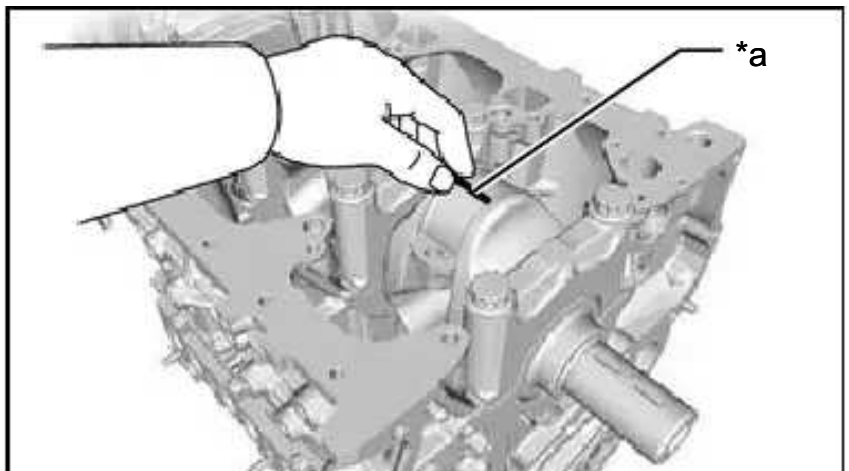
e. Lay a strip of Plastigage on the crank pin.

f. Install the connecting rod cap to the connecting rod sub-assembly.

Click here ENGINE MECHANICAL (2GD-FTV) > CYLINDER BLOCK > REASSEMBLY > INSTALL PISTON AND CONNECTING ROD SUB-ASSEMBLY (for 2GD-FTV)

NOTICE:

Do not turn the crankshaft.



g. Remove the 2 connecting rod bolts and connecting rod cap from the connecting rod sub-assembly.

HINT:

A337466C01

*a	Plastigage

Keep the connecting rod bearing and connecting rod cap together.

h. Measure the Plastigage at its widest point.

Standard oil clearance:
0.036 to 0.042 mm (0.00142 to 0.00165 in.)

Maximum oil clearance:
0.048 mm (0.00189 in.)

NOTICE:

Remove the Plastigage completely after the measurement.

If the oil clearance is more than the maximum, replace the connecting rod bearing. If necessary, grind or replace the crankshaft.

HINT:

If using a standard connecting rod bearing, replace it with one that has the same number. If the number of the connecting rod bearing cannot be determined, select the correct connecting rod bearing by adding together the numbers imprinted on the crankshaft and connecting rod cap, and then selecting the connecting rod bearing with the same number as the total. There are 5 sizes of standard connecting rod bearings, marked 2, 3, 4, 5 and 6.

EXAMPLE:

Connecting rod cap (A) "3" + Crankshaft (B) "1" = Total number 4 (Use connecting rod bearing (C) "4")

Connecting Rod Cap (A)	Crankshaft (B)	Use Connecting Rod Bearing (C)
1	1	2
	2	3
	3	4
2	1	3
	2	4
	3	5
3	1	4
	2	5
	3	6

Standard Connecting Rod Sub-assembly Big End Inside Diameter (A):

Item	Specified Condition
Mark 1	53.014 to 53.020 mm (2.0872 to 2.0874 in.)
Mark 2	53.020 to 53.026 mm (2.0874 to 2.0876 in.)
Mark 3	53.026 to 53.032 mm (2.0876 to 2.0879 in.)

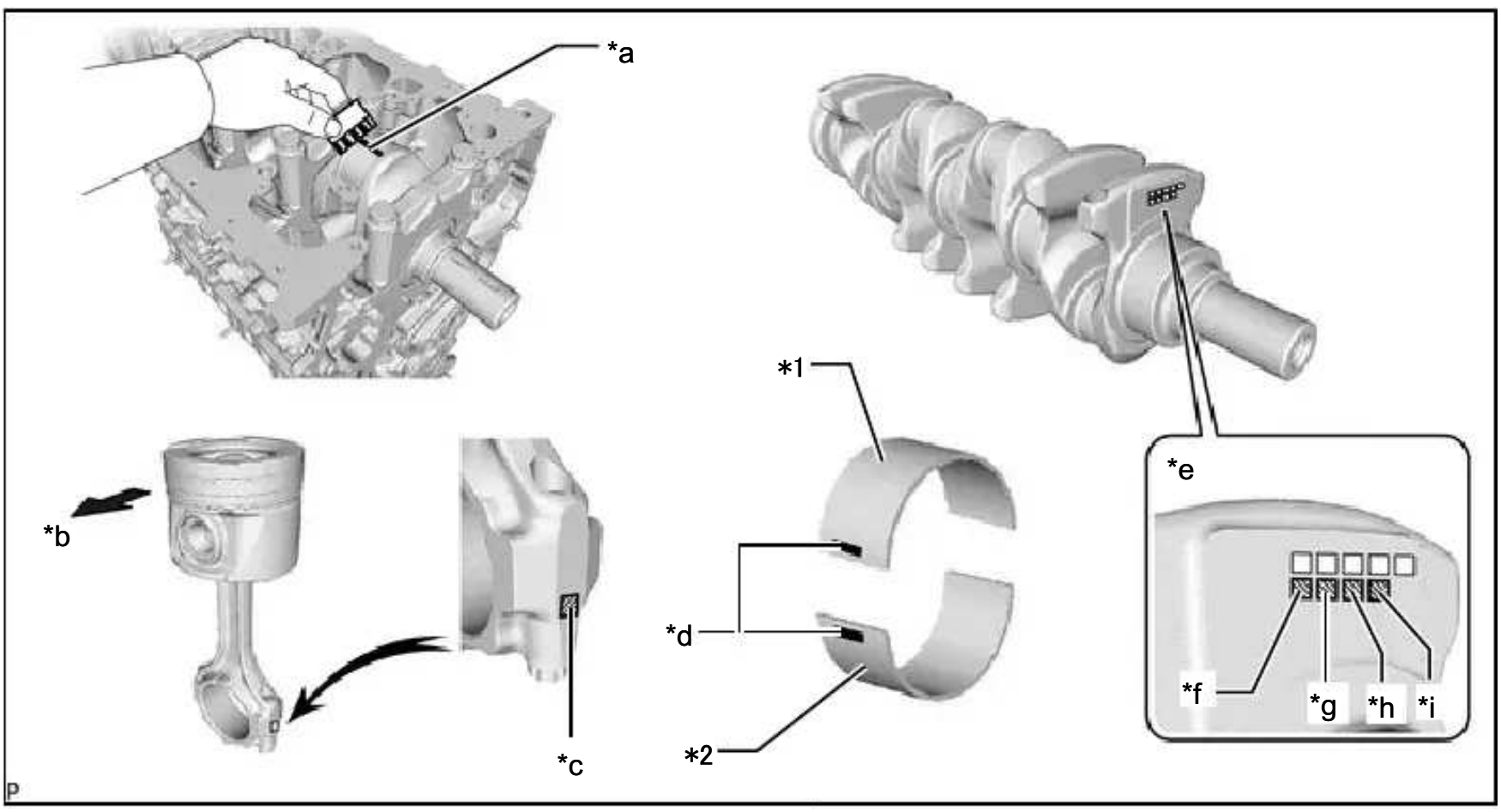
Standard Crank Pin Diameter (B):

Item	Specified Condition
Mark 1	49.994 to 50.000 mm (1.9683 to 1.9685 in.)

Mark 2	49.988 to 49.994 mm (1.9680 to 1.9683 in.)
Mark 3	49.982 to 49.988 mm (1.9678 to 1.9680 in.)

Standard Sized Connecting Rod Bearing Center Wall Thickness (C):

Item	Specified Condition
Mark 2	1.486 to 1.489 mm (0.0585 to 0.0586 in.)
Mark 3	1.489 to 1.492 mm (0.0586 to 0.0587 in.)
Mark 4	1.492 to 1.495 mm (0.0587 to 0.0589 in.)
Mark 5	1.495 to 1.498 mm (0.0589 to 0.0590 in.)
Mark 6	1.498 to 1.501 mm (0.0590 to 0.0591 in.)



A337470C01

*1	No. 1 Connecting Rod Bearing	*2	No. 2 Connecting Rod Bearing
*a	Plastigage	*b	Front Side
*c	Connecting Rod Sub-assembly Big End Inside Diameter: Mark 1, 2 or 3	*d	Connecting Rod Bearing: Mark 2, 3, 4, 5 or 6
*e	Crank Pin Diameter: Mark 1, 2 or 3	*f	No. 1
*g	No. 2	*h	No. 3
*i	No. 4	-	-

i. Completely remove the Plastigage from the crank pin.

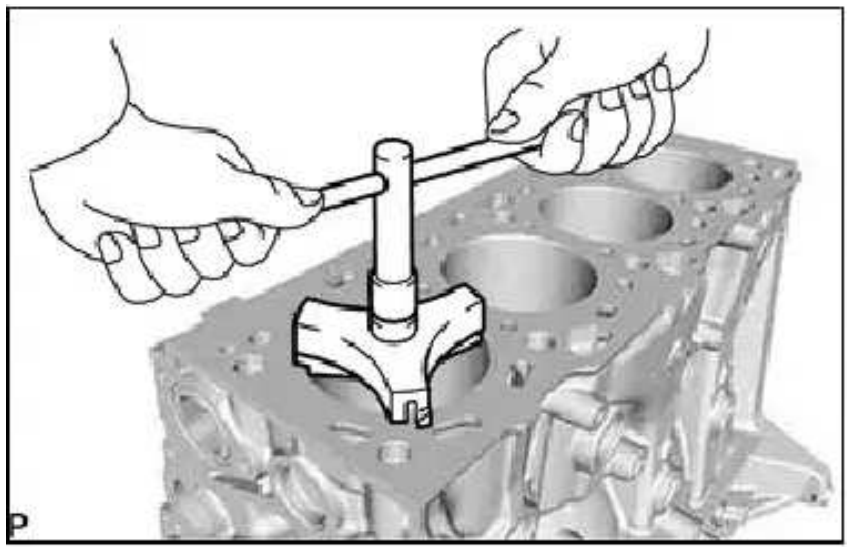
3. REMOVE PISTON AND CONNECTING ROD SUB-ASSEMBLY

a. Using a ridge reamer, remove all the carbon from the top of the cylinder.

b. Push out the piston and connecting rod sub-assembly with connecting rod bearing through the top of the cylinder block sub-assembly to remove them.

HINT:

- **Keep the connecting rod sub-assembly and connecting rod cap together.**
- **Arrange the piston and connecting rod sub-assemblies in the correct order.**
- **Be sure to arrange the removed piston and connecting rod sub-assemblies in such a way that they can be reinstalled exactly as before.**



A337471

4. REMOVE CONNECTING ROD BEARING

a. Remove the No. 1 connecting rod bearings and No. 2 connecting rod bearings from the connecting rod sub-assemblies and connecting rod caps.

HINT:

Arrange the removed parts in the correct order.

5. REMOVE PISTON RING SET

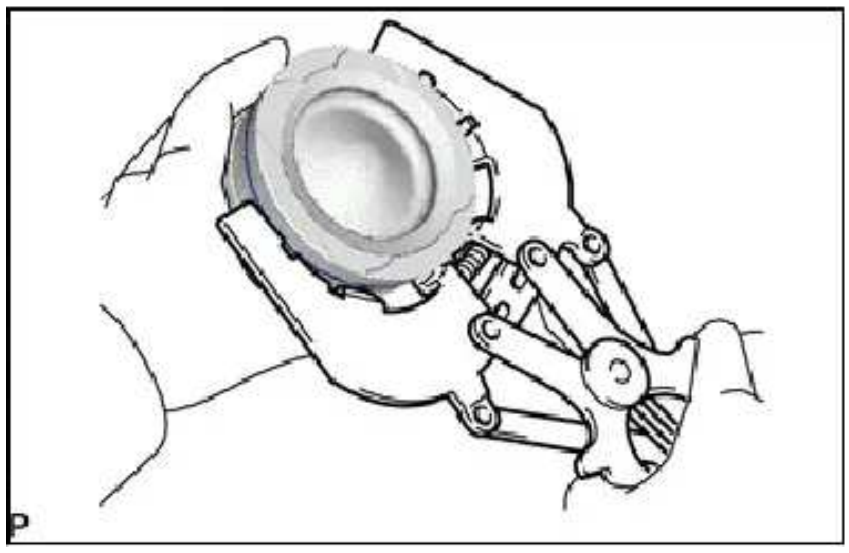
HINT:

Arrange the piston rings in the correct order.

a. Using a piston ring expander, remove the No. 1 compression ring and No. 2 compression ring from the piston.

b. Using a piston ring expander, remove the oil ring rail from the piston.

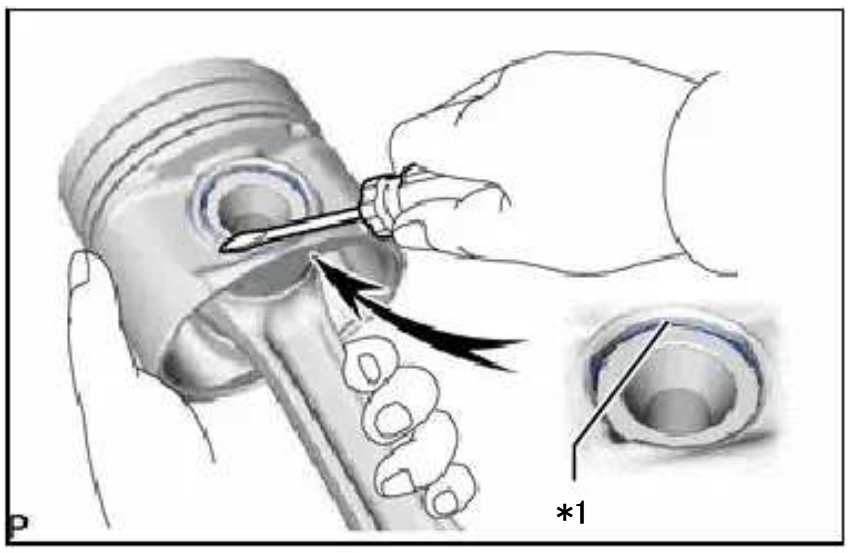
c. Remove the oil ring expander from the piston by hand.



A337472

6. REMOVE PISTON WITH PIN SUB-ASSEMBLY

a. Using a small screwdriver, pry out the front side piston pin hole snap ring from the piston.



A337474C01

*1	Piston Pin Hole Snap Ring

b. Gradually heat the piston to approximately 80°C (176°F).

CAUTION:

Be sure to wear protective gloves.

c. Using a plastic-faced hammer and brass bar, lightly tap out the piston pin from the piston. Then remove the connecting rod sub-assembly.

HINT:

- **The piston and piston pin are a matched set.**
- **Be sure to organize the removed pistons, piston pins, piston rings, connecting rod sub-assemblies and connecting rod bearings in such a way that the parts can be reinstalled exactly as before.**
- **Arrange the pistons, piston pins, connecting rod sub-assemblies and connecting rod bearings in the correct order.**

7. INSPECT CRANKSHAFT THRUST CLEARANCE

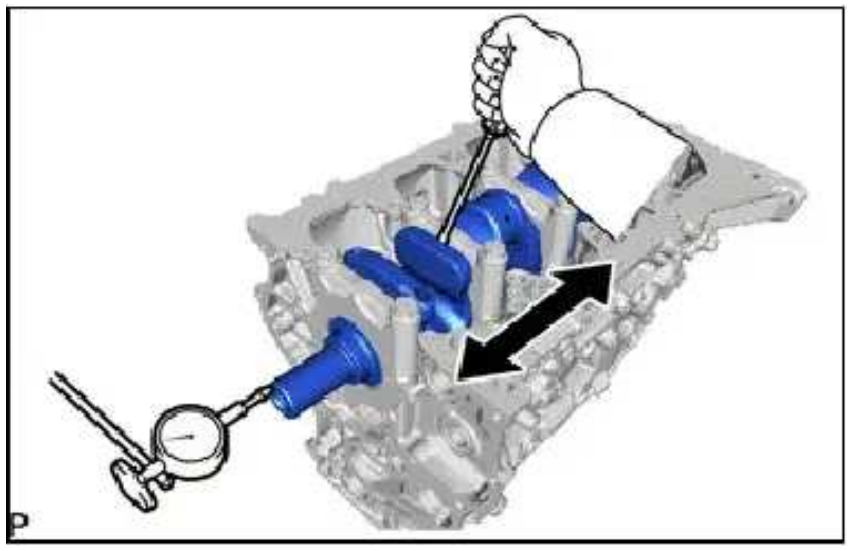
a. Using a dial indicator, measure the crankshaft thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:
0.04 to 0.24 mm (0.00157 to 0.00945 in.)

Maximum thrust clearance:
0.24 mm (0.00945 in.)

If the thrust clearance is more than the maximum, replace the upper crankshaft thrust washers and lower crankshaft thrust washers. If necessary, replace the crankshaft.

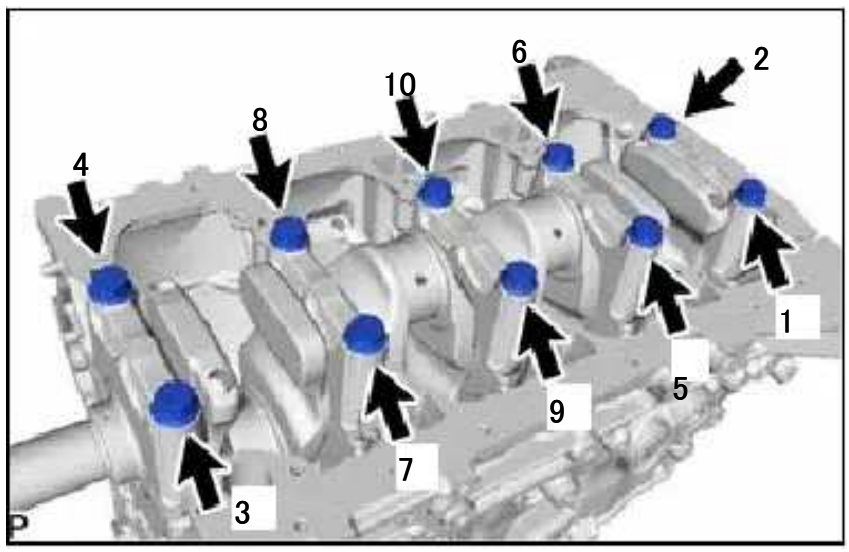
Standard crankshaft thrust washer thickness:
2.2 to 2.8 mm (0.0866 to 0.110 in.)



A337475

8. REMOVE CRANKSHAFT

a. Using several steps, uniformly loosen and remove the 10 crankshaft bearing cap set bolts in the sequence shown in the illustration.

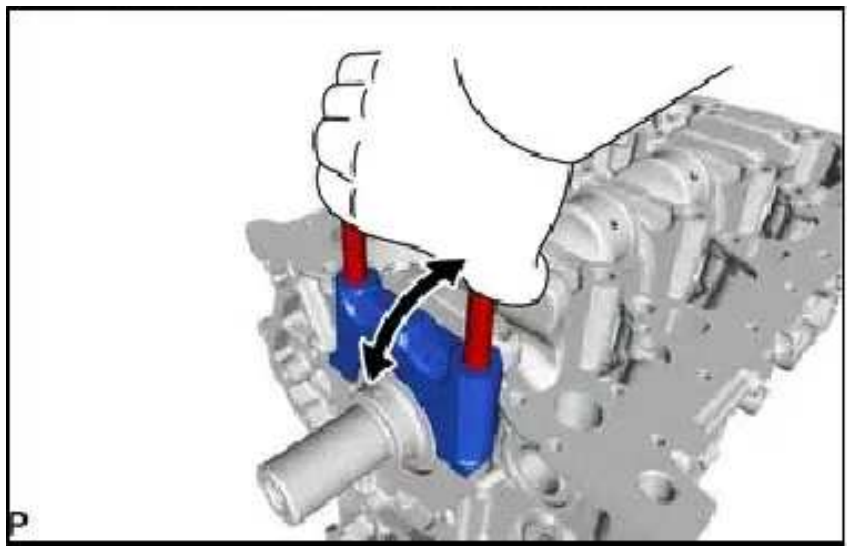


A337476N01

b. Using the removed crankshaft bearing cap set bolts, pry the crankshaft bearing cap back and forth and remove the crankshaft bearing caps, No. 2 crankshaft bearings and lower crankshaft thrust washers (No. 5 crankshaft journal only).

HINT:

- **Keep the No. 2 crankshaft bearing and crankshaft bearing cap together.**
- **Be sure to organize the crankshaft bearing caps and lower crankshaft thrust washers (No. 5 crankshaft journal only) in such a way that they can be reinstalled exactly as before.**



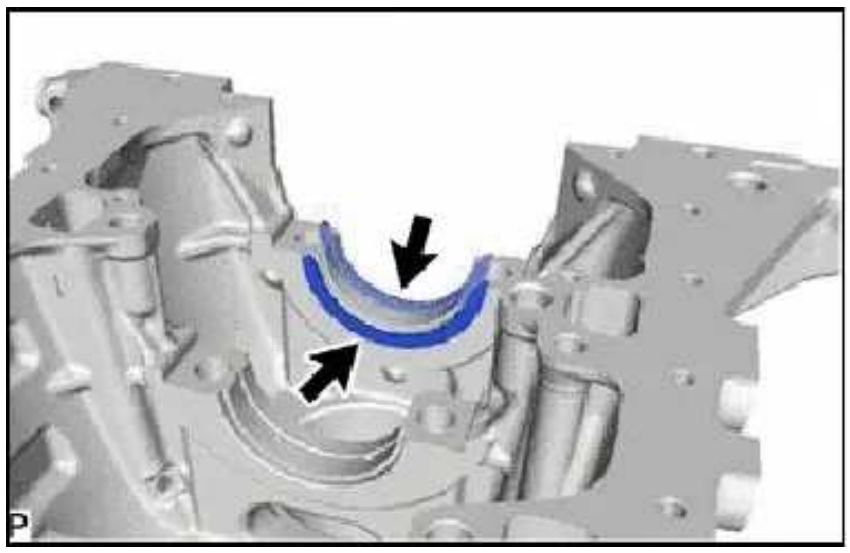
A337477

c. Remove the crankshaft from the cylinder block sub-assembly.

d. Remove the 2 upper crankshaft thrust washers (No. 5 cylinder block sub-assembly journal only) from the cylinder block sub-assembly.

HINT:

Arrange the upper crankshaft thrust washers in the correct order.

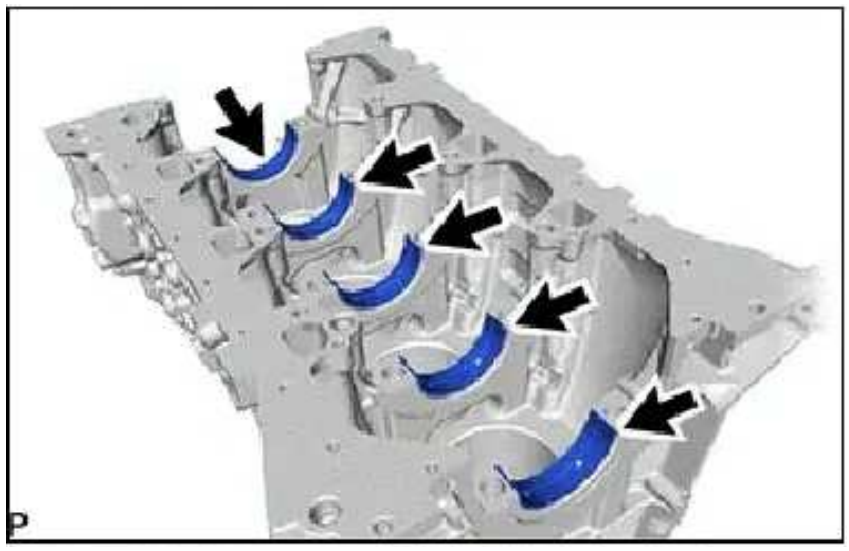


A337478

e. Remove the 5 No. 1 crankshaft bearings from the cylinder block sub-assembly.

HINT:

Arrange the No. 1 crankshaft bearings in the correct order.



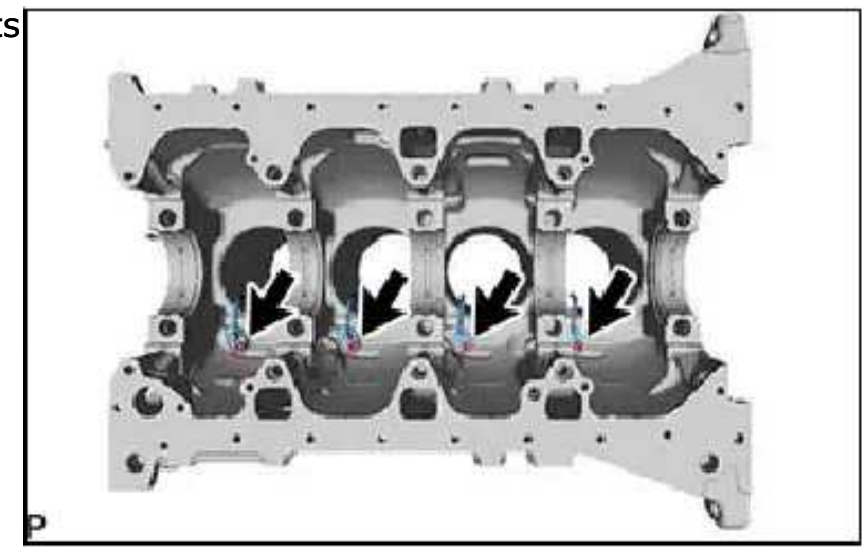
A337479

f. Check each crankshaft journal, No. 1 crankshaft bearings and No. 2 crankshaft bearings for pitting and scratches.

If the journal or crankshaft bearing is damaged, replace the crankshaft bearings. If necessary, replace the crankshaft.

9. REMOVE NO. 1 OIL NOZZLE SUB-ASSEMBLY

a. Using a 5 mm hexagon wrench, remove the 4 bolts and 4 No. 1 oil nozzle sub-assemblies from the cylinder block sub-assembly.

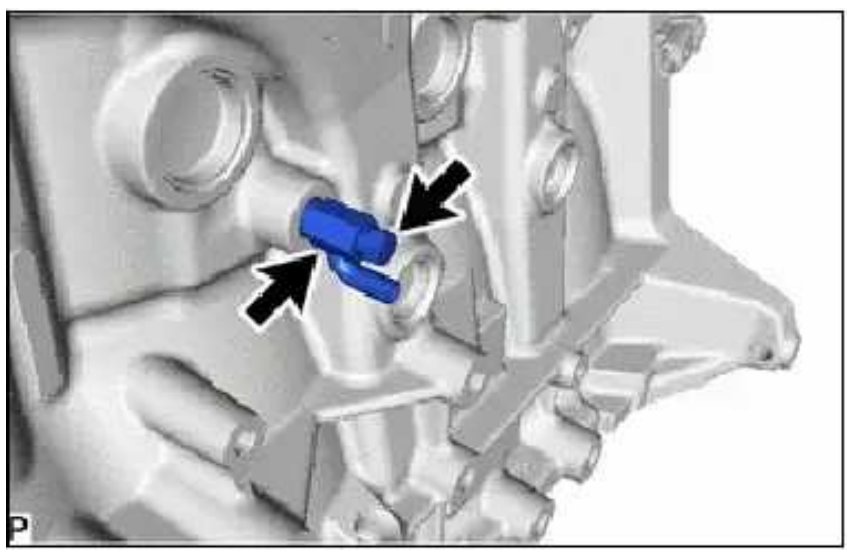


A337480

10. REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY

a. Remove the cylinder block water drain cock plug from the cylinder block water drain cock sub-assembly.

b. Remove the cylinder block water drain cock sub-assembly from the cylinder block sub-assembly.



A343484

11. REMOVE STUD BOLT

NOTICE:

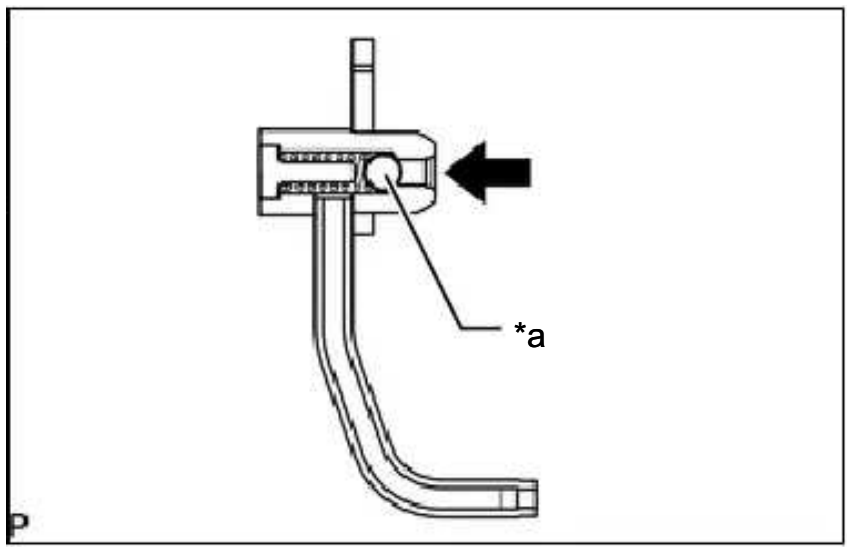
If a stud bolt is deformed or its threads are damaged, replace it.

CYLINDER BLOCK > INSPECTION

1. INSPECT NO. 1 OIL NOZZLE SUB-ASSEMBLY

a. Push the ball of the No. 1 oil nozzle sub-assembly to check if it is stuck.

If the ball is stuck, replace the No. 1 oil nozzle sub-assembly.



A343464C01

*a	Ball
➡	Push

2. CLEAN CYLINDER BLOCK SUB-ASSEMBLY

a. Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block sub-assembly.

b. Using a soft brush and solvent, thoroughly clean the cylinder block sub-assembly.

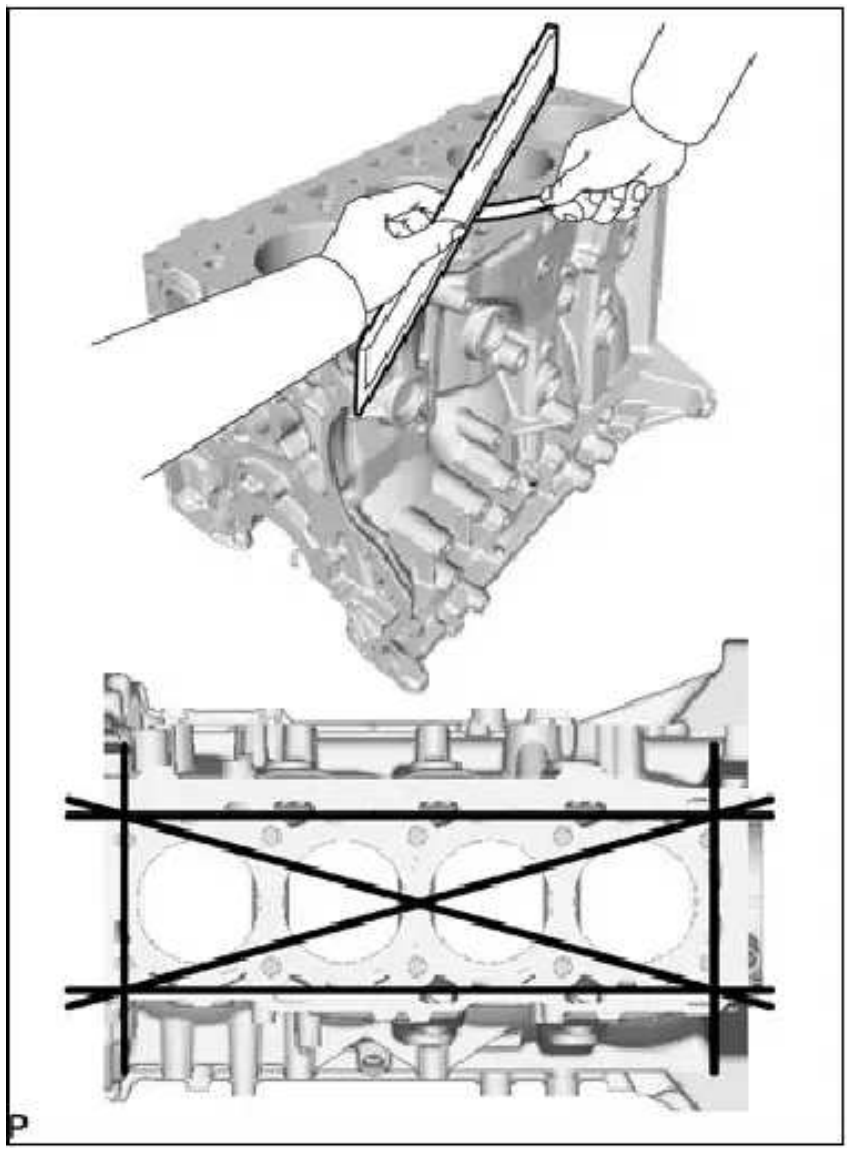
3. INSPECT CYLINDER BLOCK SUB-ASSEMBLY FOR WARPAGE

a. Using a precision straightedge and feeler gauge, measure the warpage of the surface where the cylinder head gasket contacts the cylinder head sub-assembly.

Maximum warpage:
0.05 mm (0.00197 in.)

If the warpage is more than the maximum, replace the cylinder block sub-assembly.

b. Visually check the cylinders for vertical scratches. If deep scratches are present, replace the cylinder block sub-assembly.



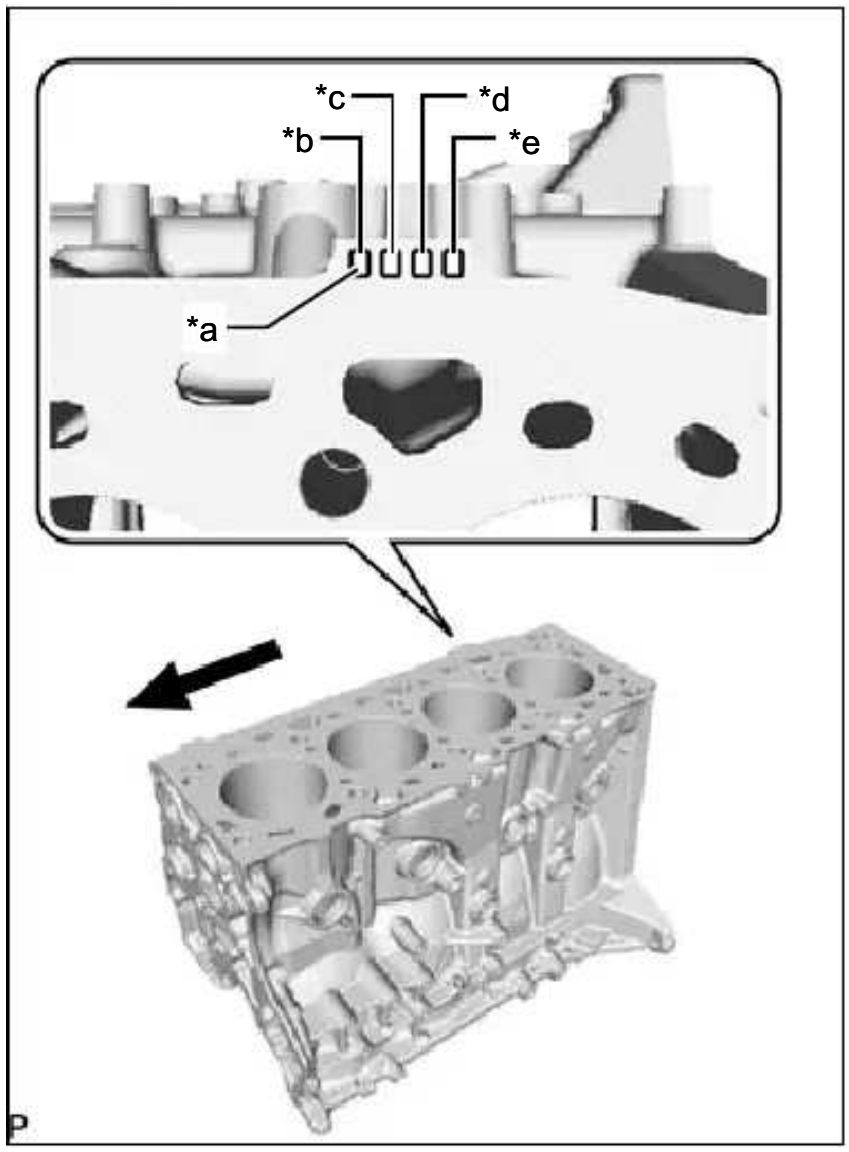
A343465

4. INSPECT CYLINDER BORE

a. Inspect the cylinder bore diameter.

HINT:

There are 2 standard cylinder bore diameter sizes, marked 1 and 2 accordingly. The mark is stamped on the cylinder block sub-assembly.



A343583C01

*a	Mark 1 or 2
*b	No. 1
*c	No. 2
*d	No. 3
*e	No. 4
➡	Engine Front Side

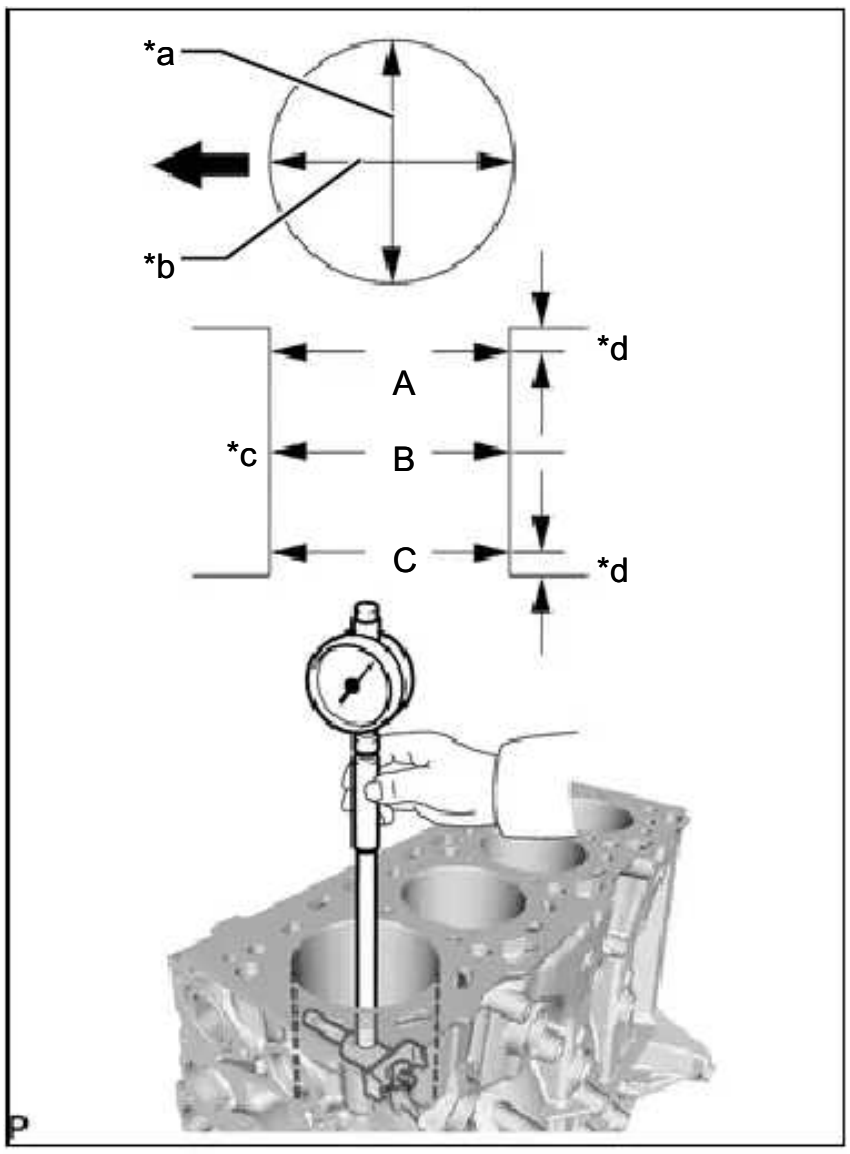
i. Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

Reference Value (New parts):

Item	Specified Condition
Mark 1	92.005 to 92.015 mm (3.6222 to 3.6226 in.)
Mark 2	92.015 to 92.025 mm (3.6226 to 3.6230 in.)

Maximum diameter:
92.025 mm (3.6230 in.)

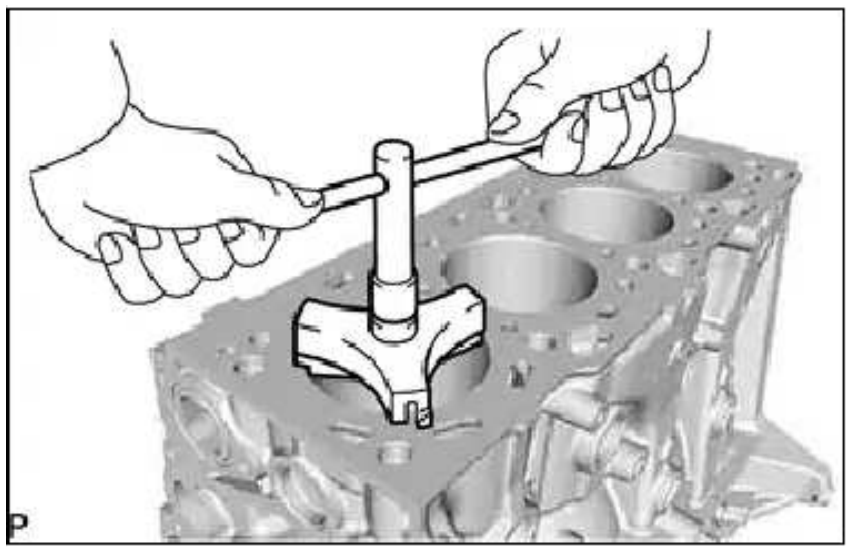
If the diameter is more than the maximum, replace the cylinder block sub-assembly.



A343466C01

*a	Thrust Direction
*b	Axial Direction
*c	Center
*d	10 mm (0.394 in.)
➡	Engine Front Side

b. Inspect the cylinder ridge.
If the wear is less than 0.2 mm (0.00787 in.), using a ridge reamer, grind the top of the cylinder.



5. CLEAN PISTON

a. Using a gasket scraper, remove the carbon from the piston top.

b. Using a groove cleaning tool or broken piston ring, clean the piston ring grooves.

c. Using solvent and a brush, thoroughly clean the piston.

NOTICE:

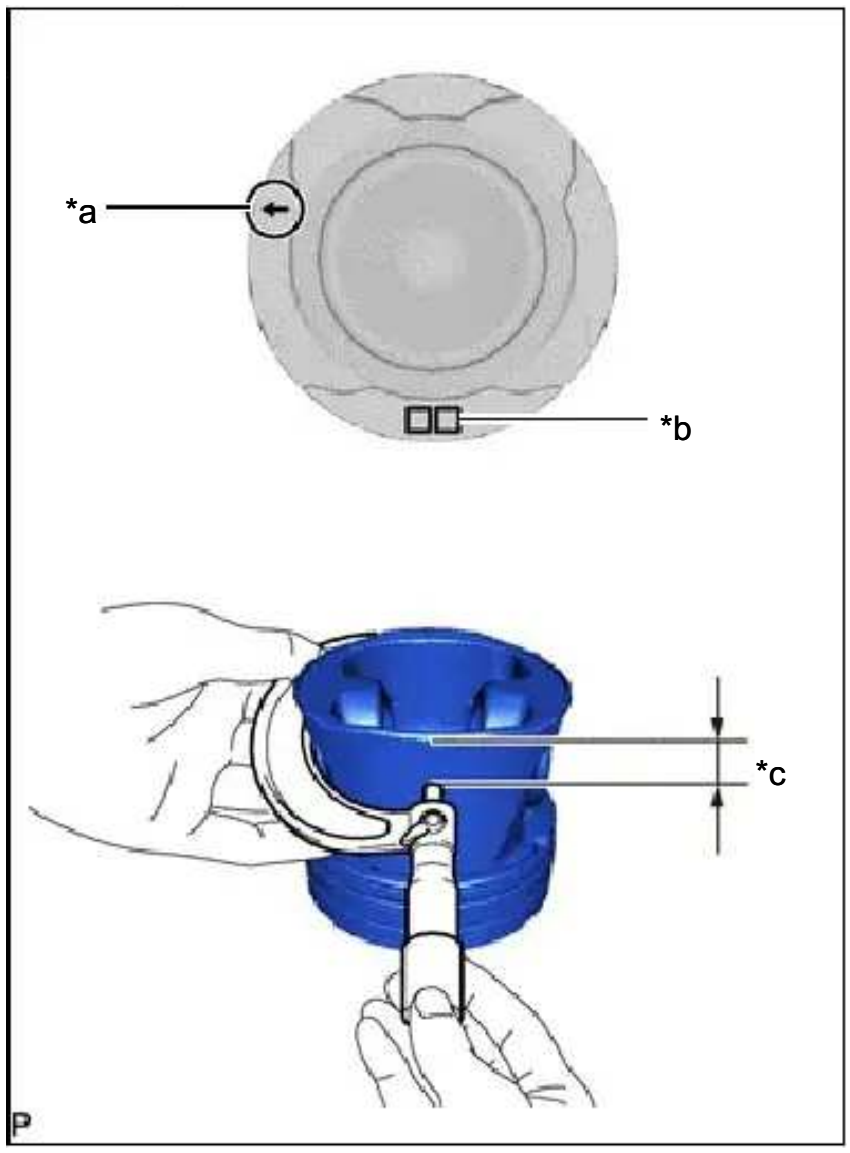
Do not use a wire brush.

6. INSPECT PISTON DIAMETER

a. Using a micrometer, measure the piston diameter at right angles to the piston center line where the position is 14 mm (0.551 in.) from the bottom edge of the piston.

Reference Value (New parts):

Item	Specified Condition
Mark 1	91.931 to 91.955 mm (3.6193 to 3.6203 in.)
Mark 2	91.955 to 91.965 mm (3.6203 to 3.6207 in.)



A343468C01

*a	Front Mark (Arrow)
*b	Piston Size Mark
*c	14 mm (0.551 in.)

7. INSPECT PISTON OIL CLEARANCE

a. Measure the cylinder bore diameter in the thrust direction.

b. Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Reference value (new parts):
0.040 to 0.094 mm (0.00157 to 0.00370 in.)

Maximum oil clearance:
0.16 mm (0.00630 in.)

If the oil clearance is more than the maximum, replace all the piston with pin sub-assemblies. If necessary, replace the cylinder block sub-assembly.

8. INSPECT PISTON RING GROOVE CLEARANCE

a. Using a feeler gauge, measure the clearance between a new piston ring and the wall of the piston ring groove.

Standard Piston Ring Groove Clearance:

Item	Specified Condition
No. 1 Compression Ring	0.121 to 0.165 mm (0.00476 to 0.00650 in.)
No. 2 Compression Ring	0.050 to 0.105 mm (0.00197 to 0.00413 in.)
Oil Ring	0.030 to 0.075 mm (0.00118 to 0.00295 in.)

If the result is not as specified, replace the piston with pin sub-assembly.

9. INSPECT PISTON RING END GAP

a. Insert the piston ring into the cylinder bore.

b. Using a piston, push the piston ring a little beyond the bottom of the ring travel, 120 mm (4.72 in.) from the top of the cylinder block sub-assembly.

c. Using a feeler gauge, measure the piston ring end gap.

Standard Piston Ring End Gap:

Item	Specified Condition
No. 1 Compression Ring	0.24 to 0.34 mm (0.00945 to 0.0134 in.)
No. 2 Compression Ring	0.47 to 0.62 mm (0.0185 to 0.0244 in.)
Oil Ring	0.20 to 0.40 mm (0.00787 to 0.0157 in.)

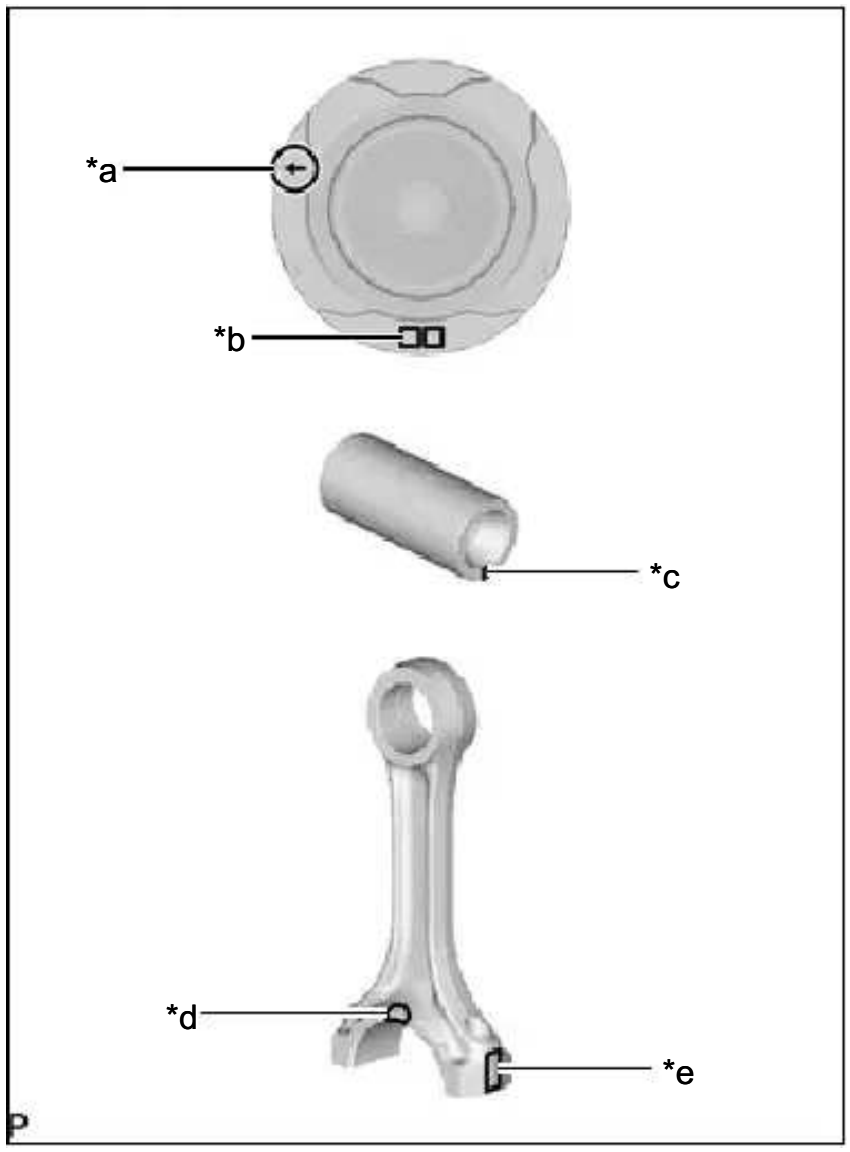
Maximum Piston Ring End Gap:

Item	Specified Condition
No. 1 Compression Ring	0.34 mm (0.0134 in.)
No. 2 Compression Ring	0.62 mm (0.0244 in.)
Oil Ring	0.40 mm (0.0157 in.)

If the end gap is more than the maximum, replace the piston ring set.
If the piston ring end gap is more than the maximum even with a new piston ring set, replace the cylinder block sub-assembly.

10. INSPECT PISTON PIN OIL CLEARANCE

a. Check each mark on the piston, piston pin and connecting rod sub-assembly.



A343470C01

*a	Front Mark (Arrow)
*b	Piston Pin Hole Inside Diameter Mark: Mark A, B or C
*c	Piston Pin Diameter Mark: Mark A, B or C
*d	Front Mark (Protrusion)
*e	Connecting Rod Sub-assembly Small End Bush Inside Diameter Mark: Mark A, B or C

b. Using a caliper gauge, measure the inside diameter of the piston pin hole.

Standard Piston Pin Hole Inside Diameter:

Item	Specified Condition
Mark A	31.009 to 31.013 mm (1.2208 to 1.2210 in.)
Mark B	31.013 to 31.017 mm (1.2210 to 1.2211 in.)
Mark C	31.017 to 31.021 mm (1.2211 to 1.2213 in.)

A343472

c. Using a micrometer, measure the piston pin diameter.

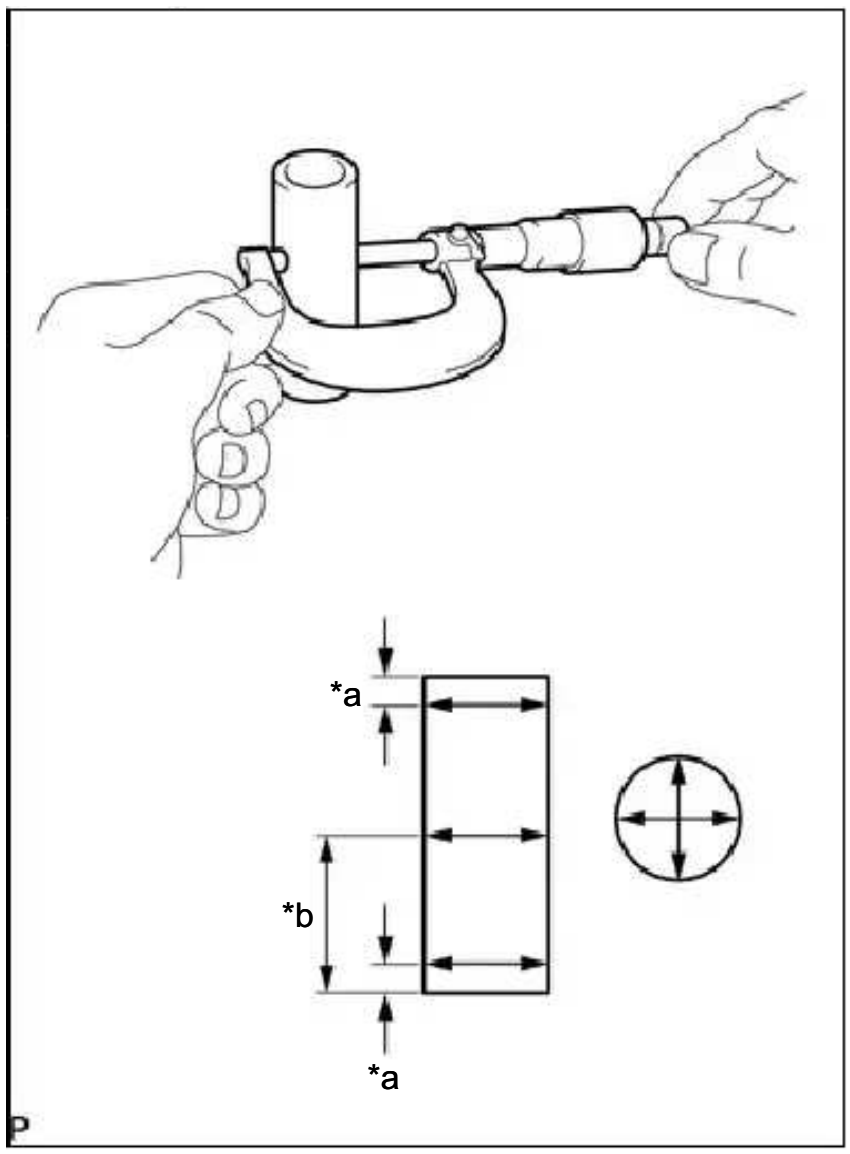
Standard Piston Pin Diameter:

Item	Specified Condition
Mark A	31.000 to 31.004 mm (1.2205 to 1.2206 in.)
Mark B	31.004 to 31.008 mm (1.2206 to 1.2208 in.)
Mark C	31.008 to 31.012 mm (1.2208 to 1.2209 in.)

d. Using a caliper gauge, measure the connecting rod sub-assembly small end bush inside diameter.

Standard Connecting Rod Sub-assembly Small End Bush Inside Diameter:

Item	Specified Condition
Mark A	31.019 to 31.023 mm (1.2212 to 1.2214 in.)
Mark B	31.023 to 31.027 mm (1.2214 to 1.2215 in.)
Mark C	31.027 to 31.031 mm (1.2215 to 1.2217 in.)



A101493C04

*a	6.0 mm (0.236 in.)
*b	33.5 mm (1.32 in.)

e. Subtract the piston pin diameter measurement from the piston pin hole diameter measurement.

Standard piston pin oil clearance:
0.005 to 0.013 mm (0.000197 to 0.000512 in.)

Maximum piston pin oil clearance:
0.013 mm (0.000512 in.)

If the piston pin oil clearance is more than the maximum, replace the piston with pin sub-assembly.

f. Subtract the piston pin diameter measurement from the connecting rod sub-assembly small end bush inside diameter measurement.

Standard piston pin oil clearance:
0.015 to 0.023 mm (0.000591 to 0.000906 in.)

Maximum piston pin oil clearance:
0.023 mm (0.000906 in.)

If the oil clearance is more than the maximum, replace the connecting rod sub-assembly. If necessary, replace the piston with pin sub-assembly.

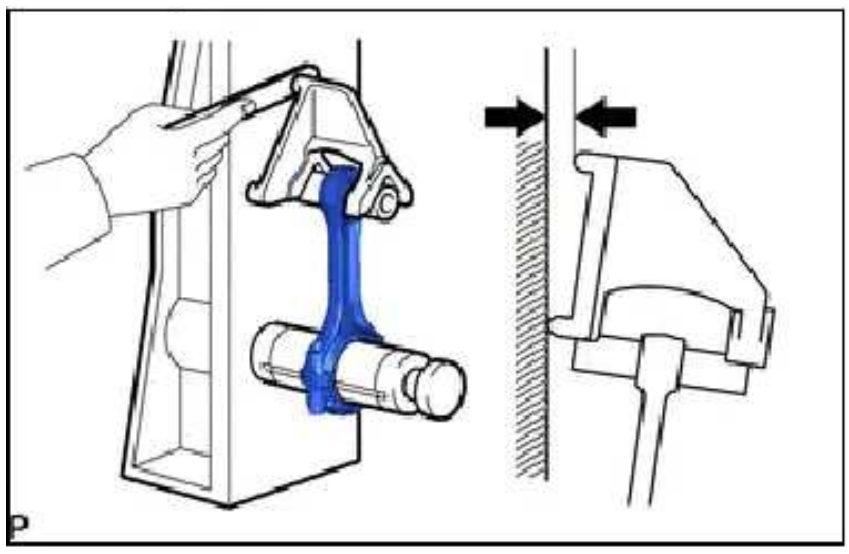
11. INSPECT CONNECTING ROD SUB-ASSEMBLY

a. Using a rod aligner and feeler gauge, check the connecting rod sub-assembly alignment.

i. Check for bend.

Maximum bend:
0.05 mm (0.00197 in.) per 100 mm (3.94 in.)

If the bend is more than the maximum, replace the connecting rod sub-assembly.

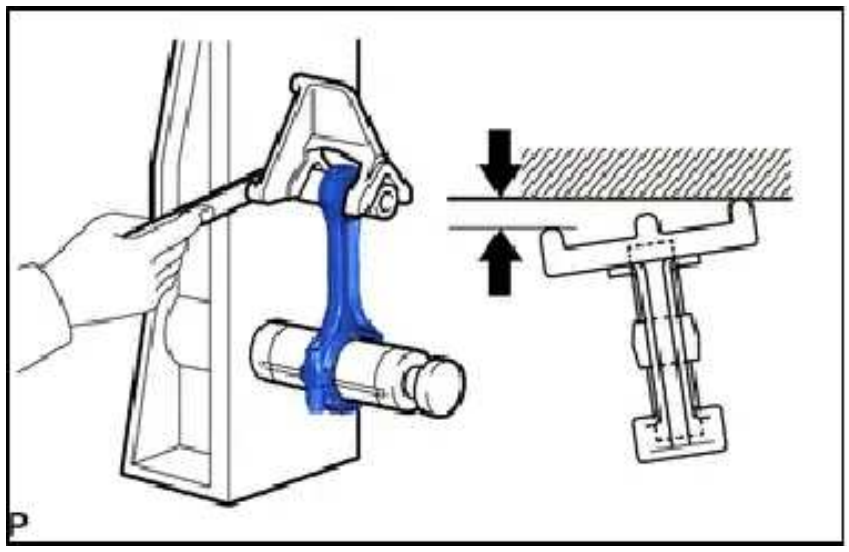


A343473

ii. Check for twist.

Maximum twist:
0.15 mm (0.00591 in.) per 100 mm (3.94 in.)

If the twist is more than the maximum, replace the connecting rod sub-assembly.



A343474

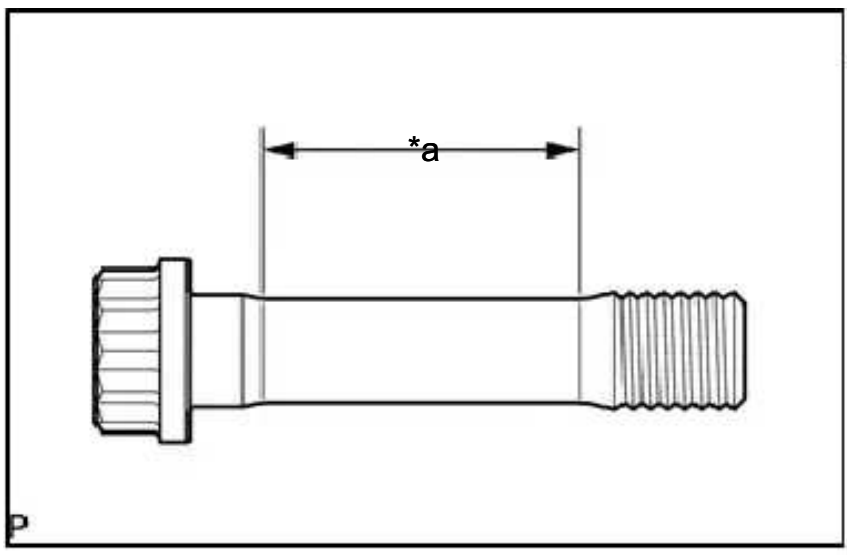
12. INSPECT CONNECTING ROD BOLT

a. Using a vernier caliper, measure the diameter of the tension portion of the connecting rod bolt.

Standard diameter:
8.7 to 8.8 mm (0.343 to 0.346 in.)

Minimum diameter:
8.5 mm (0.335 in.)

If the diameter is less than the minimum, replace the connecting rod bolt.



A343475C01

*a	Tension Portion

13. INSPECT CRANKSHAFT

a. Inspect for circle runout.

i. Place the crankshaft on V-blocks.

ii. Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:
0.03 mm (0.00118 in.)

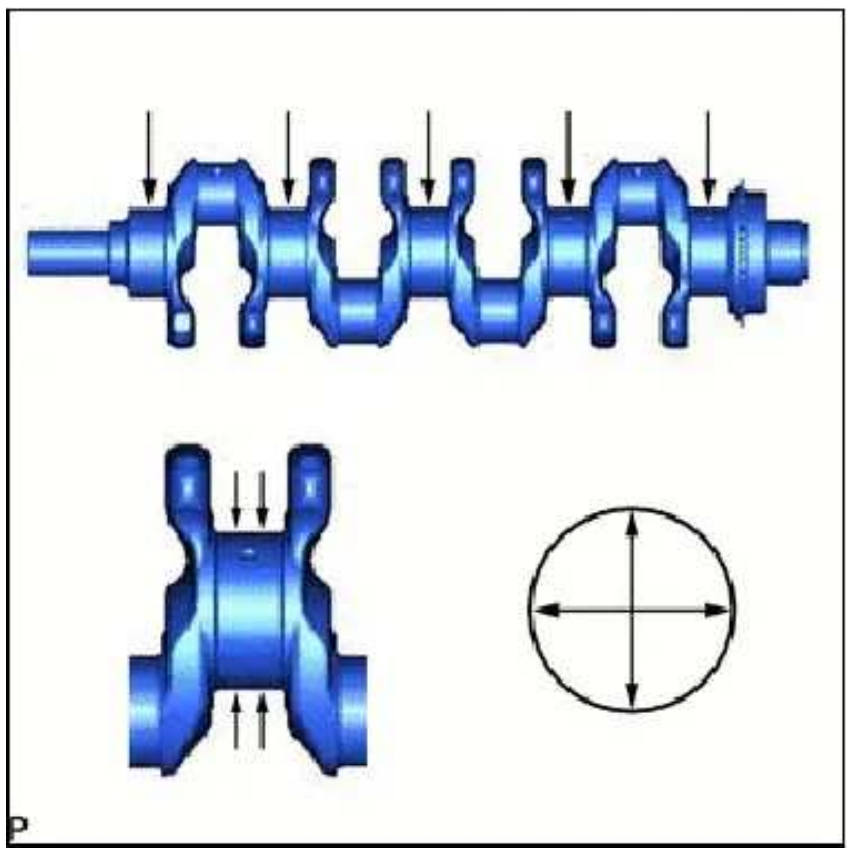
If the circle runout is more than the maximum, replace the crankshaft.

b. Inspect the main journals.

i. Using a micrometer, measure the diameter of each main journal.

Standard Main Journal Diameter:

Item	Specified Condition
Mark 1	69.994 to 70.000 mm (2.7557 to 2.7559 in.)
Mark 2	69.988 to 69.994 mm (2.7554 to 2.7557 in.)
Mark 3	69.982 to 69.988 mm (2.7552 to 2.7554 in.)



A343477

If the diameter is not as specified, check the crankshaft oil clearance. If necessary, replace the crankshaft.

ii. Check each main journal for taper and out-of round.

Maximum taper and out-of-round:
0.003 mm (0.000118 in.)

If the taper and out-of-round is more than the maximum, replace the crankshaft.

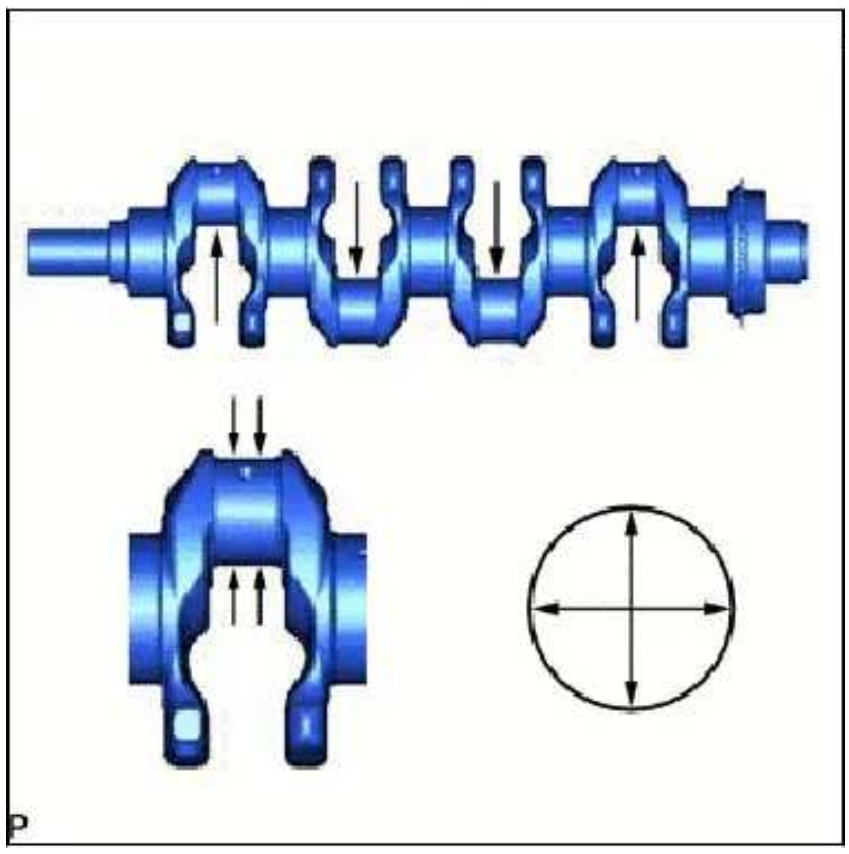
c. Inspect the crank pin.

i. Using a micrometer, measure the diameter of each crank pin.

Standard Crank Pin Diameter:

Item	Specified Condition
Mark 1	49.994 to 50.000 mm (1.9683 to 1.9685 in.)
Mark 2	49.988 to 49.994 mm (1.9680 to 1.9683 in.)
Mark 3	49.982 to 49.988 mm (1.9678 to 1.9680 in.)

If the diameter is not as specified, check the connecting rod sub-assembly oil clearance. If necessary, replace the crankshaft.



A343479

ii. Check each crank pin for taper and out-of-round.

Maximum taper and out-of-round:
0.003 mm (0.000118 in.)

If the taper and out-of-round is more than the maximum, replace the crankshaft.

14. INSPECT CRANKSHAFT OIL CLEARANCE

a. Install the crankshaft bearings to the cylinder block sub-assembly.
Click here ENGINE MECHANICAL (2GD-FTV) > CYLINDER BLOCK > REASSEMBLY > INSTALL CRANKSHAFT BEARING

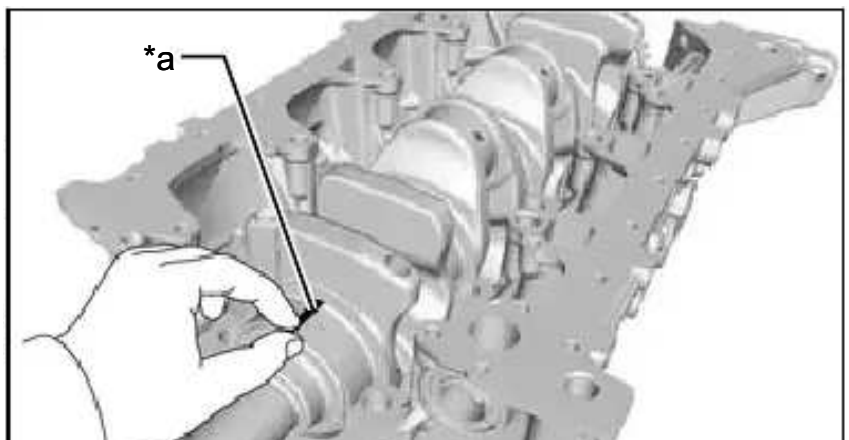
b. Clean each main journal and crankshaft bearings.

c. Apply engine oil to the crankshaft bearing, and then install the crankshaft to the cylinder block sub-assembly.

d. Install the crankshaft thrust washers to the cylinder block sub-assembly.

Click here ENGINE MECHANICAL (2GD-FTV) > CYLINDER BLOCK > REASSEMBLY > INSTALL CRANKSHAFT

e. Lay a strip of Plastigage across each journal.



f. Install the crankshaft bearing caps to the cylinder block sub-assembly.
Click here ENGINE MECHANICAL (2GD-FTV) > CYLINDER BLOCK > REASSEMBLY > INSTALL CRANKSHAFT

NOTICE:

Do not turn the crankshaft.

g. Remove the crankshaft bearing caps from the cylinder block sub-assembly.
Click here ENGINE MECHANICAL (2GD-FTV) > CYLINDER BLOCK > DISASSEMBLY > REMOVE CRANKSHAFT

A343480C01

*a	Plastigage

h. Measure the Plastigage at its widest point.

Standard oil clearance:
0.036 to 0.042 mm (0.00142 to 0.00165 in.)

Maximum oil clearance:
0.048 mm (0.00189 in.)

If the oil clearance is more than the maximum, replace the crankshaft bearing. If necessary, replace the crankshaft.

HINT:

If using a standard crankshaft bearing, replace it with one having the same number. If the number of the crankshaft bearing cannot be determined, select the correct crankshaft bearing by adding together the numbers imprinted on the cylinder block sub-assembly and crankshaft, and then selecting the crankshaft bearing with the same number as the total. There are 5 sizes of standard crankshaft bearings, marked 2, 3, 4, 5 and 6.
EXAMPLE:
Cylinder block sub-assembly (A) "3" + Crankshaft (B) "1" = Total number 4 (Use crankshaft bearing (C) "4")

Crankshaft Bearing Chart:

Cylinder Block Sub-assembly (A)	Crankshaft (B)	Use Crankshaft Bearing (C)
1	1	2
	2	3
	3	4
2	1	3
	2	4
	3	5
3	1	4
	2	5
	3	6

Standard Cylinder Block Sub-assembly Main Journal Bore Diameter (A):

Item	Specified Condition
Mark 1	75.000 to 75.006 mm (2.9528 to 2.9530 in.)
Mark 2	75.006 to 75.012 mm (2.9530 to 2.9532 in.)
Mark 3	75.012 to 75.018 mm (2.9532 to 2.9535 in.)

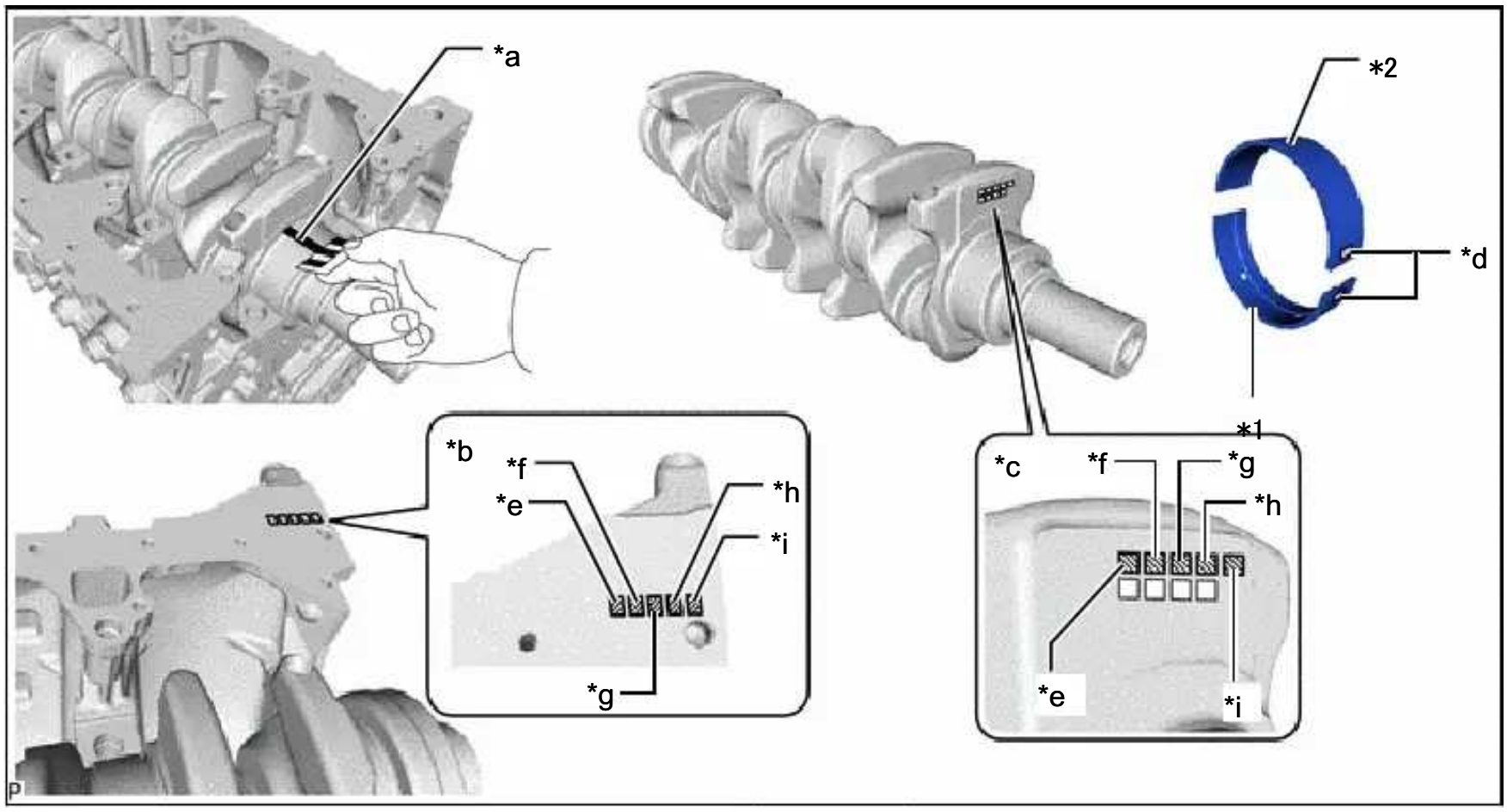
Standard Crankshaft Journal Diameter (B):

Item	Specified Condition
Mark 1	69.994 to 70.000 mm (2.7557 to 2.7559 in.)
Mark 2	69.988 to 69.994 mm (2.7554 to 2.7557 in.)
Mark 3	69.982 to 69.988 mm (2.7552 to 2.7554 in.)

Standard Sized Crankshaft Bearing Center Wall Thickness (C):

Item	Specified Condition
Mark 2	2.482 to 2.485 mm (0.0977 to 0.0978 in.)

Mark 3	2.485 to 2.488 mm (0.0978 to 0.0980 in.)
Mark 4	2.488 to 2.491 mm (0.0980 to 0.0981 in.)
Mark 5	2.491 to 2.494 mm (0.0981 to 0.0982 in.)
Mark 6	2.494 to 2.497 mm (0.0982 to 0.0983 in.)



A343482C01

*1	No. 1 Crankshaft Bearing	*2	No. 2 Crankshaft Bearing
*a	Plastigage	*b	Cylinder Block Sub-assembly Main Journal Bore Diameter: Mark 1, 2 or 3
*c	Crankshaft Journal Diameter: Mark 1, 2 or 3	*d	Crankshaft Bearing: Mark 2, 3, 4, 5 or 6
*e	No. 1	*f	No. 2
*g	No. 3	*h	No. 4
*i	No. 5	-	-

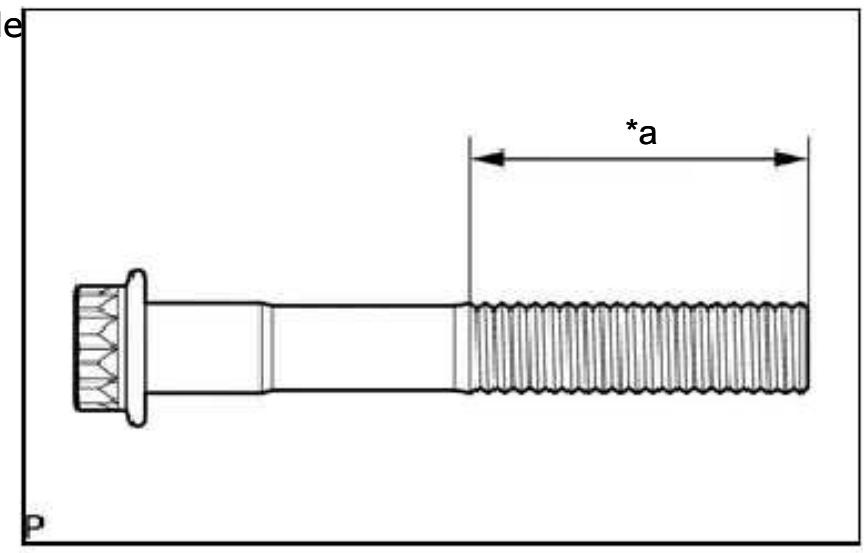
i. Completely remove the Plastigage from the crankshaft main journal.

15. INSPECT CRANKSHAFT BEARING CAP SET BOLT

a. Using a vernier caliper, measure the thread outside diameter of the crankshaft bearing cap set bolt.

Minimum diameter:
13.7 mm (0.539 in.)

If the diameter is less than the minimum, replace the crankshaft bearing cap set bolt.



A343483C01

*a	Measuring Area

CYLINDER BLOCK > REPLACEMENT

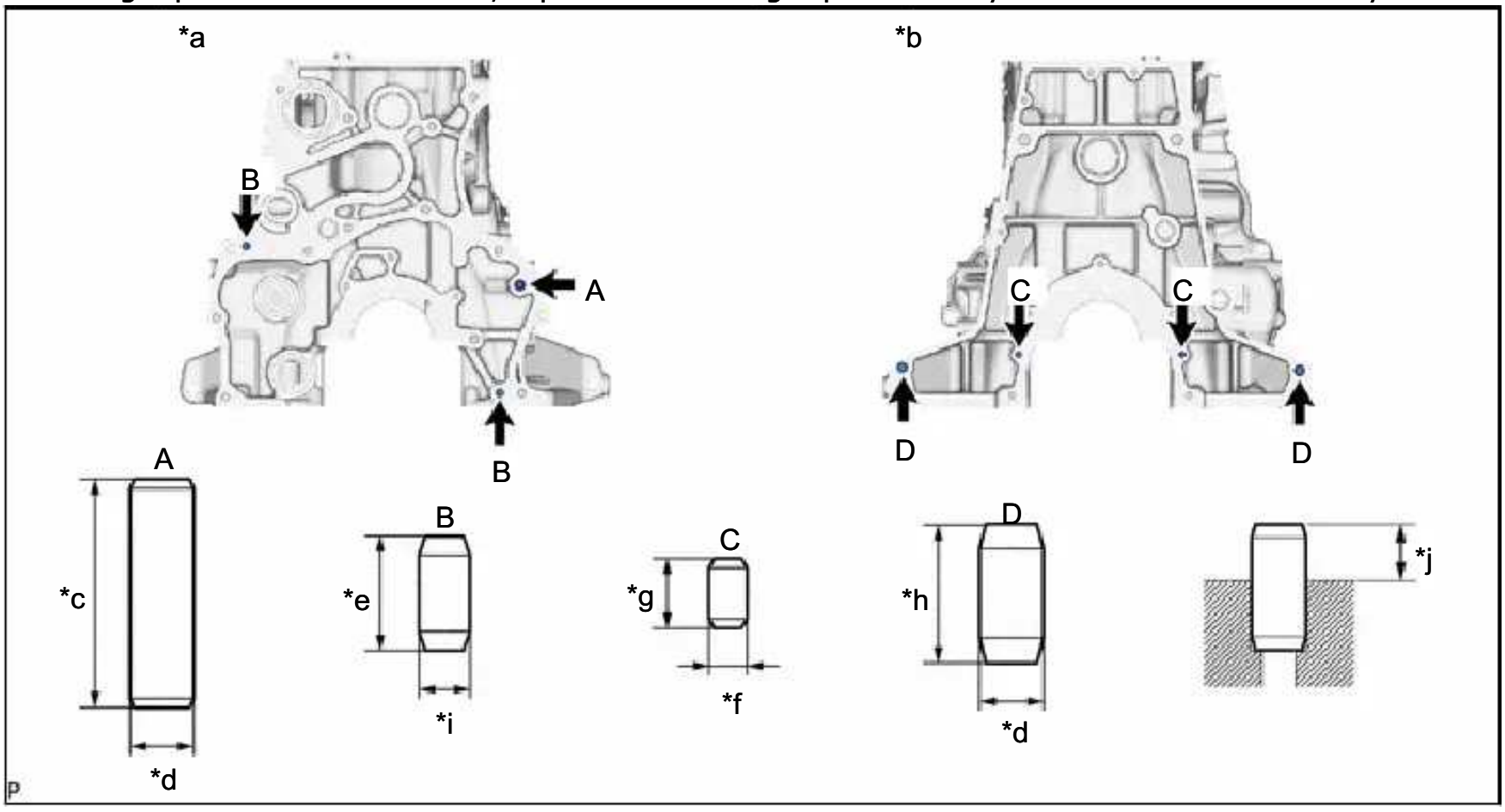
1. REPLACE STRAIGHT PIN

NOTICE:

It is not necessary to remove the straight pin unless it is being replaced.

a. Remove the straight pin from the cylinder block sub-assembly.

b. Using a plastic-faced hammer, tap in a new straight pin to the cylinder block sub-assembly.



A337482C01

*a	Engine Front Side	*b	Engine Rear Side
*c	36 mm (1.42 in.)	*d	10 mm (0.394 in.)
*e	18 mm (0.709 in.)	*f	6.0 mm (0.236 in.)
*g	11 mm (0.433 in.)	*h	22 mm (0.866 in.)
*i	8.0 mm (0.315 in.)	*j	Protrusion Height

Standard Protrusion Height:

Item	Specified Condition
Straight Pin A	18 to 20 mm (0.709 to 0.787 in.)
Straight Pin B	8.0 to 10 mm (0.315 to 0.394 in.)
Straight Pin C	4.0 to 6.0 mm (0.157 to 0.236 in.)
Straight Pin D	10 to 12 mm (0.394 to 0.472 in.)

2. REPLACE RING PIN

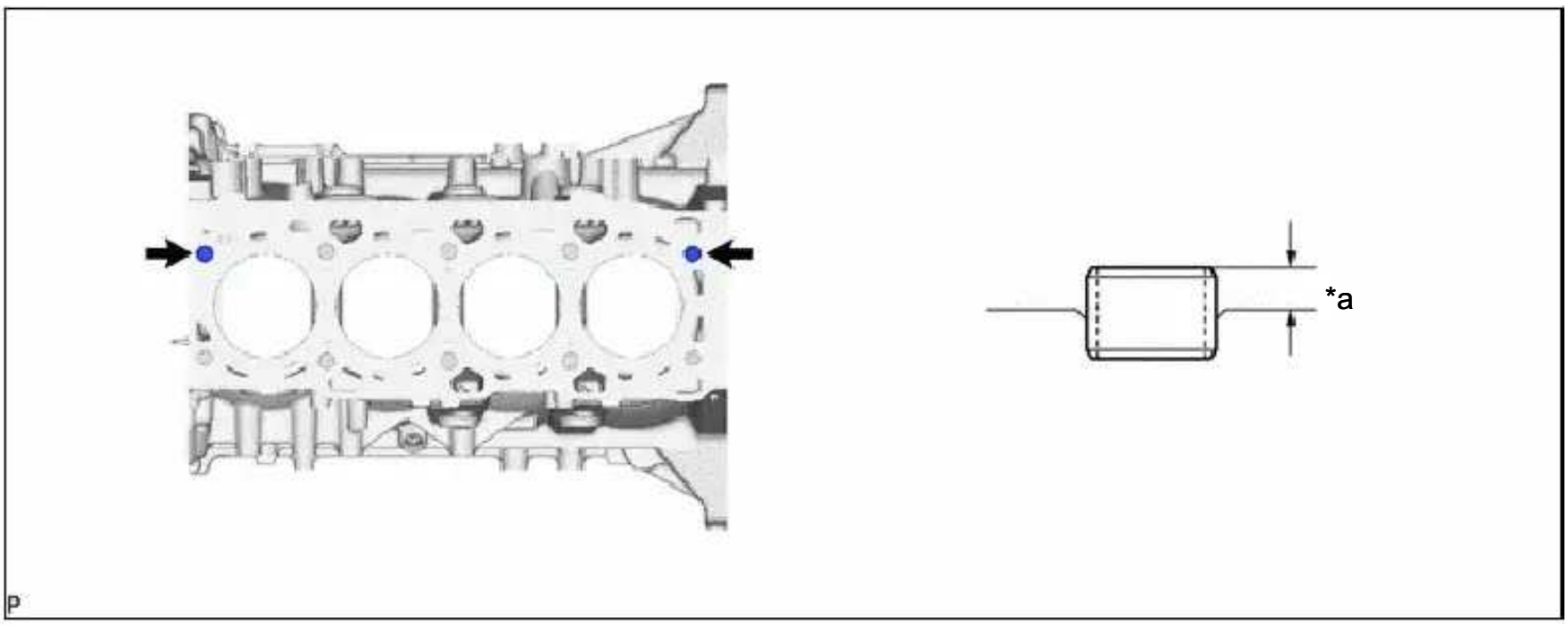
NOTICE:

It is not necessary to remove the ring pin unless it is being replaced.

a. Remove the ring pin from the cylinder block sub-assembly.

b. Using a plastic-faced hammer, tap in a new ring pin to the cylinder block sub-assembly.

Standard protrusion height:
5.5 to 7.5 mm (0.217 to 0.295 in.)



A337483C01

*a	Protrusion Height	-	-

CYLINDER BLOCK > REASSEMBLY

1. INSTALL STUD BOLT

NOTICE:

If a stud bolt is deformed or its threads are damaged, replace it.

a. Using an E6 "TORX" socket wrench, install the stud bolt labeled A to the cylinder block sub-assembly.

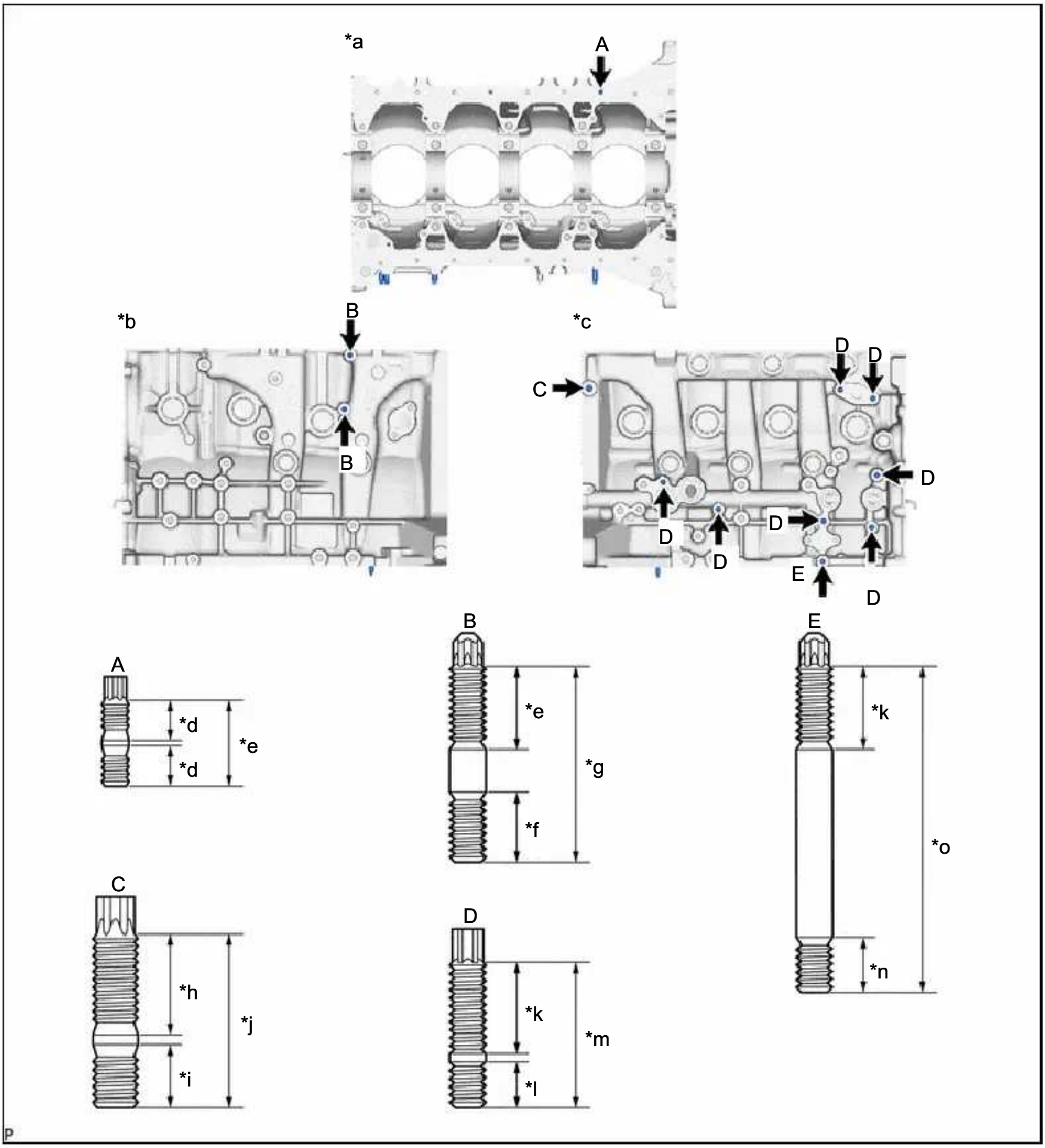
Torque:
for stud bolt A
6.0 N*m (61 kgf*cm, 53 in.*lbf)

b. Using an E8 "TORX" socket wrench, install the stud bolts labeled B, D and E to the cylinder block sub-assembly.

Torque:
for stud bolt B, D and E
10 N*m (102 kgf*cm, 7 ft.*lbf)

c. Using an E10 "TORX" socket wrench, install the stud bolt labeled C to the cylinder block sub-assembly.

Torque:
for stud bolt C
19 N*m (194 kgf*cm, 14 ft.*lbf)



A337484C01

*a	Engine Lower Side	*b	Engine LH Side
*c	Engine RH Side	*d	9.0 mm (0.354 in.)
*e	19 mm (0.748 in.)	*f	16 mm (0.630 in.)
*g	44 mm (1.73 in.)	*h	23 mm (0.906 in.)

*i	15 mm (0.591 in.)	*j	40 mm (1.57 in.)
*k	20 mm (0.787 in.)	*l	10 mm (0.394 in.)
*m	32 mm (1.26 in.)	*n	13 mm (0.511 in.)
*o	73 mm (2.87 in.)	-	-

2. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY

a. Install a new cylinder block water drain cock sub-assembly to the cylinder block sub-assembly.

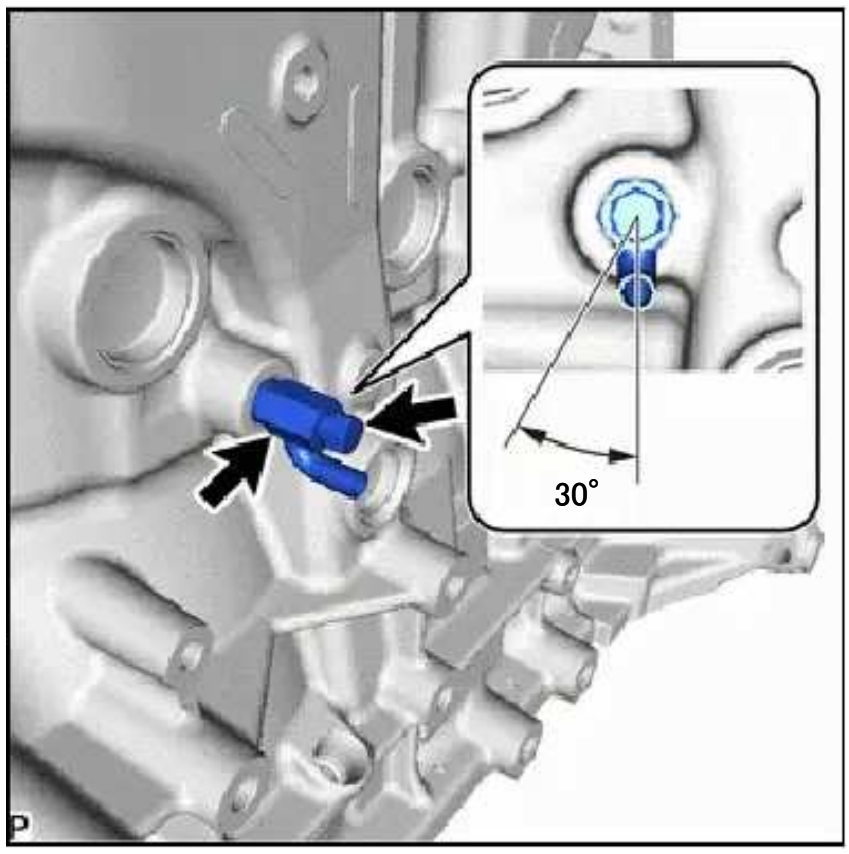
Torque:
25 N*m (255 kgf*cm, 18 ft.*lbf)

HINT:

Install the cylinder block water drain cock sub-assembly so that the installation angle is within the range indicated by the illustration.

b. Install a new cylinder block water drain cock plug to the cylinder block water drain cock sub-assembly.

Torque:
12.7 N*m (130 kgf*cm, 9 ft.*lbf)



A343485N01

3. INSTALL NO. 1 OIL NOZZLE SUB-ASSEMBLY

a. Using a 5 mm hexagon wrench, install the 4 No. 1 oil nozzle sub-assemblies with the 4 bolts to the cylinder block sub-assembly.

Torque:
10 N*m (102 kgf*cm, 7 ft.*lbf)

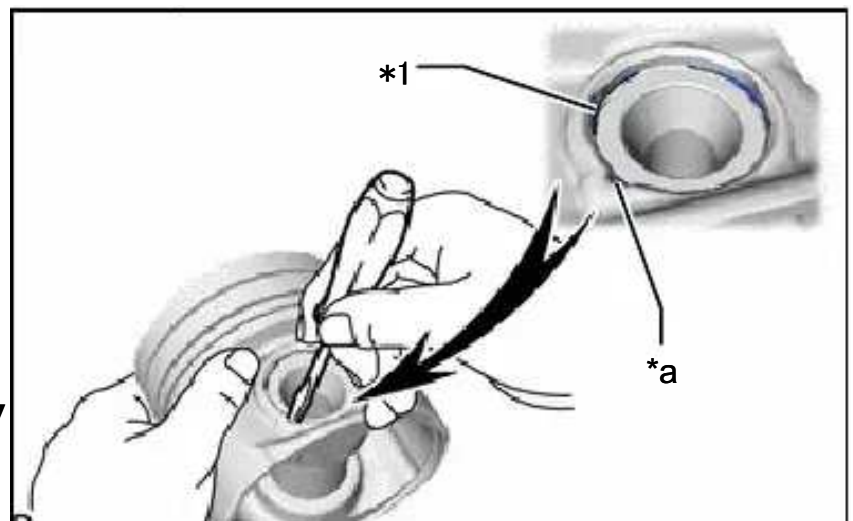
4. INSTALL PISTON WITH PIN SUB-ASSEMBLY

a. Using a small screwdriver, install a new piston pin hole snap ring on one side of the piston pin hole.

HINT:

- **Be sure that the end gap of the piston pin hole snap ring is not aligned with the service hole cutout portion of the piston.**
- **If the new piston pin is difficult to insert, heat the piston to approximately 80°C (176°F).**

CAUTION:



Be sure to wear protective gloves.

b. Coat the piston pin with engine oil.

A343440C01

*1	Piston Pin Hole Snap Ring
*a	Service Hole Cutout Portion

c. Align the front marks of the piston and connecting rod sub-assembly, install the connecting rod sub-assembly to the piston and push in the piston pin with your thumb.

d. Check the fitting condition between the piston and piston pin by trying to move the piston back and forth on the piston pin.

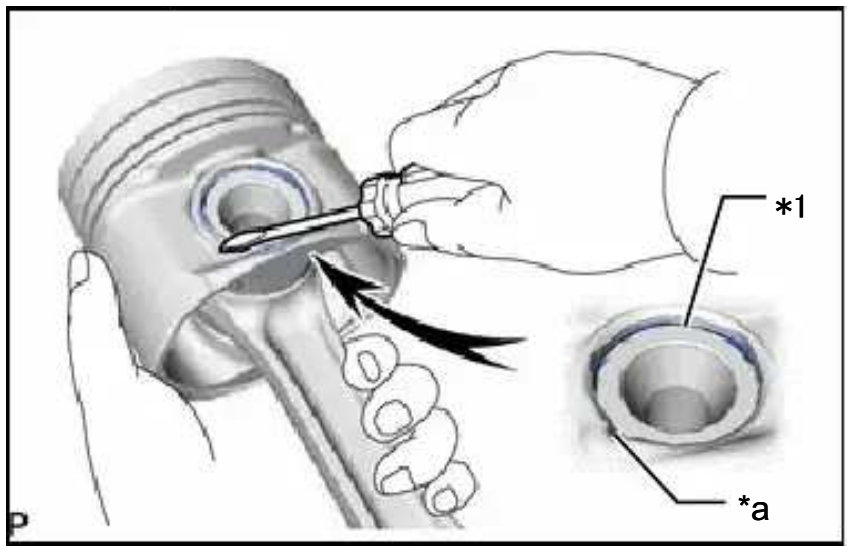
A343442C01

*a	Front Mark (Arrow)
*b	Front Mark (Protrusion)

e. Using a small screwdriver, install a new piston pin hole snap ring on one side of the piston pin hole.

HINT:

Be sure that the end gap of the piston pin hole snap ring is not aligned with the service hole cutout portion of the piston.



A343444C01

*1	Piston Pin Hole Snap Ring
*a	Service Hole Cutout Portion

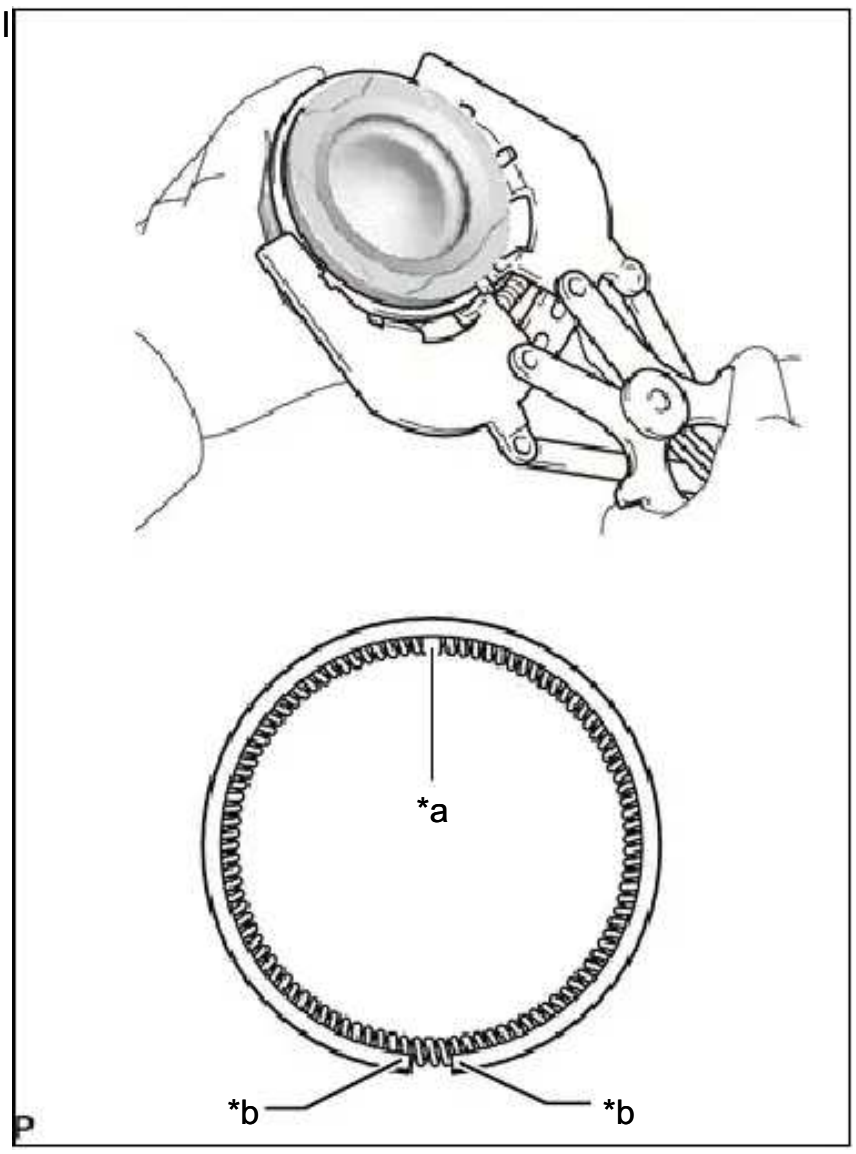
5. INSTALL PISTON RING SET

a. Install the oil ring expander to the piston by hand.

b. Using a piston ring expander, install the oil ring rail to the piston.

HINT:

Make sure the end gap of the oil ring rail and the coil joint are on opposite sides.



A343447C01

*a	Coil Joint
*b	Oil Ring Rail End Gap

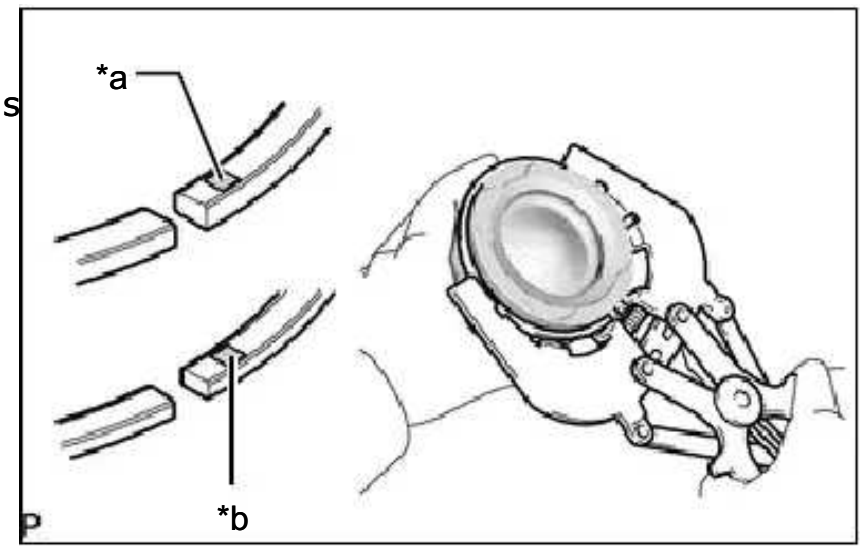
c. Using a piston ring expander, install the No. 1 compression ring and No. 2 compression ring to the piston so that the code marks are positioned as shown in the illustration.

Code Mark:

Item	Code Mark
No. 1 Compression Ring	G1
No. 2 Compression Ring	N2

HINT:

Install the No. 1 compression ring and No. 2 compression ring with the code mark facing upward.



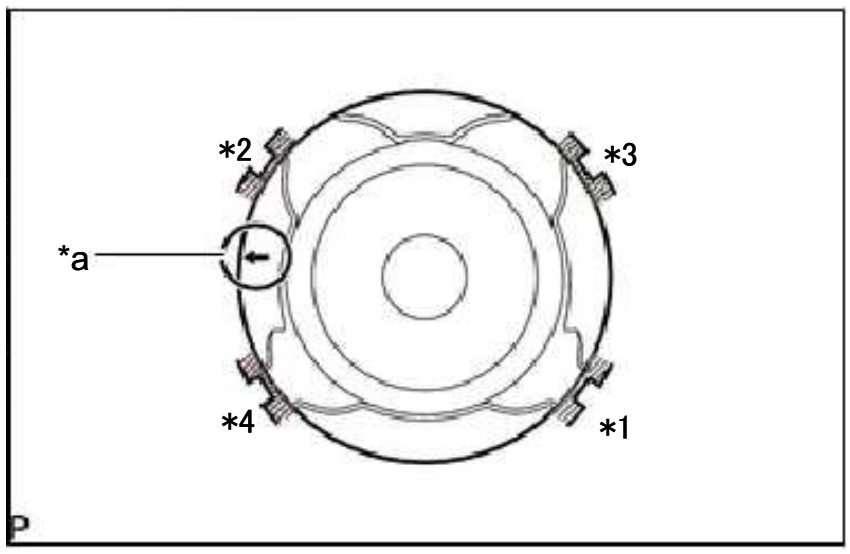
A343448C01

*a	No. 1 Compression Ring Code Mark
*b	No. 2 Compression Ring Code Mark

d. Position the piston rings so that the ring ends are as shown in the illustration.

NOTICE:

Do not align the ring ends.



A343449C01

*1	No. 1 Compression Ring
*2	No. 2 Compression Ring
*3	Oil Ring Expander
*4	Oil Ring Rail
*a	Front Mark (Arrow)

6. INSTALL CRANKSHAFT BEARING

HINT:

- **No. 1 crankshaft bearings have an oil groove and oil hole. No. 2 crankshaft bearings do not.**
- **Check that the No. 1 and No. 2 crankshaft bearing colors are correct, as the colors differ depending on the vehicle specification.**

w/o Stop And Start System:

Journal Position	No. 1 Crankshaft Bearing Color	No. 2 Crankshaft Bearing Color
No. 1	Silver	Silver
No. 2	Silver	Silver
No. 3	Silver	Silver
No. 4	Silver	Silver
No. 5	Silver	Silver

w/ Stop And Start System:

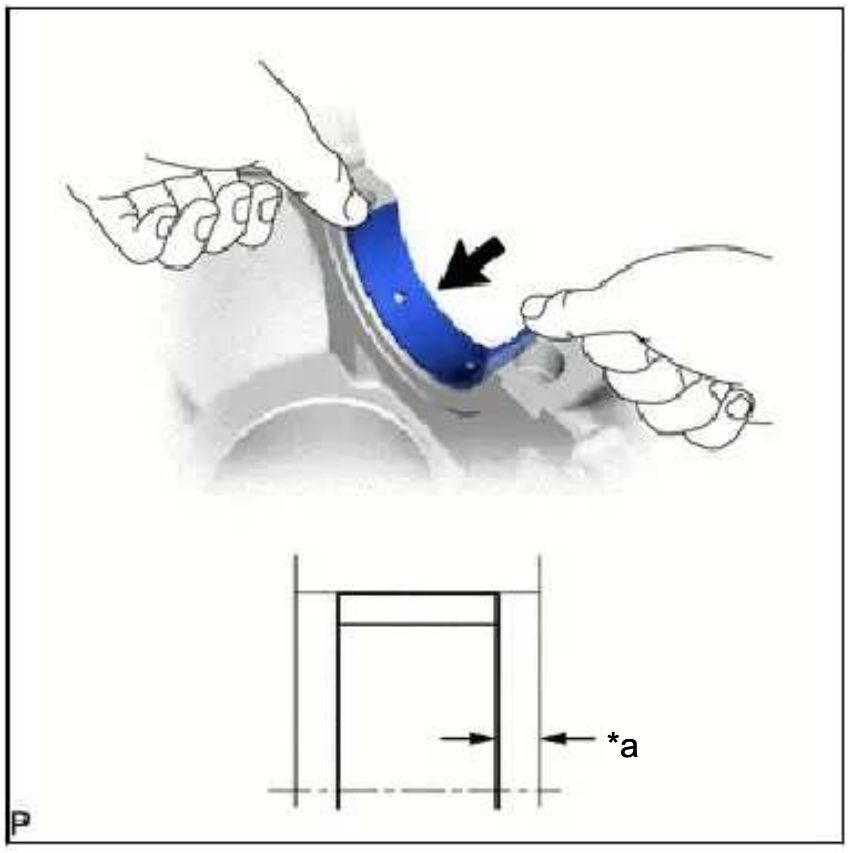
Journal Position	No. 1 Crankshaft Bearing Color	No. 2 Crankshaft Bearing Color
No. 1	Brown	Brown
No. 2	Silver	Silver
No. 3	Silver	Silver
No. 4	Silver	Silver
No. 5	Brown	Brown

a. Install the No. 1 crankshaft bearing to the cylinder block sub-assembly as shown in the illustration.

Standard width:
4.25 mm (0.167 in.)

NOTICE:

- **Clean the contact surface of the No. 1 crankshaft bearing and cylinder block sub-assembly.**
- **Apply oil to the inner surface of each No. 1 crankshaft bearing (the surface which contacts the crankshaft), but not to the outer surface (the surface which contacts the cylinder block sub-assembly).**



A343452C01

*a	Width

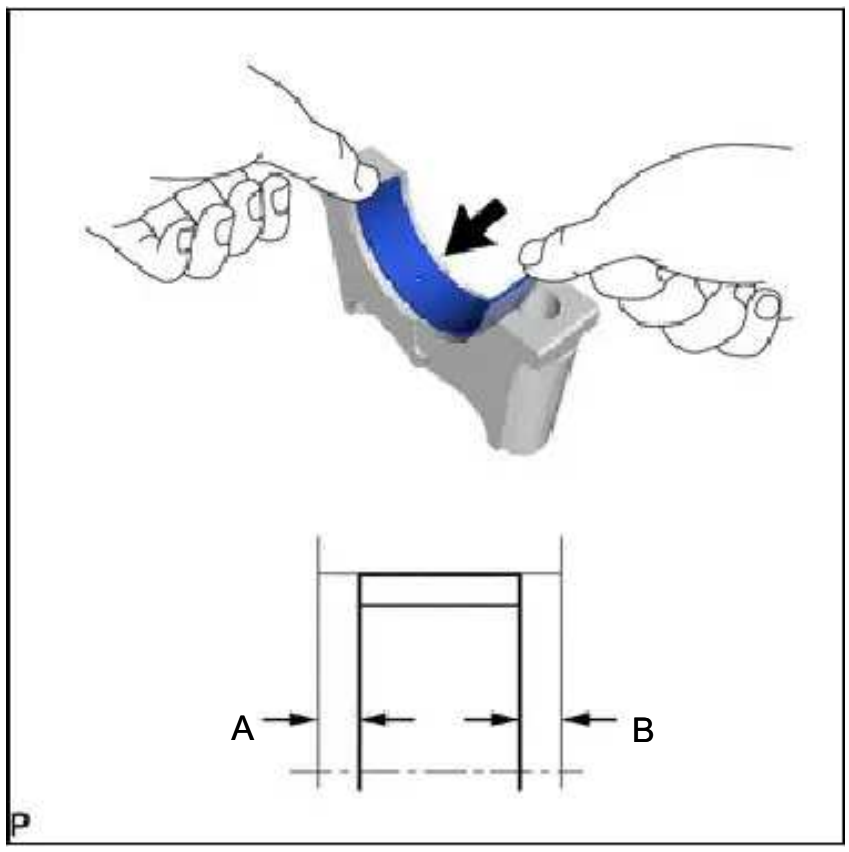
b. Install the No. 2 crankshaft bearing to the crankshaft bearing cap.

NOTICE:

- **Clean the contact surface of the No. 2 crankshaft bearing and crankshaft bearing cap.**
- **Apply oil to the inner surface of each No. 2 crankshaft bearing (the surface which contacts the crankshaft), but not to the outer surface (the surface which contacts the crankshaft bearing cap).**

c. Using a vernier caliper, measure the distance between the crankshaft bearing cap edge and crankshaft bearing edge.

Dimension A - B or B - A:
0 to 0.7 mm (0 to 0.0276 in.)



A343582N01

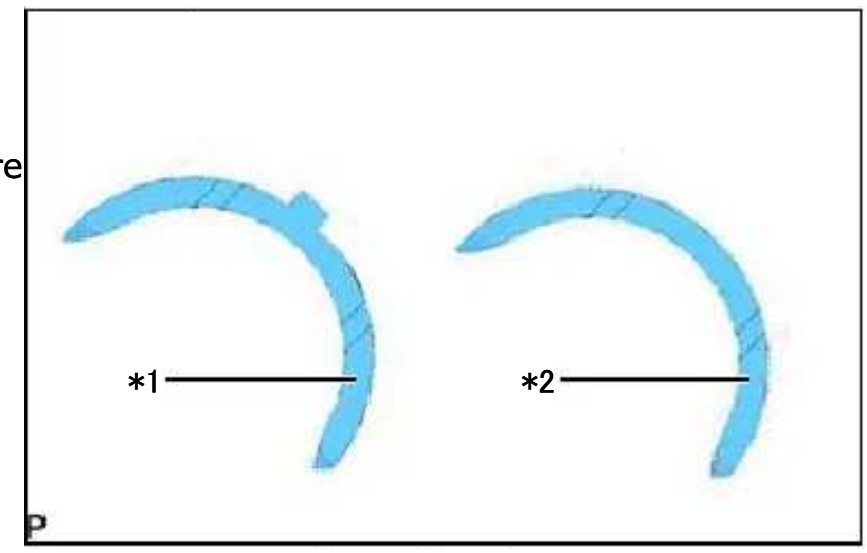
7. INSTALL CRANKSHAFT

a. Apply engine oil to the crankshaft bearing, and then install the crankshaft to the cylinder block sub-assembly.

b. Apply engine oil to the 2 upper crankshaft thrust washers and 2 lower crankshaft thrust washers.

HINT:

Check the crankshaft thrust washers, as there are different types as shown in the illustration.

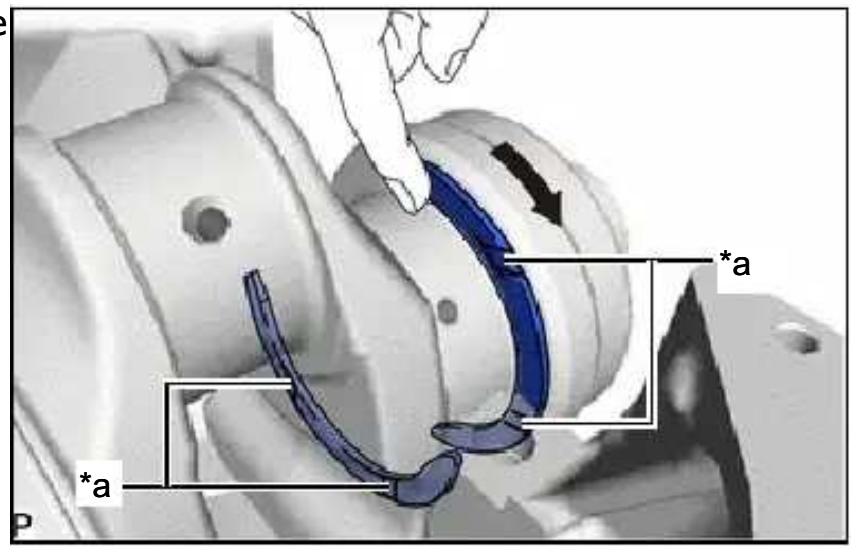


A343453C01

*1	Lower Crankshaft Thrust Washer
*2	Upper Crankshaft Thrust Washer

c. Push the crankshaft in one direction and install one upper crankshaft thrust washer to the No. 5 cylinder block sub-assembly journal position with the oil groove facing outward.

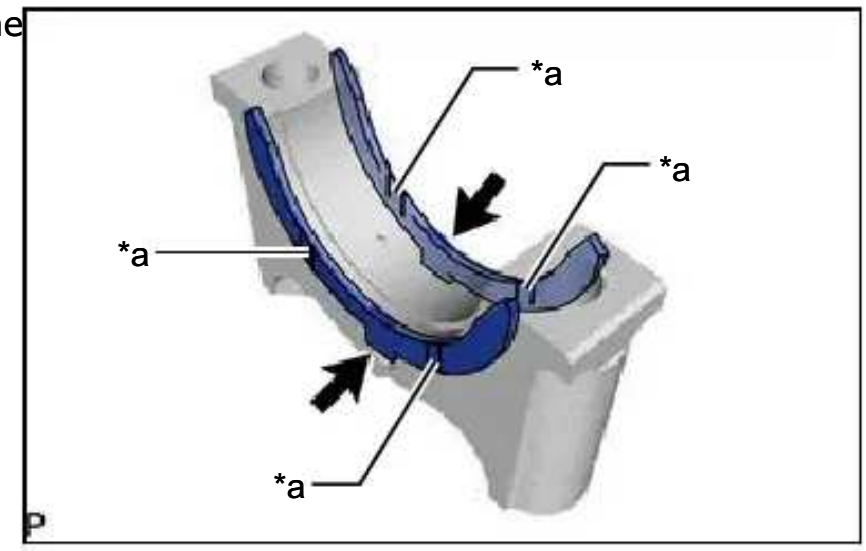
d. Push the crankshaft in the opposite direction and install the other upper crankshaft thrust washer to the No. 5 cylinder block sub-assembly journal position with the oil groove facing outward.



A343454C01

*a	Groove

e. Install the 2 lower crankshaft thrust washers to the crankshaft bearing cap (No. 5 crankshaft journal) with the grooves facing outward.



A343455C01

*a	Groove

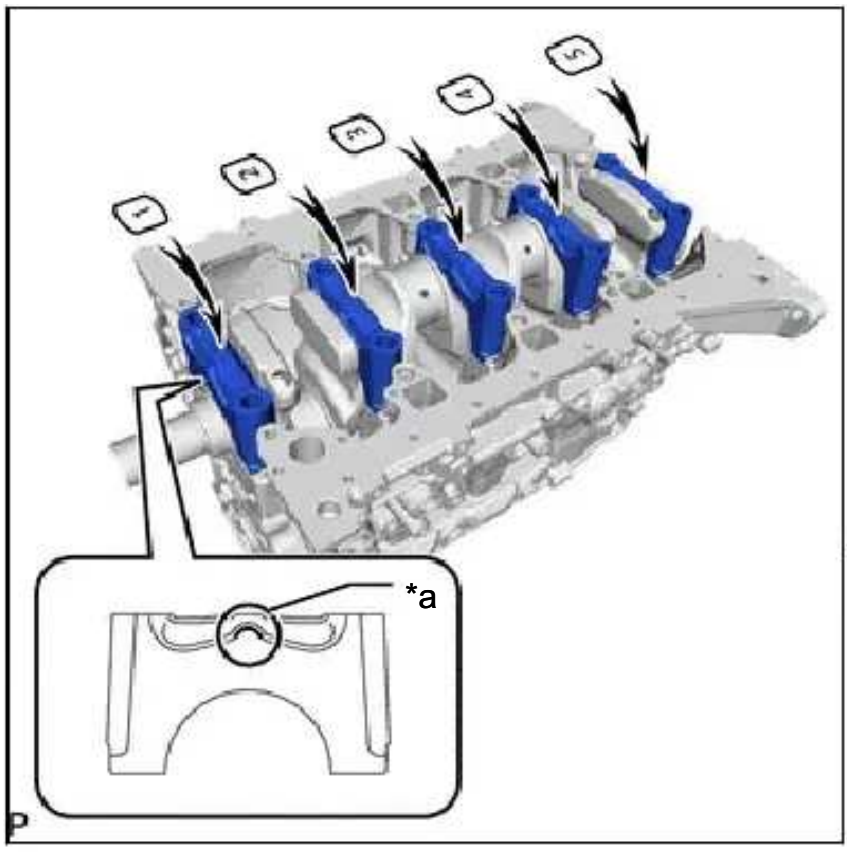
f. Install the 5 crankshaft bearing caps to the cylinder block sub-assembly, making sure that the front marks (protrusions) and crankshaft bearing cap number of the crankshaft bearing caps are as shown in the illustration.

g. Apply a light coat of engine oil to the threads and under the heads of the crankshaft bearing cap set bolts.

h. Install the crankshaft bearing cap set bolts.

HINT:

- **The crankshaft bearing cap set bolts are tightened in 2 progressive steps.**
- **If a crankshaft bearing cap set bolt is broken or deformed, replace it.**



A343456C01

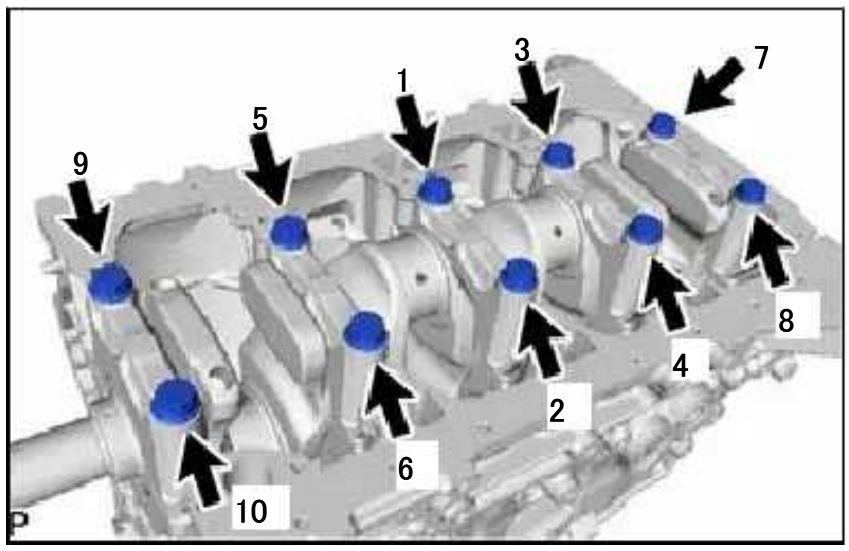
*a	Front Mark (Protrusion)

i. Step 1:
Using several steps, install and uniformly tighten the 10 crankshaft bearing cap set bolts in the sequence shown in the illustration.

Torque:
95 N*m (969 kgf*cm, 70 ft.*lbf)

HINT:

If any of the crankshaft bearing cap set bolts does not meet the torque specification, replace the crankshaft bearing cap set bolt.



A337476N02

j. Step 2:

i. Mark the front of the crankshaft bearing cap set bolts with paint.

ii. Tighten the crankshaft bearing cap set bolts by 90°.

iii. Check that the painted marks are now at a 90° angle to the front.

k. Check that the crankshaft turns smoothly.

8. INSPECT CRANKSHAFT THRUST CLEARANCE

Click here ENGINE MECHANICAL (2GD-FTV) > CYLINDER BLOCK > DISASSEMBLY > INSPECT

CRANKSHAFT THRUST CLEARANCE

9. INSTALL CONNECTING ROD BEARING

HINT:

Check that the No. 1 and No. 2 connecting rod bearing colors are correct, as the colors differ.

Bearing Color:

Item	Connecting Rod Bearing Color
No. 1 Connecting Rod Bearing	Brown
No. 2 Connecting Rod Bearing	Silver

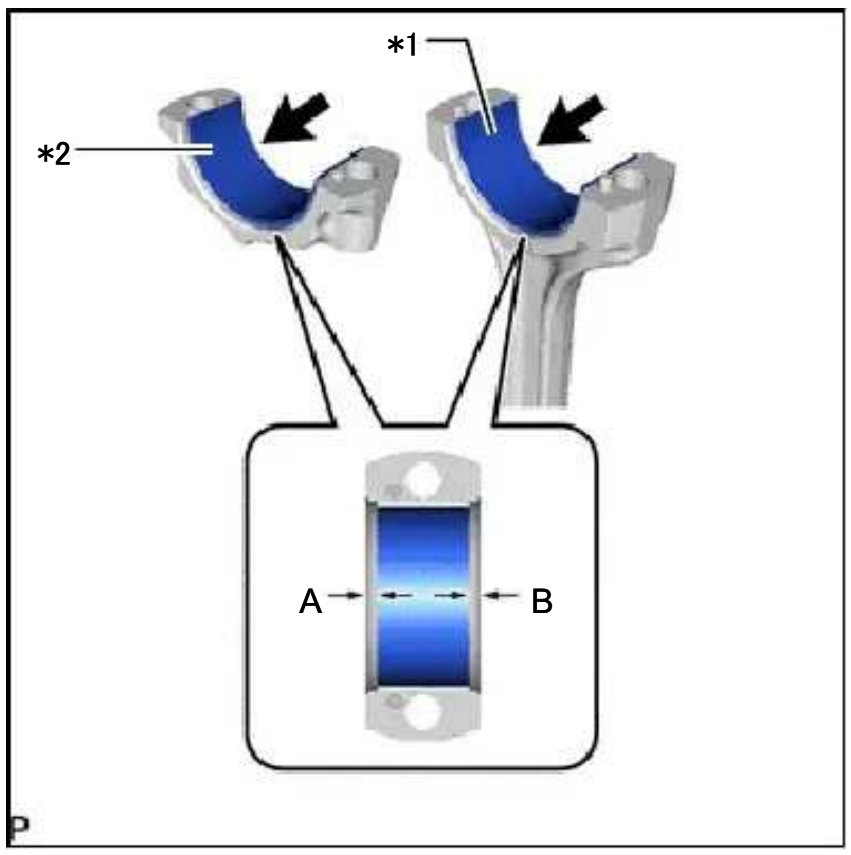
a. Clean the backside of the connecting rod bearing and the connecting rod bearing surface of the connecting rod sub-assembly and connecting rod cap.

b. Install the No. 1 connecting rod bearings to the connecting rod sub-assembly.

c. Install the No. 2 connecting rod bearings to the connecting rod cap.

d. Using a vernier caliper, measure the distance between the connecting rod cap edge and connecting rod bearing edge.

Dimension A - B or B - A:
0 to 0.7 mm (0 to 0.0276 in.)



A343451C01

*1	No. 1 Connecting Rod Bearing
*2	No. 2 Connecting Rod Bearing

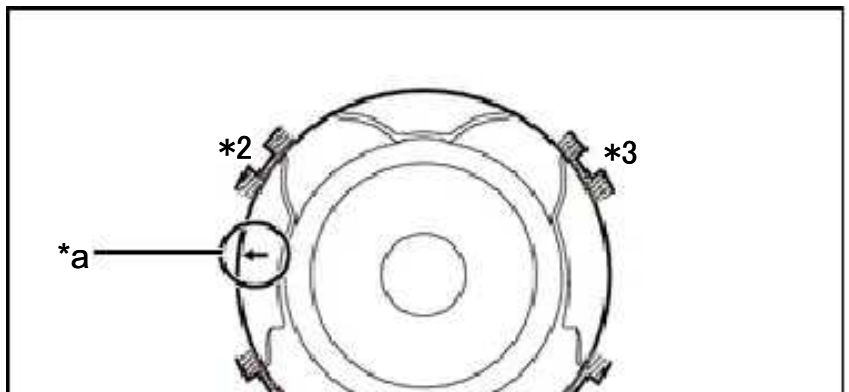
10. INSTALL PISTON AND CONNECTING ROD SUB-ASSEMBLY

a. Apply engine oil to the cylinder walls, pistons, and surfaces of the connecting rod bearings.

b. Position the piston rings so that the piston ring ends are as shown in the illustration.

NOTICE:

Do not align the piston ring ends.

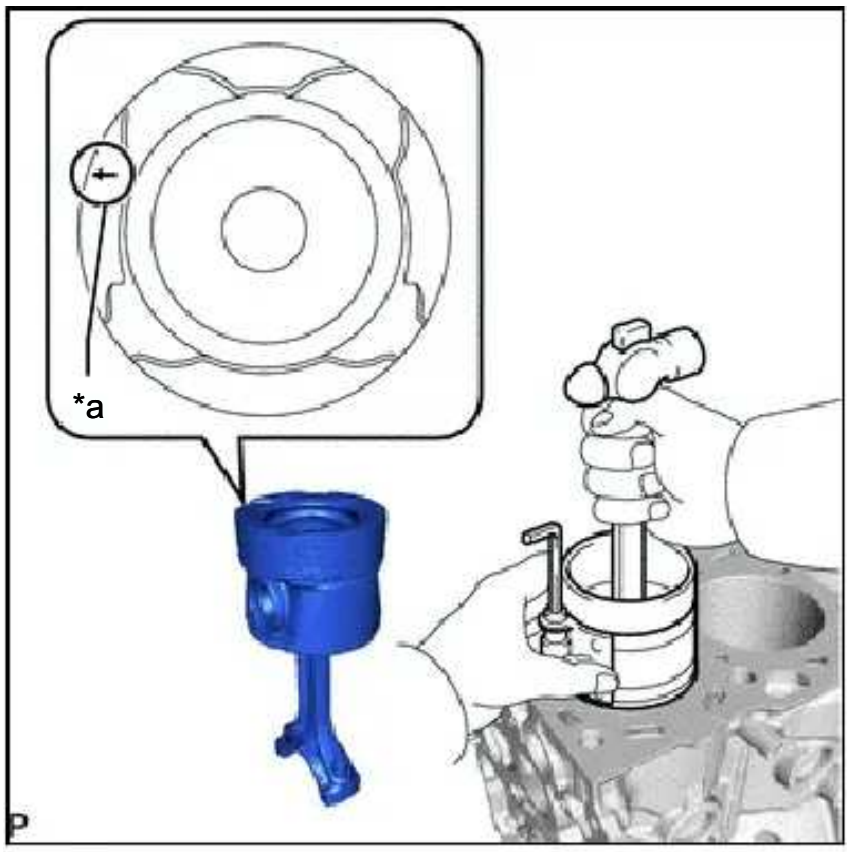


A343449C01

*1	No. 1 Compression Ring
*2	No. 2 Compression Ring

*3	Oil Ring Expander
*4	Oil Ring Rail
*a	Front Mark (Arrow)

c. Using a piston ring compressor and hammer handle, press a piston with connecting rod sub-assembly into each cylinder with the front mark (arrow) of the piston facing forward.

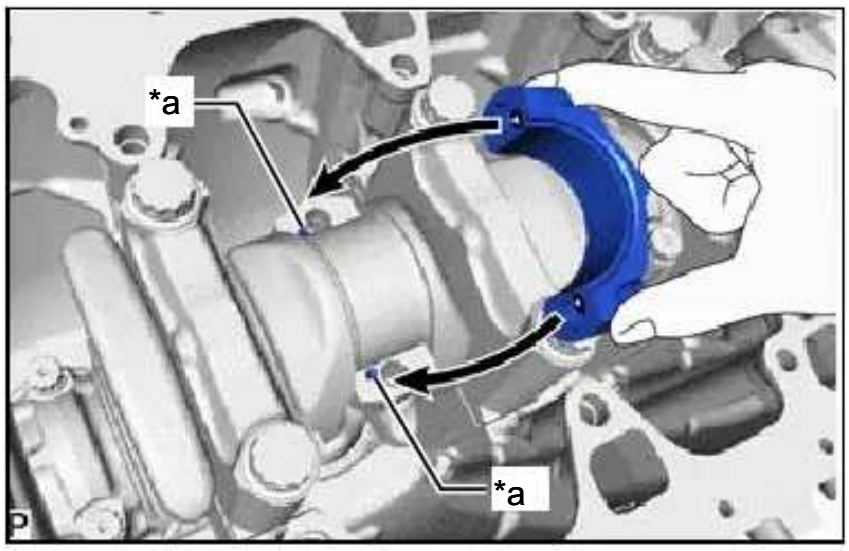


A343458C01

*a	Front Mark (Arrow)

d. Place the connecting rod cap on the connecting rod sub-assembly.

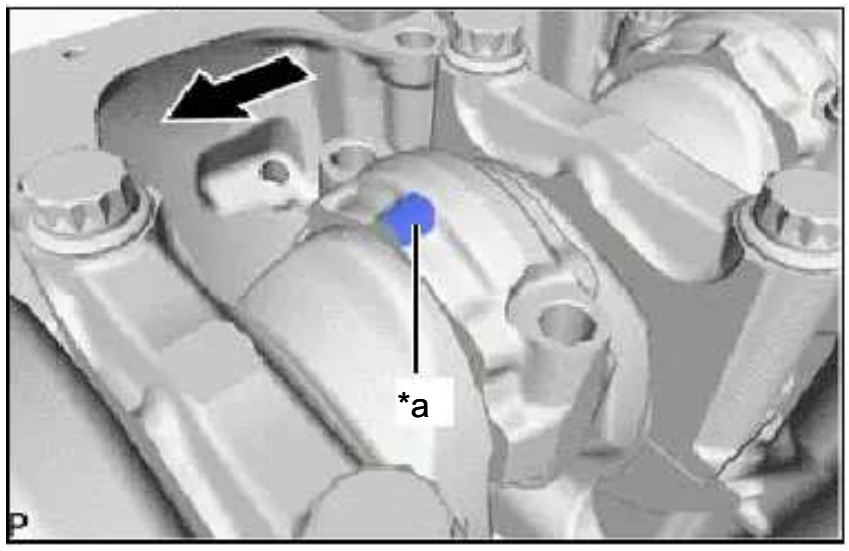
i. Align the pin holes of the connecting rod cap with the pins of the connecting rod sub-assembly, and then install the connecting rod cap.



A343460C01

*a	Pin

ii. Check that the front mark (protrusion) of the connecting rod cap is facing forward.

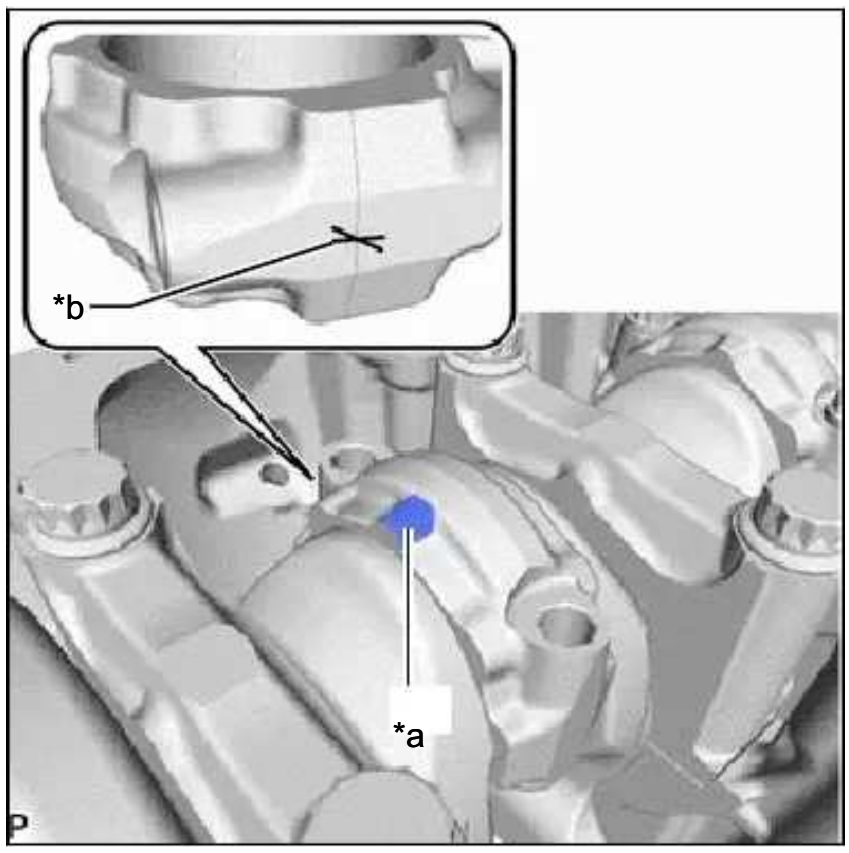


A343462C01

*a	Front Mark (Protrusion)
➡	Front

iii. Check that the matchmarks of the connecting rod sub-assembly and connecting rod cap are aligned.

e. Apply a light coat of engine oil to the threads and under the heads of the connecting rod bolts.



A343585C01

*a	Front Mark (Protrusion)
*b	Matchmark

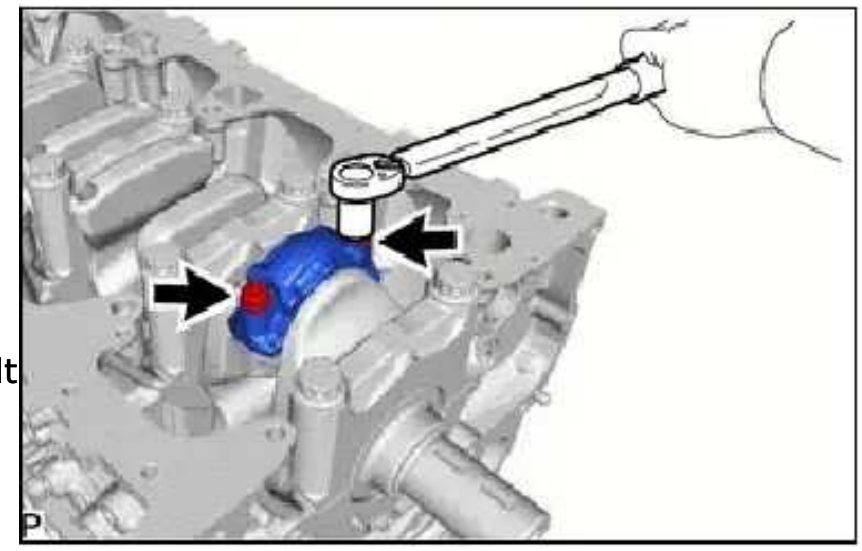
f. Install the connecting rod bolts.

HINT:

The connecting rod bolts are tightened in 2 progressive steps.

i. Step 1:
Install and alternately tighten the connecting rod bolts of each connecting rod cap in several steps.

Torque:
40 N*m (408 kgf*cm, 30 ft.*lbf)



A343463

ii. Mark the front side of each connecting rod bolt with paint.

iii. Step 2:
Tighten the connecting rod bolts 90°.

iv. Check that the paint marks are now at a 90° angle to the front.

g. Check that the crankshaft turns smoothly.

11. INSPECT CONNECTING ROD SUB-ASSEMBLY THRUST CLEARANCE

Click here ENGINE MECHANICAL (2GD-FTV) > CYLINDER BLOCK > DISASSEMBLY > INSPECT CONNECTING ROD SUB-ASSEMBLY THRUST CLEARANCE