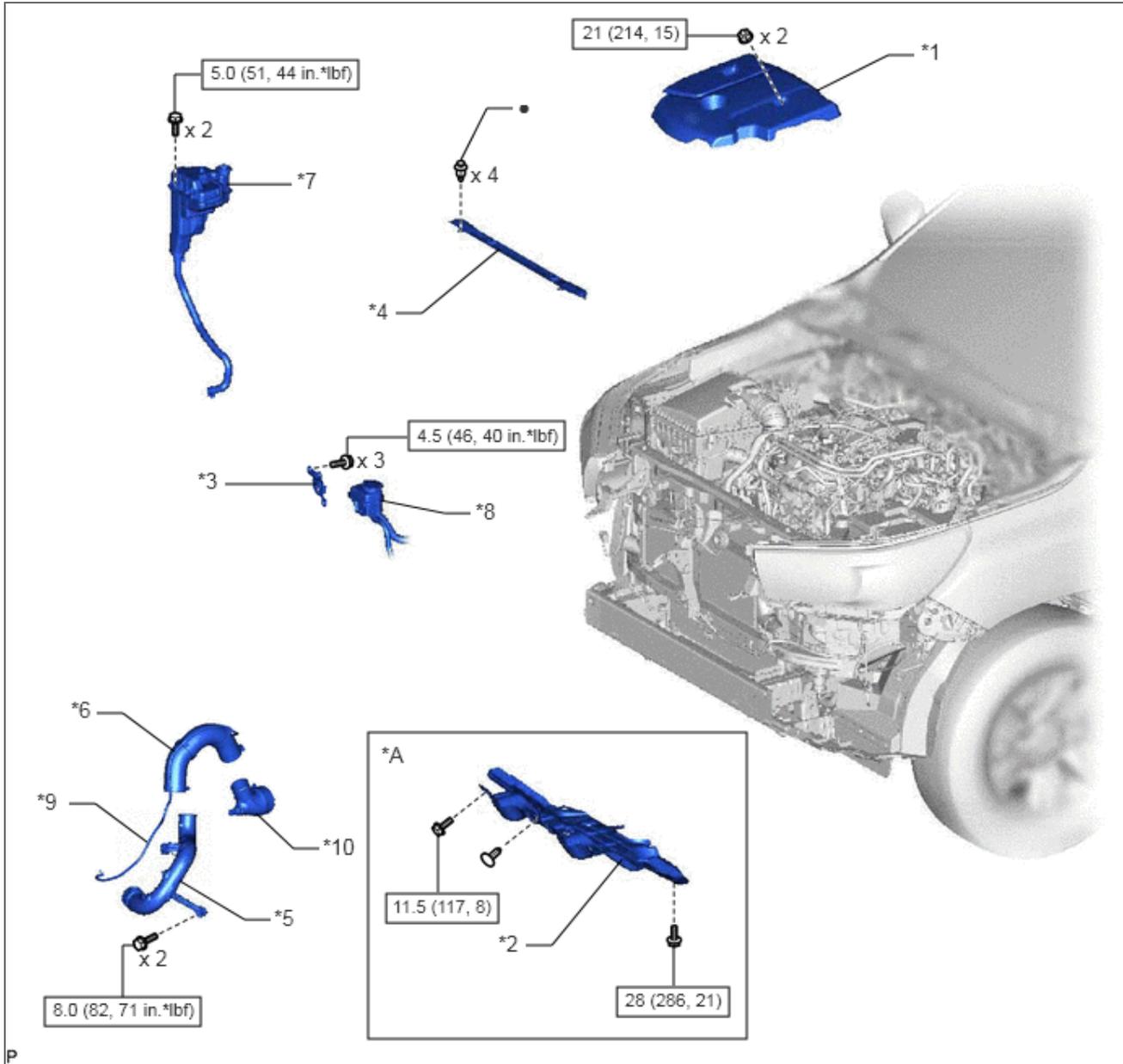


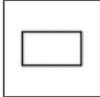
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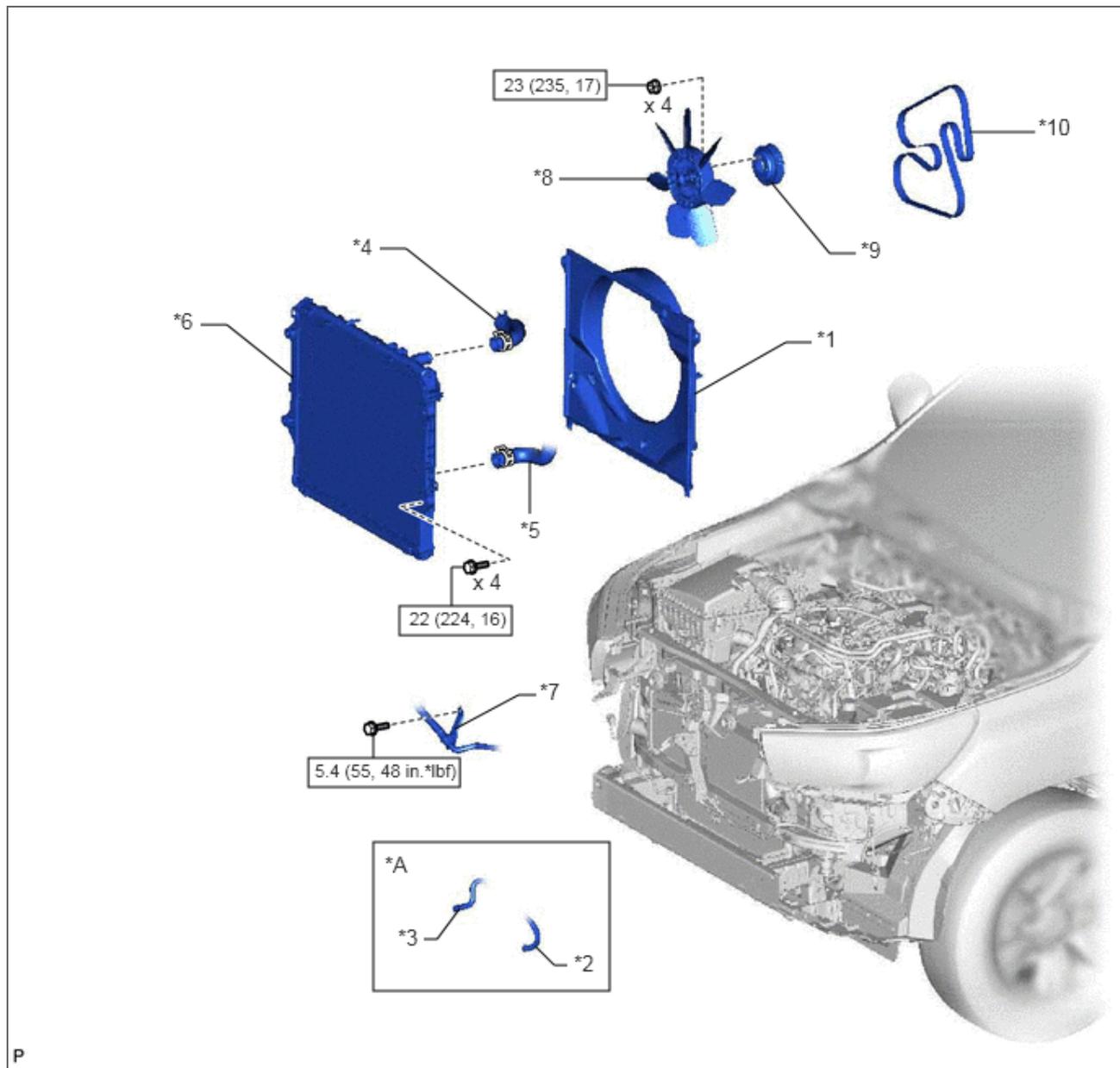
1GD-FTV ENGINE MECHANICAL CAMSHAFT COMPONENTS

ILLUSTRATION



*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

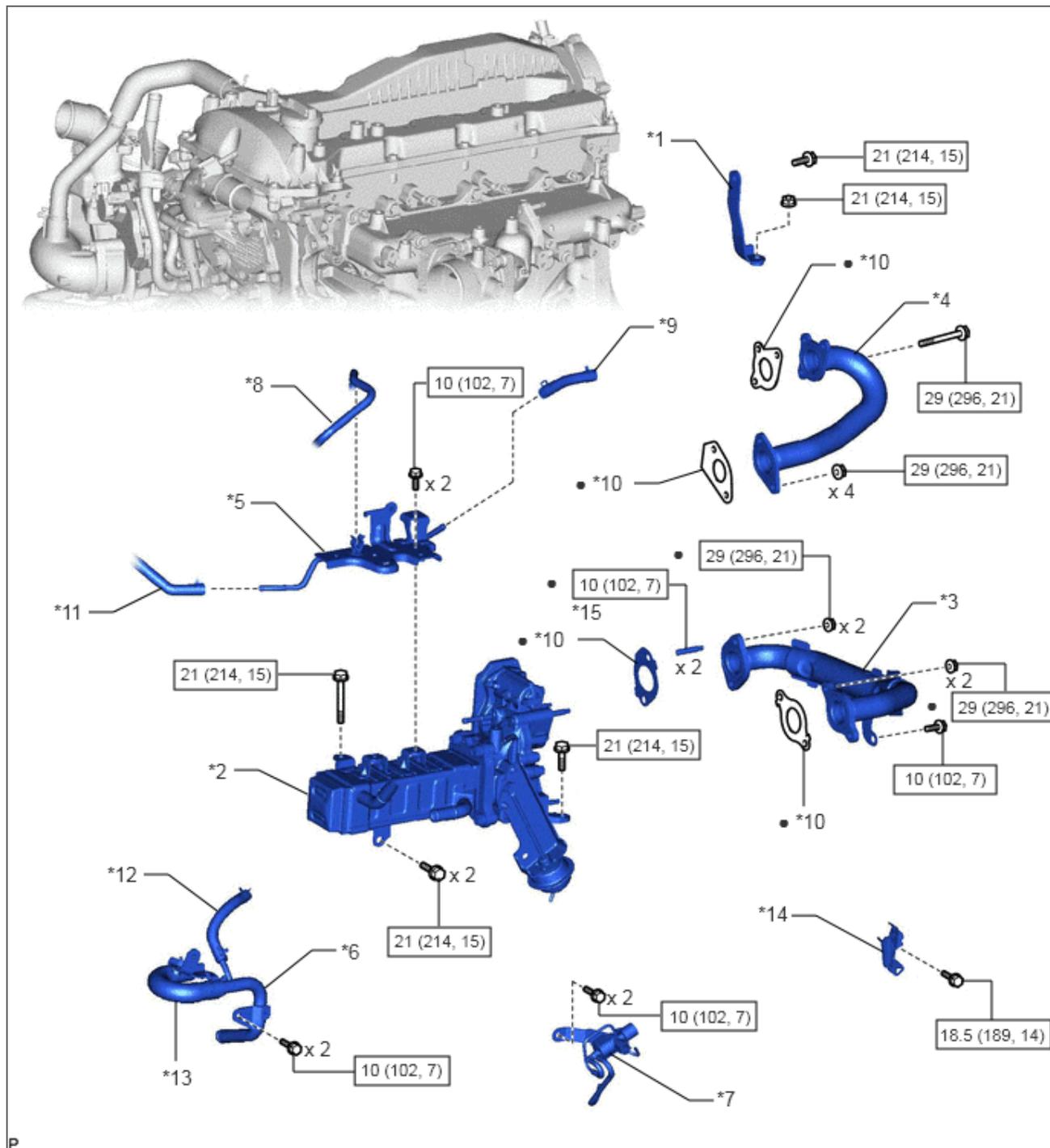
ILLUSTRATION



*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	-	-

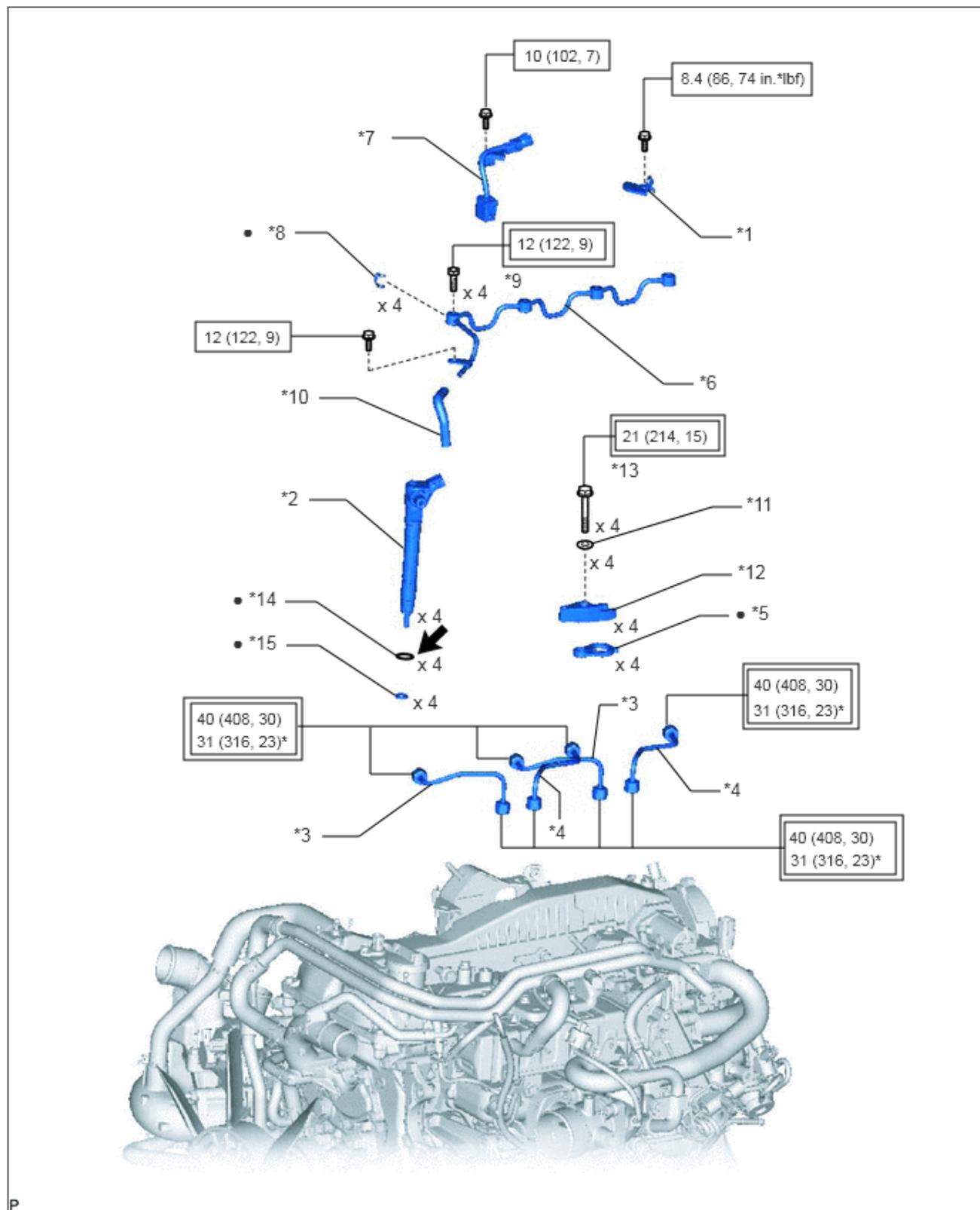
## ILLUSTRATION





*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 SUB-ASSEMBLY	*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

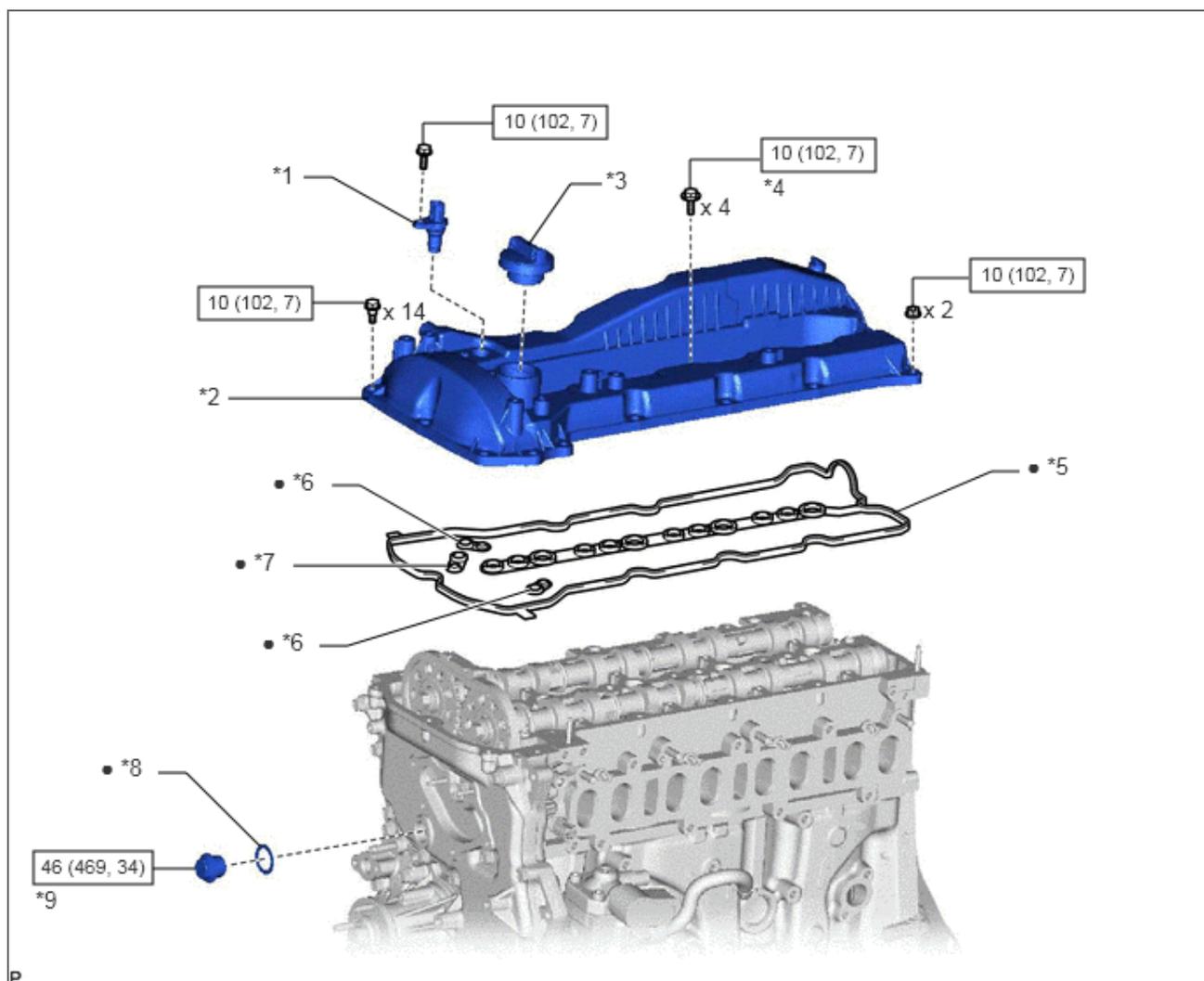
# ILLUSTRATION



*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

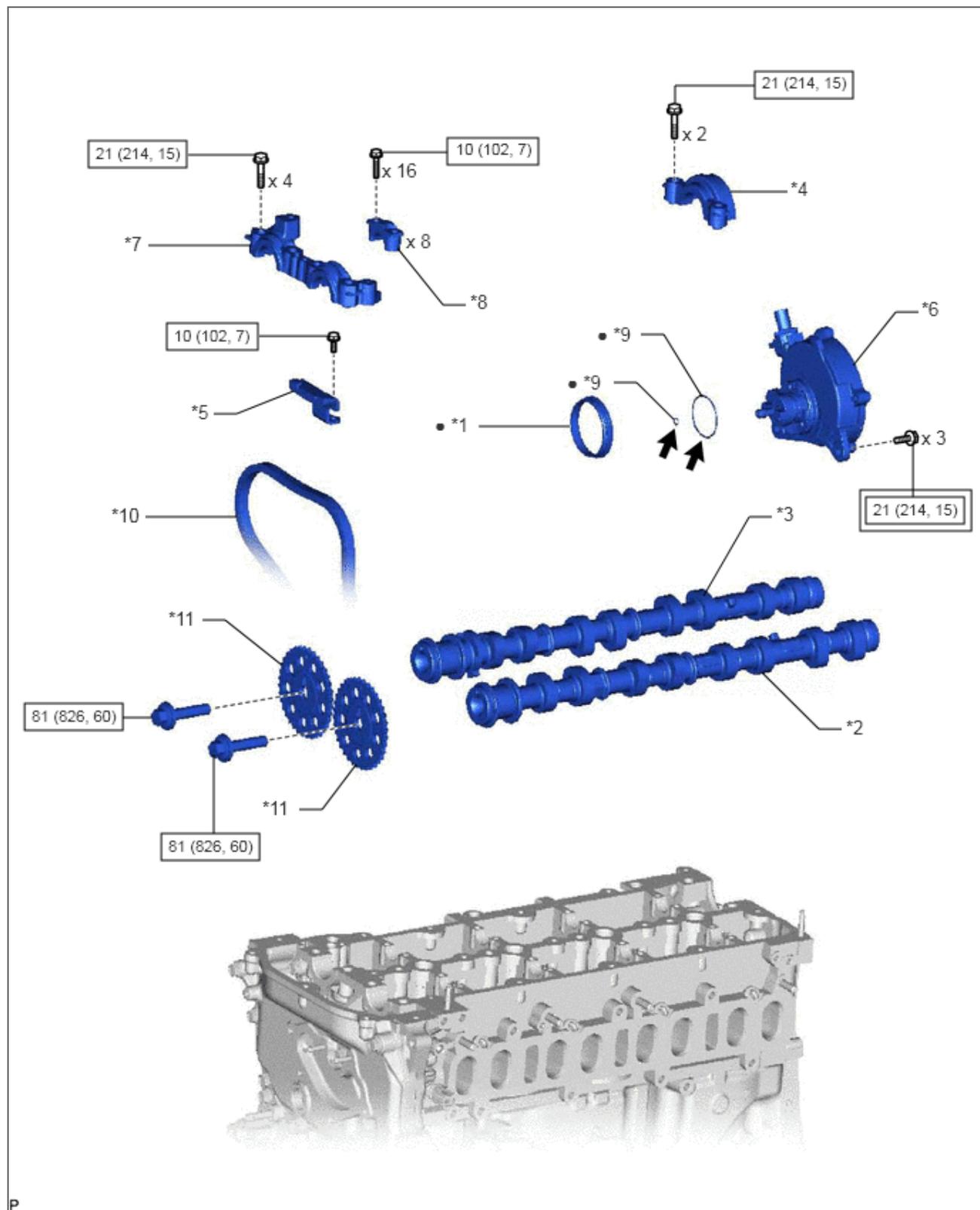
*15	INJECTION NOZZLE SEAT	-	-
	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping" : N*m (kgf*cm, ft.*lbf)		N*m (kgf*cm, ft.*lbf) : Specified torque
*	For use with SST		Engine oil
•	Non-reusable part	-	-

## ILLUSTRATION



*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

# ILLUSTRATION



*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
<ul style="list-style-type: none"> <li>•</li> </ul>	Non-reusable part		Engine oil

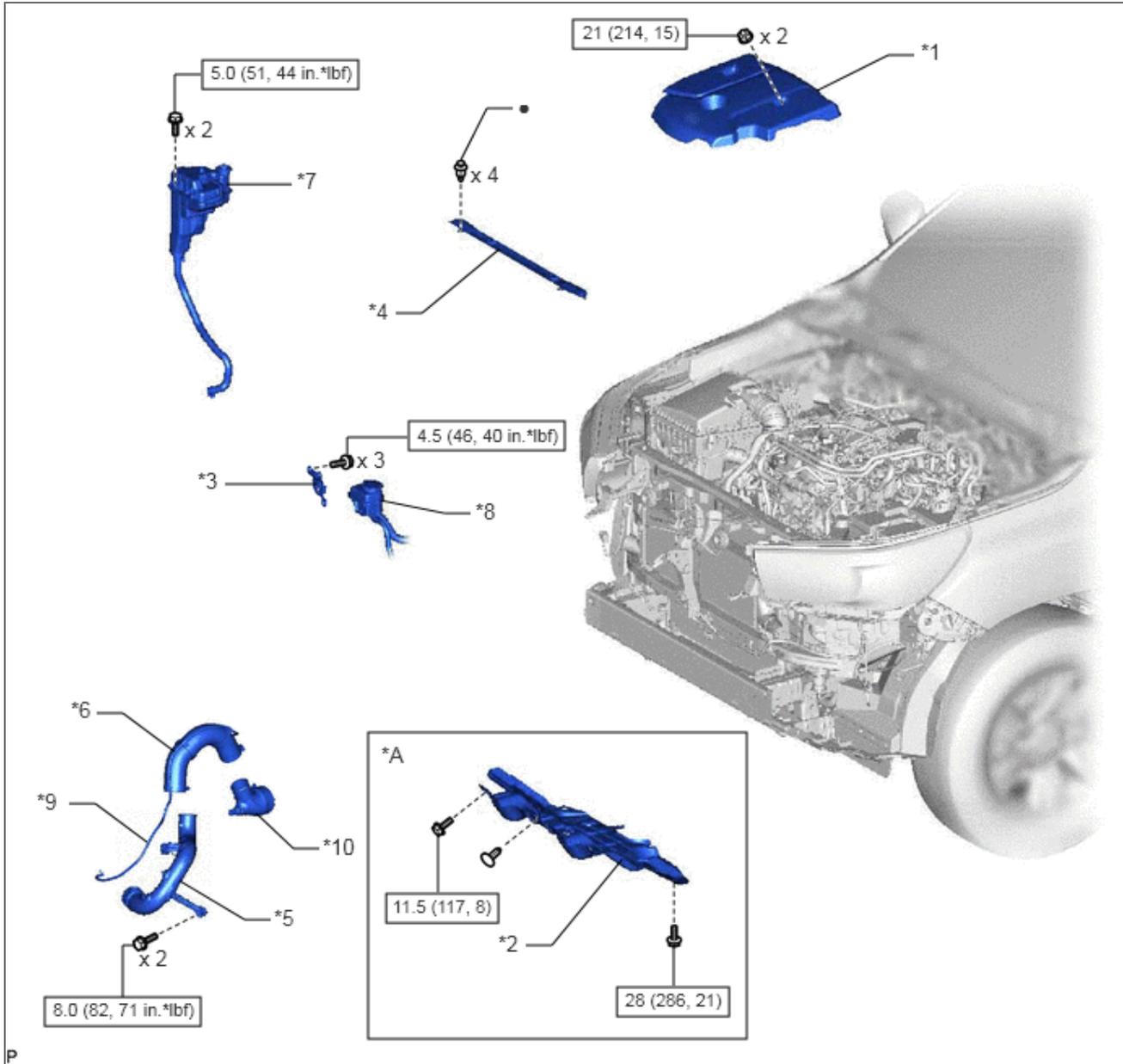
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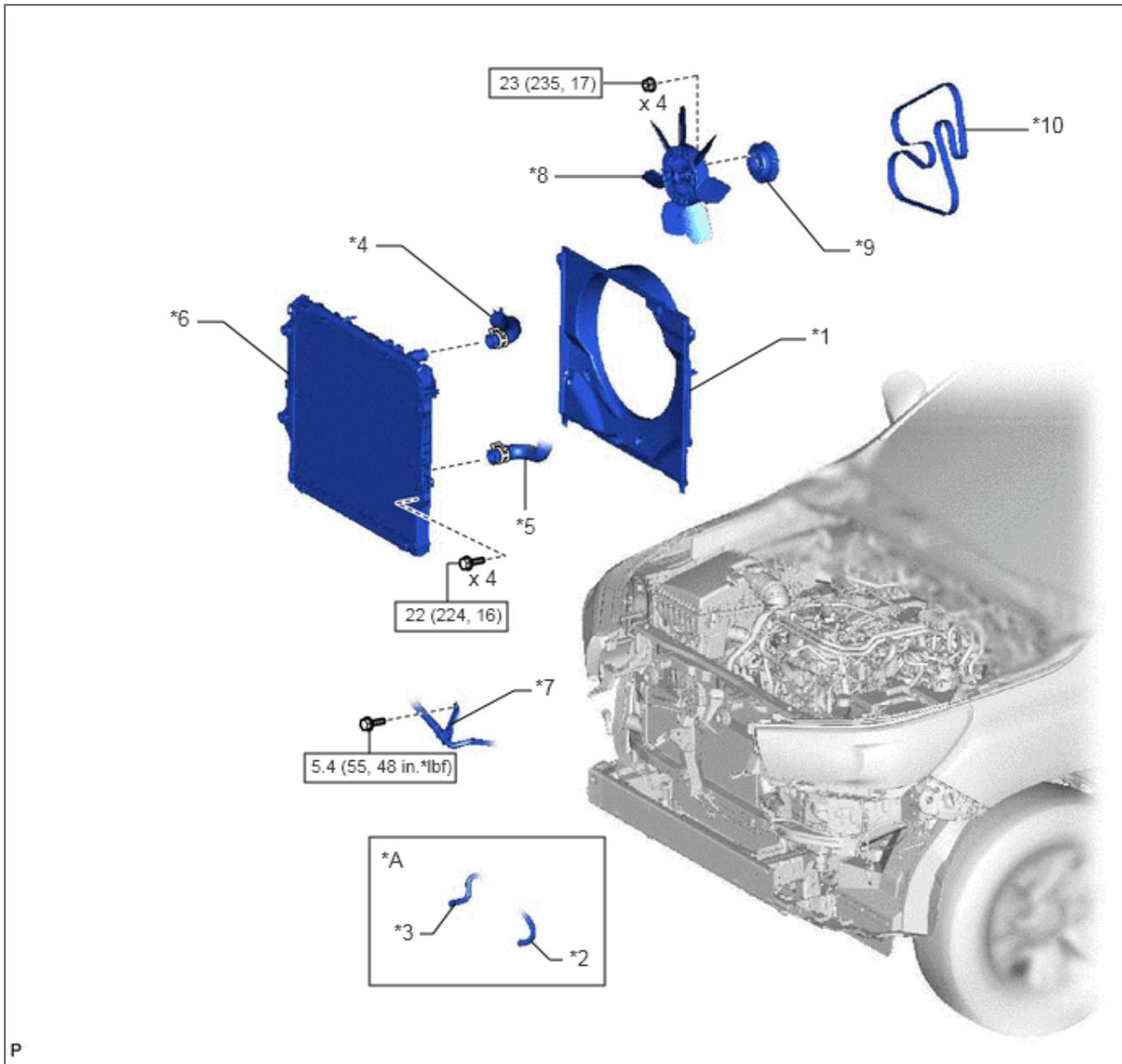
1GD-FTV ENGINE MECHANICAL CAMSHAFT COMPONENTS

ILLUSTRATION

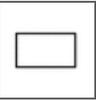


*A	for 4WD and Pre-Runner	-	-
*1	NO. 1 ENGINE COVER SUB-ASSEMBLY	*2	NO. 1 ENGINE UNDER COVER ASSEMBLY
*3	NO. 1 OIL RESERVOIR BRACKET	*4	NO. 1 RADIATOR AIR GUIDE
*5	NO. 2 AIR TUBE	*6	NO. 4 AIR HOSE
*7	RADIATOR RESERVE TANK ASSEMBLY	*8	VANE PUMP OIL RESERVOIR ASSEMBLY
*9	OIL RETURN HOSE	*10	NO. 3 AIR TUBE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

ILLUSTRATION

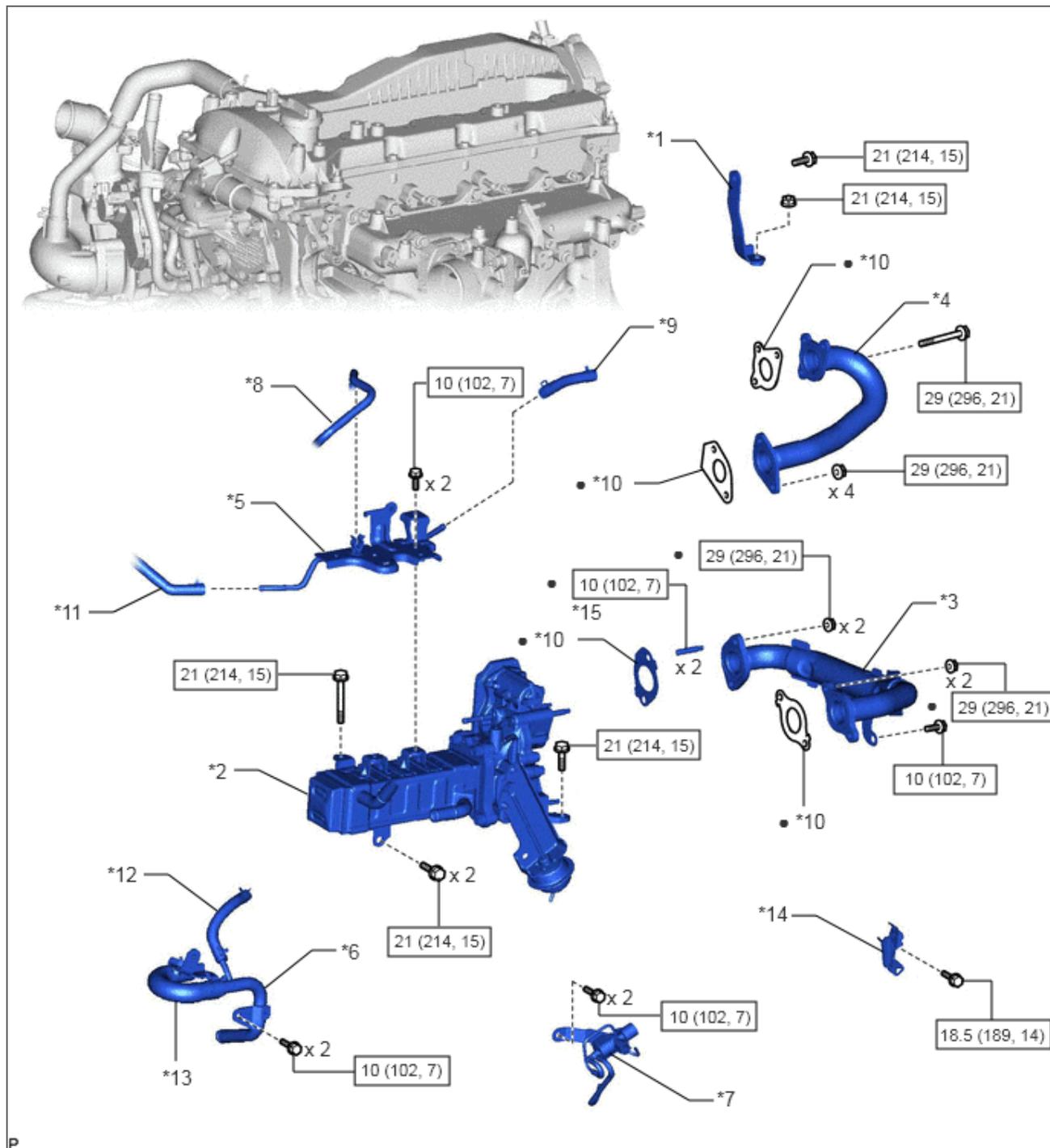


P

*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	-	-

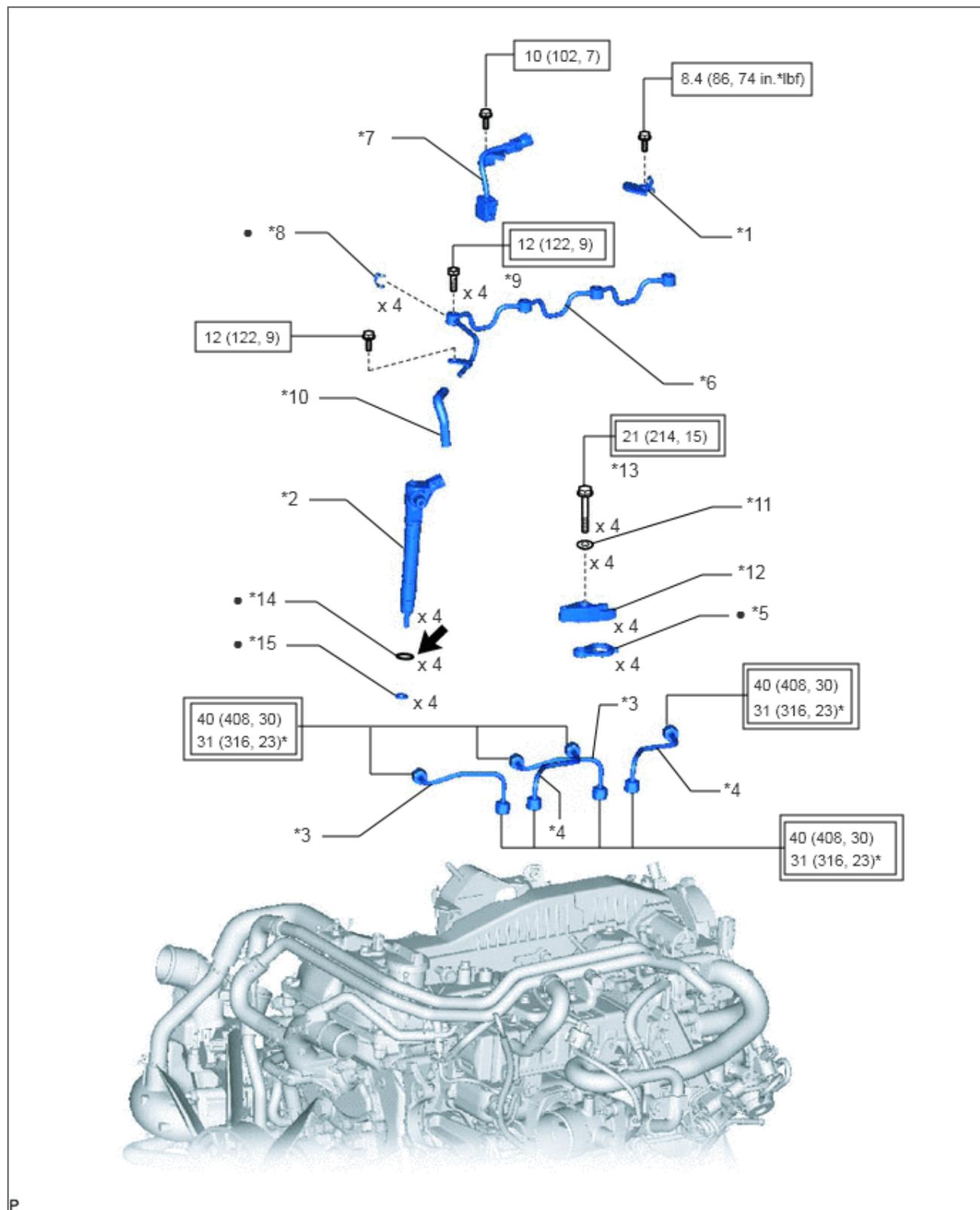
## ILLUSTRATION





*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 SUB-ASSEMBLY	*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

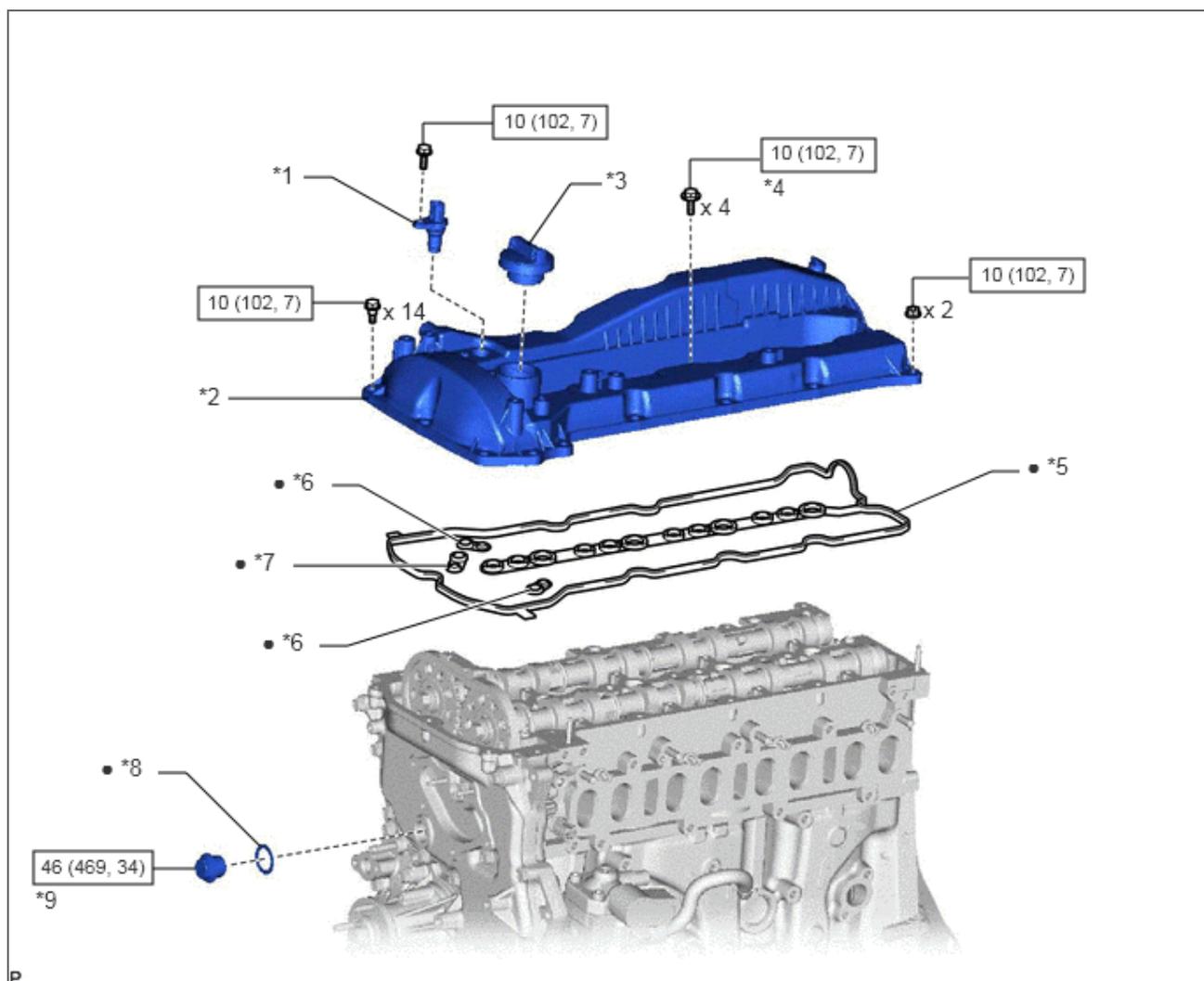
# ILLUSTRATION



*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

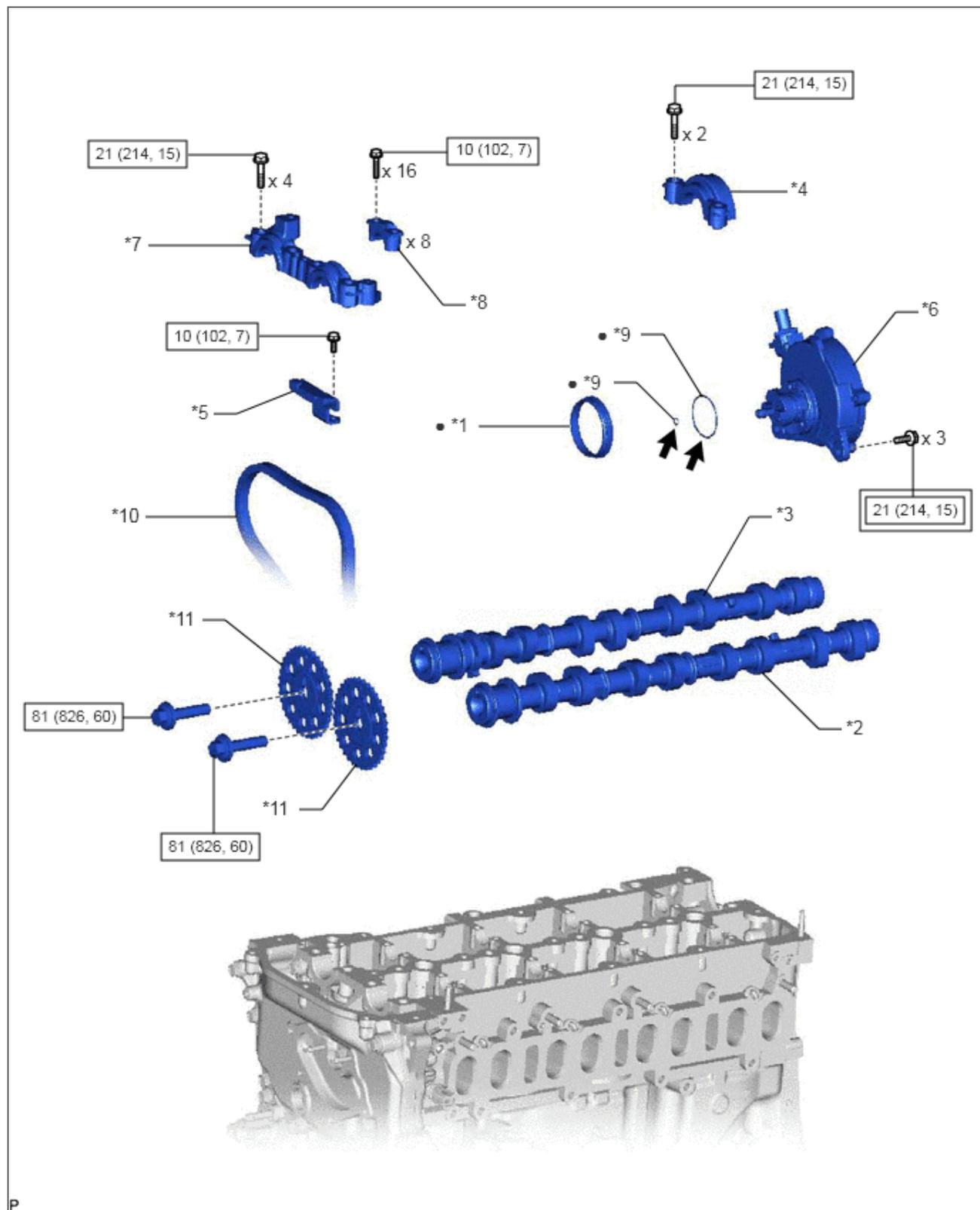
*15	INJECTION NOZZLE SEAT	-	-
	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping" : N*m (kgf*cm, ft.*lbf)		N*m (kgf*cm, ft.*lbf) : Specified torque
*	For use with SST		Engine oil
•	Non-reusable part	-	-

## ILLUSTRATION



*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

# ILLUSTRATION



*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
<ul style="list-style-type: none"> <li>•</li> </ul>	Non-reusable part		Engine oil

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1GD-FTV ENGINE MECHANICAL CAMSHAFT INSTALLATION

**CAUTION / NOTICE / HINT**

**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)	<ul style="list-style-type: none"> <li>No. 1 injection pipe sub-assembly</li> <li>No. 2 injection pipe sub-assembly</li> </ul>
<ul style="list-style-type: none"> <li>Supply pump assembly</li> <li>Common rail assembly</li> <li>Cylinder block sub-assembly</li> <li>Cylinder head sub-assembly</li> <li>Cylinder head gasket</li> <li>Timing chain case assembly</li> </ul>	<ul style="list-style-type: none"> <li>No. 1 injection pipe sub-assembly</li> <li>No. 2 injection pipe sub-assembly</li> <li>Fuel inlet pipe sub-assembly</li> </ul>

- 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.

**PROCEDURE**

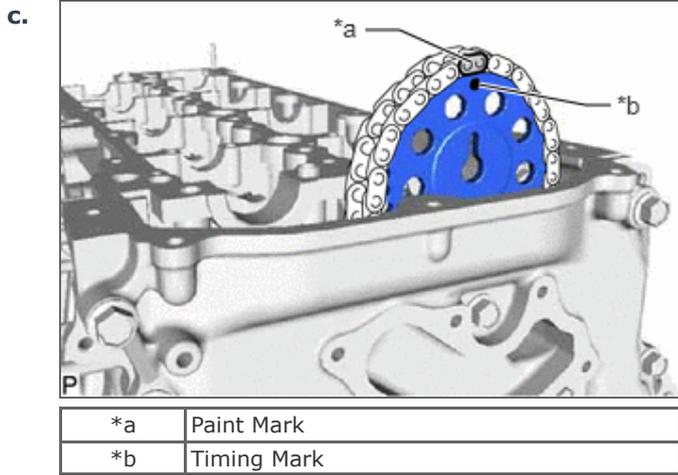
**1.INSTALL CAMSHAFT**

a.

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

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

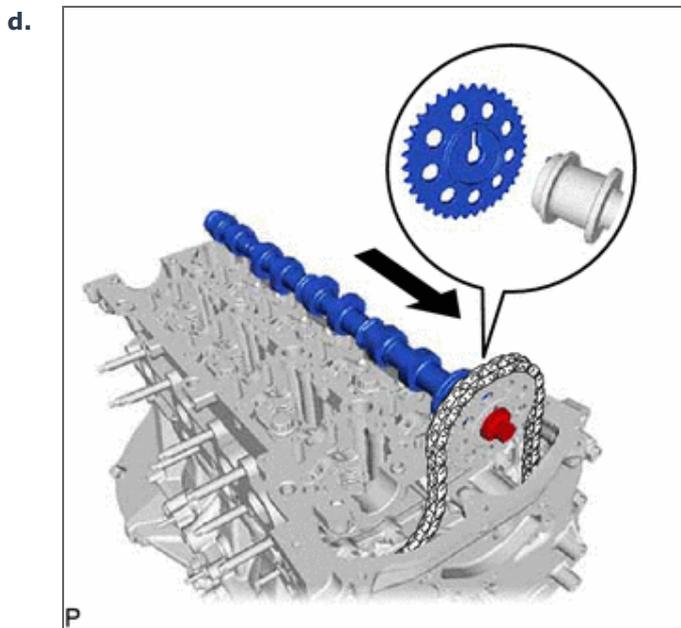
- b. Apply a light coat of engine oil to the camshaft journals of the cylinder head sub-assembly and the thrust portion of the camshaft.



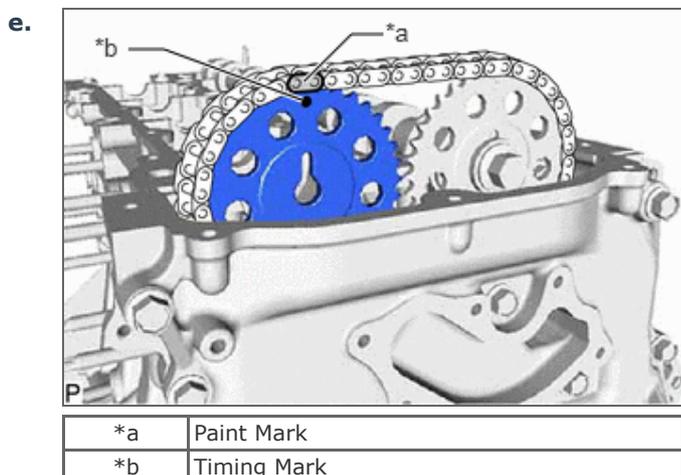
Align the paint mark of the No. 2 chain sub-assembly and timing mark of the camshaft timing sprocket, and install the camshaft timing sprocket to the No. 2 chain sub-assembly.

**HINT:**

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



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.

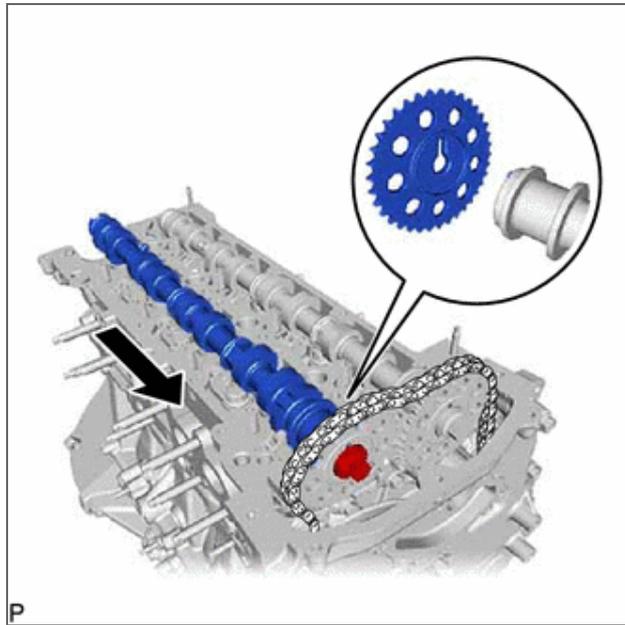


Align the paint mark of the No. 2 chain sub-assembly and timing mark of the camshaft timing sprocket, and install the camshaft timing sprocket to the No. 2 chain sub-assembly.

**HINT:**

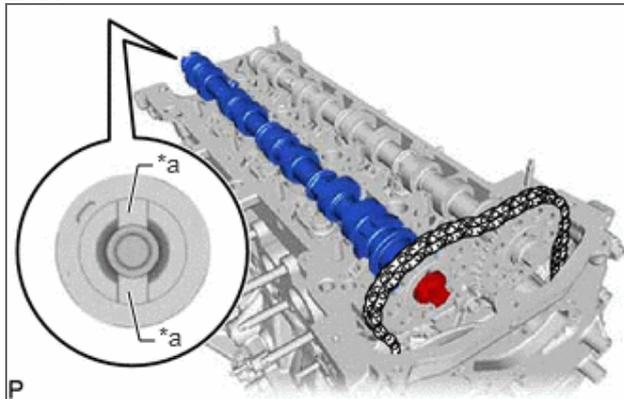
Make sure the timing mark of the camshaft timing sprocket face the front side.

f.



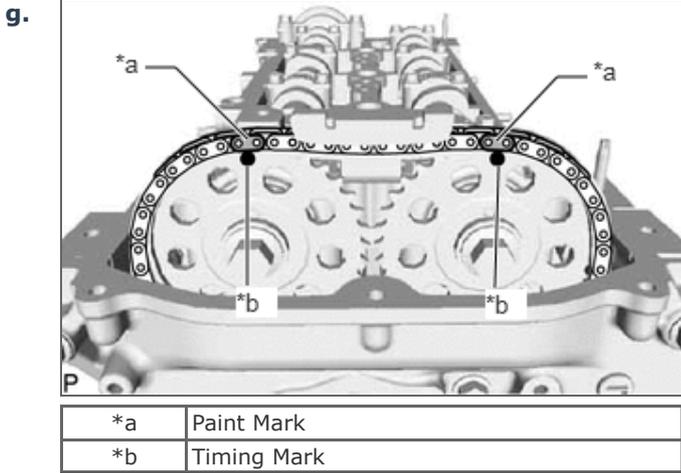
Align the knock pin of the No. 2 camshaft to the groove of the sprocket and install the No. 2 camshaft to the camshaft timing sprocket, and set the bolt.

**HINT:**

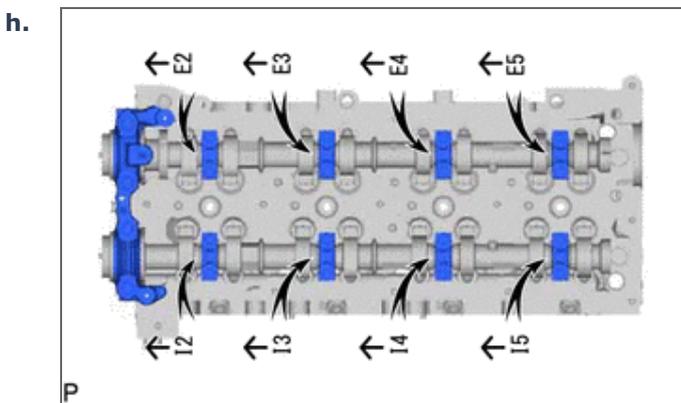


*a	Glove
----	-------

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

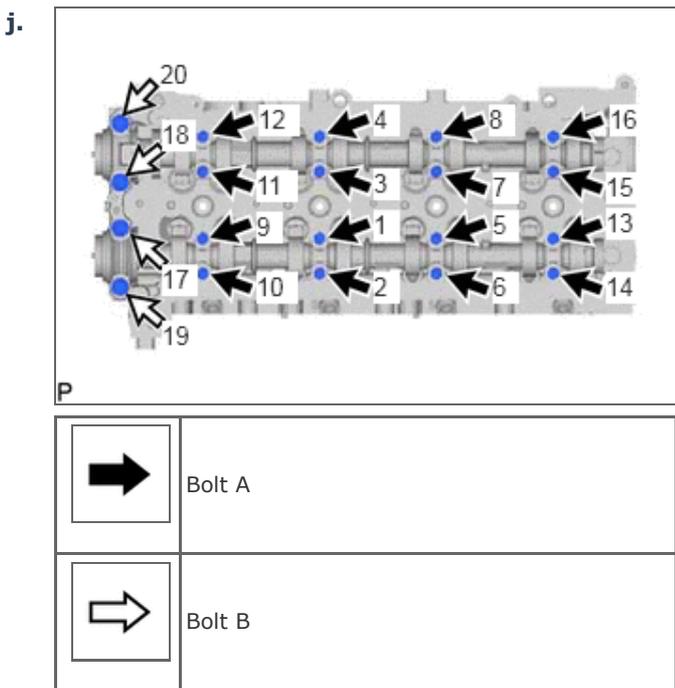


Check the timing mark of the camshaft timing sprocket and paint mark of the No. 2 chain sub-assembly.



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.

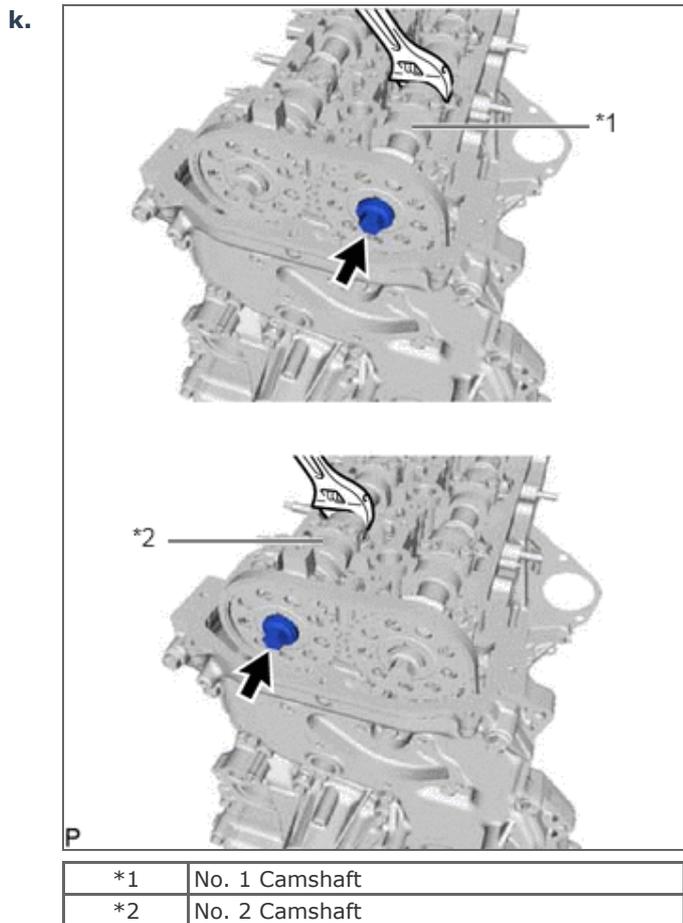
**i.** Temporarily install the 20 bolts.



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)**



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)**

**2.INSTALL TIMING CHAIN GUIDE**

**13566B**

- 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****11382C**

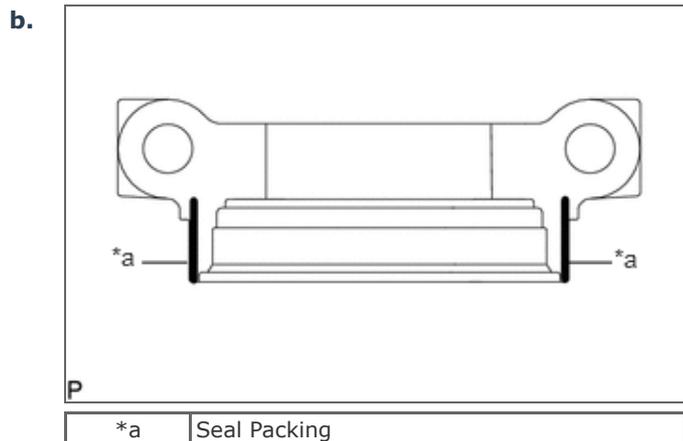
[Click here](#)Brake>BRAKE SYSTEM (OTHER)>VACUUM PUMP(for 1GD-FTV, 2GD-FTV)>INSTALLATION

**4.TEMPORARILY INSTALL VACUUM PUMP ASSEMBLY****29300**

[Click here](#)Brake>BRAKE SYSTEM (OTHER)>VACUUM PUMP(for 1GD-FTV, 2GD-FTV)>INSTALLATION

**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.



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 10 minutes.
- Do not start the engine for at least 2 hours after installation.

- 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****29300**

[Click here](#)Brake>BRAKE SYSTEM (OTHER)>VACUUM PUMP(for 1GD-FTV, 2GD-FTV)>INSTALLATION

**7.INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY****11201**

[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>INSTALLATION

**8.INSTALL NOZZLE HOLDER GASKET****23682**

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION

 **9.TEMPORARILY INSTALL INJECTOR ASSEMBLY** **23670**

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION

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

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION

 **11.TIGHTEN INJECTOR ASSEMBLY** **23670**

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION

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

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION

 **13.INSTALL NOZZLE LEAKAGE PIPE ASSEMBLY** **23760**

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION

 **14.INSTALL HARNESS BRACKET**

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION

 **15.INSTALL WIRING HARNESS CLAMP BRACKET**

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION

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

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR COOLER>INSTALLATION

 **17.INSTALL VACUUM CONTROL VALVE SET** **25804**

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION

 **18.INSTALL NO. 1 EGR PIPE SUB-ASSEMBLY** **25601**

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION

 **19.CONNECT NO. 4 WATER BY-PASS PIPE SUB-ASSEMBLY** **16209**

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION

 **20.INSTALL NO. 3 WATER BY-PASS PIPE SUB-ASSEMBLY** **16206B**

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR COOLER>INSTALLATION

 **21.INSTALL NO. 2 EGR PIPE** **25612**

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION

 **22.INSTALL EGR VALVE BRACKET** **25625**

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION

 <b>23.CONNECT ENGINE WIRE</b>	<b>82121</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION	
 <b>24.CONNECT FUEL FILTER ASSEMBLY</b>	<b>23300</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION	
 <b>25.INSTALL NO. 2 ENGINE COVER BRACKET</b>	<b>12632</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION	
 <b>26.INSTALL NO. 2 HOSE TO HOSE TUBE</b>	<b>44763C</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION	
 <b>27.INSTALL TURBO PRESSURE SENSOR</b>	<b>89421C</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION	
 <b>28.INSTALL GAS FILTER</b>	<b>23265C</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION	
 <b>29.INSTALL NO. 1 FUEL PIPE (w/ DPF)</b>	<b>23811H</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EXHAUST FUEL ADDITION INJECTOR>INSTALLATION	
 <b>30.INSTALL NO. 2 WATER BY-PASS PIPE</b>	<b>16278</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION	
 <b>31.INSTALL DIESEL THROTTLE BODY ASSEMBLY</b>	<b>26100G</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>INSTALLATION	
 <b>32.INSTALL INTERCOOLER AIR TUBE</b>	<b>17363K</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>INSTALLATION	
 <b>33.INSTALL NO. 4 AIR HOSE</b>	<b>17344E</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>INSTALLATION	
 <b>34.INSTALL RADIATOR ASSEMBLY</b>	<b>16400</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION	
 <b>35.CONNECT NO. 2 RADIATOR HOSE</b>	<b>16572D</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION	
 <b>36.INSTALL FAN SHROUD</b>	<b>16711</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION	
 <b>37.CONNECT NO. 1 OIL COOLER INLET HOSE (for Automatic Transmission)</b>	<b>32941</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION	

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	<b>38.CONNECT NO. 1 OIL COOLER OUTLET HOSE (for Automatic Transmission)</b>	<b>32942</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION](#)

	<b>39.INSTALL RADIATOR RESERVE TANK ASSEMBLY</b>	<b>16470</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION](#)

	<b>40.INSTALL NO. 1 OIL RESERVOIR BRACKET</b>	<b>44369A</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION](#)

	<b>41.CONNECT VANE PUMP OIL RESERVOIR ASSEMBLY</b>	<b>44360</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION](#)

	<b>42.INSTALL NO. 1 RADIATOR HOSE</b>	<b>16571C</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION](#)

	<b>43.INSTALL NO. 2 AIR TUBE</b>	<b>17362B</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION](#)

	<b>44.INSTALL NO. 4 AIR HOSE</b>	<b>17344E</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION](#)

	<b>45.INSTALL NO. 1 RADIATOR AIR GUIDE</b>	<b>16593</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION](#)

	<b>46.INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY</b>	<b>12601B</b>
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Click here [Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>INSTALLATION](#)

	<b>47.INSTALL FRONT BUMPER</b>
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Click here [Vehicle Exterior>EXTERIOR PANELS / TRIM>FRONT BUMPER\(for Steel Type Bumper\)>INSTALLATION](#)

	<b>48.INSTALL NO. 1 ENGINE UNDER COVER ASSEMBLY (for 4WD and Pre-Runner)</b>	<b>51410</b>
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Click here [Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>ENGINE ASSEMBLY>INSTALLATION](#)

	<b>49.CONNECT CABLE TO NEGATIVE BATTERY TERMINAL</b>
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**NOTICE:**

When disconnecting the cable, some systems need to be initialized after the cable is reconnected.  
 Click here [General>INTRODUCTION>REPAIR INSTRUCTION>INITIALIZATION](#)

	<b>50.ADD ENGINE COOLANT</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>COOLANT>REPLACEMENT](#)

	<b>51.INSPECT FOR COOLANT LEAK</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>COOLING SYSTEM>ON-VEHICLE INSPECTION](#)

 **52.BLEED AIR FROM FUEL SYSTEM**

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[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL SYSTEM>ON-VEHICLE INSPECTION

 **53.INSPECT FOR FUEL LEAK**

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[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL SYSTEM>ON-VEHICLE INSPECTION

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Exit

1GD-FTV ENGINE MECHANICAL CAMSHAFT INSTALLATION

**CAUTION / NOTICE / HINT**

**NOTICE:**

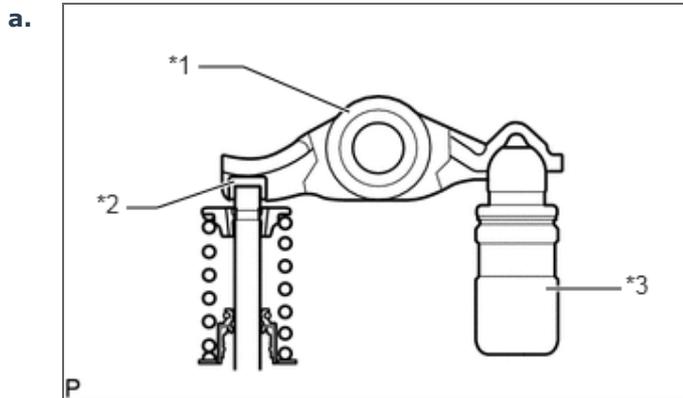
- When replacing the parts in the following chart (A), replace the No. 1 injection pipe sub-assembly, No. 2 injection pipe sub-assembly and/or fuel inlet pipe sub-assembly with new ones.

Replaced Parts (A)	Pipes Requiring New Replacement
Injector assembly (including shuffling the injector assemblies between the cylinders)	<ul style="list-style-type: none"> <li>No. 1 injection pipe sub-assembly</li> <li>No. 2 injection pipe sub-assembly</li> </ul>
<ul style="list-style-type: none"> <li>Supply pump assembly</li> <li>Common rail assembly</li> <li>Cylinder block sub-assembly</li> <li>Cylinder head sub-assembly</li> <li>Cylinder head gasket</li> <li>Timing chain case assembly</li> </ul>	<ul style="list-style-type: none"> <li>No. 1 injection pipe sub-assembly</li> <li>No. 2 injection pipe sub-assembly</li> <li>Fuel inlet pipe sub-assembly</li> </ul>

- 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.

**PROCEDURE**

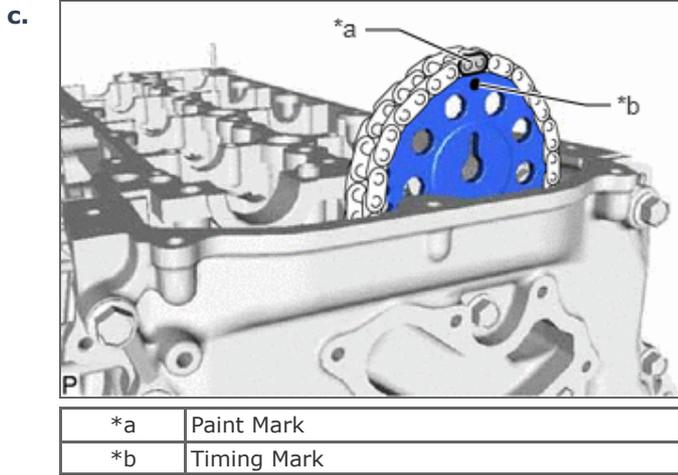
**1.INSTALL CAMSHAFT**



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

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

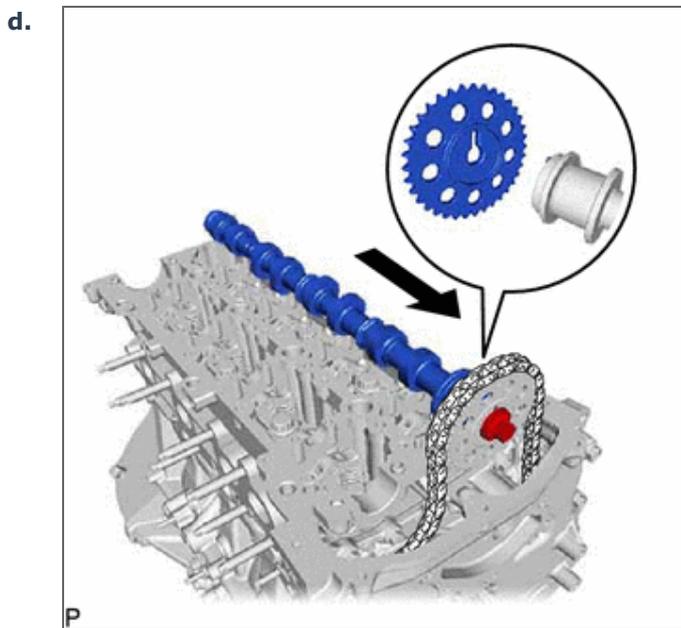
- Apply a light coat of engine oil to the camshaft journals of the cylinder head sub-assembly and the thrust portion of the camshaft.



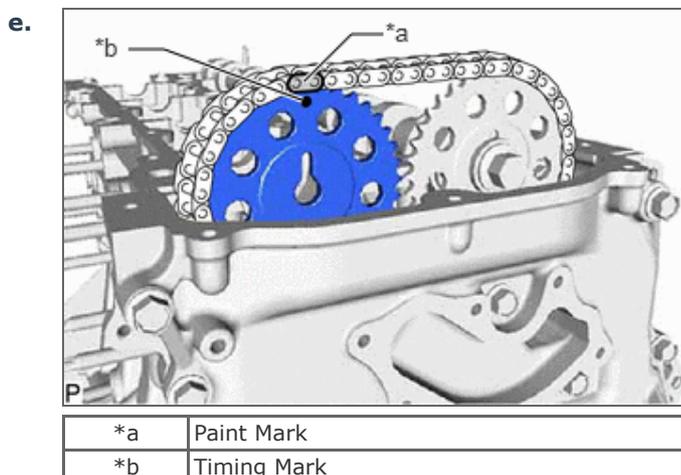
Align the paint mark of the No. 2 chain sub-assembly and timing mark of the camshaft timing sprocket, and install the camshaft timing sprocket to the No. 2 chain sub-assembly.

**HINT:**

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



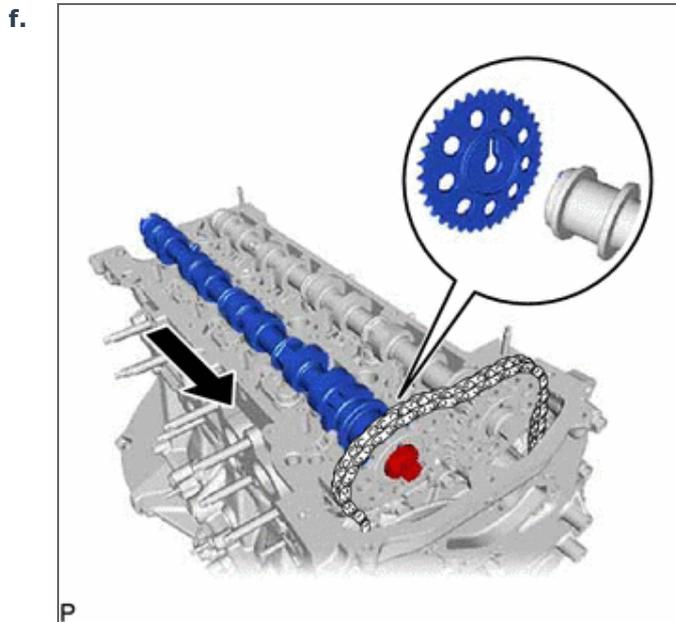
Align the knock pin of the No. 1 camshaft to the groove of the sprocket and install the No. 1 camshaft to the camshaft timing sprocket, and set the bolt.



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.

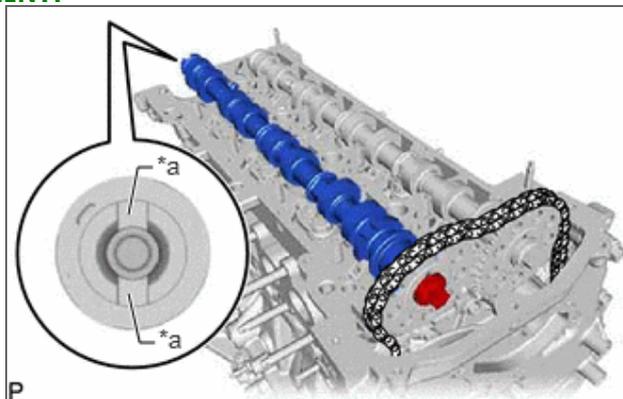
**HINT:**

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



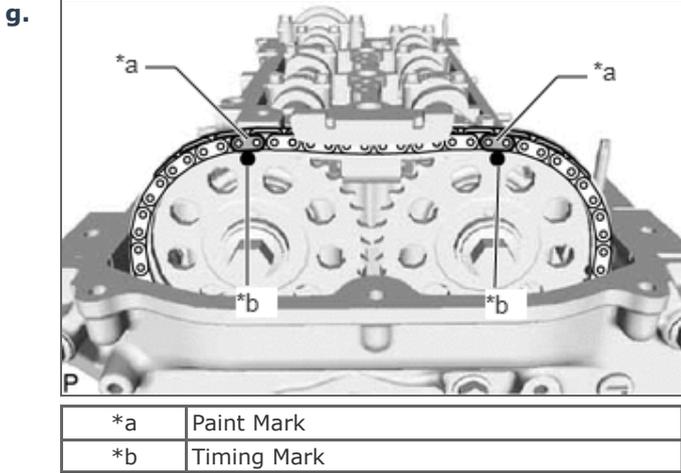
Align the knock pin of the No. 2 camshaft to the groove of the sprocket and install the No. 2 camshaft to the camshaft timing sprocket, and set the bolt.

**HINT:**

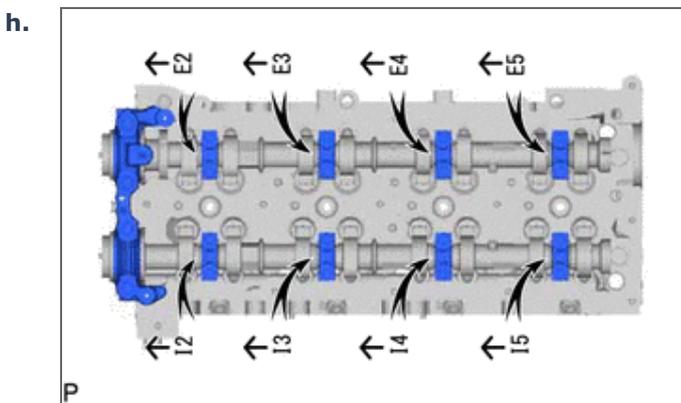


*a	Glove
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Glove is at the rear end of the No. 2 camshaft.

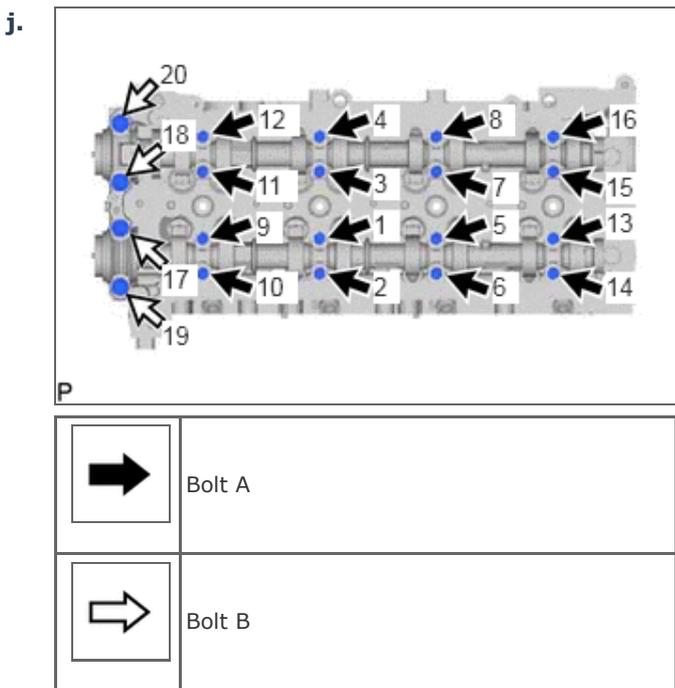


Check the timing mark of the camshaft timing sprocket and paint mark of the No. 2 chain sub-assembly.



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.

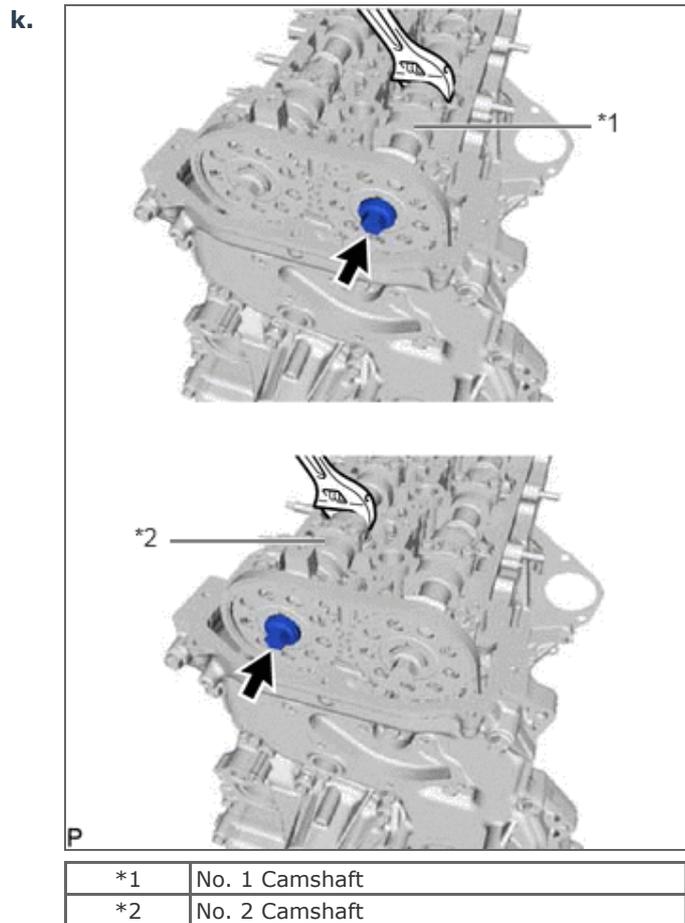


Uniformly tighten the 20 bolts in several steps in the order shown in the illustration.

**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)**



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)**

**2.INSTALL TIMING CHAIN GUIDE**

**13566B**

- 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****11382C**

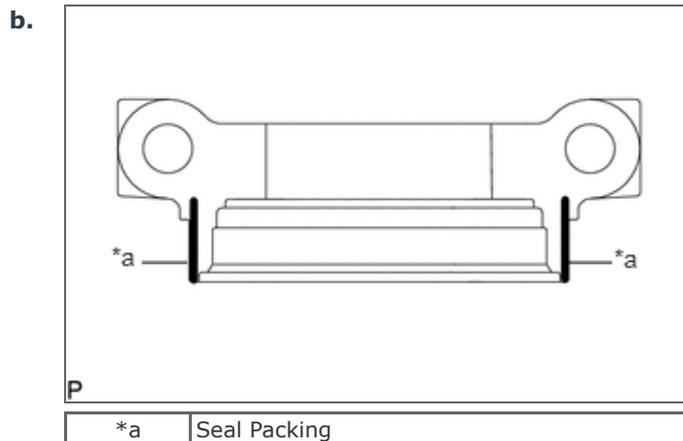
[Click here](#)Brake>BRAKE SYSTEM (OTHER)>VACUUM PUMP(for 1GD-FTV, 2GD-FTV)>INSTALLATION

**4.TEMPORARILY INSTALL VACUUM PUMP ASSEMBLY****29300**

[Click here](#)Brake>BRAKE SYSTEM (OTHER)>VACUUM PUMP(for 1GD-FTV, 2GD-FTV)>INSTALLATION

**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.



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 10 minutes.
- Do not start the engine for at least 2 hours after installation.

- 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****29300**

[Click here](#)Brake>BRAKE SYSTEM (OTHER)>VACUUM PUMP(for 1GD-FTV, 2GD-FTV)>INSTALLATION

**7.INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY****11201**

[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>INSTALLATION

**8.INSTALL NOZZLE HOLDER GASKET****23682**

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION

 **9.TEMPORARILY INSTALL INJECTOR ASSEMBLY** **23670**

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION

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

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION

 **11.TIGHTEN INJECTOR ASSEMBLY** **23670**

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION

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

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION

 **13.INSTALL NOZZLE LEAKAGE PIPE ASSEMBLY** **23760**

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION

 **14.INSTALL HARNESS BRACKET**

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION

 **15.INSTALL WIRING HARNESS CLAMP BRACKET**

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION

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

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR COOLER>INSTALLATION

 **17.INSTALL VACUUM CONTROL VALVE SET** **25804**

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION

 **18.INSTALL NO. 1 EGR PIPE SUB-ASSEMBLY** **25601**

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION

 **19.CONNECT NO. 4 WATER BY-PASS PIPE SUB-ASSEMBLY** **16209**

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION

 **20.INSTALL NO. 3 WATER BY-PASS PIPE SUB-ASSEMBLY** **16206B**

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR COOLER>INSTALLATION

 **21.INSTALL NO. 2 EGR PIPE** **25612**

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION

 **22.INSTALL EGR VALVE BRACKET** **25625**

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION

 <b>23.CONNECT ENGINE WIRE</b>	<b>82121</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION	
 <b>24.CONNECT FUEL FILTER ASSEMBLY</b>	<b>23300</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION	
 <b>25.INSTALL NO. 2 ENGINE COVER BRACKET</b>	<b>12632</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION	
 <b>26.INSTALL NO. 2 HOSE TO HOSE TUBE</b>	<b>44763C</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION	
 <b>27.INSTALL TURBO PRESSURE SENSOR</b>	<b>89421C</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION	
 <b>28.INSTALL GAS FILTER</b>	<b>23265C</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION	
 <b>29.INSTALL NO. 1 FUEL PIPE (w/ DPF)</b>	<b>23811H</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EXHAUST FUEL ADDITION INJECTOR>INSTALLATION	
 <b>30.INSTALL NO. 2 WATER BY-PASS PIPE</b>	<b>16278</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION	
 <b>31.INSTALL DIESEL THROTTLE BODY ASSEMBLY</b>	<b>26100G</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>INSTALLATION	
 <b>32.INSTALL INTERCOOLER AIR TUBE</b>	<b>17363K</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>INSTALLATION	
 <b>33.INSTALL NO. 4 AIR HOSE</b>	<b>17344E</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>INSTALLATION	
 <b>34.INSTALL RADIATOR ASSEMBLY</b>	<b>16400</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION	
 <b>35.CONNECT NO. 2 RADIATOR HOSE</b>	<b>16572D</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION	
 <b>36.INSTALL FAN SHROUD</b>	<b>16711</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION	
 <b>37.CONNECT NO. 1 OIL COOLER INLET HOSE (for Automatic Transmission)</b>	<b>32941</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION	

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	<b>38.CONNECT NO. 1 OIL COOLER OUTLET HOSE (for Automatic Transmission)</b>	<b>32942</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION](#)

	<b>39.INSTALL RADIATOR RESERVE TANK ASSEMBLY</b>	<b>16470</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION](#)

	<b>40.INSTALL NO. 1 OIL RESERVOIR BRACKET</b>	<b>44369A</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION](#)

	<b>41.CONNECT VANE PUMP OIL RESERVOIR ASSEMBLY</b>	<b>44360</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION](#)

	<b>42.INSTALL NO. 1 RADIATOR HOSE</b>	<b>16571C</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION](#)

	<b>43.INSTALL NO. 2 AIR TUBE</b>	<b>17362B</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION](#)

	<b>44.INSTALL NO. 4 AIR HOSE</b>	<b>17344E</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION](#)

	<b>45.INSTALL NO. 1 RADIATOR AIR GUIDE</b>	<b>16593</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION](#)

	<b>46.INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY</b>	<b>12601B</b>
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Click here [Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>INSTALLATION](#)

	<b>47.INSTALL FRONT BUMPER</b>
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Click here [Vehicle Exterior>EXTERIOR PANELS / TRIM>FRONT BUMPER\(for Steel Type Bumper\)>INSTALLATION](#)

	<b>48.INSTALL NO. 1 ENGINE UNDER COVER ASSEMBLY (for 4WD and Pre-Runner)</b>	<b>51410</b>
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Click here [Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>ENGINE ASSEMBLY>INSTALLATION](#)

	<b>49.CONNECT CABLE TO NEGATIVE BATTERY TERMINAL</b>
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**NOTICE:**

When disconnecting the cable, some systems need to be initialized after the cable is reconnected.  
 Click here [General>INTRODUCTION>REPAIR INSTRUCTION>INITIALIZATION](#)

	<b>50.ADD ENGINE COOLANT</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>COOLANT>REPLACEMENT](#)

	<b>51.INSPECT FOR COOLANT LEAK</b>
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Click here [Engine / Hybrid System>1GD-FTV COOLING>COOLING SYSTEM>ON-VEHICLE INSPECTION](#)

 **52.BLEED AIR FROM FUEL SYSTEM**

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[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL SYSTEM>ON-VEHICLE INSPECTION

 **53.INSPECT FOR FUEL LEAK**

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[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL SYSTEM>ON-VEHICLE INSPECTION

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1GD-FTV ENGINE MECHANICAL CAMSHAFT REMOVAL

**CAUTION / NOTICE / HINT**

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
<b>w/ Stop and Start System:</b> Battery terminal is disconnected/reconnected	Drive the vehicle until stop and start control is permitted (approximately 5 to 40 minutes)	Stop and start system	
Replacement of injector assembly	<ul style="list-style-type: none"> <li>Injector compensation code registration</li> <li>Pilot quantity learning</li> </ul>	Engine starting	w/o DPF  ) w/ DPF  )
<ul style="list-style-type: none"> <li>Replacement of diesel throttle body assembly</li> <li>Replacement of electric EGR control valve assembly</li> <li>Replacement of turbocharger sub-assembly</li> <li>Replacement of turbocharger sub-assembly or turbocharger variable nozzle motor</li> </ul>	Perform initialization	-	w/o DPF  ) w/ DPF  )

**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.

Replaced Parts (A)	Pipes Requiring New Replacement
Injector assembly (including shuffling the injector assemblies between the cylinders)	<ul style="list-style-type: none"> <li>No. 1 injection pipe sub-assembly</li> <li>No. 2 injection pipe sub-assembly</li> </ul>

- 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.

## PROCEDURE

### 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](#)General>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](#)General>INTRODUCTION>REPAIR INSTRUCTION>INITIALIZATION

### 3.REMOVE NO. 1 ENGINE UNDER COVER ASSEMBLY (for 4WD and Pre-Runner) 51410

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>REMOVAL

### 4.DRAIN ENGINE COOLANT

[Click here](#)Engine / Hybrid System>1GD-FTV COOLING>COOLANT>REPLACEMENT

### 5.REMOVE FRONT BUMPER

[Click here](#)Vehicle Exterior>EXTERIOR PANELS / TRIM>FRONT BUMPER(for Steel Type Bumper)>REMOVAL

### 6.REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY 12601B

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>REMOVAL

### 7.REMOVE NO. 1 RADIATOR AIR GUIDE 16593

[Click here](#)Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL

### 8.REMOVE NO. 4 AIR HOSE 17344E

[Click here](#)Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL

### 9.REMOVE NO. 2 AIR TUBE 17362B

[Click here](#)Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL

 <b>10.REMOVE NO. 1 RADIATOR HOSE</b>	<b>16571C</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>11.DISCONNECT VANE PUMP OIL RESERVOIR ASSEMBLY</b>	<b>44360</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>12.REMOVE NO. 1 OIL RESERVOIR BRACKET</b>	<b>44369A</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>13.REMOVE RADIATOR RESERVE TANK ASSEMBLY</b>	<b>16470</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>14.DISCONNECT NO. 1 OIL COOLER OUTLET HOSE (for Automatic Transmission)</b>	<b>32942</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>15.DISCONNECT NO. 1 OIL COOLER INLET HOSE (for Automatic Transmission)</b>	<b>32941</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>16.REMOVE FAN SHROUD</b>	<b>16711</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>17.DISCONNECT NO. 2 RADIATOR HOSE</b>	<b>16572D</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>18.REMOVE RADIATOR ASSEMBLY</b>	<b>16400</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>19.REMOVE NO. 4 AIR HOSE</b>	<b>17344E</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>REMOVAL	
 <b>20.REMOVE INTERCOOLER AIR TUBE</b>	<b>17363K</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>REMOVAL	
 <b>21.REMOVE DIESEL THROTTLE BODY ASSEMBLY</b>	<b>26100G</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>REMOVAL	
 <b>22.REMOVE NO. 2 WATER BY-PASS PIPE</b>	<b>16278</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>23.REMOVE NO. 1 FUEL PIPE (w/ DPF)</b>	<b>23811H</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EXHAUST FUEL ADDITION INJECTOR>REMOVAL	
 <b>24.REMOVE GAS FILTER</b>	<b>23265C</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	

 <b>25.REMOVE TURBO PRESSURE SENSOR</b>	<b>89421C</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>26.REMOVE NO. 2 HOSE TO HOSE TUBE</b>	<b>44763C</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>27.REMOVE NO. 2 ENGINE COVER BRACKET</b>	<b>12632</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>28.DISCONNECT FUEL FILTER ASSEMBLY</b>	<b>23300</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>29.DISCONNECT ENGINE WIRE</b>	<b>82121</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>30.REMOVE EGR VALVE BRACKET</b>	<b>25625</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>31.REMOVE NO. 2 EGR PIPE</b>	<b>25612</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>32.DISCONNECT NO. 3 WATER BY-PASS PIPE SUB-ASSEMBLY</b>	<b>16206B</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR COOLER>REMOVAL	
 <b>33.REMOVE NO. 4 WATER BY-PASS PIPE SUB-ASSEMBLY</b>	<b>16209</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>34.REMOVE NO. 1 EGR PIPE SUB-ASSEMBLY</b>	<b>25601</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>35.REMOVE VACUUM CONTROL VALVE SET</b>	<b>25804</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>36.REMOVE NO. 1 EGR COOLER AND NO. 2 EGR VALVE ASSEMBLY WITH ELECTRIC EGR CONTROL VALVE ASSEMBLY</b>	
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR COOLER>REMOVAL	
 <b>37.REMOVE WIRING HARNESS CLAMP BRACKET</b>	
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>REMOVAL	
 <b>38.REMOVE HARNESS BRACKET</b>	
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>REMOVAL	
 <b>39.REMOVE NOZZLE LEAKAGE PIPE ASSEMBLY</b>	<b>23760</b>

Click here [Engine / Hybrid System > 1GD-FTV FUEL > FUEL INJECTOR > REMOVAL](#)

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

Click here [Engine / Hybrid System > 1GD-FTV FUEL > FUEL INJECTOR > REMOVAL](#)

**41. REMOVE INJECTOR ASSEMBLY 23670**

Click here [Engine / Hybrid System > 1GD-FTV FUEL > FUEL INJECTOR > REMOVAL](#)

**42. REMOVE NOZZLE HOLDER GASKET 23682**

Click here [Engine / Hybrid System > 1GD-FTV FUEL > FUEL INJECTOR > REMOVAL](#)

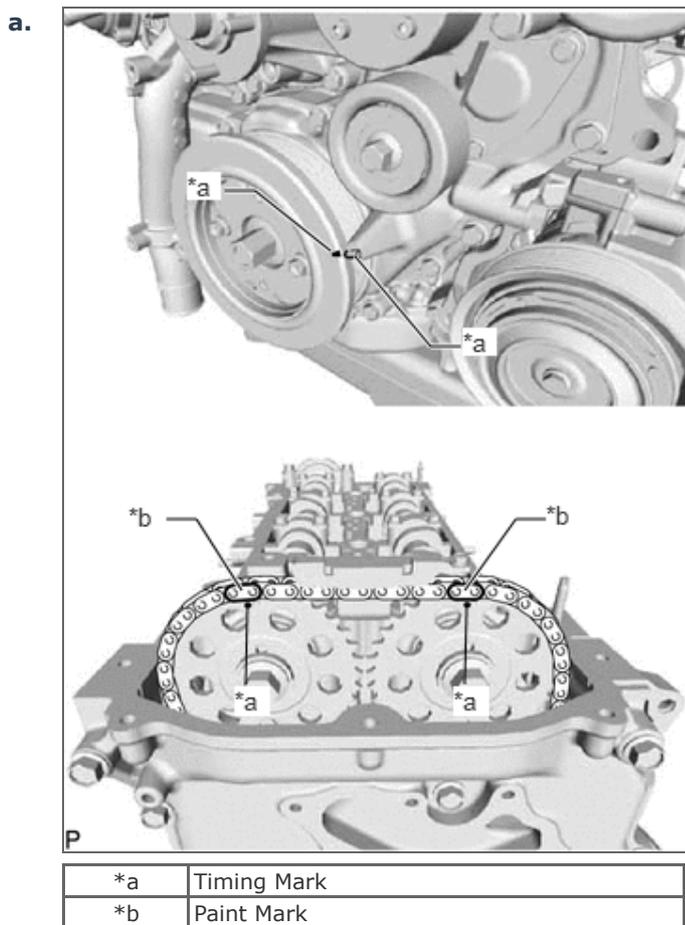
**43. REMOVE CAMSHAFT POSITION SENSOR 11301M**

Click here [Engine / Hybrid System > 1GD-FTV ENGINE CONTROL > CAMSHAFT POSITION SENSOR > REMOVAL](#)

**44. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY 11201**

Click here [Engine / Hybrid System > 1GD-FTV LUBRICATION > OIL PUMP > REMOVAL](#)

**45. SET NO. 1 CYLINDER TO TDC/COMPRESSION**



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

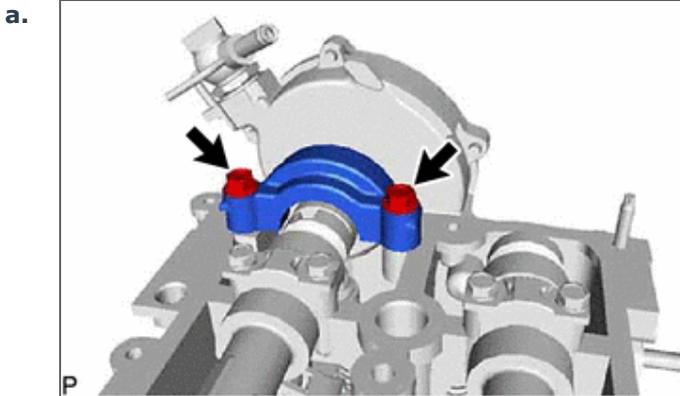
**b.** Make sure that the timing mark of the camshaft timing sprocket is at the top.

**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.

**46.REMOVE NO. 3 CAMSHAFT BEARING CAP**



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

**47.REMOVE VACUUM PUMP ASSEMBLY**

**29300**

Click here [Brake>BRAKE SYSTEM \(OTHER\)>VACUUM PUMP\(for 1GD-FTV, 2GD-FTV\)>REMOVAL](#)

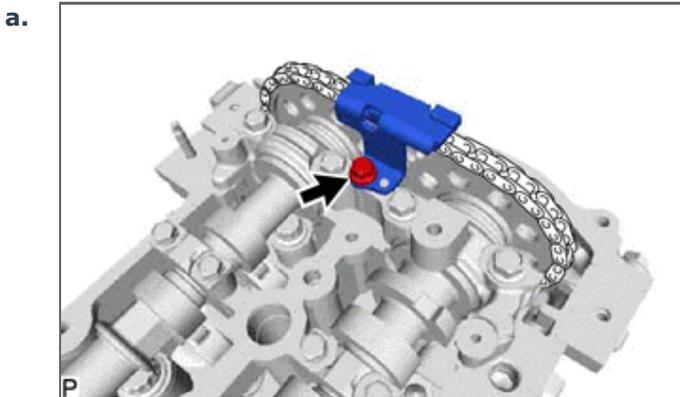
**48.REMOVE CAMSHAFT OIL SEAL RETAINER**

**11382C**

Click here [Brake>BRAKE SYSTEM \(OTHER\)>VACUUM PUMP\(for 1GD-FTV, 2GD-FTV\)>REMOVAL](#)

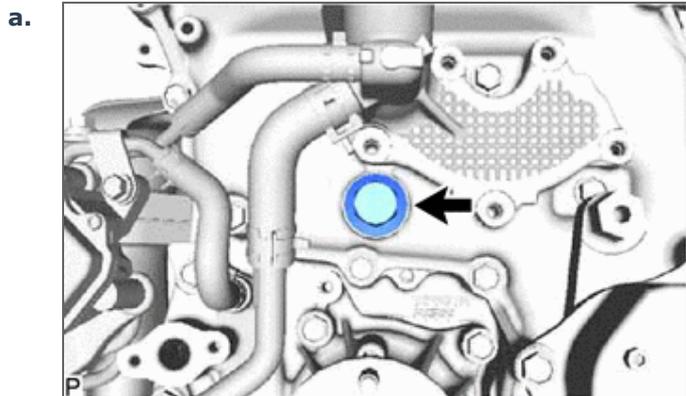
**49.REMOVE TIMING CHAIN GUIDE**

**13566B**

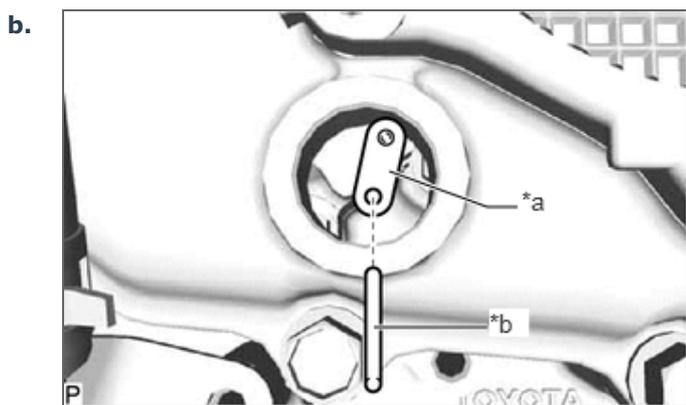


Remove the bolt and timing chain guide from the cylinder head sub-assembly.

**50.REMOVE CAMSHAFT**

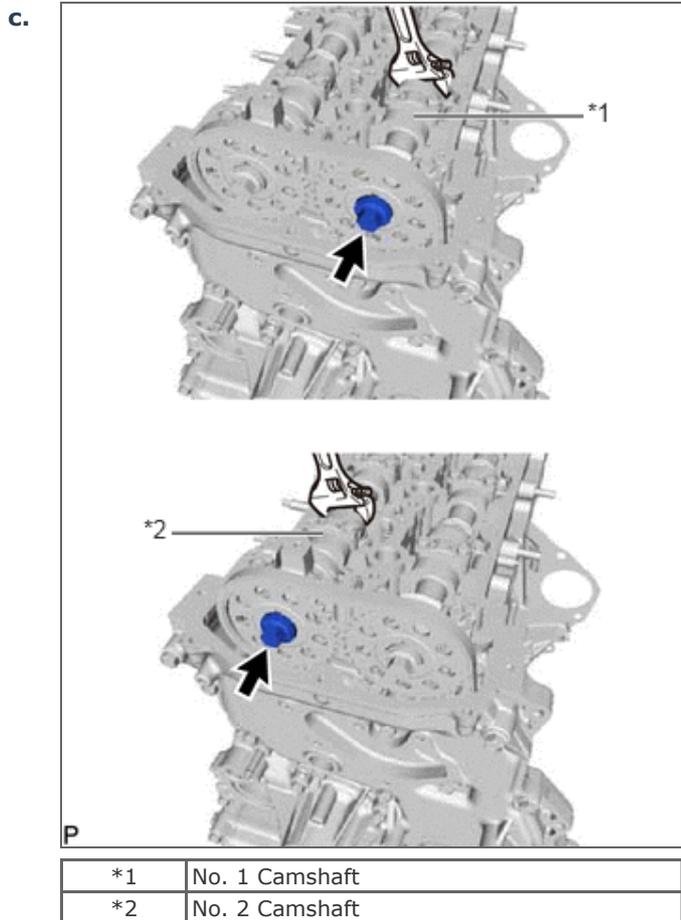


Remove the oil pump relief valve plug and gasket from timing chain cover.



*a	Stopper Plate
*b	Pin

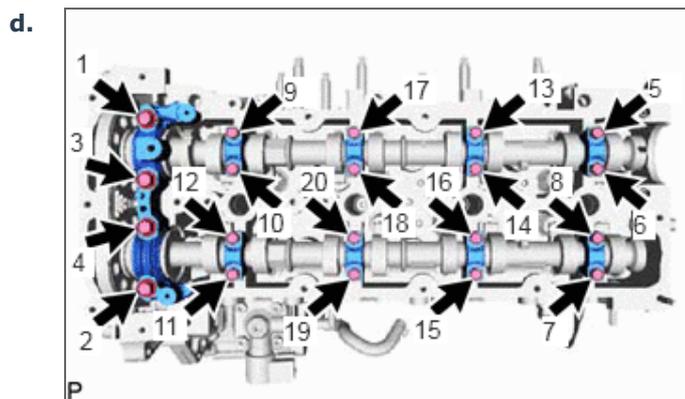
Insert a pin into stopper plate hole of the No. 2 chain tensioner assembly and lock the No. 2 chain tensioner assembly.



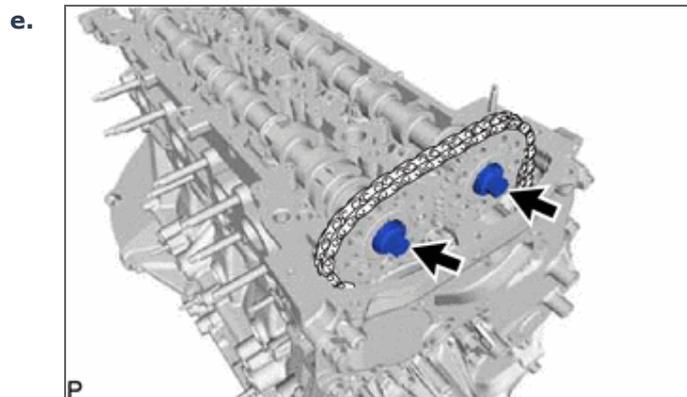
Hold the hexagonal portion of the camshaft with a wrench and loosen the 2 bolts from the No. 1 camshaft and No. 2 camshaft.

**NOTICE:**

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

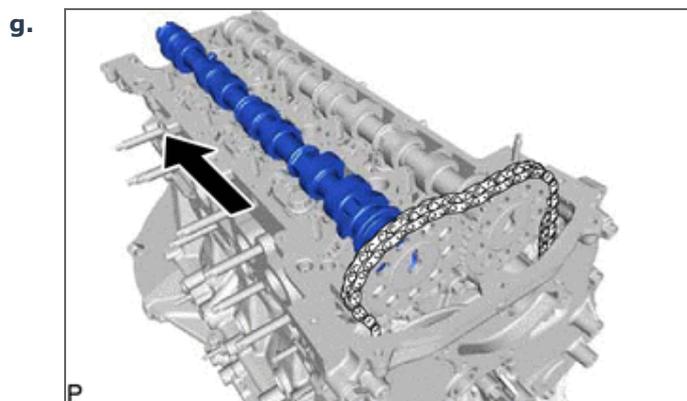


Using several steps, remove the 20 bolts, No. 1 camshaft bearing cap and 8 No. 2 camshaft bearing caps from the cylinder head sub-assembly.

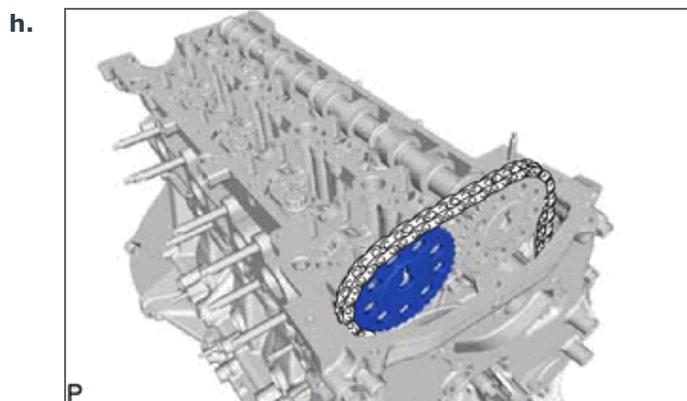


Raise the No. 1 camshaft and remove the bolt from the No. 1 camshaft.

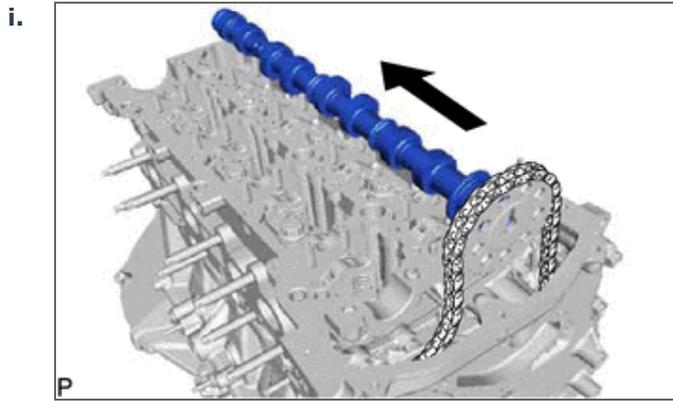
**f.** Raise the No. 2 camshaft and remove the bolt from the No. 2 camshaft.



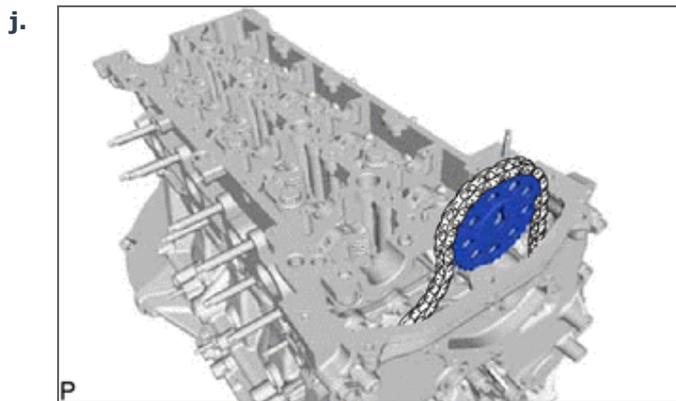
Remove the No. 2 camshaft from the camshaft timing sprocket.



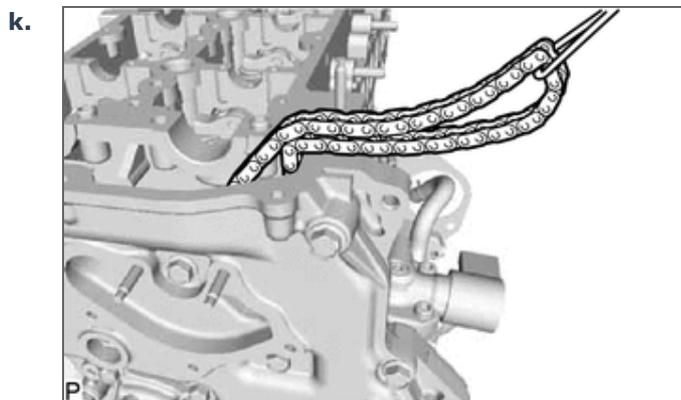
Remove the camshaft timing sprocket from the No. 2 chain sub-assembly.



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



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



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.

Print

Exit

1GD-FTV ENGINE MECHANICAL CAMSHAFT REMOVAL

**CAUTION / NOTICE / HINT**

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
<b>w/ Stop and Start System:</b> Battery terminal is disconnected/reconnected	Drive the vehicle until stop and start control is permitted (approximately 5 to 40 minutes)	Stop and start system	
Replacement of injector assembly	<ul style="list-style-type: none"> <li>Injector compensation code registration</li> <li>Pilot quantity learning</li> </ul>	Engine starting	w/o DPF  ) w/ DPF  )
<ul style="list-style-type: none"> <li>Replacement of diesel throttle body assembly</li> <li>Replacement of electric EGR control valve assembly</li> <li>Replacement of turbocharger sub-assembly</li> <li>Replacement of turbocharger sub-assembly or turbocharger variable nozzle motor</li> </ul>	Perform initialization	-	w/o DPF  ) w/ DPF  )

**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.

Replaced Parts (A)	Pipes Requiring New Replacement
Injector assembly (including shuffling the injector assemblies between the cylinders)	<ul style="list-style-type: none"> <li>No. 1 injection pipe sub-assembly</li> <li>No. 2 injection pipe sub-assembly</li> </ul>

- 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.

## PROCEDURE

### 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](#)General>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](#)General>INTRODUCTION>REPAIR INSTRUCTION>INITIALIZATION

### 3.REMOVE NO. 1 ENGINE UNDER COVER ASSEMBLY (for 4WD and Pre-Runner) 51410

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>REMOVAL

### 4.DRAIN ENGINE COOLANT

[Click here](#)Engine / Hybrid System>1GD-FTV COOLING>COOLANT>REPLACEMENT

### 5.REMOVE FRONT BUMPER

[Click here](#)Vehicle Exterior>EXTERIOR PANELS / TRIM>FRONT BUMPER(for Steel Type Bumper)>REMOVAL

### 6.REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY 12601B

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>REMOVAL

### 7.REMOVE NO. 1 RADIATOR AIR GUIDE 16593

[Click here](#)Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL

### 8.REMOVE NO. 4 AIR HOSE 17344E

[Click here](#)Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL

### 9.REMOVE NO. 2 AIR TUBE 17362B

[Click here](#)Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL

 <b>10.REMOVE NO. 1 RADIATOR HOSE</b>	<b>16571C</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>11.DISCONNECT VANE PUMP OIL RESERVOIR ASSEMBLY</b>	<b>44360</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>12.REMOVE NO. 1 OIL RESERVOIR BRACKET</b>	<b>44369A</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>13.REMOVE RADIATOR RESERVE TANK ASSEMBLY</b>	<b>16470</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>14.DISCONNECT NO. 1 OIL COOLER OUTLET HOSE (for Automatic Transmission)</b>	<b>32942</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>15.DISCONNECT NO. 1 OIL COOLER INLET HOSE (for Automatic Transmission)</b>	<b>32941</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>16.REMOVE FAN SHROUD</b>	<b>16711</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>17.DISCONNECT NO. 2 RADIATOR HOSE</b>	<b>16572D</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>18.REMOVE RADIATOR ASSEMBLY</b>	<b>16400</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL	
 <b>19.REMOVE NO. 4 AIR HOSE</b>	<b>17344E</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>REMOVAL	
 <b>20.REMOVE INTERCOOLER AIR TUBE</b>	<b>17363K</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>REMOVAL	
 <b>21.REMOVE DIESEL THROTTLE BODY ASSEMBLY</b>	<b>26100G</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>REMOVAL	
 <b>22.REMOVE NO. 2 WATER BY-PASS PIPE</b>	<b>16278</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>23.REMOVE NO. 1 FUEL PIPE (w/ DPF)</b>	<b>23811H</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EXHAUST FUEL ADDITION INJECTOR>REMOVAL	
 <b>24.REMOVE GAS FILTER</b>	<b>23265C</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	

 <b>25.REMOVE TURBO PRESSURE SENSOR</b>	<b>89421C</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>26.REMOVE NO. 2 HOSE TO HOSE TUBE</b>	<b>44763C</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>27.REMOVE NO. 2 ENGINE COVER BRACKET</b>	<b>12632</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>28.DISCONNECT FUEL FILTER ASSEMBLY</b>	<b>23300</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>29.DISCONNECT ENGINE WIRE</b>	<b>82121</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>30.REMOVE EGR VALVE BRACKET</b>	<b>25625</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>31.REMOVE NO. 2 EGR PIPE</b>	<b>25612</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>32.DISCONNECT NO. 3 WATER BY-PASS PIPE SUB-ASSEMBLY</b>	<b>16206B</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR COOLER>REMOVAL	
 <b>33.REMOVE NO. 4 WATER BY-PASS PIPE SUB-ASSEMBLY</b>	<b>16209</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>34.REMOVE NO. 1 EGR PIPE SUB-ASSEMBLY</b>	<b>25601</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>35.REMOVE VACUUM CONTROL VALVE SET</b>	<b>25804</b>
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL	
 <b>36.REMOVE NO. 1 EGR COOLER AND NO. 2 EGR VALVE ASSEMBLY WITH ELECTRIC EGR CONTROL VALVE ASSEMBLY</b>	
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR COOLER>REMOVAL	
 <b>37.REMOVE WIRING HARNESS CLAMP BRACKET</b>	
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>REMOVAL	
 <b>38.REMOVE HARNESS BRACKET</b>	
<a href="#">Click here</a> Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>REMOVAL	
 <b>39.REMOVE NOZZLE LEAKAGE PIPE ASSEMBLY</b>	<b>23760</b>

Click here [Engine / Hybrid System > 1GD-FTV FUEL > FUEL INJECTOR > REMOVAL](#)

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

Click here [Engine / Hybrid System > 1GD-FTV FUEL > FUEL INJECTOR > REMOVAL](#)

**41. REMOVE INJECTOR ASSEMBLY 23670**

Click here [Engine / Hybrid System > 1GD-FTV FUEL > FUEL INJECTOR > REMOVAL](#)

**42. REMOVE NOZZLE HOLDER GASKET 23682**

Click here [Engine / Hybrid System > 1GD-FTV FUEL > FUEL INJECTOR > REMOVAL](#)

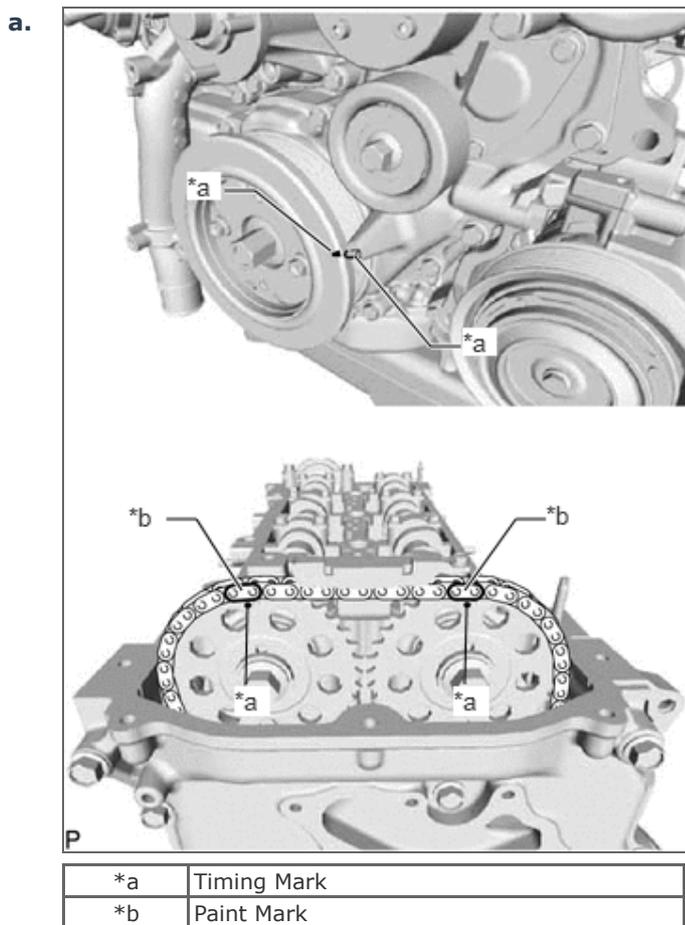
**43. REMOVE CAMSHAFT POSITION SENSOR 11301M**

Click here [Engine / Hybrid System > 1GD-FTV ENGINE CONTROL > CAMSHAFT POSITION SENSOR > REMOVAL](#)

**44. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY 11201**

Click here [Engine / Hybrid System > 1GD-FTV LUBRICATION > OIL PUMP > REMOVAL](#)

**45. SET NO. 1 CYLINDER TO TDC/COMPRESSION**



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

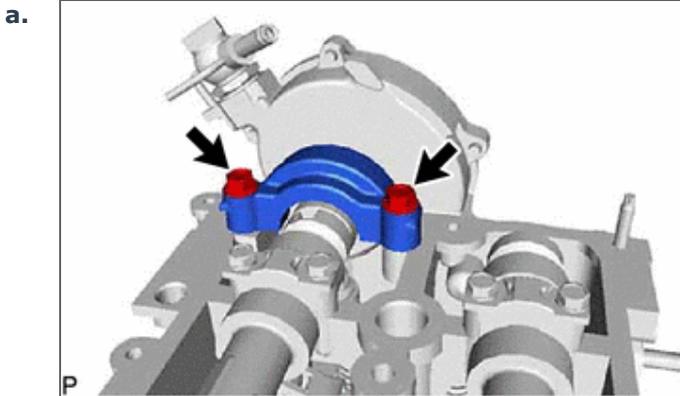
**b.** Make sure that the timing mark of the camshaft timing sprocket is at the top.

**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.

**46.REMOVE NO. 3 CAMSHAFT BEARING CAP**



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

**47.REMOVE VACUUM PUMP ASSEMBLY**

**29300**

Click here [Brake>BRAKE SYSTEM \(OTHER\)>VACUUM PUMP\(for 1GD-FTV, 2GD-FTV\)>REMOVAL](#)

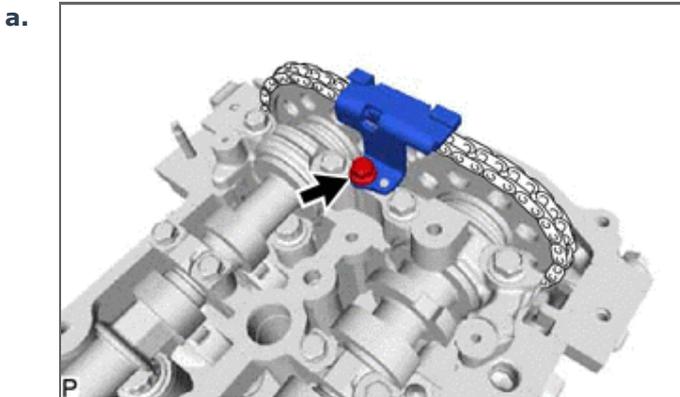
**48.REMOVE CAMSHAFT OIL SEAL RETAINER**

**11382C**

Click here [Brake>BRAKE SYSTEM \(OTHER\)>VACUUM PUMP\(for 1GD-FTV, 2GD-FTV\)>REMOVAL](#)

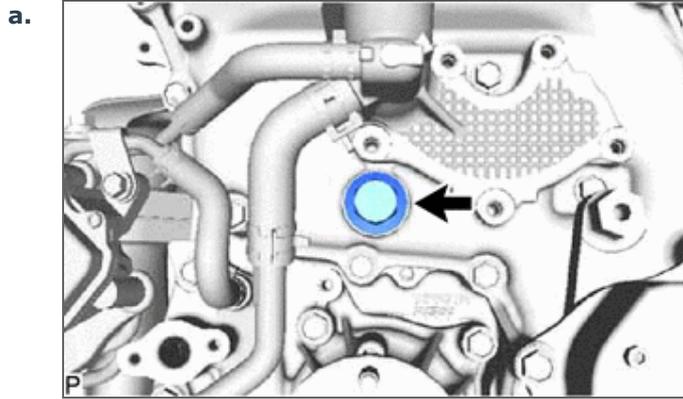
**49.REMOVE TIMING CHAIN GUIDE**

**13566B**

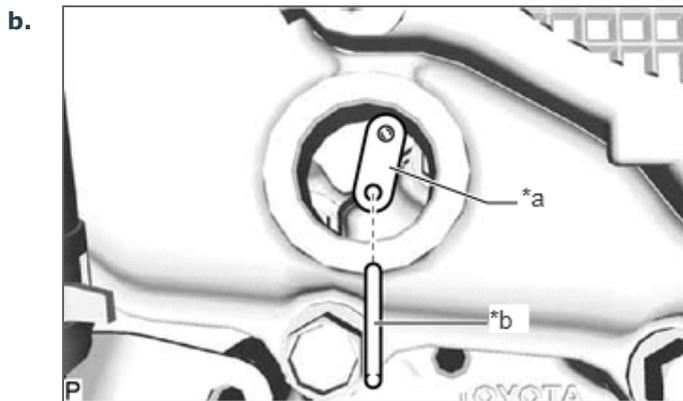


Remove the bolt and timing chain guide from the cylinder head sub-assembly.

**50.REMOVE CAMSHAFT**

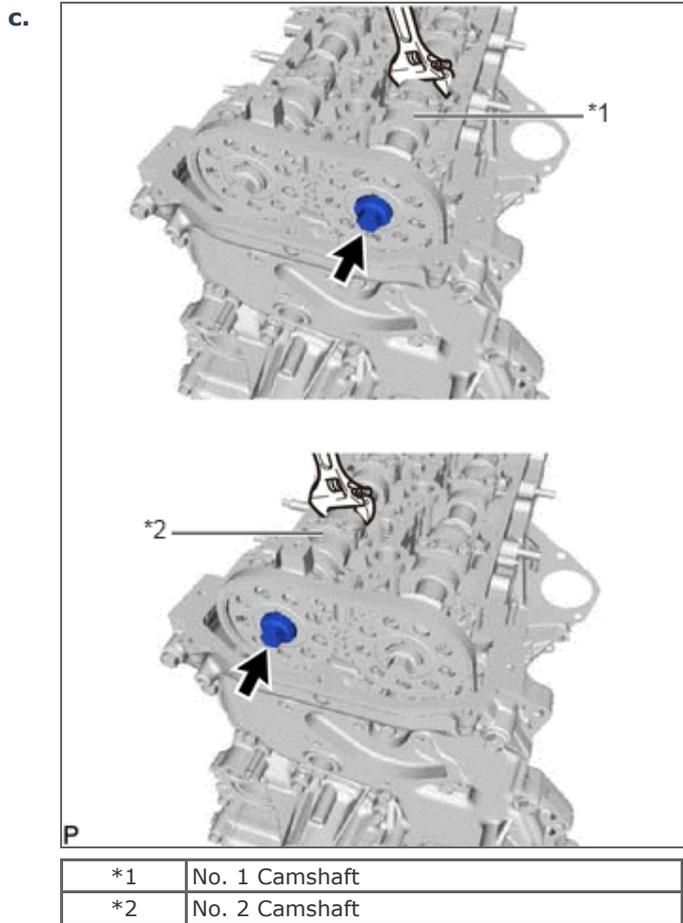


Remove the oil pump relief valve plug and gasket from timing chain cover.



*a	Stopper Plate
*b	Pin

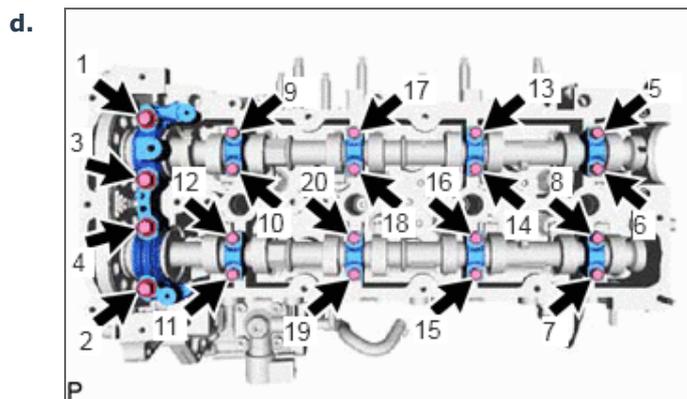
Insert a pin into stopper plate hole of the No. 2 chain tensioner assembly and lock the No. 2 chain tensioner assembly.



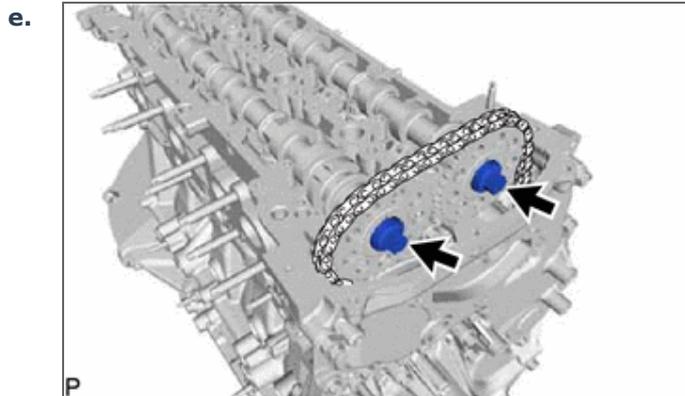
Hold the hexagonal portion of the camshaft with a wrench and loosen the 2 bolts from the No. 1 camshaft and No. 2 camshaft.

**NOTICE:**

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

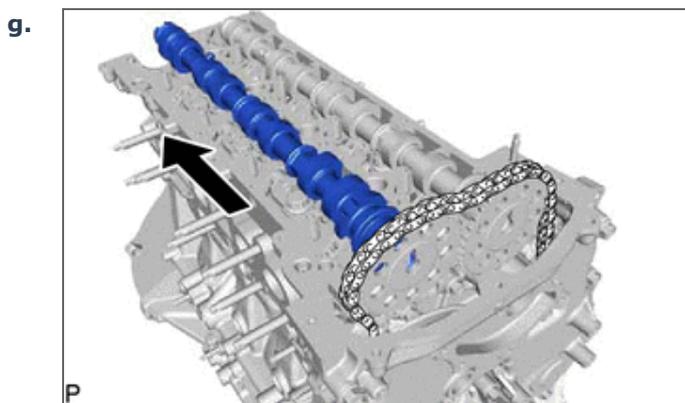


Using several steps, remove the 20 bolts, No. 1 camshaft bearing cap and 8 No. 2 camshaft bearing caps from the cylinder head sub-assembly.

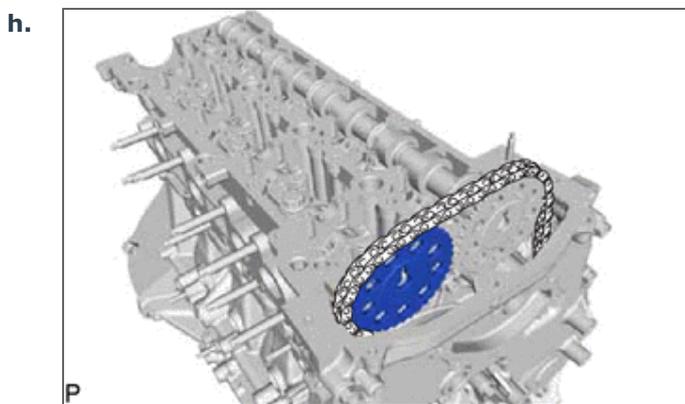


Raise the No. 1 camshaft and remove the bolt from the No. 1 camshaft.

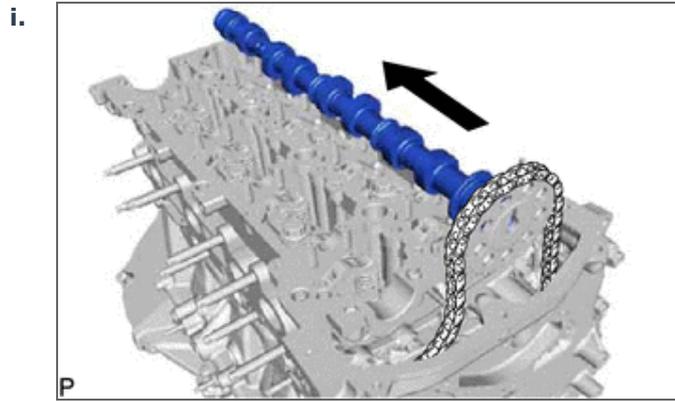
**f.** Raise the No. 2 camshaft and remove the bolt from the No. 2 camshaft.



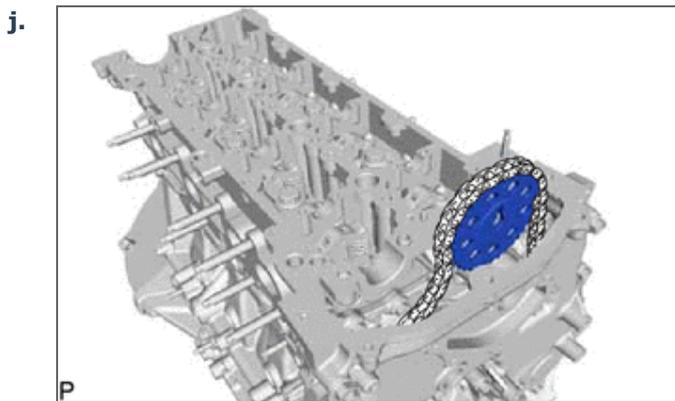
Remove the No. 2 camshaft from the camshaft timing sprocket.



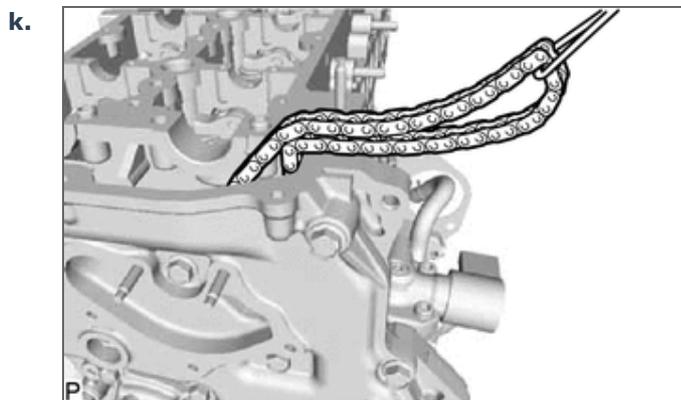
Remove the camshaft timing sprocket from the No. 2 chain sub-assembly.



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



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



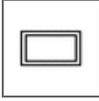
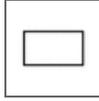
Suspend the No. 2 chain sub-assembly with a string or equivalent.

**HINT:**

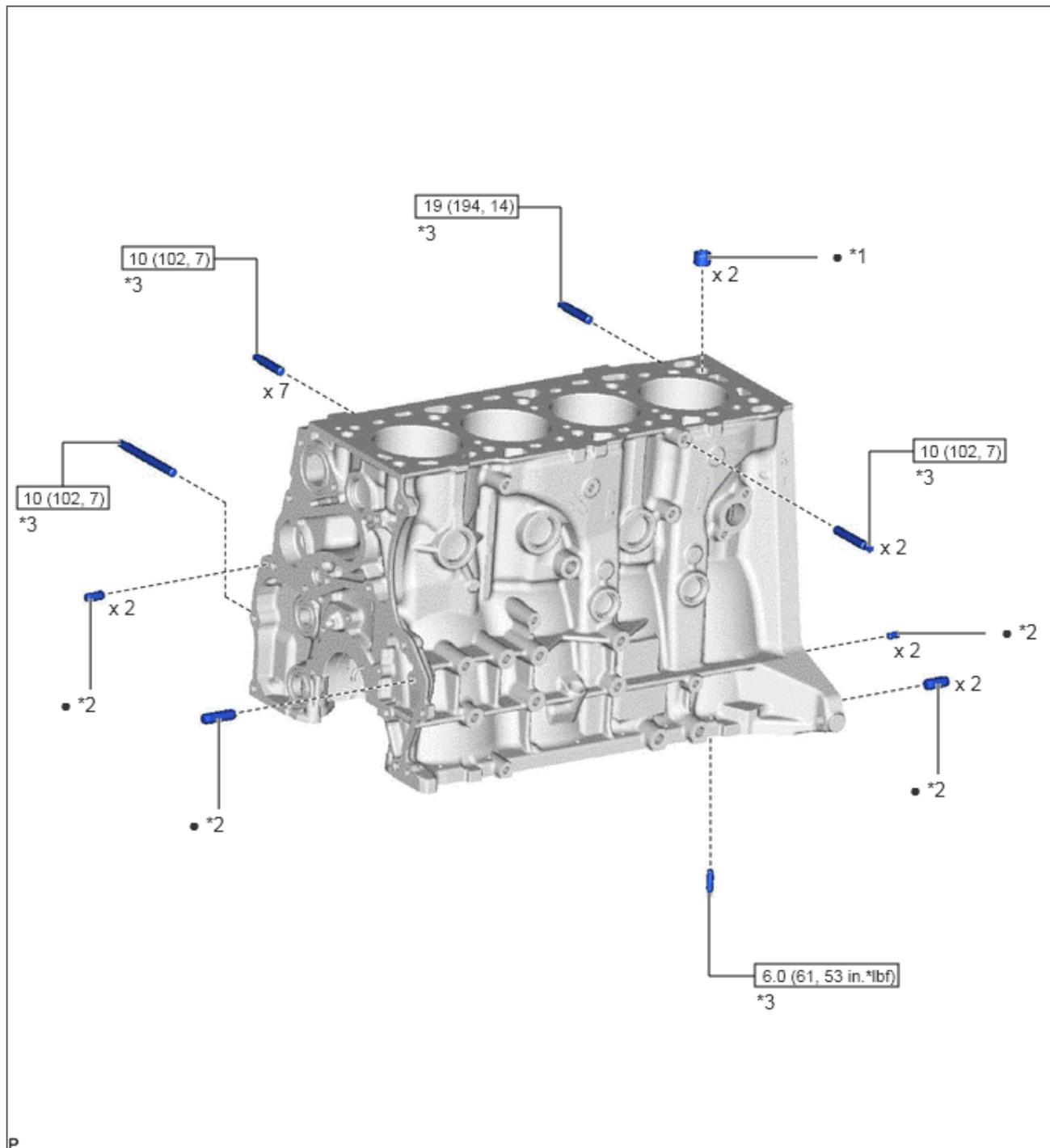
Be careful not to drop the No. 2 chain sub-assembly inside the timing chain cover assembly.

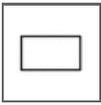
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*5	NO. 1 OIL NOZZLE SUB-ASSEMBLY	*6	CONNECTING ROD SUB-ASSEMBLY
*7	PISTON RING SET	*8	PISTON
*9	PISTON PIN	*10	NO. 1 COMPRESSION RING
*11	NO. 2 COMPRESSION RING	*12	OIL RING RAIL
*13	OIL RING EXPANDER	*14	PISTON PIN HOLE SNAP RING
*15	CONNECTING ROD 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°

## ILLUSTRATION



*1	RING PIN	*2	STRAIGHT PIN
*3	STUD BOLT	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part

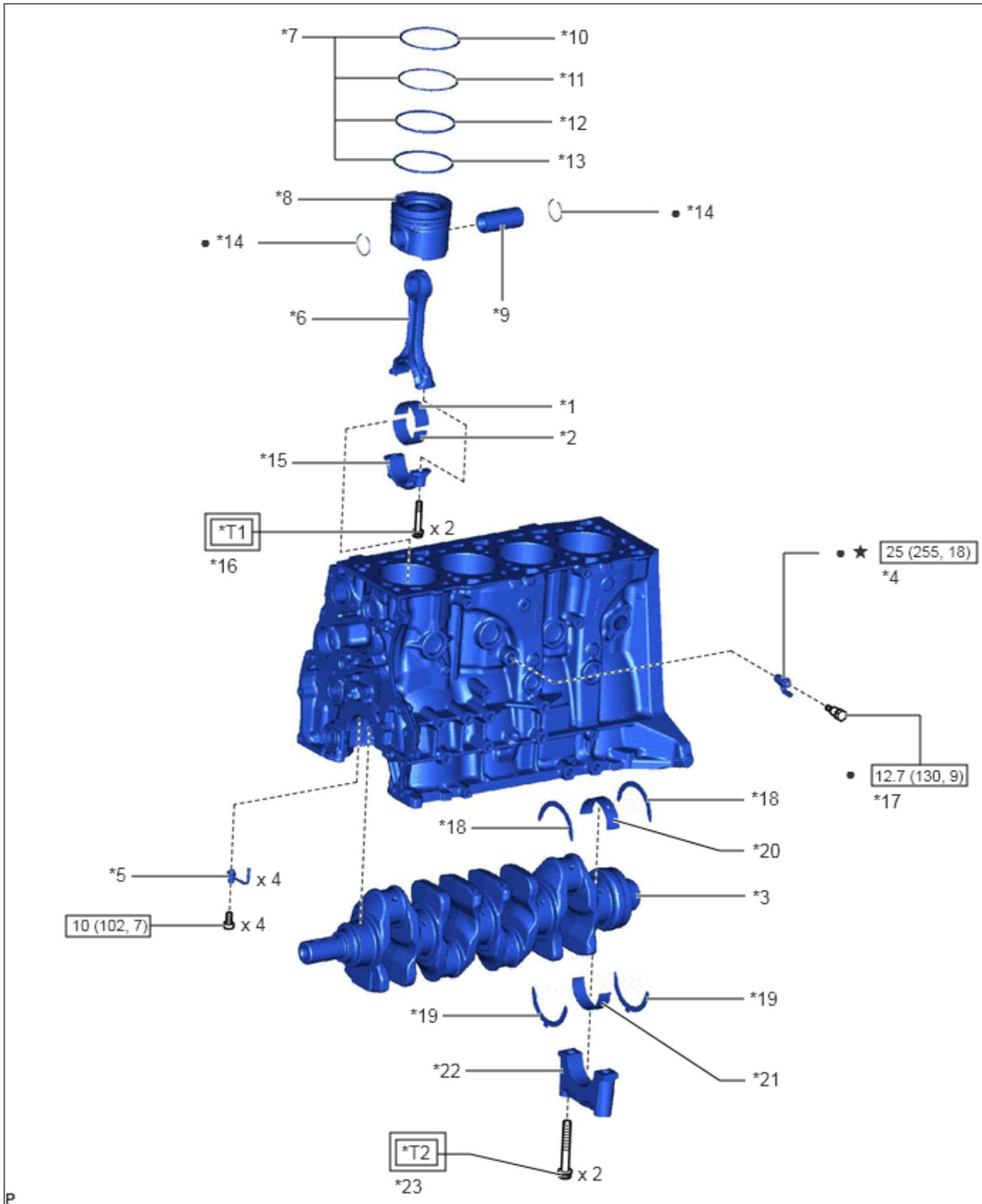
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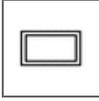
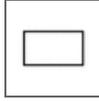
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1GD-FTV ENGINE MECHANICAL CYLINDER BLOCK COMPONENTS

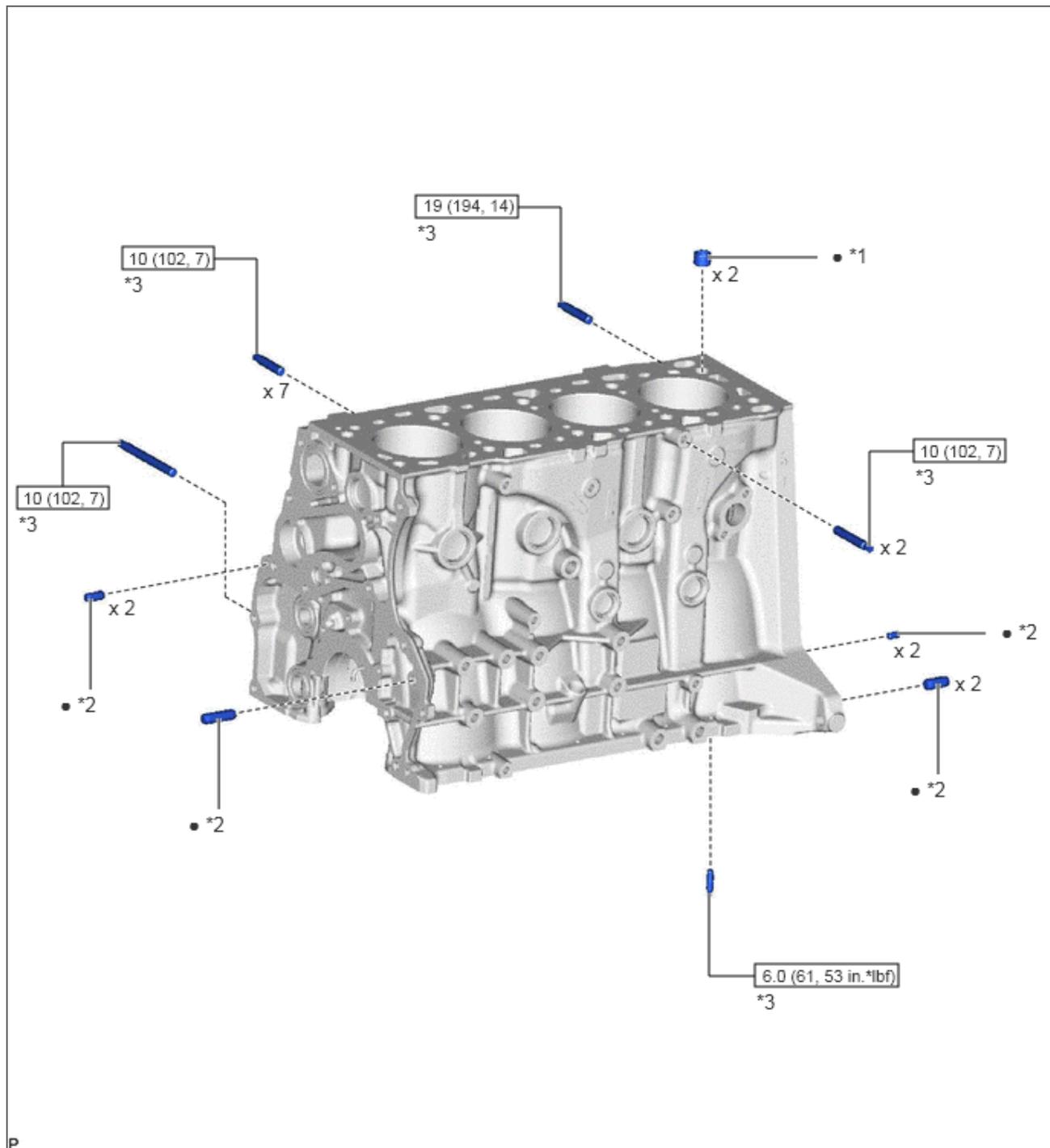
ILLUSTRATION

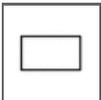


*1	NO. 1 CONNECTING ROD BEARING	*2	NO. 2 CONNECTING ROD BEARING
*3	CRANKSHAFT	*4	CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY

*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°

## ILLUSTRATION



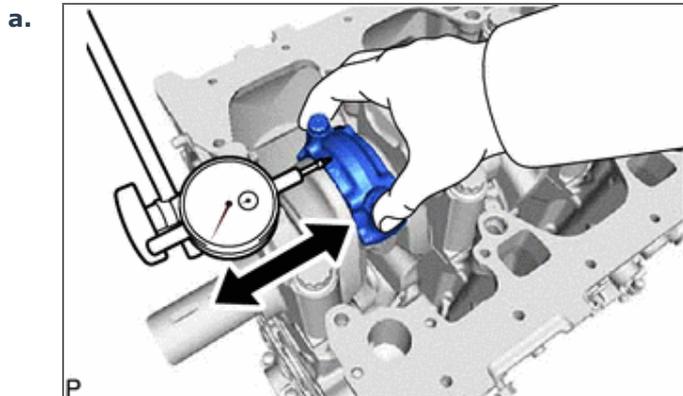
*1	RING PIN	*2	STRAIGHT PIN
*3	STUD BOLT	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part

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## 1GD-FTV ENGINE MECHANICAL CYLINDER BLOCK DISASSEMBLY

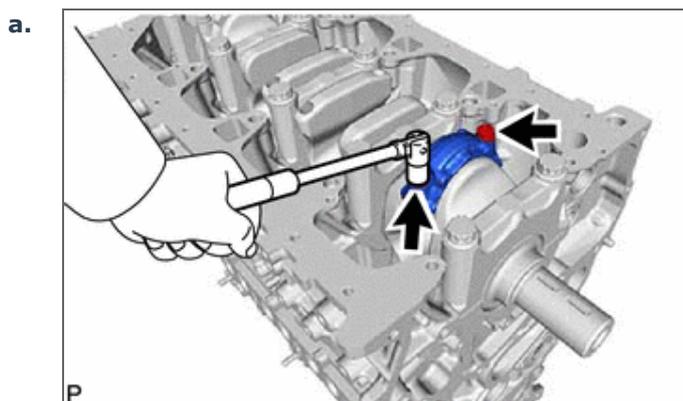
**PROCEDURE****1.INSPECT CONNECTING ROD SUB-ASSEMBLY THRUST CLEARANCE**

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.

**2.INSPECT CONNECTING ROD SUB-ASSEMBLY OIL CLEARANCE**

Remove the 2 connecting rod bolts.

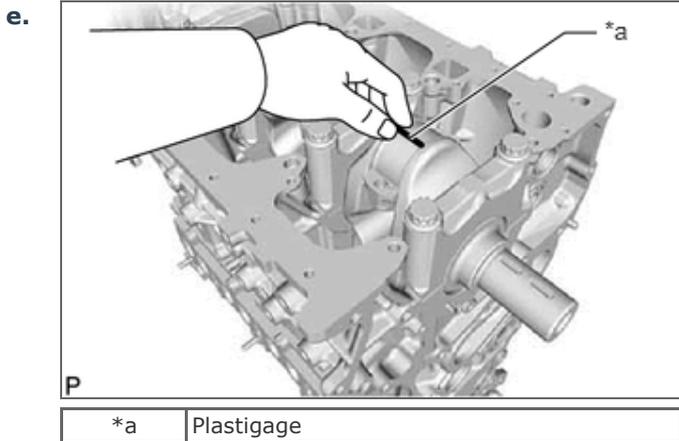
- b. Using the 2 removed connecting rod bolts, move the connecting rod cap back and forth to remove the connecting rod cap from the connecting rod sub-assembly.

**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.  
If the crank pin or connecting rod bearing is damaged, replace the connecting rod bearings. If necessary, replace the crankshaft.



Lay a strip of Plastigage on the crank pin.

- f. Install the connecting rod cap to the connecting rod sub-assembly.  
[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>CYLINDER BLOCK>REASSEMBLY

**NOTICE:**  
Do not turn the crankshaft.

- g. Remove the 2 connecting rod bolts and connecting rod cap from the connecting rod sub-assembly.

**HINT:**  
Keep the connecting rod bearing and connecting rod cap together.

- h. Measure the Plastigage at its widest point.

**Standard oil clearance:**  
**0.042 to 0.048 mm (0.00165 to 0.00189 in.)**

**Maximum oil clearance:**  
**0.054 mm (0.00213 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):**

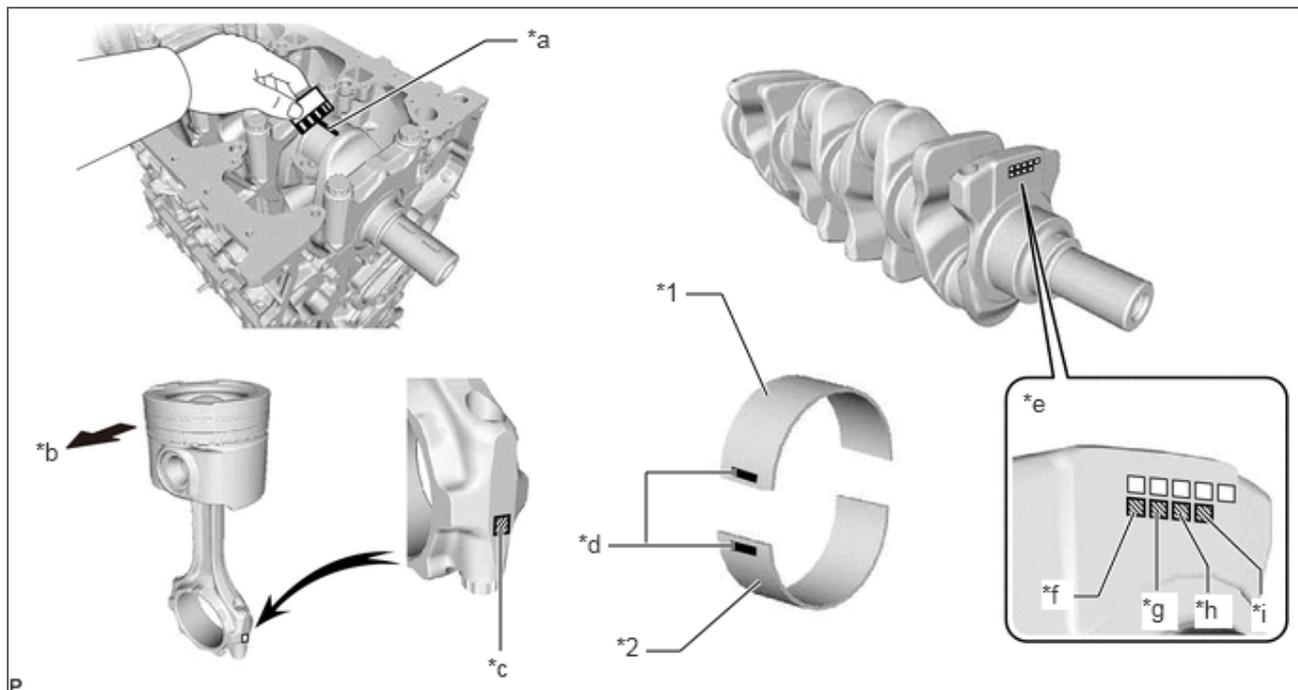
Item	Specified Condition
Mark 1	58.014 to 58.020 mm (2.2840 to 2.2842 in.)
Mark 2	58.020 to 58.026 mm (2.2842 to 2.2845 in.)
Mark 3	58.026 to 58.032 mm (2.2845 to 2.2847 in.)

**Standard Crank Pin Diameter (B):**

Item	Specified Condition
Mark 1	54.994 to 55.000 mm (2.1651 to 2.1654 in.)
Mark 2	54.988 to 54.994 mm (2.1649 to 2.1651 in.)
Mark 3	54.982 to 54.988 mm (2.1646 to 2.1649 in.)

**Standard Sized Connecting Rod Bearing Center Wall Thickness (C):**

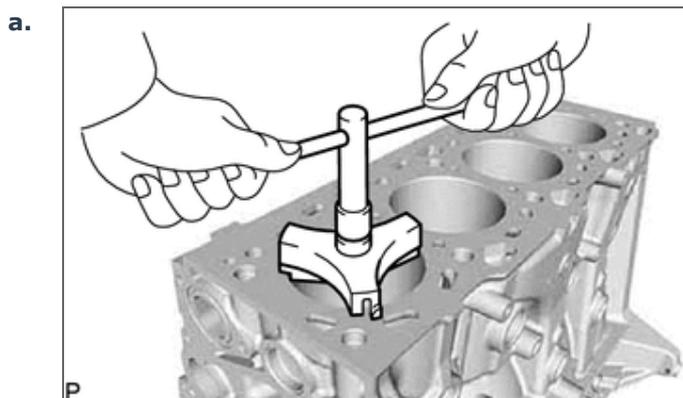
Item	Specified Condition
Mark 2	1.486 to 1.489 mm (0.0585 to 0.0586 in.)
Mark 3	1.489 to 1.492 mm (0.0586 to 0.0587 in.)
Mark 4	1.492 to 1.495 mm (0.0587 to 0.0589 in.)
Mark 5	1.495 to 1.498 mm (0.0589 to 0.0590 in.)
Mark 6	1.498 to 1.501 mm (0.0590 to 0.0591 in.)



*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**



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.

#### 4.REMOVE CONNECTING ROD BEARING

13041

- 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:**

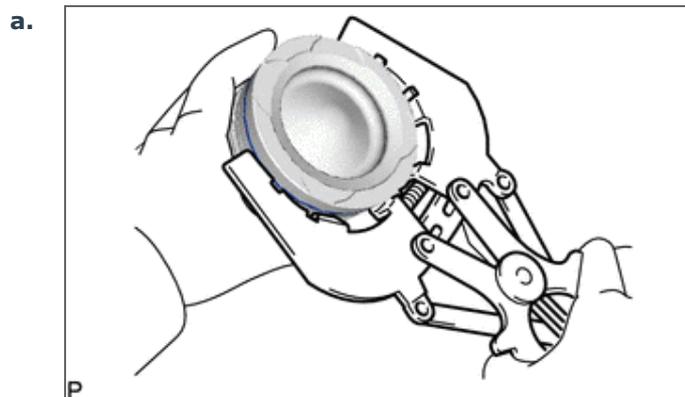
Arrange the removed parts in the correct order.

#### 5.REMOVE PISTON RING SET

13011

**HINT:**

Arrange the piston rings in the correct order.

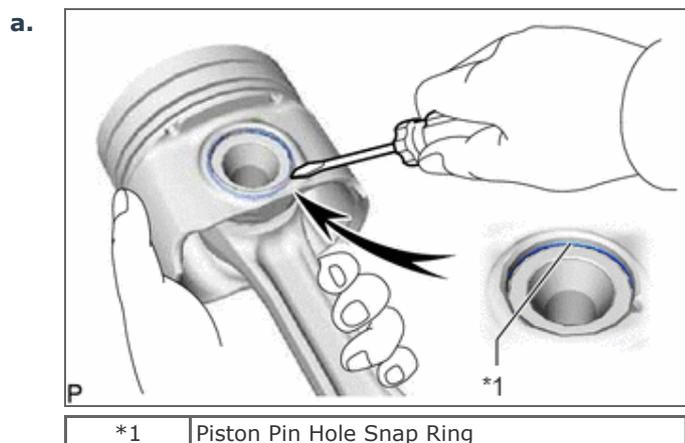


Using a piston ring expander, remove the No. 1 compression ring and No. 2 compression ring from the piston.

- 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.

#### 6.REMOVE PISTON WITH PIN SUB-ASSEMBLY

13101



Using a small screwdriver, pry out the front side piston pin hole snap ring from the piston.

- b. Gradually heat the piston to approximately 80°C (176°F).

**CAUTION:**

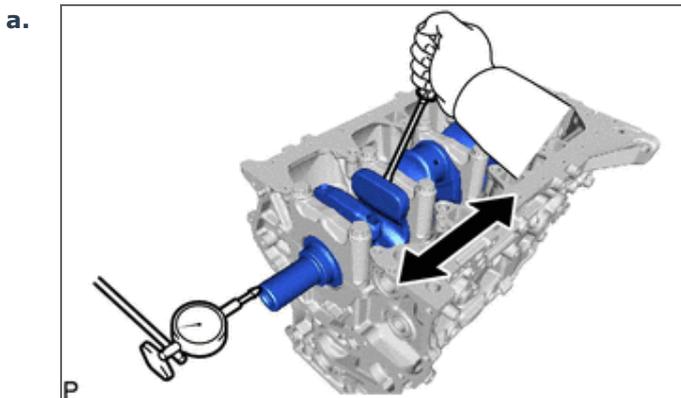
Be sure to wear protective gloves.

- 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



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.)**

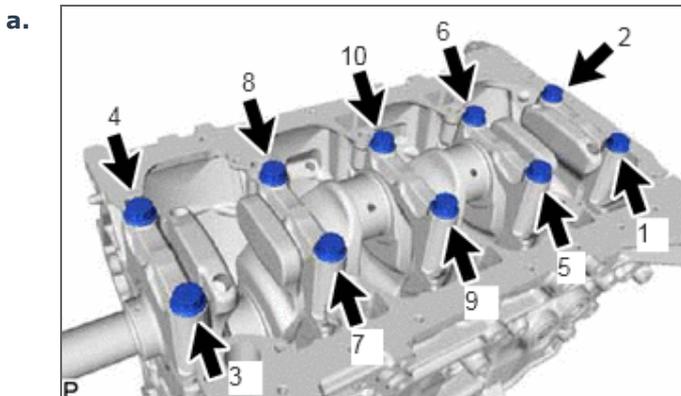
If the thrust clearance is more than the maximum, replace the upper crankshaft thrust washers and lower crankshaft thrust washers. If necessary, replace the crankshaft.

**Standard crankshaft thrust washer thickness:**

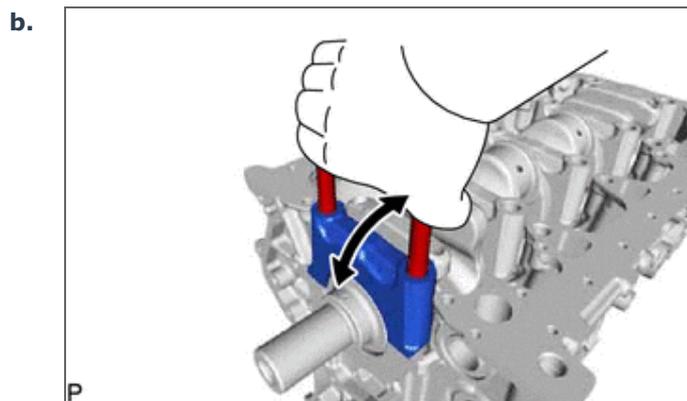
**2.2 to 2.8 mm (0.0866 to 0.110 in.)**

## 8.REMOVE CRANKSHAFT

13411



Using several steps, uniformly loosen and remove the 10 crankshaft bearing cap set bolts in the sequence shown in the illustration.

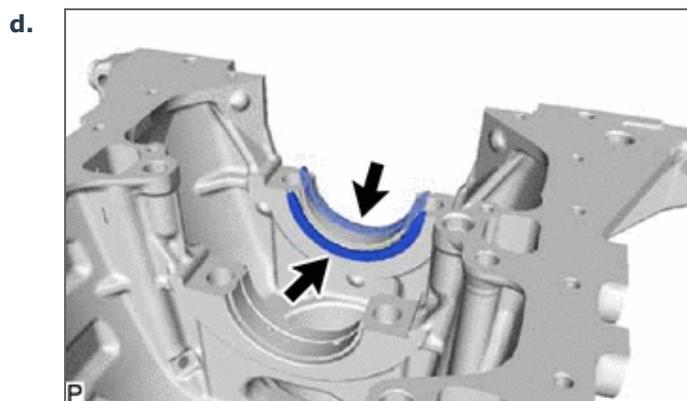


Using the removed crankshaft bearing cap set bolts, pry the crankshaft bearing cap back and forth and remove the crankshaft bearing caps, No. 2 crankshaft bearings and lower crankshaft thrust washers (No. 5 crankshaft journal only).

**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.

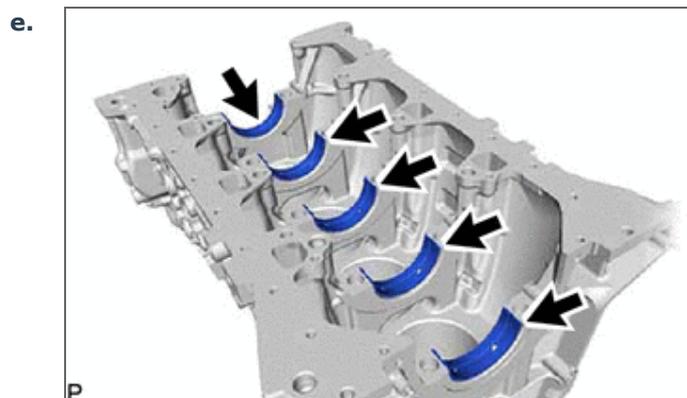
c. Remove the crankshaft from the cylinder block sub-assembly.



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.



Remove the 5 No. 1 crankshaft bearings from the cylinder block sub-assembly.

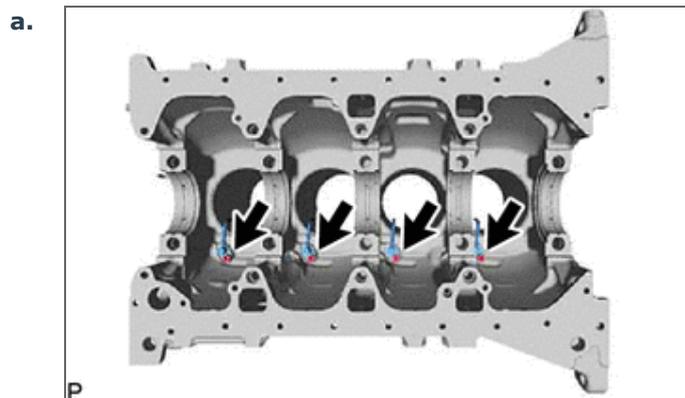
**HINT:**

Arrange the No. 1 crankshaft bearings in the correct order.

- 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**

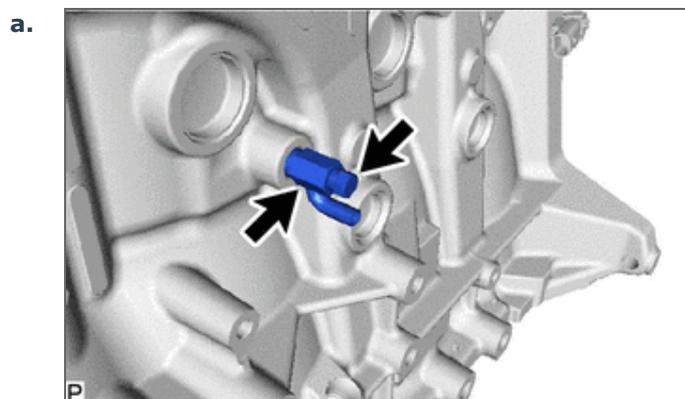
**15708**



Using a 5 mm hexagon wrench, remove the 4 bolts and 4 No. 1 oil nozzle sub-assemblies from the cylinder block sub-assembly.

**10.REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY**

**11415**



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.

**11.REMOVE STUD BOLT**

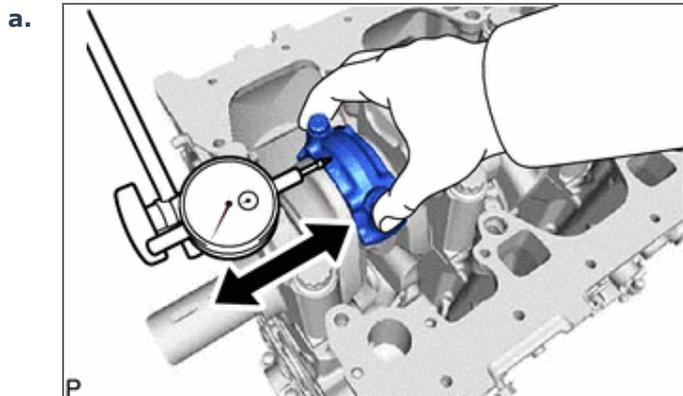
**NOTICE:**

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

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## 1GD-FTV ENGINE MECHANICAL CYLINDER BLOCK DISASSEMBLY

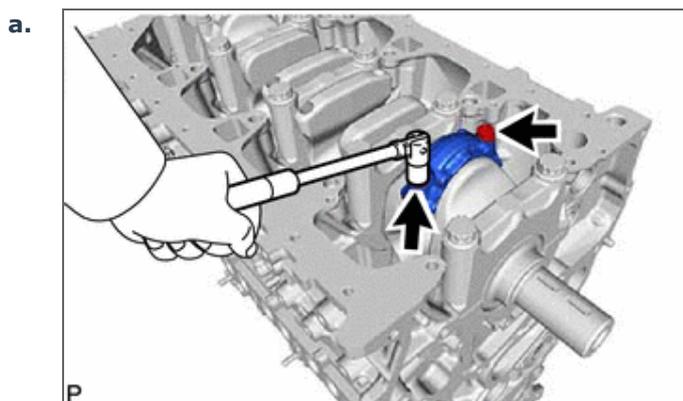
**PROCEDURE****1.INSPECT CONNECTING ROD SUB-ASSEMBLY THRUST CLEARANCE**

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.

**2.INSPECT CONNECTING ROD SUB-ASSEMBLY OIL CLEARANCE**

Remove the 2 connecting rod bolts.

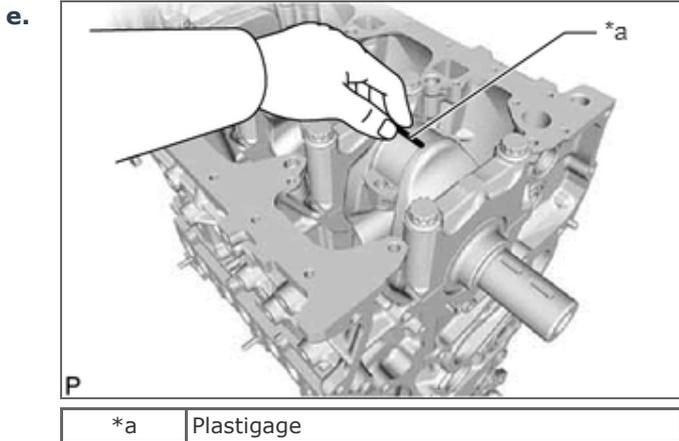
- b. Using the 2 removed connecting rod bolts, move the connecting rod cap back and forth to remove the connecting rod cap from the connecting rod sub-assembly.

**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.  
If the crank pin or connecting rod bearing is damaged, replace the connecting rod bearings. If necessary, replace the crankshaft.



Lay a strip of Plastigage on the crank pin.

- f. Install the connecting rod cap to the connecting rod sub-assembly.  
[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>CYLINDER BLOCK>REASSEMBLY

**NOTICE:**

Do not turn the crankshaft.

- g. Remove the 2 connecting rod bolts and connecting rod cap from the connecting rod sub-assembly.

**HINT:**

Keep the connecting rod bearing and connecting rod cap together.

- h. Measure the Plastigage at its widest point.

**Standard oil clearance:**

**0.042 to 0.048 mm (0.00165 to 0.00189 in.)**

**Maximum oil clearance:**

**0.054 mm (0.00213 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):**

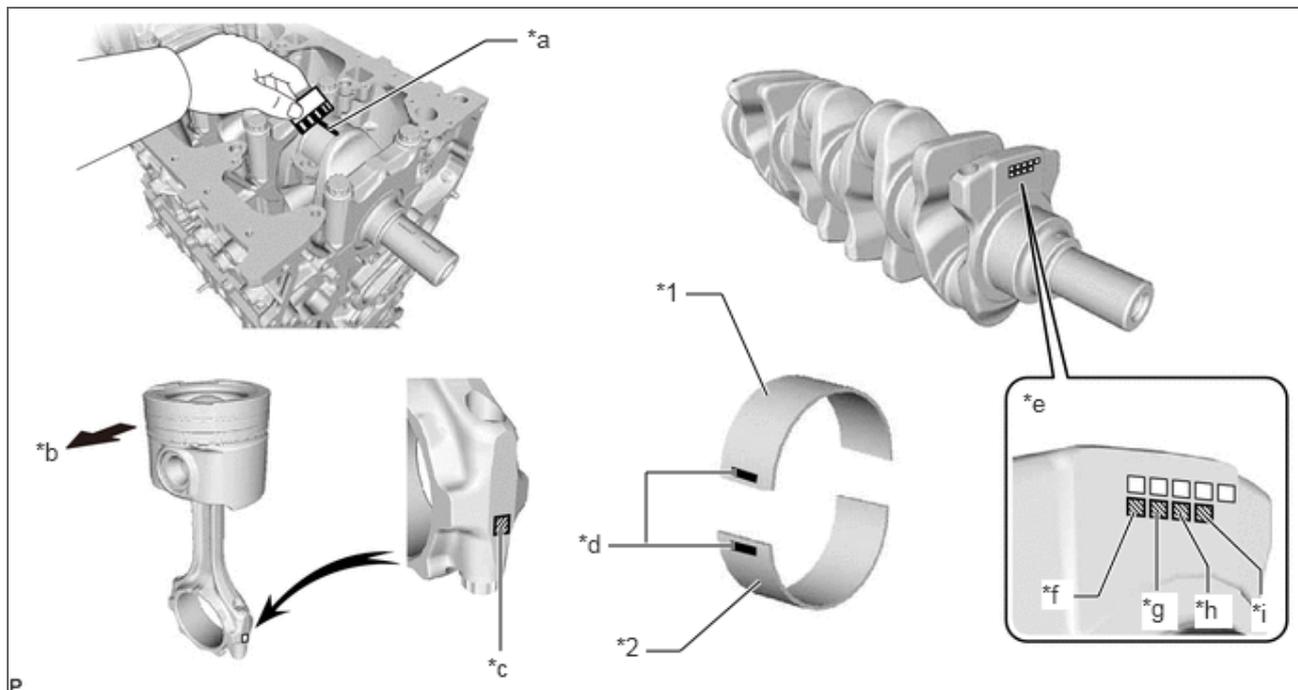
Item	Specified Condition
Mark 1	58.014 to 58.020 mm (2.2840 to 2.2842 in.)
Mark 2	58.020 to 58.026 mm (2.2842 to 2.2845 in.)
Mark 3	58.026 to 58.032 mm (2.2845 to 2.2847 in.)

**Standard Crank Pin Diameter (B):**

Item	Specified Condition
Mark 1	54.994 to 55.000 mm (2.1651 to 2.1654 in.)
Mark 2	54.988 to 54.994 mm (2.1649 to 2.1651 in.)
Mark 3	54.982 to 54.988 mm (2.1646 to 2.1649 in.)

**Standard Sized Connecting Rod Bearing Center Wall Thickness (C):**

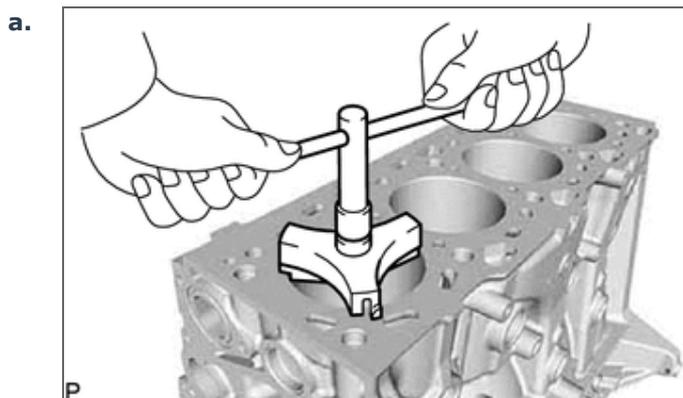
Item	Specified Condition
Mark 2	1.486 to 1.489 mm (0.0585 to 0.0586 in.)
Mark 3	1.489 to 1.492 mm (0.0586 to 0.0587 in.)
Mark 4	1.492 to 1.495 mm (0.0587 to 0.0589 in.)
Mark 5	1.495 to 1.498 mm (0.0589 to 0.0590 in.)
Mark 6	1.498 to 1.501 mm (0.0590 to 0.0591 in.)



*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**



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.

#### 4.REMOVE CONNECTING ROD BEARING

13041

- 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:**

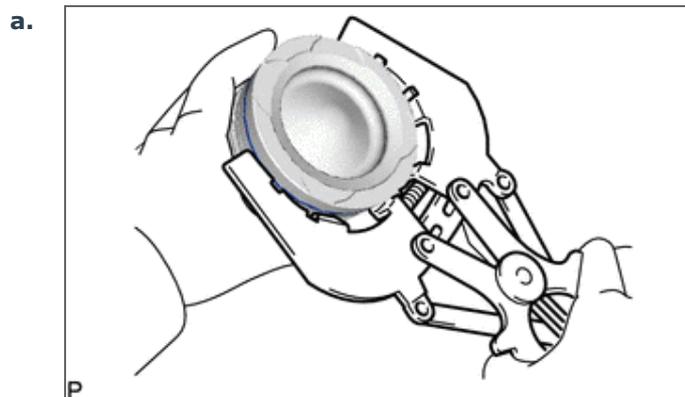
Arrange the removed parts in the correct order.

#### 5.REMOVE PISTON RING SET

13011

**HINT:**

Arrange the piston rings in the correct order.

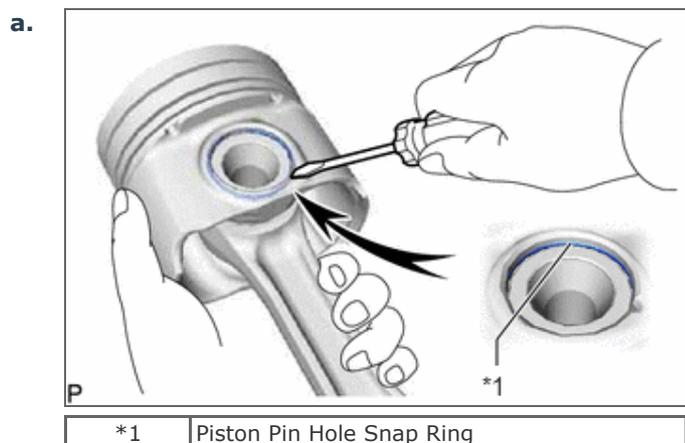


Using a piston ring expander, remove the No. 1 compression ring and No. 2 compression ring from the piston.

- 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.

#### 6.REMOVE PISTON WITH PIN SUB-ASSEMBLY

13101



Using a small screwdriver, pry out the front side piston pin hole snap ring from the piston.

- b. Gradually heat the piston to approximately 80°C (176°F).

**CAUTION:**

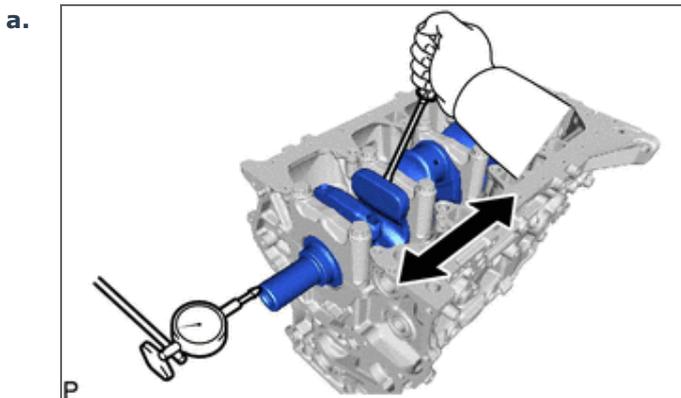
Be sure to wear protective gloves.

- 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



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.)**

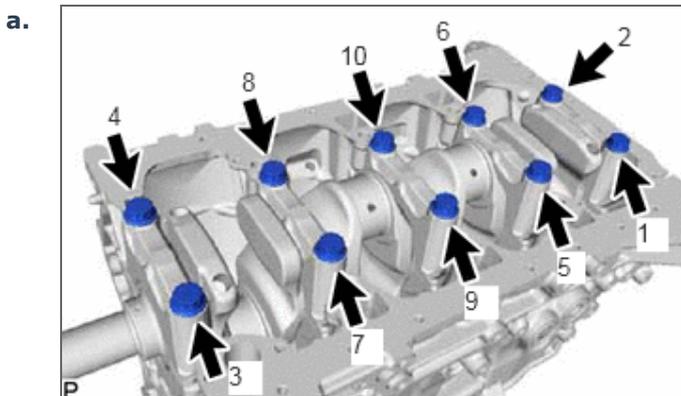
If the thrust clearance is more than the maximum, replace the upper crankshaft thrust washers and lower crankshaft thrust washers. If necessary, replace the crankshaft.

**Standard crankshaft thrust washer thickness:**

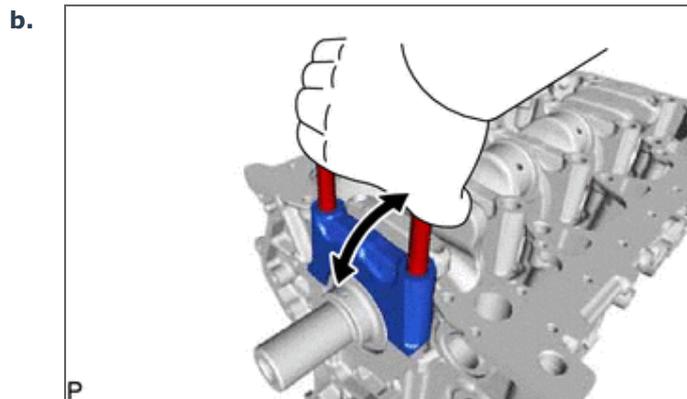
**2.2 to 2.8 mm (0.0866 to 0.110 in.)**

## 8.REMOVE CRANKSHAFT

13411



Using several steps, uniformly loosen and remove the 10 crankshaft bearing cap set bolts in the sequence shown in the illustration.

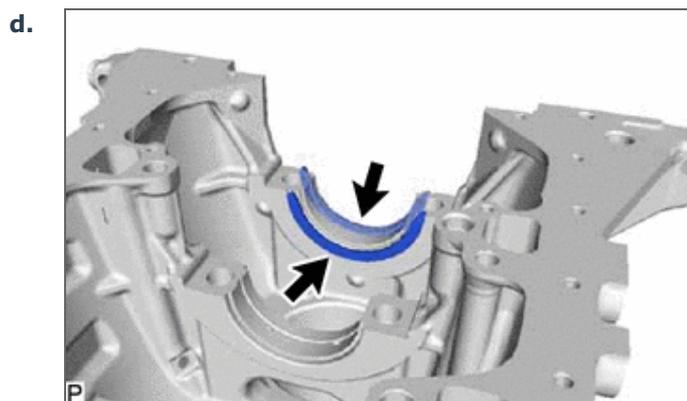


Using the removed crankshaft bearing cap set bolts, pry the crankshaft bearing cap back and forth and remove the crankshaft bearing caps, No. 2 crankshaft bearings and lower crankshaft thrust washers (No. 5 crankshaft journal only).

**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.

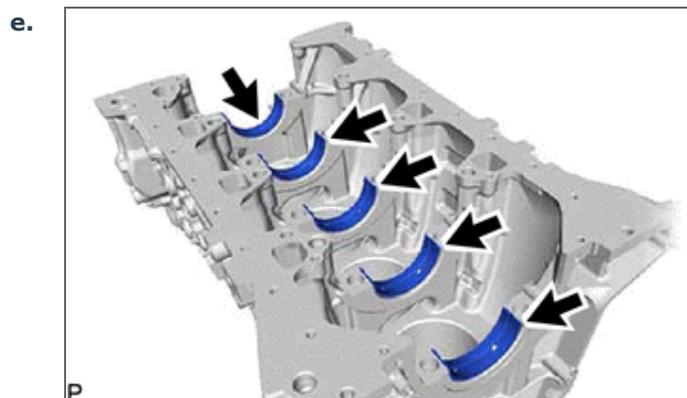
c. Remove the crankshaft from the cylinder block sub-assembly.



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.



Remove the 5 No. 1 crankshaft bearings from the cylinder block sub-assembly.

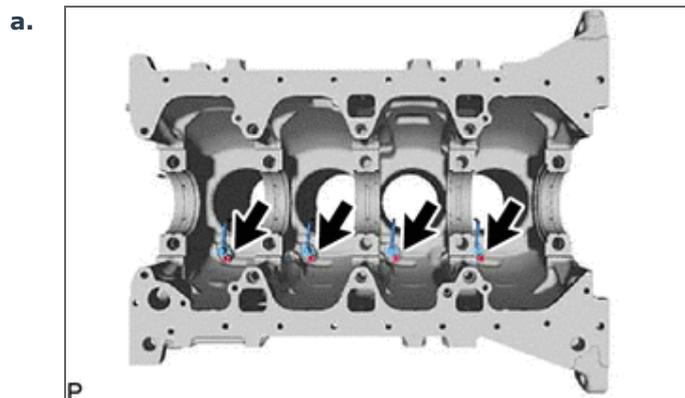
**HINT:**

Arrange the No. 1 crankshaft bearings in the correct order.

- 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**

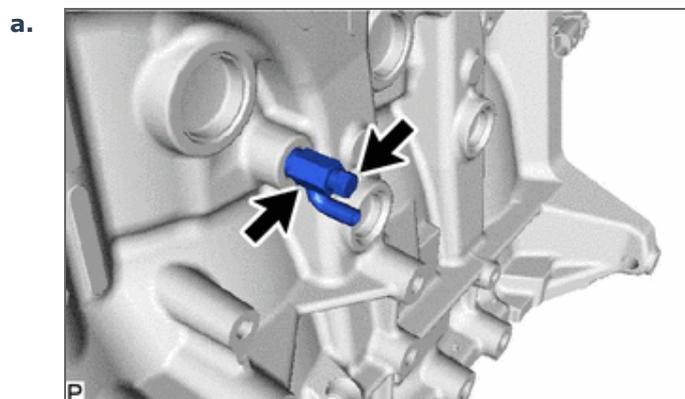
**15708**



Using a 5 mm hexagon wrench, remove the 4 bolts and 4 No. 1 oil nozzle sub-assemblies from the cylinder block sub-assembly.

**10.REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY**

**11415**



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.

**11.REMOVE STUD BOLT**

**NOTICE:**

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

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## 1GD-FTV ENGINE MECHANICAL CYLINDER BLOCK REASSEMBLY

### PROCEDURE

#### 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.

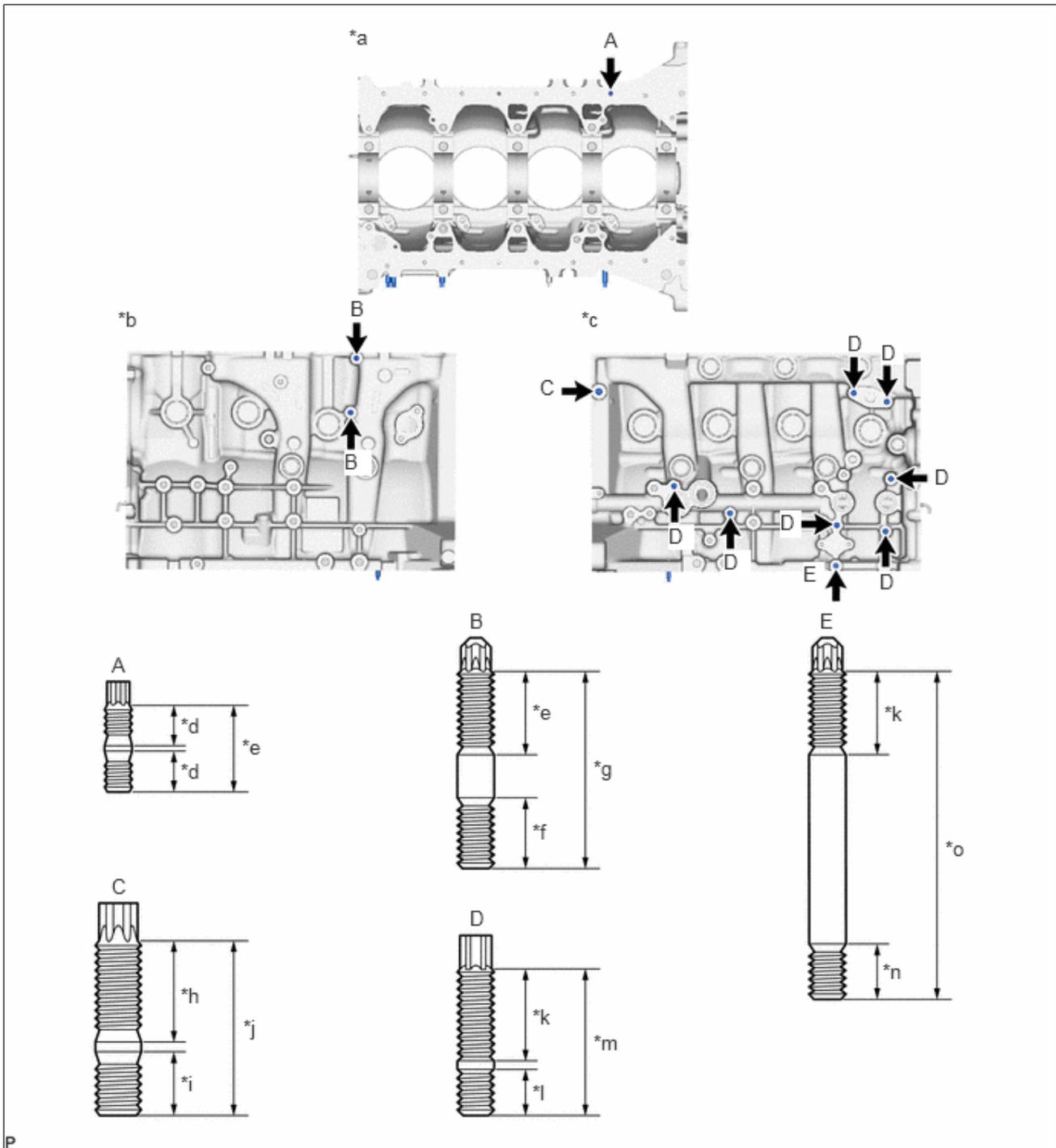
**Torque:**

**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:**

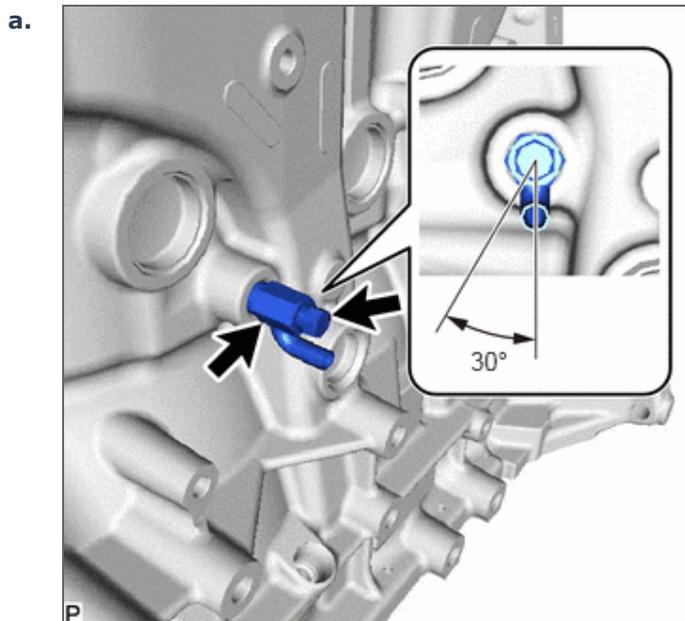
**for stud bolt C : 19 N\*m (194 kgf\*cm, 14 ft.\*lbf)**



*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**

**11415**



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)**

**3.INSTALL NO. 1 OIL NOZZLE SUB-ASSEMBLY**

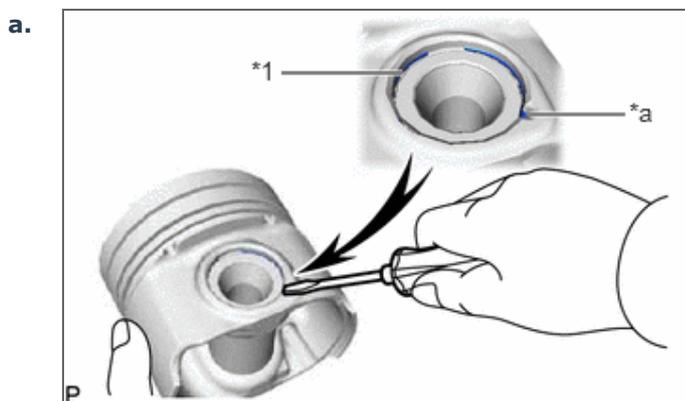
**15708**

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**

**13101**



*1	Piston Pin Hole Snap Ring
----	---------------------------

*a	Service Hole Cutout Portion
----	-----------------------------

Using a small screwdriver, install a new piston pin hole snap ring on one side of the piston pin hole.

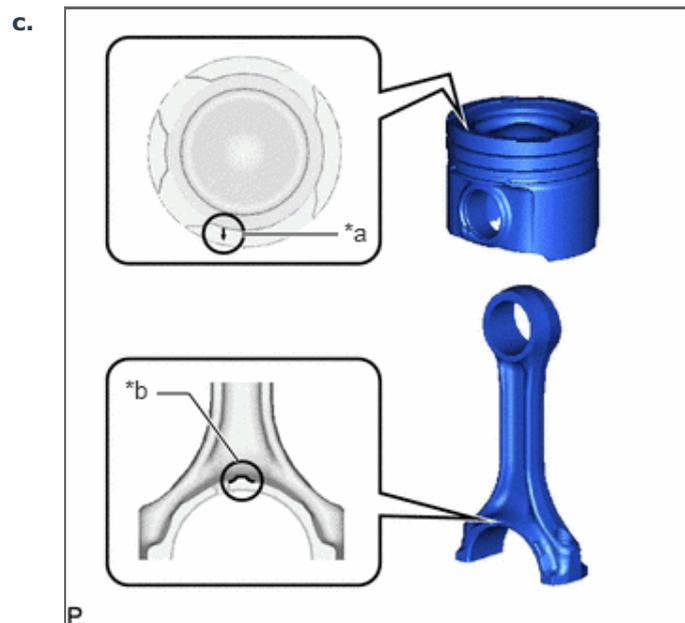
**HINT:**

- 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.

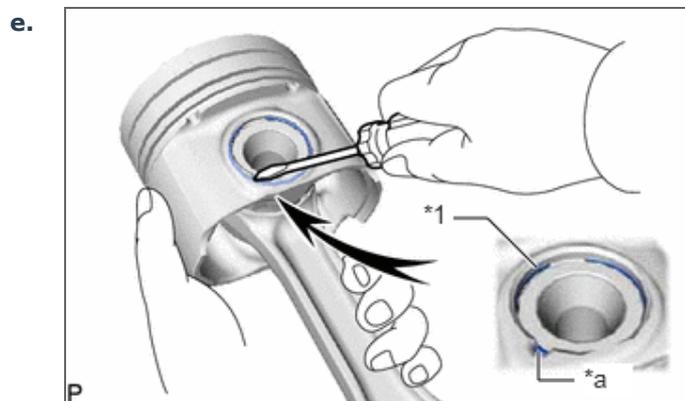
b. Coat the piston pin with engine oil.



*a	Front Mark (Arrow)
*b	Front Mark (Protrusion)

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.



*1	Piston Pin Hole Snap Ring
*a	Service Hole Cutout Portion

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.

**5.INSTALL PISTON RING SET**

**13011**

a. Install the oil ring expander to the piston by hand.

b.

*a	Coil Joint
*b	Oil Ring Rail End Gap

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.

c.

*a	No. 1 Compression Ring Code Mark
*b	No. 2 Compression Ring Code Mark

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.

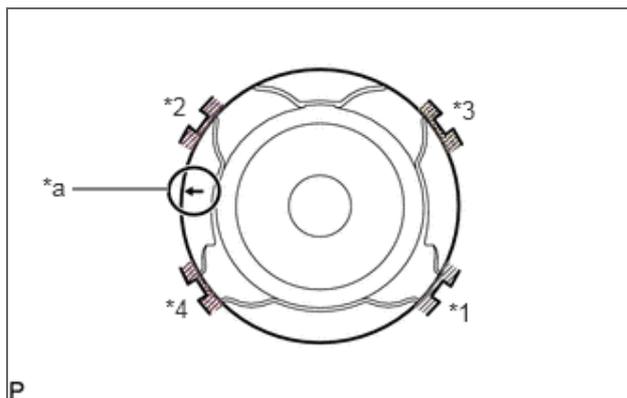
**Code Mark:**

Item	Code Mark
No. 1 Compression Ring	G1 or 1G
No. 2 Compression Ring	N2 or 2N

**HINT:**

Install the No. 1 compression ring and No. 2 compression ring with the code mark facing upward.

d.



*1	No. 1 Compression Ring
*2	No. 2 Compression Ring
*3	Oil Ring Expander
*4	Oil Ring Rail
*a	Front Mark (Arrow)

Position the piston rings so that the ring ends are as shown in the illustration.

**NOTICE:**

Do not align the ring ends.

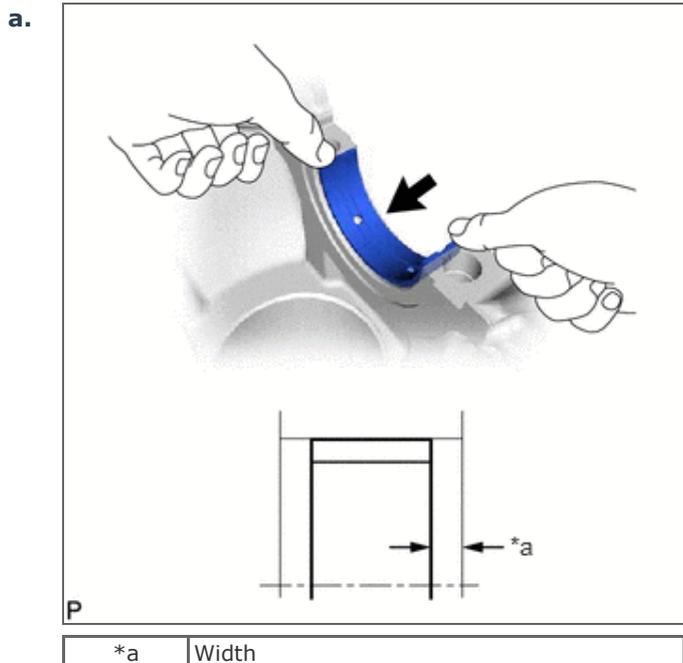
**6. INSTALL CRANKSHAFT BEARING**

**HINT:**

- No. 1 crankshaft bearings have an oil groove and oil hole. No. 2 crankshaft bearings do not.
- There are different types of crankshaft bearings for the No. 1 and No. 5 journal. Therefore, be sure to install crankshaft bearings with the same colors as the ones that were removed.

**Crankshaft Bearing Color:**

Journal Position	No. 1 Crankshaft Bearing Color	No. 2 Crankshaft Bearing Color
No. 1	Silver or Brown	Silver or Brown
No. 2	Silver	Silver
No. 3	Silver	Silver
No. 4	Silver	Silver
No. 5	Silver or Brown	Silver or Brown

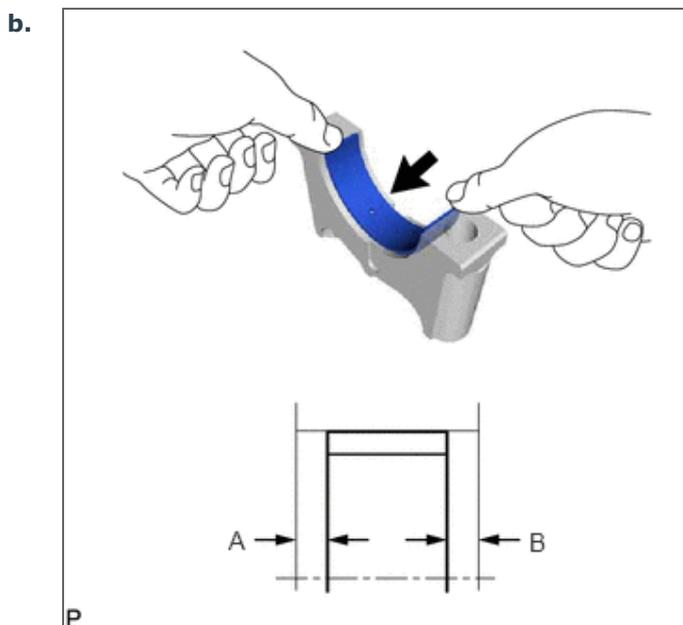


Install the No. 1 crankshaft bearing to the cylinder block sub-assembly as shown in the illustration.

**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).



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).

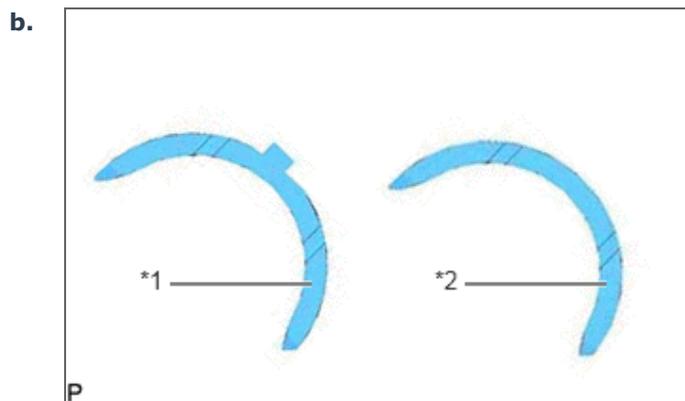
- c. Using a vernier caliper, measure the distance between the crankshaft bearing cap edge and crankshaft bearing edge.

**Dimension A - B or B - A:  
0 to 0.7 mm (0 to 0.0276 in.)**

**7.INSTALL CRANKSHAFT**

**13411**

- a. Apply engine oil to the crankshaft bearing, and then install the crankshaft to the cylinder block sub-assembly.

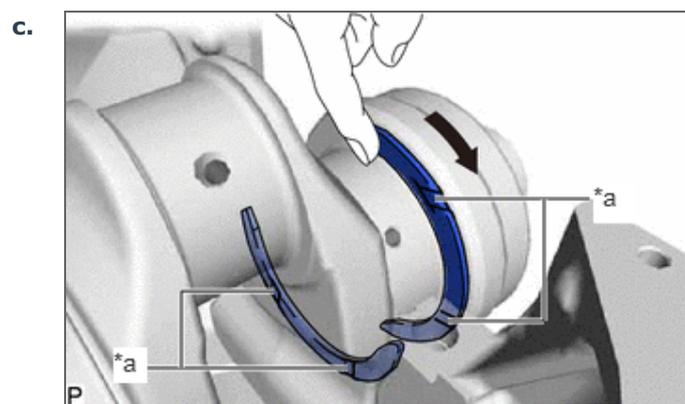


*1	Lower Crankshaft Thrust Washer
*2	Upper Crankshaft Thrust Washer

Apply engine oil to the 2 upper crankshaft thrust washers and 2 lower crankshaft thrust washers.

**HINT:**

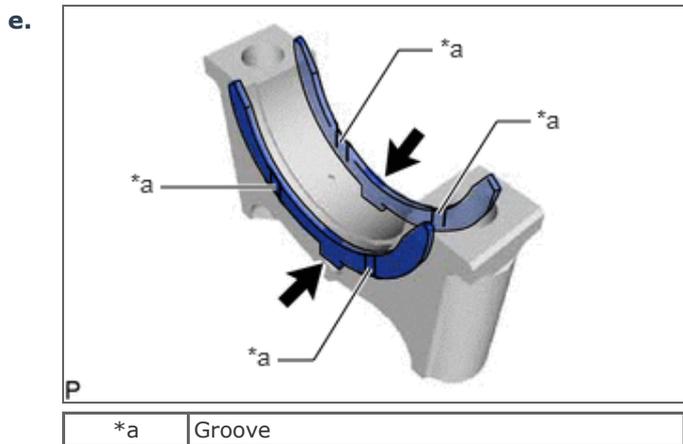
Check the crankshaft thrust washers, as there are different types as shown in the illustration.



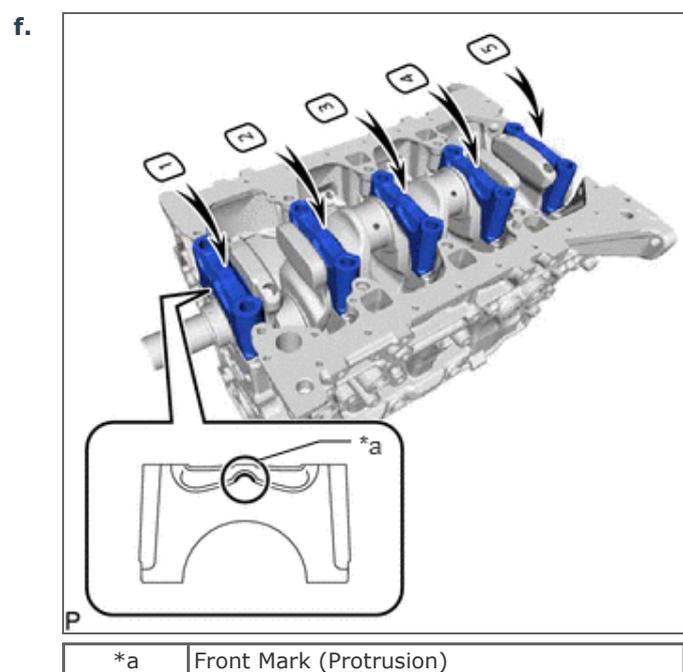
*a	Groove
----	--------

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.



Install the 2 lower crankshaft thrust washers to the crankshaft bearing cap (No. 5 crankshaft journal) with the grooves facing outward.



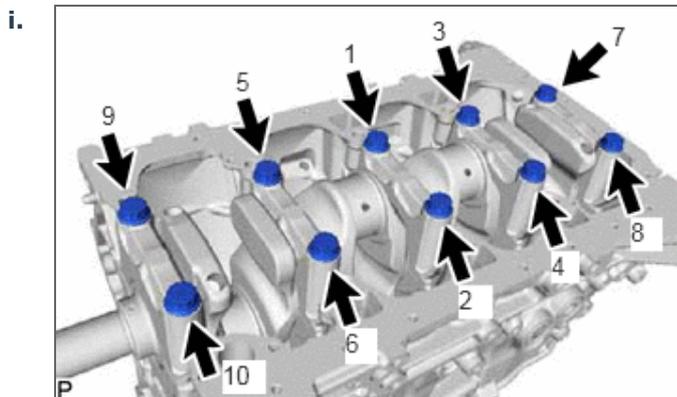
Install the 5 crankshaft bearing caps to the cylinder block sub-assembly, making sure that the front marks (protrusions) and crankshaft bearing cap number of the crankshaft bearing caps are as shown in the illustration.

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.



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.

- 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 / Hybrid System>1GD-FTV ENGINE MECHANICAL>CYLINDER BLOCK>DISASSEMBLY

**9.INSTALL CONNECTING ROD BEARING**

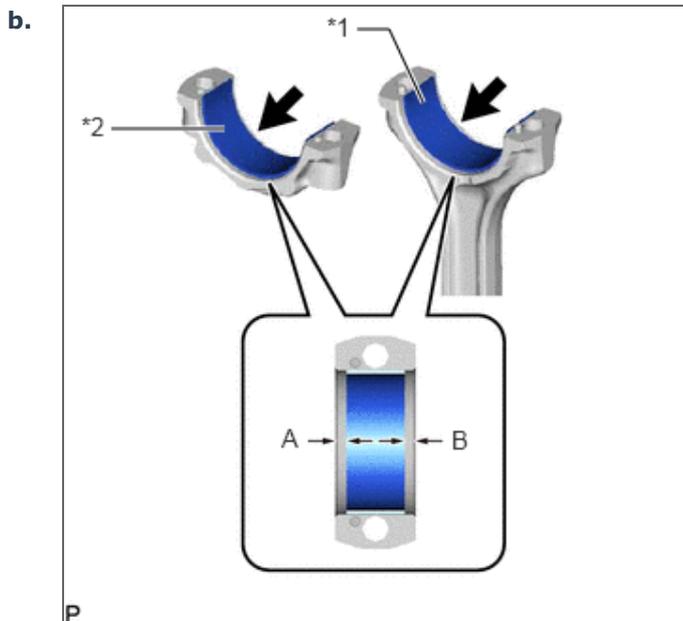
**13041**

**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.



*1	No. 1 Connecting Rod Bearing
*2	No. 2 Connecting Rod Bearing

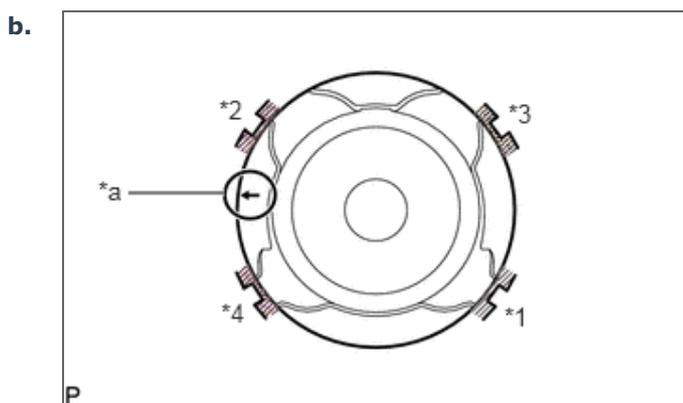
Install the No. 1 connecting rod bearings to the connecting rod sub-assembly.

- 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.)**

**10. INSTALL PISTON AND CONNECTING ROD SUB-ASSEMBLY**

- a.** Apply engine oil to the cylinder walls, pistons, and surfaces of the connecting rod bearings.

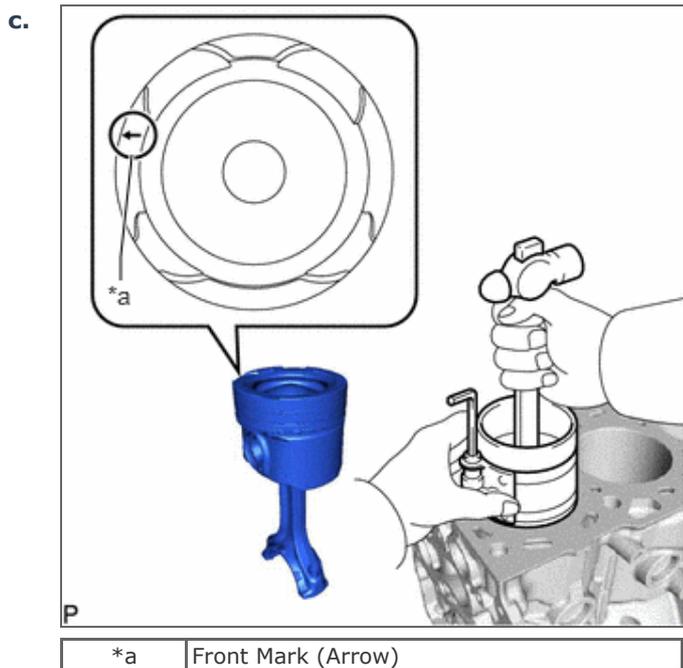


*1	No. 1 Compression Ring
*2	No. 2 Compression Ring
*3	Oil Ring Expander
*4	Oil Ring Rail
*a	Front Mark (Arrow)

Position the piston rings so that the piston ring ends are as shown in the illustration.

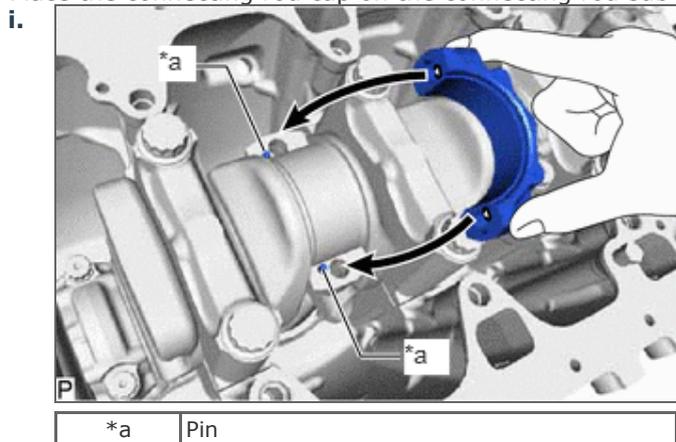
**NOTICE:**

Do not align the piston ring ends.

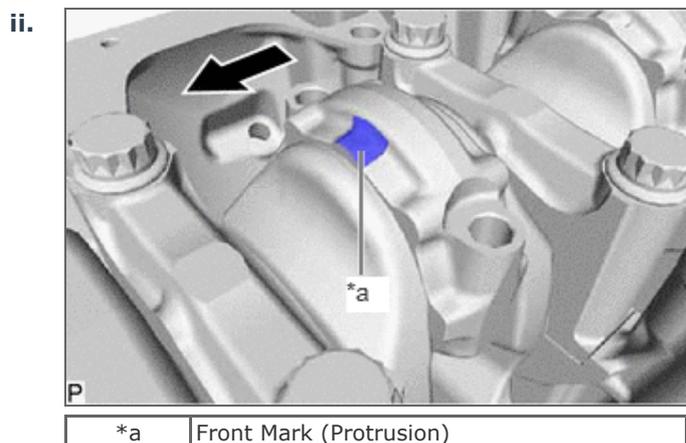


Using a piston ring compressor and hammer handle, press a piston with connecting rod sub-assembly into each cylinder with the front mark (arrow) of the piston facing forward.

d. Place the connecting rod cap on the connecting rod sub-assembly.



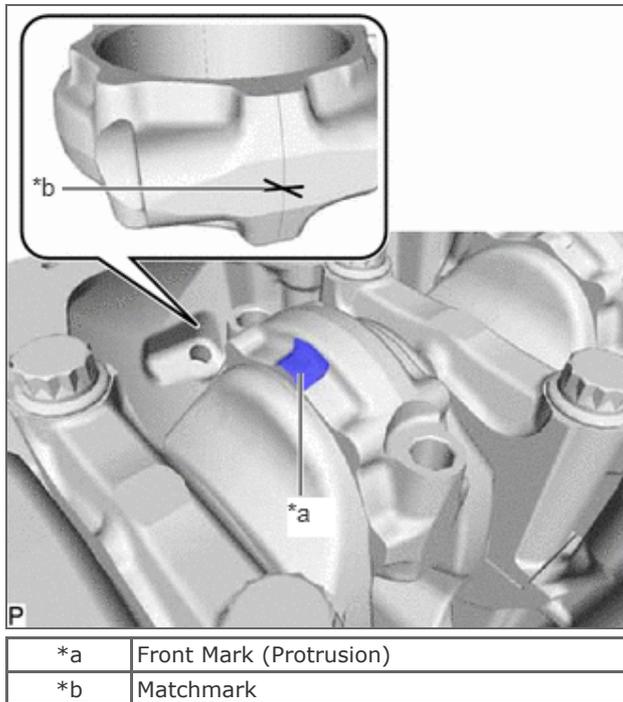
Align the pin holes of the connecting rod cap with the pins of the connecting rod sub-assembly, and then install the connecting rod cap.





Check that the front mark (protrusion) of the connecting rod cap is facing forward.

iii.



Check that the matchmarks of the connecting rod sub-assembly and connecting rod cap are aligned.

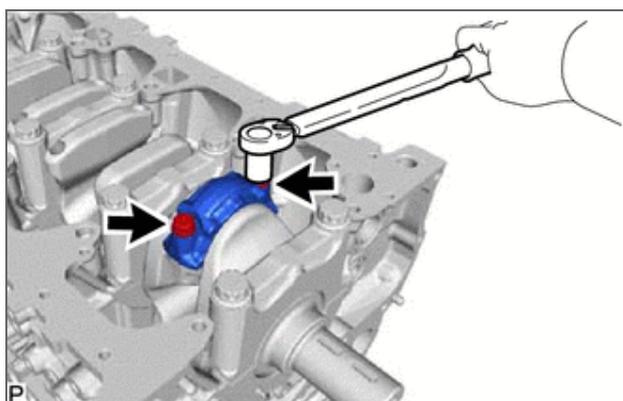
e. Apply a light coat of engine oil to the threads and under the heads of the connecting rod bolts.

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)**

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 / Hybrid System>1GD-FTV ENGINE MECHANICAL>CYLINDER BLOCK>DISASSEMBLY

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1GD-FTV ENGINE MECHANICAL CYLINDER BLOCK REPLACEMENT

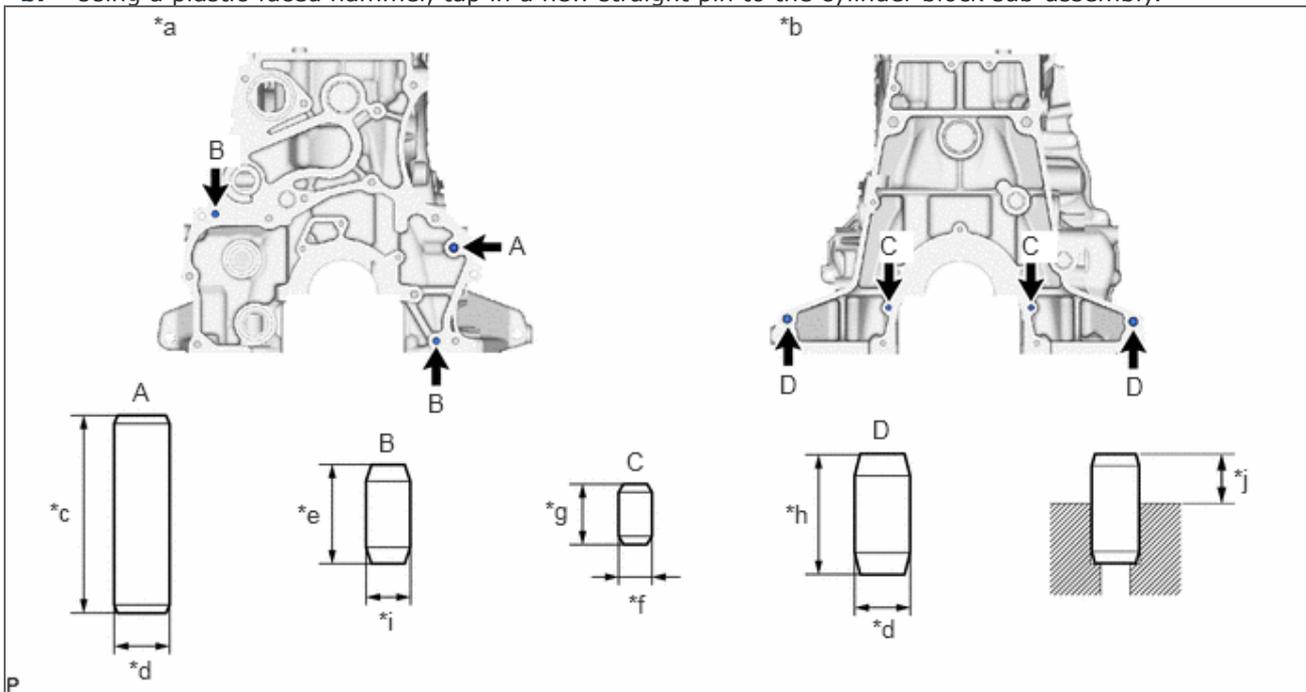
**PROCEDURE**

**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.



*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.)

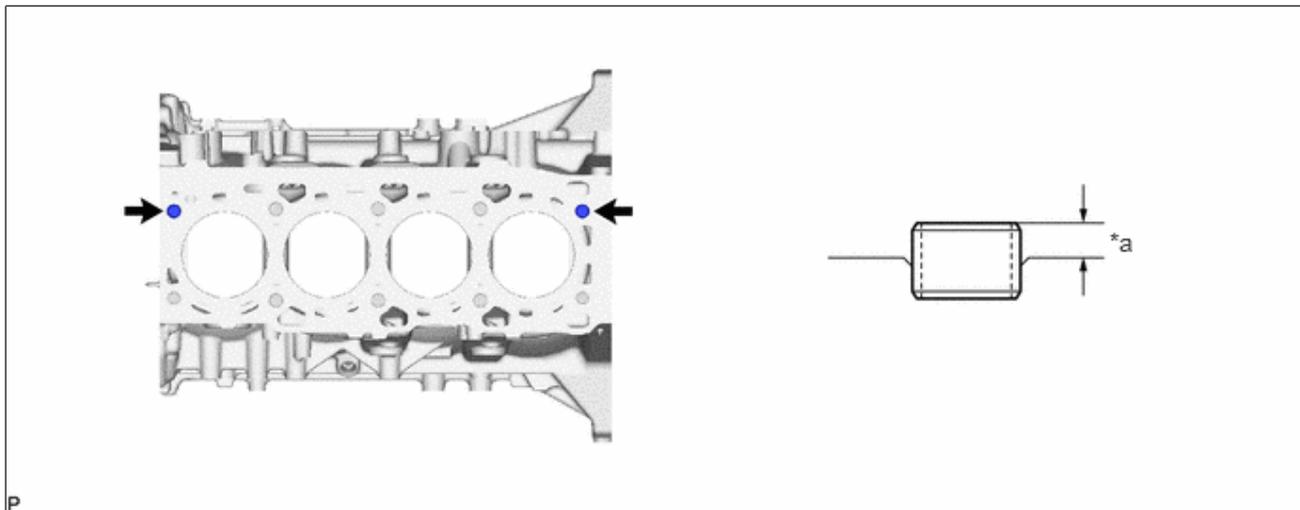
**2.REPLACE RING PIN**

**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.)**



*a	Protrusion Height	-	-
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1GD-FTV ENGINE MECHANICAL CYLINDER BLOCK REPLACEMENT

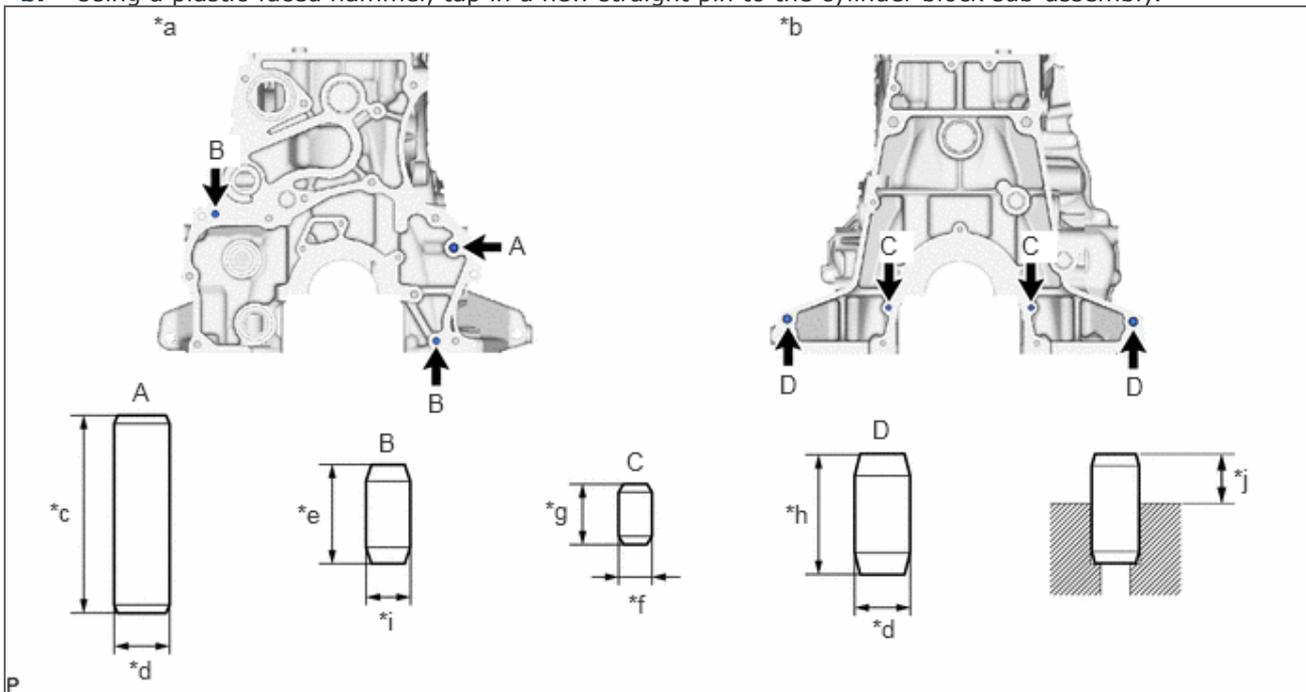
**PROCEDURE**

**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.



*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.)

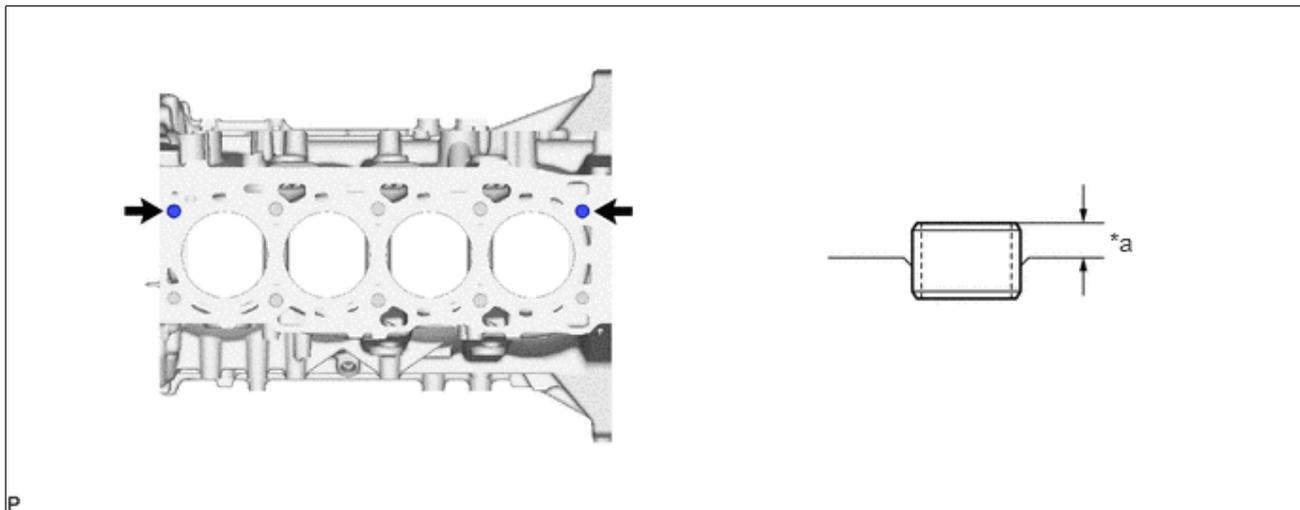
**2.REPLACE RING PIN**

**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.)**



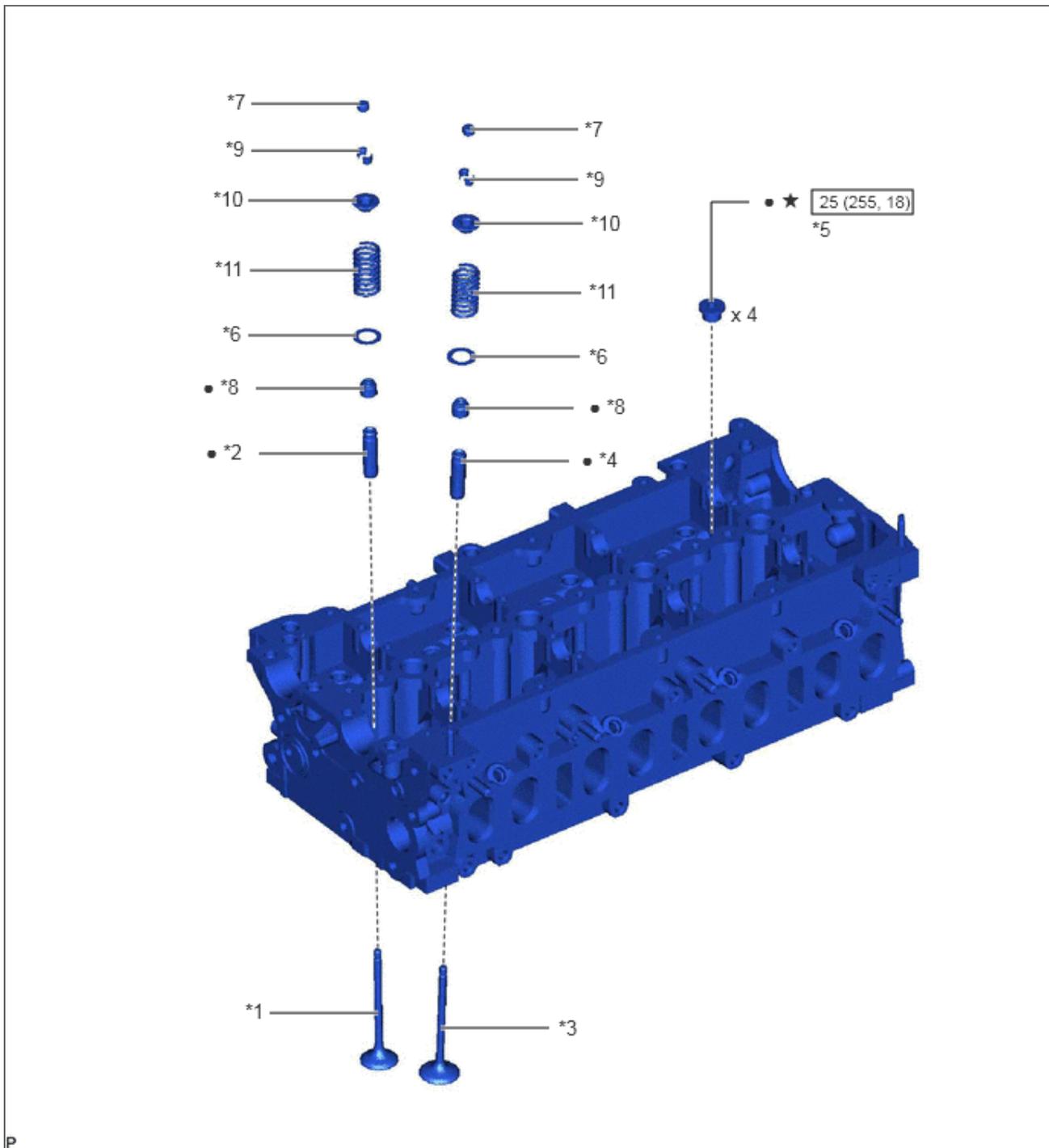
*a	Protrusion Height	-	-
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1GD-FTV ENGINE MECHANICAL CYLINDER HEAD COMPONENTS

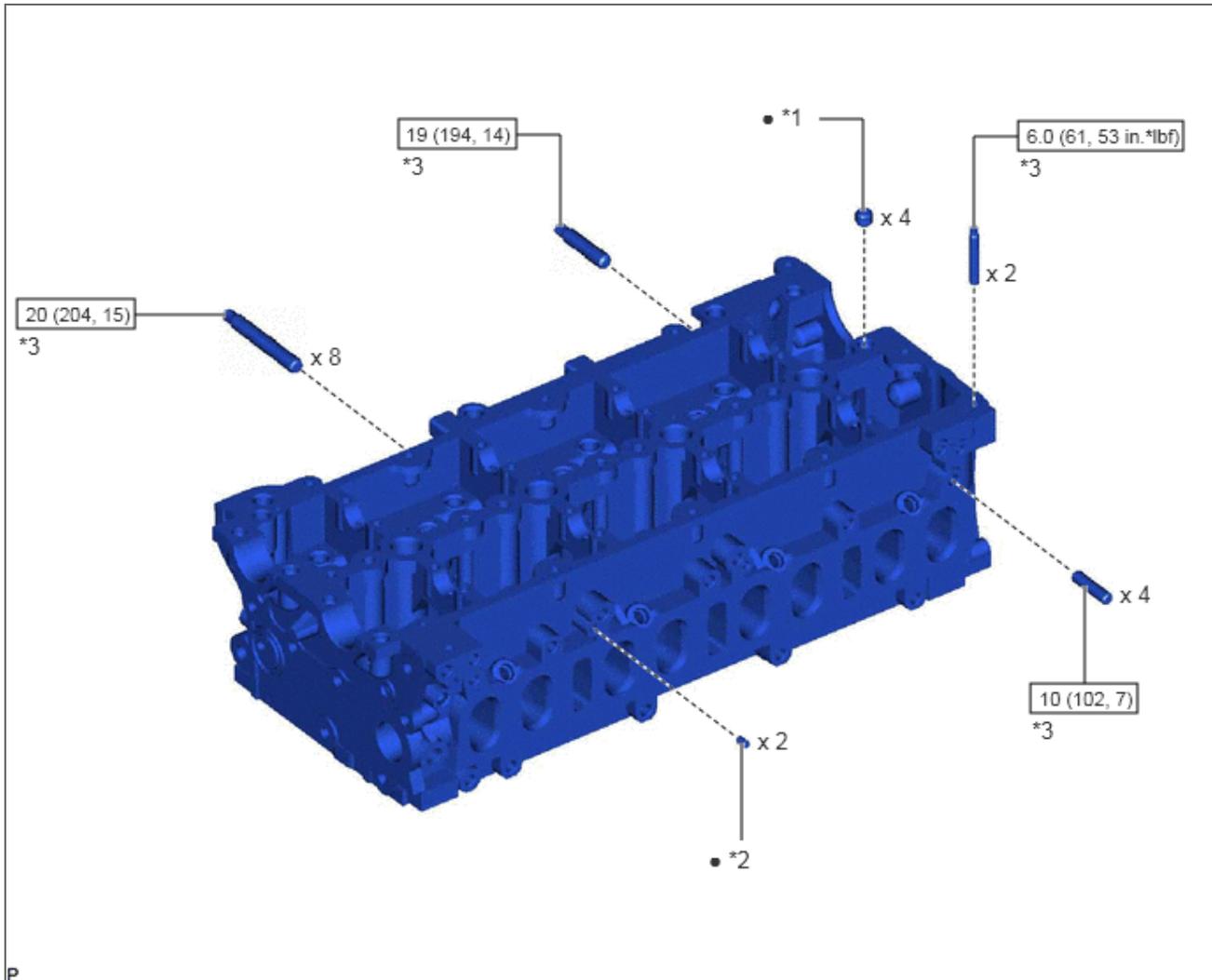
ILLUSTRATION



*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	-	-

## ILLUSTRATION



*1	RING PIN	*2	STRAIGHT PIN
*3	STUD BOLT	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part

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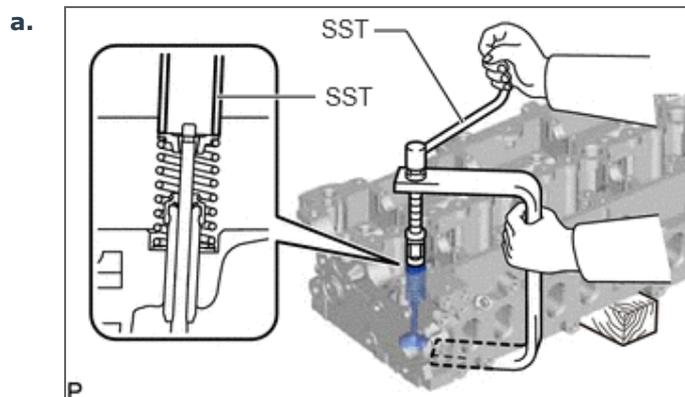
## 1GD-FTV ENGINE MECHANICAL CYLINDER HEAD DISASSEMBLY

**PROCEDURE****1.REMOVE VALVE STEM CAP****13716**

- 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****13711**

Using SST and wooden blocks, compress the valve compression spring and remove the valve spring retainer locks from the valve spring retainer.

**SST**

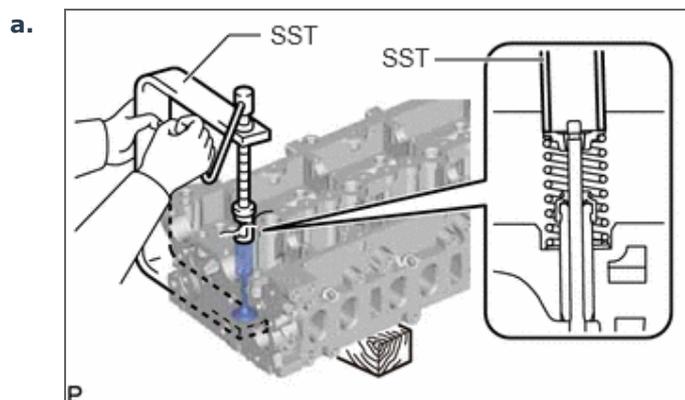
**09202-70020**

**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.

**3.REMOVE EXHAUST VALVE****13715**

Using SST and wooden blocks, compress the valve compression spring and remove the valve spring retainer locks from the valve spring retainer.

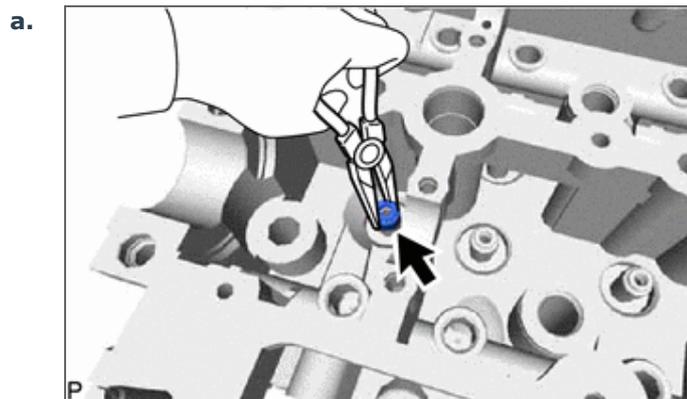
**SST****09202-70020****09202-00021**

- b. Remove the valve spring retainer, valve compression spring and exhaust valve from the cylinder head sub-assembly.

**HINT:**

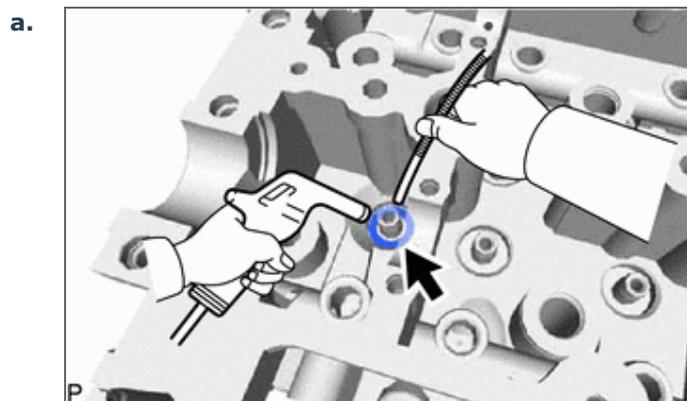
Arrange the removed parts in the correct order.

---

**4.REMOVE VALVE STEM OIL SEAL**
**13711E**

Using needle-nose pliers, remove the valve stem oil seals from the valve guide bush.

---

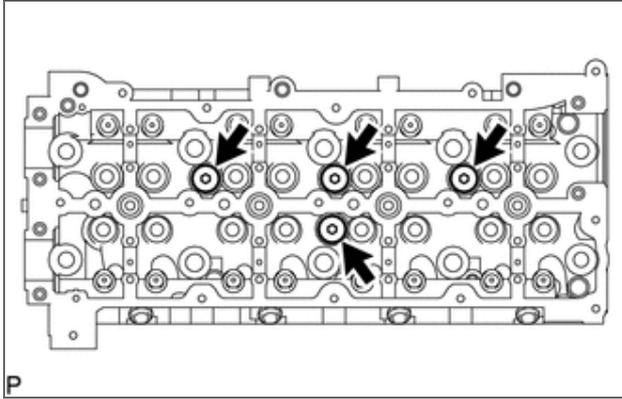
**5.REMOVE VALVE SPRING SEAT**
**13734A**

Using compressed air and a magnet hand, remove the valve spring seat from the cylinder head sub-assembly by blowing air onto it.

---

**6.REMOVE NO. 1 STRAIGHT SCREW PLUG WITH HEAD**
**11117E**

a.



Using a 6 mm hexagon wrench, remove the 4 No. 1 straight screw plug with heads from the cylinder head sub-assembly.

## 7.REMOVE STUD BOLT

### **NOTICE:**

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

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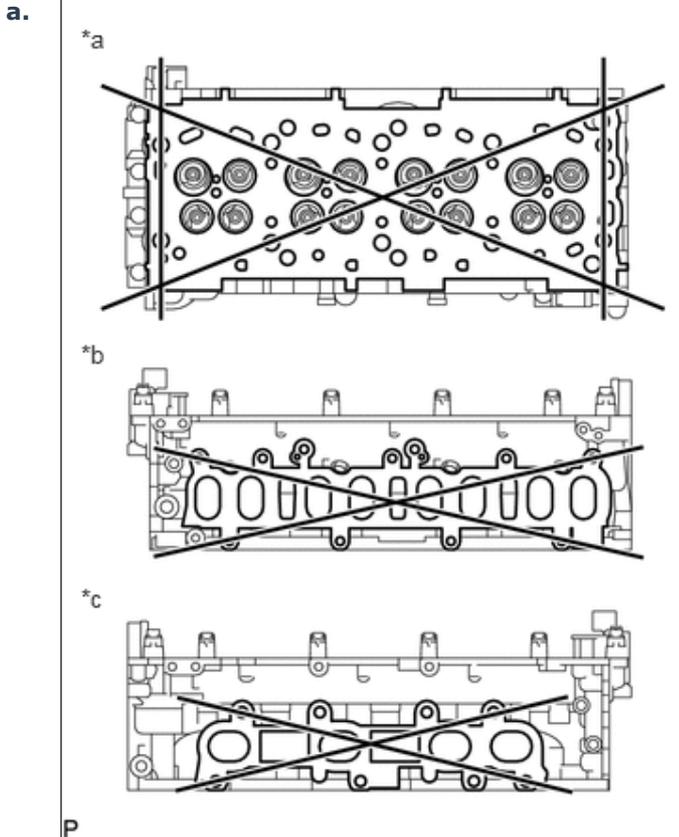
Exit

1GD-FTV ENGINE MECHANICAL CYLINDER HEAD INSPECTION

**PROCEDURE**

**1.INSPECT CYLINDER HEAD SUB-ASSEMBLY**

**11101**



*a	Cylinder Block Sub-assembly Side
*b	Intake Manifold Side
*c	Exhaust Manifold Side

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:**

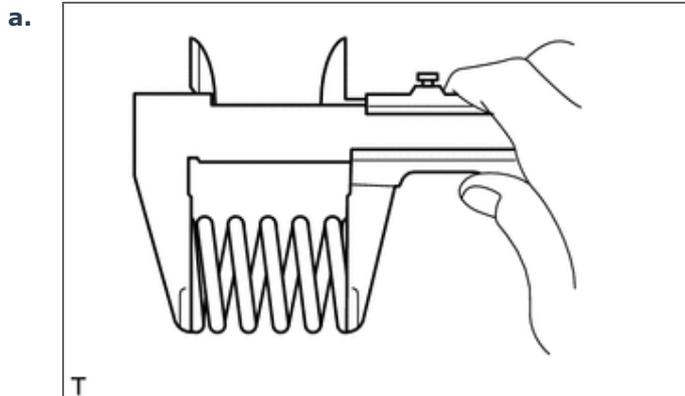
Item	Specified Condition
Cylinder Block Sub-assembly Side	0.05 mm (0.00197 in.)
Intake Manifold Side	0.10 mm (0.00394 in.)
Exhaust Manifold Side	0.10 mm (0.00394 in.)

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.

**2.INSPECT VALVE COMPRESSION SPRING**

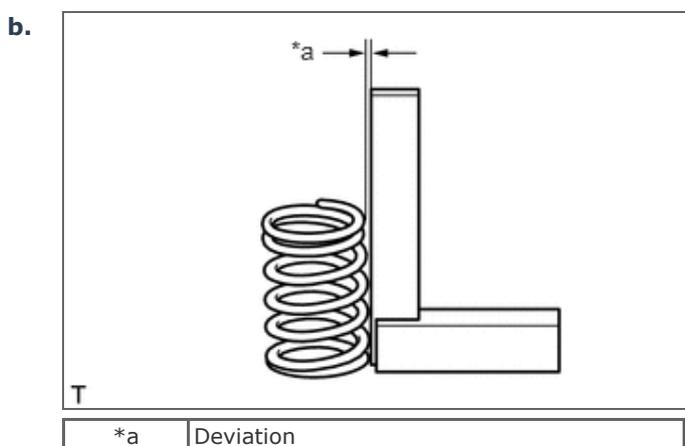
**13711M**



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.



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.

### 3.INSPECT INTAKE VALVE

13711

- 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.)**

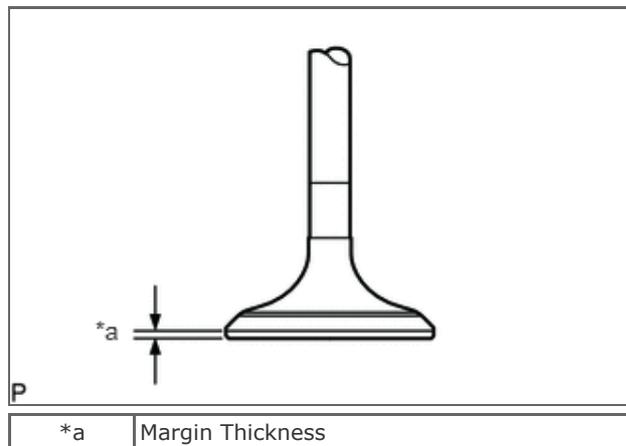
If the length is less than the minimum, replace the intake valve.

- 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.

#### 4.INSPECT EXHAUST VALVE

13715

- 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.)**

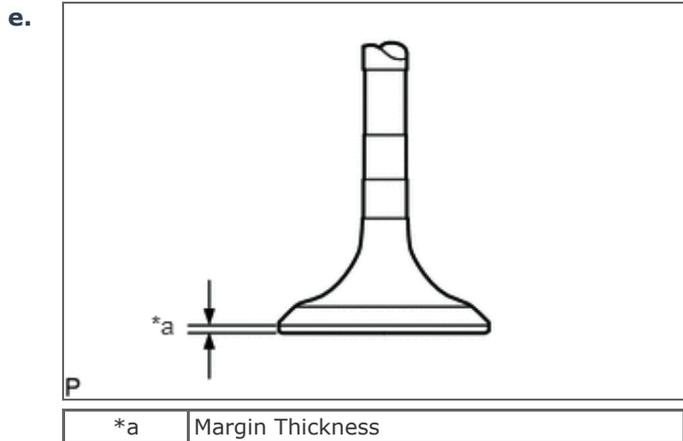
**Minimum overall length:**  
**98.89 mm (3.89 in.)**

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.



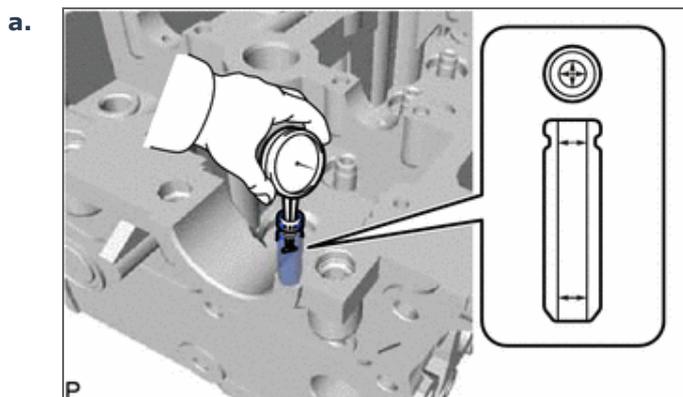
Using a vernier caliper, measure the exhaust valve head margin thickness.

**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.

**5.INSPECT VALVE GUIDE BUSH OIL CLEARANCE**



Using a caliper gauge, measure the inside diameter of the valve guide bush.

**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:**

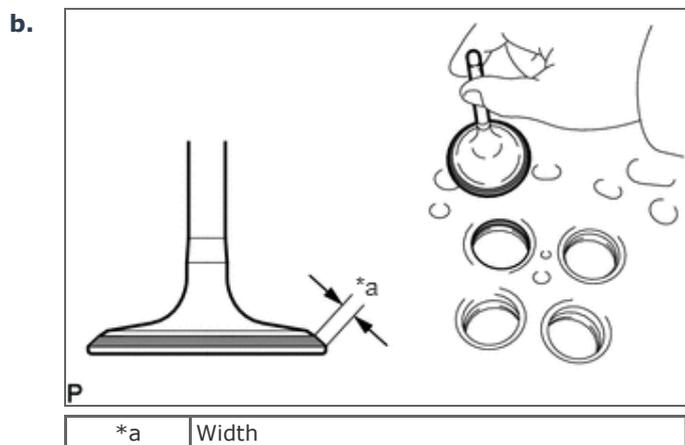
Item	Specified Condition
Intake Side	0.11 mm (0.00433 in.)

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.



Lightly press the intake valve face against the intake valve seat.

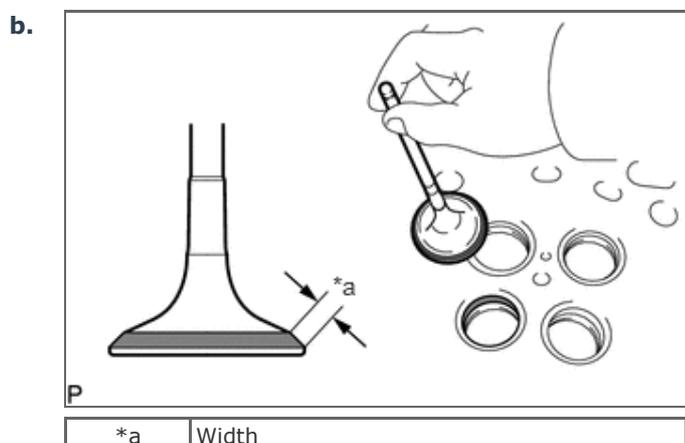
**HINT:**

Do not rotate the intake valve while pressing the intake valve.

- c. Check the intake valve face and intake valve seat.
- 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.
  - 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.
  - 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.



Lightly press the exhaust valve face against the exhaust valve seat.

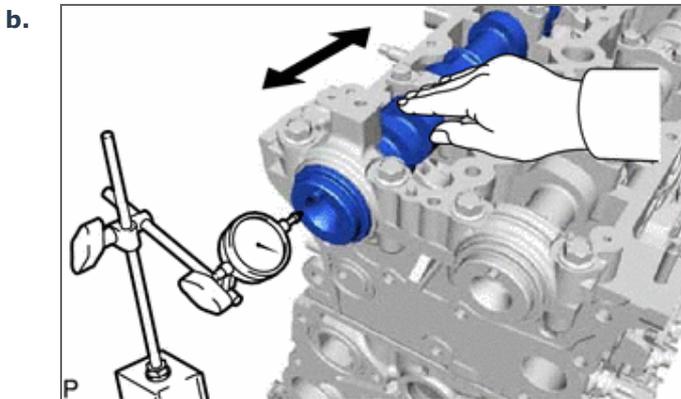
**HINT:**

Do not rotate the exhaust valve while pressing the exhaust valve.

- 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 / Hybrid System>1GD-FTV ENGINE MECHANICAL>ENGINE UNIT>REASSEMBLY](#)



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.)**

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 / Hybrid System>1GD-FTV ENGINE MECHANICAL>ENGINE UNIT>DISASSEMBLY](#)

## 9.INSPECT CAMSHAFT OIL CLEARANCE

Click here [Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>ENGINE UNIT>INSPECTION](#)

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**1GD-FTV ENGINE MECHANICAL 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.

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## 1GD-FTV ENGINE MECHANICAL CYLINDER HEAD REASSEMBLY

### PROCEDURE

#### 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:**

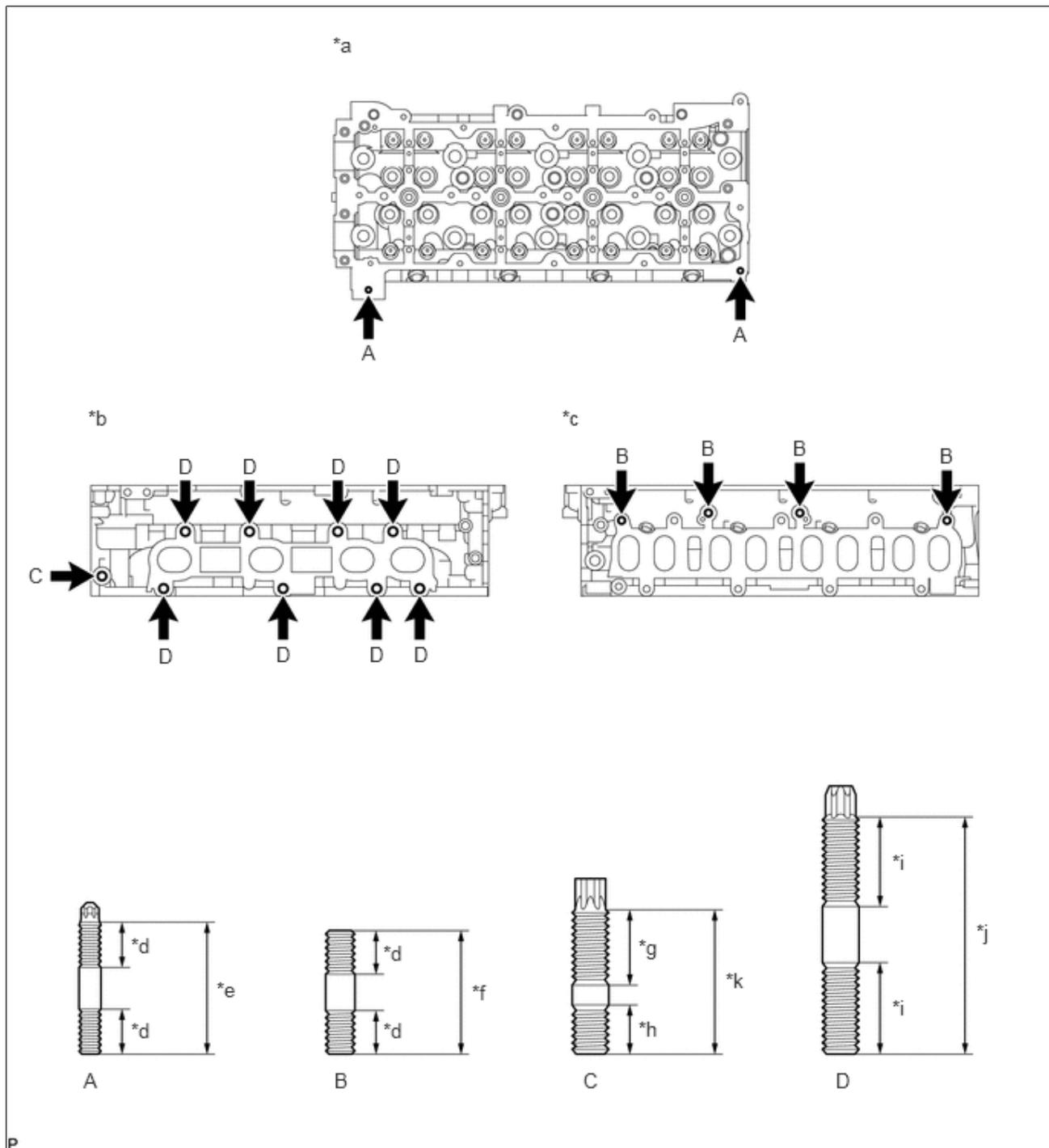
**for stud bolt B : 10 N\*m (102 kgf\*cm, 7 ft.\*lbf)**

- 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)**



*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.)	-	-

**2.INSTALL NO. 1 STRAIGHT SCREW PLUG WITH HEAD**

**11117E**

- 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**

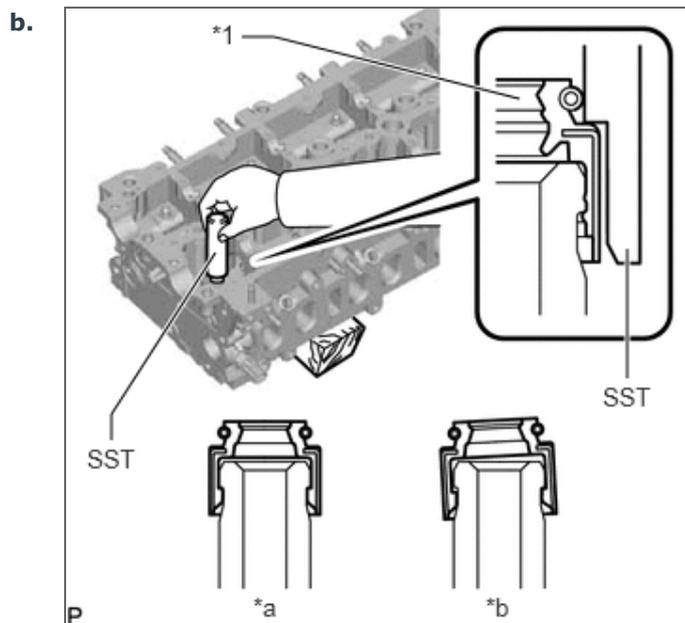
**13734A**

- a. Install the valve spring seats to the cylinder head sub-assembly.

**4.INSTALL VALVE STEM OIL SEAL**

**13711E**

- a. Apply a light coat of engine oil to a new valve stem oil seals.



*1	Valve Stem Oil Seal
*a	CORRECT
*b	INCORRECT

Using SST, push in the intake valve stem oil seals and exhaust valve stem oil seals to the valve guide bush.

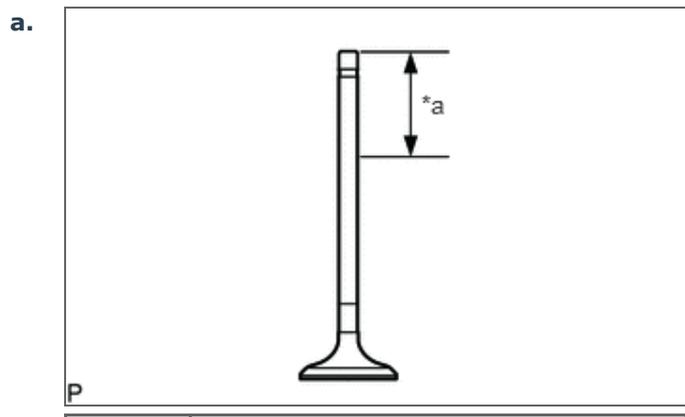
**SST**  
**09201-41020**

**NOTICE:**

Failure to use SST will cause the valve stem oil seal to be damaged or improperly seated.

**5.INSTALL INTAKE VALVE**

**13711**



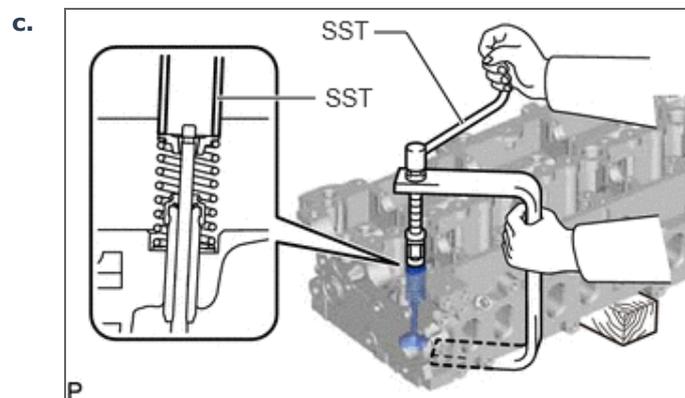
*a	30 mm (1.18 in.) or more
----	--------------------------

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.



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

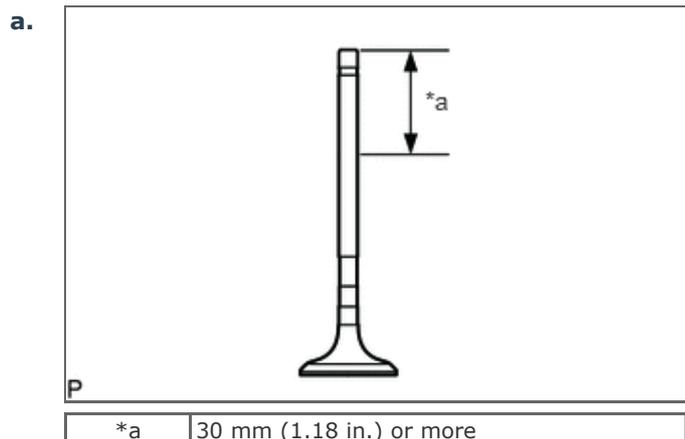
- d. Using a plastic-faced hammer, lightly tap the intake valve stem tip to ensure a proper fit.

**NOTICE:**

Be careful not to damage the valve spring retainer.

## 6.INSTALL EXHAUST VALVE

13715

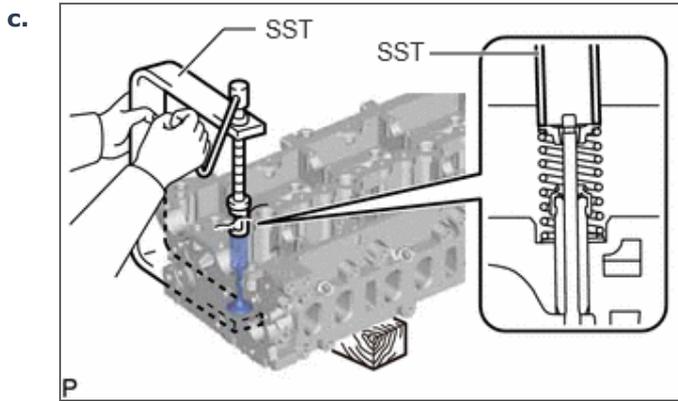


Apply plenty of engine oil to the tip area of the exhaust valve shown in the illustration.

- 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.



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 exhaust valve stem tip to ensure a proper fit.

**NOTICE:**

Be careful not to damage the valve spring retainer.

**7.INSTALL VALVE STEM CAP**

**13716**

- 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.

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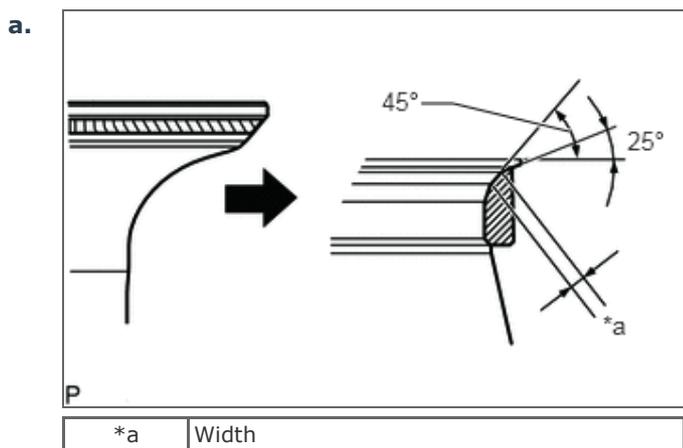
## 1GD-FTV ENGINE MECHANICAL CYLINDER HEAD REPAIR

## PROCEDURE

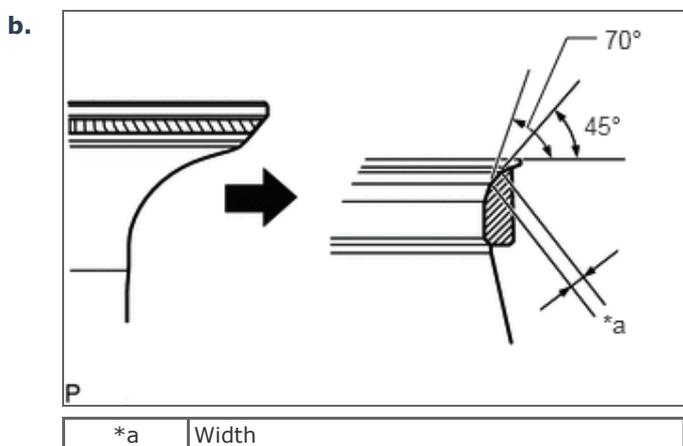
## 1.REPAIR INTAKE VALVE SEAT

## 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.



If the seating is too high on the intake valve face, use 25° and 45° cutters to correct the intake valve seat.



If the seating is too low on the intake valve face, use 70° and 45° cutters to correct the intake valve seat.

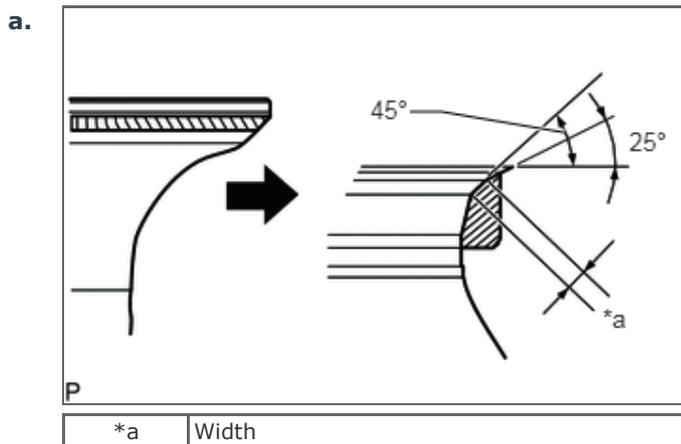
- c. Check that the intake valve seat contact is in the middle of the intake valve face and has the following width.

**Standard width:**  
**1.2 to 1.6 mm (0.0472 to 0.0630 in.)**

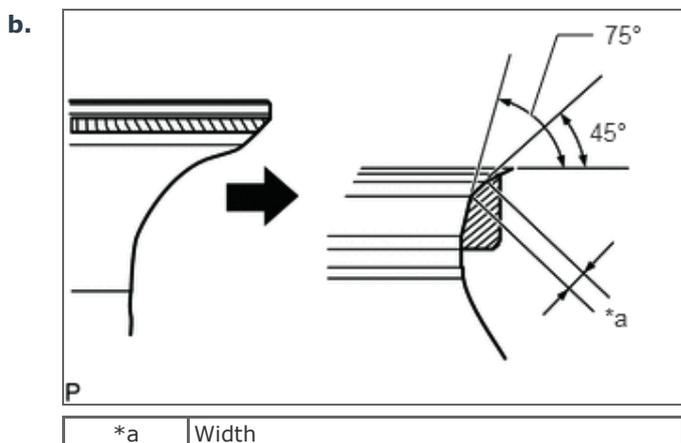
## 2.REPAIR EXHAUST VALVE SEAT

## 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.



If the seating is too high on the exhaust valve face, use 25° and 45° cutters to correct the exhaust valve seat.



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.)**

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1GD-FTV ENGINE MECHANICAL CYLINDER HEAD REPLACEMENT

**PROCEDURE**

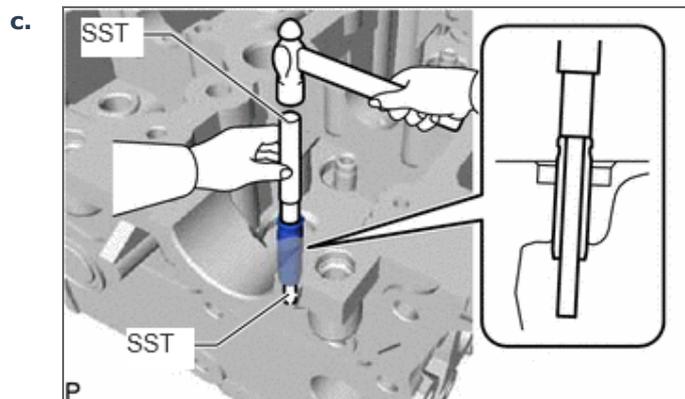
**1.REPLACE INTAKE VALVE GUIDE BUSH**

- 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.



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)

- 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:**

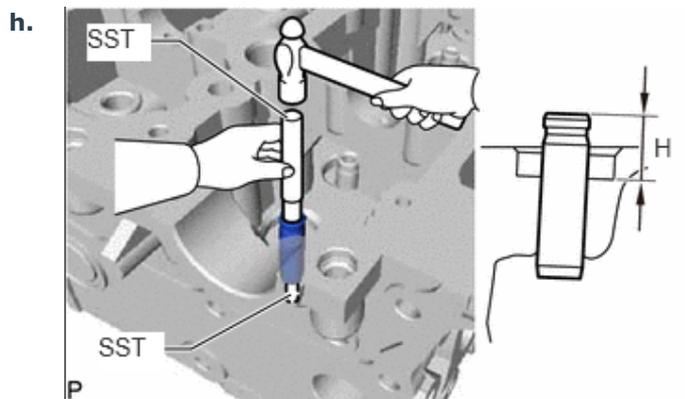
Bush Size	Specified Condition
Use STD	11.033 to 11.044 mm (0.4344 to 0.4348 in.)
Use O/S 0.05	11.083 to 11.094 mm (0.4363 to 0.4368 in.)

- 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.



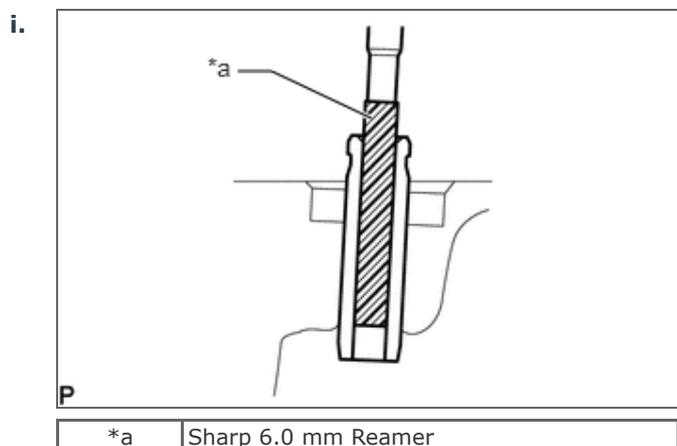
Using SST and a hammer, tap in a new intake valve guide bush to the specified protrusion height.

**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.)**



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.)**

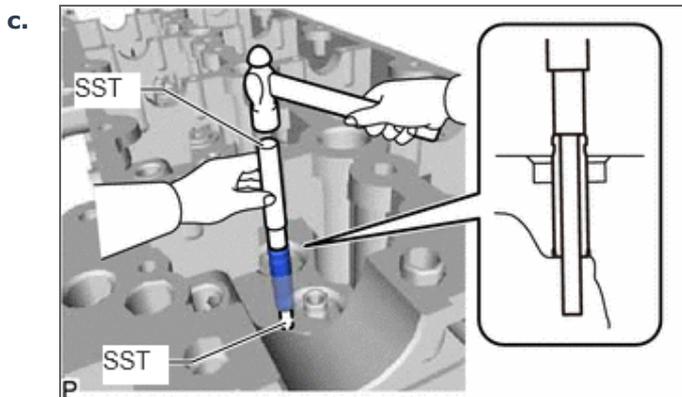
## **2.REPLACE EXHAUST VALVE GUIDE BUSH**

- 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.



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 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).

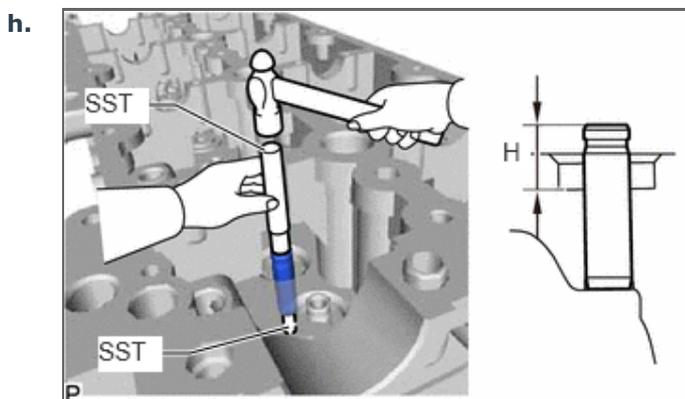
**Exhaust Valve Guide Bush:**

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.

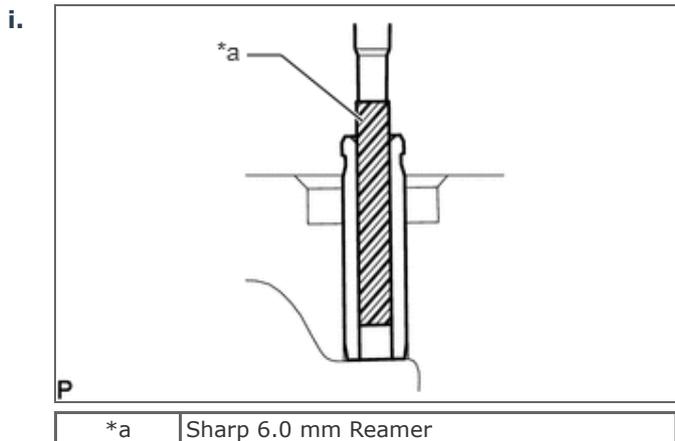


Using SST and a hammer, tap in a new exhaust valve guide bush to the specified protrusion height.

**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.)**



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.

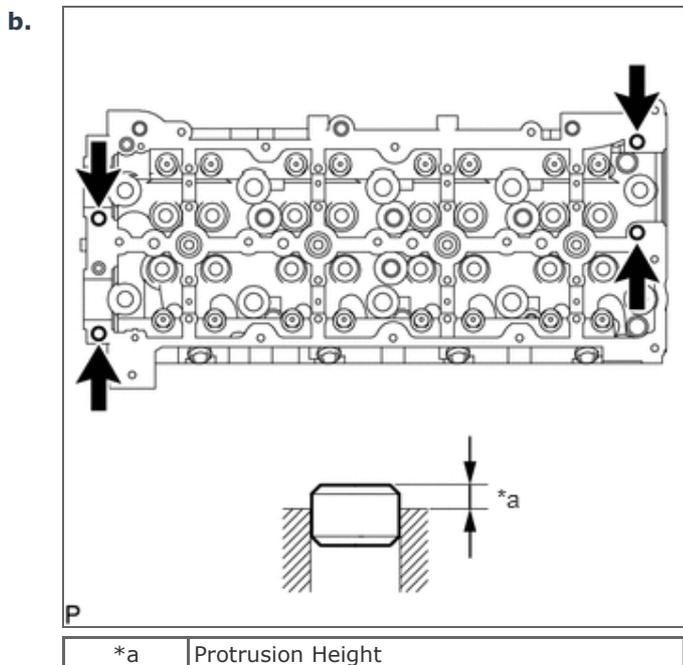
**Standard oil clearance:**  
**0.035 to 0.070 mm (0.00138 to 0.00276 in.)**

**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.



Using a plastic-faced hammer, tap in new ring pins to the cylinder head sub-assembly.

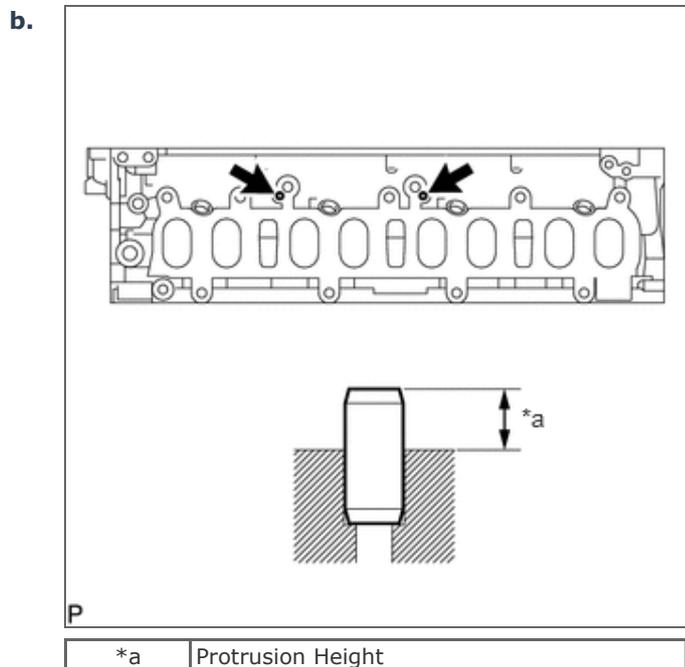
**Standard protrusion height:**  
**3.5 to 4.5 mm (0.138 to 0.177 in.)**

**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.



Using a plastic-faced hammer, tap in new straight pins to the cylinder head sub-assembly.

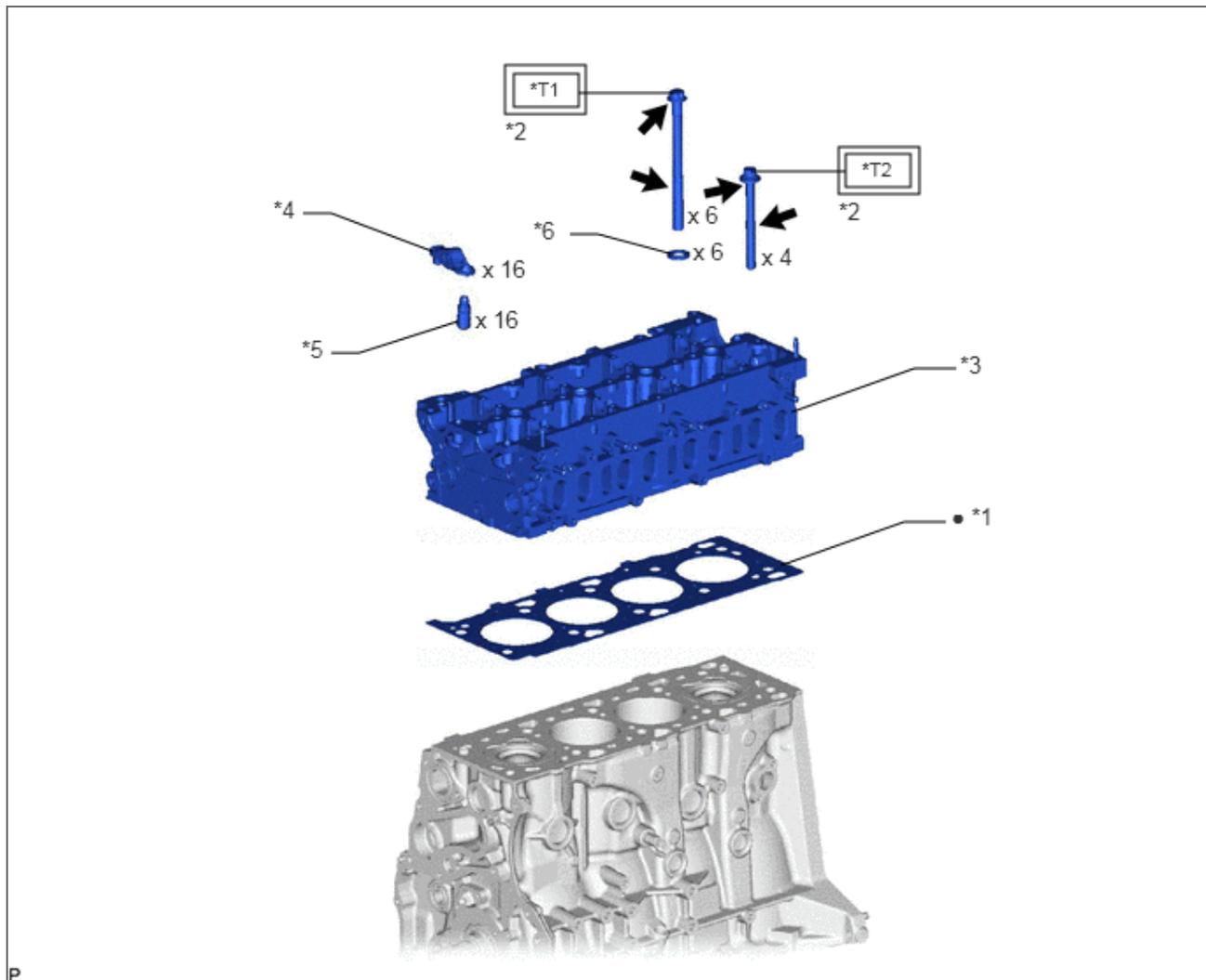
**Standard protrusion height:  
2.0 to 4.0 mm (0.0787 to 0.157 in.)**

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1GD-FTV ENGINE MECHANICAL CYLINDER HEAD GASKET COMPONENTS

ILLUSTRATION



*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°

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1GD-FTV ENGINE MECHANICAL CYLINDER HEAD GASKET INSTALLATION

**CAUTION / NOTICE / HINT**

**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)	<ul style="list-style-type: none"> <li>No. 1 injection pipe sub-assembly</li> <li>No. 2 injection pipe sub-assembly</li> </ul>
<ul style="list-style-type: none"> <li>Supply pump assembly</li> <li>Common rail assembly</li> <li>Cylinder block sub-assembly</li> <li>Cylinder head sub-assembly</li> <li>Cylinder head gasket</li> <li>Timing chain case assembly</li> </ul>	<ul style="list-style-type: none"> <li>No. 1 injection pipe sub-assembly</li> <li>No. 2 injection pipe sub-assembly</li> <li>Fuel inlet pipe sub-assembly</li> </ul>

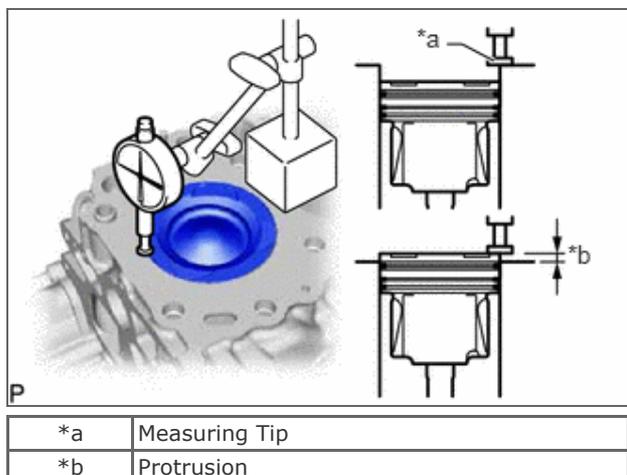
- After removing the No. 1 injection pipe sub-assembly, No. 2 injection pipe sub-assembly and/or fuel inlet pipe sub-assembly, clean them with a brush and compressed air.
- The injector assembly is a precision instrument. Do not use the injector assembly if it is struck or dropped.
- The supply pump 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.

**PROCEDURE**

**1.INSTALL CYLINDER HEAD GASKET**

11115

- 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.



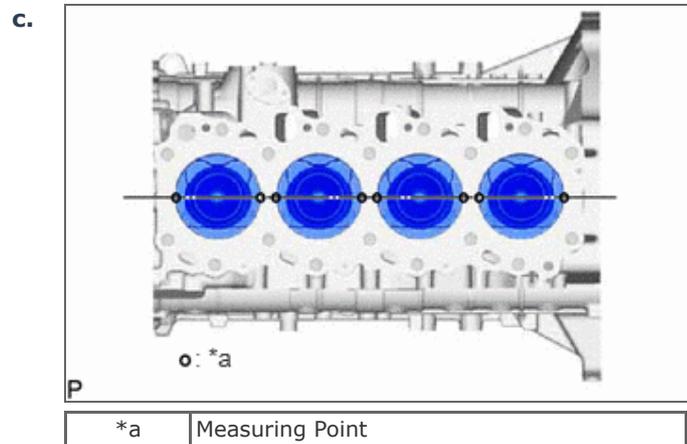
Place a dial indicator on the cylinder block sub-assembly, and position the measuring tip as shown in the illustration.

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.



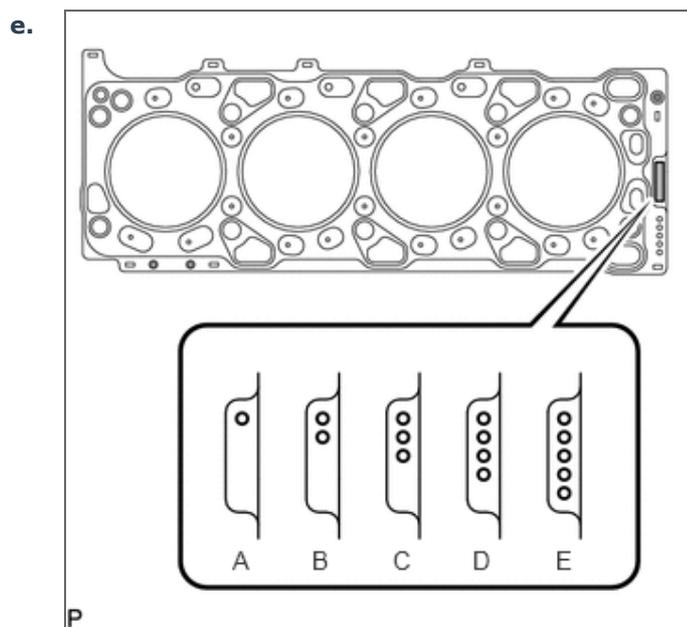
Measure the piston protrusion of each cylinder at the 2 points shown in the illustration.

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.



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.)

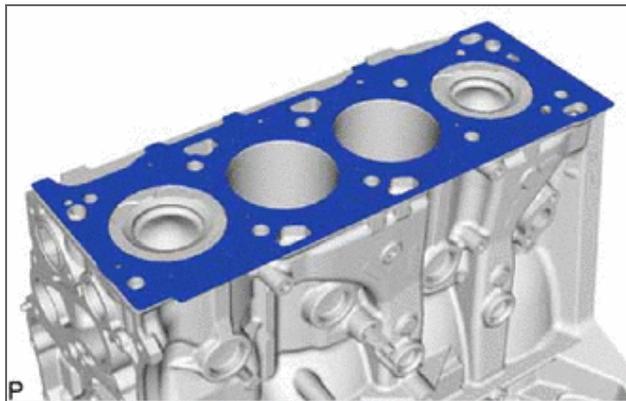
- i. Select the largest piston protrusion value from the measurements made. Then select a new appropriate cylinder head gasket according to the table below.

**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.

**2.INSTALL CYLINDER HEAD SUB-ASSEMBLY**

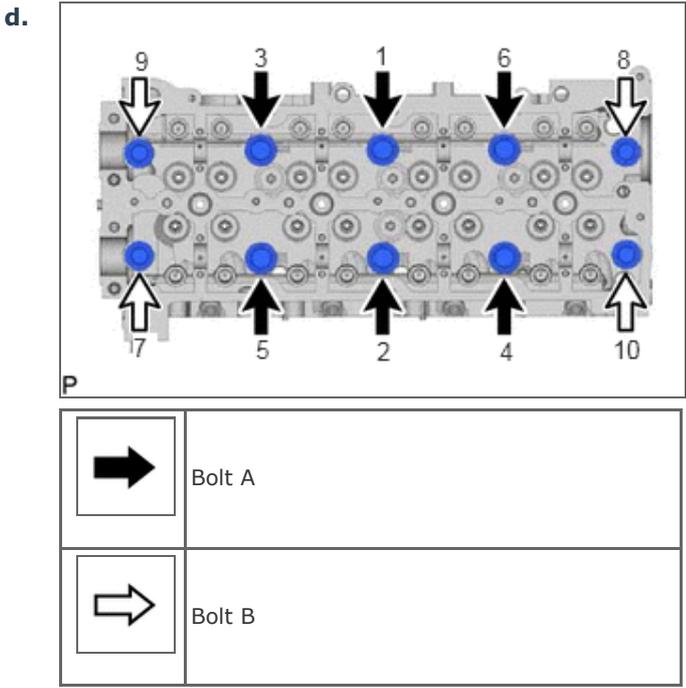
**11101**

**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.



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)**

**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 13750**

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>ENGINE UNIT>REASSEMBLY

**4.INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY 13801**

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>ENGINE UNIT>REASSEMBLY

**5.INSTALL TIMING CHAIN COVER ASSEMBLY 11310**

[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>INSTALLATION

**6.INSTALL CAMSHAFT**

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[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>CAMSHAFT>INSTALLATION

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## 1GD-FTV ENGINE MECHANICAL CYLINDER HEAD GASKET REMOVAL

**CAUTION / NOTICE / HINT**

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

**Necessary Procedure After Parts Removed/Installed/Replaced**

Replacement Part or Procedure	Necessary Procedures	Effects/Inoperative when not Performed	Link
Replacement of ECM	<ul style="list-style-type: none"> <li>Learning values save</li> <li>Learning values write</li> </ul>	Engine starting	w/o DPF (  ) w/ DPF (  )
	<b>for RC61:</b> Performing iMT installation information reset	<ul style="list-style-type: none"> <li>iMT system</li> <li>DTCs are output</li> </ul>	(  )
	Code registration (Immobiliser system)	Engine start function	See the Service Bulletin for the registration method.
Replacement of engine assembly	<ul style="list-style-type: none"> <li>Injector compensation code registration</li> <li>Pilot quantity learning</li> </ul>	Engine starting	w/o DPF (  ) w/ DPF (  )
	Clear Crank Time Compensation Data	Engine starting	w/o DPF (  ) w/ DPF (  )
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	w/o DPF (  ) w/ DPF (  )
Replacement of injector assembly	<ul style="list-style-type: none"> <li>Injector compensation code registration</li> <li>Pilot quantity learning</li> </ul>	Engine starting	w/o DPF (  ) w/ DPF (  )
<ul style="list-style-type: none"> <li>Replacement of diesel throttle body assembly</li> <li>Replacement of electric EGR control valve assembly</li> <li>Replacement of turbocharger sub-assembly</li> <li>Replacement of turbocharger sub-assembly or turbocharger variable nozzle motor</li> </ul>	Perform initialization	-	w/o DPF (  ) w/ DPF (  )

<p><b>for AC60E:</b> Replacement of automatic transmission assembly</p>	Reset memory	<ul style="list-style-type: none"> <li>Large shift shock</li> <li>Engine overruns</li> </ul>	(  )
<p><b>for AC60E:</b> Replacement of automatic transmission fluid</p>	ATF thermal degradation estimate reset	The value of the Data List item "ATF Thermal Degradation Estimate" is not estimated correctly	
<p><b>for AC60F:</b> Replacement of automatic transmission assembly</p>	Reset memory	<ul style="list-style-type: none"> <li>Large shift shock</li> <li>Engine overruns</li> </ul>	(  )
<p><b>for AC60F:</b> Replacement of automatic transmission fluid</p>	ATF thermal degradation estimate reset	The value of the Data List item "ATF Thermal Degradation Estimate" is not estimated correctly	
<p><b>w/ Automatic Headlight Beam Level Control System:</b> The vehicle height changes due to replacement of suspension components or after performing such operations as removal and reinstallation</p>	Headlight leveling ECU assembly initialization	Headlight leveling function	(  )
<p><b>for 4WD:</b> Front wheel alignment adjustment</p>	<ul style="list-style-type: none"> <li>Clearing zero point calibration data</li> <li>Yaw rate and acceleration sensor zero point calibration</li> </ul>	VSC malfunctioning	(  )

**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.

Replaced Parts (A)	Pipes Requiring New Replacement
Injector assembly (including shuffling the injector assemblies between the cylinders)	<ul style="list-style-type: none"> <li>No. 1 injection pipe sub-assembly</li> <li>No. 2 injection pipe sub-assembly</li> </ul>
<ul style="list-style-type: none"> <li>Supply pump assembly</li> <li>Common rail assembly</li> <li>Cylinder block sub-assembly</li> <li>Cylinder head sub-assembly</li> <li>Cylinder head gasket</li> <li>Timing chain case assembly</li> </ul>	<ul style="list-style-type: none"> <li>No. 1 injection pipe sub-assembly</li> <li>No. 2 injection pipe sub-assembly</li> <li>Fuel inlet pipe sub-assembly</li> </ul>

- 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.

## PROCEDURE

### 1.REMOVE CAMSHAFT

Click here [Engine / Hybrid System > 1GD-FTV ENGINE MECHANICAL > CAMSHAFT > REMOVAL](#)

### 2.REMOVE TIMING CHAIN COVER ASSEMBLY

11310

Click here [Engine / Hybrid System > 1GD-FTV LUBRICATION > OIL PUMP > REMOVAL](#)

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

13801

Click here [Engine / Hybrid System > 1GD-FTV ENGINE MECHANICAL > ENGINE UNIT > DISASSEMBLY](#)

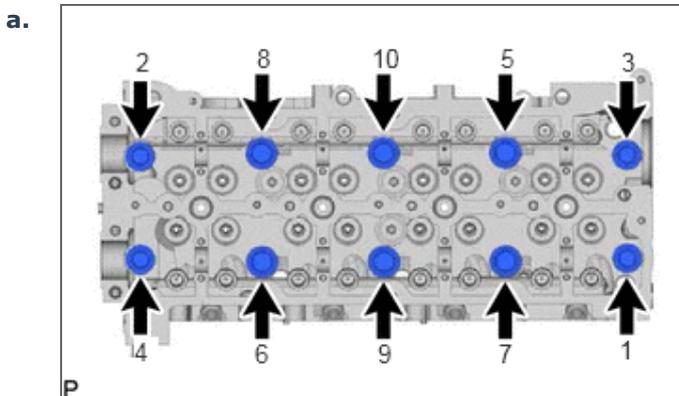
### 4.REMOVE VALVE LASH ADJUSTER ASSEMBLY

13750

Click here [Engine / Hybrid System > 1GD-FTV ENGINE MECHANICAL > ENGINE UNIT > DISASSEMBLY](#)

### 5.REMOVE CYLINDER HEAD SUB-ASSEMBLY

11101



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.

- 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.

 <b>6.REMOVE CYLINDER HEAD GASKET</b>	<b>11115</b>
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[Click here](#)Engine / Hybrid System>1KD-FTV ENGINE MECHANICAL>CYLINDER HEAD GASKET>REMOVAL

 <b>7.INSPECT CYLINDER HEAD SET BOLT</b>	<b>11101A</b>
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[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>ENGINE UNIT>INSPECTION

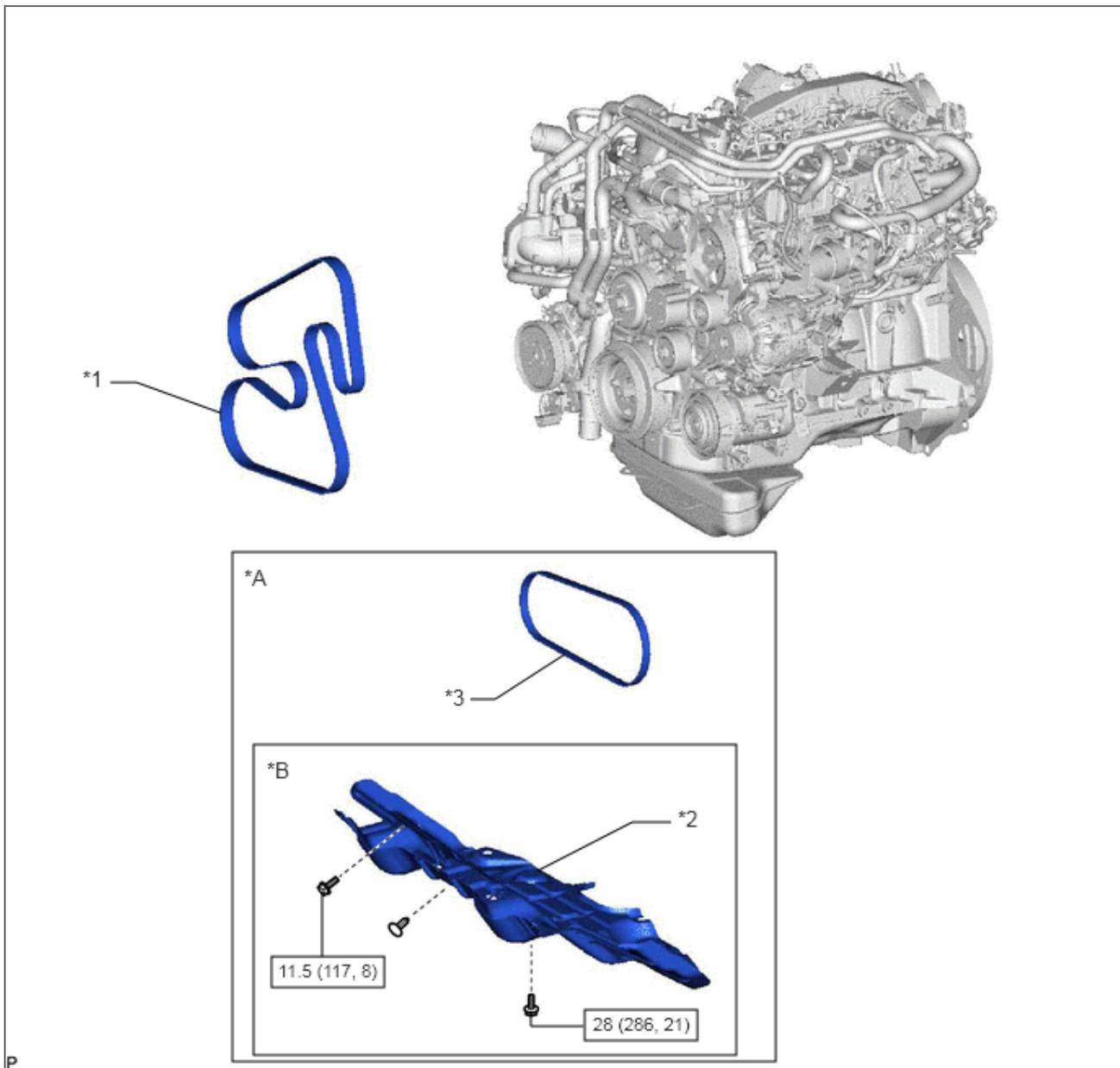
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1GD-FTV ENGINE MECHANICAL DRIVE BELT COMPONENTS

ILLUSTRATION



*A	w/ Viscous Heater	*B	for 4WD and Pre-Runner
*1	FAN AND GENERATOR V BELT	*2	NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY
*3	VISCOUS HEATER V BELT	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	-	-

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## 1GD-FTV ENGINE MECHANICAL DRIVE BELT INSTALLATION

## PROCEDURE

## 1.INSTALL FAN AND GENERATOR V BELT

16361A

- a. Set the fan and generator V belt onto each part.

**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.

- b. While turning the V-ribbed belt tensioner assembly clockwise, remove the pin.
- c. Check that the fan and generator V belt fits properly in the ribbed grooves.

**NOTICE:**

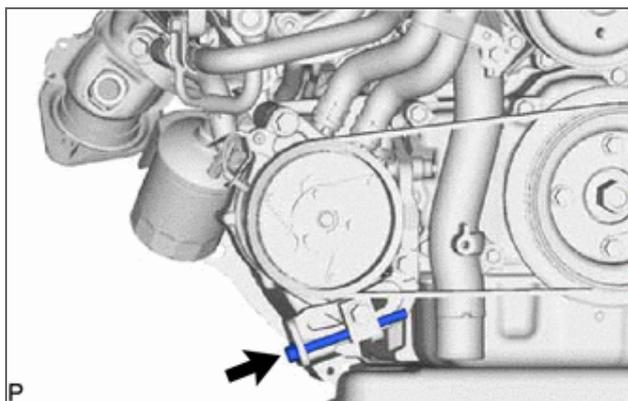
Make sure that the fan and generator V belt is set properly on each pulley.

## 2.INSTALL VISCOUS HEATER V BELT (w/ Viscous Heater)

88359

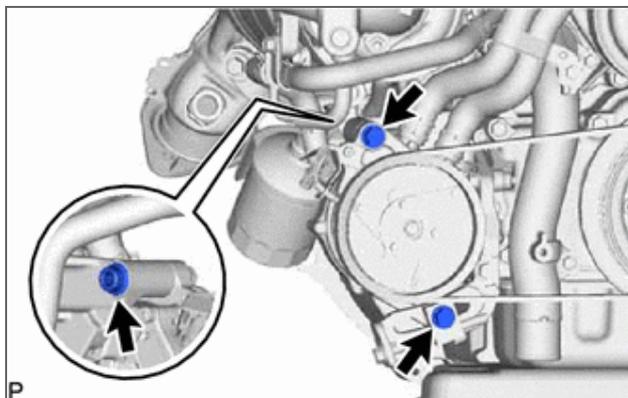
- a. Install the viscous heater V belt.

- b.



Turn the bolt and adjust the tension of the viscous heater V belt.

- c.



Tighten the 2 bolts and nut.

**Torque:**

**39 N\*m (398 kgf\*cm, 29 ft.\*lbf)**

- d. Check the tension of the viscous heater V belt.



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

**51410**

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>ENGINE ASSEMBLY>INSTALLATION

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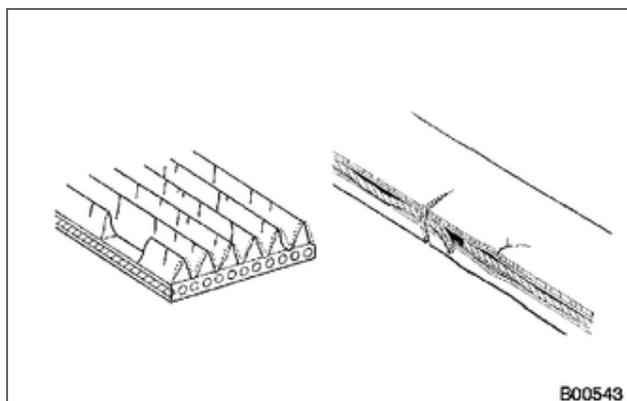
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## 1GD-FTV ENGINE MECHANICAL DRIVE BELT ON-VEHICLE INSPECTION

**CAUTION / NOTICE / HINT****CAUTION:**

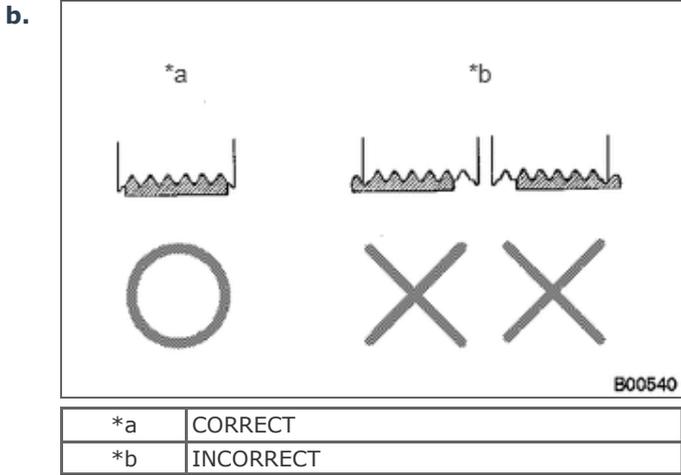
To prevent injury due to contact with an operating fan and generator V belt or cooling fan, keep your hands and clothing away from the fan and generator V belt and cooling fans when working in the engine compartment with the engine running.

**PROCEDURE****1.INSPECT FAN AND GENERATOR V BELT****16361A****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.



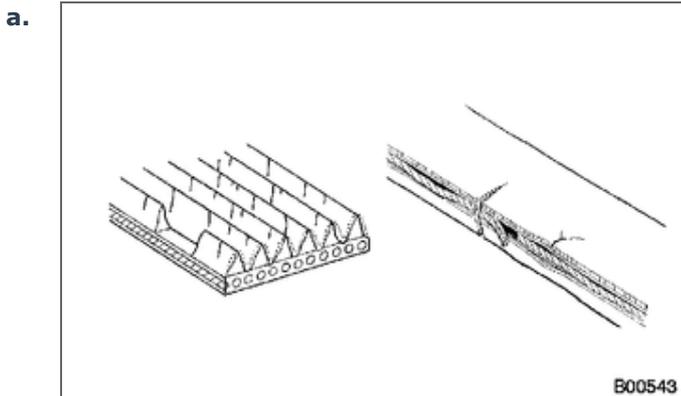
Check that the fan and generator V belt fits properly in the ribbed grooves.

**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.

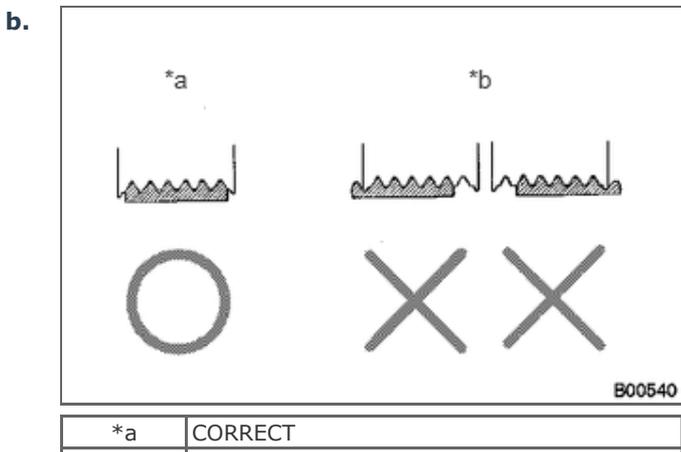
**2.INSPECT VISCOUS HEATER V BELT (w/ Viscous Heater)**

**88359**



Check the viscous heater V belt for wear, cracks or other signs of damage. If any of the following defects is found, replace the viscous heater V belt.

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



*b	INCORRECT
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Check that the viscous heater V belt fits properly in the ribbed grooves.

**HINT:**

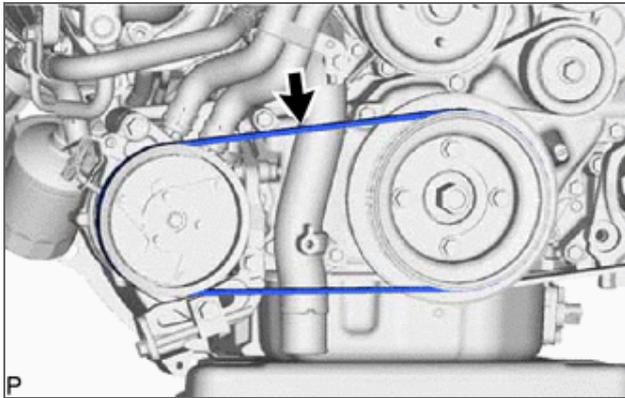
Check with your hand to confirm that the viscous heater V belt has not slipped out of the grooves on the bottom of the pulley. If it has slipped out, replace the viscous heater V belt. Install a new viscous heater V belt correctly.

c. Inspect the viscous heater V belt tension or deflection value.

**NOTICE:**

- Check and adjust the viscous heater V belt when engine is cold.
- Check the viscous heater V belt tension at the specified point.
- Perform the V belt tension and deflection value check after idling the engine for a few minutes. After this, rotate the crankshaft pulley 2 times and adjust to the middle of the range of values given for "New belt".
- With the exception of new belts, when reinstalling a belt used for 5 minutes or more, adjust to the middle of the range of values given for "Used belt".

i.



Using a belt tension gauge, check the viscous heater V belt tension.

**Standard Tension:**

Item	Condition	Specified Condition
New belt	Crankshaft pulley after 2 rotations	382 to 618 N (39 to 63 kgf, 85.9 to 138.9 lbf)
Used belt	Crankshaft pulley after 2 rotations	282 to 478 N (29 to 49 kgf, 63.4 to 107.5 lbf)

If the belt tension is not specified, adjust the viscous heater V belt.

ii. Check the viscous heater V belt deflection by pressing on the V belt at the point indicated in the illustration with 98 N (10 kgf, 22 lbf) of force.

**Standard Drive Deflection:**

Item	Condition	Specified Condition
New belt	Crankshaft pulley after 2 rotations	9 to 12 mm (0.354 to 0.472 in.)
Used belt	Crankshaft pulley after 2 rotations	11 to 14 mm (0.433 to 0.551 in.)

If the belt tension is not specified, adjust the viscous heater V belt.

### 3.INSPECT V-RIBBED BELT TENSIONER ASSEMBLY

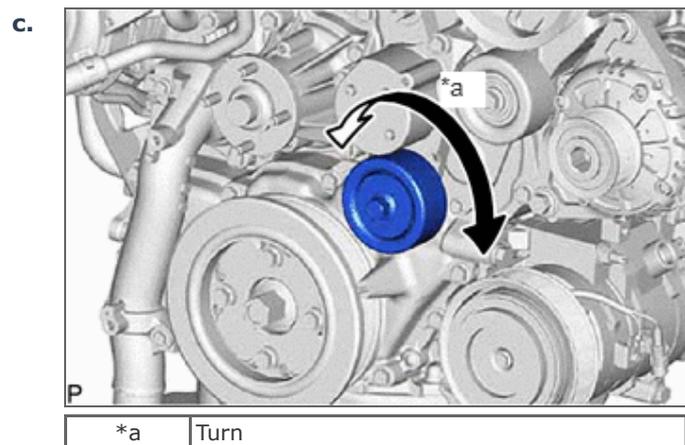
16620

- a. Remove the fan and generator V belt.  
Click here [Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>DRIVE BELT>REMOVAL](#)



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.



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 / Hybrid System>1GD-FTV ENGINE MECHANICAL>DRIVE BELT>INSTALLATION](#)

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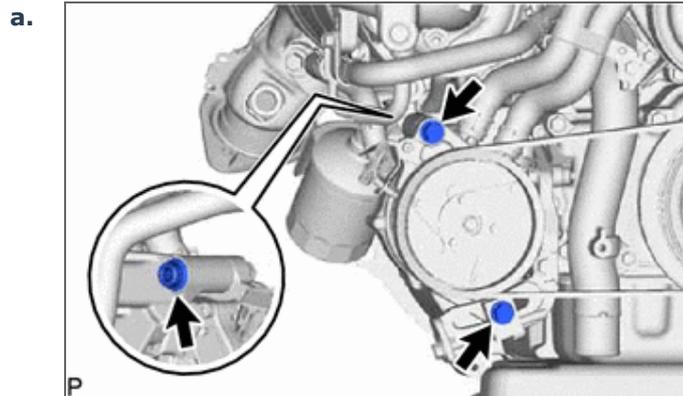
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## 1GD-FTV ENGINE MECHANICAL DRIVE BELT REMOVAL

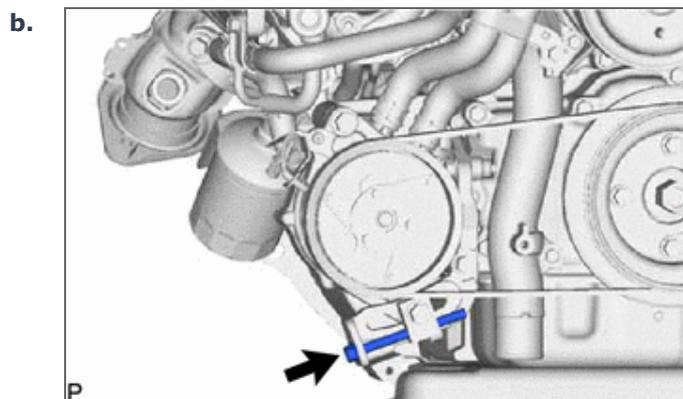
**PROCEDURE**

 1.REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY (for 4WD and Pre-Runner)	<b>51410</b>
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 2.REMOVE VISCOUS HEATER V BELT (w/ Viscous Heater)	<b>88359</b>
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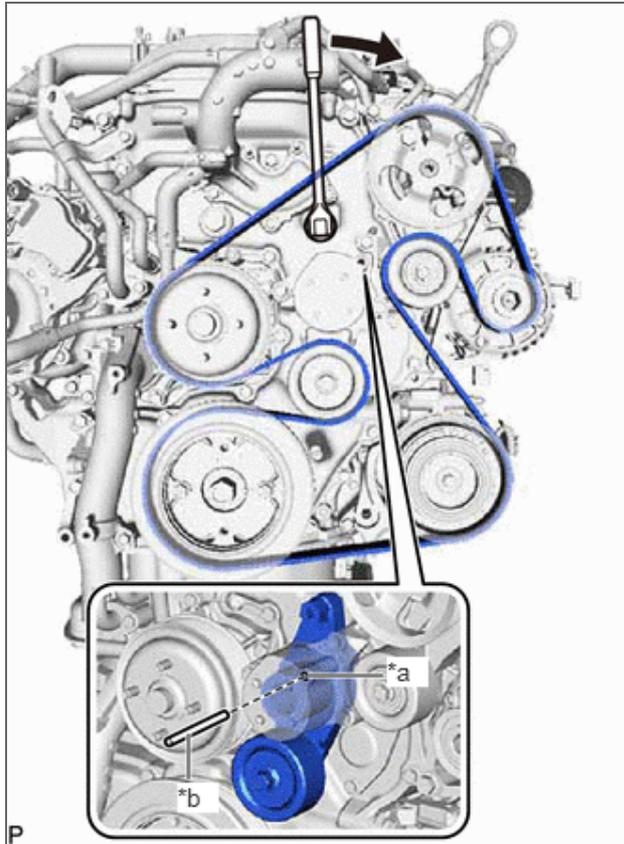
Loosen the 2 bolts and nut.



Turn the bolt to loosen the viscous heater V belt and reduce the tension. Then remove the viscous heater V belt.

 3.REMOVE FAN AND GENERATOR V BELT	<b>16361A</b>
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a.



*a	Service Hole
*b	Pin

While turning the V-ribbed belt tensioner assembly clockwise, align the service holes of the V-ribbed belt tensioner assembly, and then insert a pin with a diameter of 5.0 mm (0.197 in.) into the service holes to fix the V-ribbed belt tensioner assembly in place.

b. Remove the fan and generator V belt.

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## 1GD-FTV ENGINE MECHANICAL ENGINE ON-VEHICLE INSPECTION

**CAUTION / NOTICE / HINT****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](#) Engine / Hybrid System > 1GD-FTV STARTING > STARTING SYSTEM > PRECAUTION

**PROCEDURE**

<input type="checkbox"/>	<b>1.INSPECT ENGINE COOLANT</b>	
--------------------------	---------------------------------	--

[Click here](#) Engine / Hybrid System > 1GD-FTV COOLING > COOLING SYSTEM > ON-VEHICLE INSPECTION

<input type="checkbox"/>	<b>2.INSPECT ENGINE OIL</b>	
--------------------------	-----------------------------	--

[Click here](#) Engine / Hybrid System > 1GD-FTV LUBRICATION > LUBRICATION SYSTEM > ON-VEHICLE INSPECTION

<input type="checkbox"/>	<b>3.INSPECT BATTERY</b>	<b>28800</b>
--------------------------	--------------------------	--------------

[Click here](#) Power Source / Network > 1GD-FTV BATTERY / CHARGING > CHARGING SYSTEM > ON-VEHICLE INSPECTION

<input type="checkbox"/>	<b>4.INSPECT V-RIBBED BELT TENSIONER ASSEMBLY</b>	<b>16620</b>
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[Click here](#) Engine / Hybrid System > 1GD-FTV ENGINE MECHANICAL > DRIVE BELT > ON-VEHICLE INSPECTION

<input type="checkbox"/>	<b>5.CHECK VALVE LASH ADJUSTER NOISE</b>	<b>13750</b>
--------------------------	--	--------------

- 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.

<input type="checkbox"/>	<b>6.INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY</b>	<b>17801</b>
--------------------------	--	--------------

- 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.

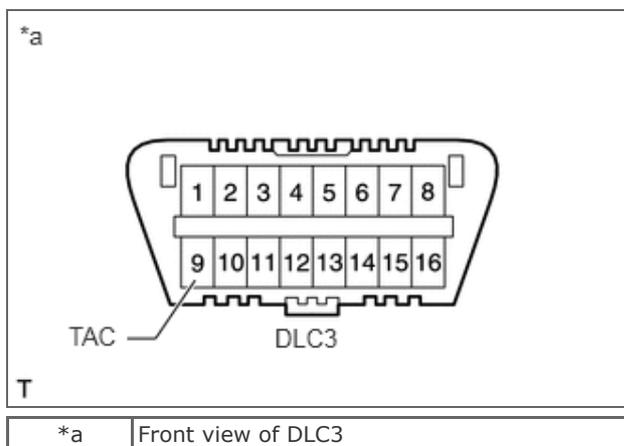
- ii. Start the engine and idle it.

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

**Powertrain > Engine and ECT > Data List**



- 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.
- 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.

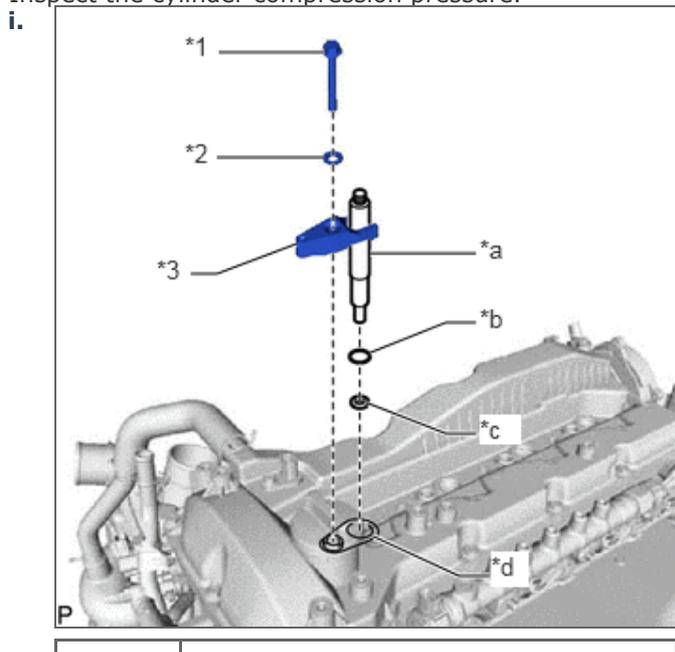
### 8.INSPECT MAXIMUM ENGINE SPEED

- 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 [Engine / Hybrid System > 1GD-FTV FUEL > FUEL INJECTOR > REMOVAL](#)
- c. Inspect the cylinder compression pressure.



*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

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.

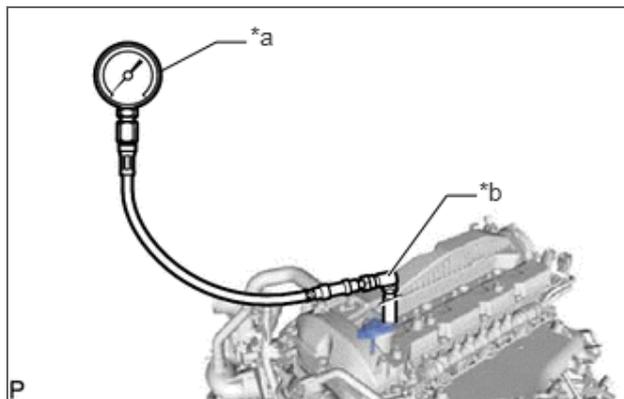
**SST**

**09992-19015 (09992-10120)**

**Torque:**

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

ii.



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

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

**SST**

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

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

**Standard compression pressure:**

**2700 kPa (27.5 kgf/cm<sup>2</sup>, 392 psi) or higher**

**Minimum pressure:**

**2200 kPa (22.4 kgf/cm<sup>2</sup>, 319 psi)**

**Difference between each cylinder:**

**500 kPa (5.1 kgf/cm<sup>2</sup>, 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 [Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION](#)

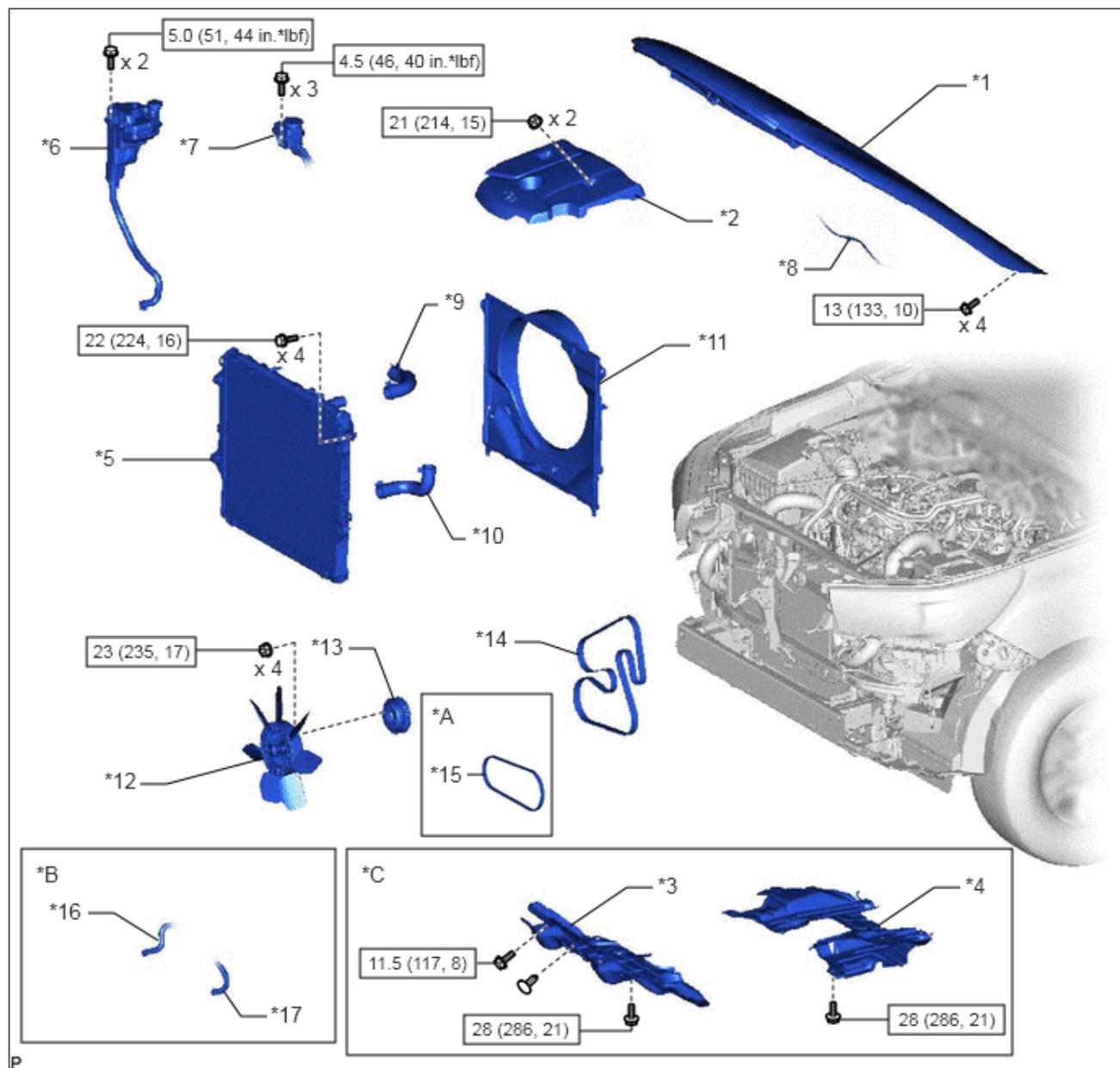
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1GD-FTV ENGINE MECHANICAL ENGINE ASSEMBLY COMPONENTS

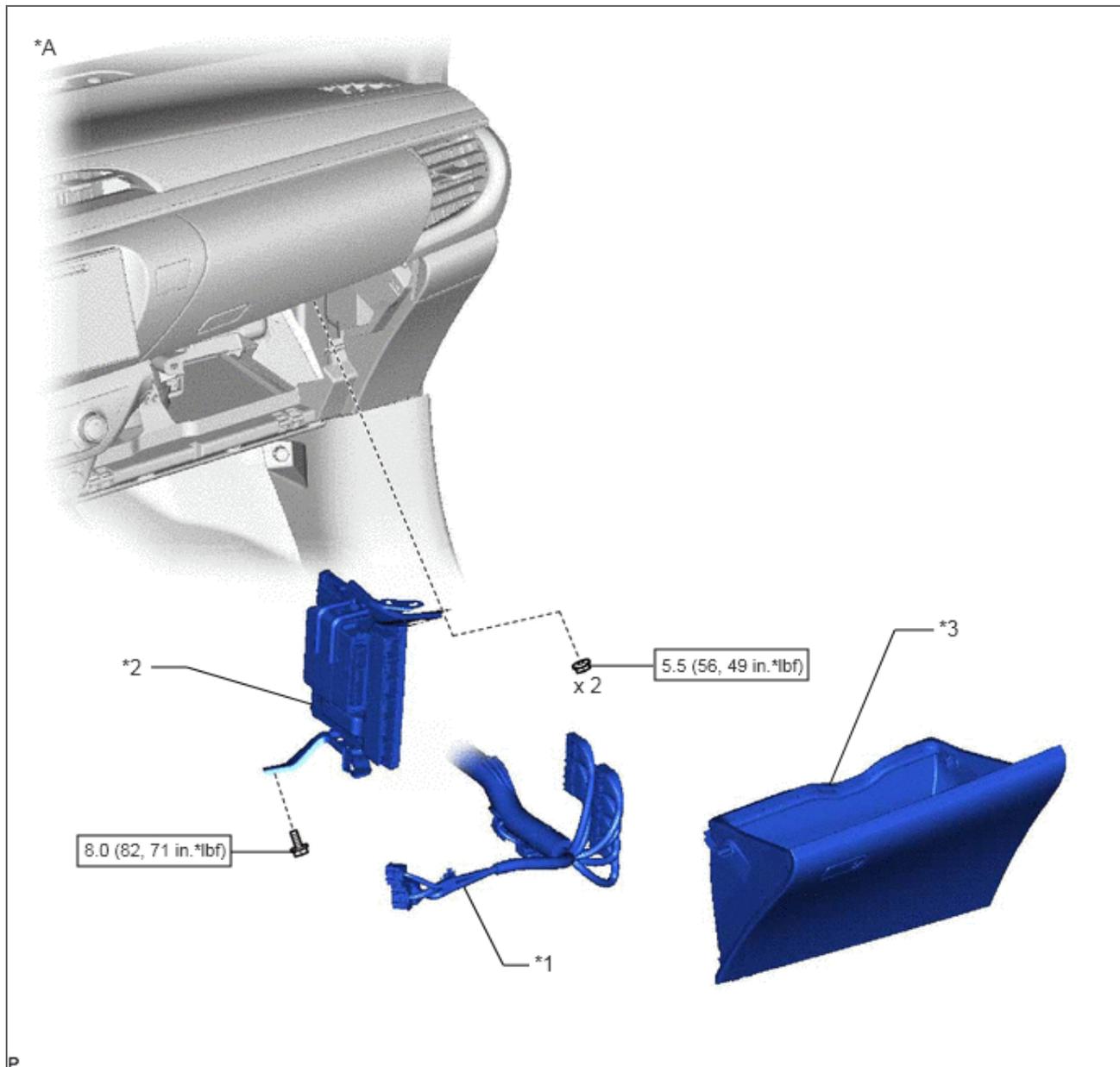
ILLUSTRATION



*A	w/ Viscous Heater	*B	for Automatic Transmission
*C	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	NO. 1 RADIATOR HOSE	*10	NO. 2 RADIATOR HOSE
*11	FAN SHROUD	*12	FAN WITH FLUID COUPLING ASSEMBLY
*13	FAN PULLEY	*14	FAN AND GENERATOR V BELT
*15	VISCOUS HEATER V BELT	*16	NO. 1 OIL COOLER OUTLET TUBE
*17	NO. 1 OIL COOLER INLET TUBE	-	-

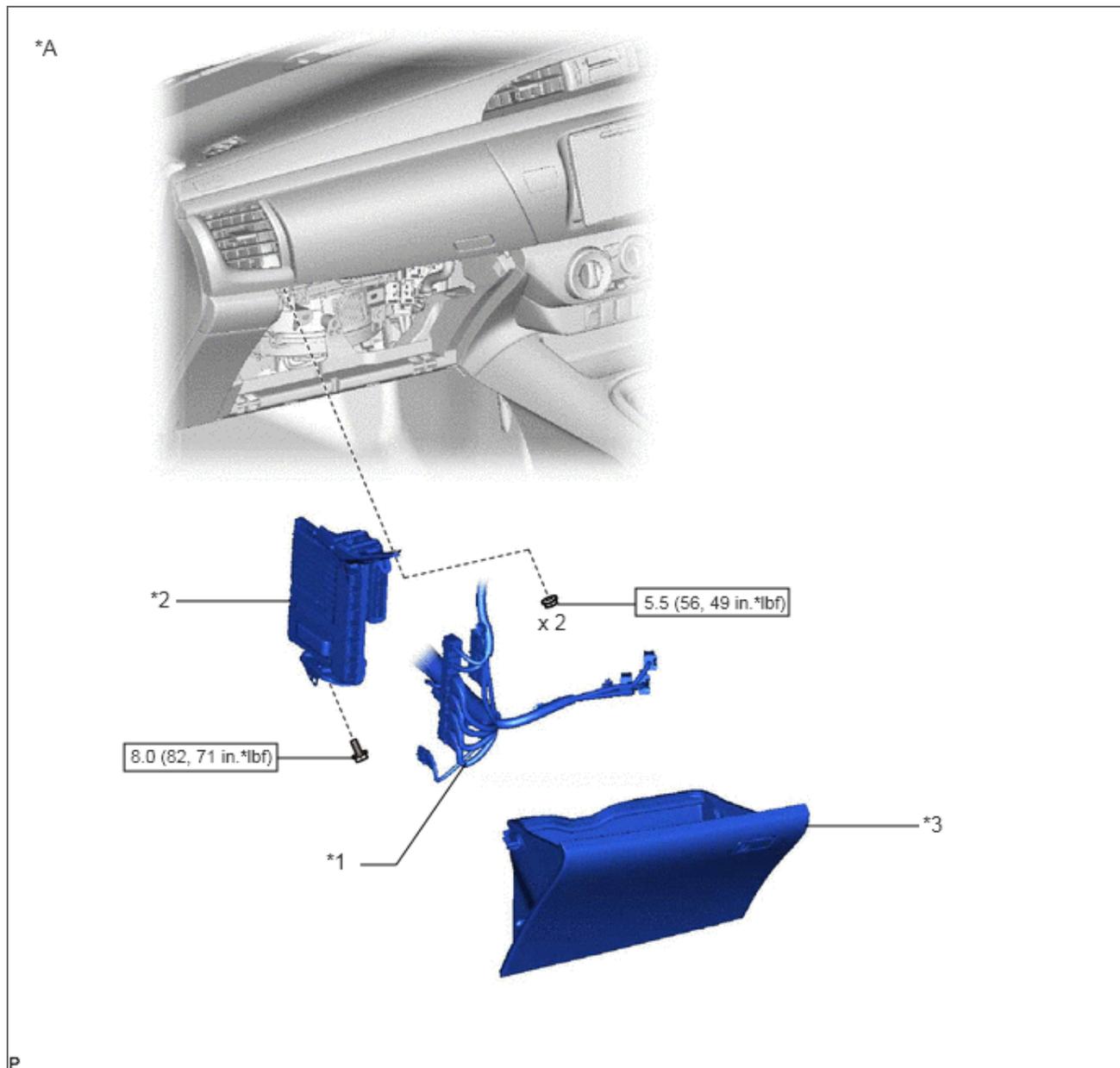
	N*m (kgf*cm, ft.*lbf): Specified torque	-	-	
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## ILLUSTRATION



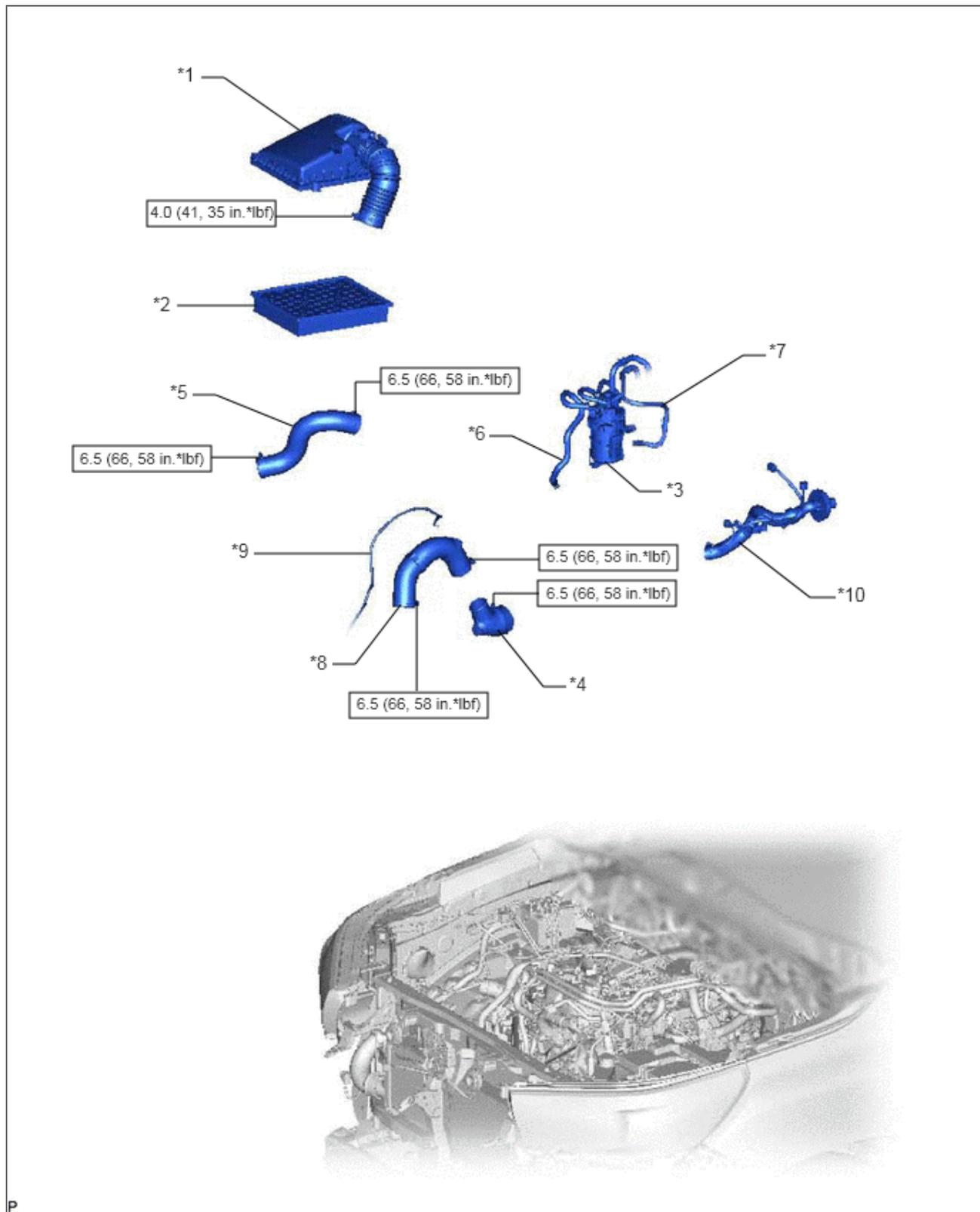
*A	for LHD	-	-	
*1	ENGINE WIRE	*2	ECM	
*3	GLOVE COMPARTMENT DOOR ASSEMBLY	-	-	
	N*m (kgf*cm, ft.*lbf): Specified torque	-	-	

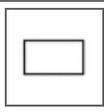
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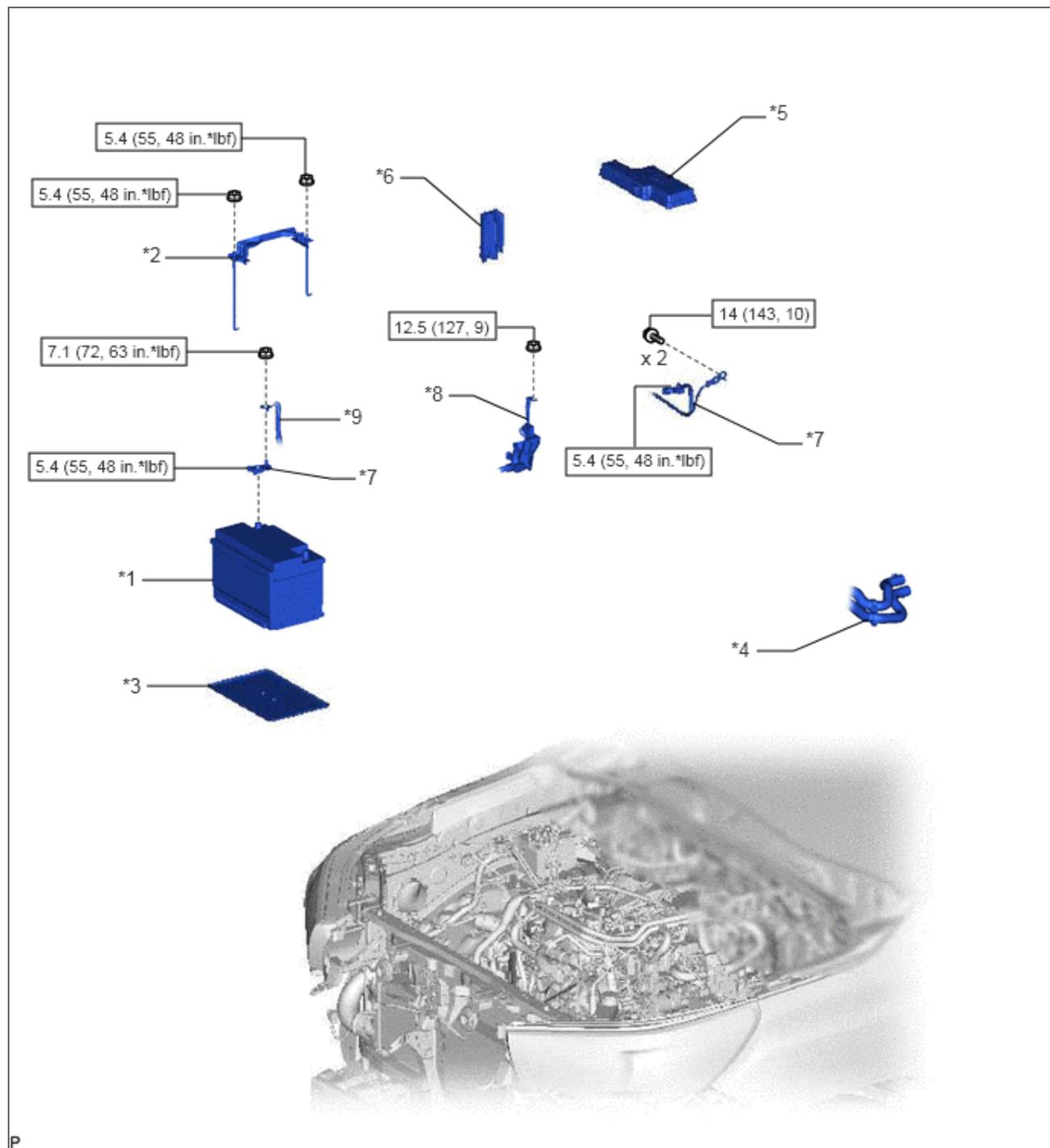
*A	for RHD	-	-
*1	ENGINE WIRE	*2	ECM
*3	GLOVE COMPARTMENT DOOR ASSEMBLY	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	-	-

## ILLUSTRATION

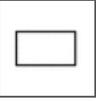


*1	AIR CLEANER CAP AND HOSE	*2	AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY
*3	FUEL FILTER ASSEMBLY	*4	INTERCOOLER AIR TUBE
*5	NO. 1 AIR HOSE	*6	NO. 1 FUEL HOSE
*7	NO. 2 FUEL HOSE	*8	NO. 4 AIR HOSE
*9	OIL RETURN HOSE	*10	ENGINE WIRE
	N*m (kgf*cm, ft.*lbf): Specified torque	-	-

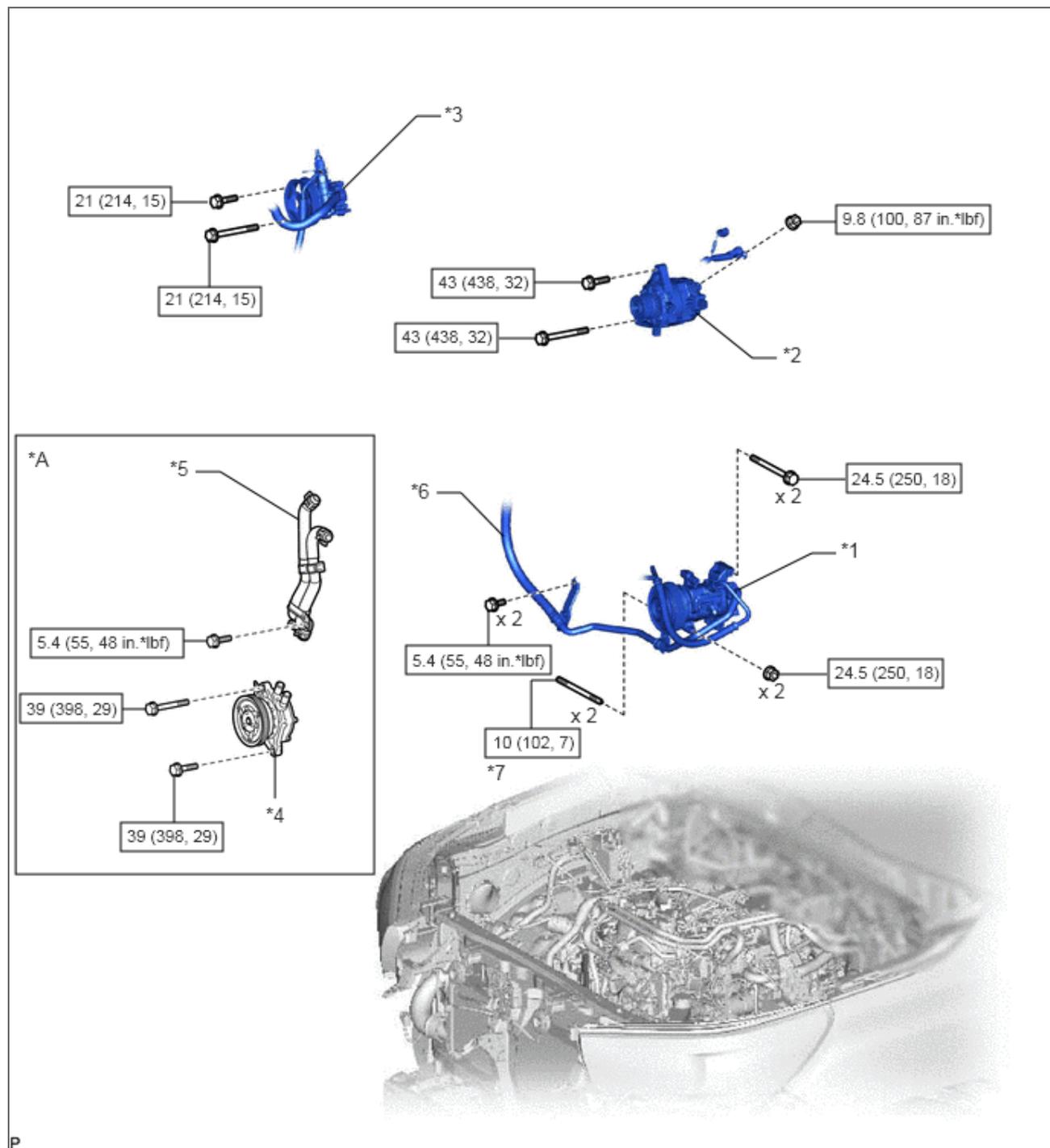
# ILLUSTRATION



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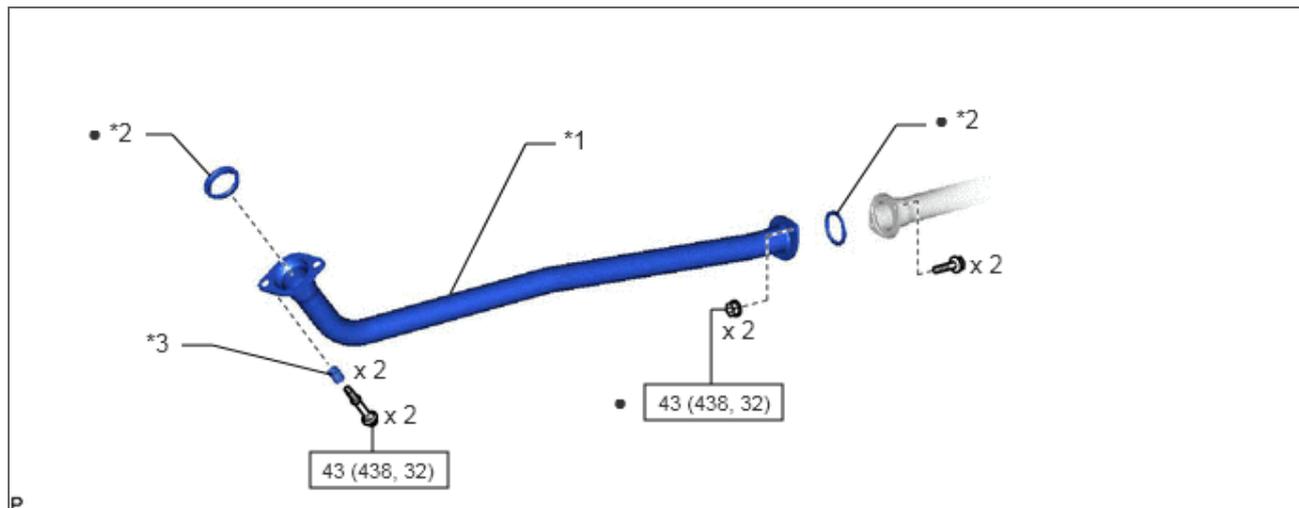
*1	BATTERY	*2	BATTERY CLAMP SUB-ASSEMBLY
*3	BATTERY TRAY	*4	WATER HOSE SUB-ASSEMBLY
*5	NO. 1 RELAY BLOCK UPPER	*6	NO. 1 RELAY BLOCK SIDE
*7	NO. 2 ENGINE WIRE	*8	WIRE TO WIRE
*9	ENGINE ROOM MAIN WIRE	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	-	-

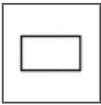
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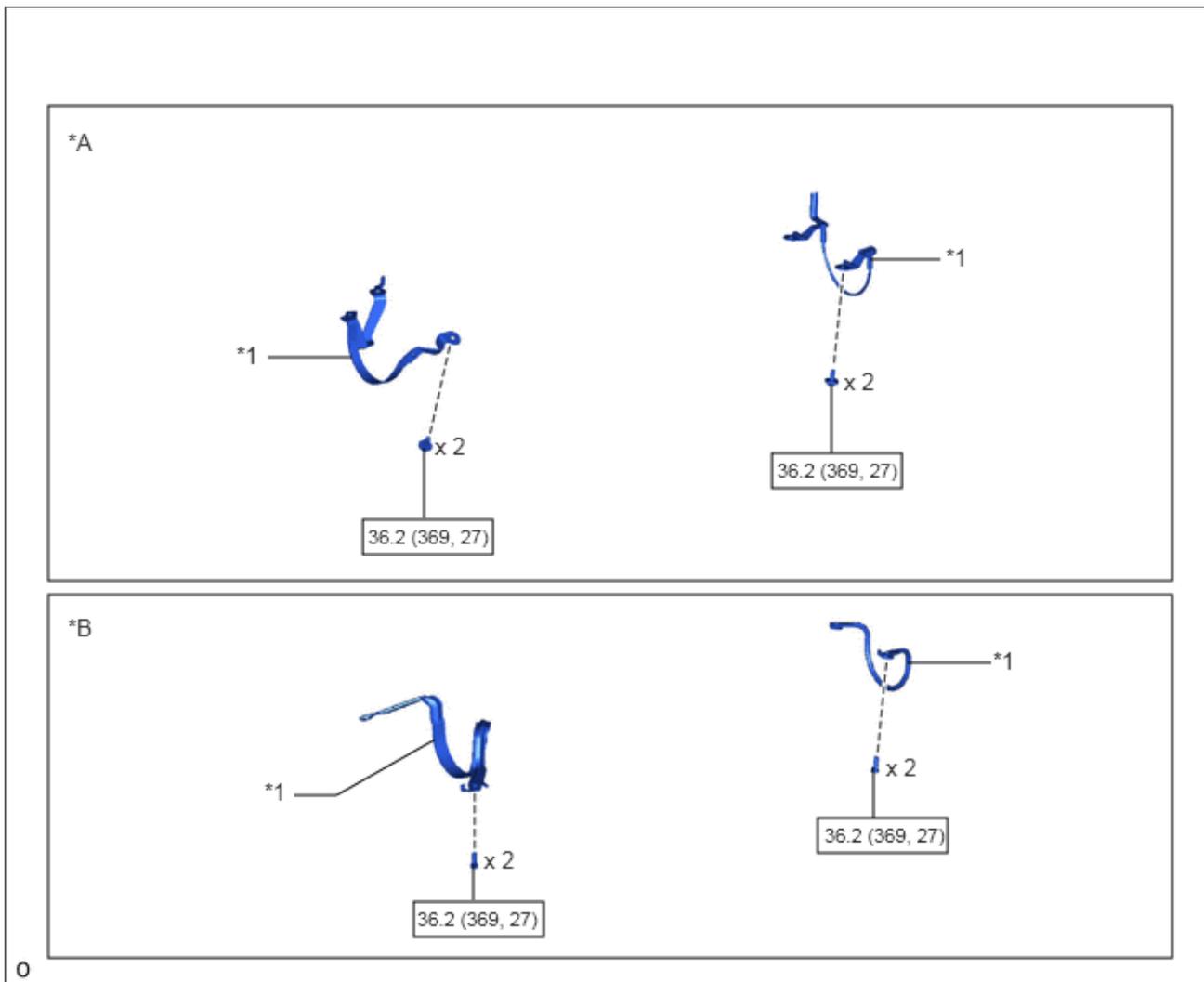
*A	w/ Viscous Heater	-	-
*1	COOLER COMPRESSOR ASSEMBLY	*2	GENERATOR ASSEMBLY
*3	VANE PUMP ASSEMBLY	*4	VISCOUS HEATER WITH MAGNET CLUTCH ASSEMBLY
*5	WATER HOSE SUB-ASSEMBLY	*6	SUCTION HOSE SUB-ASSEMBLY
*7	STUD BOLT	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	-	-

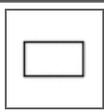
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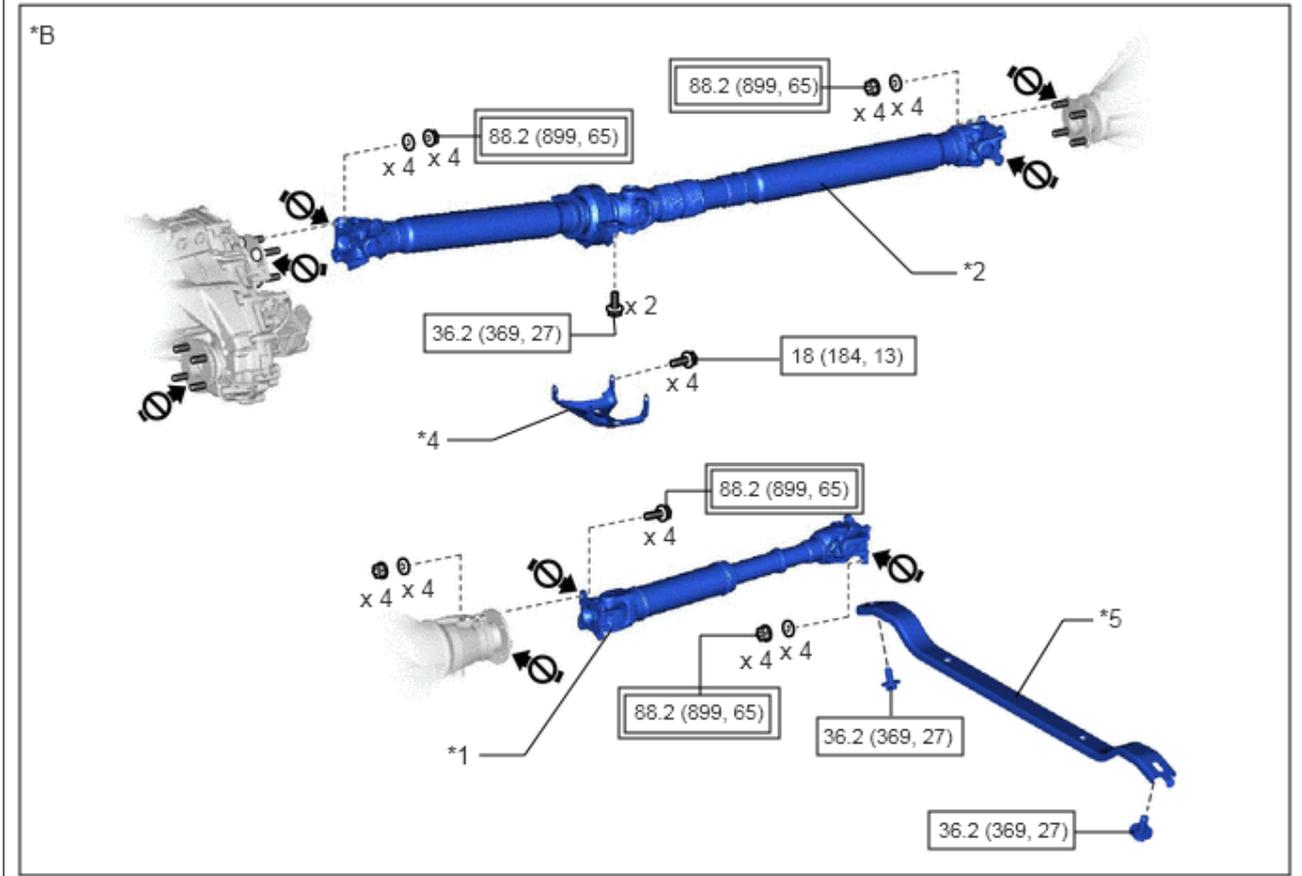
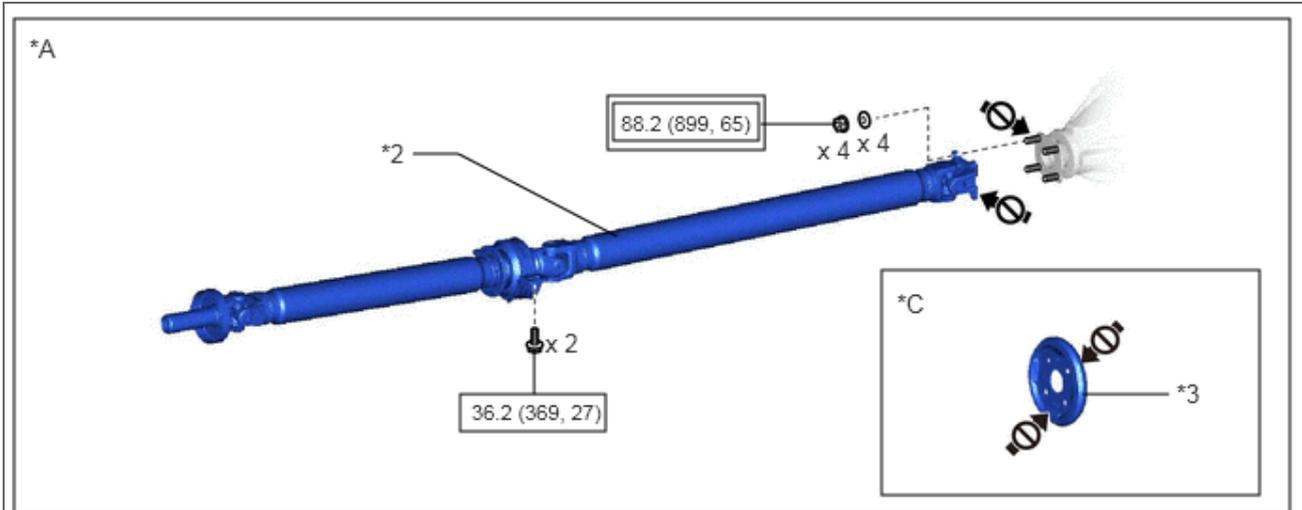
*1	FRONT EXHAUST PIPE ASSEMBLY	*2	GASKET
*3	COMPRESSION SPRING	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part

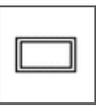
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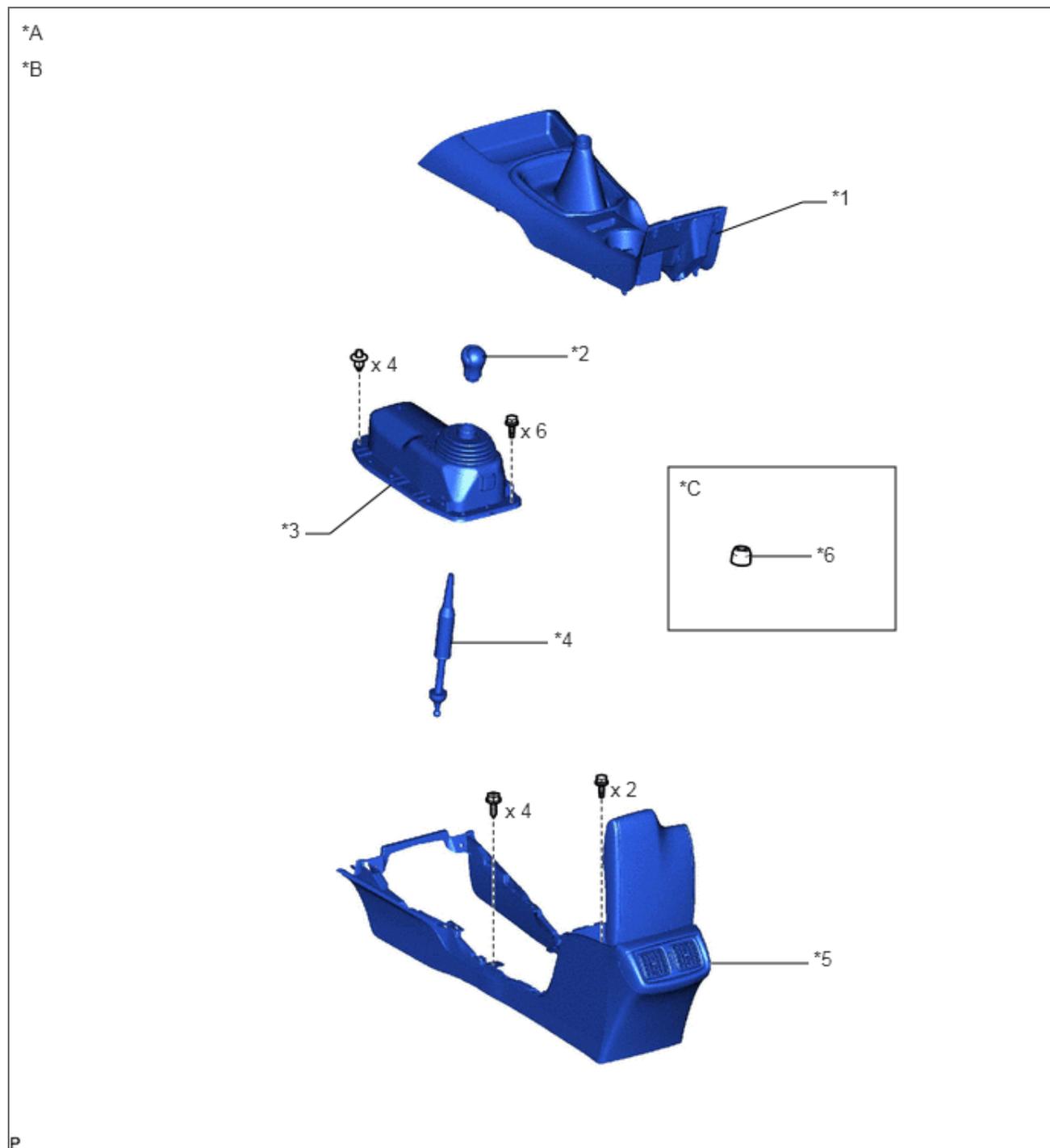
*A	for 2WD and Pre-Runner	*B	for 4WD
*1	PROPELLER SHAFT GUARD	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	-	-

## ILLUSTRATION



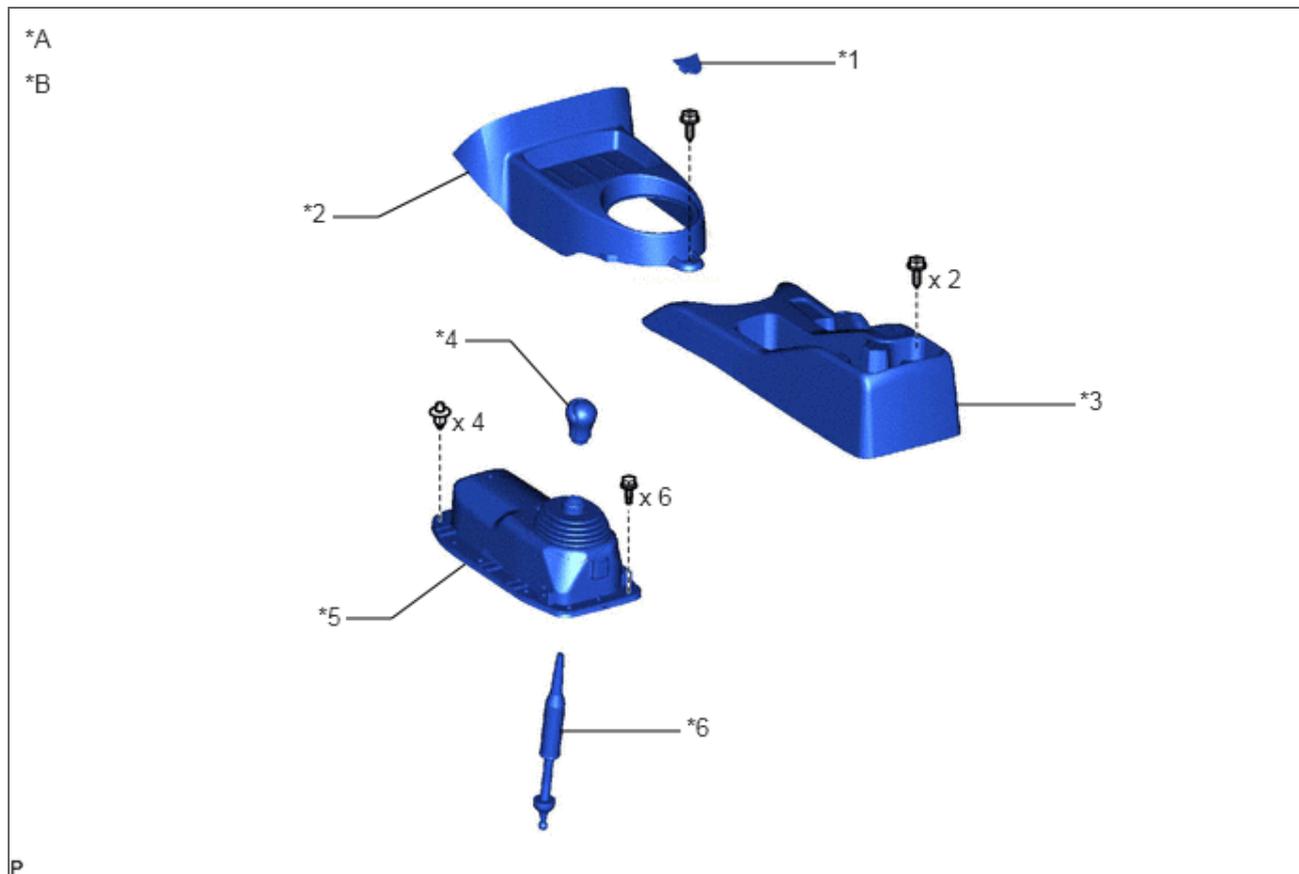
*A	for 2WD and Pre-Runner	*B	for 4WD
*C	for RC61	-	-
*1	FRONT PROPELLER SHAFT ASSEMBLY	*2	PROPELLER WITH CENTER BEARING SHAFT ASSEMBLY
*3	DIFFERENTIAL TORSIONAL DAMPER	*4	TRANSFER CASE PROTECTOR LOWER
*5	PROPELLER SHAFT GUARD	-	-
	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping": N*m (kgf*cm, ft.*lbf)		N*m (kgf*cm, ft.*lbf): Specified torque
	Do not apply lubricants	-	-

# ILLUSTRATION



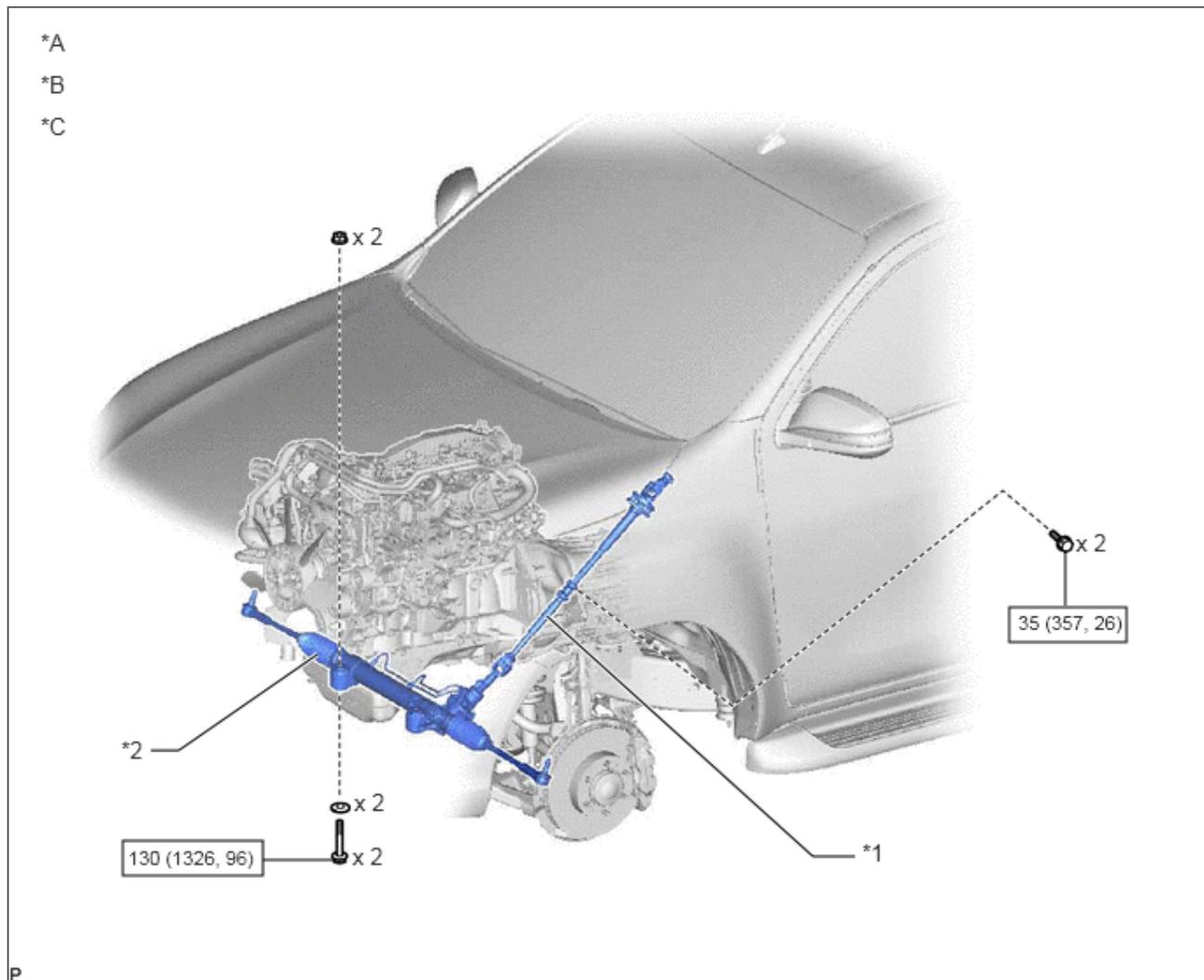
*A	for Manual Transmission	*B	w/ Console Box Lid
*C	for R151	-	-
*1	UPPER CONSOLE PANEL ASSEMBLY	*2	SHIFT LEVER KNOB SUB-ASSEMBLY
*3	SHIFT LEVER BOOT ASSEMBLY	*4	FLOOR SHIFT LEVER ASSEMBLY
*5	CONSOLE BOX ASSEMBLY	*6	FLOOR SHIFT LEVER COVER

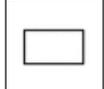
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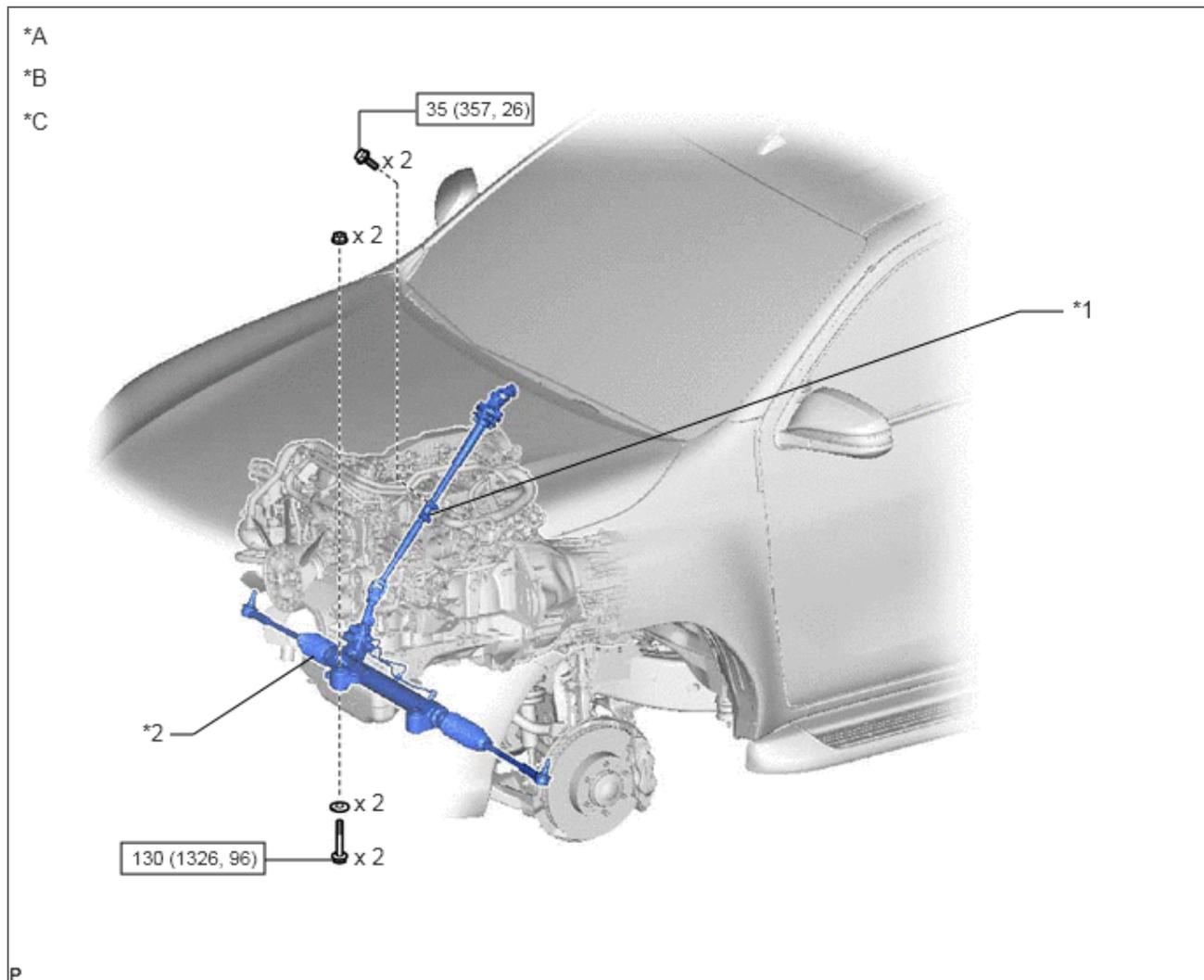
*A	for Manual Transmission	*B	w/o Console Box Lid
*1	FRONT CONSOLE BOX COVER	*2	FRONT CONSOLE BOX
*3	REAR CONSOLE BOX SUB-ASSEMBLY	*4	SHIFT LEVER KNOB SUB-ASSEMBLY
*5	SHIFT LEVER BOOT ASSEMBLY	*6	FLOOR SHIFT LEVER ASSEMBLY

## ILLUSTRATION



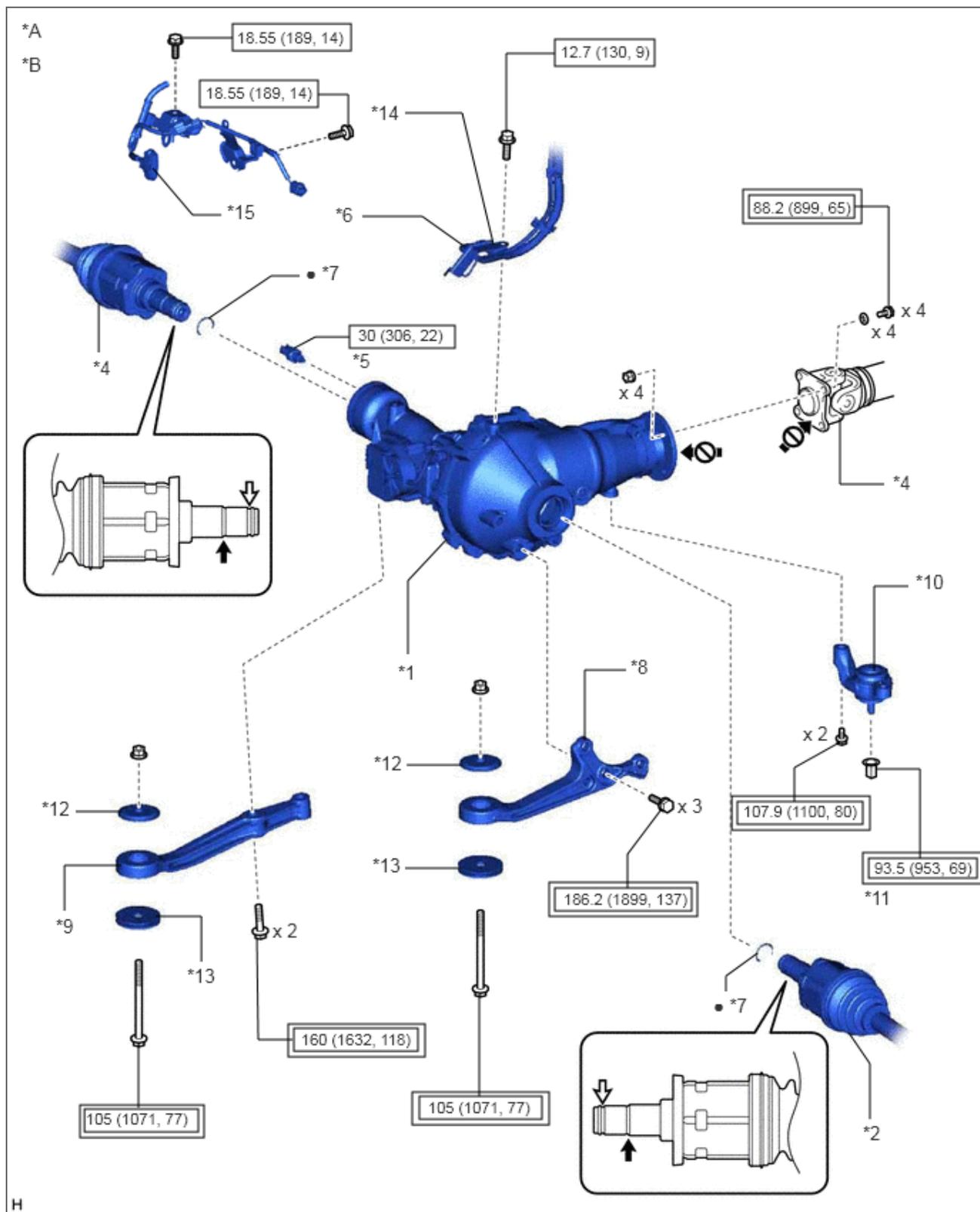
*A	for LHD	*B	for Manual Transmission
*C	for 4WD	-	-
*1	STEERING SLIDING YOKE	*2	POWER STEERING LINK ASSEMBLY
	N*m (kgf*cm, ft.*lbf) : Specified torque	-	-

**ILLUSTRATION**



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

**ILLUSTRATION**

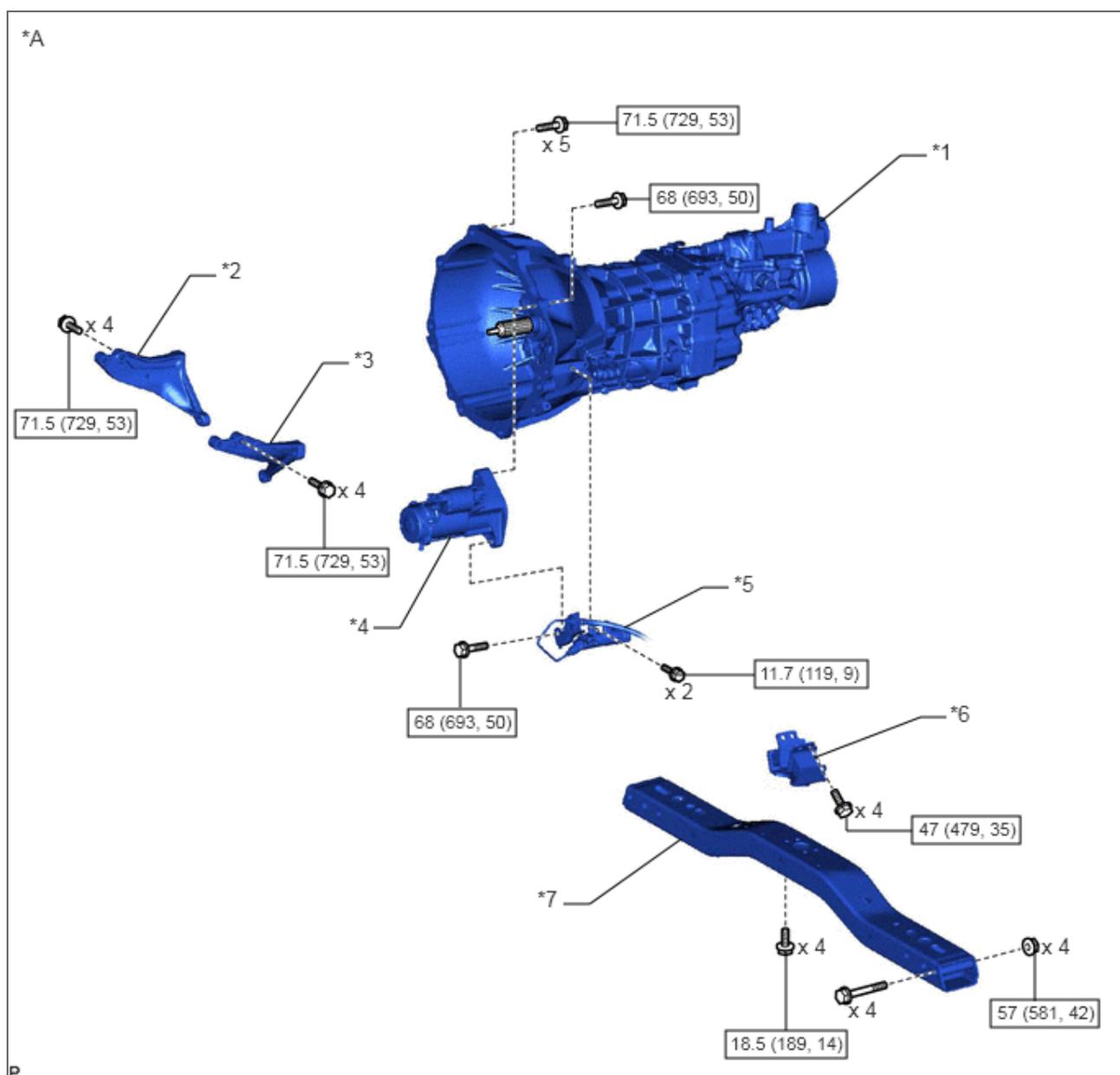


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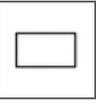
*A	for Manual Transmission	*B	for 4WD
*1	FRONT DIFFERENTIAL CARRIER ASSEMBLY	*2	FRONT DRIVE SHAFT ASSEMBLY LH
*3	FRONT DRIVE SHAFT ASSEMBLY RH	*4	FRONT PROPELLER SHAFT ASSEMBLY
*5	OIL TEMPERATURE SENSOR	*6	FRONT DIFFERENTIAL BREATHER HOSE
*7	FRONT DRIVE SHAFT HOLE SNAP RING	*8	FRONT NO. 1 DIFFERENTIAL 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
*15	WIRE HARNESS	-	-

	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
<ul style="list-style-type: none"> <li>•</li> </ul>	Non-reusable part		Differential oil
	MP grease		Do not apply lubricants

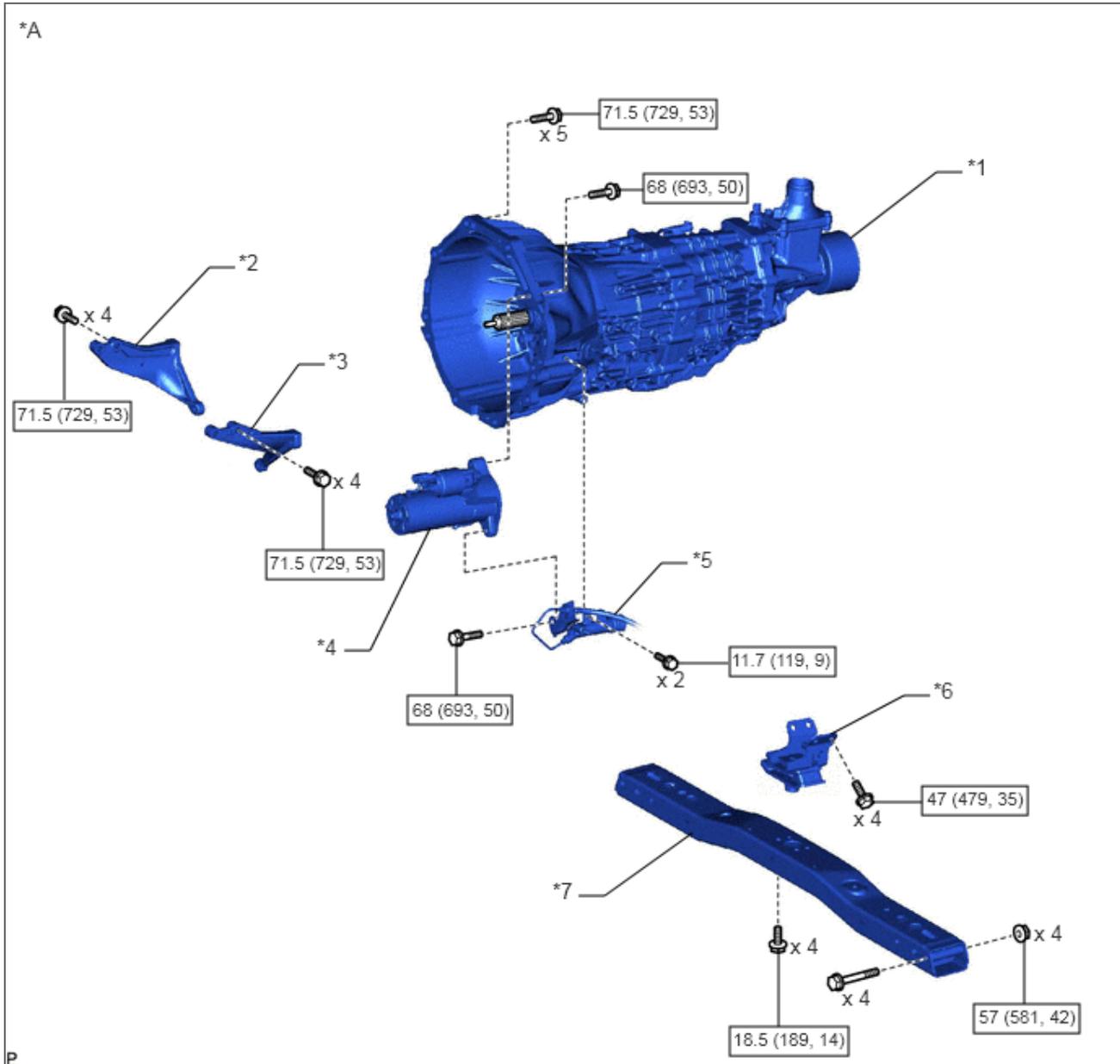
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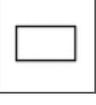


*A	for R151	-	-
*1	MANUAL TRANSMISSION UNIT ASSEMBLY	*2	STIFFENER PLATE RH
*3	STIFFENER PLATE LH	*4	STARTER ASSEMBLY
*5	CLUTCH RELEASE CYLINDER ASSEMBLY	*6	REAR ENGINE MOUNTING INSULATOR

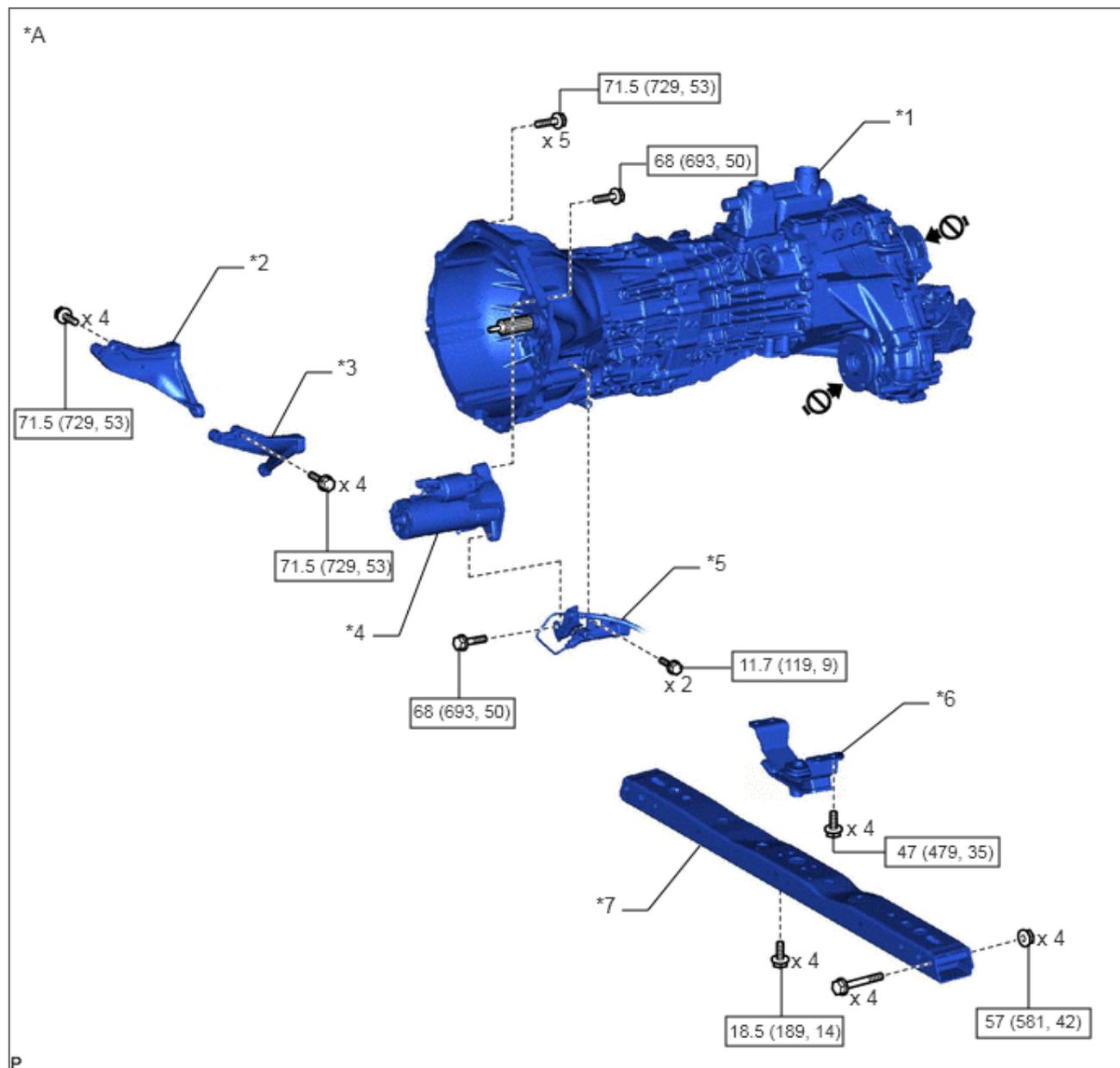
*7	NO. 3 FRAME CROSSMEMBER SUB-ASSEMBLY	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	-	-

## ILLUSTRATION



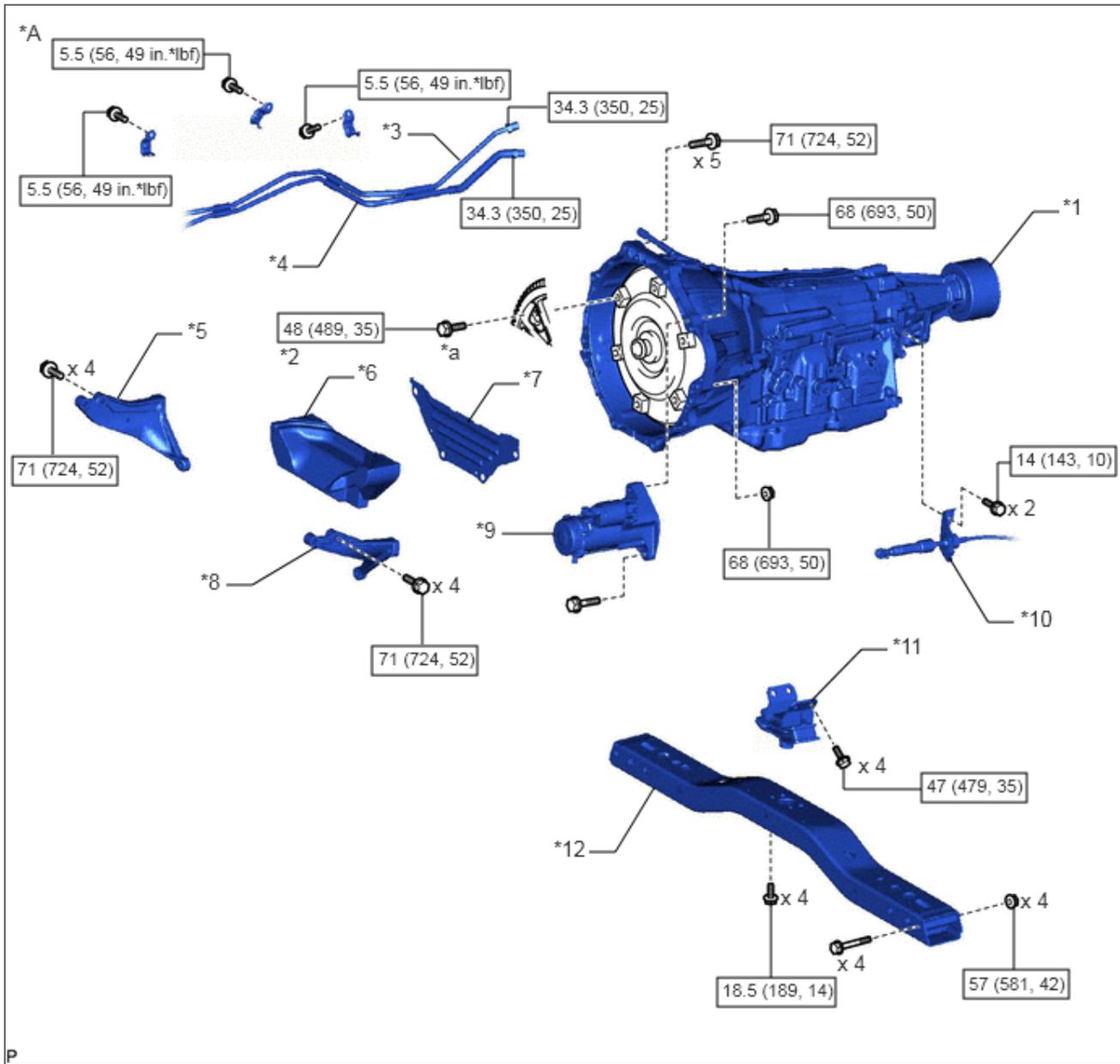
*A	for RC61	-	-
*1	MANUAL TRANSMISSION UNIT ASSEMBLY	*2	STIFFENER PLATE RH
*3	STIFFENER PLATE LH	*4	STARTER ASSEMBLY
*5	CLUTCH RELEASE CYLINDER ASSEMBLY	*6	REAR ENGINE MOUNTING INSULATOR
*7	NO. 3 FRAME CROSSMEMBER SUB-ASSEMBLY	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	-	-

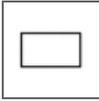
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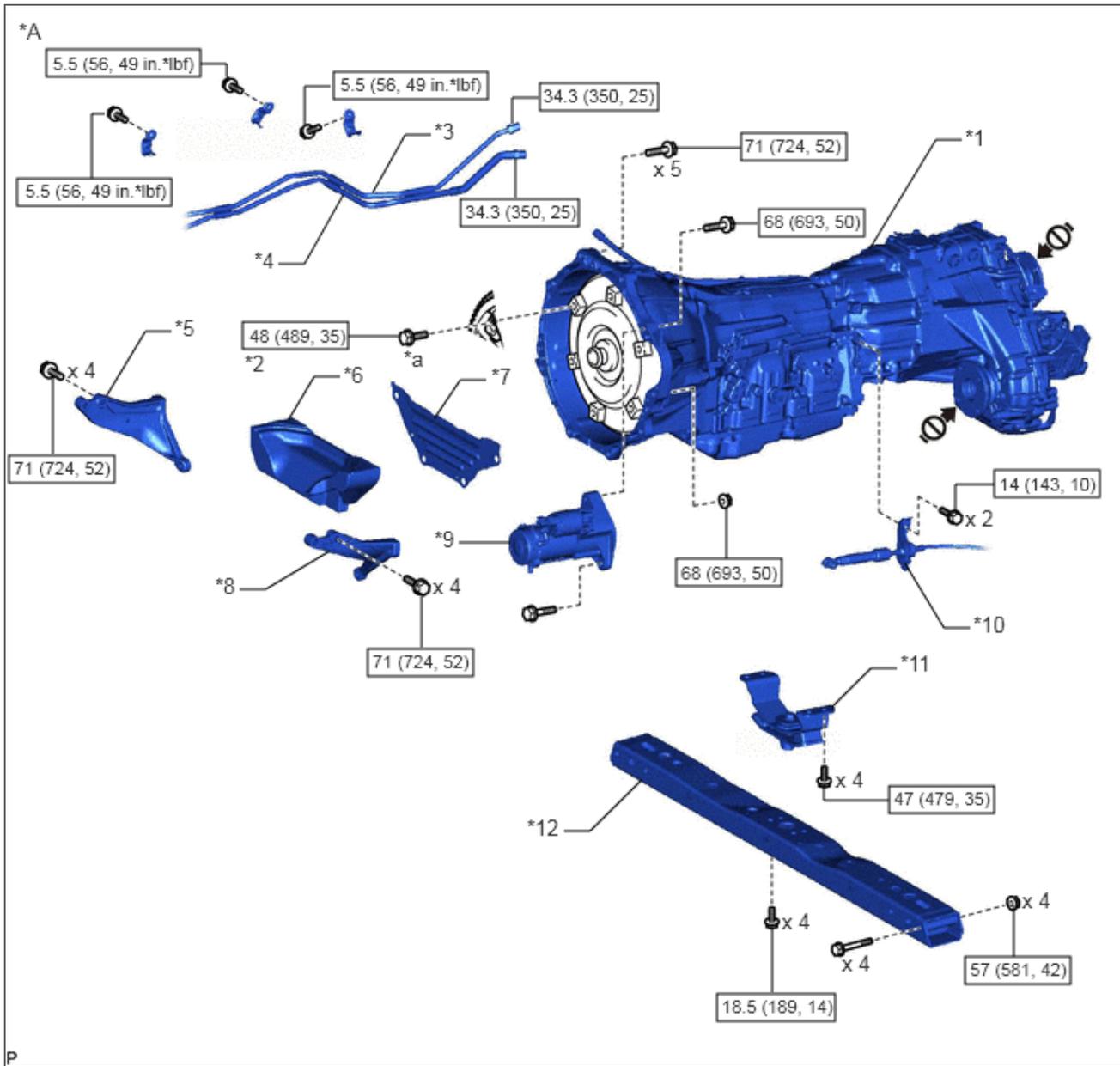
*A	for RC61F	-	-
*1	MANUAL TRANSMISSION UNIT ASSEMBLY	*2	STIFFENER PLATE RH
*3	STIFFENER PLATE LH	*4	STARTER ASSEMBLY
*5	CLUTCH RELEASE CYLINDER ASSEMBLY	*6	REAR ENGINE MOUNTING INSULATOR
*7	NO. 3 FRAME CROSSMEMBER SUB-ASSEMBLY	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque		Do not apply lubricants to the threads

# ILLUSTRATION



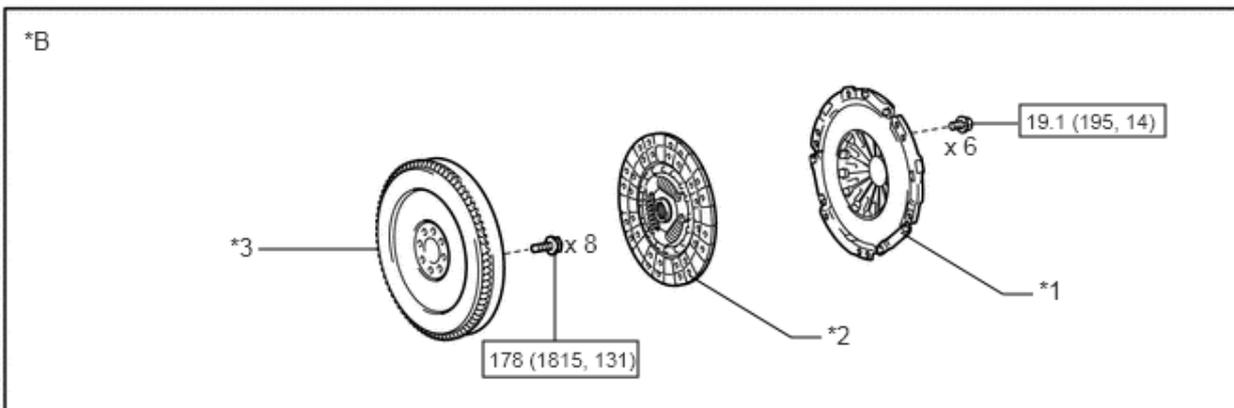
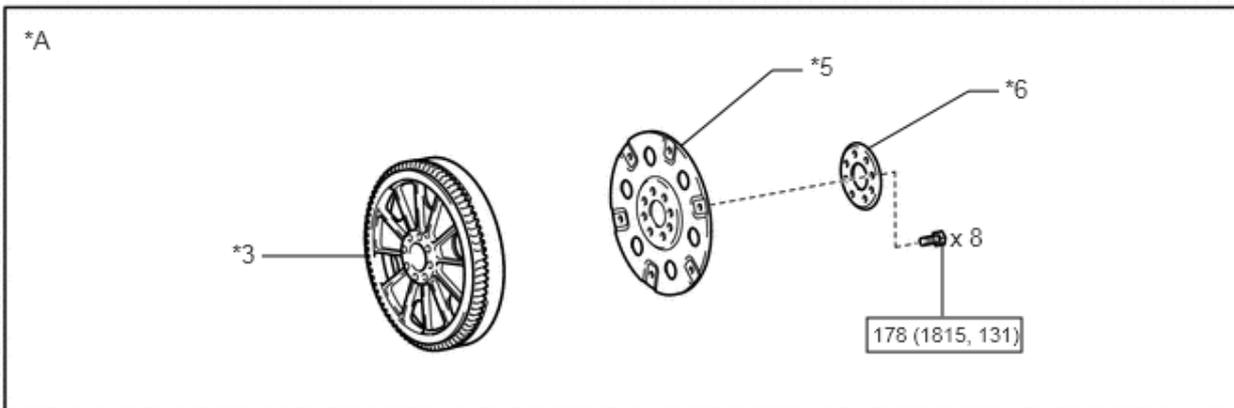
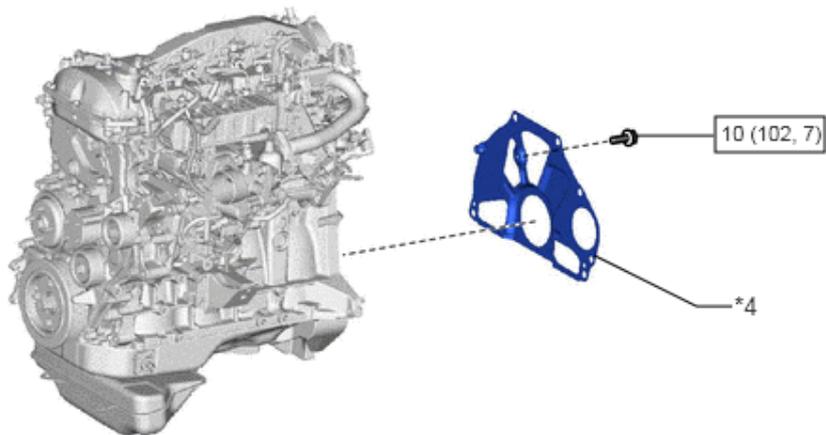
*A	for AC60E	-	-
*1	AUTOMATIC TRANSMISSION ASSEMBLY	*2	DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT
*3	OUTLET OIL COOLER TUBE	*4	INLET OIL COOLER TUBE
*5	STIFFENER PLATE RH	*6	NO. 4 CYLINDER BLOCK INSULATOR
*7	NO. 2 END PLATE	*8	STIFFENER PLATE LH
*9	STARTER ASSEMBLY	*10	TRANSMISSION CONTROL 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	-	-

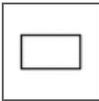
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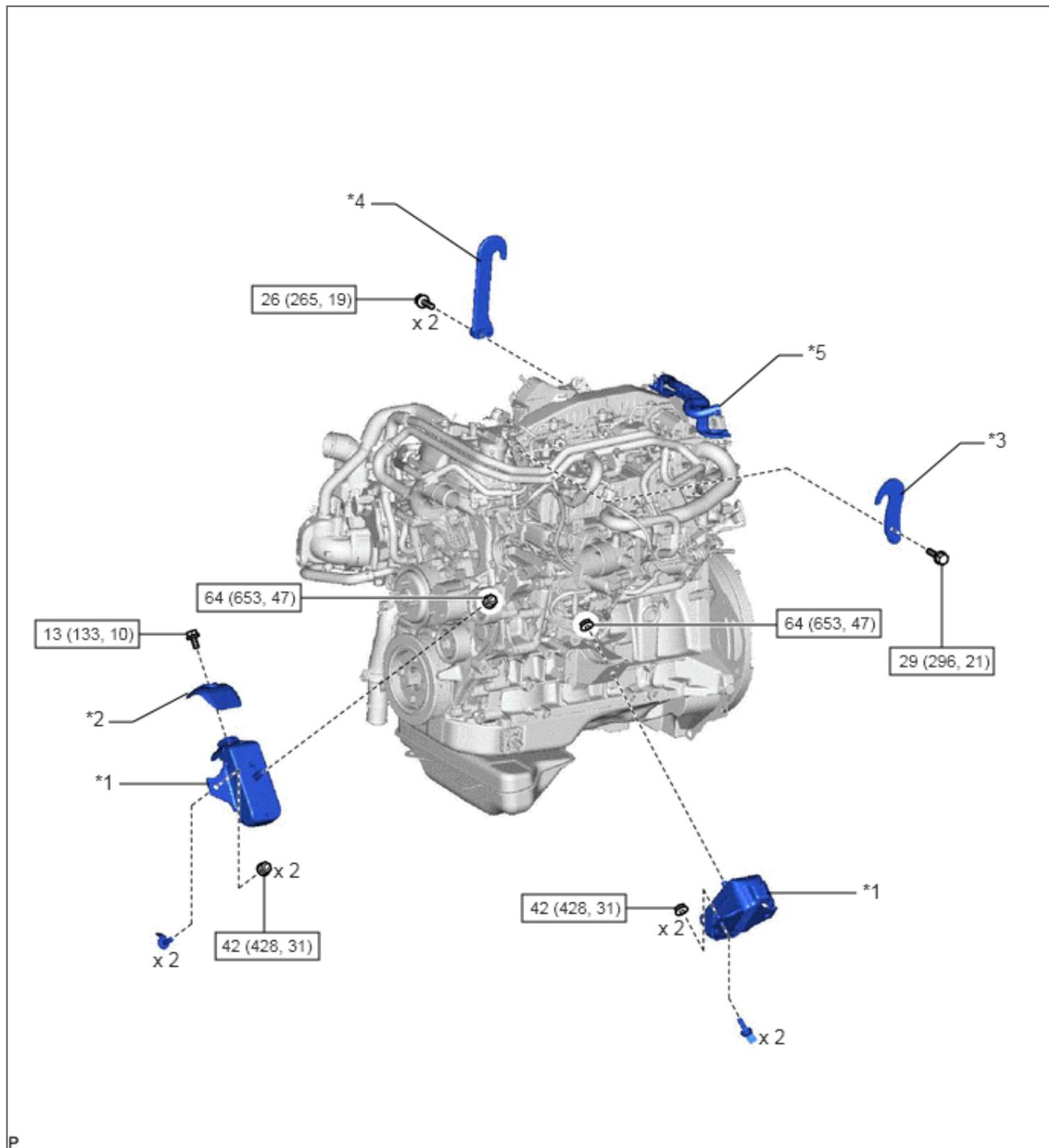
*A	for AC60F	-	-
*1	AUTOMATIC TRANSMISSION ASSEMBLY	*2	DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT
*3	OUTLET OIL COOLER TUBE	*4	INLET OIL COOLER TUBE
*5	STIFFENER PLATE RH	*6	NO. 4 CYLINDER BLOCK INSULATOR
*7	NO. 2 END PLATE	*8	STIFFENER PLATE LH
*9	STARTER ASSEMBLY	*10	TRANSMISSION CONTROL 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

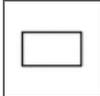
## ILLUSTRATION



P			
*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	-	-

## ILLUSTRATION



*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	-	-

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## 1GD-FTV ENGINE MECHANICAL ENGINE ASSEMBLY INSTALLATION

**PROCEDURE****1.INSTALL FRONT ENGINE MOUNTING INSULATOR 12361**

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

**Torque:****64 N\*m (653 kgf\*cm, 47 ft.\*lbf)****2.INSTALL FRONT ENGINE MOUNTING INSULATOR RH 12391**

- 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 82121**

- a. Install the engine wire to the engine assembly.

**4.INSTALL ENGINE HANGER**

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>ENGINE ASSEMBLY>REMOVAL

**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 bolts and 4 nuts.

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

- Make sure to tighten the side with the nut.
- When installing a bolt with a claw (stopper), make sure that the claw (stopper) does not damage

the body of the vehicle.

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

## 7.INSTALL REAR END PLATE

11355

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

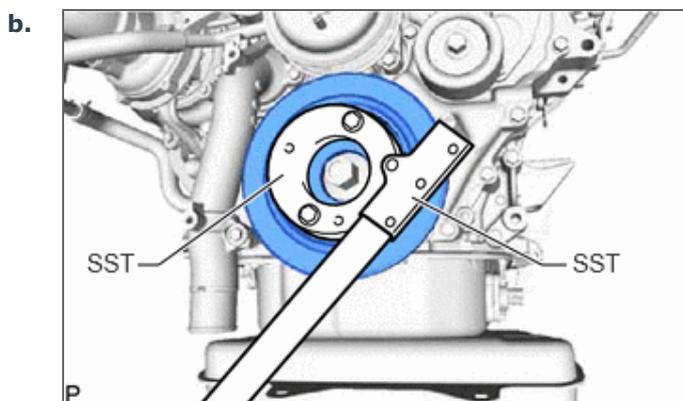
**Torque:**

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

## 8.INSTALL FLYWHEEL SUB-ASSEMBLY

13405

- a. Clean the bolt holes.



Using SST, hold the crankshaft pulley.

**SST**

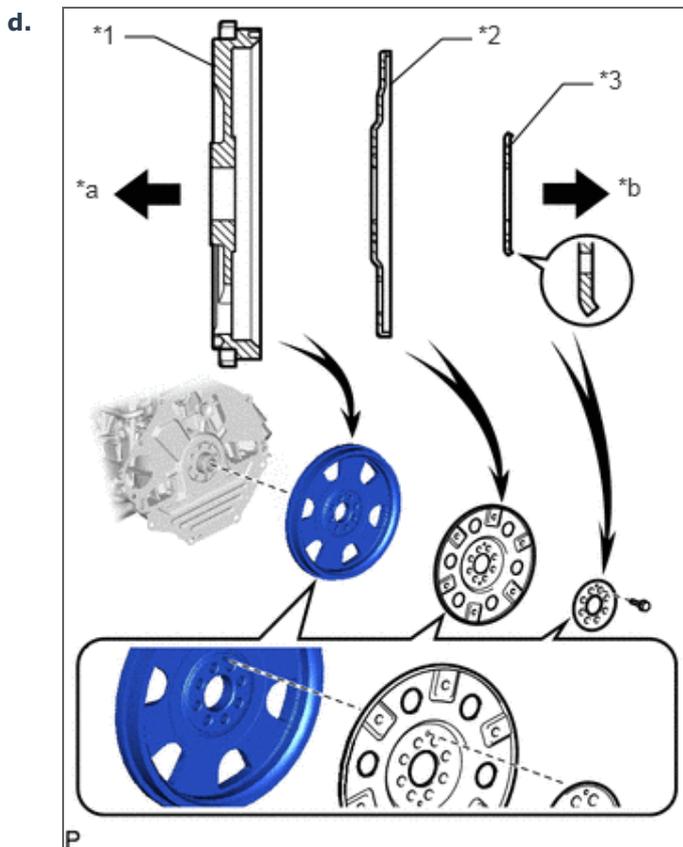
**09213-58014 (91551-80840)**

**09330-00021**

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

**Torque:**

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



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

for Automatic Transmission:

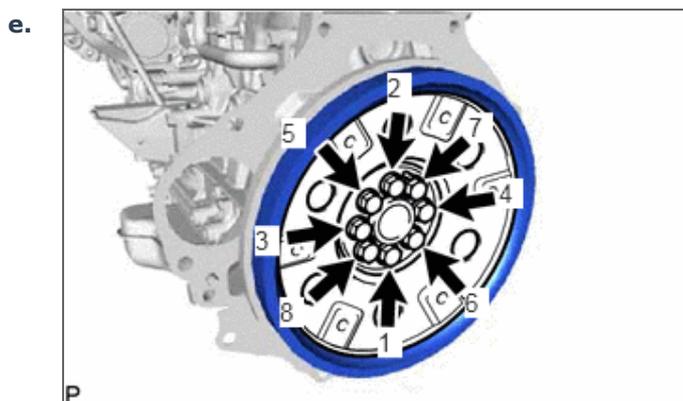
Install the flywheel sub-assembly, the pump impeller drive plate and the rear drive plate spacer to the crankshaft with the 8 bolts.

**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.



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)**

**f. w/o Viscous Heater:**

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

**Torque:**

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

**g. w/ Viscous Heater:**

Install the crankshaft pulley cover and viscous heater crankshaft pulley to the crankshaft pulley with the 4 bolts.

**Torque:**

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

---

**9.INSTALL CLUTCH DISC ASSEMBLY (for Manual Transmission) 31250**

---

- for R151:  
Click here[Drivetrain>CLUTCH>CLUTCH UNIT\(for R151\)>INSTALLATION](#)
- for RC61:  
Click here[Drivetrain>CLUTCH>CLUTCH UNIT\(for RC60, RC61\)>INSTALLATION](#)

---

**10.INSTALL CLUTCH COVER ASSEMBLY (for Manual Transmission) 31210**

---

- for R151:  
Click here[Drivetrain>CLUTCH>CLUTCH UNIT\(for R151\)>INSTALLATION](#)
- for RC61:  
Click here[Drivetrain>CLUTCH>CLUTCH UNIT\(for RC60, RC61\)>INSTALLATION](#)

---

**11.INSPECT AND ADJUST CLUTCH COVER ASSEMBLY (for Manual Transmission) 31210**

---

- for R151:  
Click here[Drivetrain>CLUTCH>CLUTCH UNIT\(for R151\)>INSTALLATION](#)
- for RC61:  
Click here[Drivetrain>CLUTCH>CLUTCH UNIT\(for RC60, RC61\)>INSTALLATION](#)

---

**12.INSTALL AUTOMATIC TRANSMISSION ASSEMBLY (for Automatic Transmission) 35000**

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- for AC60E:  
Click here[Drivetrain>AC60E AUTOMATIC TRANSMISSION / TRANSAXLE>AUTOMATIC TRANSMISSION ASSEMBLY\(for 1GD-FTV, 2GD-FTV\)>INSTALLATION](#)
- for AC60F:  
Click here[Drivetrain>AC60F AUTOMATIC TRANSMISSION / TRANSAXLE>AUTOMATIC TRANSMISSION ASSEMBLY\(for 1GD-FTV, 2GD-FTV\)>INSTALLATION](#)

---

**13.INSTALL DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT (for Automatic Transmission) 32101A**

---

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

- for AC60F:  
Click here [Drivetrain>AC60F AUTOMATIC TRANSMISSION / TRANSAXLE>AUTOMATIC TRANSMISSION ASSEMBLY\(for 1GD-FTV, 2GD-FTV\)>INSTALLATION](#)

#### 14.INSTALL MANUAL TRANSMISSION UNIT ASSEMBLY (for Manual Transmission) 33030

- for R151:  
Click here [Drivetrain>R151 MANUAL TRANSMISSION / TRANSAXLE>MANUAL TRANSMISSION ASSEMBLY>INSTALLATION](#)
- for RC61:  
Click here [Drivetrain>RC60 / RC61 MANUAL TRANSMISSION / TRANSAXLE>MANUAL TRANSMISSION ASSEMBLY>INSTALLATION](#)
- for RC61F:  
Click here [Drivetrain>RC60F / RC61F MANUAL TRANSMISSION / TRANSAXLE>MANUAL TRANSMISSION ASSEMBLY>INSTALLATION](#)

#### 15.INSTALL PROPELLER WITH CENTER BEARING SHAFT ASSEMBLY 37100

Click here [Drivetrain>DRIVE SHAFT / PROPELLER SHAFT>PROPELLER SHAFT ASSEMBLY\(for TMT Made\)>INSTALLATION](#)

#### 16.INSTALL FRONT PROPELLER SHAFT ASSEMBLY (for 4WD) 37140

Click here [Drivetrain>DRIVE SHAFT / PROPELLER SHAFT>FRONT DRIVE SHAFT ASSEMBLY>INSTALLATION](#)

#### 17.INSTALL FRONT EXHAUST PIPE ASSEMBLY 17410

Click here [Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST PIPE>INSTALLATION](#)

#### 18.INSTALL VISCOUS HEATER WITH MAGNET CLUTCH ASSEMBLY (w/ Viscous Heater) 87120G

- Install the viscous heater with magnet clutch assembly to the No. 1 viscous heater bracket.

**Torque:**

**39 N\*m (398 kgf\*cm, 29 ft.\*lbf)**

- Connect the connector to the viscous heater with magnet clutch assembly.

#### 19.INSTALL WATER HOSE SUB-ASSEMBLY (w/ Viscous Heater)

- Install the water hose sub-assembly to the viscous heater with magnet clutch assembly, No. 2 water pipe and water outlet sub-assembly, and slide the 4 clamps to secure the 2 hoses.
- Connect the water hose sub-assembly to the water inlet with the bolt.

**Torque:**

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

#### 20.CONNECT COOLER COMPRESSOR ASSEMBLY 88320

- Temporarily install the cooler compressor assembly to the compressor mounting bracket with the 2 stud bolts.
- 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)**

---

**21.INSTALL GENERATOR ASSEMBLY** **27020**

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[Click here](#)Power Source / Network>1GD-FTV BATTERY / CHARGING>GENERATOR(for 80A Type)>INSTALLATION

---

**22.CONNECT UNION TO CONNECTOR TUBE HOSE** **44774**

---

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

---

**23.CONNECT VANE PUMP ASSEMBLY** **44320**

---

- 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.

---

**24.CONNECT WATER HOSE SUB-ASSEMBLY**

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

---

**25.INSTALL BATTERY TRAY** **74431**

---



---

**26.INSTALL BATTERY** **28800**

---



---

**27.INSTALL BATTERY CLAMP SUB-ASSEMBLY** **74404B**

---

- 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)**

---

**28.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.

**29.CONNECT NO. 2 FUEL HOSE****23273H**

- 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.

**30.CONNECT NO. 1 FUEL HOSE****23271H**

- 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.

**31.INSTALL FUEL FILTER ASSEMBLY****23300**

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL FILTER>REPLACEMENT

**32.INSTALL INTERCOOLER AIR TUBE****17363K**

- 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.

**33.INSTALL NO. 4 AIR TUBE****17344E**

- 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.

**34.INSTALL NO. 1 AIR HOSE****17341F**

- 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)****35.INSTALL AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY****17801****36.INSTALL AIR CLEANER CAP AND HOSE**

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

- b. Tighten the hose clamp.

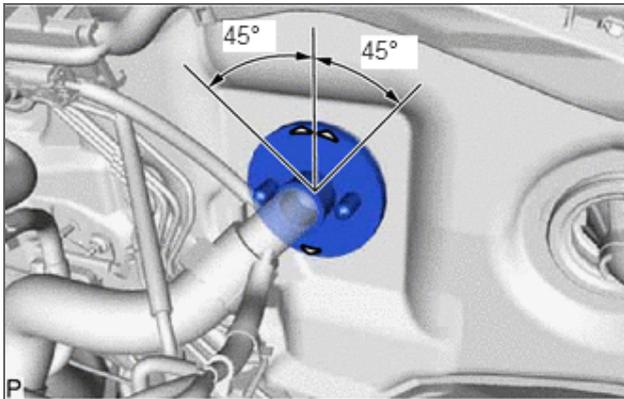
**Torque:****4.0 N\*m (41 kgf\*cm, 35 in.\*lbf)**

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

**37.CONNECT ENGINE WIRE****82121**

- 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.

- 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 / Hybrid System>1GD-FTV ENGINE CONTROL>ECM>INSTALLATION

**38.INSTALL RADIATOR ASSEMBLY****16400**

[Click here](#)Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION

### 39.INSTALL HOOD SUB-ASSEMBLY

53301

- 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.

### 40.ADD ENGINE OIL

[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>OIL AND OIL FILTER>REPLACEMENT

### 41.ADD MANUAL TRANSMISSION OIL (for Manual Transmission)

- for R151:  
[Click here](#)Drivetrain>R151 MANUAL TRANSMISSION / TRANSAXLE>MANUAL TRANSMISSION OIL>REPLACEMENT
- for RC61:  
[Click here](#)Drivetrain>RC60 / RC61 MANUAL TRANSMISSION / TRANSAXLE>MANUAL TRANSMISSION OIL>REPLACEMENT
- for RC61F:  
[Click here](#)Drivetrain>RC60F / RC61F MANUAL TRANSMISSION / TRANSAXLE>MANUAL TRANSMISSION OIL>REPLACEMENT

### 42.ADD AUTOMATIC TRANSMISSION FLUID (for Automatic Transmission)

- for AC60E:  
[Click here](#)Drivetrain>AC60E AUTOMATIC TRANSMISSION / TRANSAXLE>AUTOMATIC TRANSMISSION FLUID>ADJUSTMENT
- for AC60F:  
[Click here](#)Drivetrain>AC60F AUTOMATIC TRANSMISSION / TRANSAXLE>AUTOMATIC TRANSMISSION FLUID>ADJUSTMENT

### 43.CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

**NOTICE:**

When disconnecting the cable, some systems need to be initialized after the cable is reconnected.  
[Click here](#)General>INTRODUCTION>REPAIR INSTRUCTION>INITIALIZATION

### 44.BLEED AIR FROM FUEL SYSTEM

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL SYSTEM>ON-VEHICLE INSPECTION

### 45.ADD ENGINE COOLANT

[Click here](#)Engine / Hybrid System>1GD-FTV COOLING>COOLANT>REPLACEMENT

### 46.INSPECT FOR COOLANT LEAK

[Click here](#)Engine / Hybrid System>1GD-FTV COOLING>COOLING SYSTEM>ON-VEHICLE INSPECTION

### 47.INSPECT ENGINE OIL LEVEL

[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>LUBRICATION SYSTEM>ON-VEHICLE INSPECTION

---

**48.INSPECT ENGINE IDLE SPEED AND MAXIMUM SPEED**


---

Click here [Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>ENGINE>ON-VEHICLE INSPECTION](#)

**49.INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY 12601B**


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Click here [Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>INSTALLATION](#)

**50.INSTALL NO. 2 ENGINE UNDER COVER (for 4WD and Pre-Runner) 51442**


---

**Torque:**

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

**51.INSTALL NO. 1 ENGINE UNDER COVER ASSEMBLY (for 4WD and Pre-Runner) 51410**


---

**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)**

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## 1GD-FTV ENGINE MECHANICAL ENGINE ASSEMBLY REMOVAL

**CAUTION / NOTICE / HINT**

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
Replacement of ECM	<ul style="list-style-type: none"> <li>Learning values save</li> <li>Learning values write</li> </ul>	Engine starting	(  )
	<b>for RC61:</b> Performing iMT installation information reset	<ul style="list-style-type: none"> <li>iMT system</li> <li>DTCs are output</li> </ul>	(  )
	Code registration (Immobiliser system)	Engine start function	See the Service Bulletin for the registration method.
Replacement of engine assembly	<ul style="list-style-type: none"> <li>Injector compensation code registration</li> <li>Pilot quantity learning</li> </ul>	Engine starting	(  )
	Clear Crank Time Compensation Data	Engine starting	(  )
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	(  )
Replacement of injector assembly	<ul style="list-style-type: none"> <li>Injector compensation code registration</li> <li>Pilot quantity learning</li> </ul>	Engine starting	(  )
<ul style="list-style-type: none"> <li>Replacement of diesel throttle body assembly</li> <li>Replacement of electric EGR control valve assembly</li> <li>Replacement of turbocharger sub-assembly</li> <li>Replacement of turbocharger sub-assembly or turbocharger variable nozzle motor</li> </ul>	Perform initialization	-	(  )
<b>for AC60E:</b> Replacement of automatic transmission	Reset memory	<ul style="list-style-type: none"> <li>Large shift shock</li> <li>Engine overruns</li> </ul>	

assembly			(  )
<b>for AC60E:</b> 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	
<b>for AC60F:</b> Replacement of automatic transmission assembly	Reset memory	<ul style="list-style-type: none"> <li>· Large shift shock</li> <li>· Engine overruns</li> </ul>	(  )
<b>for AC60F:</b> 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	
<b>w/ Automatic Headlight Beam Level Control System:</b> 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	(  )
<b>for 4WD:</b> Front wheel alignment adjustment	<ul style="list-style-type: none"> <li>· Clearing zero point calibration data</li> <li>· Yaw rate and acceleration sensor zero point calibration</li> </ul>	VSC malfunctioning	(  )

**CAUTION:**



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

**PROCEDURE**

 **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](#)[General](#)>[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](#)[General](#)>[INTRODUCTION](#)>[REPAIR INSTRUCTION](#)>[INITIALIZATION](#)

## 3.REMOVE NO. 1 ENGINE UNDER COVER ASSEMBLY (for 4WD and Pre-Runner) 51410

## 4.REMOVE NO. 2 ENGINE UNDER COVER (for 4WD and Pre-Runner) 51442

## 5.DRAIN ENGINE OIL

[Click here](#)[Engine / Hybrid System](#)>[1GD-FTV LUBRICATION](#)>[OIL AND OIL FILTER](#)>[REPLACEMENT](#)

## 6.DRAIN ENGINE COOLANT

[Click here](#)[Engine / Hybrid System](#)>[1GD-FTV COOLING](#)>[COOLANT](#)>[REPLACEMENT](#)

## 7.DRAIN MANUAL TRANSMISSION OIL (for Manual Transmission)

- for R151:  
[Click here](#)[Drivetrain](#)>[R151 MANUAL TRANSMISSION / TRANSAXLE](#)>[MANUAL TRANSMISSION OIL](#)>[REPLACEMENT](#)
- for RC61:  
[Click here](#)[Drivetrain](#)>[RC60 / RC61 MANUAL TRANSMISSION / TRANSAXLE](#)>[MANUAL TRANSMISSION OIL](#)>[REPLACEMENT](#)
- for RC61F:  
[Click here](#)[Drivetrain](#)>[RC60F / RC61F MANUAL TRANSMISSION / TRANSAXLE](#)>[MANUAL TRANSMISSION OIL](#)>[REPLACEMENT](#)

## 8.DRAIN AUTOMATIC TRANSMISSION FLUID (for Automatic Transmission)

- for AC60:  
[Click here](#)[Drivetrain](#)>[AC60E AUTOMATIC TRANSMISSION / TRANSAXLE](#)>[TRANSMISSION WIRE](#)>[REMOVAL](#)
- for AC60F:  
[Click here](#)[Drivetrain](#)>[AC60F AUTOMATIC TRANSMISSION / TRANSAXLE](#)>[TRANSMISSION WIRE](#)>[REMOVAL](#)

## 9.REMOVE HOOD SUB-ASSEMBLY 53301

- 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 16400

[Click here](#)[Engine / Hybrid System](#)>[1GD-FTV COOLING](#)>[RADIATOR](#)>[REMOVAL](#)

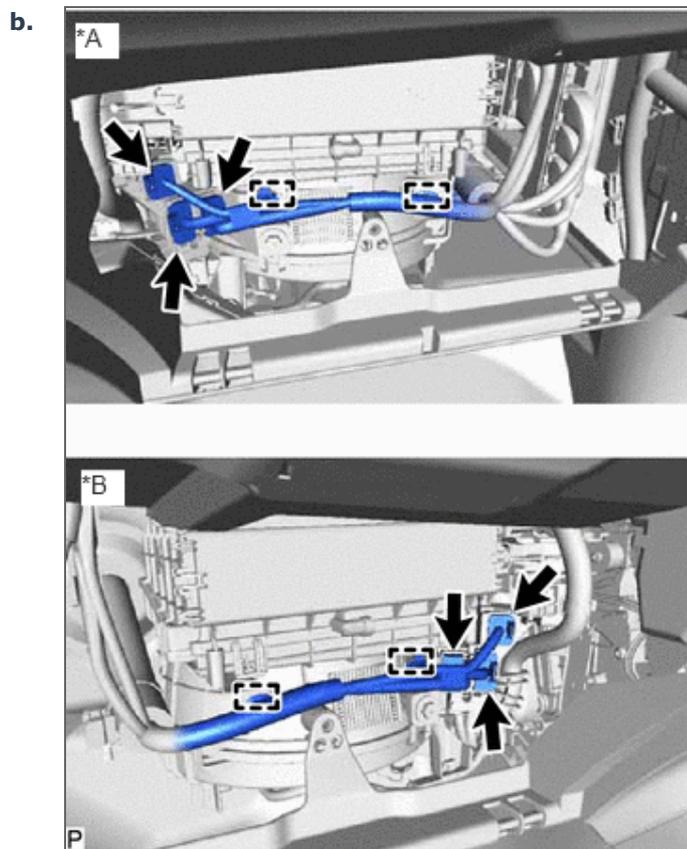
## 11.REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY 12601B

Click here [Engine / Hybrid System > 1GD-FTV ENGINE CONTROL > DIESEL THROTTLE BODY > REMOVAL](#)

**12.DISCONNECT ENGINE WIRE**

**82121**

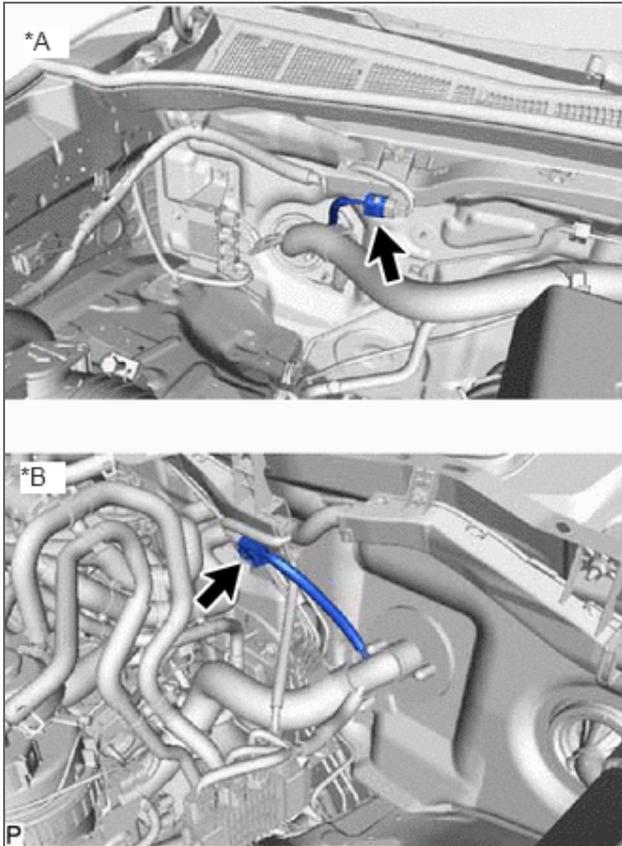
- a. Remove the ECM.  
Click here [Engine / Hybrid System > 1GD-FTV ENGINE CONTROL > ECM > REMOVAL](#)



*A	for LHD
*B	for RHD

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

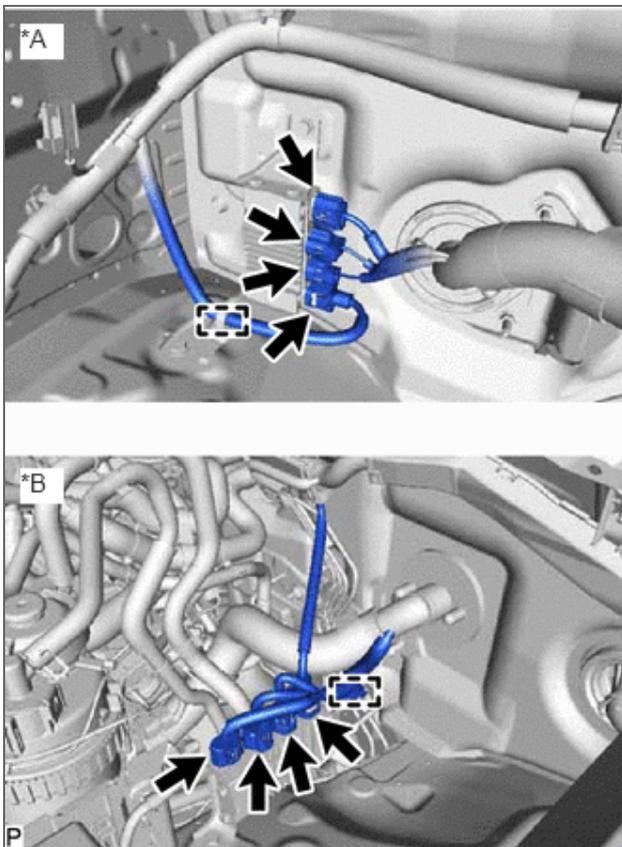
c.



*A	for LHD
*B	for RHD

Disconnect the connector from the engine room main wire.

d.



*A	for LHD
----	---------

*B	for RHD
----	---------

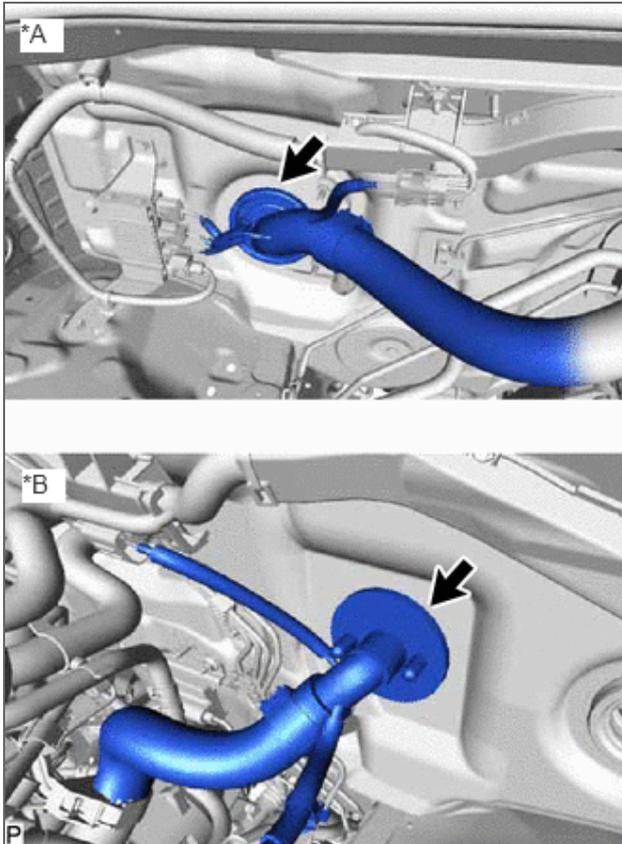
Detach the clamp and disconnect the 4 connectors from the glow plug controller.

e.

*A	for LHD
*B	for RHD

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

f.

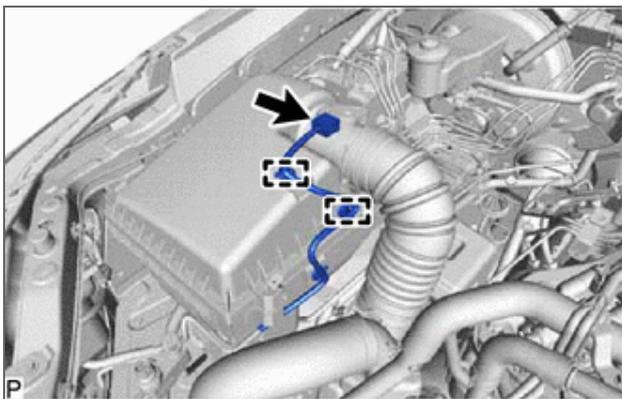


*A	for LHD
*B	for RHD

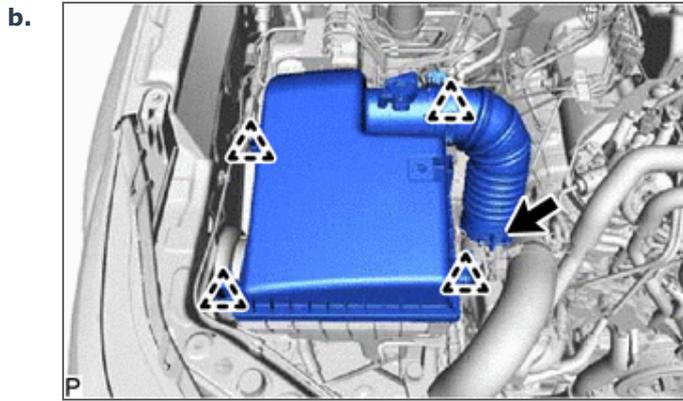
Detach the grommet and pull out the engine wire from the cabin.

**13.REMOVE AIR CLEANER CAP AND HOSE**

a.



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

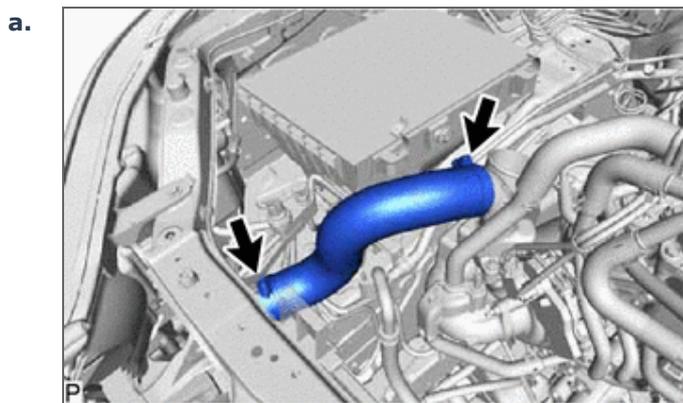


Loosen the hose clamp.

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

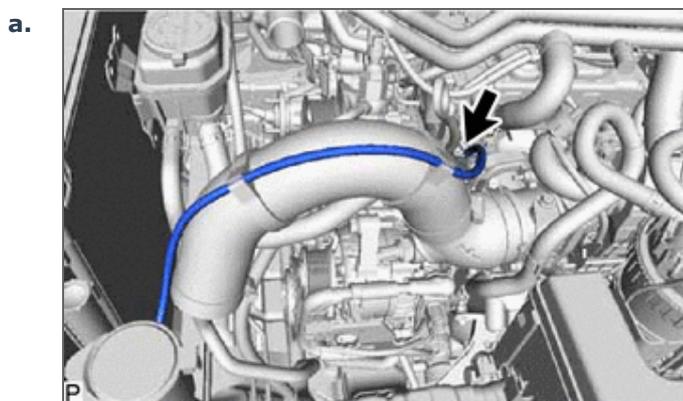
 <b>14.REMOVE AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY</b>	<b>17801</b>
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 <b>15.REMOVE NO. 1 AIR HOSE</b>	<b>17341F</b>
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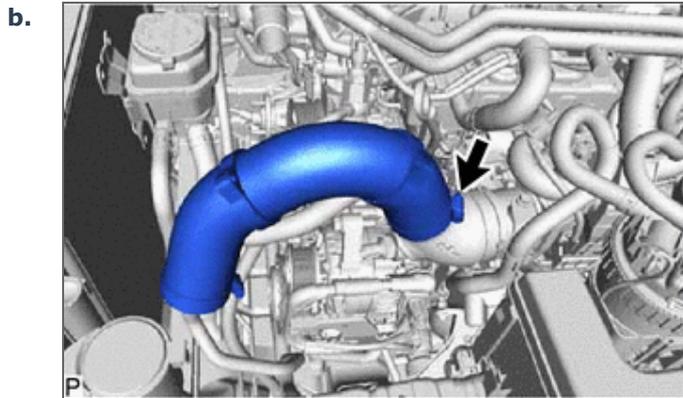


Slide the 2 clamps and remove the No. 1 air hose from the compressor outlet elbow and air tube.

 <b>16.REMOVE NO. 4 AIR HOSE</b>	<b>17344E</b>
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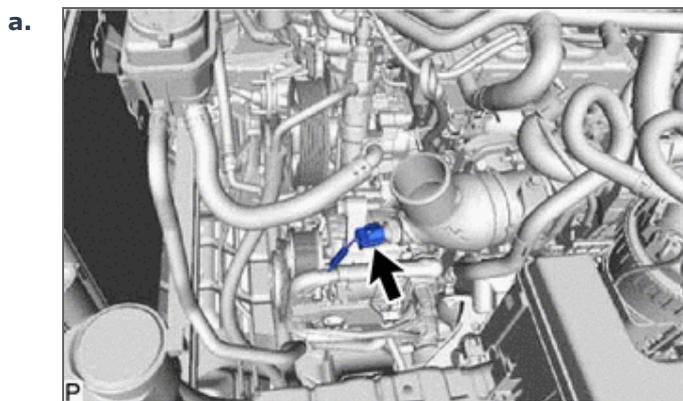
Slide the clamp and disconnect the oil return hose from the engine oil level dipstick guide assembly.



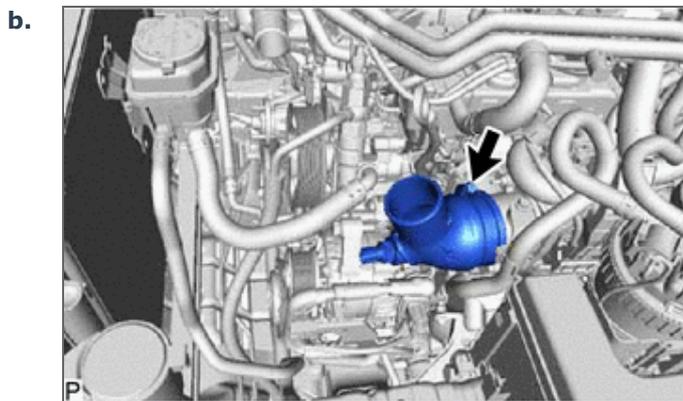
Slide the 2 clamps and remove the No. 4 air hose from the No. 2 air tube and intercooler air tube.

**17.REMOVE INTERCOOLER AIR TUBE**

**17363K**



Disconnect the connector from the intake air temperature sensor.



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

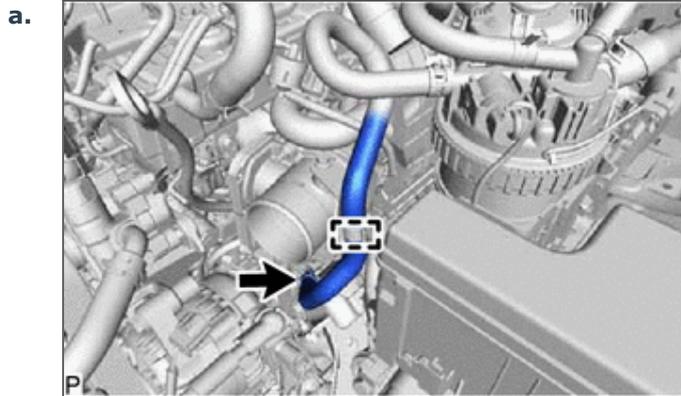
**18.REMOVE FUEL FILTER ASSEMBLY**

**23300**

[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL FILTER>REPLACEMENT

**19.REMOVE NO. 1 FUEL HOSE**

**23271H**

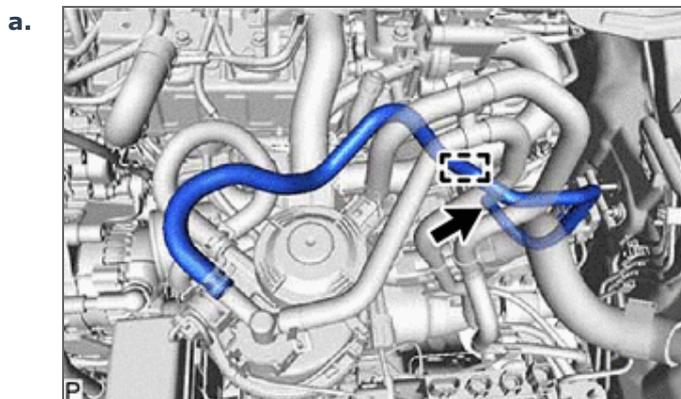


Detach the clamp from the No. 1 fuel hose.

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

## 20.REMOVE NO. 2 FUEL HOSE

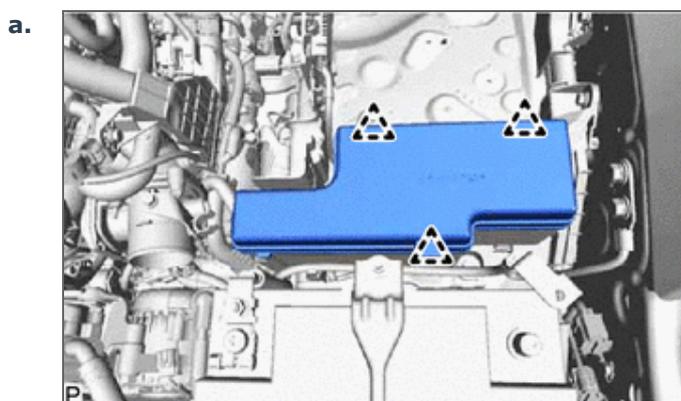
23273H



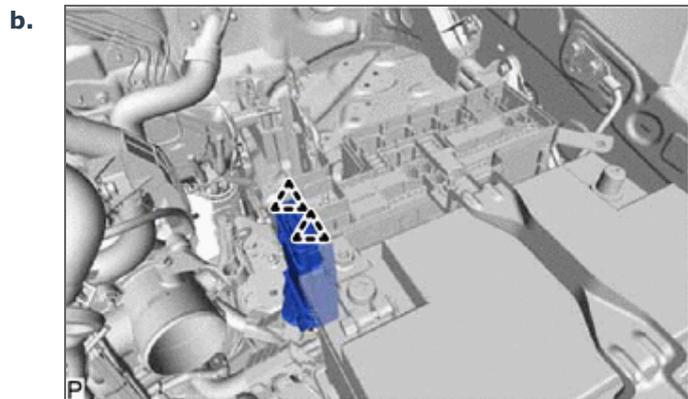
Detach the clamp from the No. 2 fuel hose.

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

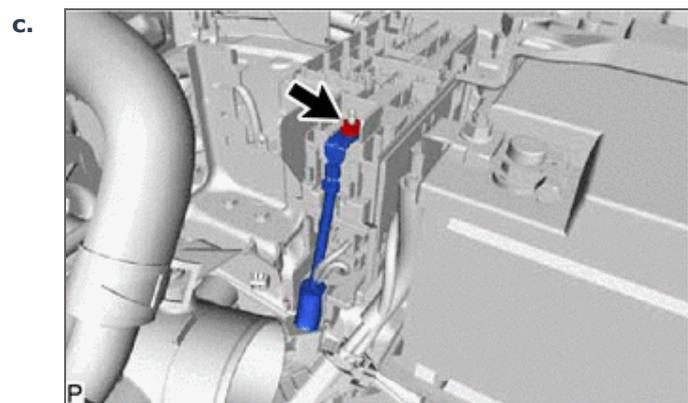
## 21.DISCONNECT WIRE HARNESS



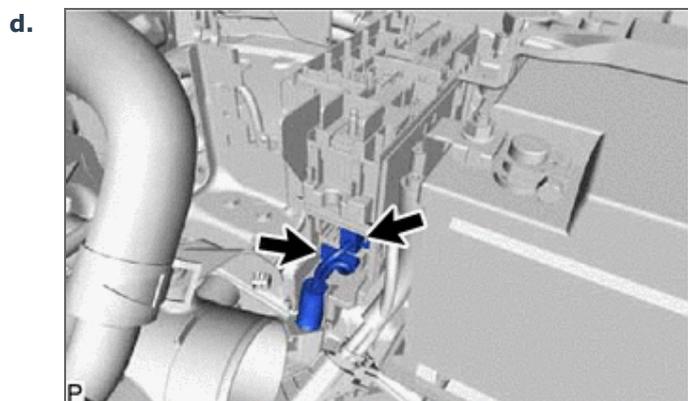
Detach the 3 clips and remove the No. 1 relay block cover upper from the engine room relay block.



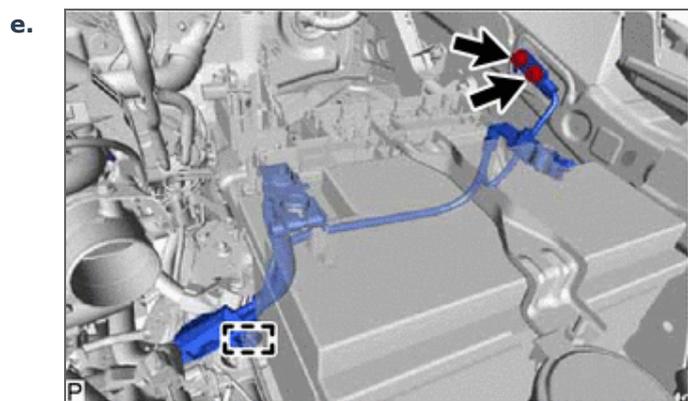
Detach the 2 clips and remove the No. 1 relay block cover side from the engine room relay block sub-assembly.



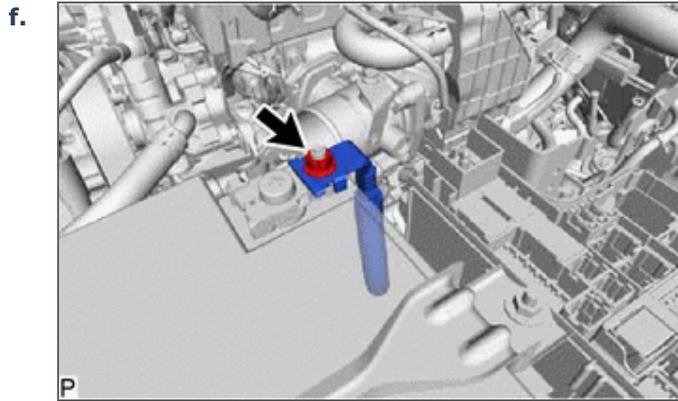
Remove the nut and disconnect the wire to wire from the engine room relay block sub-assembly.



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



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



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

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<b>22.REMOVE BATTERY CLAMP SUB-ASSEMBLY</b>	<b>74404B</b>
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a. Loosen the 2 nuts and remove the battery clamp sub-assembly from the battery.

<b>23.REMOVE BATTERY</b>	<b>28800</b>
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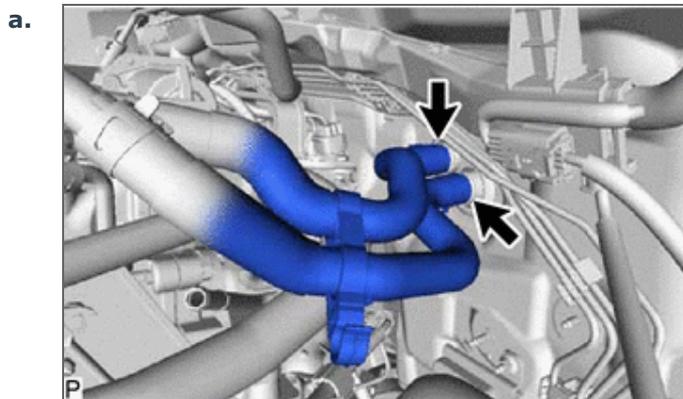
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<b>24.REMOVE BATTERY TRAY</b>	<b>74431</b>
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<b>25.DISCONNECT WATER HOSE SUB-ASSEMBLY</b>	
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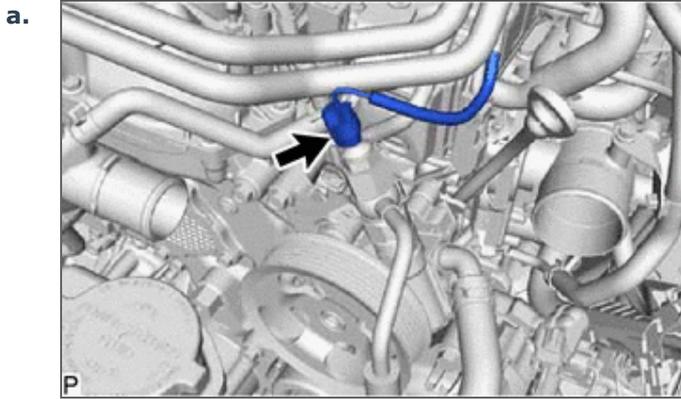


Slide the 2 clamps and disconnect the water hose sub-assembly from the air conditioning unit assembly.

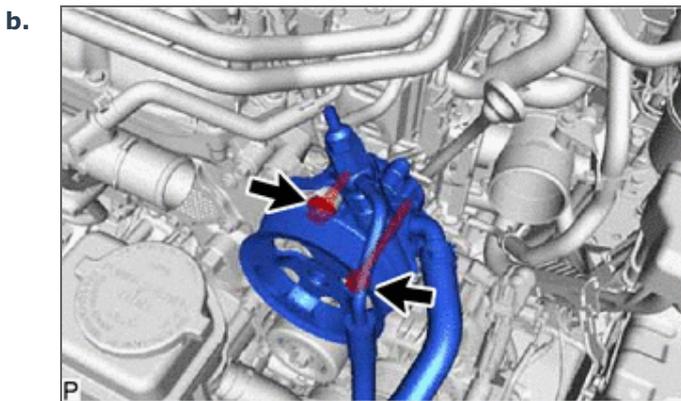
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<b>26.DISCONNECT VANE PUMP ASSEMBLY</b>	<b>44320</b>
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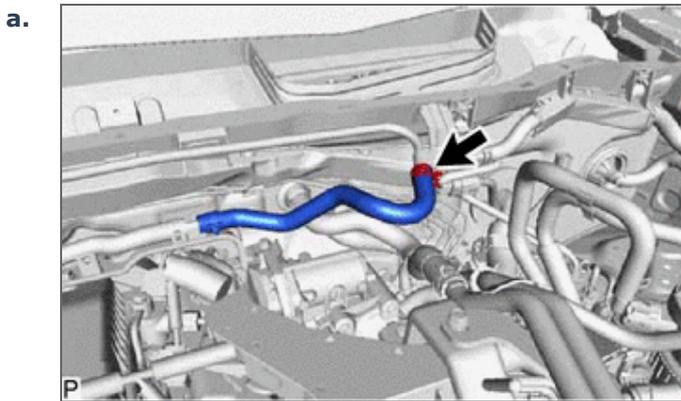
Disconnect the connector from the power steering oil pressure switch.



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

**27.DISCONNECT UNION TO CONNECTOR TUBE HOSE**

**44774**



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

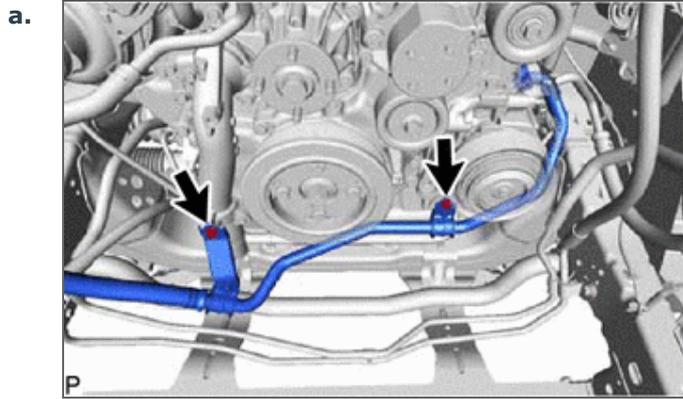
**28.REMOVE GENERATOR ASSEMBLY**

**27020**

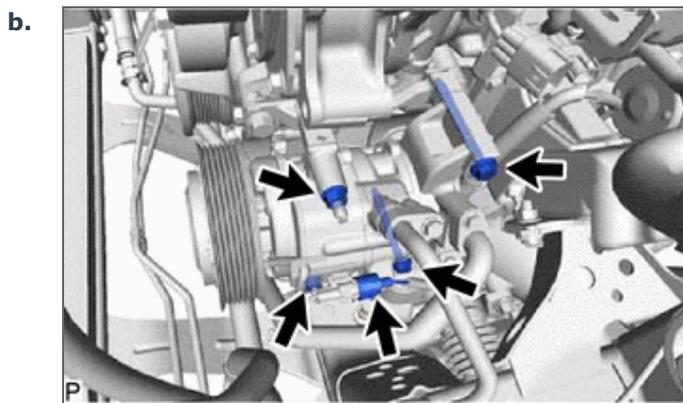
[Click here](#)Power Source / Network>1GD-FTV BATTERY / CHARGING>GENERATOR(for 80A Type)>REMOVAL

**29.DISCONNECT COOLER COMPRESSOR ASSEMBLY**

**88320**

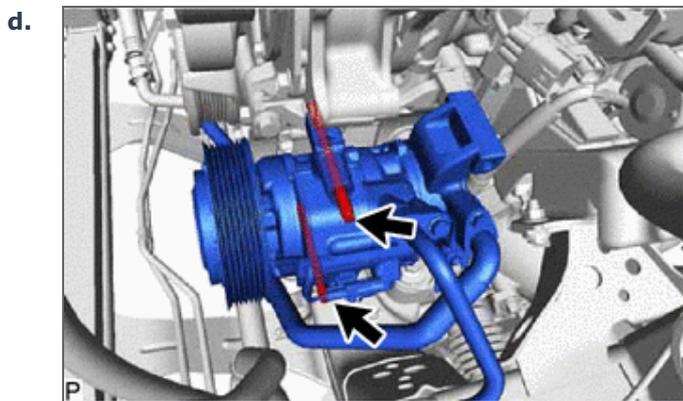


Remove the 2 bolts and disconnect the suction hose sub-assembly from the water inlet and timing chain cover.



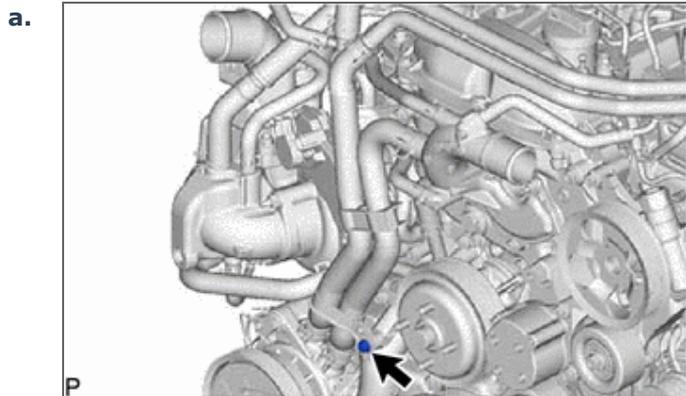
Disconnect the connector from the cooler compressor assembly.

c. Remove the 2 bolt and 2 nuts.

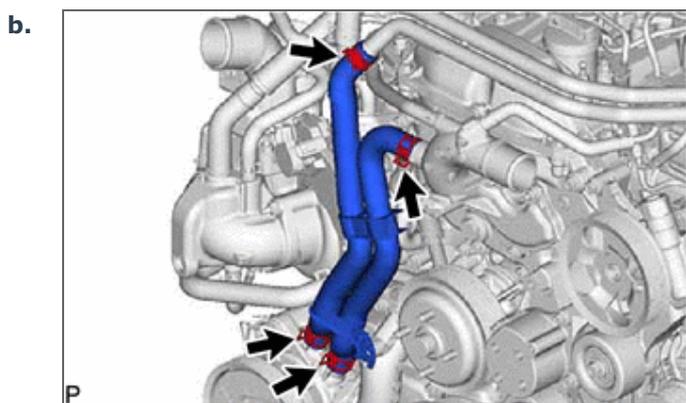


Using an E8 "TORX" socket wrench, remove the 2 stud bolts and disconnect the cooler compressor assembly from the compressor mounting bracket.

**30.REMOVE WATER HOSE SUB-ASSEMBLY (w/ Viscous Heater)**



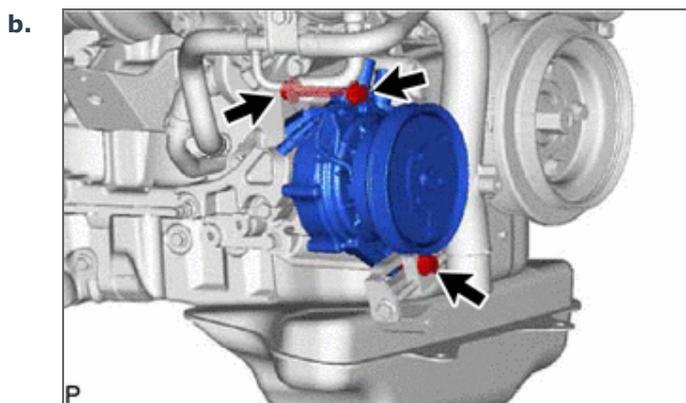
Remove the bolt and disconnect the water hose from the water inlet.



Slide the 4 clamps and remove the water hose sub-assembly from the viscous heater with magnet clutch assembly, No. 2 water pipe and water outlet sub-assembly.

**31.REMOVE VISCOUS HEATER WITH MAGNET CLUTCH ASSEMBLY (w/ Viscous Heater) 87120G**

a. Disconnect the connector from the viscous heater with magnet clutch assembly.



Remove the 2 bolts, nut and viscous heater with magnet clutch assembly from the No. 1 viscous heater bracket.

**32.REMOVE FRONT EXHAUST PIPE ASSEMBLY 17410**

[Click here](#)Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST PIPE>REMOVAL

**33.REMOVE FRONT PROPELLER SHAFT ASSEMBLY (for 4WD) 37140**

Click here [Drivetrain>DRIVE SHAFT / PROPELLER SHAFT>FRONT PROPELLER SHAFT ASSEMBLY\(for TMT Made\)>REMOVAL](#)

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**34.REMOVE PROPELLER WITH CENTER BEARING SHAFT ASSEMBLY 37100**

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Click here [Drivetrain>DRIVE SHAFT / PROPELLER SHAFT>PROPELLER SHAFT ASSEMBLY\(for TMT Made\)>REMOVAL](#)

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**35.REMOVE MANUAL TRANSMISSION UNIT ASSEMBLY (for Manual Transmission) 33030**

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- for R151:  
Click here [Drivetrain>R151 MANUAL TRANSMISSION / TRANSAXLE>MANUAL TRANSMISSION ASSEMBLY>REMOVAL](#)
- for RC61:  
Click here [Drivetrain>RC60 / RC61 MANUAL TRANSMISSION / TRANSAXLE>MANUAL TRANSMISSION ASSEMBLY>REMOVAL](#)
- for RC61F:  
Click here [Drivetrain>RC60F / RC61F MANUAL TRANSMISSION / TRANSAXLE>MANUAL TRANSMISSION ASSEMBLY>REMOVAL](#)

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**36.REMOVE DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT (for Automatic Transmission) 32101A**

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- AC60E:  
Click here [Drivetrain>AC60E AUTOMATIC TRANSMISSION / TRANSAXLE>AUTOMATIC TRANSMISSION ASSEMBLY\(for 1GD-FTV, 2GD-FTV\)>REMOVAL](#)
- AC60F:  
Click here [Drivetrain>AC60F AUTOMATIC TRANSMISSION / TRANSAXLE>AUTOMATIC TRANSMISSION ASSEMBLY\(for 1GD-FTV, 2GD-FTV\)>REMOVAL](#)

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**37.REMOVE AUTOMATIC TRANSMISSION ASSEMBLY (for Automatic Transmission) 35000**

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- for AC60E:  
Click here [Drivetrain>AC60E AUTOMATIC TRANSMISSION / TRANSAXLE>AUTOMATIC TRANSMISSION ASSEMBLY\(for 1GD-FTV, 2GD-FTV\)>REMOVAL](#)
- for AC60F:  
Click here [Drivetrain>AC60F AUTOMATIC TRANSMISSION / TRANSAXLE>AUTOMATIC TRANSMISSION ASSEMBLY\(for 1GD-FTV, 2GD-FTV\)>REMOVAL](#)

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**38.REMOVE CLUTCH COVER ASSEMBLY (for Manual Transmission) 31210**

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- for R151:  
Click here [Drivetrain>CLUTCH>CLUTCH UNIT\(for R151\)>REMOVAL](#)
- for RC61:  
Click here [Drivetrain>CLUTCH>CLUTCH UNIT\(for RC60, RC61\)>REMOVAL](#)

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**39.REMOVE CLUTCH DISC ASSEMBLY (for Manual Transmission) 31250**

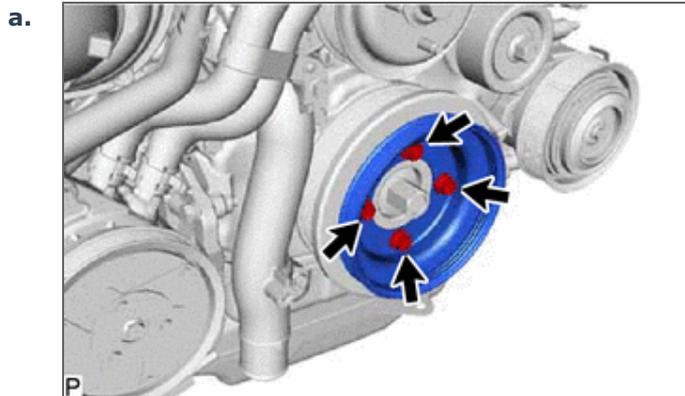
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- for R151:  
Click here [Drivetrain>CLUTCH>CLUTCH UNIT\(for R151\)>REMOVAL](#)
- for RC61:  
Click here [Drivetrain>CLUTCH>CLUTCH UNIT\(for RC60, RC61\)>REMOVAL](#)

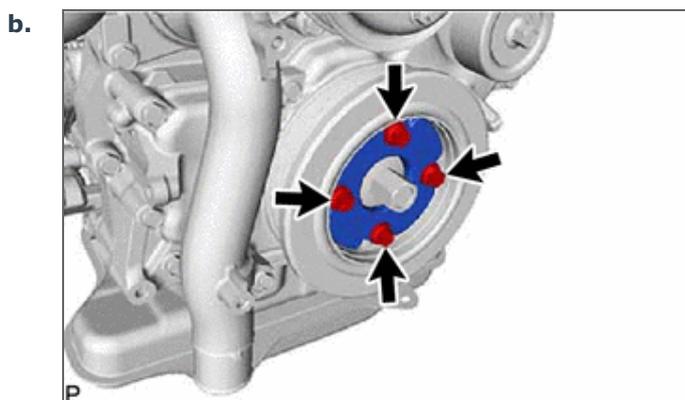
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**40.REMOVE FLYWHEEL SUB-ASSEMBLY 13405**

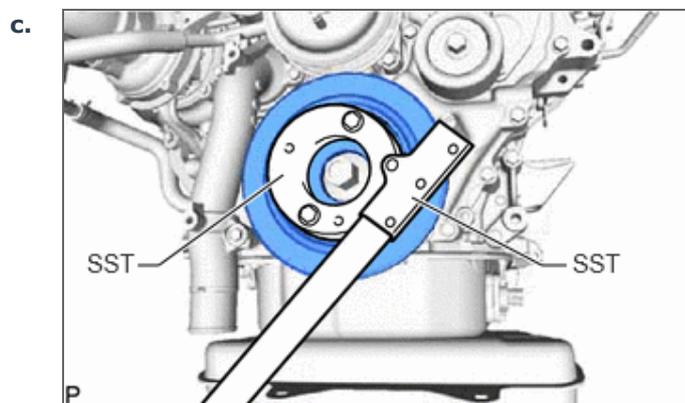
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w/ Viscous Heater:  
 Remove the 4 bolts, viscous heater crankshaft pulley and crankshaft pulley cover from the crankshaft pulley.

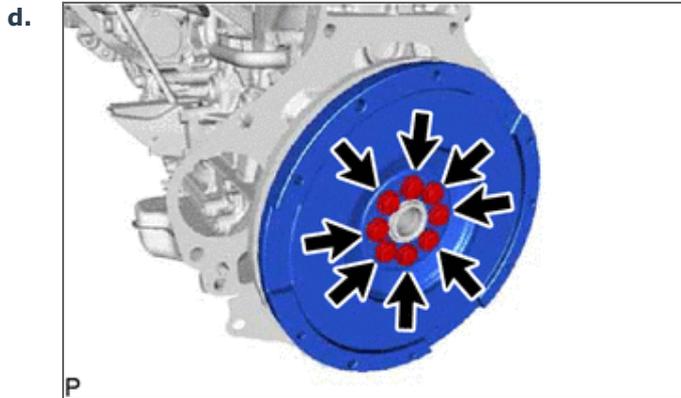


w/o Viscous Heater:  
 Remove the 4 bolts and crankshaft pulley cover from the crankshaft pulley.



Using SST, hold the crankshaft pulley.

**SST**  
**09213-58014 (91551-80840)**  
**09330-00021**



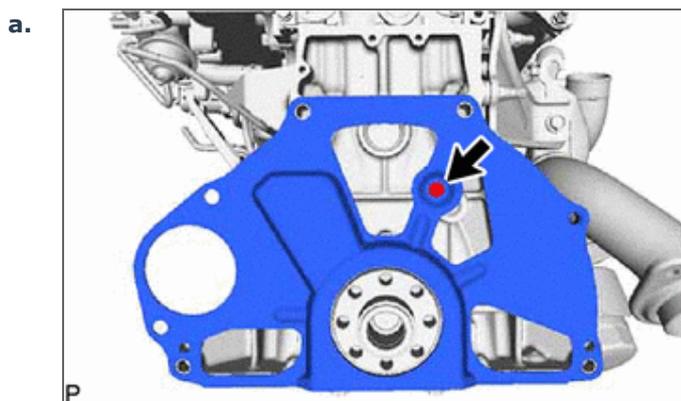
for Manual Transmission:  
Remove the 8 bolts and flywheel sub-assembly from the crankshaft.



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

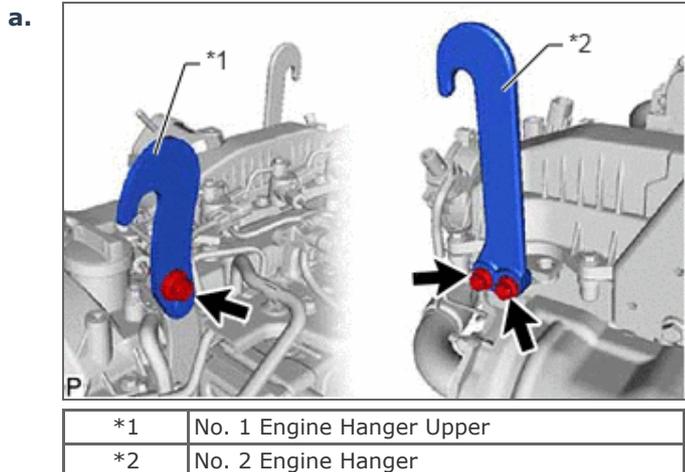
**41.REMOVE REAR END PLATE**

**11355**



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

**42.INSTALL ENGINE HANGER**



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

**Torque:**

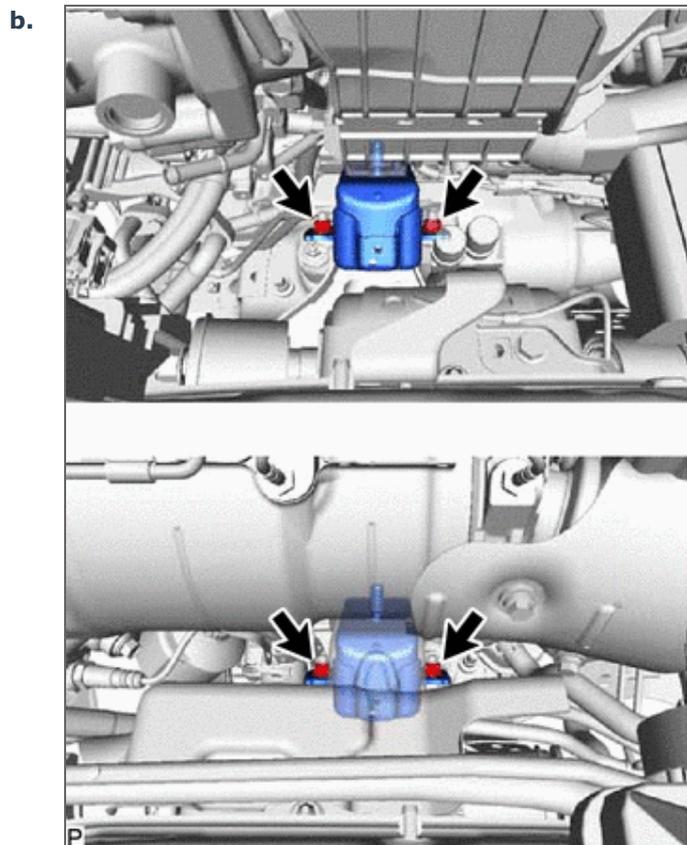
**for No. 1 engine hanger upper : 29 N\*m (296 kgf\*cm, 21 ft.\*lbf)**  
**for No. 2 engine hanger : 26 N\*m (265 kgf\*cm, 19 ft.\*lbf)**

**HINT:**

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

**43.REMOVE ENGINE ASSEMBLY**

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



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.

**44.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.

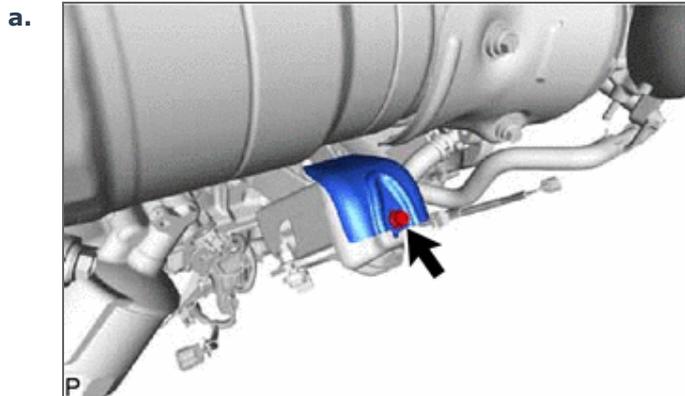
**45.REMOVE ENGINE WIRE**

**82121**

- a. Remove the engine wire from the engine assembly.

**46.REMOVE FRONT ENGINE MOUNTING INSULATOR RH**

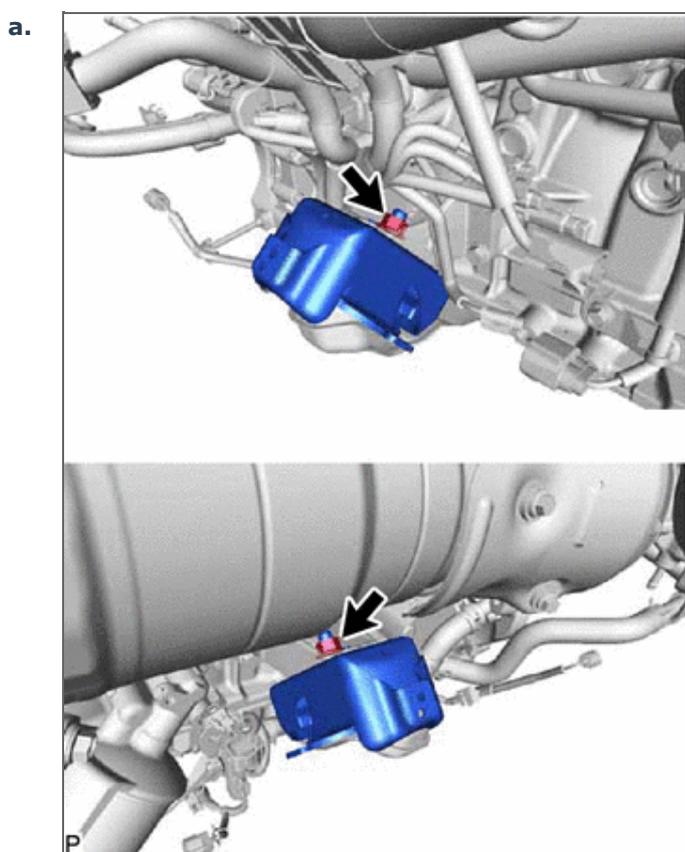
**12391**



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

**47.REMOVE FRONT ENGINE MOUNTING INSULATOR**

**12361**



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

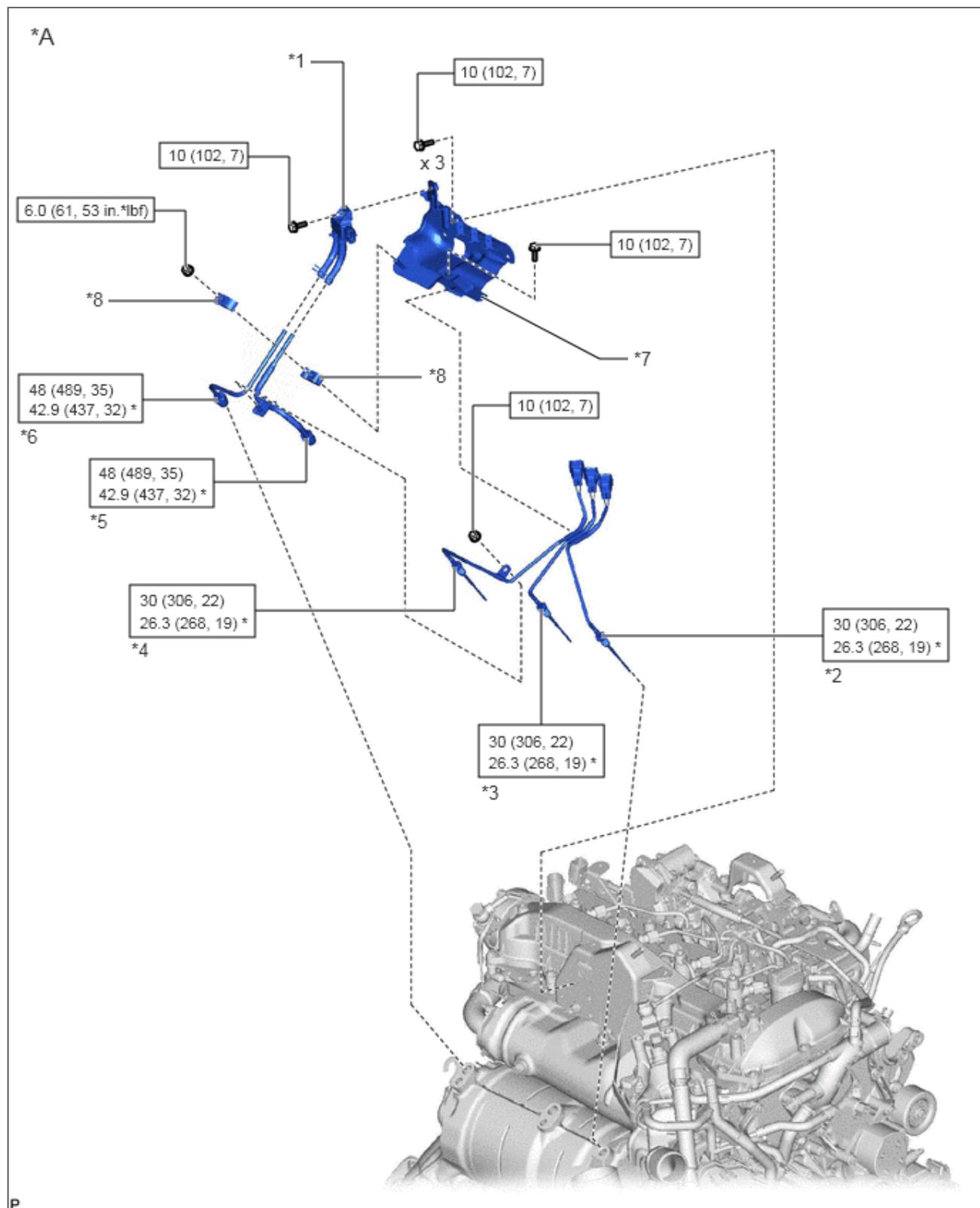
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Print

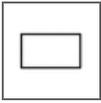
Exit

1GD-FTV ENGINE MECHANICAL ENGINE UNIT COMPONENTS

ILLUSTRATION



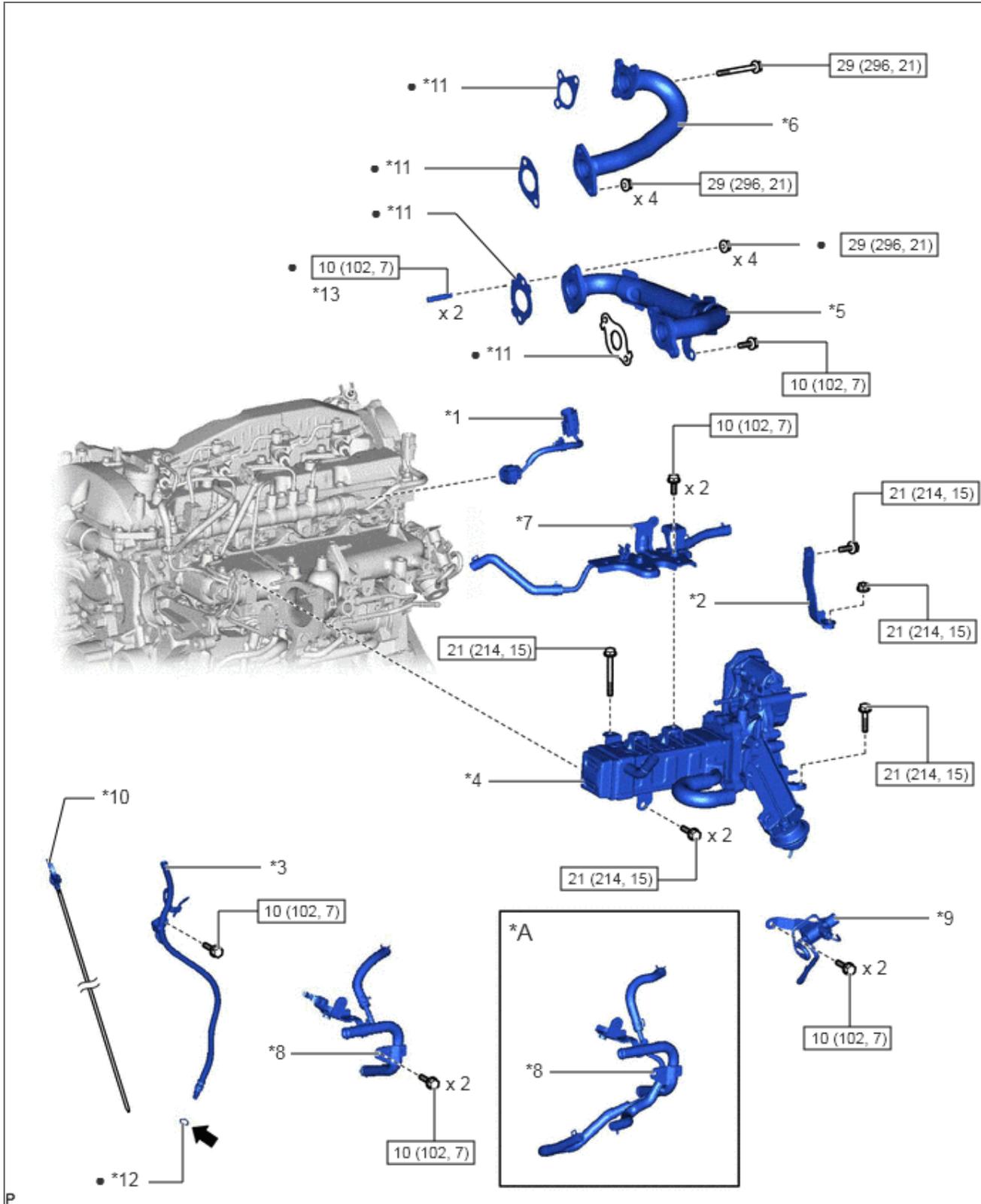
*A	w/ DPF	-	-
*1	DIFFERENTIAL PRESSURE SENSOR	*2	NO. 1 EXHAUST GAS TEMPERATURE SENSOR
*3	NO. 2 EXHAUST GAS TEMPERATURE SENSOR	*4	NO. 3 EXHAUST GAS TEMPERATURE SENSOR

*5	NO. 1 VACUUM PIPE	*6	NO. 2 VACUUM PIPE
*7	PIPE CLAMP	*8	CLAMP
	N*m (kgf*cm, ft.*lbf): Specified torque	*	For use with union nut wrench

## ILLUSTRATION



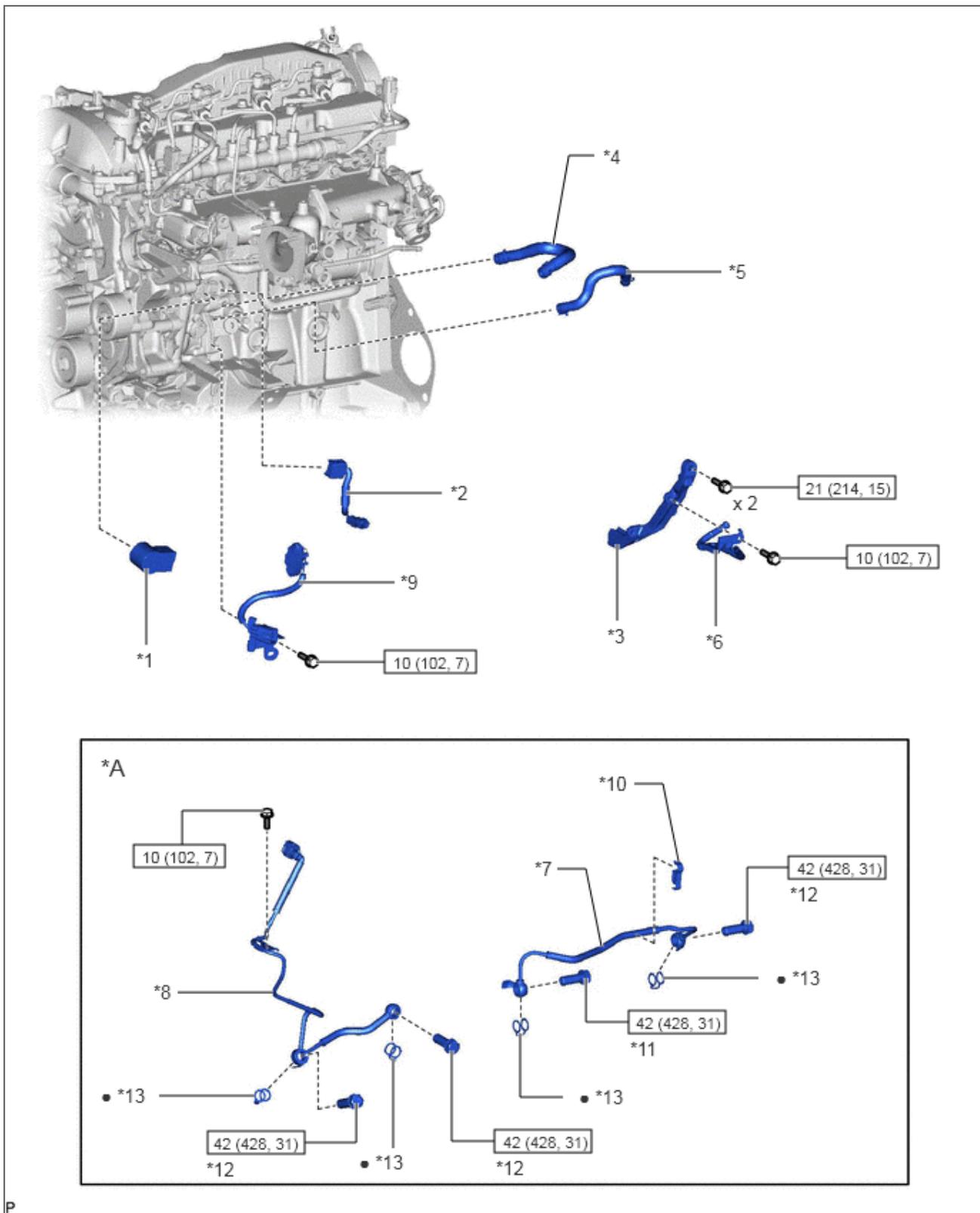
# ILLUSTRATION



*A	for Cold Area Specification Vehicles	-	-
*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 SUB-ASSEMBLY	*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	-	-

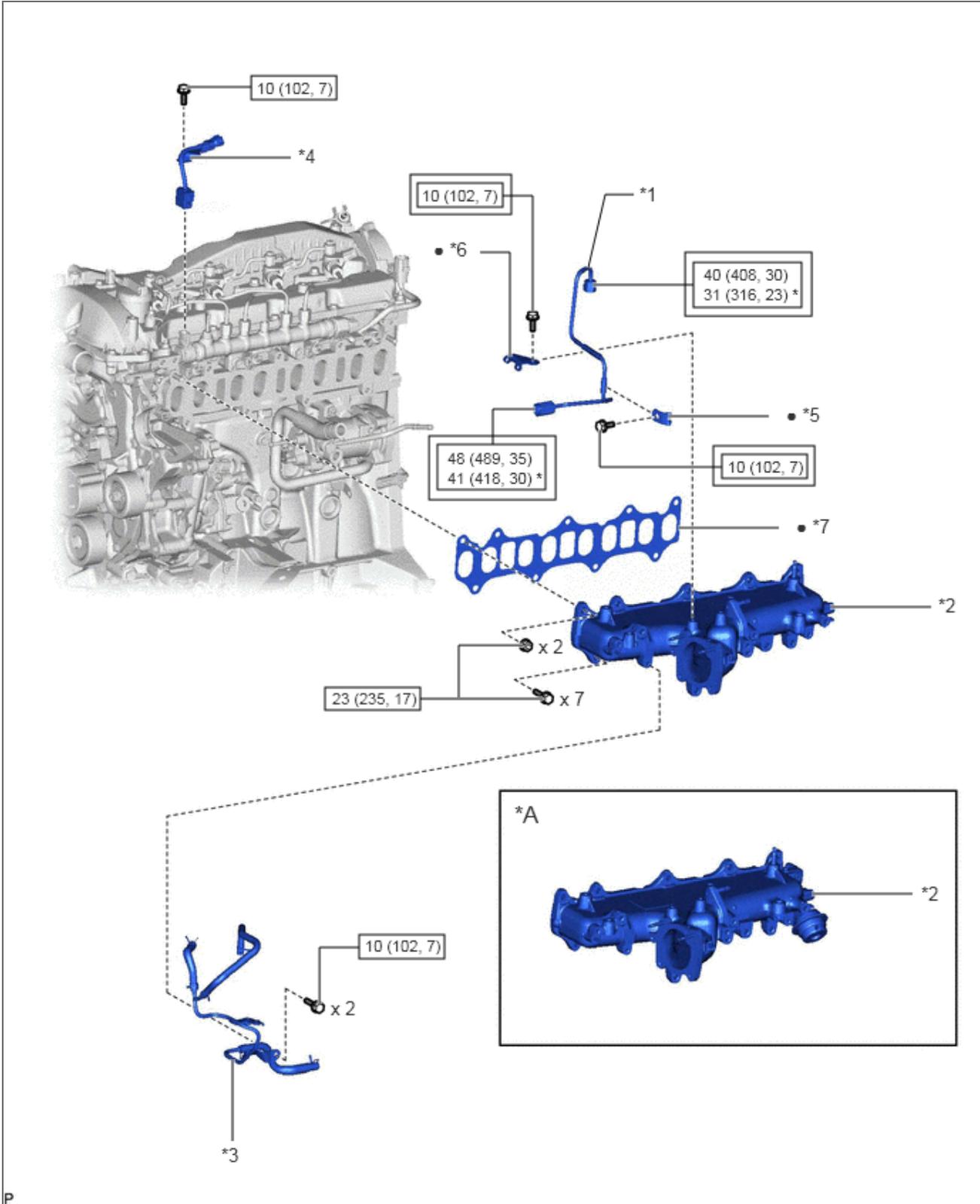
## ILLUSTRATION



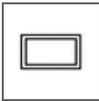
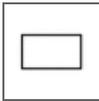
*A	w/ DPF	-	-
*1	FUEL INJECTION PUMP COVER SUB-ASSEMBLY	*2	FUEL PUMP MOTOR WIRE
*3	MANIFOLD STAY	*4	NO. 1 FUEL HOSE
*5	NO. 2 FUEL HOSE	*6	NO. 2 FUEL PIPE
*7	NO. 3 FUEL PIPE	*8	NO. 4 FUEL PIPE SUB-ASSEMBLY
*9	WIRING HARNESS CLAMP BRACKET	*10	FUEL PIPE CLAMP
*11	SUPPLY PUMP HOLLOW SCREW	*12	UNION BOLT
*13	GASKET	-	-

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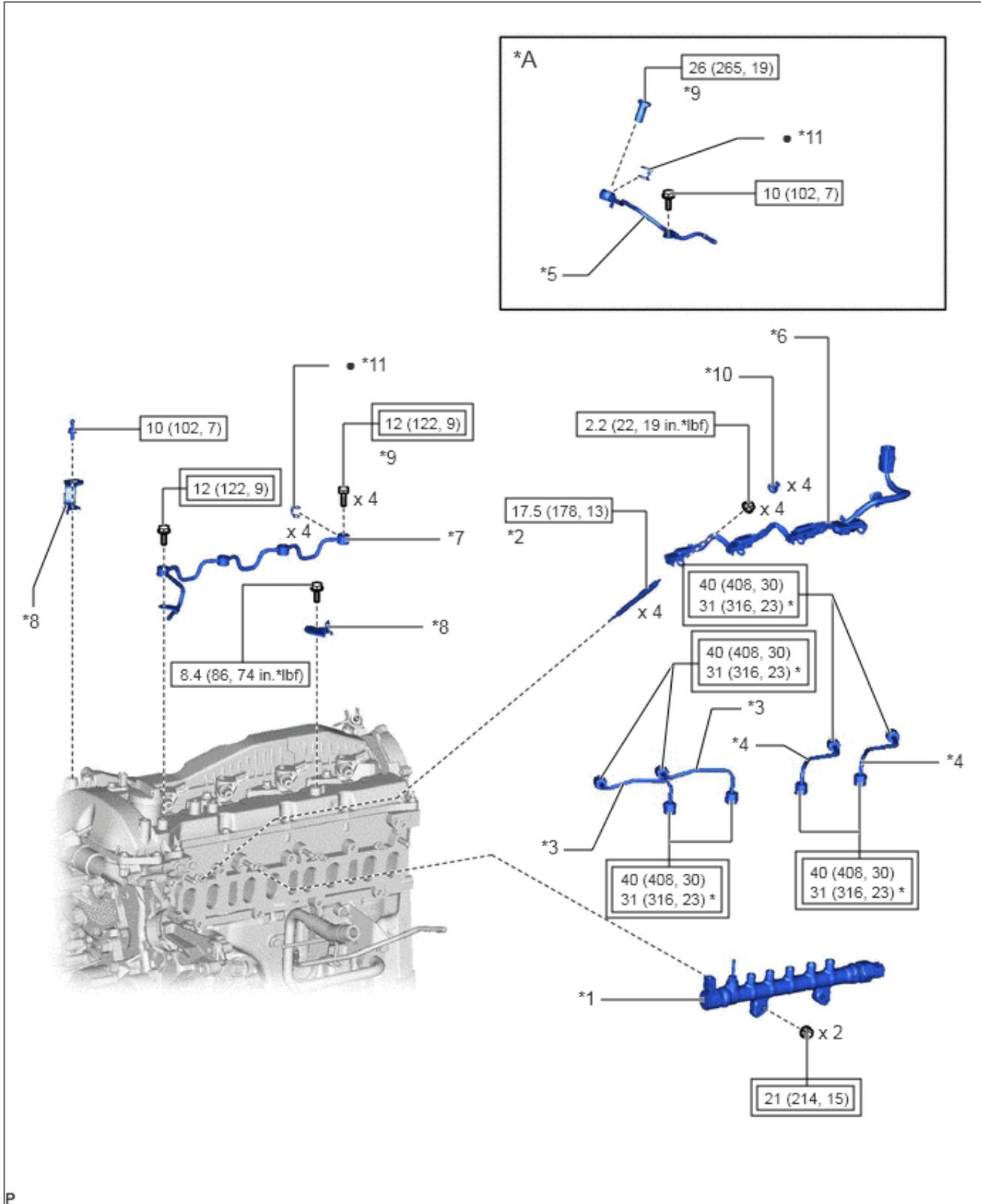
## ILLUSTRATION



*A	w/ DPF	-	-
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*1	FUEL INLET PIPE SUB-ASSEMBLY	*2	INTAKE MANIFOLD
*3	NO. 2 NOZZLE LEAKAGE PIPE ASSEMBLY	*4	WIRING HARNESS CLAMP BRACKET
*5	INJECTION PIPE CLAMP	*6	NO. 2 INJECTION PIPE CLAMP
*7	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

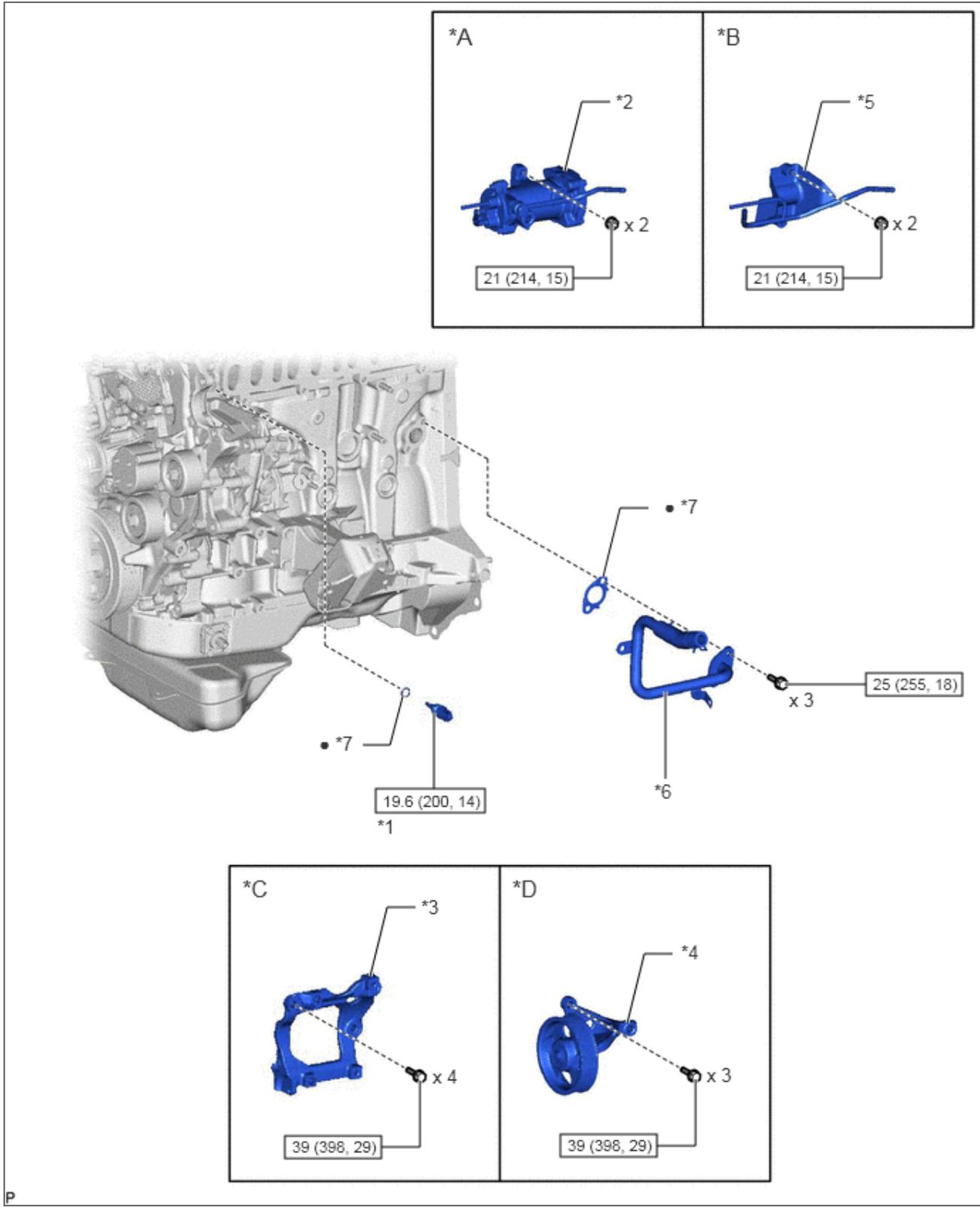
## ILLUSTRATION



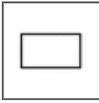
*A	w/ DPF	-	-
*1	COMMON RAIL ASSEMBLY	*2	GLOW PLUG ASSEMBLY
*3	NO. 1 INJECTION PIPE SUB-ASSEMBLY	*4	NO. 2 INJECTION PIPE SUB-ASSEMBLY
*5	NO. 1 FUEL PIPE	*6	NO. 1 GLOW PLUG CONNECTOR
*7	NOZZLE LEAKAGE PIPE ASSEMBLY	*8	WIRING HARNESS CLAMP BRACKET
*9	UNION BOLT	*10	SCREW GROMMET
*11	GASKET	-	-
	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping": N*m (kgf*cm,		N*m (kgf*cm, ft.*lbf): Specified torque

	ft.*lbf)		
*	For use with SST	•	Non-reusable part

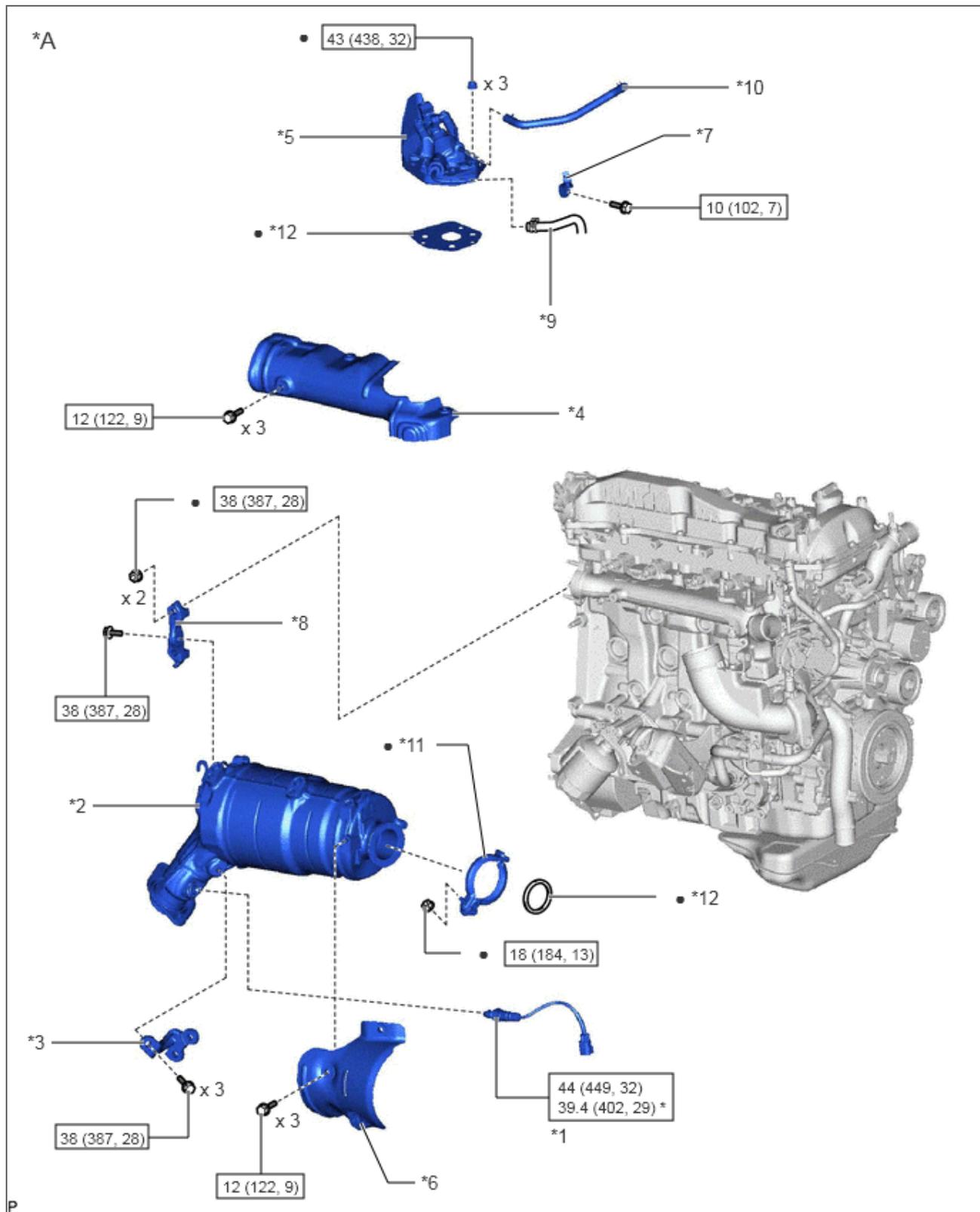
### ILLUSTRATION



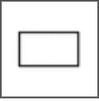
*A	w/ DPF	*B	w/o DPF
*C	w/ Air Conditioning System	*D	w/o Air Conditioning System
*1	ENGINE COOLANT TEMPERATURE SENSOR	*2	FUEL FILTER ASSEMBLY

*3	NO. 1 COMPRESSOR MOUNTING BRACKET	*4	NO. 1 IDLER PULLEY SUB-ASSEMBLY
*5	NO. 3 NOZZLE LEAKAGE PIPE	*6	NO. 5 WATER BY-PASS PIPE SUB-ASSEMBLY
*7	GASKET	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part

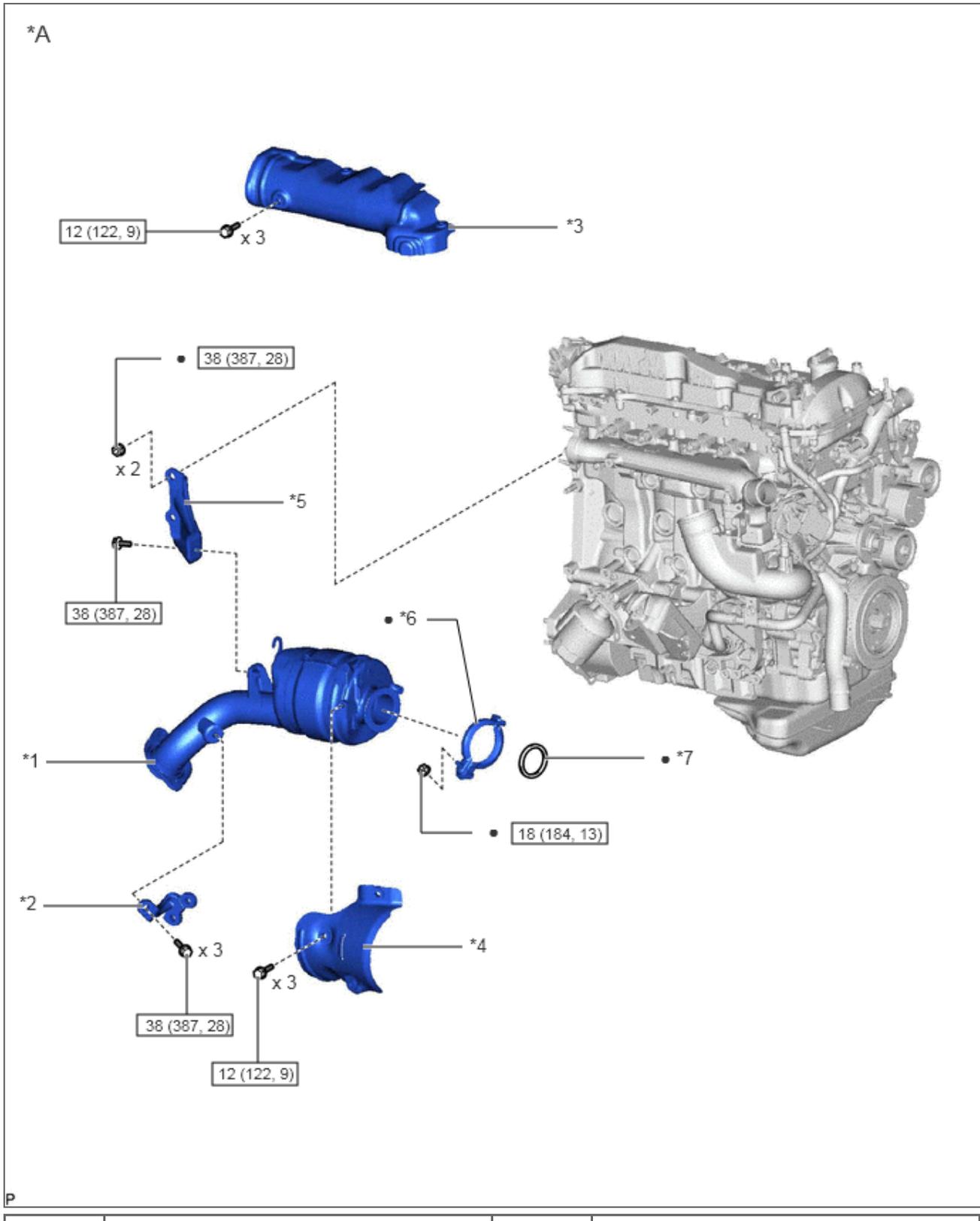
## ILLUSTRATION

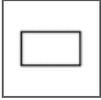


*A	w/ DPF	-	-
*1	AIR FUEL RATIO SENSOR	*2	EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY
*3	EXHAUST PIPE SUPPORT STAY	*4	NO. 1 EXHAUST MANIFOLD HEAT INSULATOR
*5	NO. 1 INJECTOR HOLDER	*6	NO. 1 TURBO INSULATOR
*7	NO. 1 WATER HOSE CLAMP BRACKET	*8	NO. 2 EXHAUST PIPE SUPPORT STAY
*9	NO. 4 WATER BY-PASS HOSE	*10	NO. 5 WATER BY-PASS HOSE
*11	EXHAUST PIPE CLAMP	*12	GASKET
N*m (kgf*cm, ft.*lbf): Specified torque		*	For use with SST

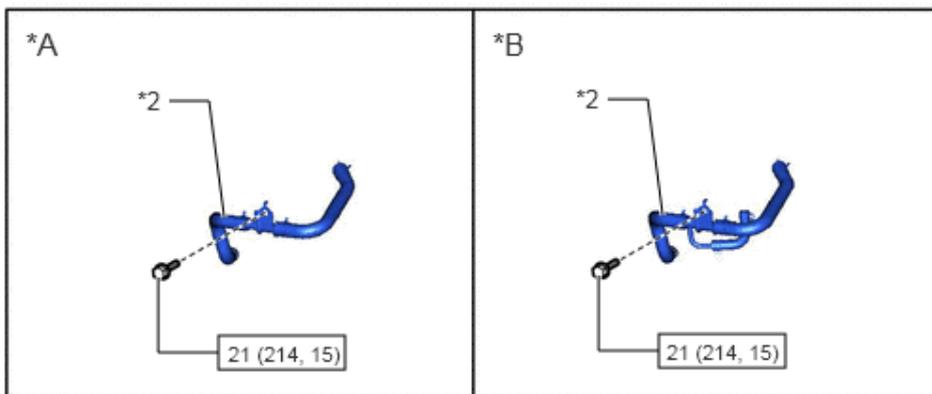
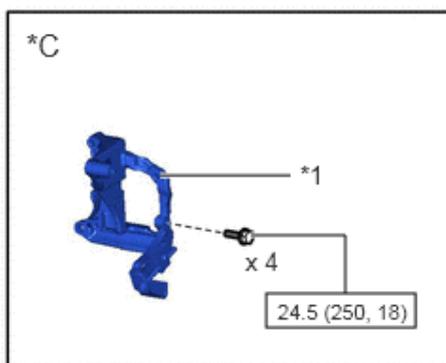
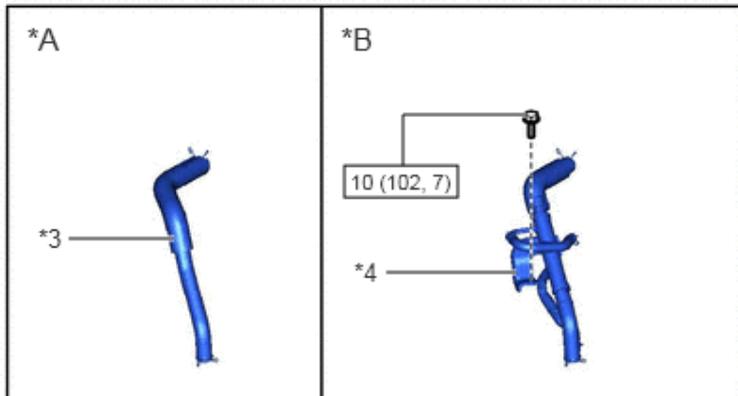
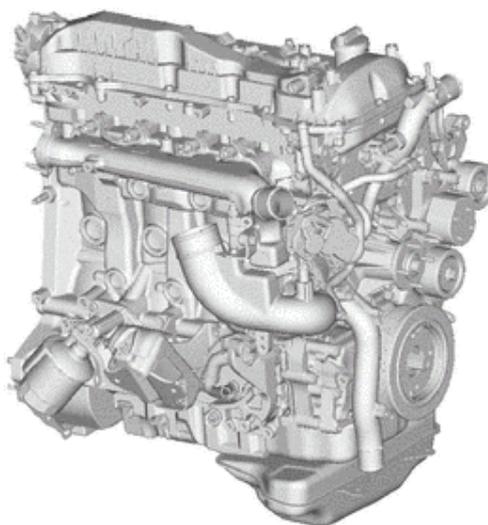
			
•	Non-reusable part	-	-

## ILLUSTRATION



*A	w/o DPF	-	-
*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	EXHAUST PIPE CLAMP
*7	GASKET	-	-
	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part

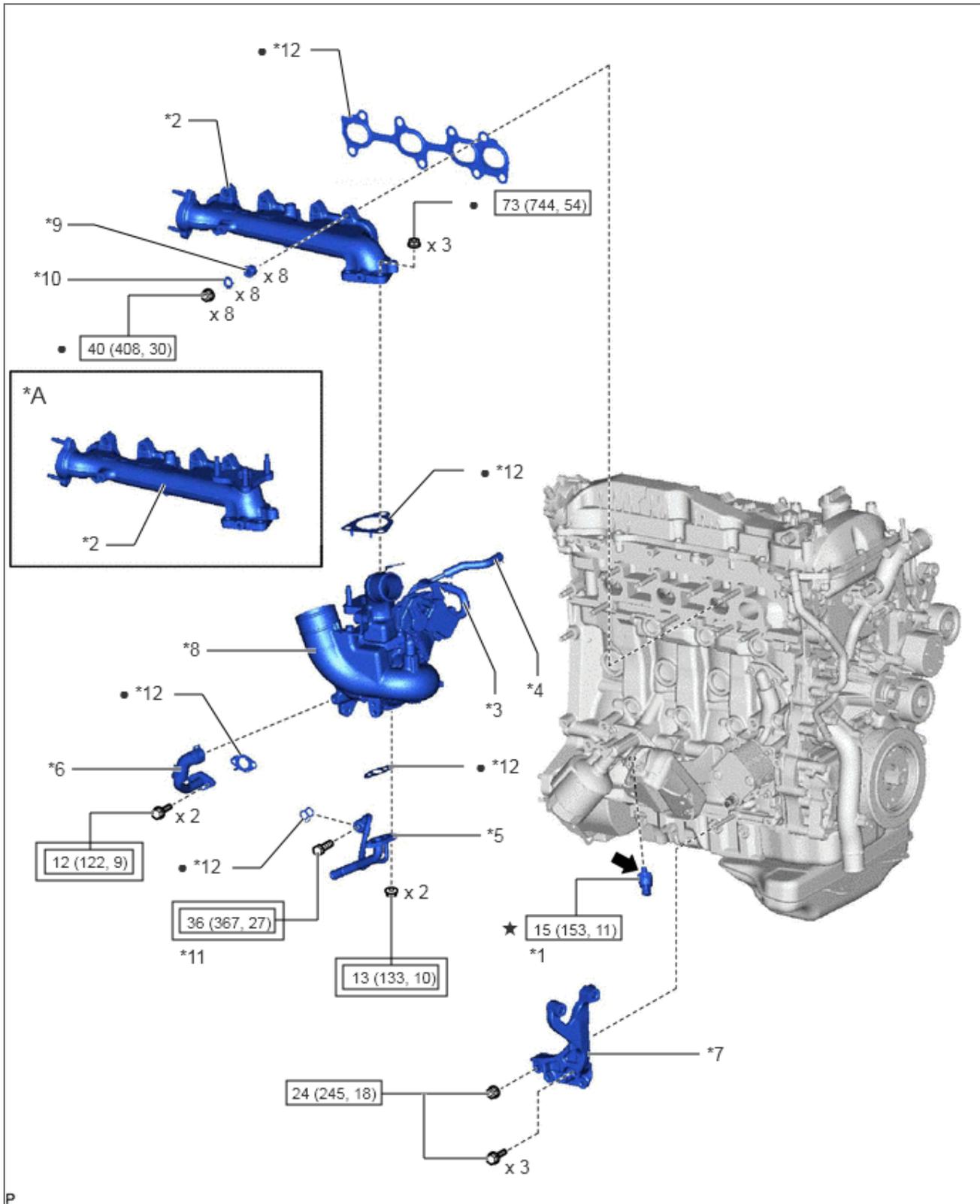
## ILLUSTRATION



P

*A	except Cold Area Specification Vehicles	*B	for Cold Area Specification Vehicles
*C	w/ Viscous Heater	-	-
*1	NO. 1 VISCIOUS HEATER BRACKET SUB-ASSEMBLY	*2	NO. 3 WATER BY-PASS PIPE
*3	PCV HOSE	*4	PCV PIPE
	N*m (kgf*cm, ft.*lbf): Specified torque	-	-

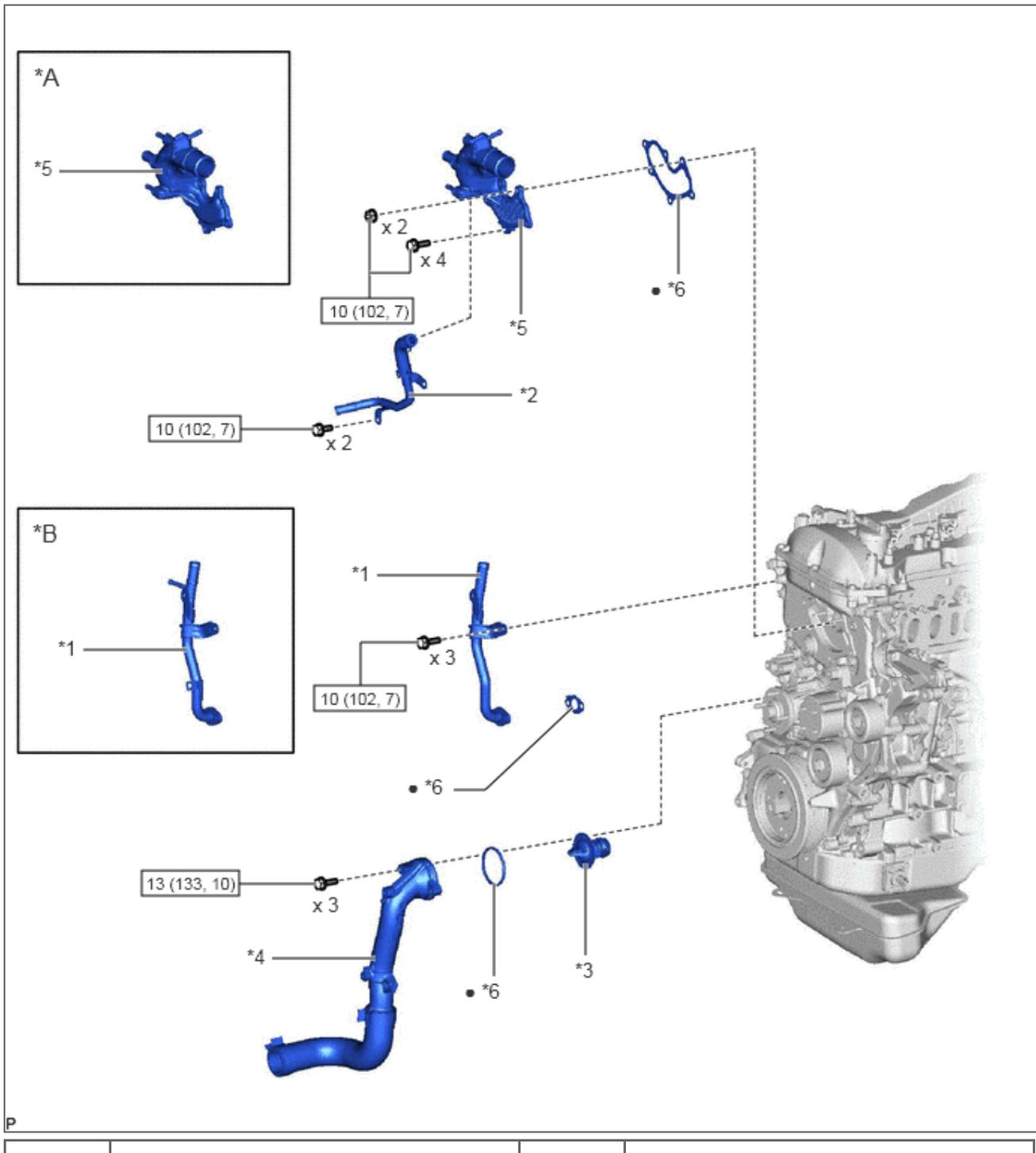
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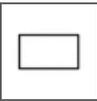


*A	w/ DPF	-	-
*1	ENGINE OIL PRESSURE SWITCH ASSEMBLY	*2	EXHAUST MANIFOLD
*3	NO. 1 TURBO WATER HOSE	*4	NO. 2 TURBO WATER HOSE
*5	TURBO OIL INLET PIPE SUB-ASSEMBLY	*6	TURBO OIL OUTLET PIPE
*7	TURBOCHARGER STAY	*8	TURBOCHARGER SUB-ASSEMBLY
*9	COLLAR	*10	SPACER

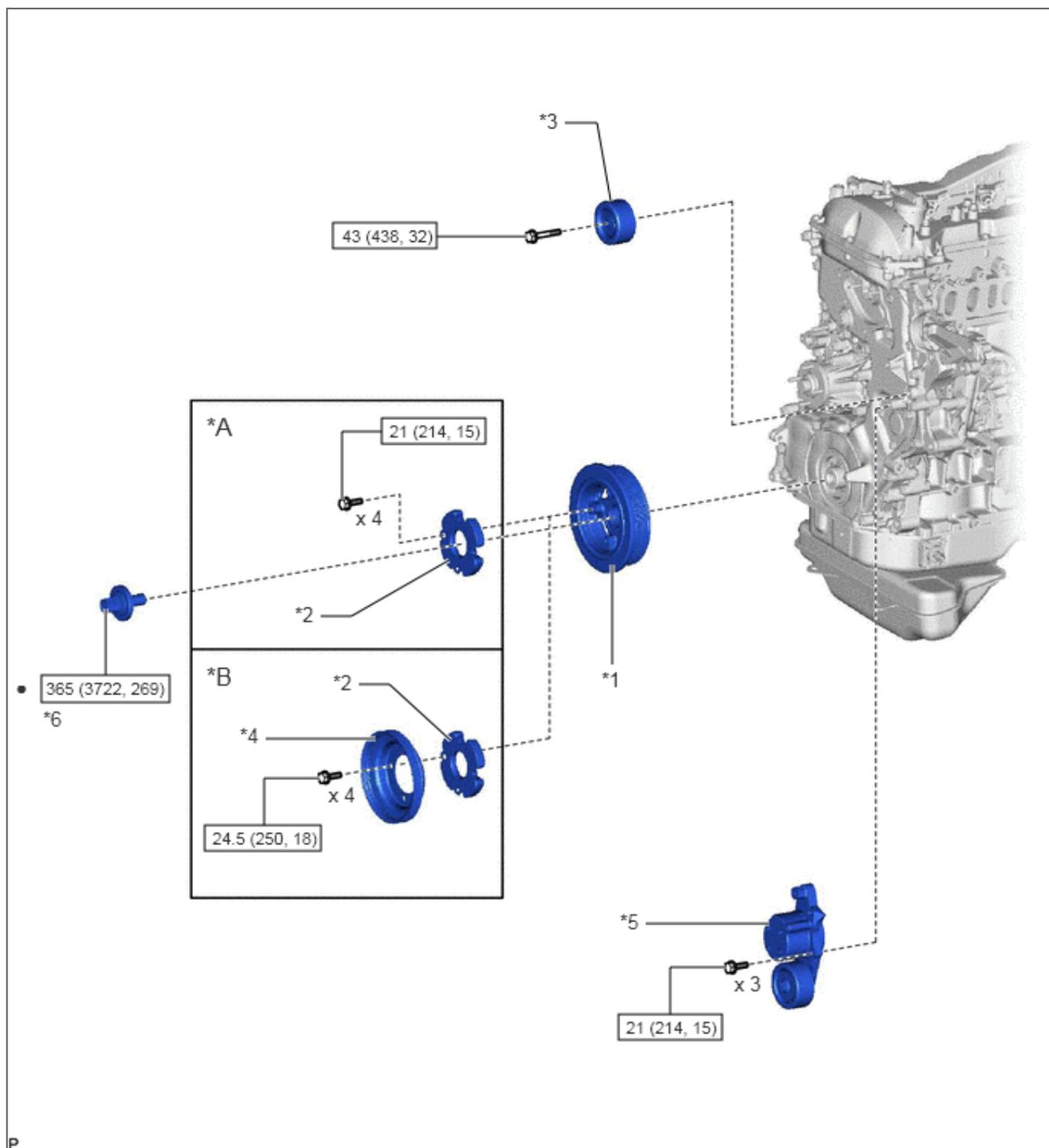
*11	UNION BOLT	*12	GASKET
	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping": N*m (kgf*cm, ft.*lbf)		N*m (kgf*cm, ft.*lbf): Specified torque
<ul style="list-style-type: none"> <li data-bbox="172 338 188 360">•</li> </ul>	Non-reusable part		Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent
★	Precoated part	-	-

## ILLUSTRATION

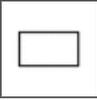


*A	w/ DPF	*B	for Cold Area Specification Vehicles
*1	NO. 1 WATER BY-PASS PIPE	*2	NO. 2 WATER BY-PASS PIPE SUB-ASSEMBLY
*3	THERMOSTAT	*4	WATER INLET
*5	WATER OUTLET SUB-ASSEMBLY	*6	GASKET
 N*m (kgf*cm, ft.*lbf): Specified torque		<ul style="list-style-type: none"> <li>Non-reusable part</li> </ul>	

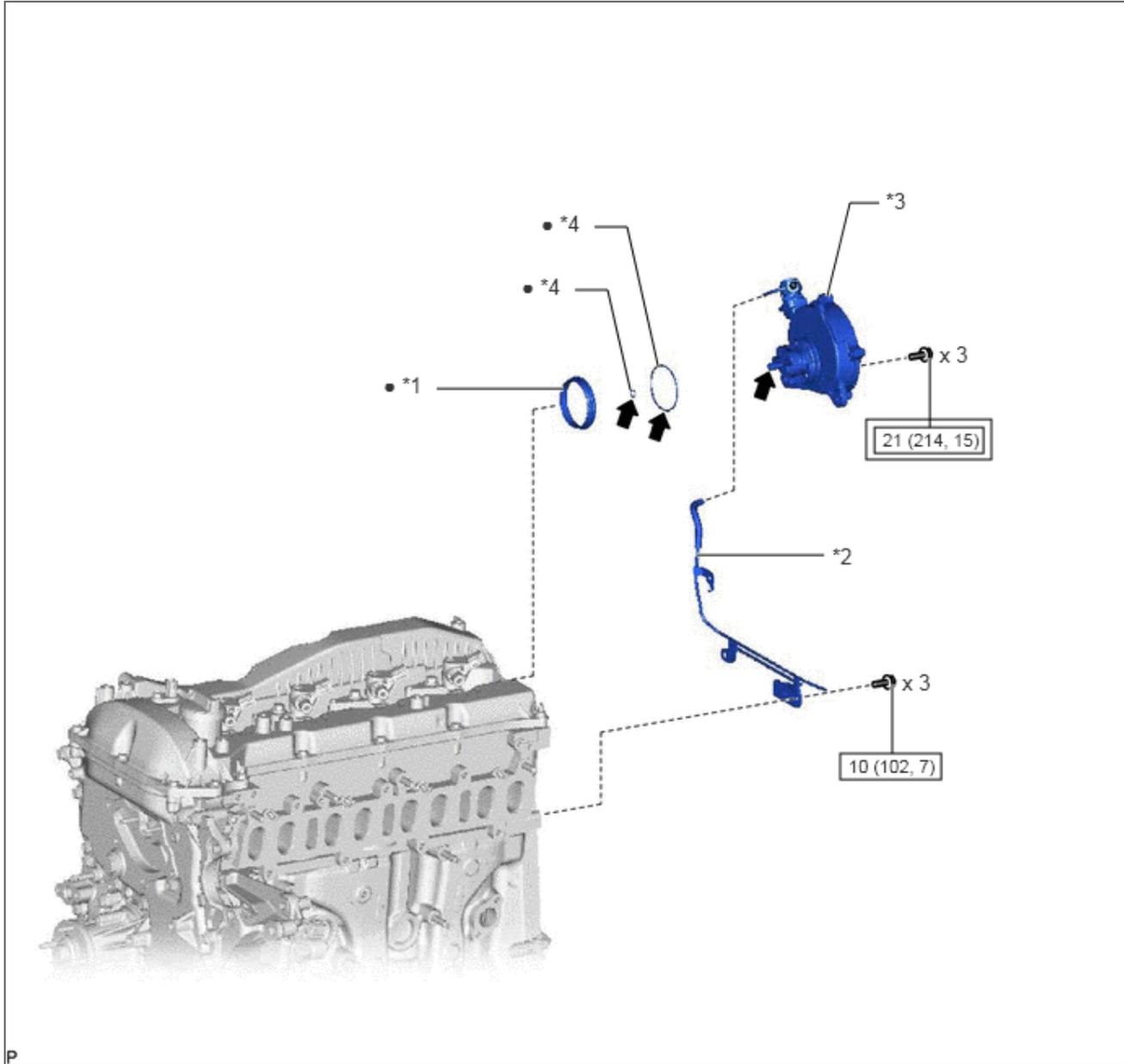
## ILLUSTRATION

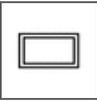
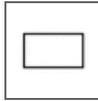


*A	w/o Viscous Heater	*B	w/ Viscous Heater
*1	CRANKSHAFT PULLEY	*2	CRANKSHAFT PULLEY COVER
*3	NO. 1 IDLER PULLEY SUB-ASSEMBLY	*4	VISCOUS HEATER CRANKSHAFT PULLEY

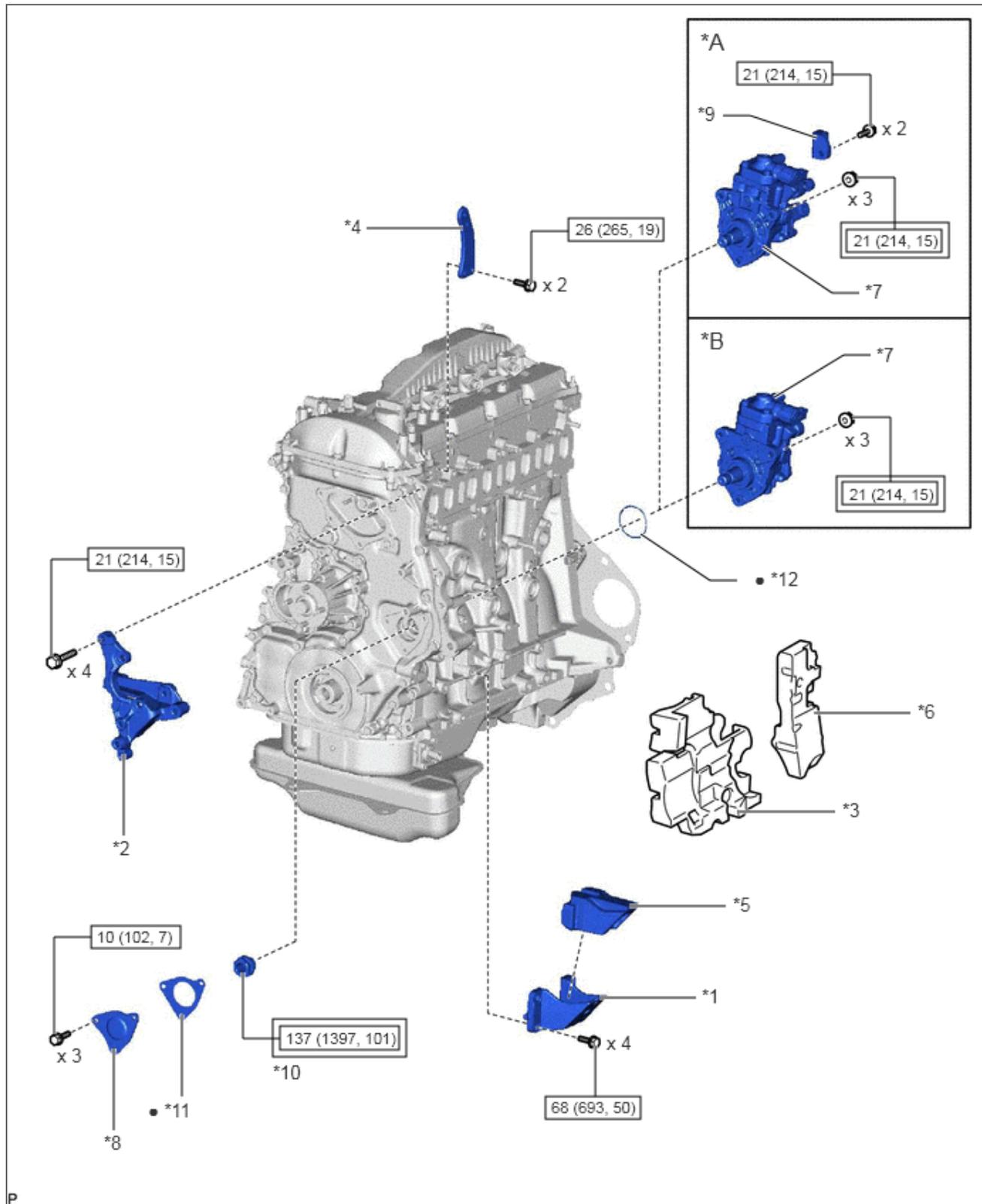
*5	V-RIBBED BELT TENSIONER ASSEMBLY	*6	CRANKSHAFT PULLEY SET BOLT
	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part

## ILLUSTRATION

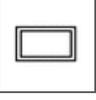
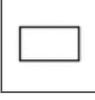


*1	CAMSHAFT OIL SEAL RETAINER	*2	NO. 1 VACUUM TRANSMITTING PIPE SUB-ASSEMBLY
*3	VACUUM PUMP ASSEMBLY	*4	O-RING
	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping": N*m (kgf*cm, ft.*lbf)		N*m (kgf*cm, ft.*lbf): Specified torque
•	Non-reusable part	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

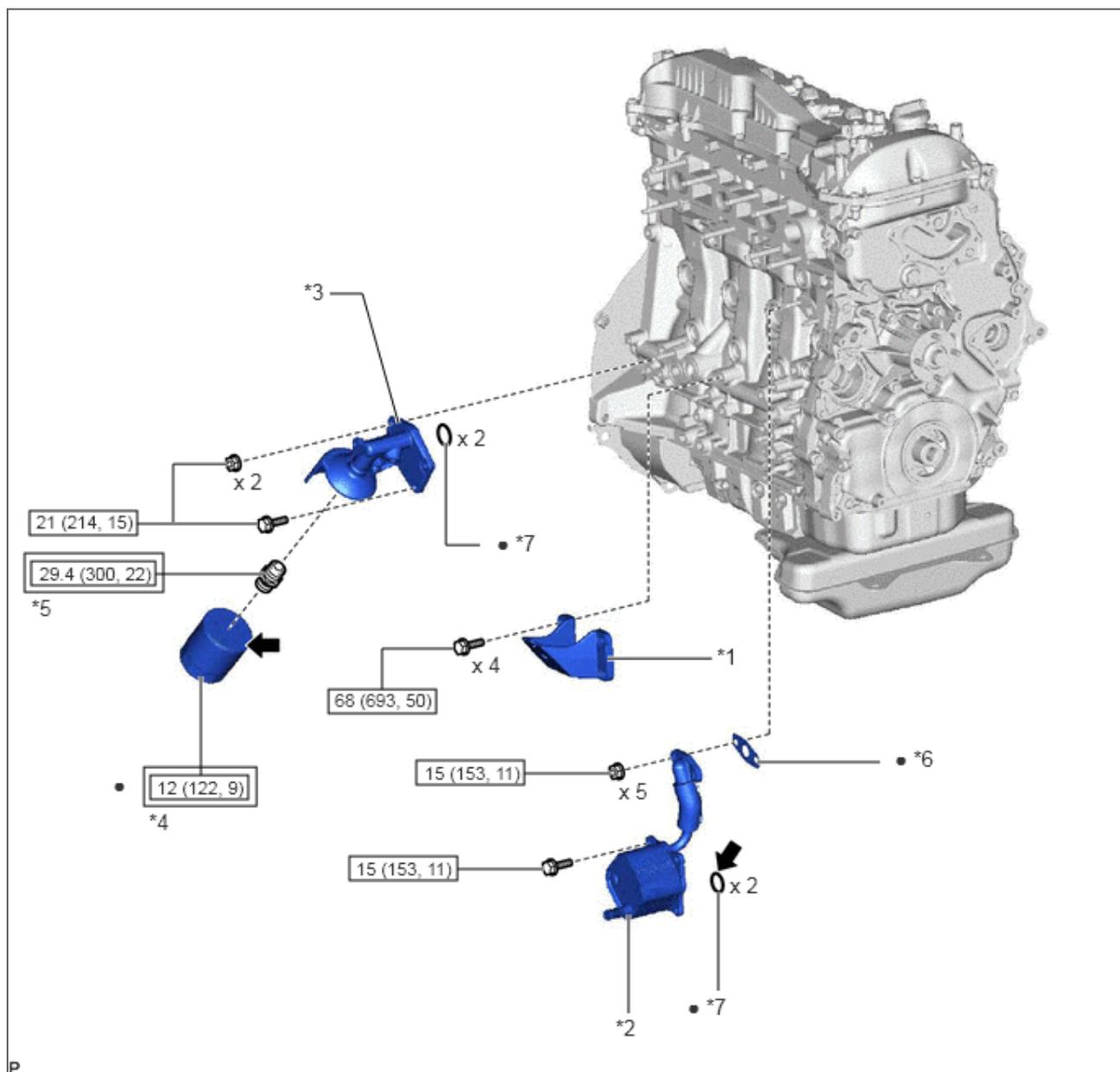
# ILLUSTRATION



*A	w/ DPF	*B	w/o DPF
*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	NO. 1 FUEL PUMP BRACKET	*10	SUPPLY PUMP SHAFT NUT
*11	GASKET	*12	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	-	-

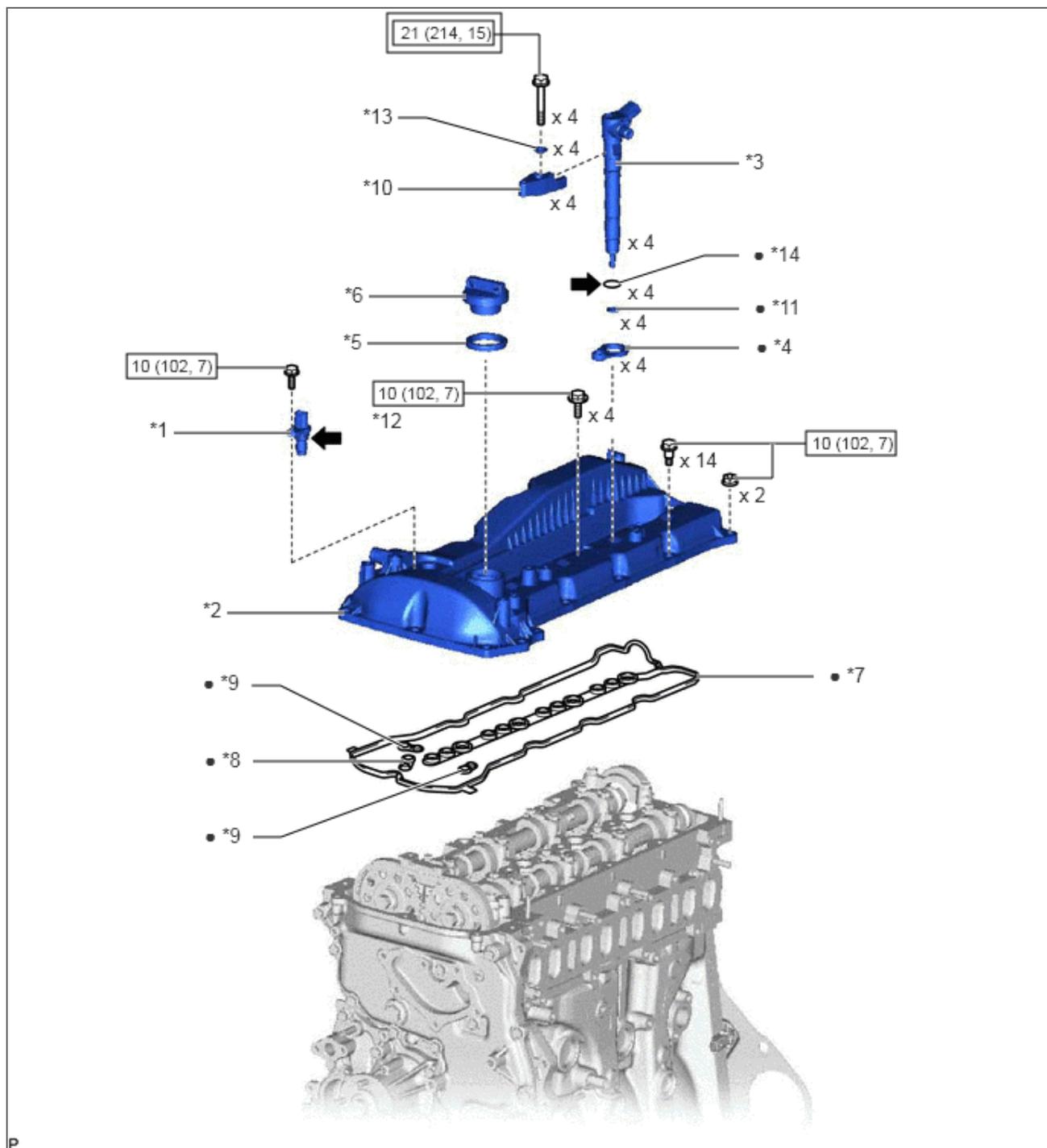
## ILLUSTRATION



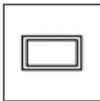
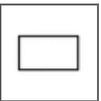
*1	FRONT NO. 1 ENGINE MOUNTING BRACKET RH	*2	OIL COOLER ASSEMBLY
*3	OIL FILTER BRACKET	*4	OIL FILTER SUB-ASSEMBLY
*5	OIL FILTER UNION	*6	WATER OUTLET PIPE GASKET
*7	O-RING	-	-
	Tightening torque for "Major areas involving basic vehicle performance such as moving/turning/stopping": N*m (kgf*cm, ft.*lbf)		N*m (kgf*cm, ft.*lbf): Specified torque

	ft.*lbf)		
•	Non-reusable part	➔	Engine oil

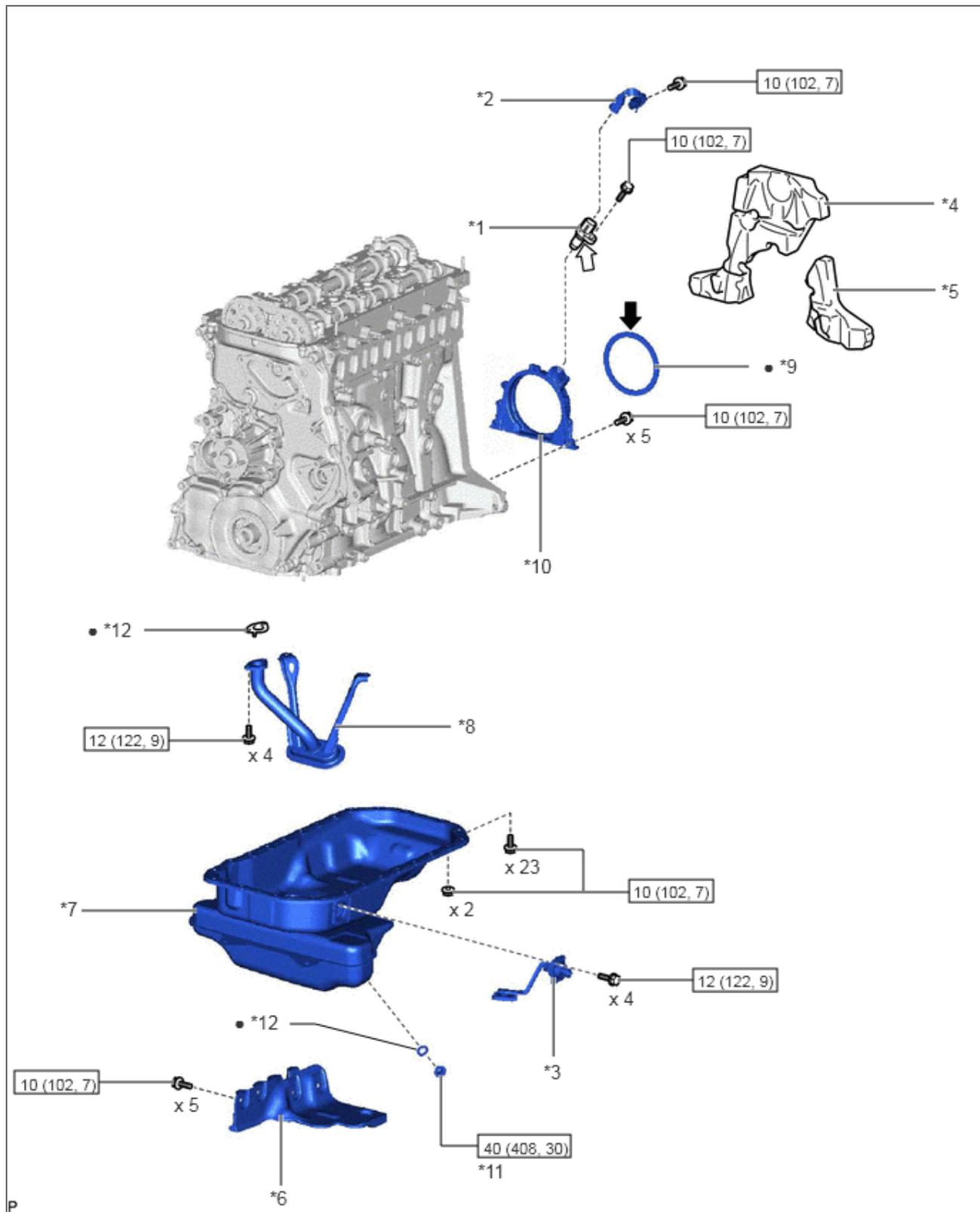
### ILLUSTRATION

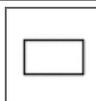


*1	CAMSHAFT POSITION SENSOR	*2	CYLINDER HEAD COVER SUB-ASSEMBLY
*3	INJECTOR ASSEMBLY	*4	NOZZLE HOLDER GASKET
*5	OIL FILLER CAP GASKET	*6	OIL FILLER CAP SUB-ASSEMBLY
*7	CYLINDER HEAD COVER GASKET	*8	NO. 2 CYLINDER HEAD COVER GASKET
*9	CAMSHAFT BEARING CAP OIL HOLE GASKET	*10	NOZZLE HOLDER CLAMP

*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

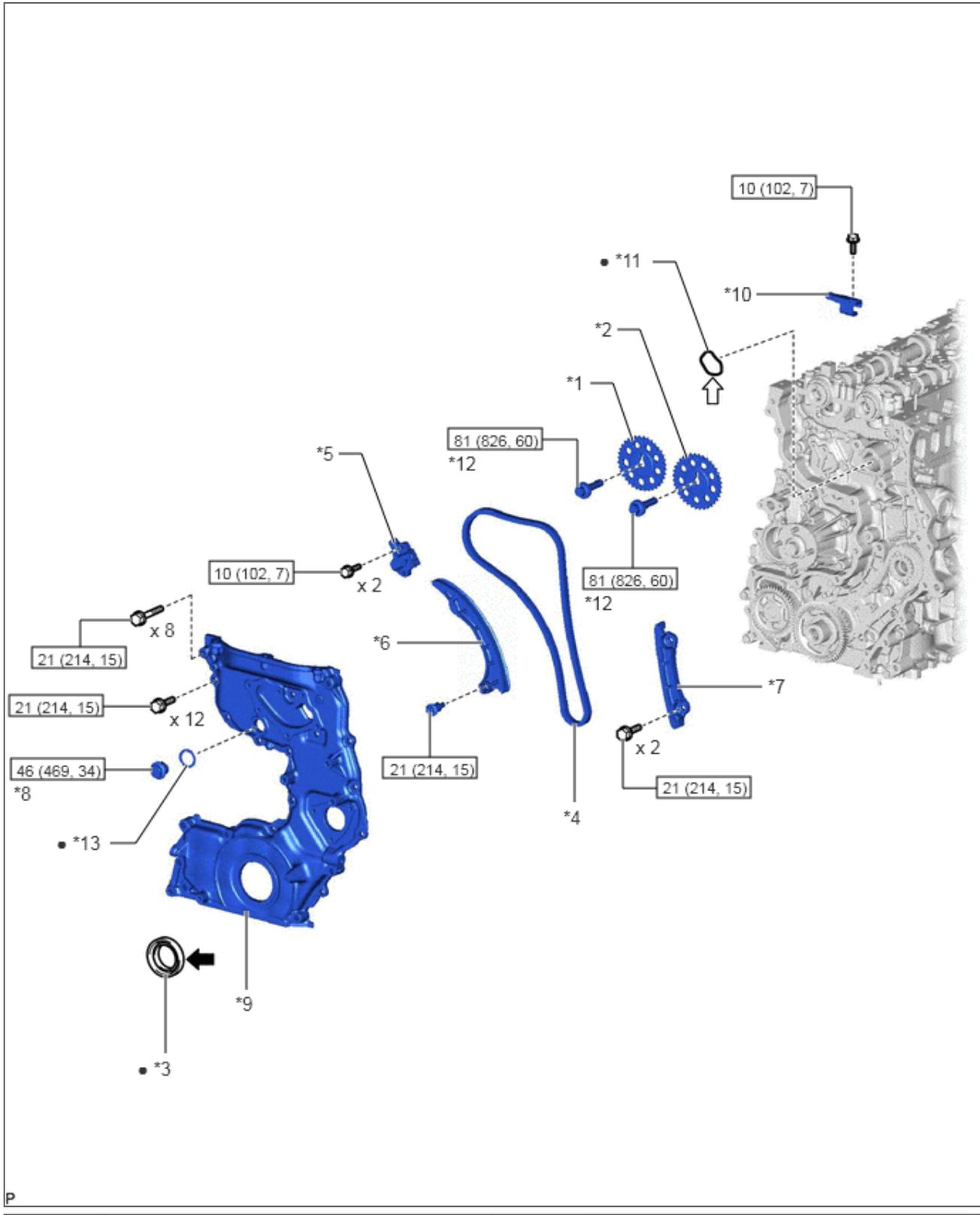
## ILLUSTRATION



*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

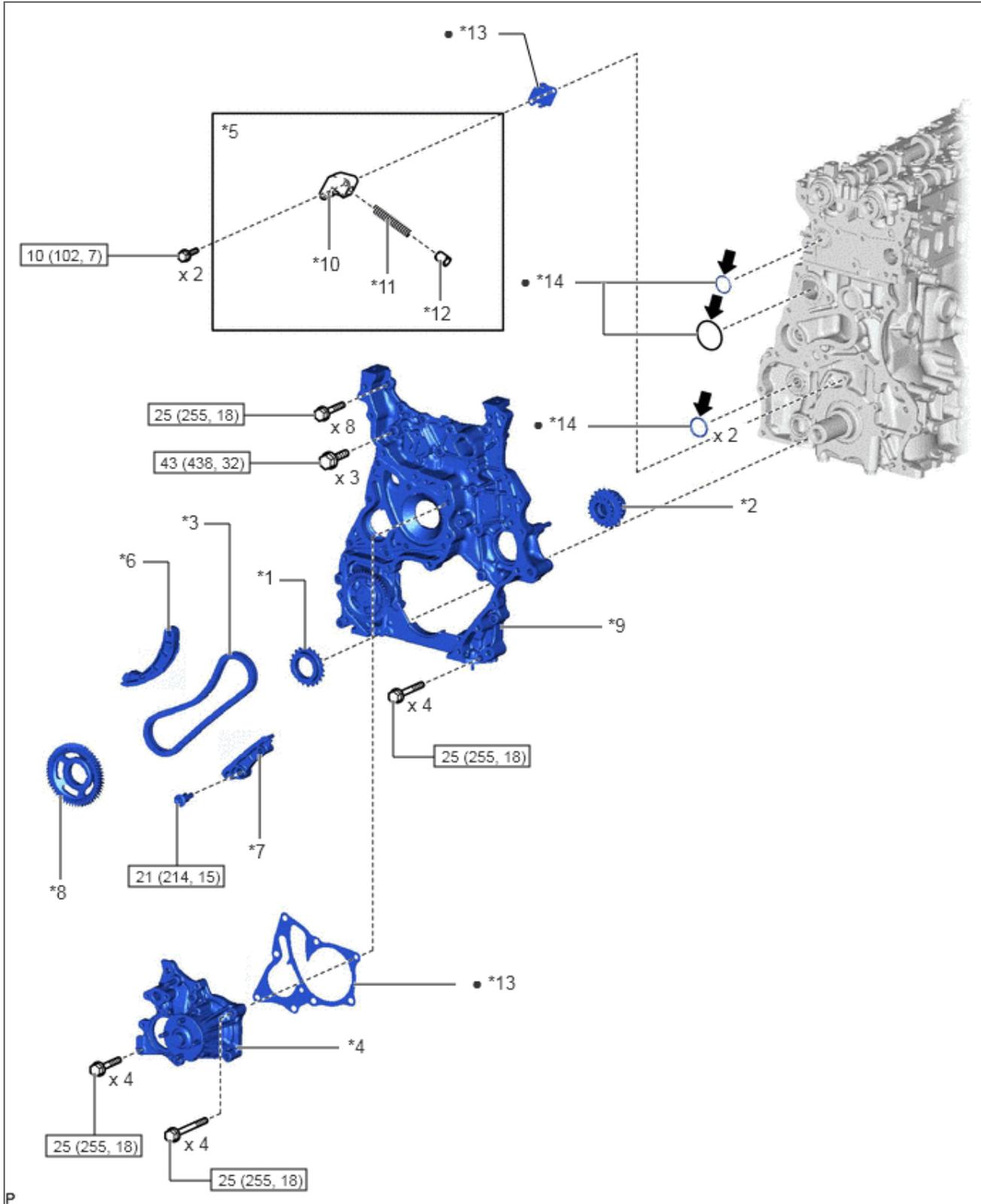
	MP grease		Engine oil
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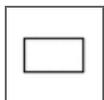
### ILLUSTRATION



*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

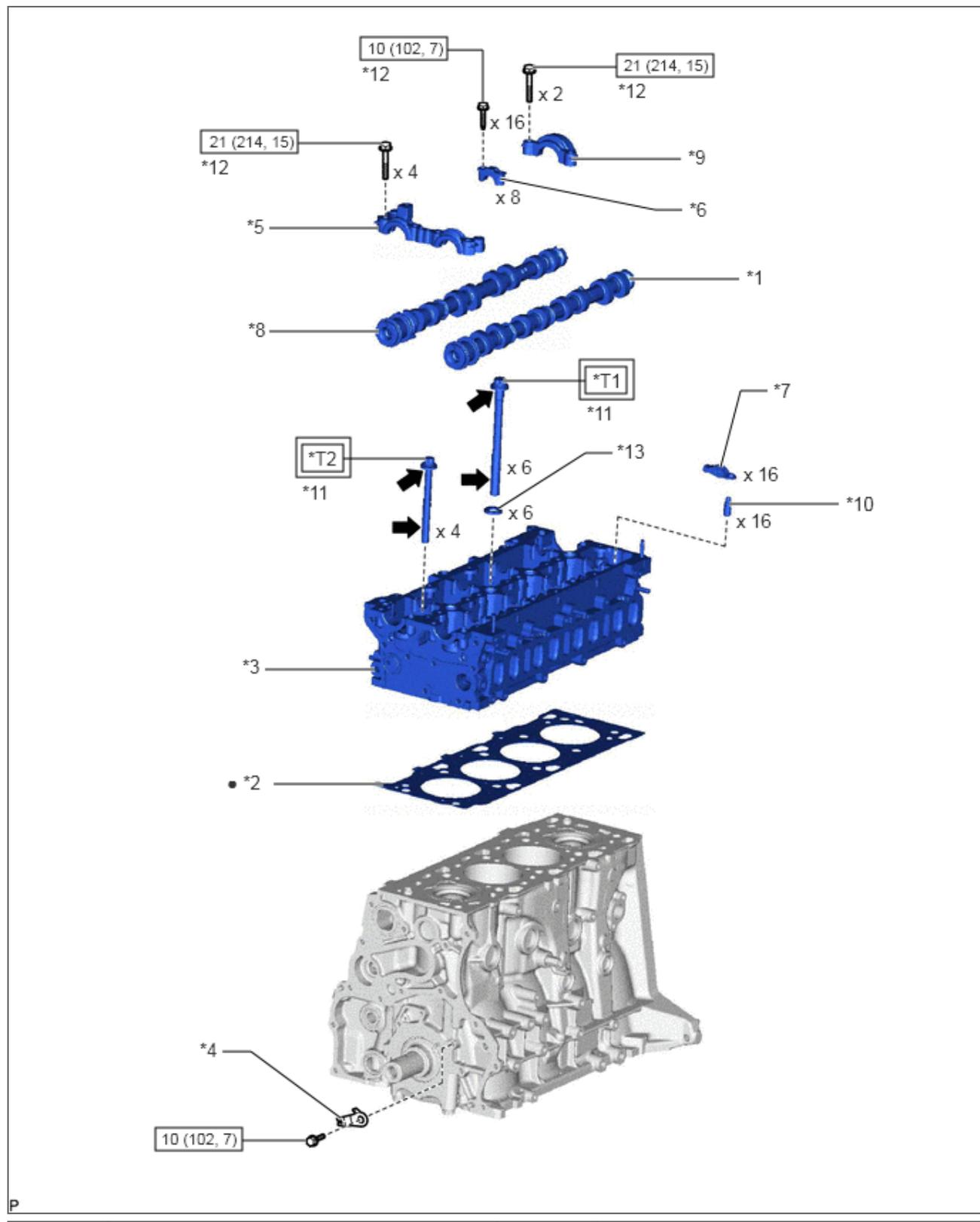
## ILLUSTRATION



*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

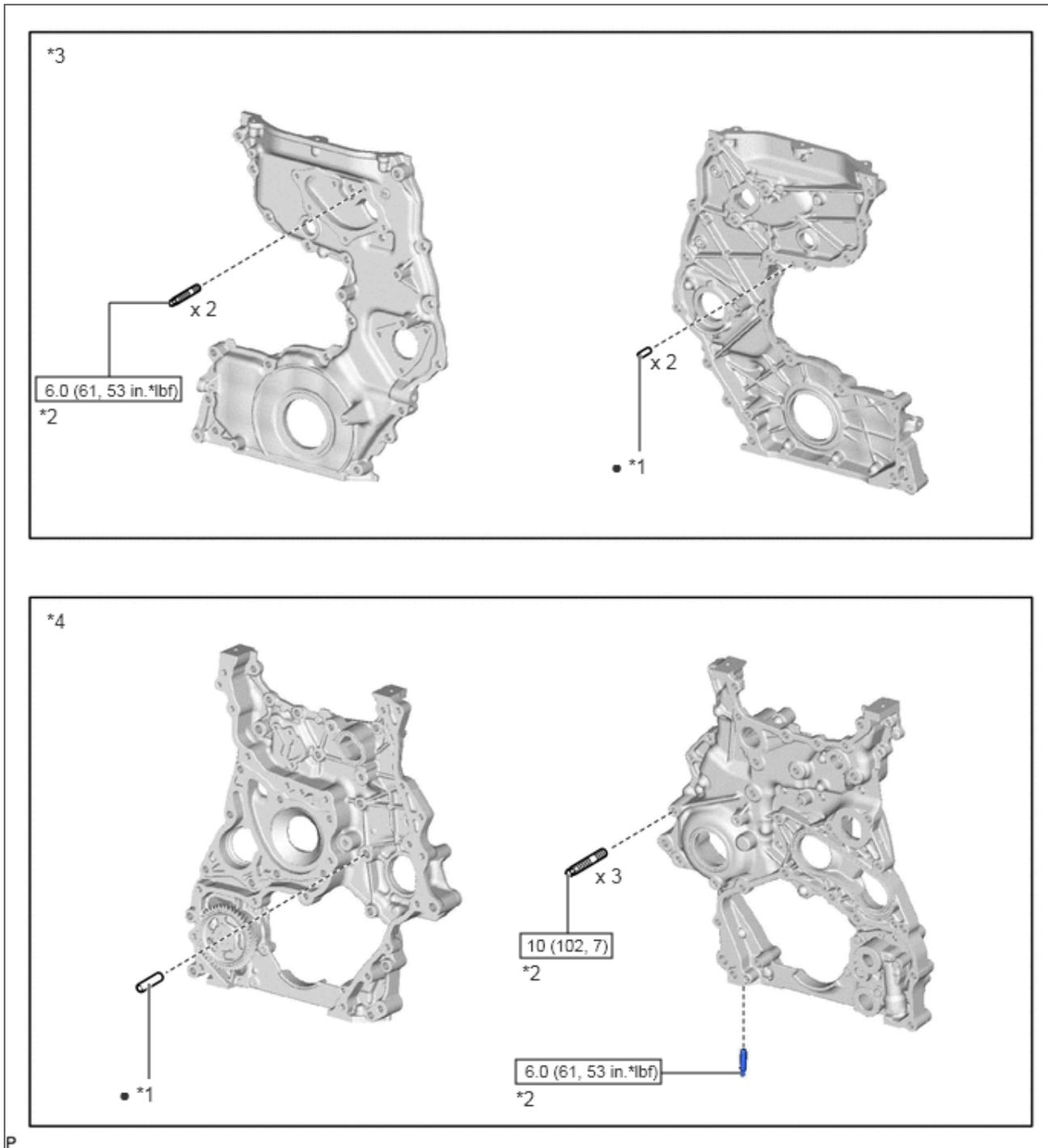
	Engine oil	-	-
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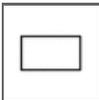
### ILLUSTRATION



*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°

## ILLUSTRATION



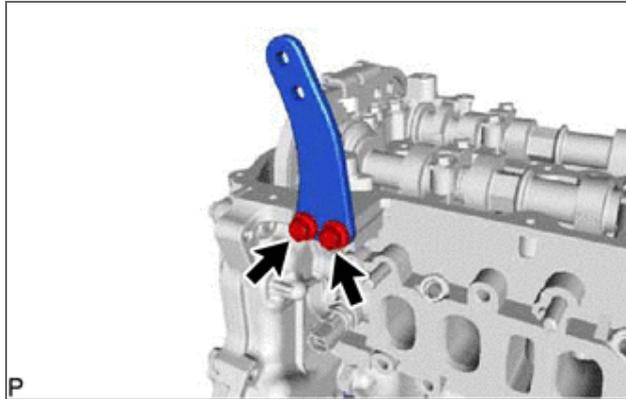
*1	STRAIGHT PIN	*2	STUD BOLT
*3	TIMING CHAIN COVER SUB-ASSEMBLY	*4	TIMING CHAIN CASE ASSEMBLY
	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part

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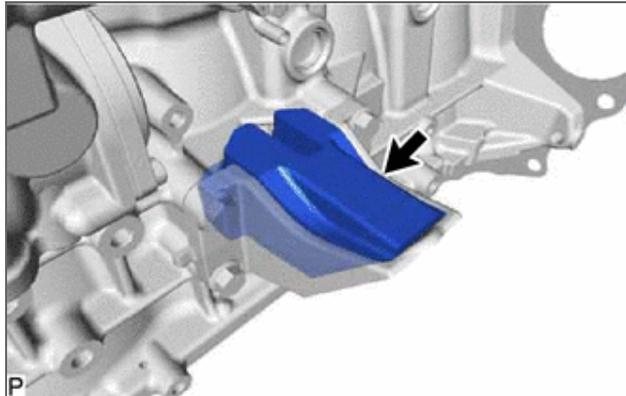
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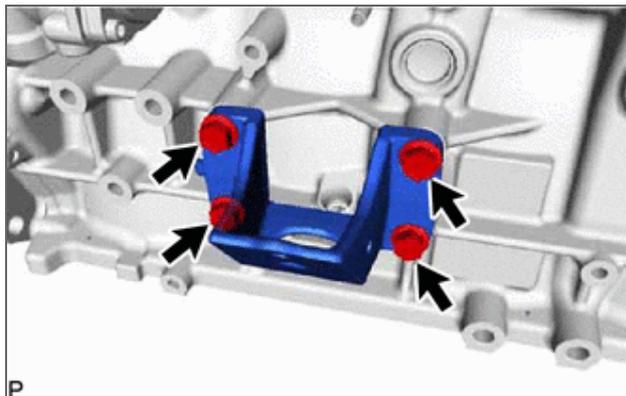
## 1GD-FTV ENGINE MECHANICAL ENGINE UNIT DISASSEMBLY

**PROCEDURE****1.REMOVE NO. 1 ENGINE HANGER****12281A****a.**

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

**2.REMOVE NO. 2 CYLINDER BLOCK INSULATOR****12582****a.**

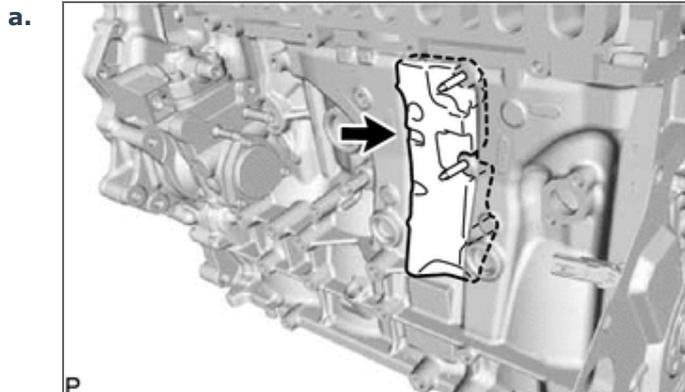
Remove the No. 2 cylinder block insulator from the front No. 1 engine mounting bracket LH.

**3.REMOVE FRONT NO. 1 ENGINE MOUNTING BRACKET LH****12315****a.**

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

**4.REMOVE NO. 3 CYLINDER BLOCK INSULATOR**

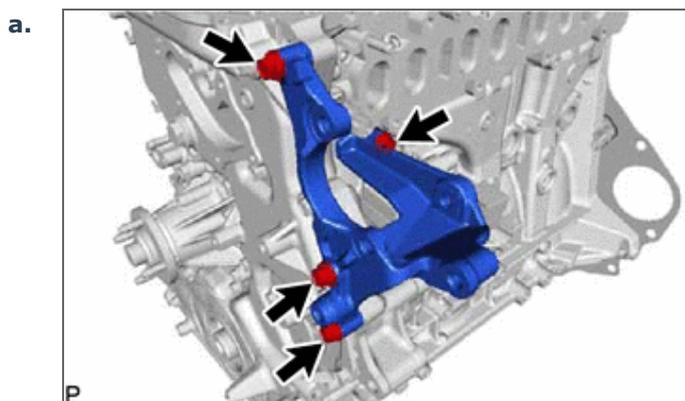
**12583A**



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

**5.REMOVE GENERATOR BRACKET SUB-ASSEMBLY**

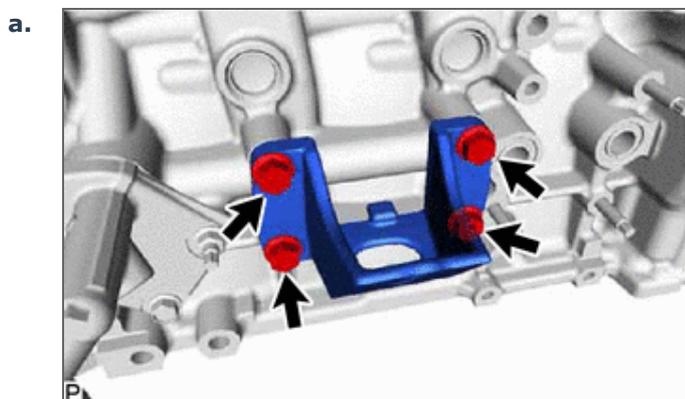
**12501**



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

**6.REMOVE FRONT NO. 1 ENGINE MOUNTING BRACKET RH**

**12311**



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

 <b>7.REMOVE OIL COOLER ASSEMBLY</b>	<b>15710</b>
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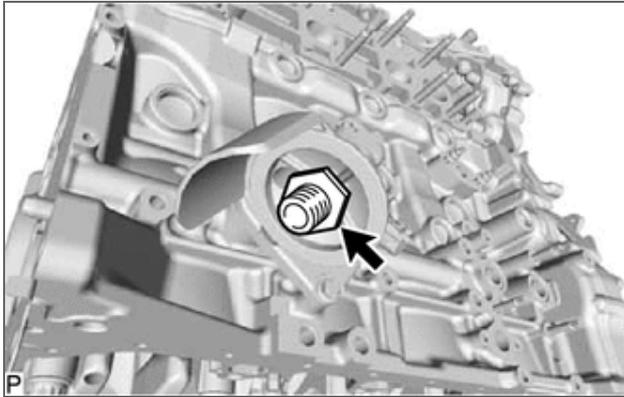
Click here [Engine / Hybrid System>1GD-FTV LUBRICATION>ENGINE OIL COOLER>REMOVAL](#)

 <b>8.REMOVE OIL FILTER SUB-ASSEMBLY</b>	<b>15601</b>
---	--------------

Click here [Engine / Hybrid System>1GD-FTV LUBRICATION>OIL AND OIL FILTER>REPLACEMENT](#)

 <b>9.REMOVE OIL FILTER UNION</b>	<b>15600A</b>
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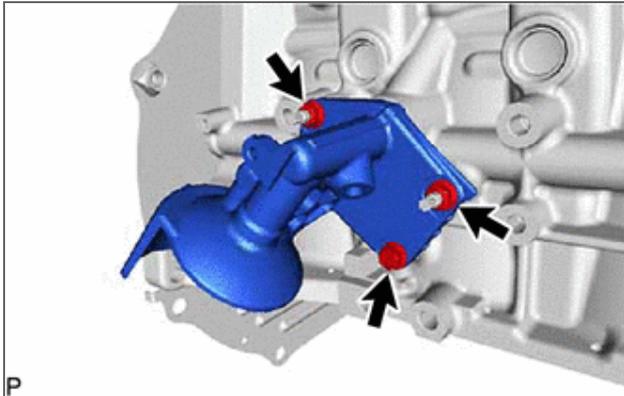
a.



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

 <b>10.REMOVE OIL FILTER BRACKET</b>	<b>15677</b>
--	--------------

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.

 <b>11.REMOVE INJECTOR ASSEMBLY</b>	<b>23670</b>
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Click here [Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>REMOVAL](#)

 <b>12.REMOVE NOZZLE HOLDER GASKET</b>	<b>23682</b>
---	--------------

Click here [Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>REMOVAL](#)

 <b>13.REMOVE CAMSHAFT POSITION SENSOR</b>	<b>11401Q</b>
---	---------------

Click here [Engine / Hybrid System>1GD-FTV ENGINE CONTROL>CAMSHAFT POSITION SENSOR>REMOVAL](#)

---

**14.REMOVE OIL FILLER CAP SUB-ASSEMBLY** **12108**

---

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

---

**15.REMOVE OIL FILLER CAP GASKET** **12108A**

---

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

---

**16.REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY** **11201**

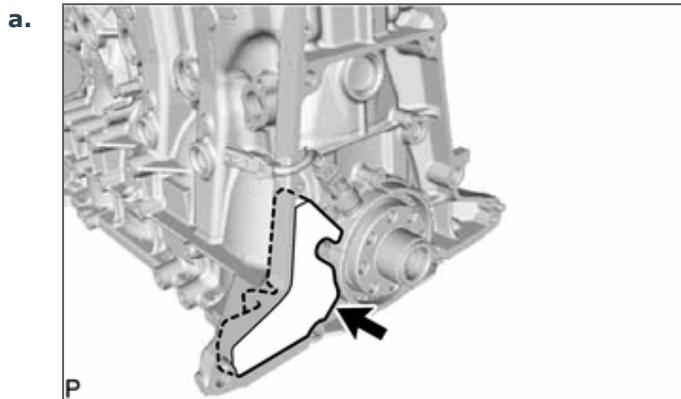
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[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>REMOVAL

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**17.REMOVE NO. 5 CYLINDER BLOCK INSULATOR** **12585**

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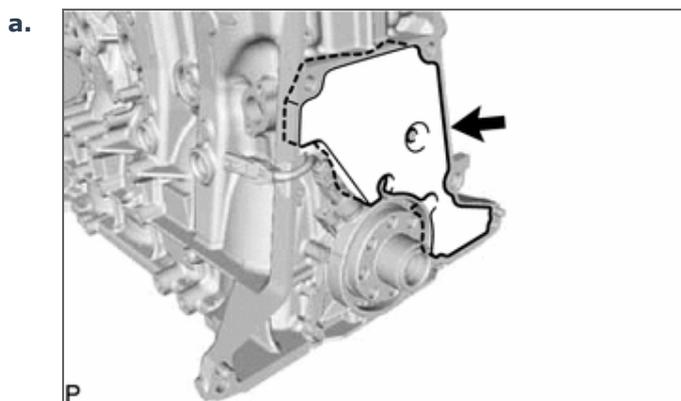


Remove the No. 5 cylinder block insulator from the cylinder block sub-assembly.

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**18.REMOVE NO. 1 CYLINDER BLOCK INSULATOR** **12581A**

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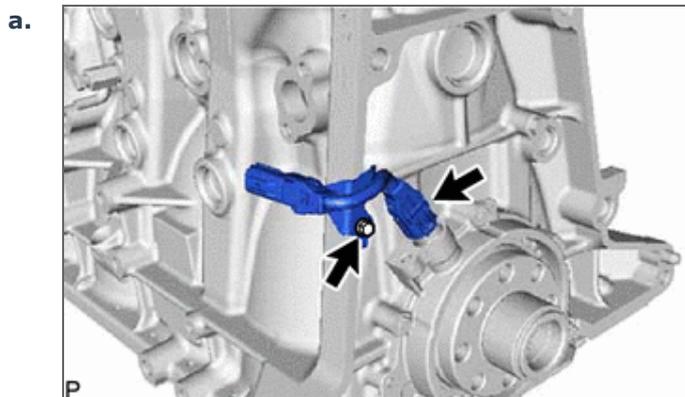


Remove the No. 1 cylinder block insulator from the cylinder block sub-assembly.

---

**19.REMOVE CRANKSHAFT POSITION SENSOR HARNESS BRACKET**

---



Disconnect the crankshaft position sensor connector.

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

<b>20.REMOVE CRANKSHAFT POSITION SENSOR</b>	<b>11401G</b>
---	---------------

Click here [Engine / Hybrid System>1GD-FTV ENGINE CONTROL>CRANKSHAFT POSITION SENSOR>REMOVAL](#)

<b>21.REMOVE OIL PAN COVER SILENCER</b>	<b>12144</b>
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Click here [Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>REMOVAL](#)

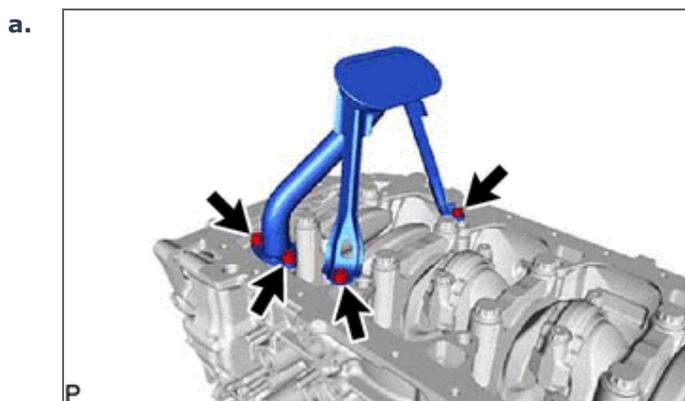
<b>22.REMOVE ENGINE OIL LEVEL SENSOR</b>	<b>89491</b>
--	--------------

Click here [Engine / Hybrid System>1GD-FTV LUBRICATION>OIL LEVEL SENSOR>REMOVAL](#)

<b>23.REMOVE OIL PAN SUB-ASSEMBLY</b>	<b>12101</b>
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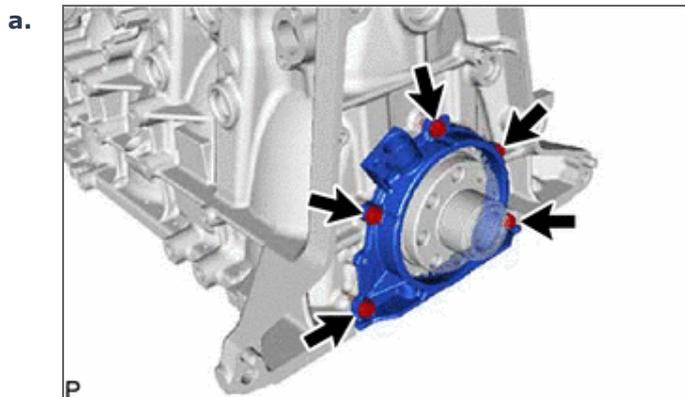
Click here [Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>REMOVAL](#)

<b>24.REMOVE OIL STRAINER SUB-ASSEMBLY</b>	<b>15104</b>
--	--------------

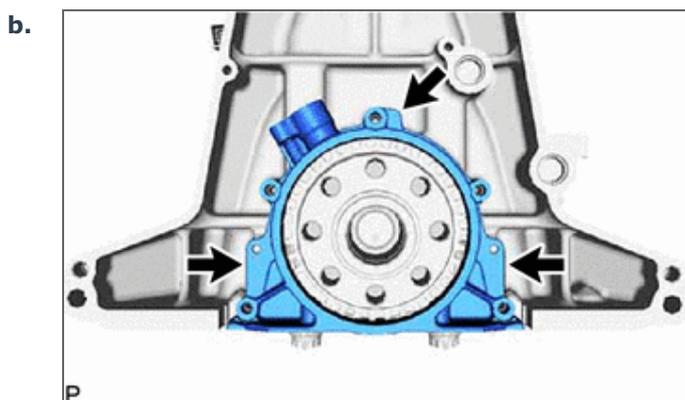


Remove the 4 bolts, oil strainer sub-assembly and gasket from the cylinder block sub-assembly.

<b>25.REMOVE REAR ENGINE OIL SEAL RETAINER</b>	<b>11381</b>
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Remove the 5 bolts.



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:**

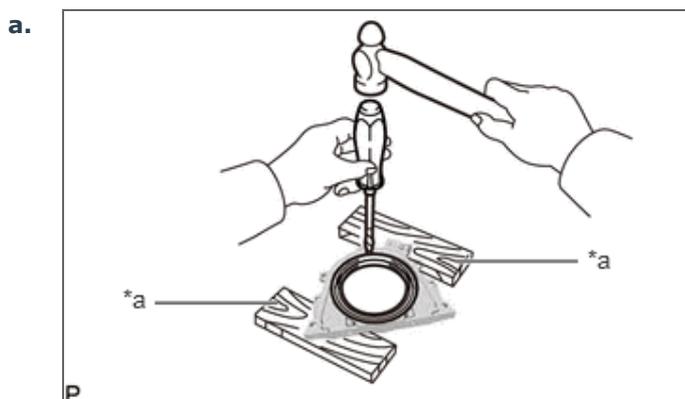
Be careful not to damage the contact surfaces of the cylinder block sub-assembly.

**HINT:**

Tape the screwdriver tip before use.

**26.REMOVE REAR ENGINE OIL SEAL**

**11381A**



*a	Wooden Block
----	--------------

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.

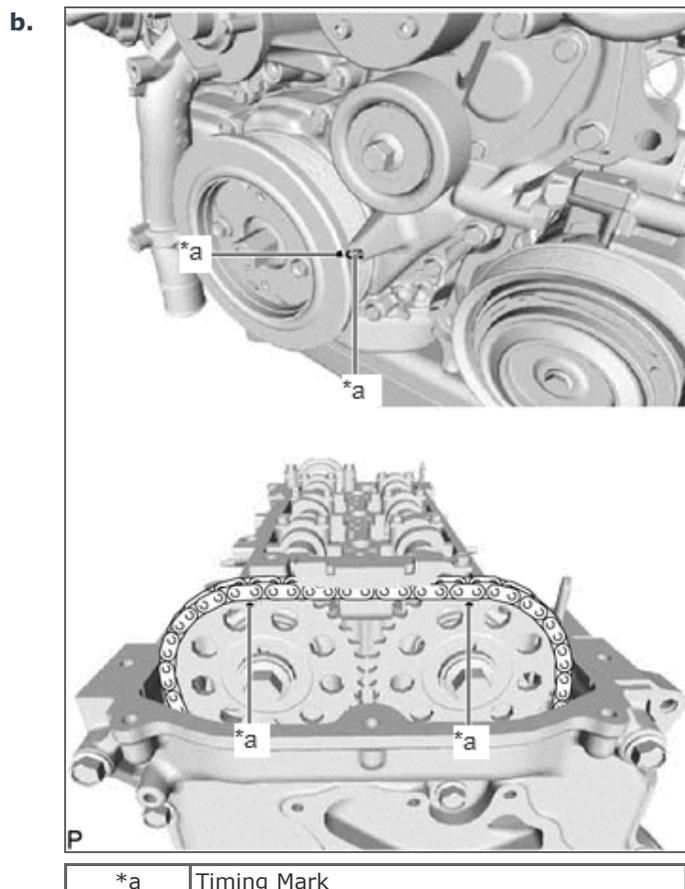
**27.REMOVE ENGINE WATER PUMP ASSEMBLY**

**16100**

Click here [Engine / Hybrid System>1GD-FTV COOLING>WATER PUMP>REMOVAL](#)

**28.SET NO. 1 CYLINDER TO TDC/COMPRESSION**

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



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).

**29.REMOVE TIMING CHAIN COVER PLATE**

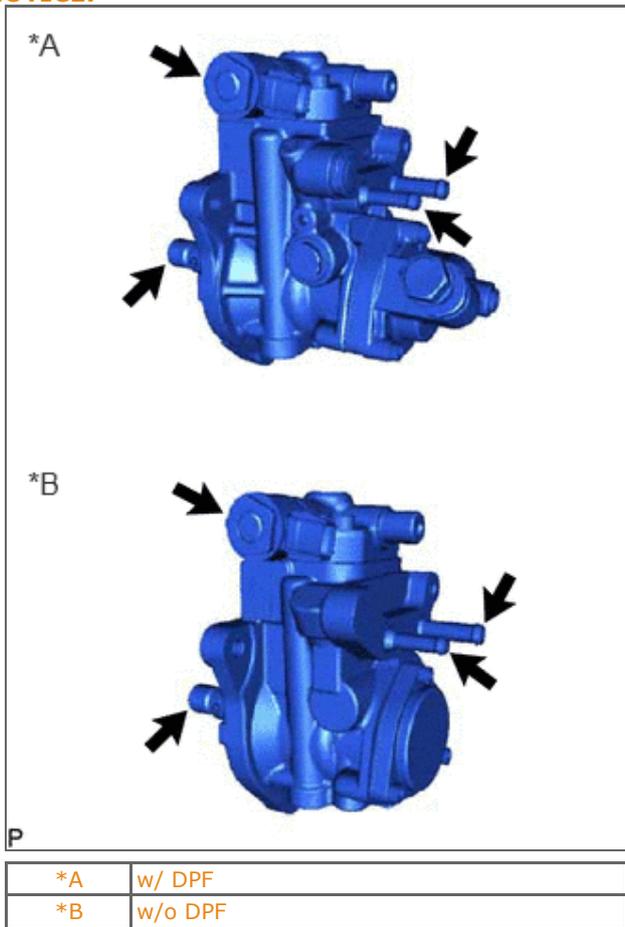
**11324**

Click here [Engine / Hybrid System>1GD-FTV FUEL>FUEL SUPPLY PUMP>REMOVAL](#)

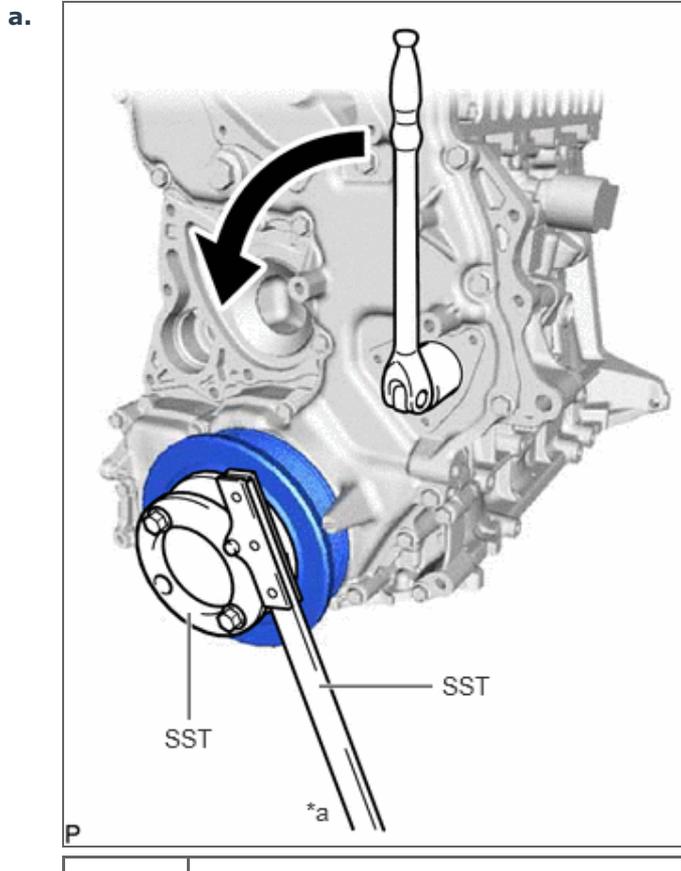
**30.REMOVE SUPPLY PUMP ASSEMBLY**

**22100**

**NOTICE:**



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



*a	Hold
	Turn

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

**SST**

**09213-58014 (91551-80840)**  
**09330-00021**

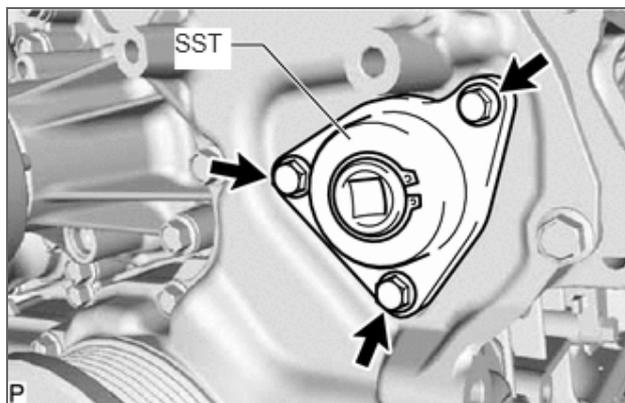
**NOTICE:**

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.

b.



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

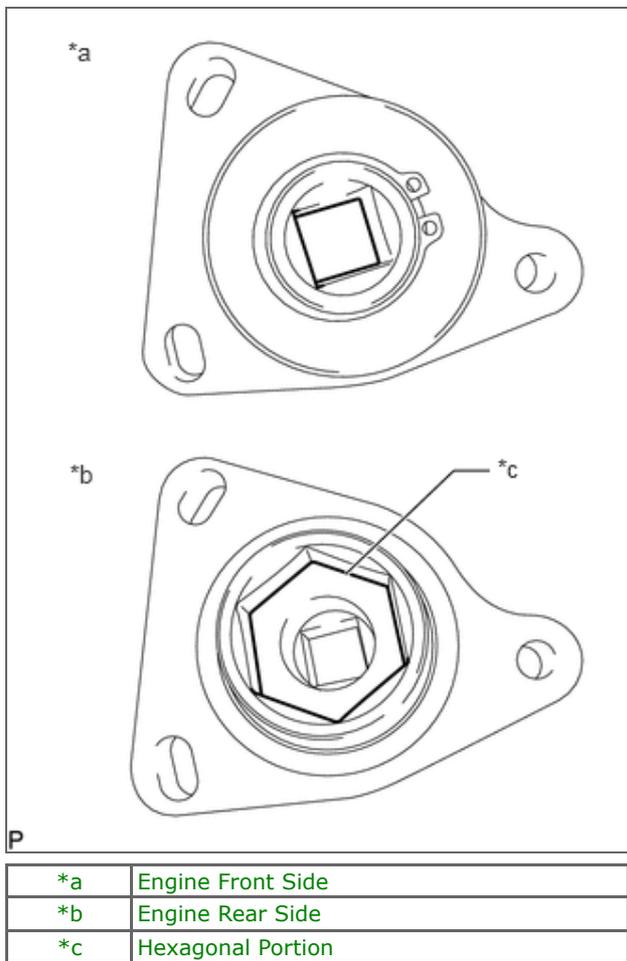
**SST**

**09241-11010**

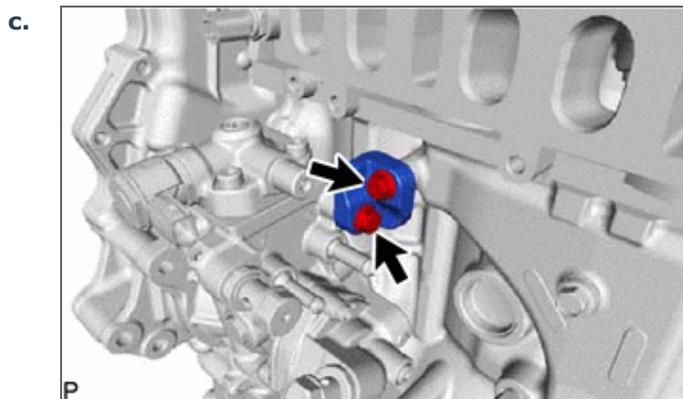
**Torque:**

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

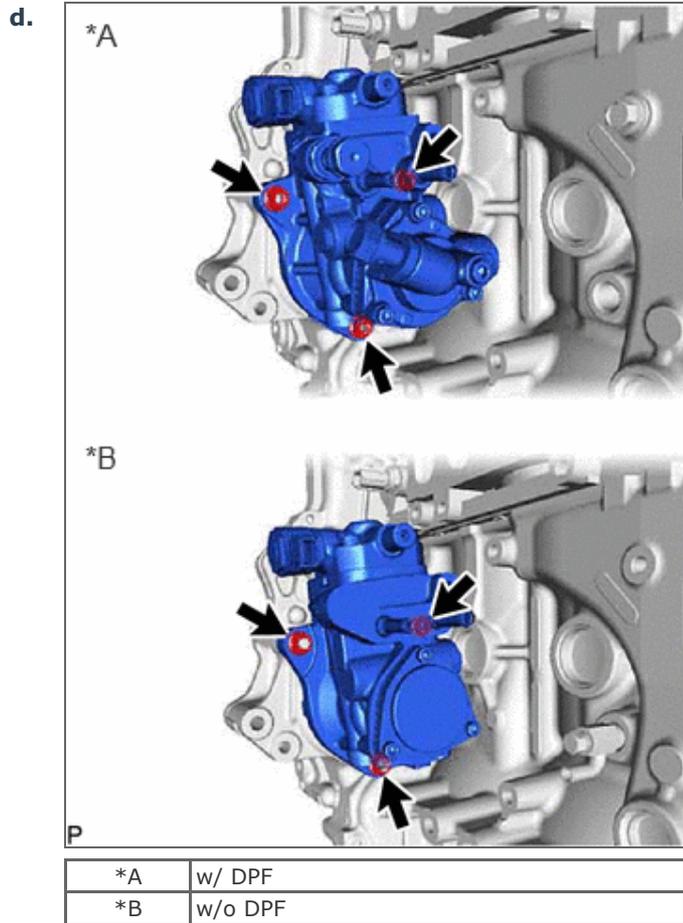
**HINT:**



- 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.



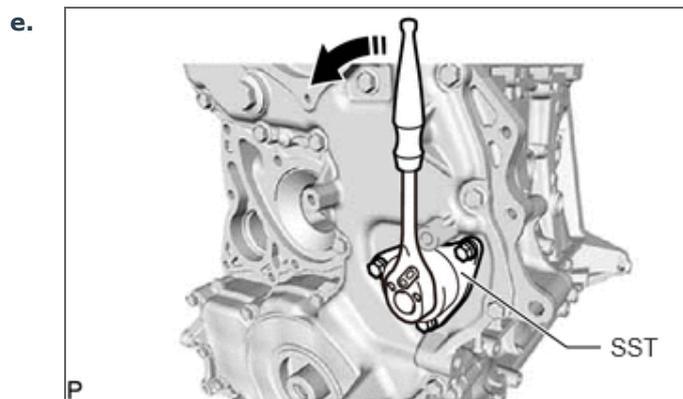
w/ DPF:  
 Remove the 2 bolts and No. 1 fuel pump bracket from the cylinder block sub-assembly and supply pump assembly.



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

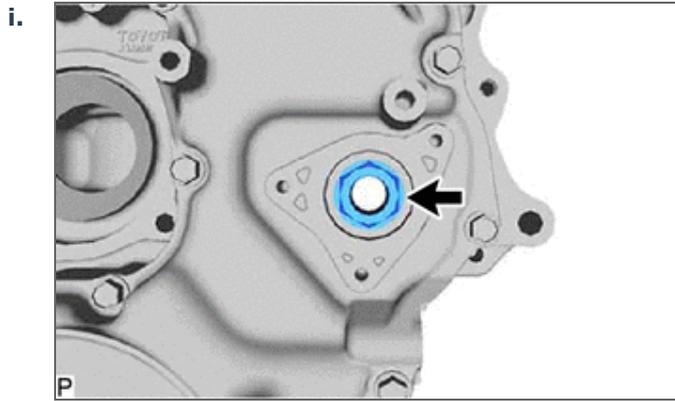
**NOTICE:**

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



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

- f. Remove the 3 nuts from the stud bolts.
- g. Remove the O-ring from the supply pump assembly.
- h. Remove SST from the timing chain cover sub-assembly.

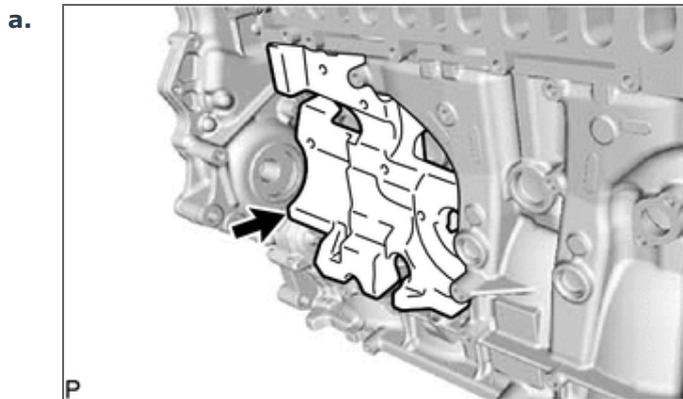


Remove the supply pump shaft nut from the timing chain cover sub-assembly service hole.

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

**31.REMOVE INJECTION PUMP INSULATOR**

**22815A**



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

**32.REMOVE TIMING CHAIN COVER SUB-ASSEMBLY**

**11302**

[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>REMOVAL

**33.REMOVE FRONT CRANKSHAFT OIL SEAL**

**11303A**

[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>REMOVAL

**34.REMOVE OIL PUMP RELIEF VALVE PLUG**

**15133B**



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

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

Click here [Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>REMOVAL](#)

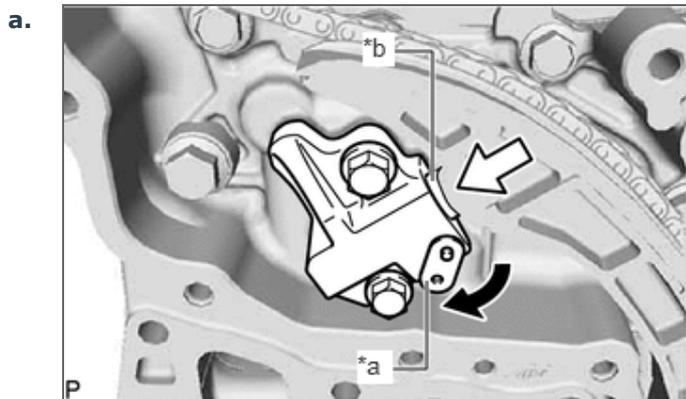
**36.REMOVE OIL PUMP DRIVE GEAR** **13519**

Click here [Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>REMOVAL](#)

**37.REMOVE TIMING CHAIN GUIDE** **13566B**

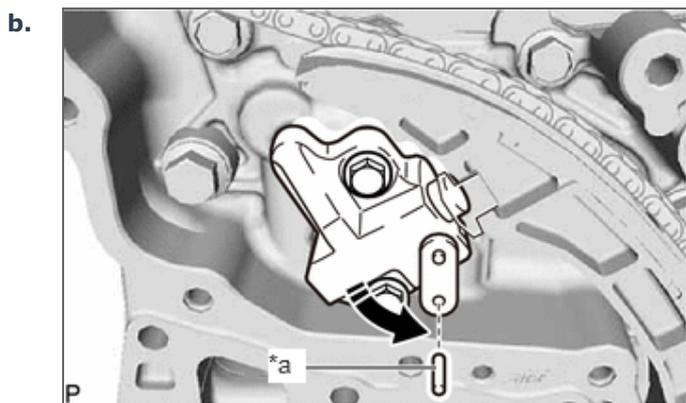
Click here [Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>CAMSHAFT>REMOVAL](#)

**38.REMOVE NO. 2 CHAIN TENSIONER ASSEMBLY** **13550**



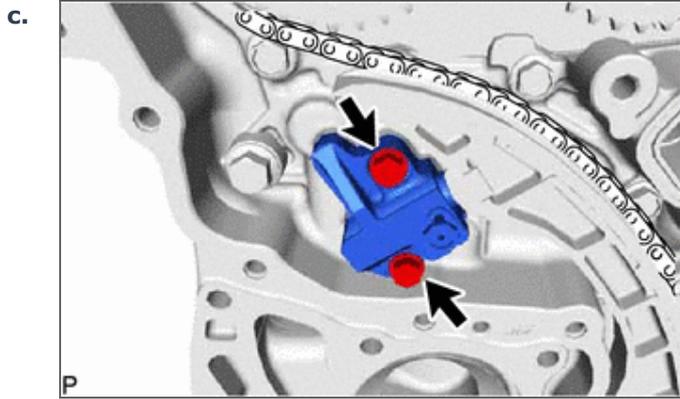
*a	Stopper Plate
*b	Plunger

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.



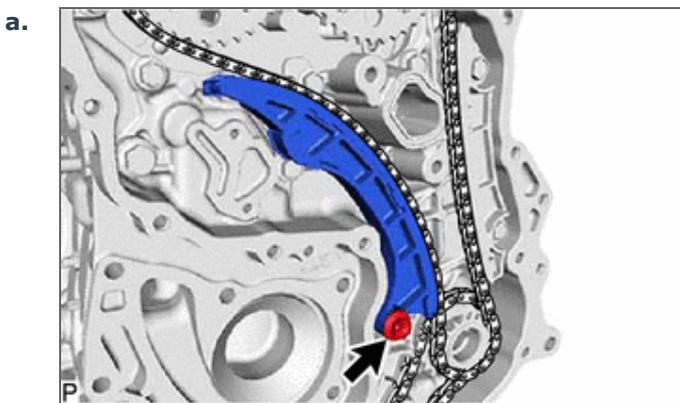
*a	Pin
----	-----

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



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

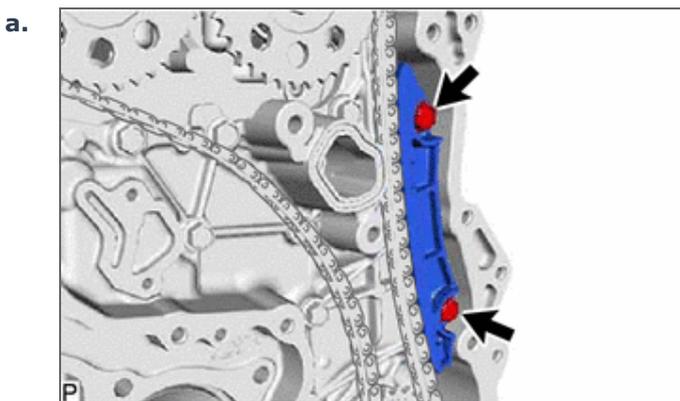
**39.REMOVE NO. 2 CHAIN TENSIONER SLIPPER**



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

**40.REMOVE NO. 2 CHAIN VIBRATION DAMPER**

**13562**



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

**41.REMOVE NO. 2 CHAIN SUB-ASSEMBLY**

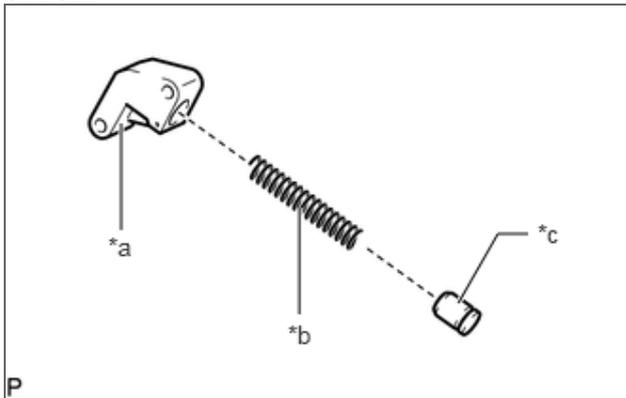
**13507**

- 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**

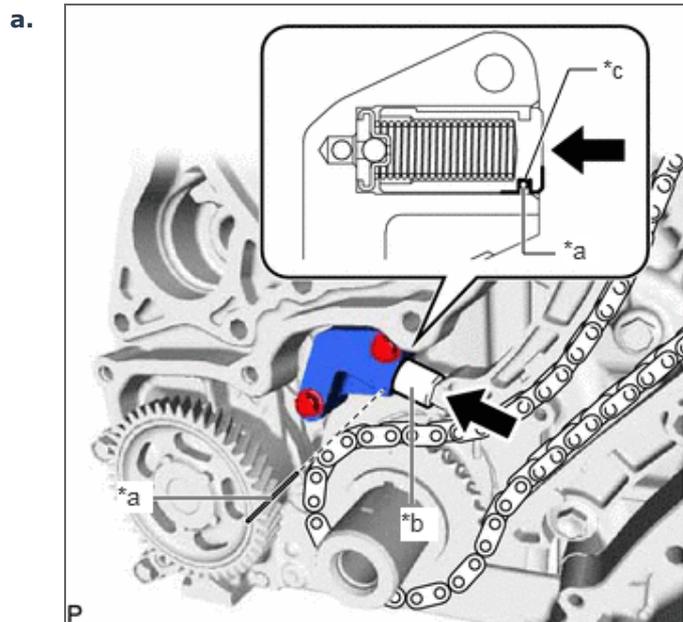
**13540**

**NOTICE:**



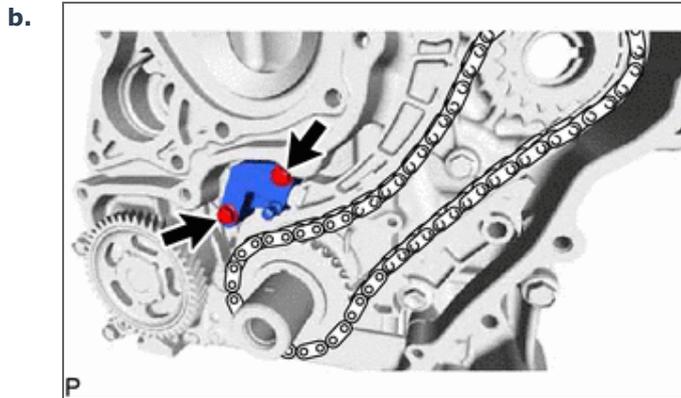
*a	No. 1 Chain Tensioner Assembly Body
*b	Spring
*c	Plunger

- 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.



*a	Pin
*b	Plunger
*c	Plunger Groove

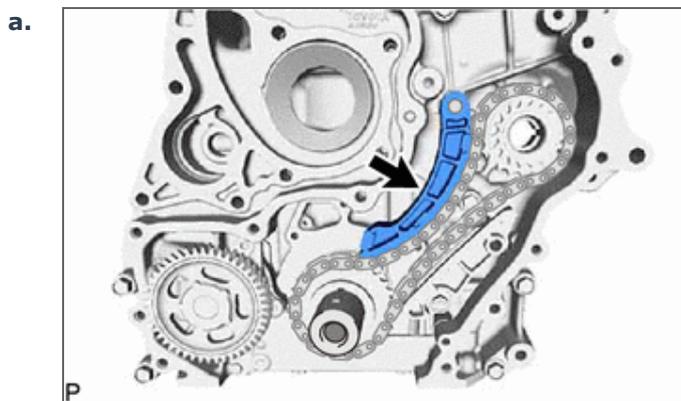
Fully insert the plunger, align the No. 1 chain tensioner assembly body hole with the plunger groove and insert the pin as shown in the illustration.



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

**43.REMOVE NO. 1 CHAIN TENSIONER SLIPPER**

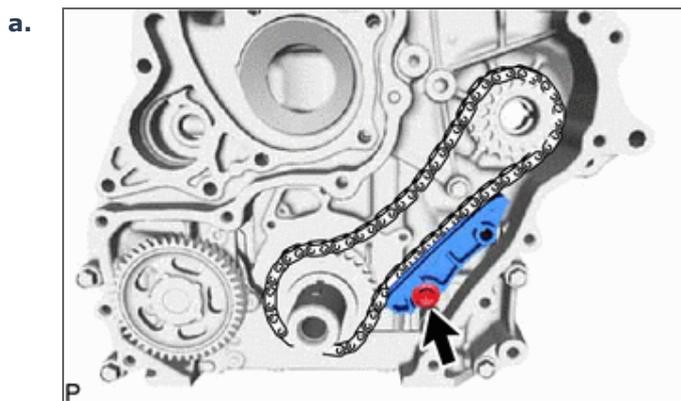
**13559**



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

**44.REMOVE NO. 1 CHAIN VIBRATION DAMPER**

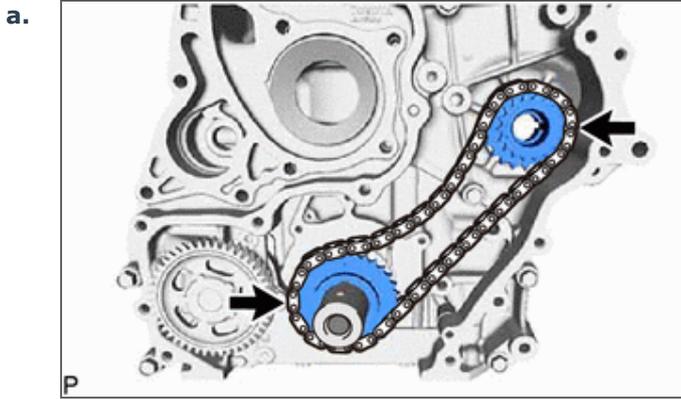
**13561**



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

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

**13506**

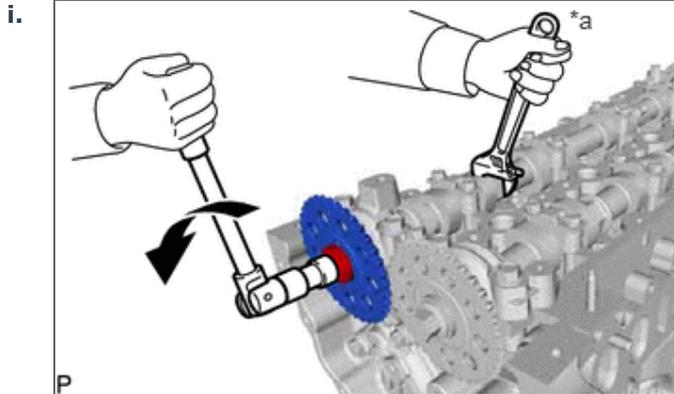


Remove the crankshaft timing sprocket, injection pump drive gear with No. 1 chain sub-assembly from the crankshaft and supply pump shaft.

**46.REMOVE CAMSHAFT TIMING SPROCKET**

13523

a. for Exhaust Side:



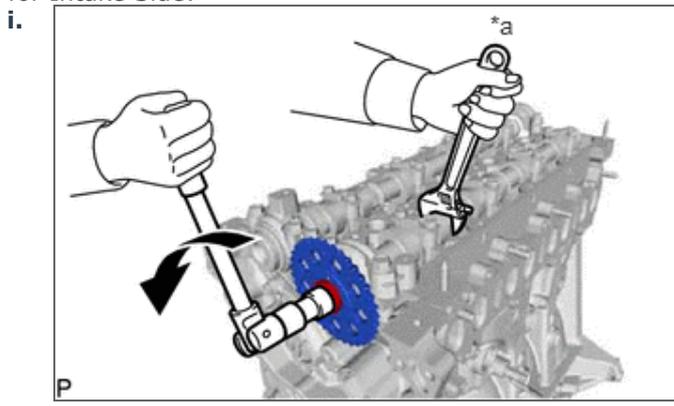
*a	Hold
	Turn

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.

b. for Intake Side:





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.

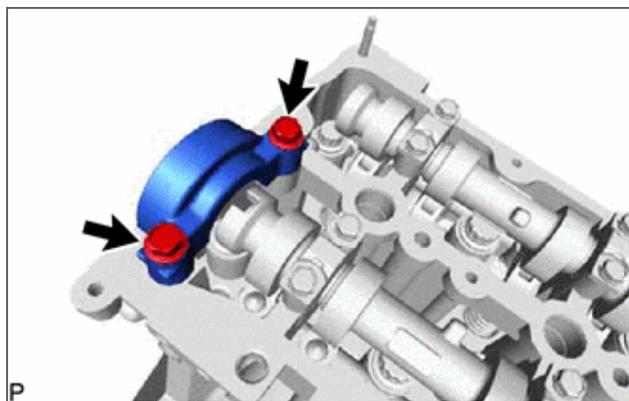
**47.REMOVE TIMING CHAIN CASE ASSEMBLY**

**11310**

[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>REMOVAL

**48.REMOVE NO. 3 CAMSHAFT BEARING CAP**

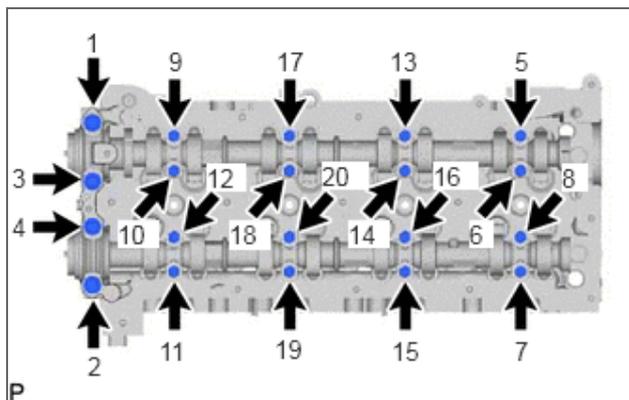
a.



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

**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.

---

<b>50.REMOVE CAMSHAFT</b>	<b>13511</b>
---------------------------	--------------

---

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

---

<b>51.REMOVE NO. 2 CAMSHAFT</b>	<b>13512</b>
---------------------------------	--------------

---

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

---

<b>52.REMOVE NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY</b>	<b>13801</b>
--	--------------

---

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

---

<b>53.REMOVE VALVE LASH ADJUSTER ASSEMBLY</b>	<b>13750</b>
---	--------------

---

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

---

<b>54.REMOVE CYLINDER HEAD SUB-ASSEMBLY</b>	<b>11101</b>
---	--------------

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[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>CYLINDER HEAD GASKET>REMOVAL

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<b>55.REMOVE CYLINDER HEAD GASKET</b>	<b>11115</b>
---------------------------------------	--------------

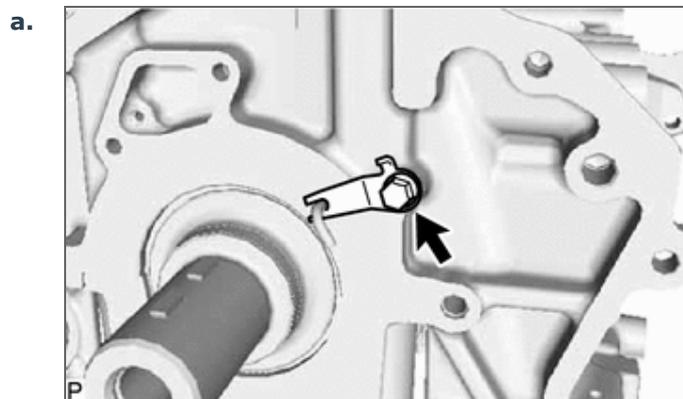
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[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>CYLINDER HEAD GASKET>REMOVAL

---

<b>56.REMOVE LOCK PLATE</b>	<b>13577D</b>
-----------------------------	---------------

---



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

---

<b>57.REMOVE STUD BOLT</b>	
----------------------------	--

---

**NOTICE:**

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

---

<b>58.REMOVE STRAIGHT PIN</b>	
-------------------------------	--

---

**NOTICE:**

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

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Print

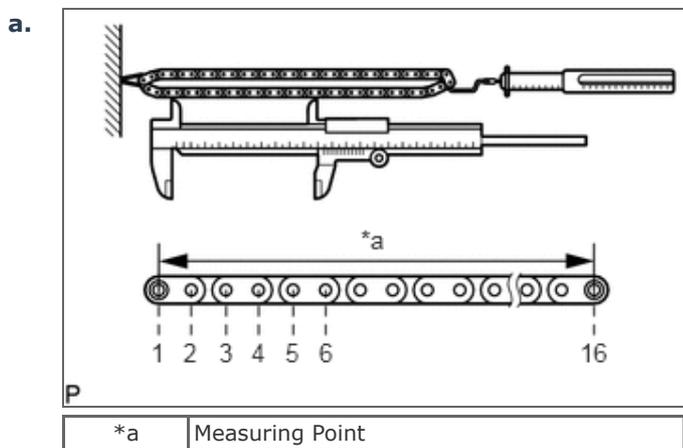
Exit

1GD-FTV ENGINE MECHANICAL ENGINE UNIT INSPECTION

PROCEDURE

1.INSPECT NO. 1 CHAIN SUB-ASSEMBLY

13506



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.)**

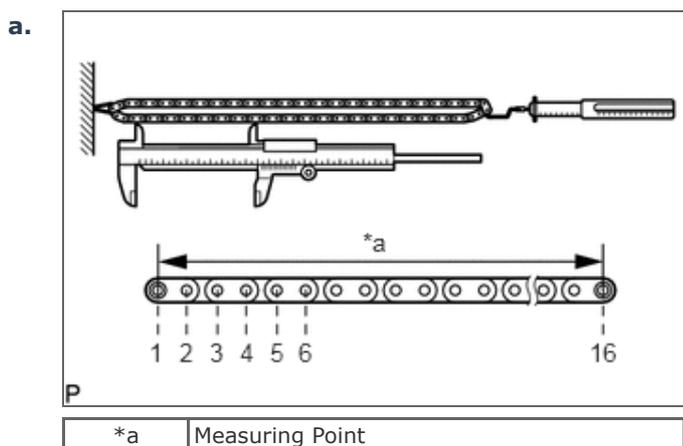
**HINT:**

Perform the measurement at 3 random places.

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

2.INSPECT NO. 2 CHAIN SUB-ASSEMBLY

13507



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:**

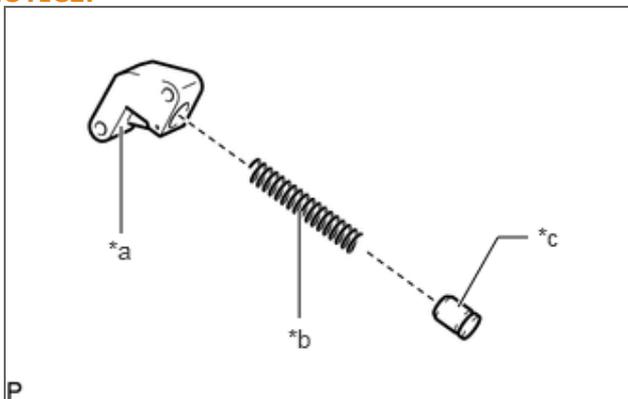
Perform the measurement at 3 random places.

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

**3.INSPECT NO. 1 CHAIN TENSIONER ASSEMBLY**

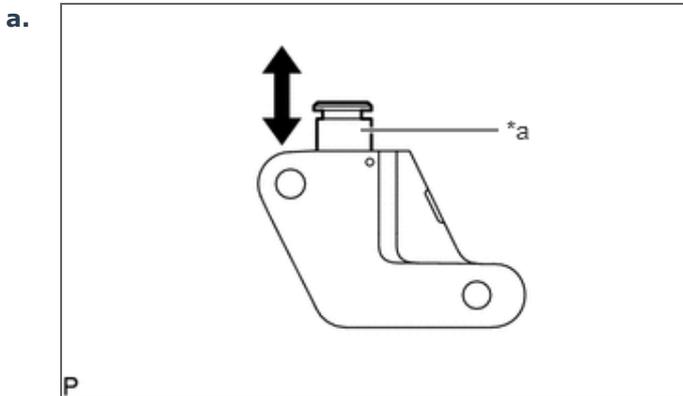
**13540**

**NOTICE:**



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

- 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.

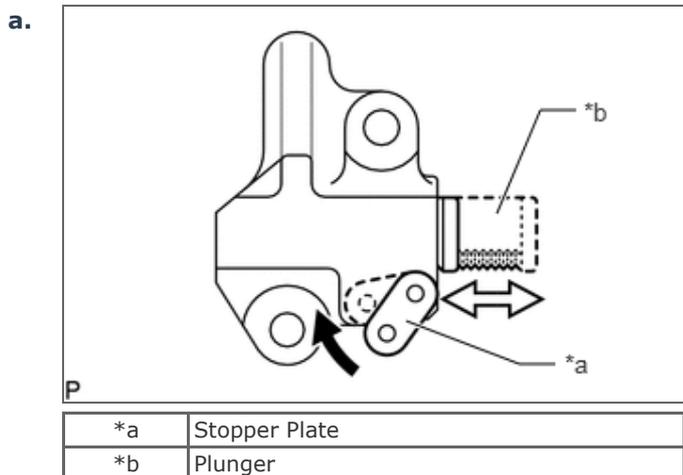


*a	Plunger
----	---------

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

**4.INSPECT NO. 2 CHAIN TENSIONER ASSEMBLY**

**13550**

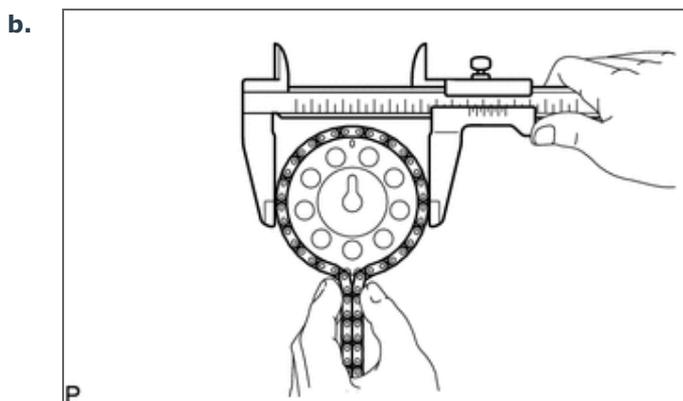


Move the stopper plate upward to release the lock. Push the plunger and check that it moves smoothly. If necessary, replace the No. 2 chain tensioner assembly.

**5.INSPECT CAMSHAFT TIMING SPROCKET**

**13523**

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



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.

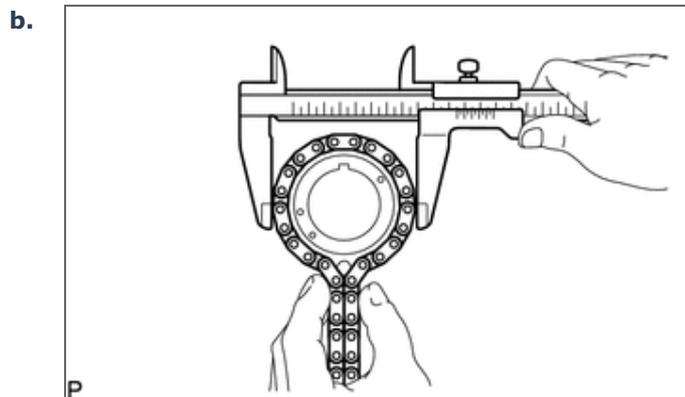
**HINT:**

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

**6.INSPECT CRANKSHAFT TIMING SPROCKET**

**13521**

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



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:**

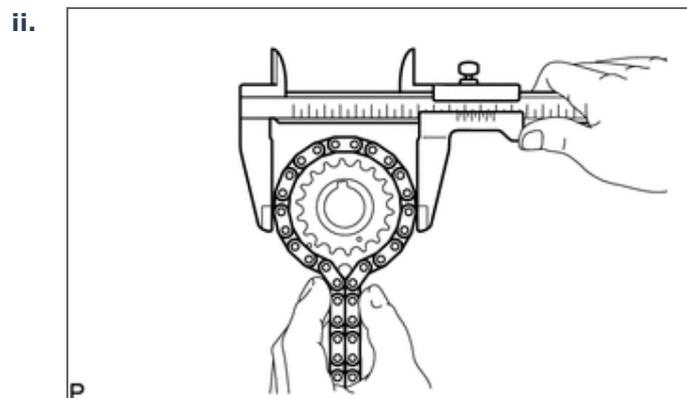
The vernier caliper must contact the No. 1 chain sub-assembly rollers for the measurement.

**7.INSPECT INJECTION PUMP DRIVE GEAR**

**13613**

a. for No. 1 Chain Sub-assembly Side:

i. Wrap the No. 1 chain sub-assembly around the injection pump drive gear.



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.

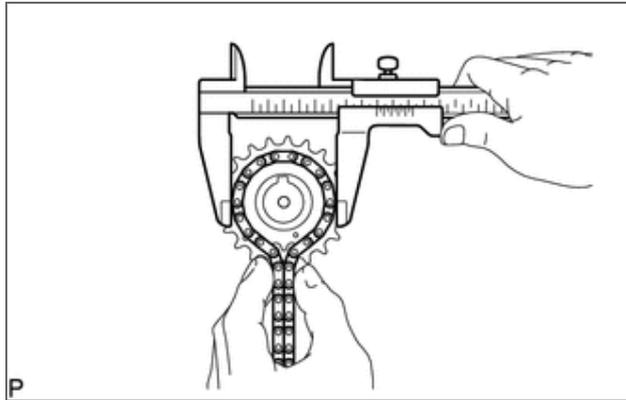
**HINT:**

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

b. for No. 2 Chain Sub-assembly Side:

i. Wrap the No. 2 chain sub-assembly around the injection pump drive gear.

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.

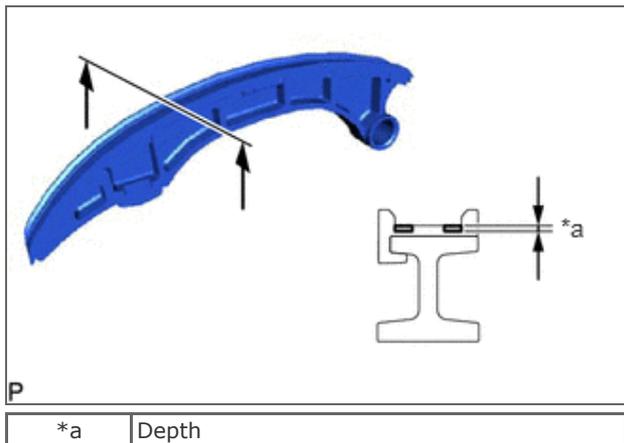
**HINT:**

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

**8.INSPECT NO. 1 CHAIN TENSIONER SLIPPER**

13559

a.



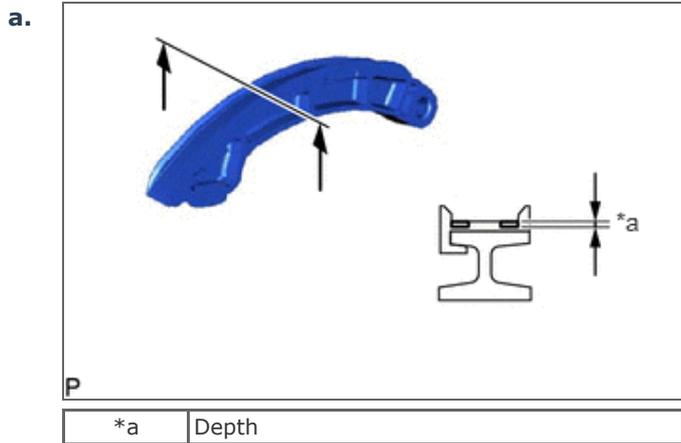
*a	Depth
----	-------

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.

**9.INSPECT NO. 2 CHAIN TENSIONER SLIPPER**



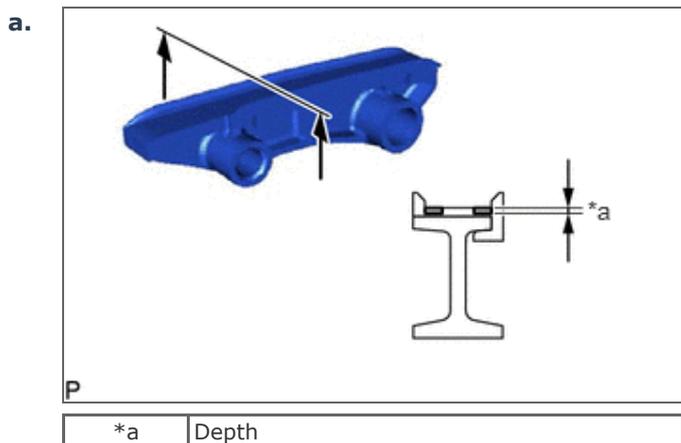
Measure the depth of wear of the No. 2 chain tensioner slipper.

**Maximum depth:**  
**1.0 mm (0.0394 in.)**

If the depth is more than the maximum, replace the No. 2 chain tensioner slipper.

**10.INSPECT NO. 1 CHAIN VIBRATION DAMPER**

**13561**



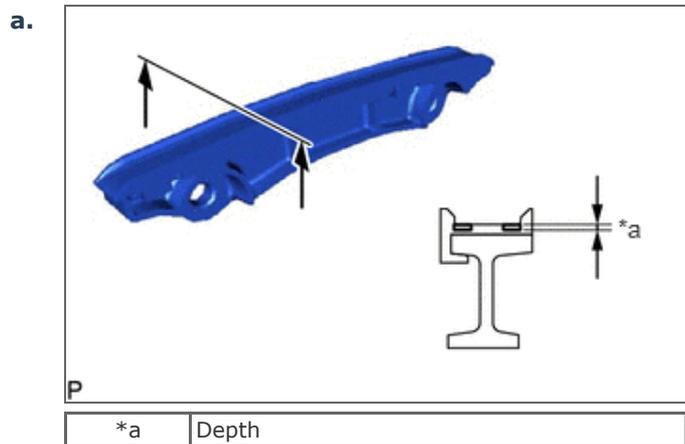
Measure the depth of wear of the No. 1 chain vibration damper.

**Maximum depth:**  
**1.0 mm (0.0394 in.)**

If the depth is more than the maximum, replace the No. 1 chain vibration damper.

**11.INSPECT NO. 2 CHAIN VIBRATION DAMPER**

**13562**



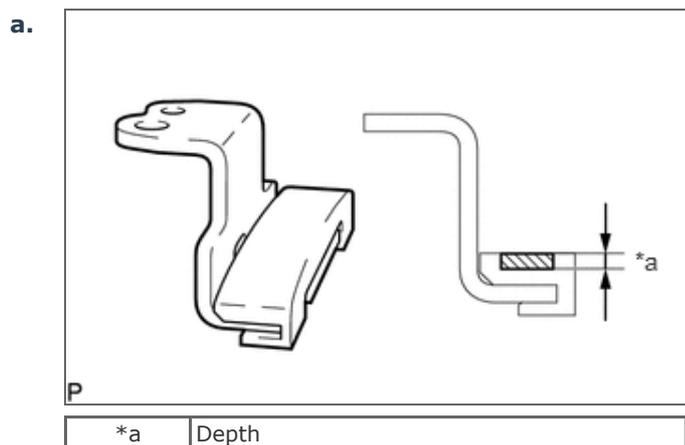
Measure the depth of wear of the No. 2 chain vibration damper.

**Maximum depth:**  
**1.0 mm (0.0394 in.)**

If the depth is more than the maximum, replace the No. 2 chain vibration damper.

**12.INSPECT TIMING CHAIN GUIDE**

**13566B**



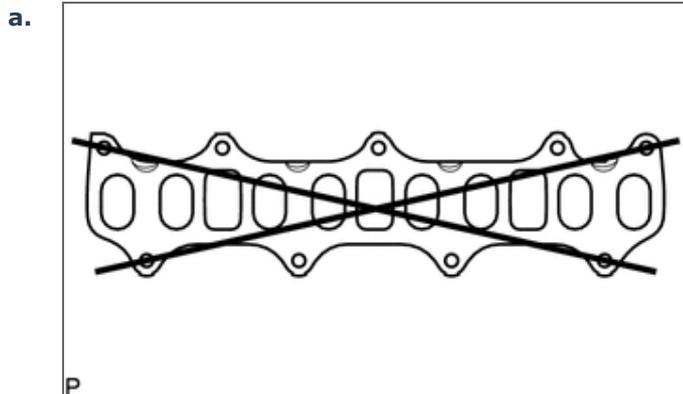
Measure the depth of wear of the timing chain guide.

**Maximum depth:**  
**1.0 mm (0.0394 in.)**

If the depth is more than the maximum, replace the timing chain guide.

**13.INSPECT INTAKE MANIFOLD**

**17111**



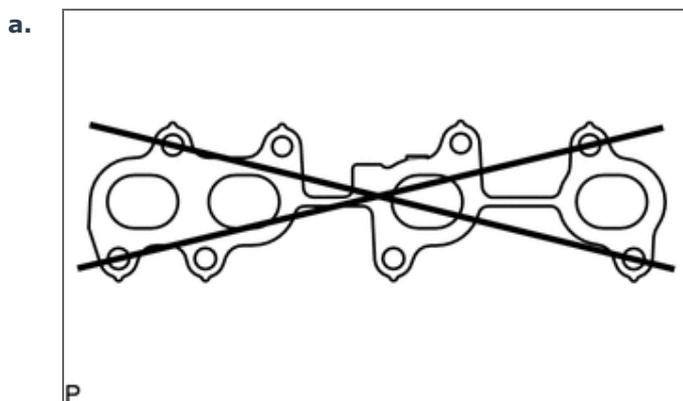
Using a precision straightedge and feeler gauge, measure the warpage of the surface where the intake manifold contacts the cylinder head sub-assembly.

**Maximum warpage:**  
**0.10 mm (0.00394 in.)**

If the warpage is more than the maximum, replace the intake manifold.

#### 14.INSPECT EXHAUST MANIFOLD

17141



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

13511

- 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**

**13512**

- 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.

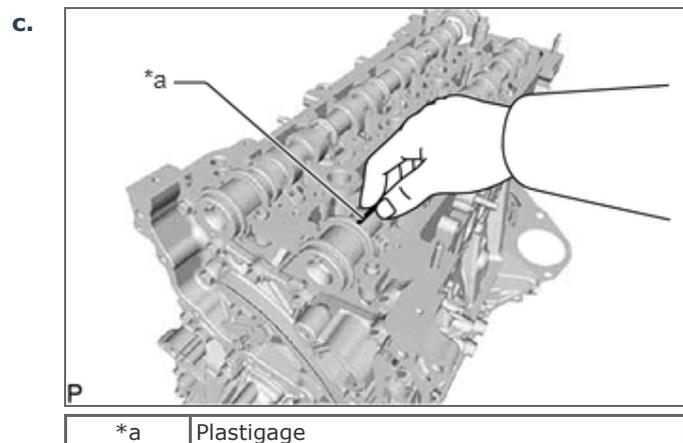
**Standard Journal Diameter:**

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.



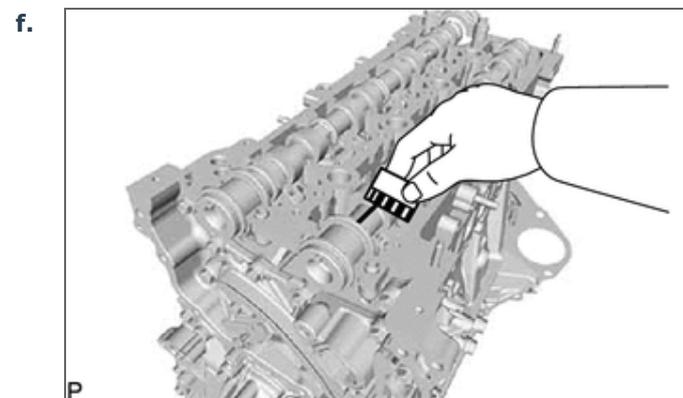
Lay a strip of Plastigage across each of the camshaft journals.

- d. Install the No. 1 camshaft bearing cap and No. 2 camshaft bearing caps to the cylinder head sub-assembly. [Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>ENGINE UNIT>REASSEMBLY

**NOTICE:**

Do not turn the camshaft and No. 2 camshaft.

- e. Remove the No. 1 camshaft bearing cap and No. 2 camshaft bearing caps from the cylinder head sub-assembly. [Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>ENGINE UNIT>DISASSEMBLY



Measure the Plastigage at its widest point.

**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.)

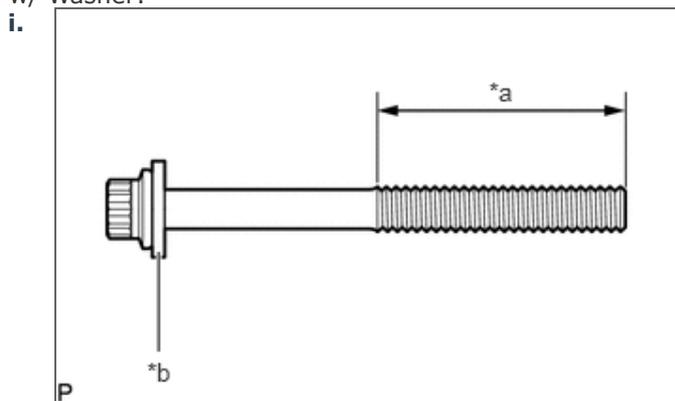
If the camshaft oil clearance is more than the maximum, replace the camshaft. If necessary, replace the cylinder head sub-assembly.

- g. Completely remove the Plastigage from the camshaft journals.

**18.INSPECT CYLINDER HEAD SET BOLT**

**11101A**

- a. w/ Washer:



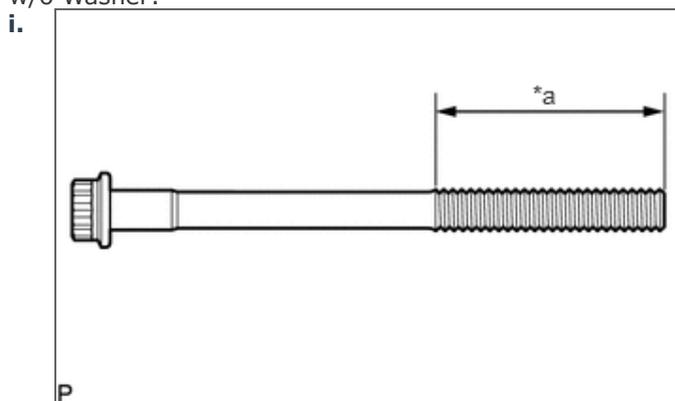
*a	Measuring Area
*b	Washer

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.

- b. w/o Washer:



*a	Measuring Area
----	----------------

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.

**19.INSPECT NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY**

**13801**

- 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.

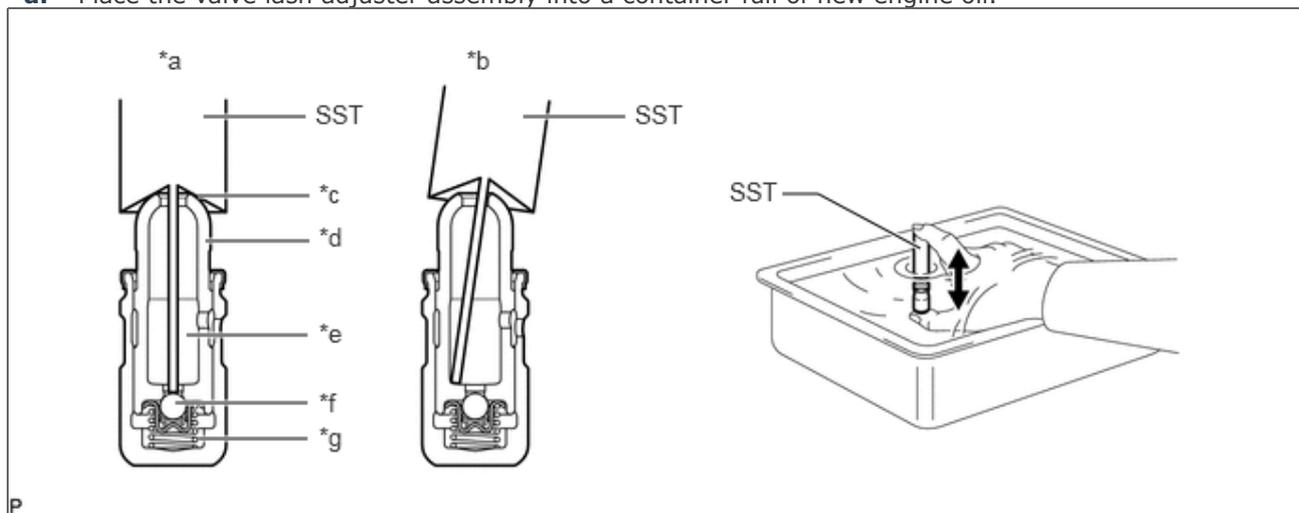
**20.INSPECT VALVE LASH ADJUSTER ASSEMBLY**

**13750**

**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.



*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.

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## 1GD-FTV ENGINE MECHANICAL ENGINE UNIT INSTALLATION

**CAUTION / NOTICE / HINT****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)	<ul style="list-style-type: none"> <li>No. 1 injection pipe sub-assembly</li> <li>No. 2 injection pipe sub-assembly</li> </ul>
<ul style="list-style-type: none"> <li>Supply pump assembly</li> <li>Common rail assembly</li> <li>Cylinder block sub-assembly</li> <li>Cylinder head sub-assembly</li> <li>Cylinder head gasket</li> <li>Timing chain case assembly</li> </ul>	<ul style="list-style-type: none"> <li>No. 1 injection pipe sub-assembly</li> <li>No. 2 injection pipe sub-assembly</li> <li>Fuel inlet pipe sub-assembly</li> </ul>

- 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.

**PROCEDURE****1.INSTALL NO. 1 WATER HOSE CLAMP BRACKET (w/ DPF)****16575C**

- a. Install the No. 1 water hose clamp bracket with the bolt to the timing chain case assembly.

**Torque:****10 N\*m (102 kgf\*cm, 7 ft.\*lbf)****2.INSTALL CRANKSHAFT PULLEY****13471**

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>FRONT CRANKSHAFT OIL SEAL>INSTALLATION

**3.INSTALL CRANKSHAFT PULLEY COVER****13496**

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>FRONT CRANKSHAFT OIL SEAL>INSTALLATION

**4.INSTALL VISCOUS HEATER CRANKSHAFT PULLEY (w/ Viscous Heater)****88451B**

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>FRONT CRANKSHAFT OIL

SEAL>INSTALLATION

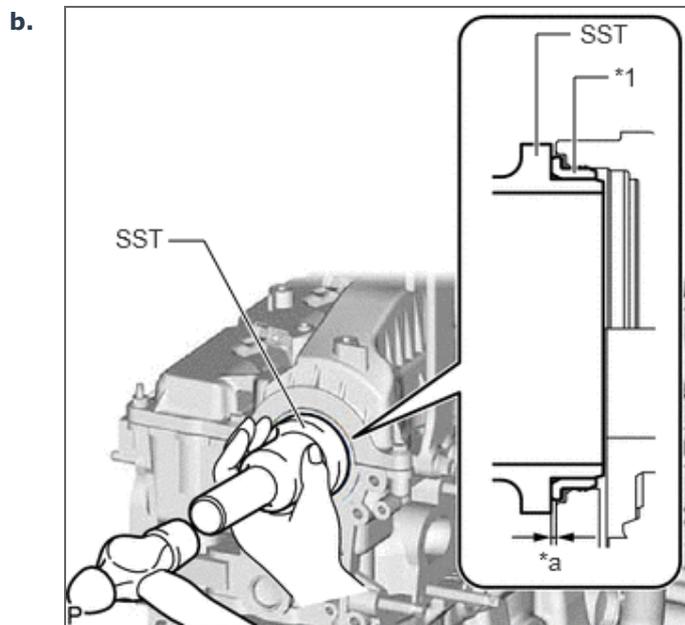
**5.INSTALL CAMSHAFT OIL SEAL RETAINER**

11382C

**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.



*1	Camshaft Oil Seal Retainer
*a	Depth

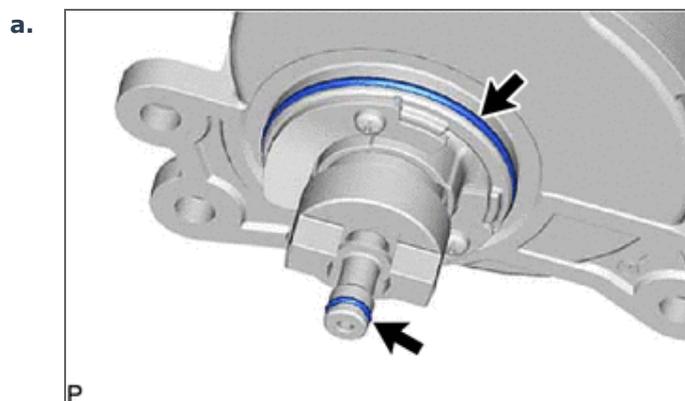
Using SST and a hammer, tap in a new camshaft oil seal retainer to the No. 3 camshaft bearing cap and cylinder head sub-assembly as shown in the illustration.

**SST**  
**09223-46011**

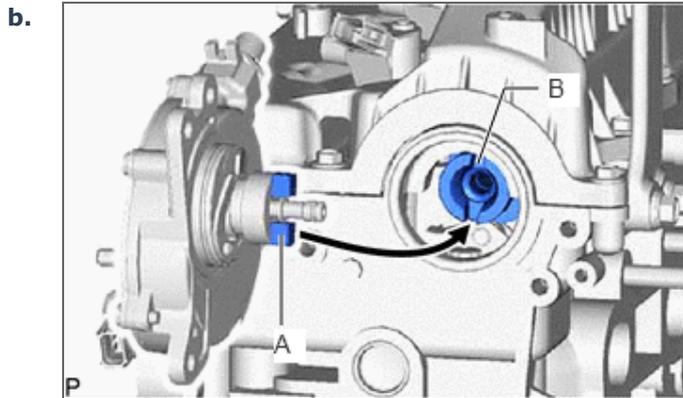
**Standard depth:**  
**0 to 0.8 mm (0 to 0.0315 in.)**

**6.INSTALL VACUUM PUMP ASSEMBLY**

29300



Coat 2 new O-rings with engine oil, and install them to the vacuum pump assembly.



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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**7.INSTALL NO. 1 VACUUM TRANSMITTING PIPE SUB-ASSEMBLY** **25706**

---

- 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.

---

**8.INSTALL V-RIBBED BELT TENSIONER ASSEMBLY** **16620**

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[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>INSTALLATION

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**9.INSTALL NO. 1 IDLER PULLEY SUB-ASSEMBLY** **16603**

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[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>INSTALLATION

---

**10.INSTALL THERMOSTAT** **16331A**

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[Click here](#)Engine / Hybrid System>1GD-FTV COOLING>THERMOSTAT>INSTALLATION

---

**11.INSTALL WATER INLET** **16321**

---

- 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)**

---

**12.INSTALL WATER OUTLET SUB-ASSEMBLY** **16304**

---

- 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)**

 <b>13.INSTALL NO. 2 WATER BY-PASS PIPE SUB-ASSEMBLY</b>	<b>16207</b>
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- 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.

 <b>14.INSTALL ENGINE OIL PRESSURE SWITCH ASSEMBLY</b>	<b>83530</b>
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Click here [Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PRESSURE SWITCH>INSTALLATION](#)

 <b>15.TEMPORARILY INSTALL TURBO OIL INLET PIPE SUB-ASSEMBLY</b>	<b>15407</b>
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Click here [Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>INSTALLATION](#)

 <b>16.TEMPORARILY INSTALL EXHAUST MANIFOLD WITH TURBOCHARGER SUB-ASSEMBLY</b>	<b>17141</b>
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Click here [Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>INSTALLATION](#)

 <b>17.INSTALL TURBO OIL OUTLET PIPE</b>	<b>15474</b>
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Click here [Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>INSTALLATION](#)

 <b>18.TEMPORARILY INSTALL TURBOCHARGER STAY</b>	<b>17293</b>
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Click here [Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>INSTALLATION](#)

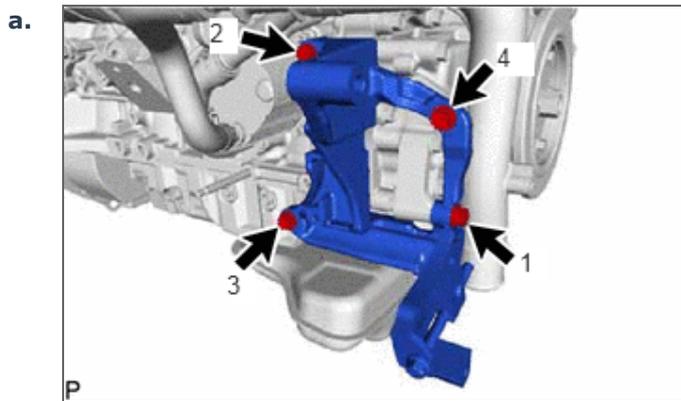
 <b>19.TIGHTEN EXHAUST MANIFOLD WITH TURBOCHARGER SUB-ASSEMBLY</b>	<b>17141</b>
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Click here [Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>INSTALLATION](#)

 <b>20.TIGHTEN TURBOCHARGER STAY</b>	<b>17293</b>
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Click here [Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>INSTALLATION](#)

 <b>21.INSTALL NO. 1 VISCOUS HEATER BRACKET SUB-ASSEMBLY (w/ Viscous Heater)</b>	<b>87101</b>
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Temporarily install the No. 1 viscous heater bracket sub-assembly with the 4 bolts to the cylinder block sub-assembly and timing chain cover sub-assembly.

- b. Tighten the 4 bolts in the sequence shown in the illustration to install the No. 1 viscous heater bracket sub-assembly.

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

---

**22.CONNECT NO. 1 AND NO. 2 TURBO WATER HOSE** **16284**

---

[Click here](#)Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>INSTALLATION

---

**23.INSTALL NO. 1 WATER BY-PASS PIPE** **16268**

---

- 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.

---

**24.INSTALL NO. 3 WATER BY-PASS PIPE** **16279**

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[Click here](#)Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>INSTALLATION

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**25.INSTALL PCV HOSE (except Cold Area Specification Vehicles)** **12261**

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[Click here](#)Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>INSTALLATION

---

**26.INSTALL EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY** **25051**

---

- w/ DPF:  
[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER(w/ DPF)>INSTALLATION
- w/o DPF:  
[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER(w/o DPF)>INSTALLATION

---

**27.INSTALL NO. 2 EXHAUST PIPE SUPPORT STAY**

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- w/ DPF:  
Click here[Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/DPF\)>INSTALLATION](#)
- w/o DPF:  
Click here[Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/oDPF\)>INSTALLATION](#)

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**28.INSTALL NO. 1 TURBO INSULATOR** **17271**

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- w/ DPF:  
Click here[Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/DPF\)>INSTALLATION](#)
- w/o DPF:  
Click here[Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/oDPF\)>INSTALLATION](#)

---

**29.INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR** **17167**

---

- w/ DPF:  
Click here[Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/DPF\)>INSTALLATION](#)
- w/o DPF:  
Click here[Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/oDPF\)>INSTALLATION](#)

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**30.INSTALL AIR FUEL RATIO SENSOR (w/ DPF)** **89467B**

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Click here[Engine / Hybrid System>1GD-FTV ENGINE CONTROL>AIR FUEL RATIO SENSOR>INSTALLATION](#)

---

**31.INSTALL NO. 1 INJECTOR HOLDER (w/ DPF)** **23295D**

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Click here[Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EXHAUST FUEL ADDITION INJECTOR>INSTALLATION](#)

---

**32.CONNECT NO. 4 WATER BY-PASS HOSE (w/ DPF)** **16281**

---

- a.** Connect the No. 4 water by-pass hose to the No. 1 injector holder, and slide the clamp to secure the hose.

---

**33.INSTALL NO. 5 WATER BY-PASS HOSE (w/ DPF)** **16282**

---

- a.** Attach the clamp and install the No. 5 water by-pass hose to the No. 1 water hose clamp bracket.
- b.** Connect the No. 5 water by-pass hose to the No. 1 injector holder and water outlet sub-assembly, and slide the 2 clamps to secure the hose.

---

**34.INSTALL PCV PIPE (for Cold Area Specification Vehicles)** **12229**

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Click here[Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>INSTALLATION](#)

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**35.INSTALL ENGINE COOLANT TEMPERATURE SENSOR** **89422C**

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Click here[Engine / Hybrid System>1GD-FTV ENGINE CONTROL>ENGINE COOLANT TEMPERATURE SENSOR>INSTALLATION](#)

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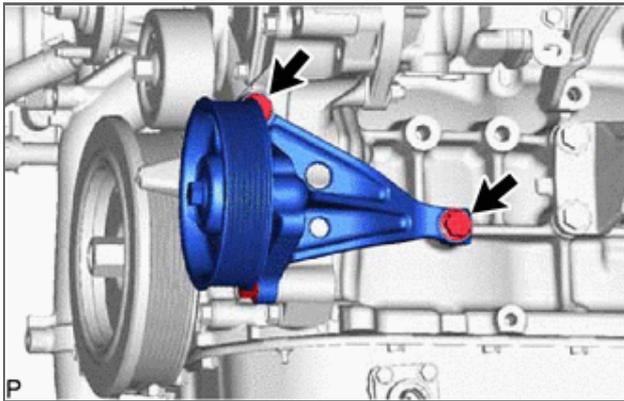
**36.INSTALL IDLER PULLEY ASSEMBLY (w/o Air Conditioning System)** **16630D**

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**NOTICE:**

Install the idler pulley assembly exactly as described in the procedures below to properly secure and prevent damage to the fan and generator V belt.

a.

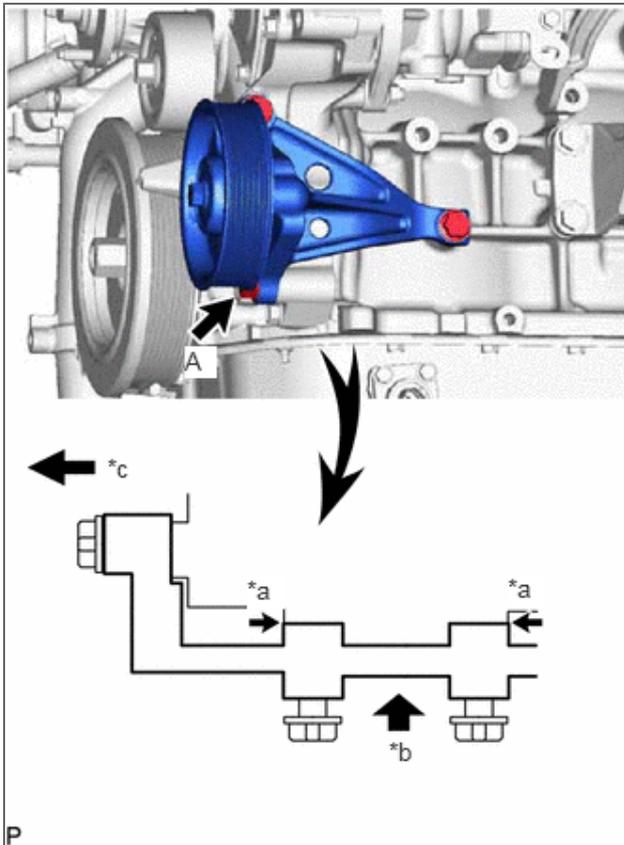


Temporarily install the idler pulley assembly with the 2 bolts to the cylinder block sub-assembly.

**HINT:**

Temporarily install the idler pulley assembly with the 2 bolts so that the idler pulley assembly can be moved by hand.

b.



*a	No Clearance
*b	Push
*c	Front

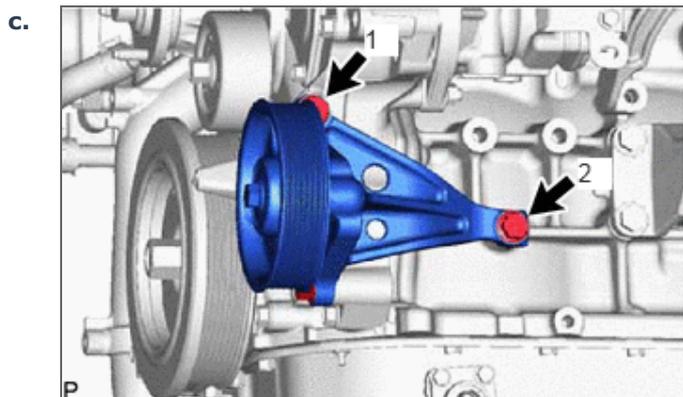
Push the idler pulley assembly toward the cylinder block sub-assembly as shown in the illustration and tighten bolt A.

**Torque:**

**39 N\*m (398 kgf\*cm, 29 ft.\*lbf)**

**HINT:**

Make sure there is no clearance between the cylinder block sub-assembly and idler pulley assembly as shown in the illustration.



Uniformly tighten the 2 bolts in the order shown in the illustration.

**Torque:**

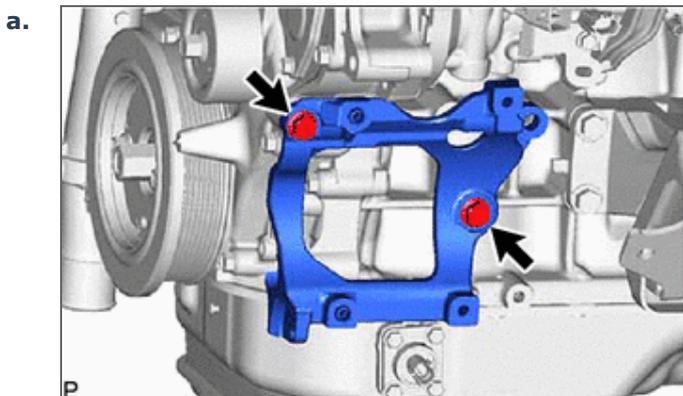
**39 N\*m (398 kgf\*cm, 29 ft.\*lbf)**

**37.INSTALL NO. 1 COMPRESSOR MOUNTING BRACKET (w/ Air Conditioning System)**

**88431**

**NOTICE:**

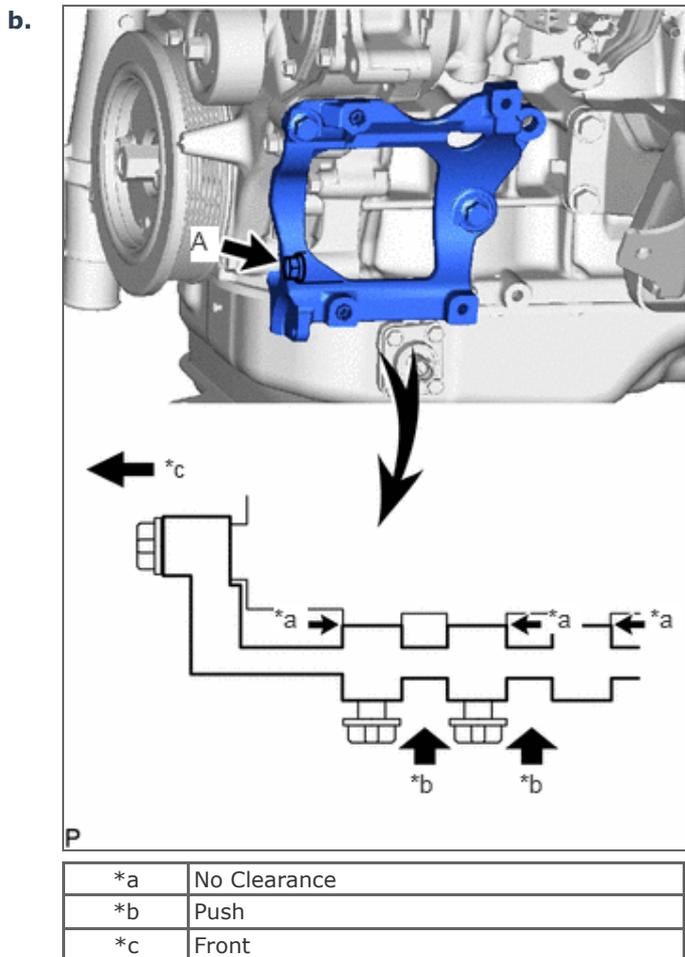
Install the No. 1 compressor mounting bracket exactly as described in the procedures below to properly secure and prevent damage to the fan and generator V belt.



Temporarily install the No. 1 compressor mounting bracket with the 2 bolts to the cylinder block sub-assembly.

**HINT:**

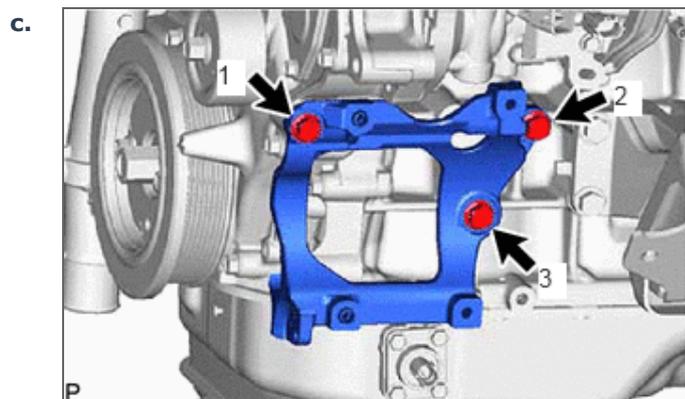
Temporarily install the No. 1 compressor mounting bracket with the 2 bolts so that the No. 1 compressor mounting bracket can be moved by hand.



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.



Uniformly tighten the 3 bolts in the order shown in the illustration.

**Torque:**  
**39 N\*m (398 kgf\*cm, 29 ft.\*lbf)**

---

<b>38.INSTALL NO. 5 WATER BY-PASS PIPE SUB-ASSEMBLY</b>	<b>16025</b>
---	--------------

---

- 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.

---

<b>39.INSTALL NO. 3 NOZZLE LEAKAGE PIPE (w/o DPF)</b>	<b>23780</b>
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---

- 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)**


---

<b>40.INSTALL FUEL FILTER ASSEMBLY (w/ DPF)</b>	<b>23300</b>
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- a. Install the fuel filter assembly with the 2 nuts to the cylinder block sub-assembly.

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


---

<b>41.INSTALL HOSE BRACKET</b>	<b>44781</b>
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- 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)**


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<b>42.INSTALL GLOW PLUG ASSEMBLY</b>	<b>19850</b>
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Click here [Engine / Hybrid System>1GD-FTV STARTING>GLOW PLUG>INSTALLATION](#)

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<b>43.INSTALL NO. 1 GLOW PLUG CONNECTOR</b>	<b>19871</b>
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Click here [Engine / Hybrid System>1GD-FTV STARTING>GLOW PLUG>INSTALLATION](#)

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<b>44.INSTALL COMMON RAIL ASSEMBLY</b>	<b>23810A</b>
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Click here [Engine / Hybrid System>1GD-FTV FUEL>COMMON RAIL>INSTALLATION](#)

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<b>45.TEMPORARILY INSTALL NO. 1 AND NO. 2 INJECTION PIPE SUB-ASSEMBLY</b>	<b>23701</b>
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Click here [Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION](#)

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<b>46.TIGHTEN INJECTOR ASSEMBLY</b>	<b>23670</b>
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Click here [Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION](#)

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<b>47.TIGHTEN NO. 1 AND NO. 2 INJECTION PIPE SUB-ASSEMBLY</b>	<b>23701</b>
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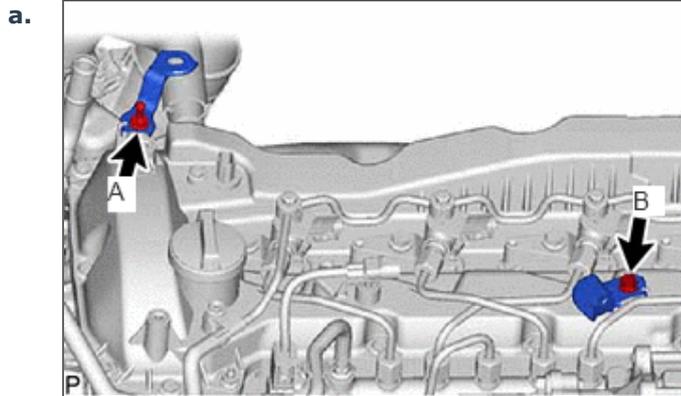
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Click here [Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION](#)

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**48.INSTALL WIRING HARNESS CLAMP BRACKET**


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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)**

---

**49.INSTALL NOZZLE LEAKAGE PIPE ASSEMBLY**
**23760**

Click here [Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION](#)

---

**50.INSTALL NO. 1 FUEL PIPE (w/ DPF)**
**23811H**

Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EXHAUST FUEL ADDITION INJECTOR>INSTALLATION](#)

---

**51.INSTALL WIRING HARNESS CLAMP BRACKET**

Click here [Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION](#)

---

**52.INSTALL INTAKE MANIFOLD**
**17111**

Click here [Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>INTAKE MANIFOLD>INSTALLATION](#)

---

**53.INSTALL NO. 2 NOZZLE LEAKAGE PIPE ASSEMBLY**
**23770**

Click here [Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>INTAKE MANIFOLD>INSTALLATION](#)

---

**54.INSTALL FUEL INLET PIPE SUB-ASSEMBLY**
**23804C**

Click here [Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>INTAKE MANIFOLD>INSTALLATION](#)

---

**55.INSTALL NO. 3 FUEL PIPE (w/ DPF)**
**23815D**

Click here [Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>INTAKE MANIFOLD>INSTALLATION](#)

---

**56.INSTALL NO. 4 FUEL PIPE SUB-ASSEMBLY (w/ DPF)**
**23804D**

Click here [Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>INTAKE MANIFOLD>INSTALLATION](#)

---

**57.INSTALL NO. 1 FUEL HOSE**
**23271H**

Click here [Engine / Hybrid System>1GD-FTV FUEL>FUEL SUPPLY PUMP>INSTALLATION](#)

 <b>58.INSTALL NO. 2 FUEL HOSE</b>	<b>23273H</b>
---	---------------

Click here [Engine / Hybrid System>1GD-FTV FUEL>FUEL SUPPLY PUMP>INSTALLATION](#)

 <b>59.INSTALL FUEL PUMP MOTOR WIRE</b>	<b>23243B</b>
--	---------------

Click here [Engine / Hybrid System>1GD-FTV FUEL>FUEL SUPPLY PUMP>INSTALLATION](#)

 <b>60.INSTALL FUEL INJECTION PUMP COVER SUB-ASSEMBLY</b>	<b>22803</b>
--	--------------

Click here [Engine / Hybrid System>1GD-FTV FUEL>FUEL SUPPLY PUMP>INSTALLATION](#)

 <b>61.INSTALL MANIFOLD STAY</b>	<b>17118</b>
---	--------------

Click here [Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>INTAKE MANIFOLD>INSTALLATION](#)

 <b>62.INSTALL WIRING HARNESS CLAMP BRACKET</b>	
--	--

Click here [Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>INTAKE MANIFOLD>INSTALLATION](#)

 <b>63.INSTALL NO. 2 FUEL PIPE</b>	<b>23812D</b>
---	---------------

- 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.

 <b>64.INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE</b>	<b>11409</b>
---	--------------

Click here [Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>INTAKE MANIFOLD>INSTALLATION](#)

 <b>65.INSTALL NO. 1 EGR COOLER AND NO. 2 EGR VALVE ASSEMBLY WITH ELECTRIC 25800 EGR CONTROL VALVE ASSEMBLY</b>	
--	--

Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR COOLER>INSTALLATION](#)

 <b>66.INSTALL NO. 4 WATER BY-PASS PIPE SUB-ASSEMBLY</b>	<b>16209</b>
---	--------------

- 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. for Cold Area Specification Vehicles:  
Attach the clamp and connect the No. 11 water by-pass hose to the No. 2 fuel pipe.
- c. Connect the water hose to the No. 2 EGR valve assembly, and slide the clamp to secure the hose.
- d. 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.
- e. 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.

 <b>67.INSTALL VACUUM CONTROL VALVE SET</b>	<b>25804</b>
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[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION

 <b>68.INSTALL NO. 1 EGR PIPE SUB-ASSEMBLY</b>	<b>25601</b>
---	--------------

- 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)**

 <b>69.INSTALL CONNECTING WIRE</b>	<b>27148A</b>
---	---------------

- a. Attach the 2 clamps and install the connecting wire to the hose bracket.
- b. Connect the connector to the common rail assembly.

 <b>70.INSTALL NO. 3 WATER BY-PASS PIPE SUB-ASSEMBLY</b>	<b>16206B</b>
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[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR COOLER>INSTALLATION

 <b>71.INSTALL NO. 2 EGR PIPE</b>	<b>25612</b>
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[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION

 <b>72.INSTALL EGR VALVE BRACKET</b>	<b>25625</b>
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[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION

 <b>73.INSTALL DIESEL TURBO PRESSURE SENSOR</b>	<b>89421C</b>
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[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE CONTROL>MANIFOLD ABSOLUTE PRESSURE SENSOR>INSTALLATION

 <b>74.INSTALL GAS FILTER</b>	<b>23265C</b>
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[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION

 <b>75.INSTALL ENGINE COVER BRACKET</b>	<b>12631A</b>
--	---------------

- 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)**

 <b>76.INSTALL PIPE CLAMP (w/ DPF)</b>	<b>17578B</b>
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[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER(w/ DPF)>INSTALLATION

 <b>77.TEMPORARILY INSTALL NO. 2 VACUUM PIPE (w/ DPF)</b>	<b>25734</b>
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[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER(w/

DPF)&gt;INSTALLATION

 <b>78.TEMPORARILY INSTALL NO. 1 VACUUM PIPE (w/ DPF)</b>	<b>25733A</b>
--	---------------

Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/ DPF\)>INSTALLATION](#)

 <b>79.TIGHTEN NO. 2 VACUUM PIPE (w/ DPF)</b>	<b>25734</b>
--	--------------

Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/ DPF\)>INSTALLATION](#)

 <b>80.TIGHTEN NO. 1 VACUUM PIPE (w/ DPF)</b>	<b>25733A</b>
--	---------------

Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/ DPF\)>INSTALLATION](#)

 <b>81.INSTALL EXHAUST GAS TEMPERATURE SENSOR (w/ DPF)</b>	<b>89425</b>
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Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EXHAUST GAS TEMPERATURE SENSOR>INSTALLATION](#)

 <b>82.INSTALL DIFFERENTIAL PRESSURE SENSOR (w/ DPF)</b>	<b>89481B</b>
---	---------------

Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>DIFFERENTIAL PRESSURE SENSOR>INSTALLATION](#)

 <b>83.INSTALL NO. 2 WATER BY-PASS PIPE</b>	<b>16278</b>
--	--------------

Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION](#)

 <b>84.INSTALL DIESEL THROTTLE BODY ASSEMBLY</b>	<b>26100G</b>
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Click here [Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>INSTALLATION](#)

 <b>85.INSTALL INTERCOOLER AIR TUBE</b>	<b>17363K</b>
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Click here [Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>INSTALLATION](#)

 <b>86.INSTALL ENGINE WIRE</b>	<b>82121</b>
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 <b>87.INSTALL NO. 2 ENGINE COVER BRACKET</b>	<b>12632</b>
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Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>INSTALLATION](#)

 <b>88.INSTALL NO. 2 HOSE TO HOSE TUBE</b>	<b>44763C</b>
---	---------------

- 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.

[Print](#)[Exit](#)

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**1GD-FTV ENGINE MECHANICAL 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.

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Print

Exit

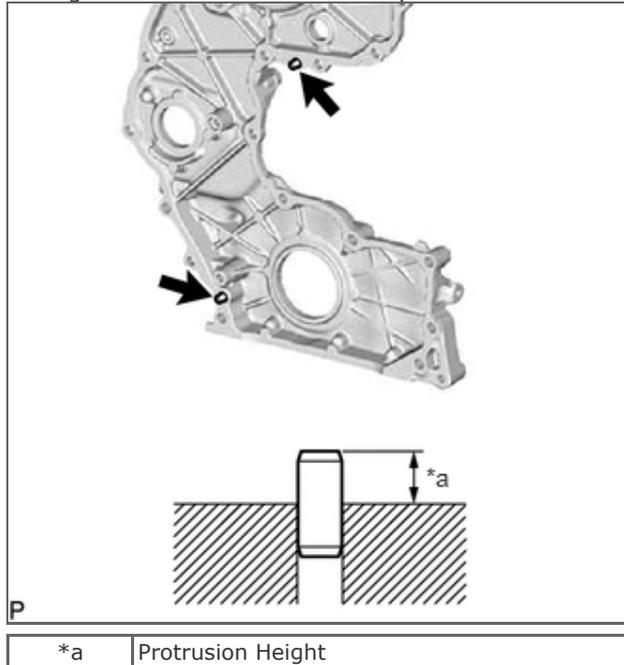
## 1GD-FTV ENGINE MECHANICAL ENGINE UNIT REASSEMBLY

## PROCEDURE

## 1.INSTALL STRAIGHT PIN

**NOTICE:**

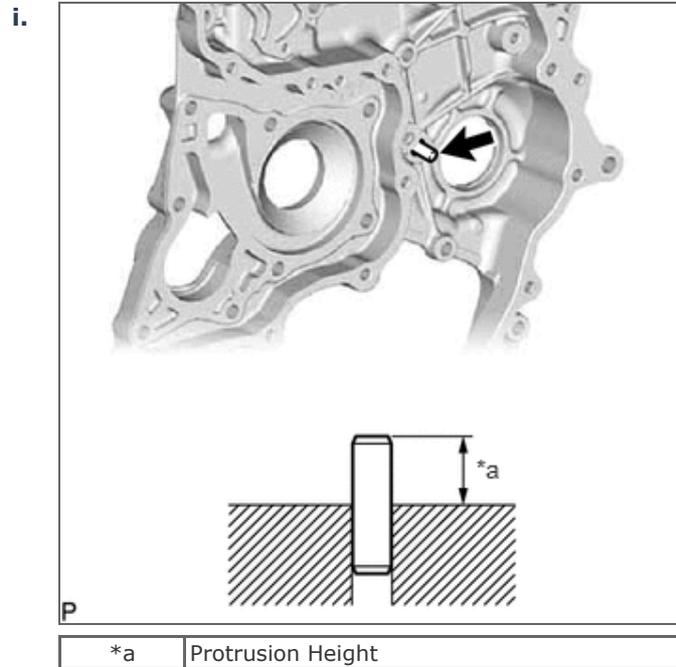
It is not necessary to remove the straight pin unless it is being replaced.

**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.)**

**b.** for Timing Chain Case Assembly Side:



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.)**

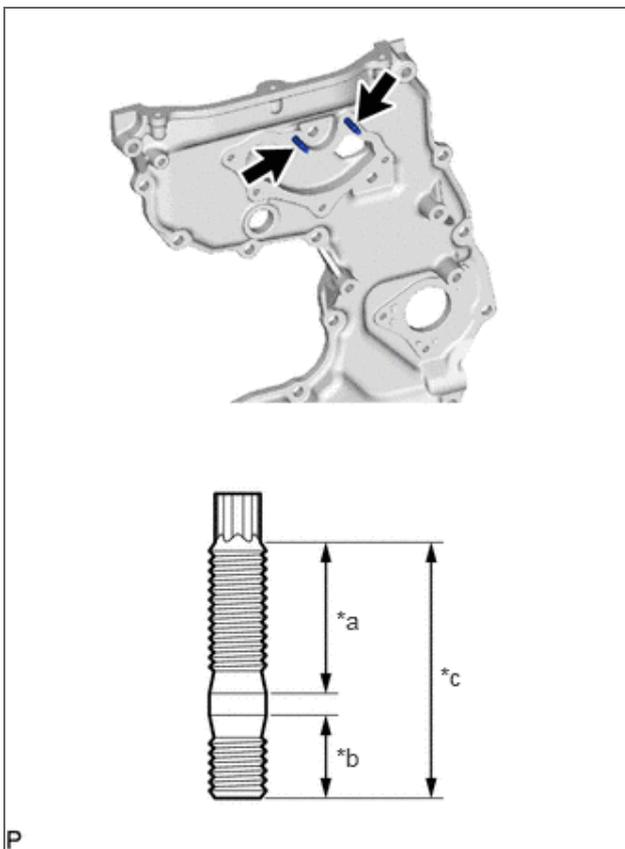
## 2.INSTALL STUD BOLT

### **NOTICE:**

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

- a. for Timing Chain Cover Sub-assembly Side:

i.



P

*a	16 mm (0.630 in.)
*b	9.0 mm (0.354 in.)
*c	27 mm (1.06 in.)

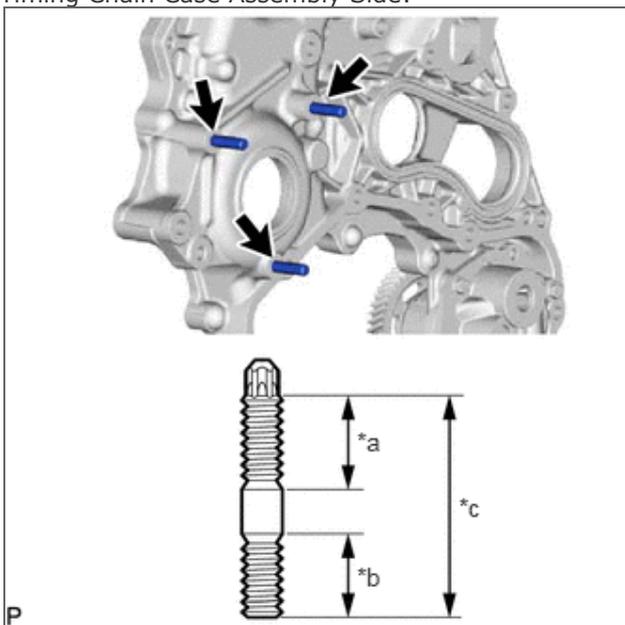
Using an E6 "TORX" socket wrench, install the stud bolts to the timing chain cover sub-assembly.

**Torque:**

**6.0 N\*m (61 kgf\*cm, 53 in.\*lbf)**

b. for Timing Chain Case Assembly Side:

i.



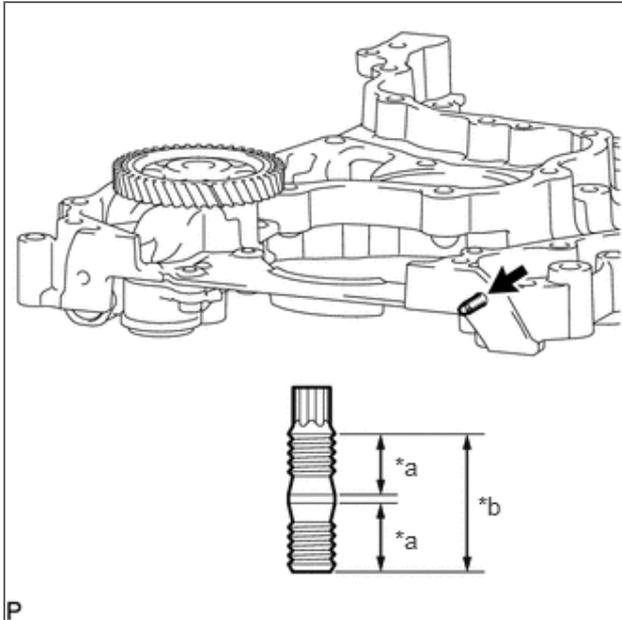
P

*a	19 mm (0.748 in.)
*b	16 mm (0.630 in.)
*c	44 mm (1.73 in.)

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)**

ii.



*a	9.0 mm (0.354 in.)
*b	19 mm (0.748 in.)

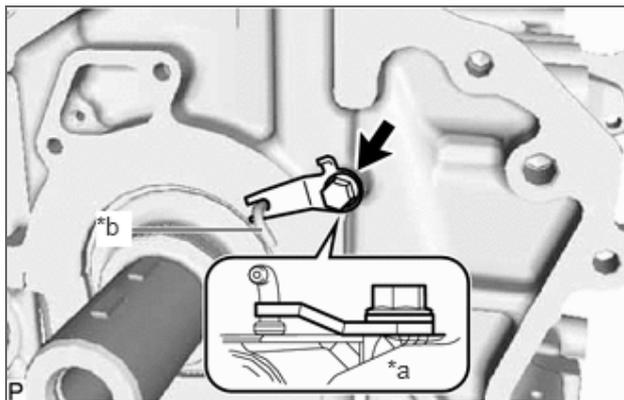
Using an E6 "TORX" socket wrench, install the stud bolt to the timing chain case assembly.

**Torque:**  
**6.0 N\*m (61 kgf\*cm, 53 in.\*lbf)**

**3.INSTALL LOCK PLATE**

**13577D**

a.



*a	Cylinder Block Sub-assembly Side
*b	Oil Jet

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.

**4.INSTALL CYLINDER HEAD GASKET** **11115**

Click here [Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>CYLINDER HEAD GASKET>INSTALLATION](#)

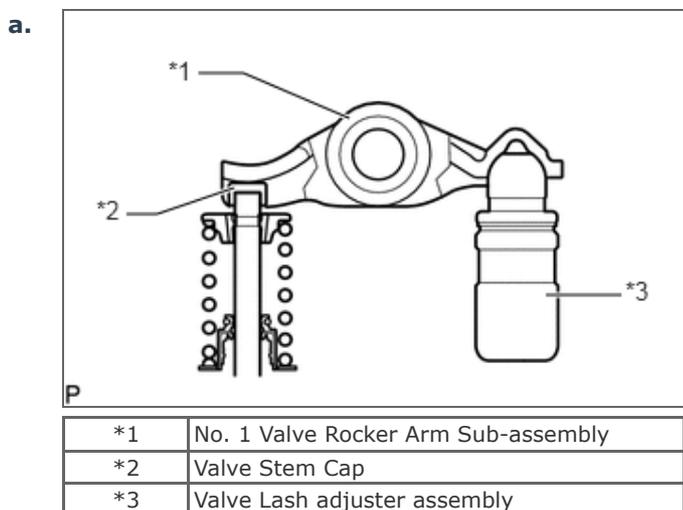
**5.INSTALL CYLINDER HEAD SUB-ASSEMBLY** **11101**

Click here [Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>CYLINDER HEAD GASKET>INSTALLATION](#)

**6.INSTALL VALVE LASH ADJUSTER ASSEMBLY** **13750**

- a. Install the 16 valve lash adjuster assemblies to the cylinder head sub-assembly.

**7.INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY** **13801**

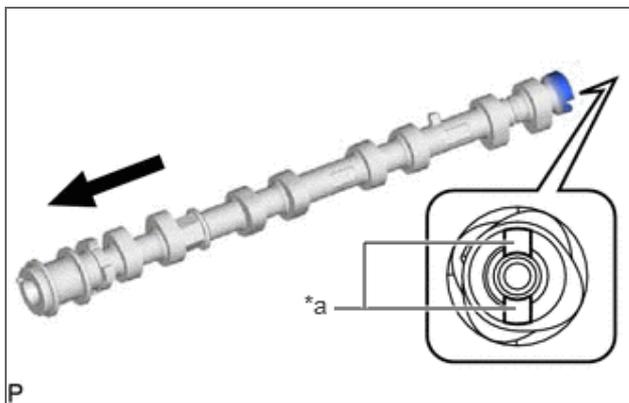


Check that the No. 1 valve rocker arm sub-assembly is firmly set to the valve lash adjuster assembly.

- 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.

**8.INSTALL NO. 2 CAMSHAFT** **13512**

**HINT:**



*a	Glove
	Engine Front Side

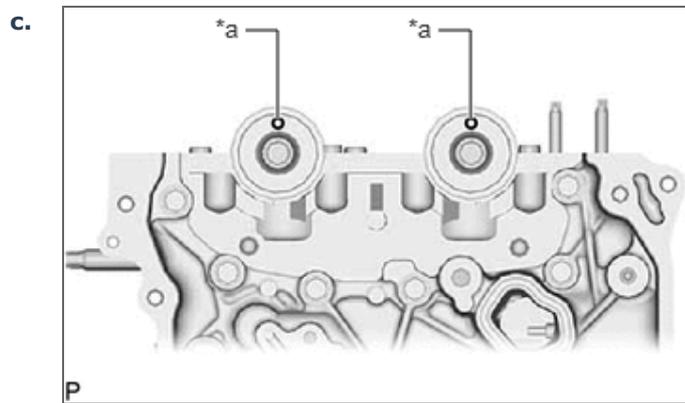
Glove is at the rear end of the No. 2 camshaft.

- 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.

**9.INSTALL CAMSHAFT**

**13511**

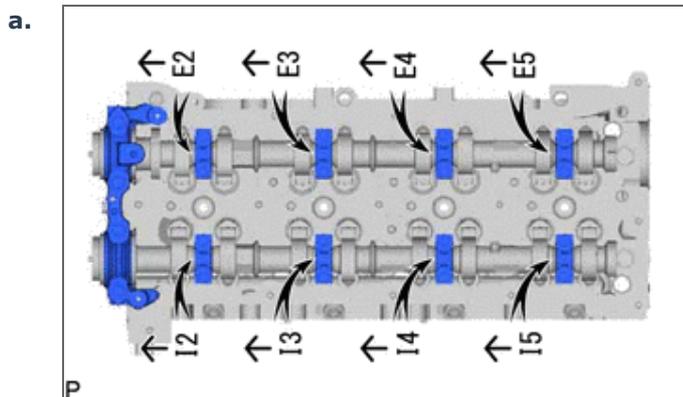
- a. Clean the camshaft journals.
- b. Apply a light coat of engine oil to the camshaft journals of the cylinder head sub-assembly and the thrust portion of the camshaft.



*a	Knock Pin
----	-----------

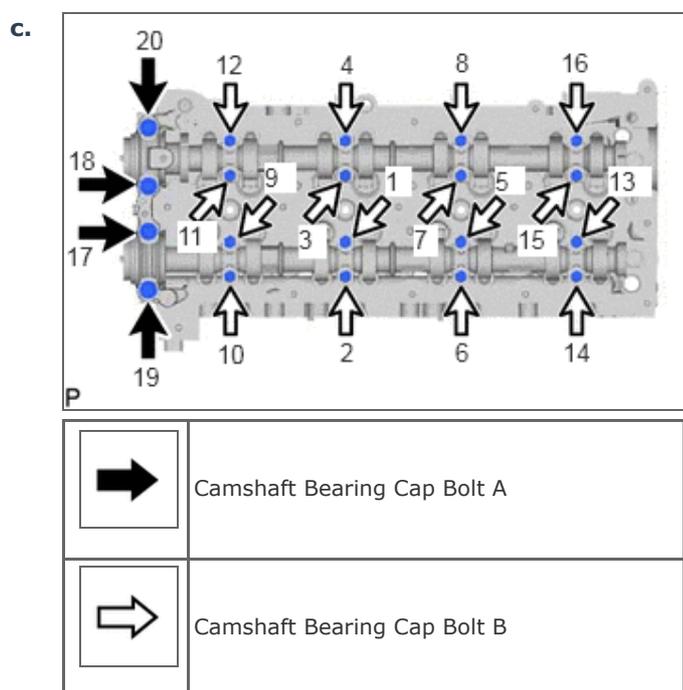
Make sure the knock pins of the camshaft and No. 2 camshaft are facing the direction shown in the illustration.

**10.INSTALL NO. 1 AND NO. 2 CAMSHAFT BEARING CAP**



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.



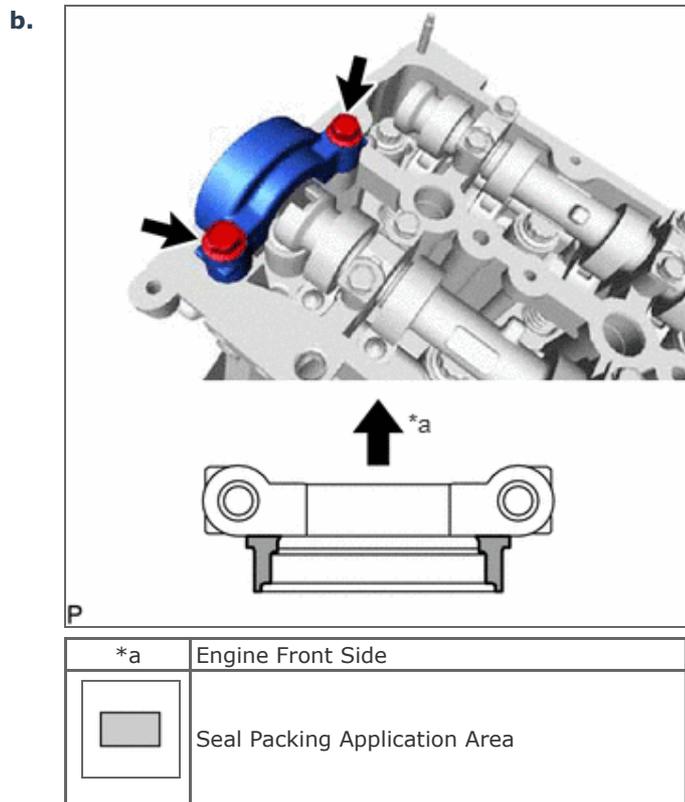
Uniformly tighten the 20 camshaft bearing cap bolts in several steps in the order shown in the illustration.

**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)**

**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.



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.

**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.

	<b>12.INSTALL TIMING CHAIN CASE ASSEMBLY AND ENGINE WATER PUMP ASSEMBLY</b>	<b>11310</b>
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[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>INSTALLATION

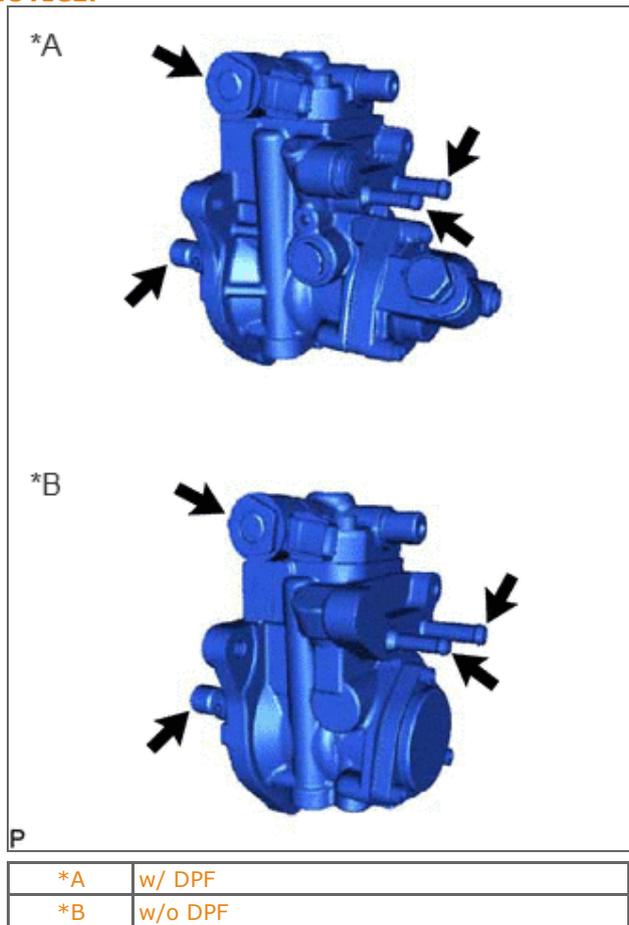
	<b>13.INSTALL INJECTION PUMP INSULATOR</b>	<b>22815A</b>
--	--	---------------

**a.** Install the injection pump insulator to the cylinder block sub-assembly.

**14.INSTALL SUPPLY PUMP ASSEMBLY**

**22100**

**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)**
- c. w/ DPF:  
 Install the No. 1 fuel pump bracket with the 2 bolts to the cylinder block sub-assembly and supply pump assembly.  
**Torque:**  
**21 N\*m (214 kgf\*cm, 15 ft.\*lbf)**

**15.INSTALL NO. 1 CHAIN TENSIONER SLIPPER**

**13559**

- a. Install the No. 1 chain tensioner slipper to the straight pin.

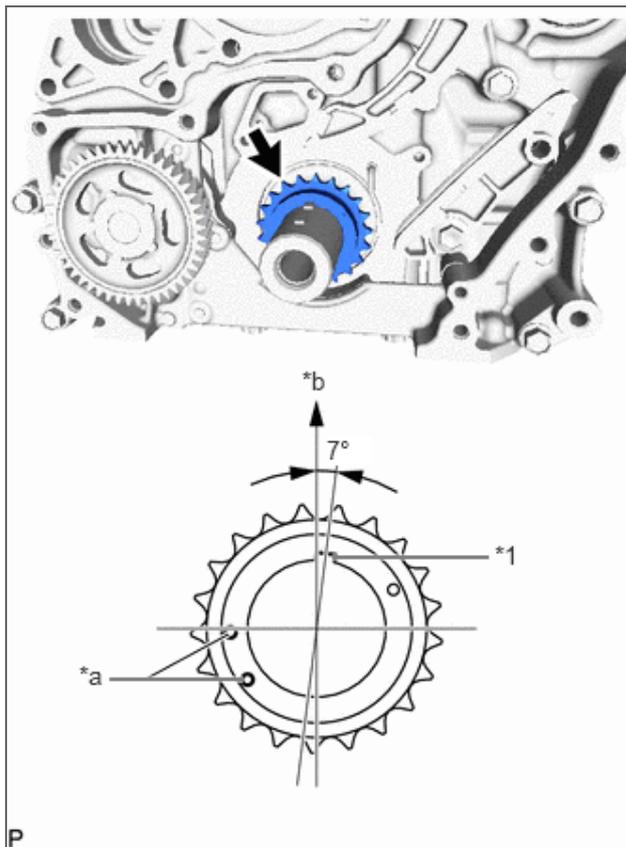
**16.TEMPORARILY INSTALL NO. 1 CHAIN VIBRATION DAMPER**

**13561**

- 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** **13506**

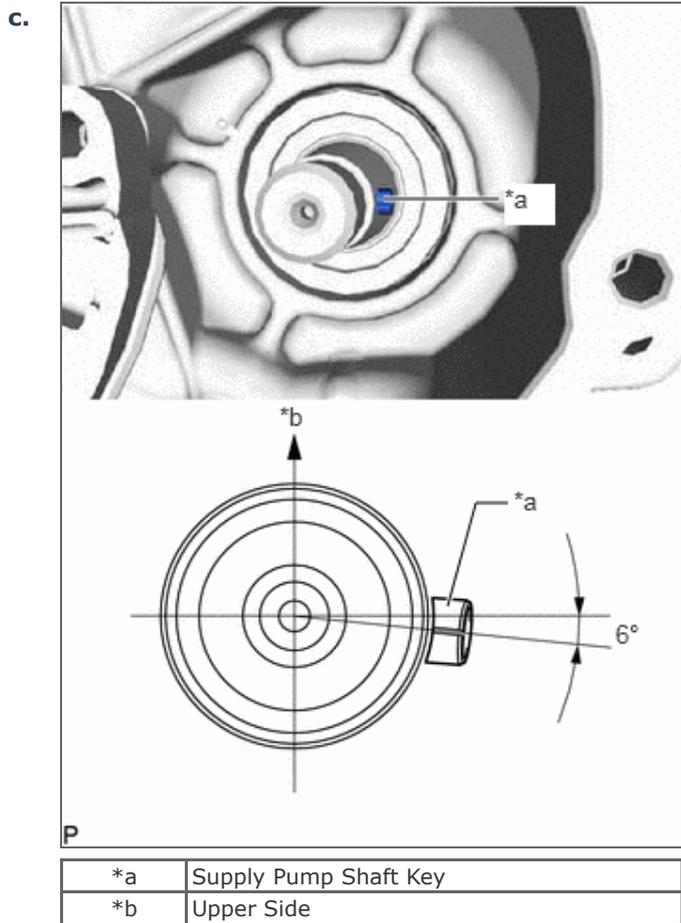
**a.**



*1	Crankshaft Pulley Set Key
*a	Timing Mark
*b	Upper Side

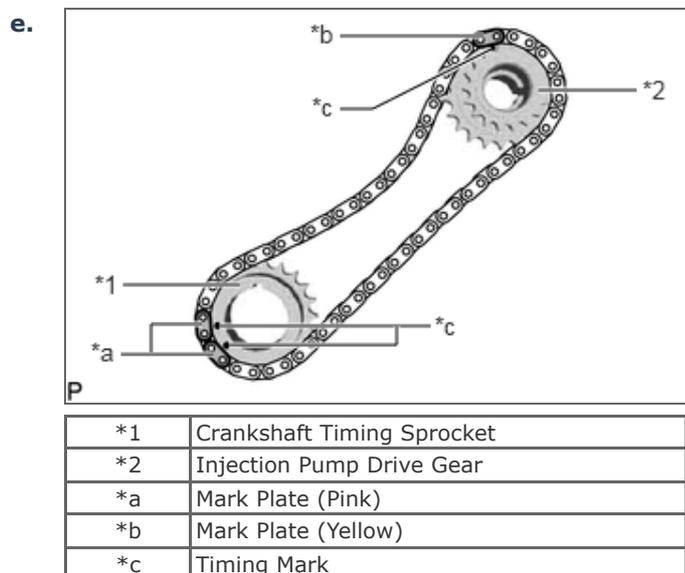
Install the crankshaft timing sprocket to the crankshaft.

**b.** Align the crankshaft pulley set key as shown in the illustration.



Align the supply pump shaft key as shown in the illustration.

**d.** Remove the crankshaft timing sprocket from the crankshaft.



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.

**18.TIGHTEN NO. 1 CHAIN VIBRATION DAMPER**

**13561**

- a. Tighten the No. 1 chain vibration damper with the bolt to the cylinder block sub-assembly.

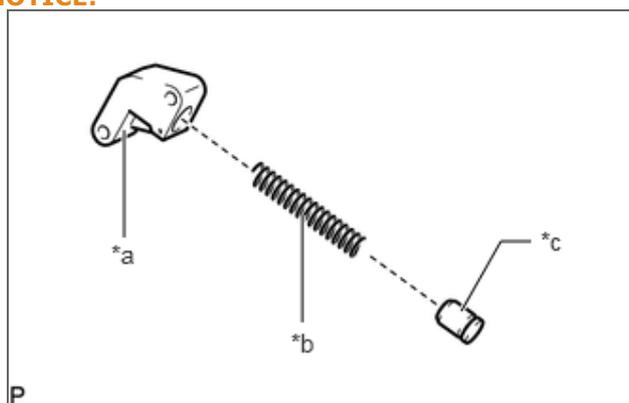
**Torque:**

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

**19.INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY**

**13540**

**NOTICE:**



P

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

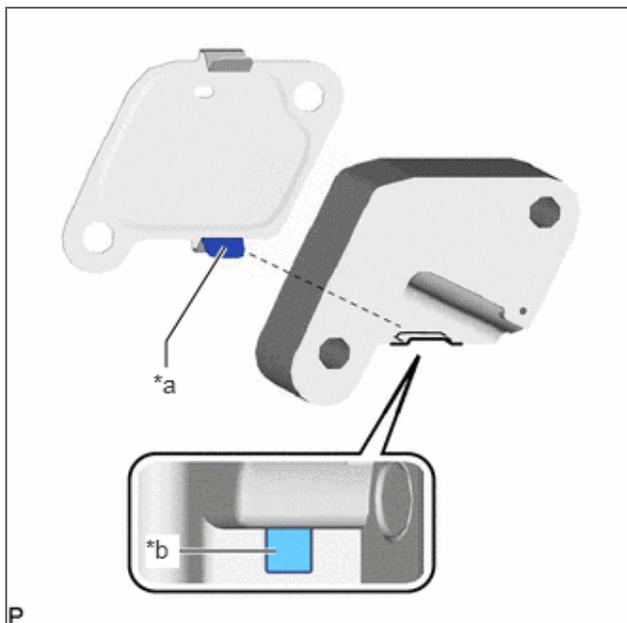
- When the pin is removed from the No. 1 chain tensioner assembly, the plunger and spring may come off of the No. 1 chain tensioner assembly body, but this is not a malfunction.
- Before installing the plunger and spring to the No. 1 chain tensioner assembly body, check that they are free of foreign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

- 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:**

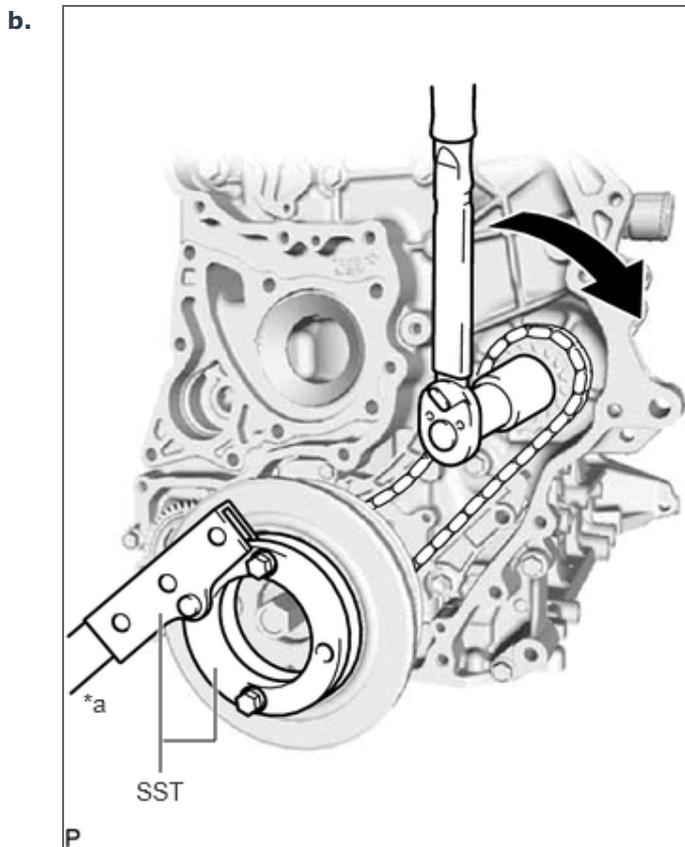


*a	Claw (Lower Side)
*b	Groove

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.

**20.INSTALL SUPPLY PUMP SHAFT NUT**

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



*a	Hold
----	------



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**

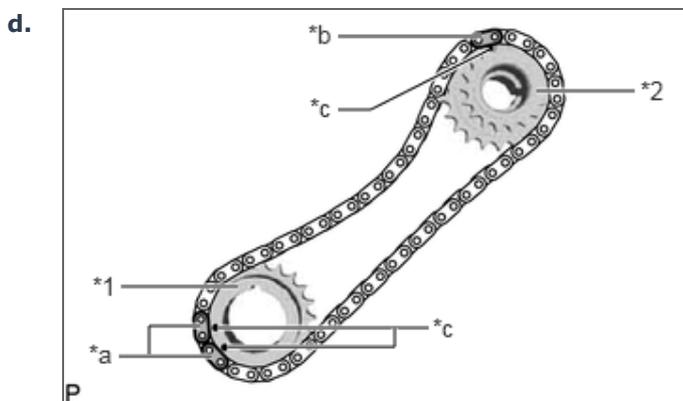
**Torque:**

**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.

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



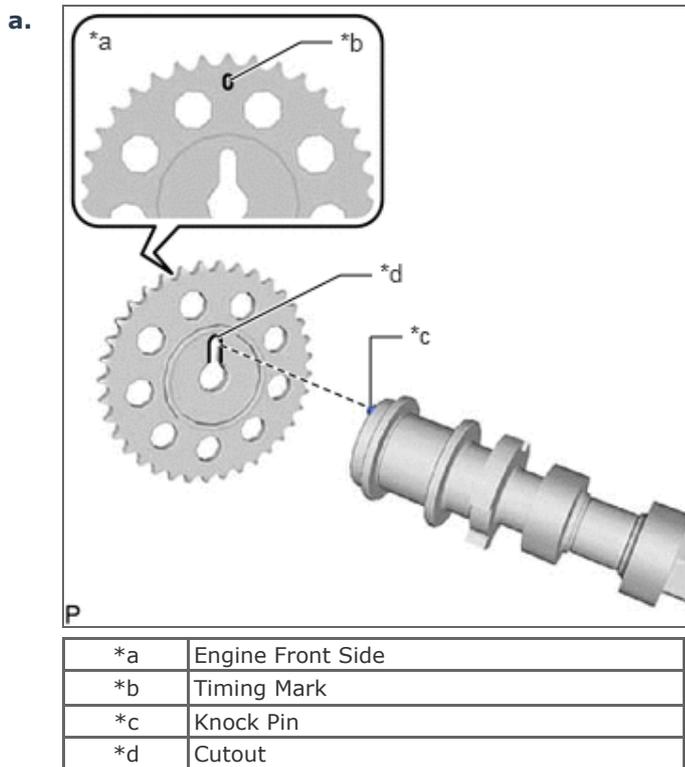
*1	Crankshaft Timing Sprocket
*2	Injection Pump Drive Gear
*a	Mark Plate (Pink)
*b	Mark Plate (Yellow)
*c	Timing Mark

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.

**21.INSTALL CAMSHAFT TIMING SPROCKET**

**13523**



Temporarily install the 2 camshaft timing sprockets with the 2 camshaft timing sprocket bolts to the camshaft and No. 2 camshaft.

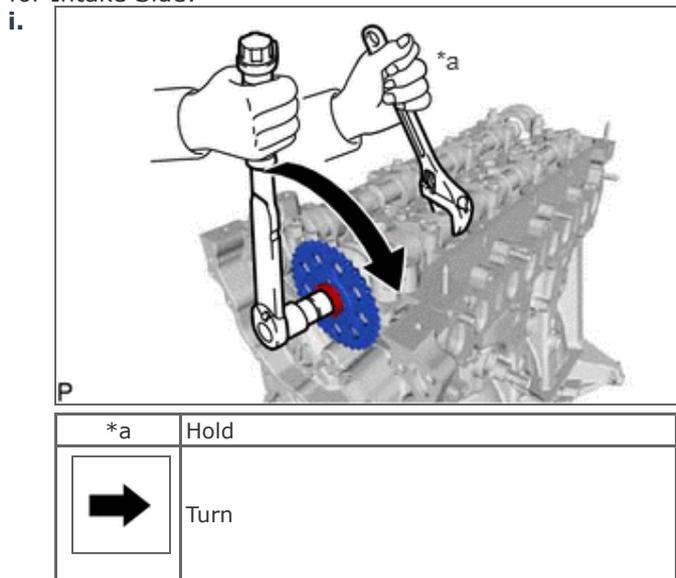
**NOTICE:**

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.

b. for Intake Side:



Use a wrench to hold the hexagonal portion of the camshaft, install the camshaft timing sprocket bolt to the camshaft.

**Torque:**

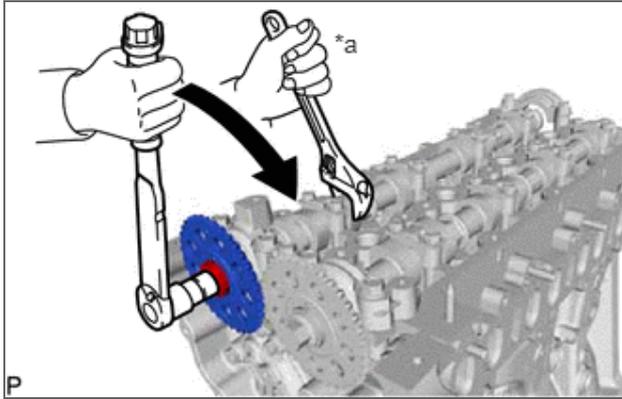
**81 N\*m (826 kgf\*cm, 60 ft.\*lbf)**

**NOTICE:**

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

c. for Exhaust Side:

i.



*a	Hold
	Turn

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.

**22.INSTALL NO. 2 CHAIN VIBRATION DAMPER**

**13562**

a. Install the No. 2 chain vibration damper with the 2 bolts to the timing chain case assembly.

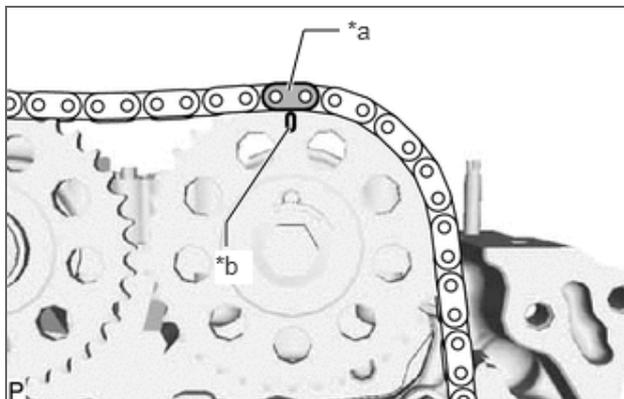
**Torque:**

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

**23.INSTALL NO. 2 CHAIN SUB-ASSEMBLY**

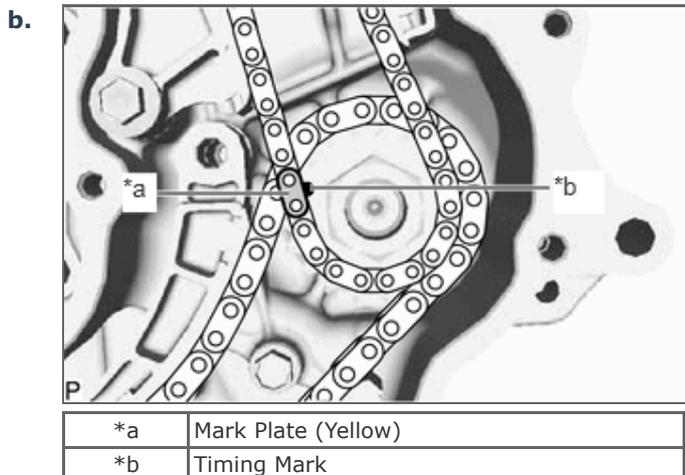
**13507**

a.

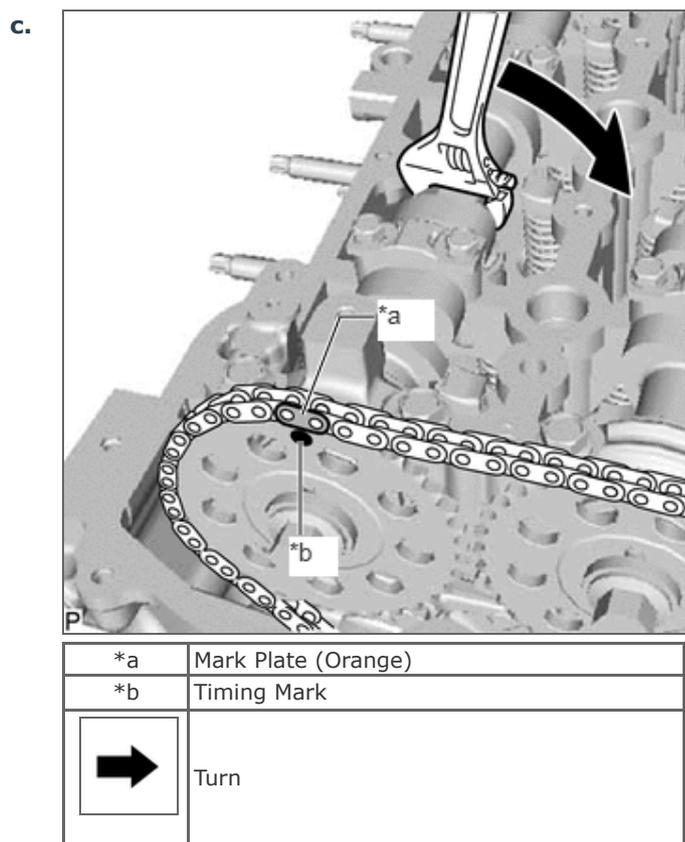


*a	Mark Plate (Orange)
*b	Timing Mark

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.



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.



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).

**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**

**13550**

- 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**

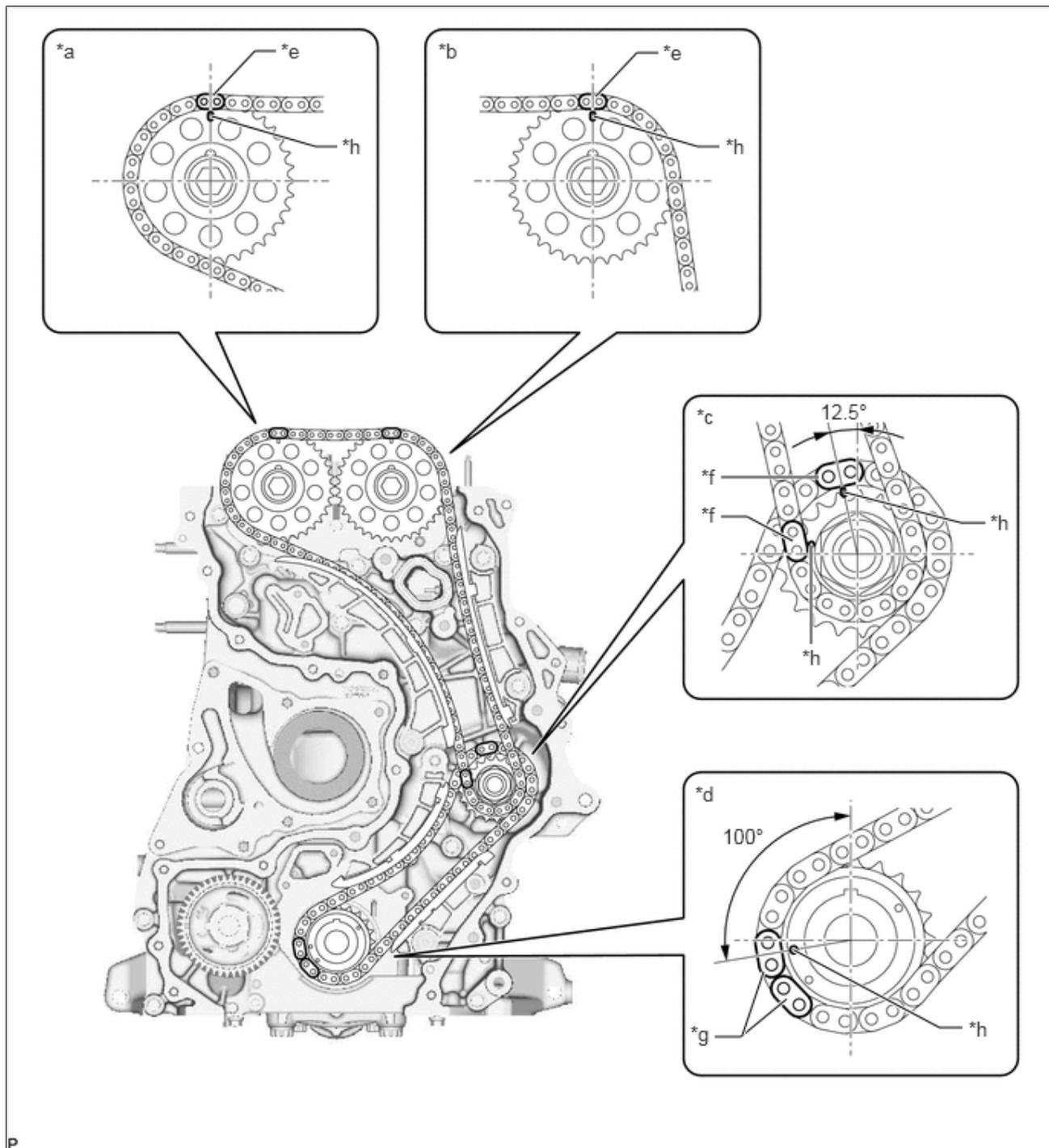
**13566B**

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>CAMSHAFT>INSTALLATION

---

**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.



*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**

**13519**

[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>INSTALLATION

**29.INSTALL OIL PUMP RELIEF VALVE PLUG**

**15133B**

- 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)**

<b>30.INSTALL TIMING CHAIN COVER PLATE</b>	<b>11324</b>
--	--------------

Click here [Engine / Hybrid System>1GD-FTV FUEL>FUEL SUPPLY PUMP>INSTALLATION](#)

<b>31.INSTALL TIMING CHAIN COVER SUB-ASSEMBLY</b>	<b>11302</b>
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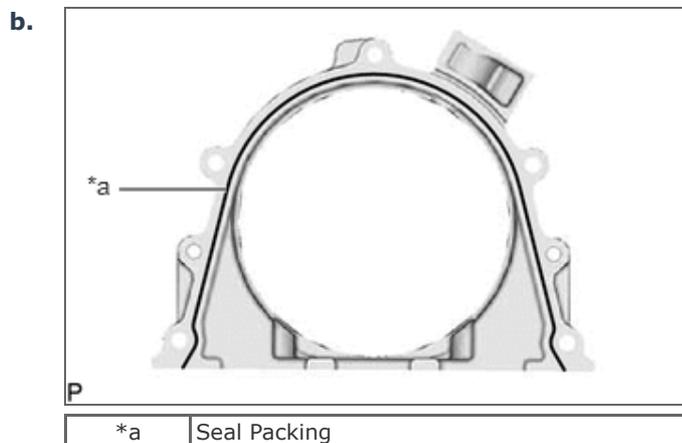
Click here [Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>INSTALLATION](#)

<b>32.INSTALL FRONT CRANKSHAFT OIL SEAL</b>	<b>11303A</b>
---	---------------

Click here [Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>FRONT CRANKSHAFT OIL SEAL>INSTALLATION](#)

<b>33.INSTALL REAR ENGINE OIL SEAL RETAINER</b>	<b>11381</b>
---	--------------

- a. Clean and degrease the contact surfaces of the rear engine oil seal retainer and cylinder block sub-assembly.



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.)**

**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:**

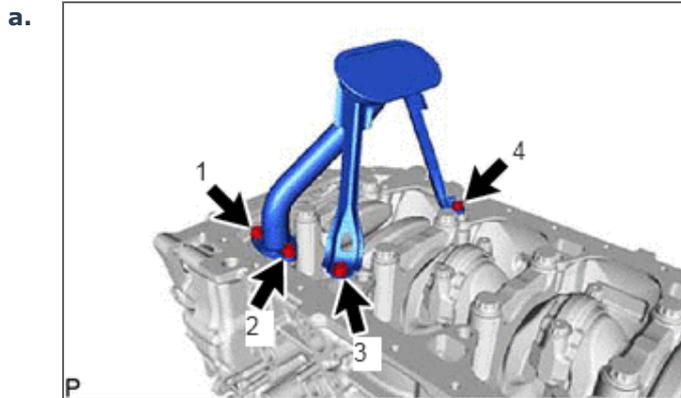
**10 N\*m (102 kgf\*cm, 7 ft.\*lbf)**

<b>34.INSTALL REAR ENGINE OIL SEAL</b>	<b>11381A</b>
--	---------------

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>REAR CRANKSHAFT OIL SEAL>INSTALLATION

**35.INSTALL OIL STRAINER SUB-ASSEMBLY**

**15104**



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.

**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**

**12101**

[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>INSTALLATION

**37.INSTALL ENGINE OIL LEVEL SENSOR**

**89491**

[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>OIL LEVEL SENSOR>INSTALLATION

**38.INSTALL OIL PAN COVER SILENCER**

**12144**

[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>INSTALLATION

**39.INSTALL CRANKSHAFT POSITION SENSOR**

**11401G**

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE CONTROL>CRANKSHAFT POSITION SENSOR>INSTALLATION

**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**

**12581A**

- a. Install the No. 1 cylinder block insulator to the cylinder block sub-assembly.

**42.INSTALL NO. 5 CYLINDER BLOCK INSULATOR**

**12585**

- a. Install the No. 5 cylinder block insulator to the cylinder block sub-assembly.

 <b>43.INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY</b>	<b>11201</b>
--	--------------

Click here [Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>INSTALLATION](#)

 <b>44.INSTALL OIL FILLER CAP GASKET</b>	<b>12108A</b>
---	---------------

- a. Install the oil filler cap gasket to the oil filler cap sub-assembly.

 <b>45.INSTALL OIL FILLER CAP SUB-ASSEMBLY</b>	<b>12108</b>
---	--------------

- a. Install the oil filler cap sub-assembly to the cylinder head cover sub-assembly.

 <b>46.INSTALL NOZZLE HOLDER GASKET</b>	<b>23682</b>
--	--------------

Click here [Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION](#)

 <b>47.TEMPORARILY INSTALL INJECTOR ASSEMBLY</b>	<b>23670</b>
---	--------------

Click here [Engine / Hybrid System>1GD-FTV FUEL>FUEL INJECTOR>INSTALLATION](#)

 <b>48.INSTALL OIL FILTER BRACKET</b>	<b>15677</b>
--	--------------

- 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)**

 <b>49.INSTALL OIL FILTER UNION</b>	<b>15600A</b>
--	---------------

- 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)**

 <b>50.INSTALL OIL FILTER SUB-ASSEMBLY</b>	<b>15601</b>
---	--------------

Click here [Engine / Hybrid System>1GD-FTV LUBRICATION>OIL AND OIL FILTER>REPLACEMENT](#)

 <b>51.INSTALL OIL COOLER ASSEMBLY</b>	<b>15710</b>
---	--------------

Click here [Engine / Hybrid System>1GD-FTV LUBRICATION>ENGINE OIL COOLER>INSTALLATION](#)

 <b>52.INSTALL FRONT NO. 1 ENGINE MOUNTING BRACKET RH</b>	<b>12311</b>
--	--------------

- 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)**

---

 <b>53.INSTALL GENERATOR BRACKET SUB-ASSEMBLY</b>	<b>12501</b>
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- 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)**

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 <b>54.INSTALL NO. 3 CYLINDER BLOCK INSULATOR</b>	<b>12583A</b>
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- a. Install the No. 3 cylinder block insulator to the cylinder block sub-assembly.

---

 <b>55.INSTALL FRONT NO. 1 ENGINE MOUNTING BRACKET LH</b>	<b>12315</b>
--	--------------

---

- 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)**

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 <b>56.INSTALL NO. 2 CYLINDER BLOCK INSULATOR</b>	<b>12582</b>
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- a. Install the No. 2 cylinder block insulator to the front No. 1 engine mounting bracket LH.

---

 <b>57.INSTALL NO. 1 ENGINE HANGER</b>	<b>12281A</b>
---	---------------

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- 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)**

Print

Exit

1GD-FTV ENGINE MECHANICAL ENGINE UNIT REMOVAL

**CAUTION / NOTICE / HINT**

**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.

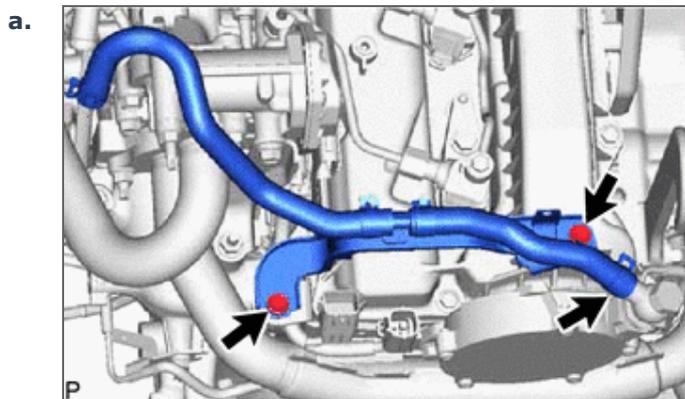
Replaced Parts (A)	Pipes Requiring New Replacement
Injector assembly (including shuffling the injector assemblies between the cylinders)	<ul style="list-style-type: none"> <li>No. 1 injection pipe sub-assembly</li> <li>No. 2 injection pipe sub-assembly</li> </ul>
<ul style="list-style-type: none"> <li>Supply pump assembly</li> <li>Common rail assembly</li> <li>Cylinder block sub-assembly</li> <li>Cylinder head sub-assembly</li> <li>Cylinder head gasket</li> <li>Timing chain case assembly</li> </ul>	<ul style="list-style-type: none"> <li>No. 1 injection pipe sub-assembly</li> <li>No. 2 injection pipe sub-assembly</li> <li>Fuel inlet pipe sub-assembly</li> </ul>

- 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.

**PROCEDURE**

**1.REMOVE NO. 2 HOSE TO HOSE TUBE**

44763C



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

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

 <b>2.REMOVE NO. 2 ENGINE COVER BRACKET</b>	<b>12632</b>
--	--------------

Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL](#)

 <b>3.REMOVE ENGINE WIRE</b>	<b>82121</b>
---	--------------

 <b>4.REMOVE INTERCOOLER AIR TUBE</b>	<b>17363K</b>
--	---------------

Click here [Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>REMOVAL](#)

 <b>5.REMOVE DIESEL THROTTLE BODY ASSEMBLY</b>	<b>26100G</b>
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Click here [Engine / Hybrid System>1GD-FTV ENGINE CONTROL>DIESEL THROTTLE BODY>REMOVAL](#)

 <b>6.REMOVE NO. 2 WATER BY-PASS PIPE</b>	<b>16278</b>
--	--------------

Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL](#)

 <b>7.REMOVE DIFFERENTIAL PRESSURE SENSOR (w/ DPF)</b>	<b>89481B</b>
---	---------------

Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>DIFFERENTIAL PRESSURE SENSOR>REMOVAL](#)

 <b>8.REMOVE EXHAUST GAS TEMPERATURE SENSOR (w/ DPF)</b>	<b>89425</b>
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Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EXHAUST GAS TEMPERATURE SENSOR>REMOVAL](#)

 <b>9.REMOVE NO. 1 VACUUM PIPE (w/ DPF)</b>	<b>25733A</b>
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Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/ DPF\)>REMOVAL](#)

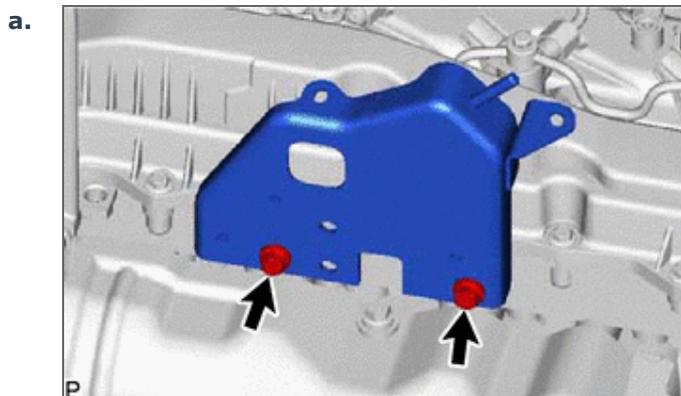
 <b>10.REMOVE NO. 2 VACUUM PIPE (w/ DPF)</b>	<b>25734</b>
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Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/ DPF\)>REMOVAL](#)

 <b>11.REMOVE PIPE CLAMP (w/ DPF)</b>	<b>17578B</b>
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Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/ DPF\)>REMOVAL](#)

 <b>12.REMOVE ENGINE COVER BRACKET</b>	<b>12631A</b>
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Remove the 2 bolts and engine cover bracket from the cylinder head sub-assembly.

 <b>13.REMOVE GAS FILTER</b>	<b>23265C</b>
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Click here [Engine / Hybrid System > 1GD-FTV EMISSION CONTROL > EGR VALVE > REMOVAL](#)

**14.REMOVE DIESEL TURBO PRESSURE SENSOR** **89421C**

Click here [Engine / Hybrid System > 1GD-FTV ENGINE CONTROL > MANIFOLD ABSOLUTE PRESSURE SENSOR > REMOVAL](#)

**15.REMOVE EGR VALVE BRACKET** **25625**

Click here [Engine / Hybrid System > 1GD-FTV EMISSION CONTROL > EGR VALVE > REMOVAL](#)

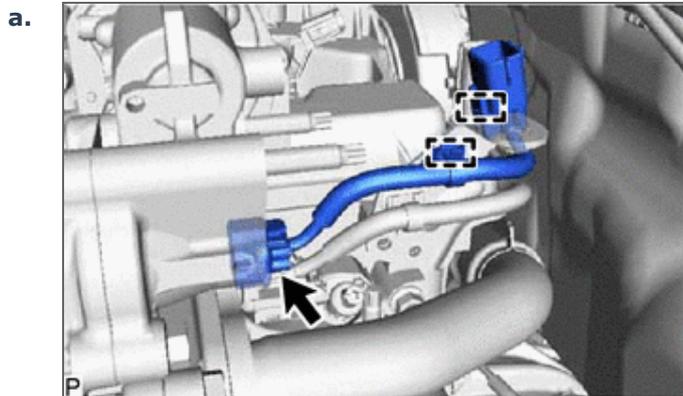
**16.REMOVE NO. 2 EGR PIPE** **25612**

Click here [Engine / Hybrid System > 1GD-FTV EMISSION CONTROL > EGR VALVE > REMOVAL](#)

**17.REMOVE NO. 3 WATER BY-PASS PIPE SUB-ASSEMBLY** **16206B**

Click here [Engine / Hybrid System > 1GD-FTV EMISSION CONTROL > EGR COOLER > REMOVAL](#)

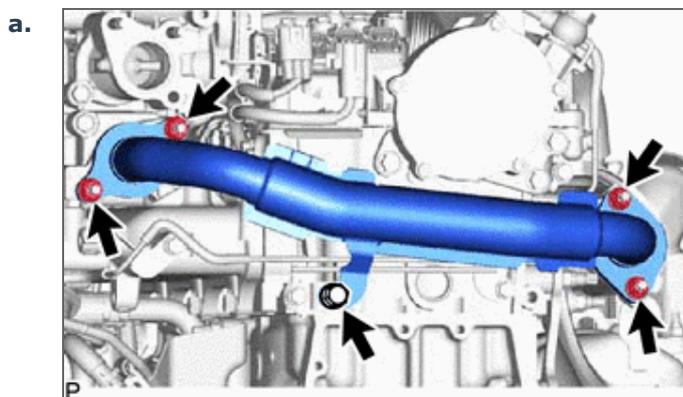
**18.REMOVE CONNECTING WIRE** **27148A**



Disconnect the connector from the common rail assembly.

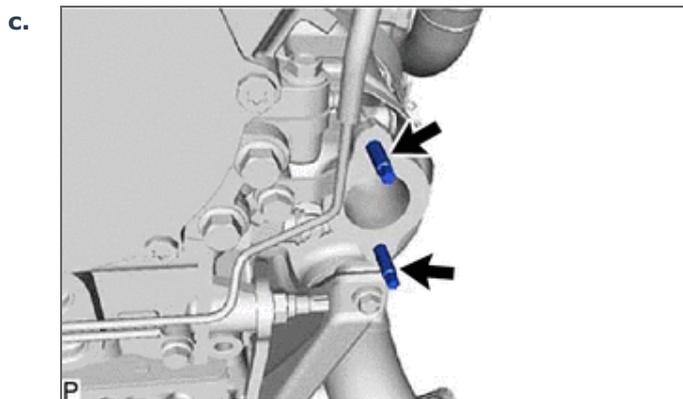
**b.** Detach the 2 clamps and remove the connecting wire from the hose bracket.

**19.REMOVE NO. 1 EGR PIPE SUB-ASSEMBLY** **25601**



Remove the 4 nuts, bolt and No. 1 EGR pipe sub-assembly 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.



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

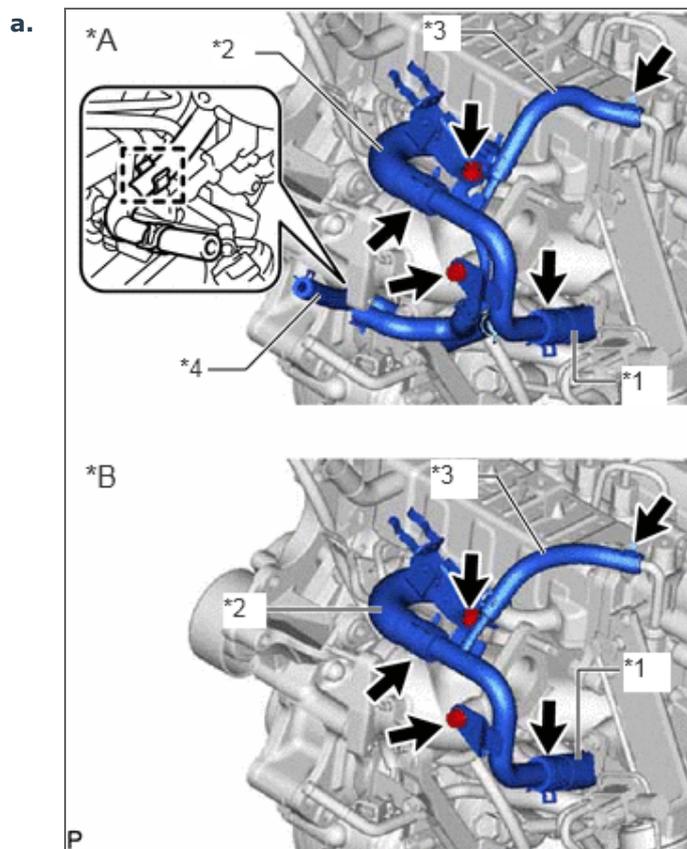
**20.REMOVE VACUUM CONTROL VALVE SET**

**25804**

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR VALVE>REMOVAL

**21.REMOVE NO. 4 WATER BY-PASS PIPE SUB-ASSEMBLY**

**16209**



*A	for Cold Area Specification Vehicles
*B	except Cold Area Specification Vehicles
*1	No. 6 Water By-pass Hose
*2	No. 7 Water By-pass Hose
*3	Water Hose
*4	No. 11 Water By-pass Hose

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. for Cold Area Specification Vehicles:  
Detach the clamp and disconnect the No. 11 water by-pass hose from the No. 2 fuel pipe.
- e. Remove the 2 bolts and No. 4 water by-pass pipe sub-assembly from the intake manifold.

---

**22.REMOVE NO. 1 EGR COOLER AND NO. 2 EGR VALVE ASSEMBLY WITH ELECTRIC 25800 EGR CONTROL VALVE ASSEMBLY**

---

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EGR COOLER>REMOVAL

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**23.REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE 11409**

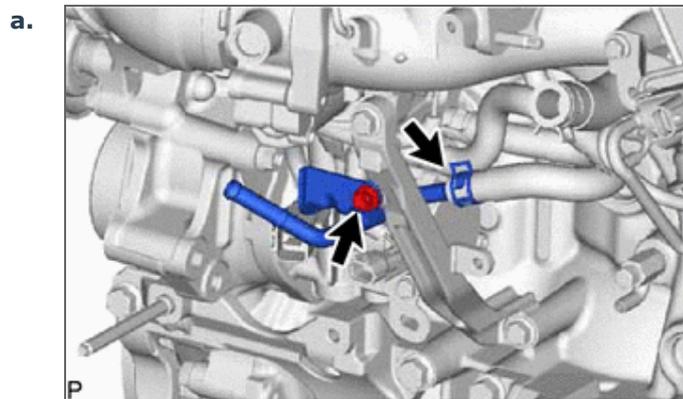
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[Click here](#)Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>INTAKE MANIFOLD>REMOVAL

---

**24.REMOVE NO. 2 FUEL PIPE 23812D**

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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.

---

**25.REMOVE WIRING HARNESS CLAMP BRACKET**

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[Click here](#)Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>INTAKE MANIFOLD>REMOVAL

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**26.REMOVE MANIFOLD STAY 17118**

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[Click here](#)Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>INTAKE MANIFOLD>REMOVAL

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**27.REMOVE FUEL INJECTION PUMP COVER SUB-ASSEMBLY 22803**

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[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL SUPPLY PUMP>REMOVAL

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**28.REMOVE FUEL PUMP MOTOR WIRE 23243B**

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[Click here](#)Engine / Hybrid System>1GD-FTV FUEL>FUEL SUPPLY PUMP>REMOVAL

---

**29.REMOVE NO. 2 FUEL HOSE 23273H**

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Click here [Engine / Hybrid System > 1GD-FTV FUEL > FUEL SUPPLY PUMP > REMOVAL](#)

**30.REMOVE NO. 1 FUEL HOSE** **23271H**

Click here [Engine / Hybrid System > 1GD-FTV FUEL > FUEL SUPPLY PUMP > REMOVAL](#)

**31.REMOVE NO. 4 FUEL PIPE SUB-ASSEMBLY (w/ DPF)** **23804D**

Click here [Engine / Hybrid System > 1GD-FTV INTAKE / EXHAUST > INTAKE MANIFOLD > REMOVAL](#)

**32.REMOVE NO. 3 FUEL PIPE (w/ DPF)** **23815D**

Click here [Engine / Hybrid System > 1GD-FTV INTAKE / EXHAUST > INTAKE MANIFOLD > REMOVAL](#)

**33.REMOVE FUEL INLET PIPE SUB-ASSEMBLY** **23804C**

Click here [Engine / Hybrid System > 1GD-FTV INTAKE / EXHAUST > INTAKE MANIFOLD > REMOVAL](#)

**34.REMOVE NO. 2 NOZZLE LEAKAGE PIPE ASSEMBLY** **23770**

Click here [Engine / Hybrid System > 1GD-FTV INTAKE / EXHAUST > INTAKE MANIFOLD > REMOVAL](#)

**35.REMOVE INTAKE MANIFOLD** **17111**

Click here [Engine / Hybrid System > 1GD-FTV INTAKE / EXHAUST > INTAKE MANIFOLD > REMOVAL](#)

**36.REMOVE WIRING HARNESS CLAMP BRACKET**

Click here [Engine / Hybrid System > 1GD-FTV FUEL > FUEL INJECTOR > REMOVAL](#)

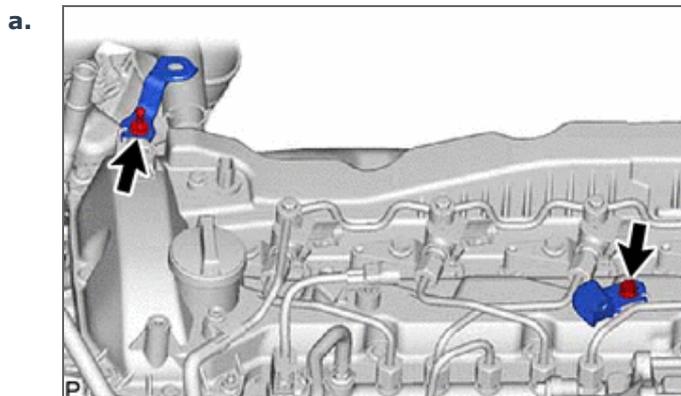
**37.REMOVE NO. 1 FUEL PIPE (w/ DPF)** **23811H**

Click here [Engine / Hybrid System > 1GD-FTV EMISSION CONTROL > EXHAUST FUEL ADDITION INJECTOR > REMOVAL](#)

**38.REMOVE NOZZLE LEAKAGE PIPE ASSEMBLY** **23760**

Click here [Engine / Hybrid System > 1GD-FTV FUEL > FUEL INJECTOR > REMOVAL](#)

**39.REMOVE WIRING HARNESS CLAMP BRACKET**



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

**40.REMOVE NO. 1 AND NO. 2 INJECTION PIPE SUB-ASSEMBLY** **23701**

Click here [Engine / Hybrid System > 1GD-FTV FUEL > FUEL INJECTOR > REMOVAL](#)

**41.REMOVE COMMON RAIL ASSEMBLY** **23810A**

Click here [Engine / Hybrid System > 1GD-FTV FUEL > COMMON RAIL > REMOVAL](#)

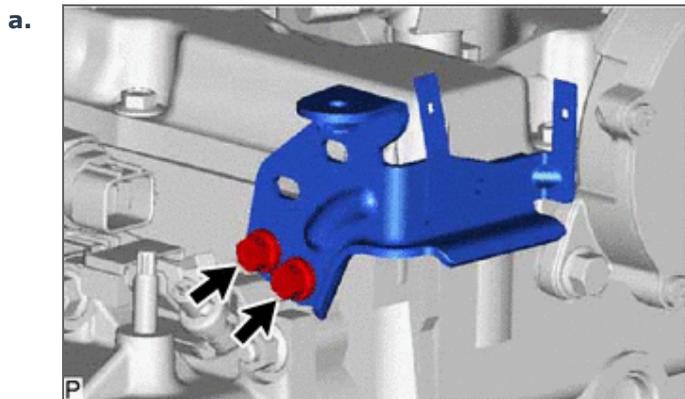
**42.REMOVE NO. 1 GLOW PLUG CONNECTOR** **19871**

Click here [Engine / Hybrid System > 1GD-FTV STARTING > GLOW PLUG > REMOVAL](#)

**43.REMOVE GLOW PLUG ASSEMBLY** **19850**

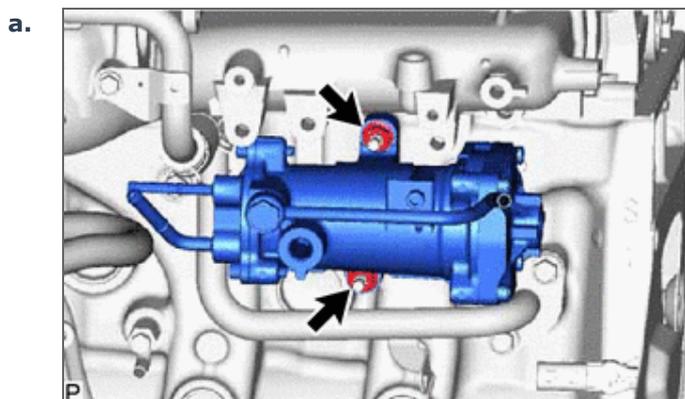
Click here [Engine / Hybrid System > 1GD-FTV STARTING > GLOW PLUG > REMOVAL](#)

**44.REMOVE HOSE BRACKET** **44781**



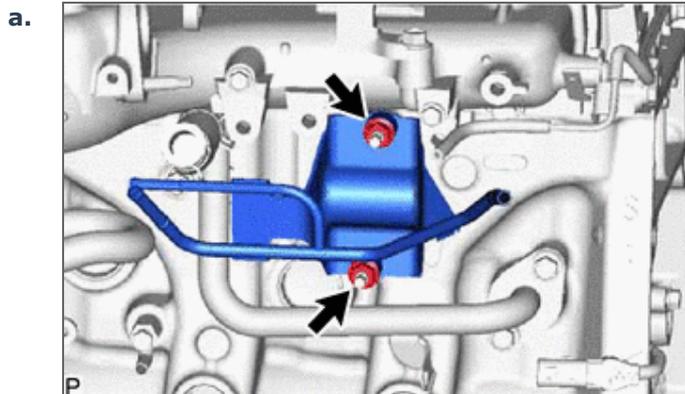
Remove the 2 bolts and hose bracket from the cylinder head sub-assembly.

**45.REMOVE FUEL FILTER ASSEMBLY (w/ DPF)** **23300**



Remove the 2 nuts and fuel filter assembly from the cylinder block sub-assembly.

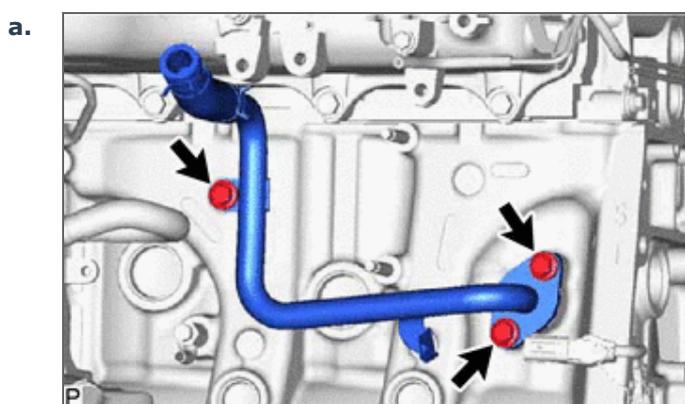
**46.REMOVE NO. 3 NOZZLE LEAKAGE PIPE (w/o DPF)** **23780**



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

**47.REMOVE NO. 5 WATER BY-PASS PIPE SUB-ASSEMBLY**

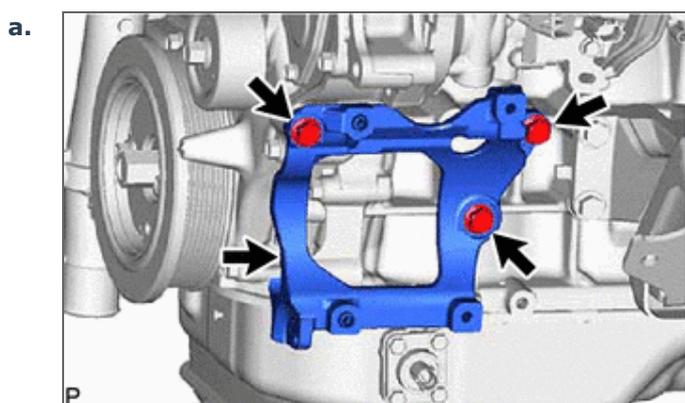
**16025**



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

**48.REMOVE NO. 1 COMPRESSOR MOUNTING BRACKET (w/ Air Conditioning System)**

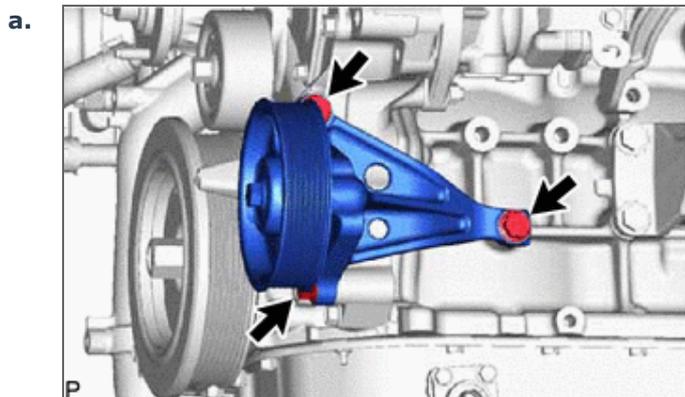
**88431**



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.

**49.REMOVE IDLER PULLEY ASSEMBLY (w/o Air Conditioning System)**

**16630D**



Remove the 3 bolts and idler pulley assembly from the cylinder block sub-assembly, timing chain case assembly and timing chain cover sub-assembly.

---

**50.REMOVE ENGINE COOLANT TEMPERATURE SENSOR** **89422C**

---

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE CONTROL>ENGINE COOLANT TEMPERATURE SENSOR>REMOVAL

---

**51.REMOVE PCV PIPE (for Cold Area Specification Vehicles)** **12229**

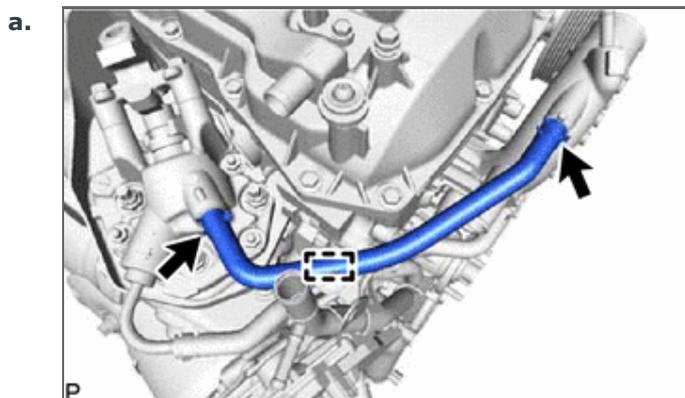
---

[Click here](#)Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>REMOVAL

---

**52.REMOVE NO. 5 WATER BY-PASS HOSE (w/ DPF)** **16282**

---



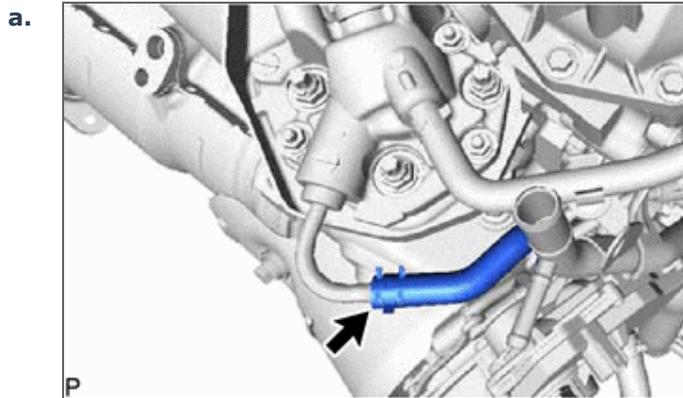
Slide the 2 clamps and disconnect the No. 5 water by-pass hose from the No. 1 injector holder and water outlet sub-assembly.

b. Detach the clamp and remove the No. 5 water by-pass hose from the No. 1 water hose clamp bracket.

---

**53.DISCONNECT NO. 4 WATER BY-PASS HOSE (w/ DPF)** **16281**

---



Slide the clamp and disconnect the No. 4 water by-pass hose from the No. 1 injector holder.

**54.REMOVE NO. 1 INJECTOR HOLDER (w/ DPF)**

**23295D**

Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>EXHAUST FUEL ADDITION INJECTOR>REMOVAL](#)

**55.REMOVE AIR FUEL RATIO SENSOR (w/ DPF)**

**89467B**

Click here [Engine / Hybrid System>1GD-FTV ENGINE CONTROL>AIR FUEL RATIO SENSOR>REMOVAL](#)

**56.REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR**

**17167**

- w/ DPF:  
Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/ DPF\)>REMOVAL](#)
- w/o DPF:  
Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/o DPF\)>REMOVAL](#)

**57.REMOVE NO. 1 TURBO INSULATOR**

**17271**

- w/ DPF:  
Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/ DPF\)>REMOVAL](#)
- w/o DPF:  
Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/o DPF\)>REMOVAL](#)

**58.REMOVE NO. 2 EXHAUST PIPE SUPPORT STAY**

- w/ DPF:  
Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/ DPF\)>REMOVAL](#)
- w/o DPF:  
Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/o DPF\)>REMOVAL](#)

**59.REMOVE EXHAUST PIPE SUPPORT STAY**

- w/ DPF:  
Click here [Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER\(w/ DPF\)>REMOVAL](#)
- w/o DPF:

[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER(w/o DPF)>REMOVAL

**60.REMOVE EXHAUST MANIFOLD CONVERTER SUB-ASSEMBLY** **25051**

- w/ DPF:  
[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER(w/ DPF)>REMOVAL
- w/o DPF:  
[Click here](#)Engine / Hybrid System>1GD-FTV EMISSION CONTROL>MONOLITHIC CONVERTER(w/o DPF)>REMOVAL

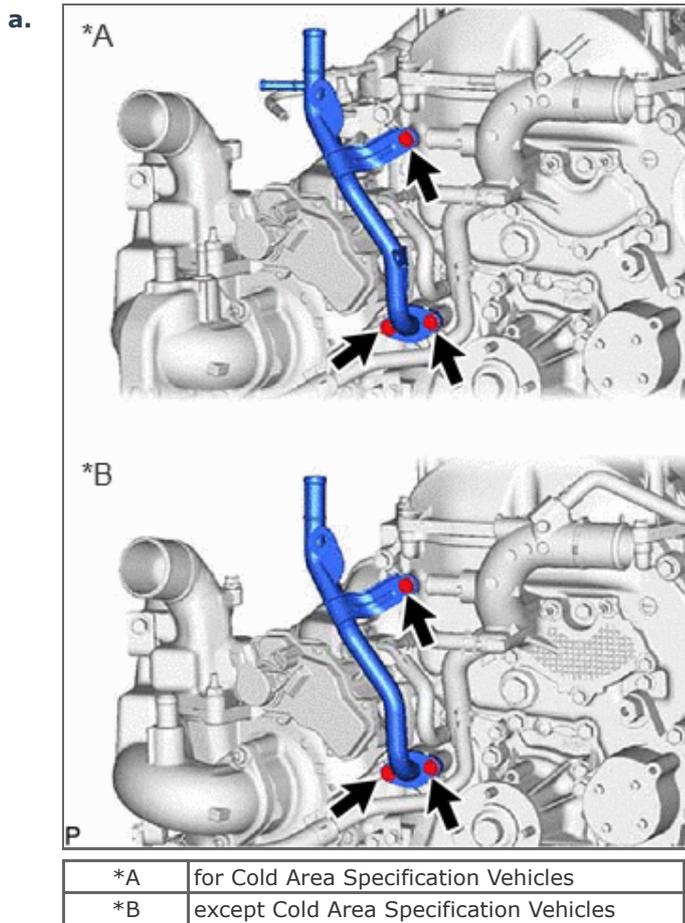
**61.REMOVE PCV HOSE (except Cold Area Specification Vehicles)** **12261**

[Click here](#)Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>REMOVAL

**62.REMOVE NO. 3 WATER BY-PASS PIPE** **16279**

[Click here](#)Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>REMOVAL

**63.REMOVE NO. 1 WATER BY-PASS PIPE** **16268**

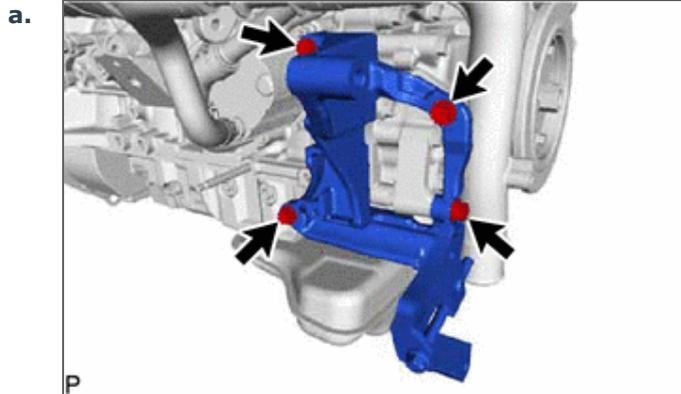


Remove the 3 bolts, No. 1 water by-pass pipe and gasket from the timing chain cover sub-assembly.

**64.DISCONNECT NO. 1 AND NO. 2 TURBO WATER HOSE** **16284**

[Click here](#)Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>REMOVAL

 **65.REMOVE NO. 1 VISCOUS HEATER BRACKET SUB-ASSEMBLY (w/ Viscous Heater)** **87101**



Remove the 4 bolts and No. 1 viscous heater bracket sub-assembly from the cylinder block sub-assembly and timing chain cover sub-assembly.

 **66.REMOVE TURBOCHARGER STAY** **17293**

[Click here](#)Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>REMOVAL

 **67.REMOVE TURBO OIL OUTLET PIPE** **15474**

[Click here](#)Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>REMOVAL

 **68.REMOVE TURBO OIL INLET PIPE SUB-ASSEMBLY** **15407**

[Click here](#)Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>REMOVAL

 **69.REMOVE TURBOCHARGER SUB-ASSEMBLY** **17201**

[Click here](#)Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>REMOVAL

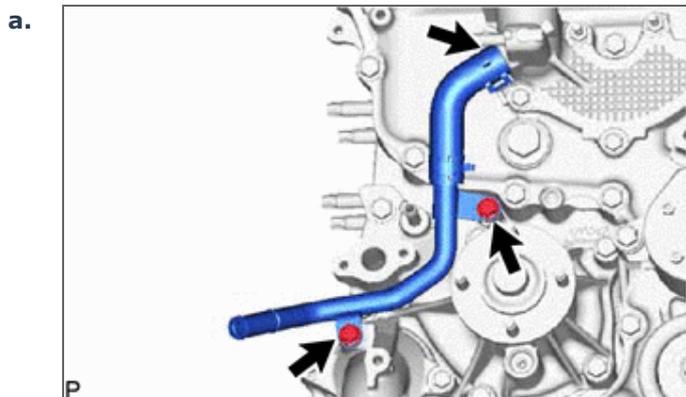
 **70.REMOVE EXHAUST MANIFOLD** **17141**

[Click here](#)Engine / Hybrid System>1GD-FTV INTAKE / EXHAUST>EXHAUST MANIFOLD W/ TURBOCHARGER>REMOVAL

 **71.REMOVE ENGINE OIL PRESSURE SWITCH ASSEMBLY** **83530**

[Click here](#)Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PRESSURE SWITCH>REMOVAL

 **72.REMOVE NO. 2 WATER BY-PASS PIPE SUB-ASSEMBLY** **16207**

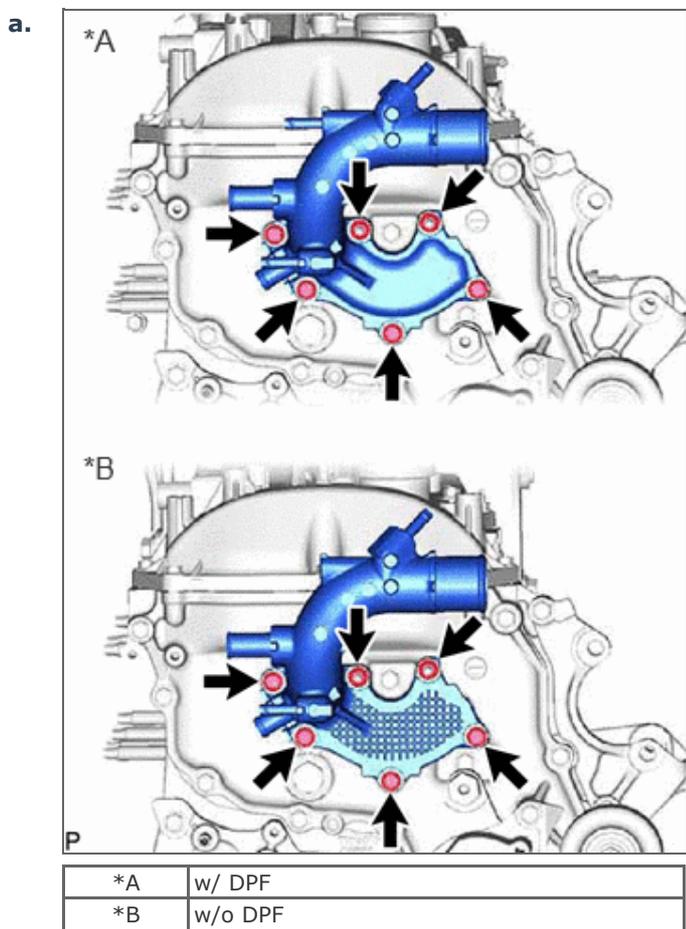


Slide the clamp and disconnect the No. 3 water by-pass hose from the water outlet sub-assembly.

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

**73.REMOVE WATER OUTLET SUB-ASSEMBLY**

**16304**

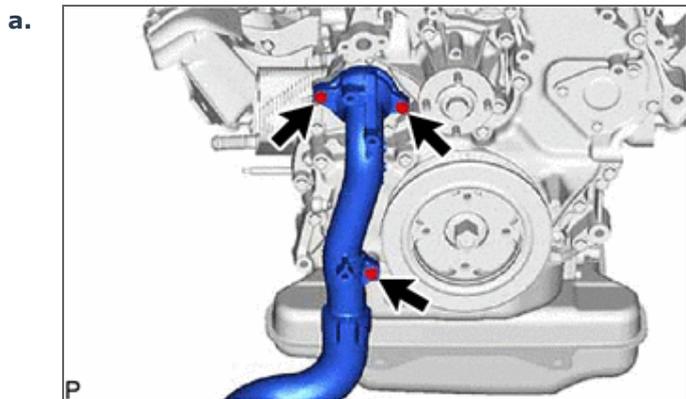


Remove the 4 bolts, 2 nuts and water outlet sub-assembly from the timing chain cover sub-assembly.

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

**74.REMOVE WATER INLET**

**16321**



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

**75.REMOVE THERMOSTAT** **16331A**

Click here [Engine / Hybrid System>1GD-FTV COOLING>THERMOSTAT>REMOVAL](#)

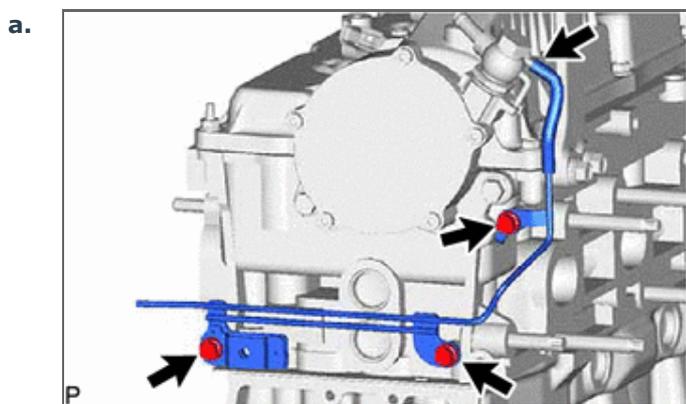
**76.REMOVE NO. 1 IDLER PULLEY SUB-ASSEMBLY** **16603**

Click here [Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>REMOVAL](#)

**77.REMOVE V-RIBBED BELT TENSIONER ASSEMBLY** **16620**

Click here [Engine / Hybrid System>1GD-FTV LUBRICATION>OIL PUMP>REMOVAL](#)

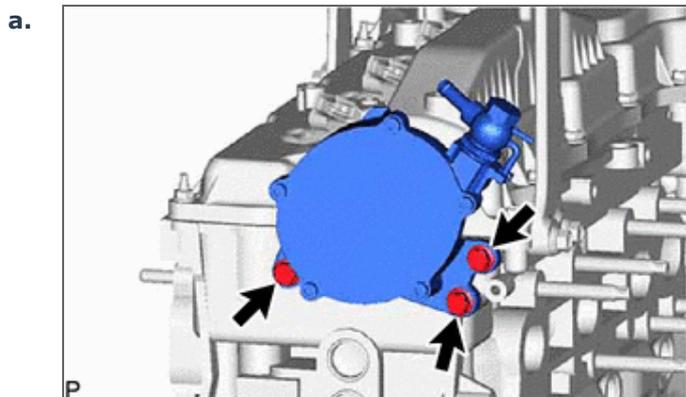
**78.REMOVE NO. 1 VACUUM TRANSMITTING PIPE SUB-ASSEMBLY** **25706**



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.

**79.REMOVE VACUUM PUMP ASSEMBLY** **29300**

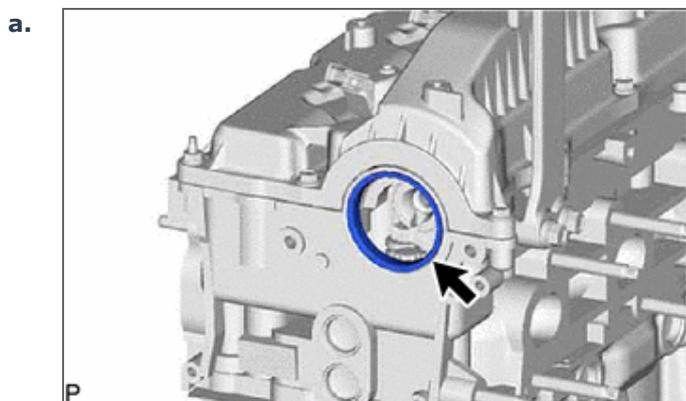


Remove the 3 bolts and vacuum pump assembly from the cylinder head sub-assembly.

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

**80.REMOVE CAMSHAFT OIL SEAL RETAINER**

**11382C**



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

**81.REMOVE VISCOUS HEATER CRANKSHAFT PULLEY (w/ Viscous Heater)**

**88451B**

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>FRONT CRANKSHAFT OIL SEAL>REMOVAL

**82.REMOVE CRANKSHAFT PULLEY COVER**

**13496**

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>FRONT CRANKSHAFT OIL SEAL>REMOVAL

**83.REMOVE CRANKSHAFT PULLEY**

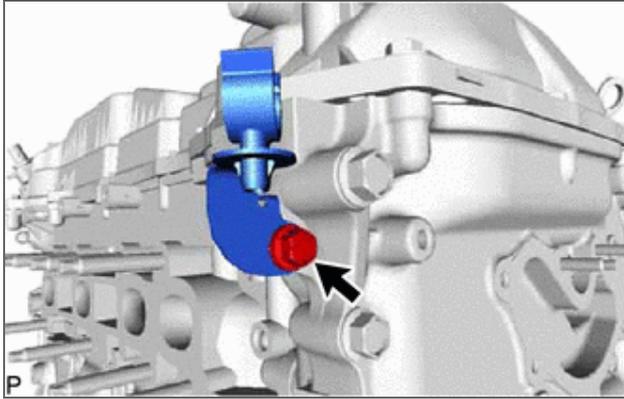
**13471**

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>FRONT CRANKSHAFT OIL SEAL>REMOVAL

**84.REMOVE NO. 1 WATER HOSE CLAMP BRACKET (w/ DPF)**

**16575C**

a.



Remove the bolt and No. 1 water hose clamp bracket from the timing chain case assembly.

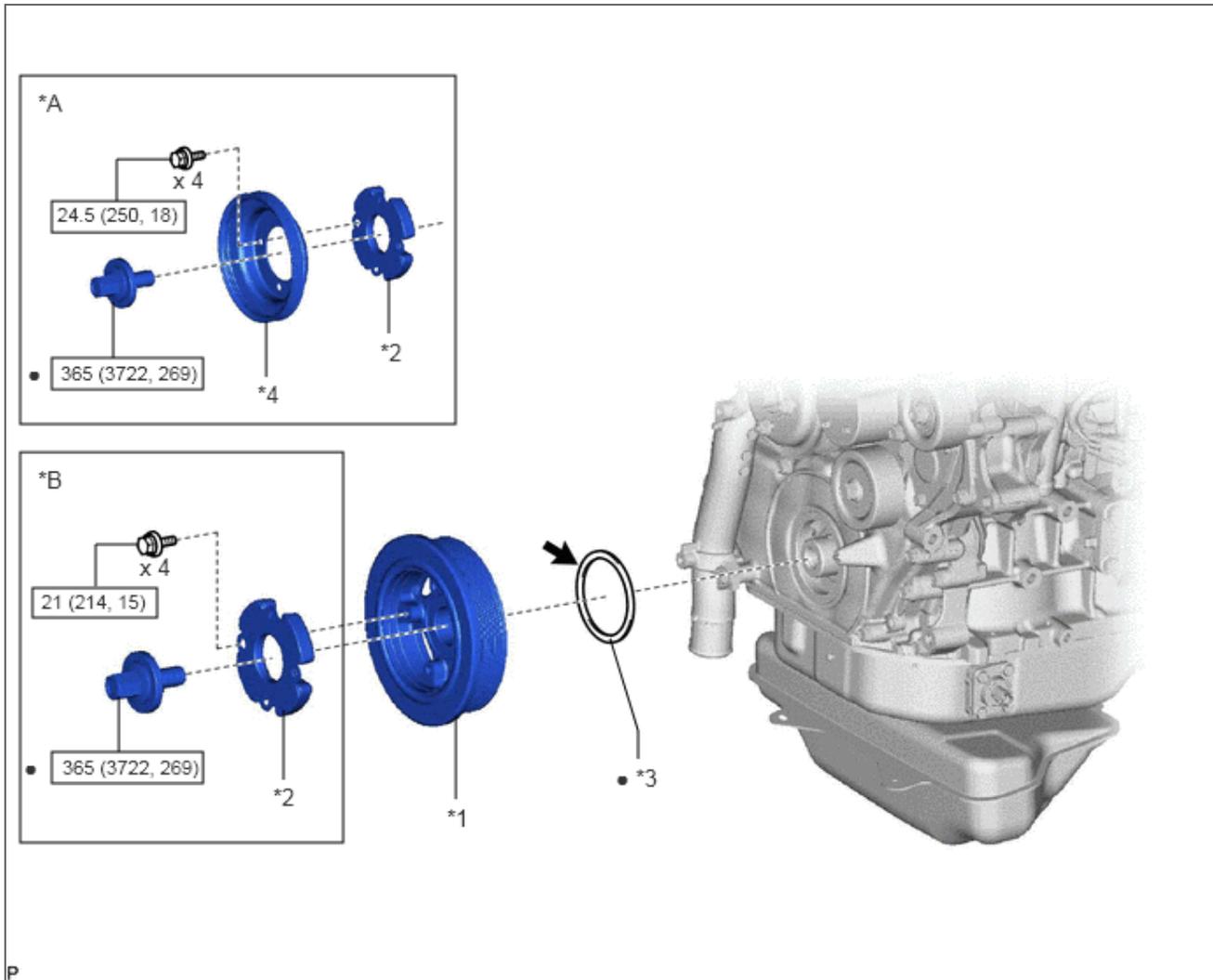
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1GD-FTV ENGINE MECHANICAL FRONT CRANKSHAFT OIL SEAL COMPONENTS

ILLUSTRATION



*A	w/ Viscous Heater	*B	w/o Viscous Heater
*1	CRANKSHAFT PULLEY	*2	CRANKSHAFT PULLEY COVER
*3	FRONT CRANKSHAFT OIL SEAL	*4	VISCOUS HEATER CRANKSHAFT PULLEY
	N*m (kgf*cm, ft.*lbf): Specified torque	•	Non-reusable part
	MP grease	-	-

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## 1GD-FTV ENGINE MECHANICAL FRONT CRANKSHAFT OIL SEAL INSTALLATION

## PROCEDURE

## 1.INSTALL FRONT CRANKSHAFT OIL SEAL

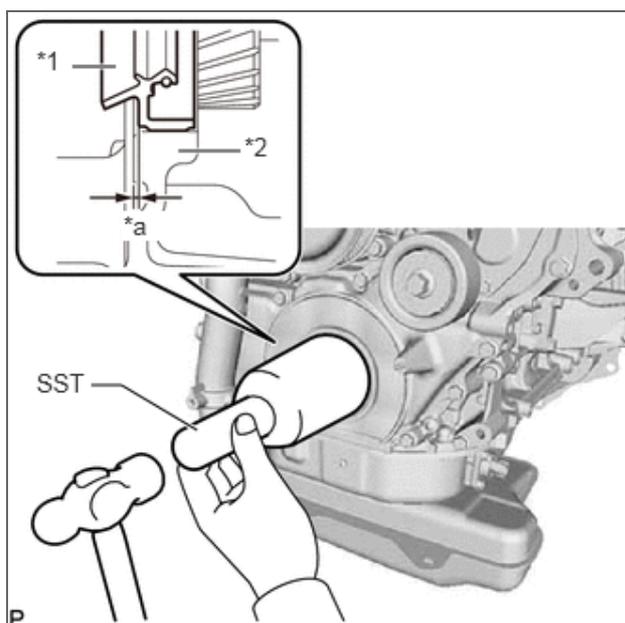
11303A

- 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.



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

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

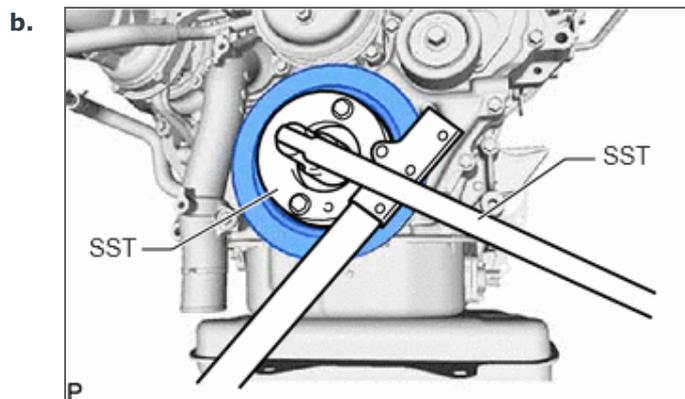
**SST****09214-76011****NOTICE:**

- 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.

## 2.INSTALL CRANKSHAFT PULLEY

13471

- 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.



Using SST, install a new pulley bolt.

**SST**

**09213-58014 (91551-80840)**  
**09330-00021**

**Torque:**

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

### **3.INSTALL CRANKSHAFT PULLEY COVER**

**13496**

a. w/o Viscous Heater:

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

**Torque:**

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

b. w/ Viscous Heater:

Install the crankshaft pulley cover to the crankshaft pulley.

### **4.INSTALL VISCOUS HEATER CRANKSHAFT PULLEY (w/ Viscous Heater)**

**88451B**

a. Install the viscous heater crankshaft pulley to the crankshaft pulley with the 4 bolts.

**Torque:**

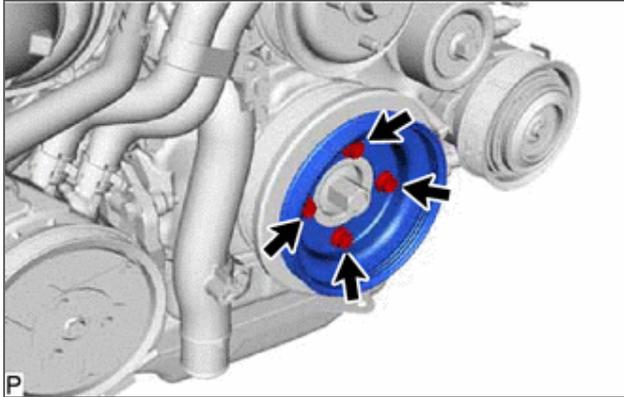
**24.5 N\*m (250 kgf\*cm, 18 ft.\*lbf)**

### **5.INSTALL RADIATOR ASSEMBLY**

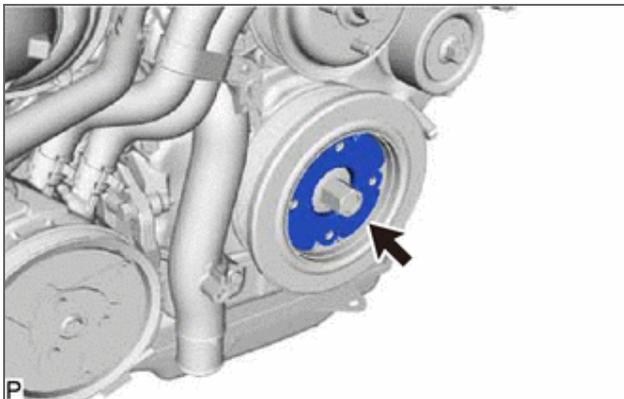
**16400**

[Click here](#)Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>INSTALLATION

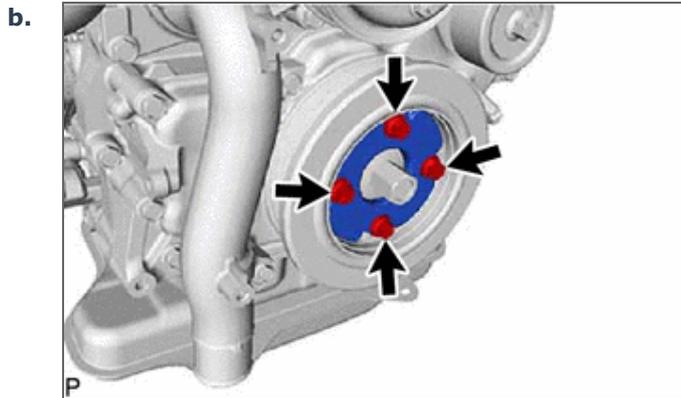
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[Print](#)[Exit](#)**1GD-FTV ENGINE MECHANICAL FRONT CRANKSHAFT OIL SEAL REMOVAL****PROCEDURE****1.REMOVE RADIATOR ASSEMBLY****16400**[Click here](#)Engine / Hybrid System>1GD-FTV COOLING>RADIATOR>REMOVAL**2.REMOVE VISCOUS HEATER CRANKSHAFT PULLEY (w/ Viscous Heater)****88451B****a.**

Remove the 4 bolts and viscous heater crankshaft pulley from the crankshaft pulley.

**3.REMOVE CRANKSHAFT PULLEY COVER****13496****a.**

w/ Viscous Heater:  
Remove the crankshaft pulley cover from the crankshaft pulley.

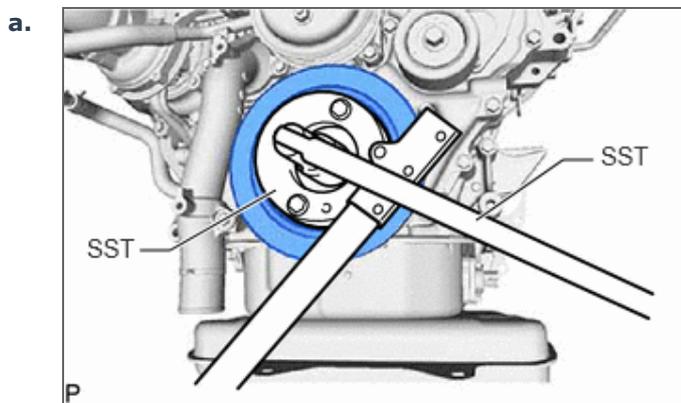


w/o Viscous Heater:

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

#### 4.REMOVE CRANKSHAFT PULLEY

13471



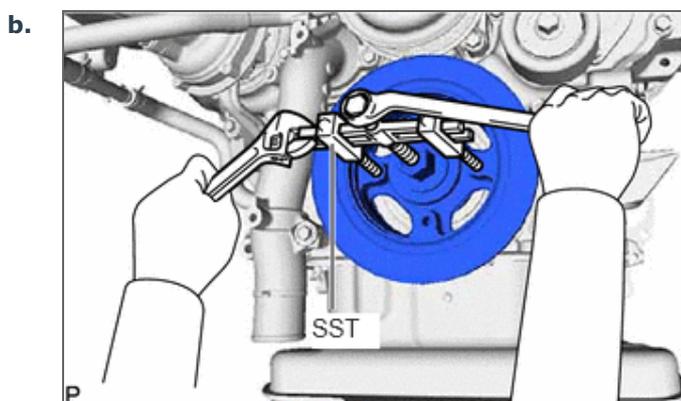
Using SST, hold the crankshaft pulley and loosen the pulley bolt.

**SST**

**09213-58014 (91551-80840)**  
**09330-00021**

**HINT:**

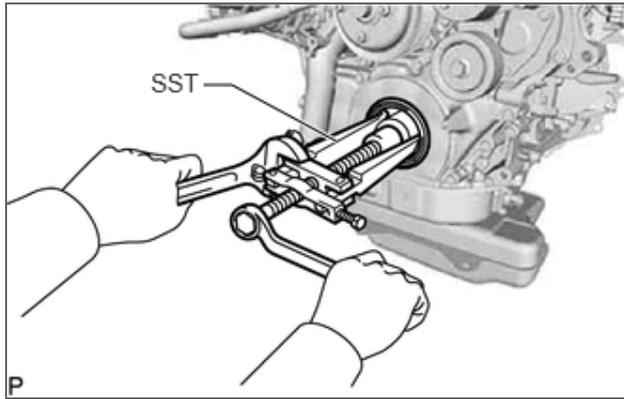
Make sure to leave the pulley bolt screwed into the crankshaft by 2 or 3 threads.



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

**SST**

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

**5.REMOVE FRONT CRANKSHAFT OIL SEAL****11303A****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.

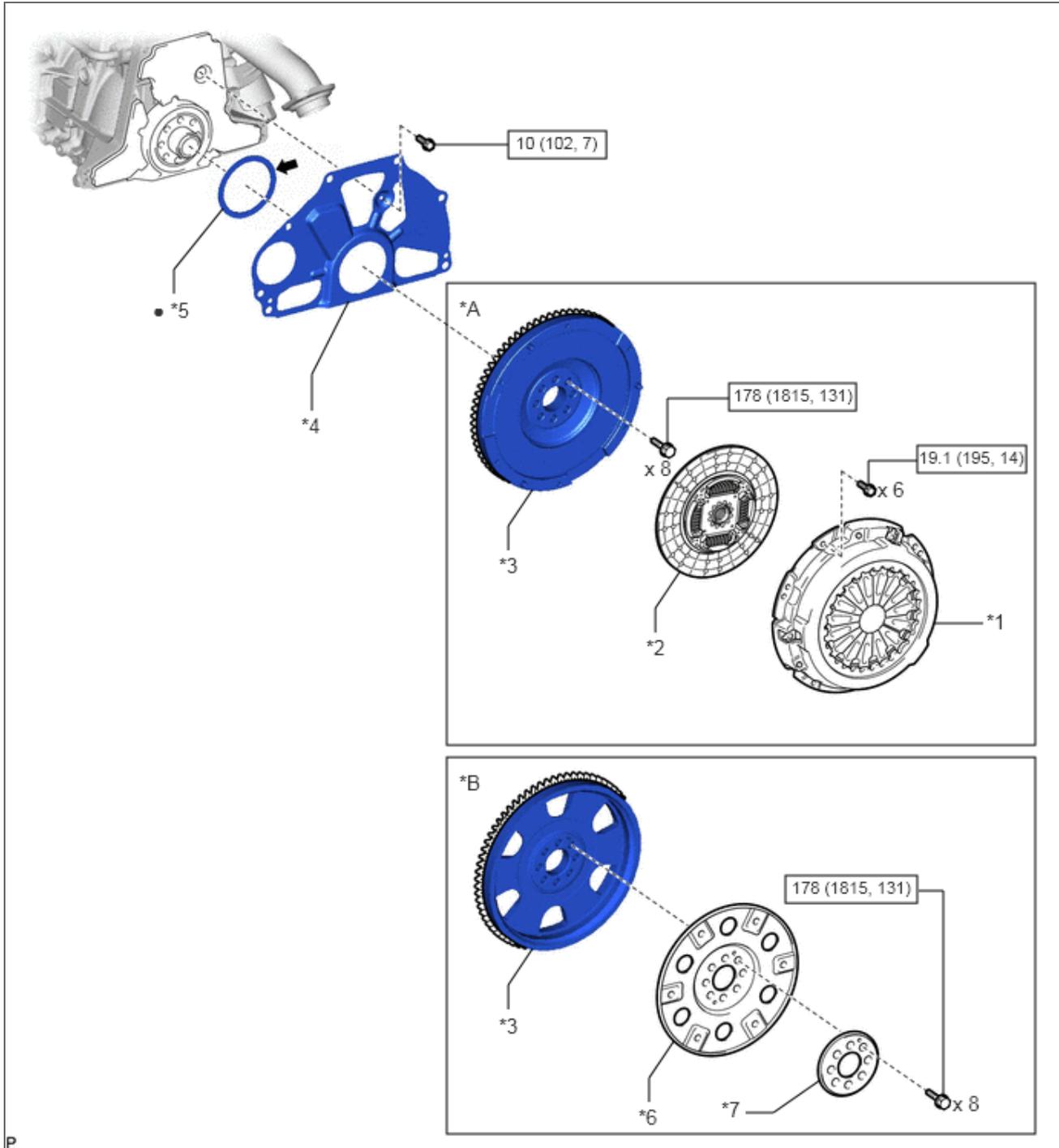
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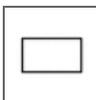
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1GD-FTV ENGINE MECHANICAL REAR CRANKSHAFT OIL SEAL COMPONENTS

ILLUSTRATION



*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	-	-
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1GD-FTV ENGINE MECHANICAL REAR CRANKSHAFT OIL SEAL INSTALLATION

**PROCEDURE**

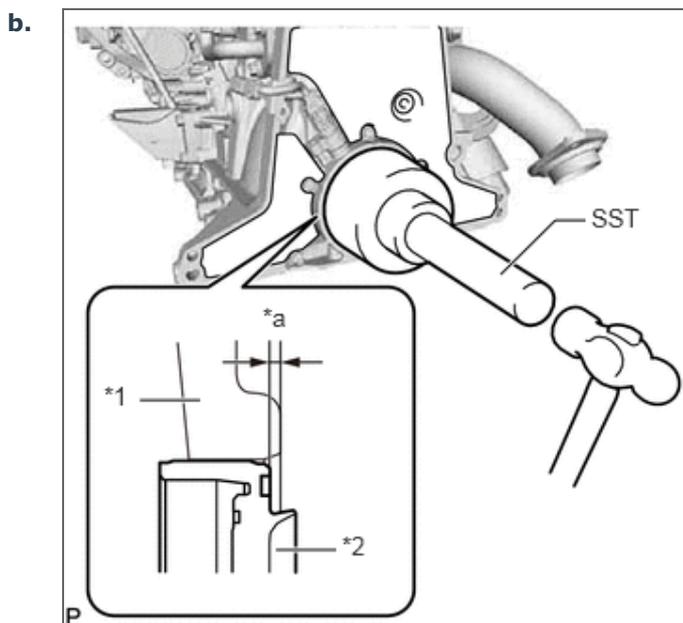
**1.INSTALL REAR ENGINE OIL SEAL**

**11381A**

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.



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

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.

**2.INSTALL REAR END PLATE**

**11355**

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>ENGINE ASSEMBLY>INSTALLATION

**3.INSTALL FLYWHEEL SUB-ASSEMBLY**

**13405**

[Click here](#)Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>ENGINE ASSEMBLY>INSTALLATION

---

**4.INSTALL CLUTCH DISC ASSEMBLY (for Manual Transmission) 31250**

---

- for R151:  
Click here[Drivetrain>CLUTCH>CLUTCH UNIT\(for R151\)>INSTALLATION](#)
- for RC61:  
Click here[Drivetrain>CLUTCH>CLUTCH UNIT\(for RC60, RC61\)>INSTALLATION](#)

---

**5.INSTALL CLUTCH COVER ASSEMBLY (for Manual Transmission) 31210**

---

- for R151:  
Click here[Drivetrain>CLUTCH>CLUTCH UNIT\(for R151\)>INSTALLATION](#)
- for RC61:  
Click here[Drivetrain>CLUTCH>CLUTCH UNIT\(for RC60, RC61\)>INSTALLATION](#)

---

**6.INSPECT AND ADJUST CLUTCH COVER ASSEMBLY (for Manual Transmission) 31210**

---

- for R151:  
Click here[Drivetrain>CLUTCH>CLUTCH UNIT\(for R151\)>INSTALLATION](#)
- for RC61:  
Click here[Drivetrain>CLUTCH>CLUTCH UNIT\(for RC60, RC61\)>INSTALLATION](#)

---

**7.INSTALL AUTOMATIC TRANSMISSION ASSEMBLY (for Automatic Transmission) 35000**

---

- for AC60E:  
Click here[Drivetrain>AC60E AUTOMATIC TRANSMISSION / TRANSAXLE>AUTOMATIC TRANSMISSION ASSEMBLY\(for 1GD-FTV, 2GD-FTV\)>INSTALLATION](#)
- for AC60F:  
Click here[Drivetrain>AC60F AUTOMATIC TRANSMISSION / TRANSAXLE>AUTOMATIC TRANSMISSION ASSEMBLY\(for 1GD-FTV, 2GD-FTV\)>INSTALLATION](#)

---

**8.INSTALL MANUAL TRANSMISSION UNIT ASSEMBLY (for Manual Transmission) 33030**

---

- for R151:  
Click here[Drivetrain>R151 MANUAL TRANSMISSION / TRANSAXLE>MANUAL TRANSMISSION ASSEMBLY>INSTALLATION](#)
- for RC61:  
Click here[Drivetrain>RC60 / RC61 MANUAL TRANSMISSION / TRANSAXLE>MANUAL TRANSMISSION ASSEMBLY>INSTALLATION](#)
- for RC61F:  
Click here[Drivetrain>RC60F / RC61F MANUAL TRANSMISSION / TRANSAXLE>MANUAL TRANSMISSION ASSEMBLY>INSTALLATION](#)

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## 1GD-FTV ENGINE MECHANICAL REAR CRANKSHAFT OIL SEAL REMOVAL

**CAUTION / NOTICE / HINT**

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
Replacement of ECM	<ul style="list-style-type: none"> <li>Learning values save</li> <li>Learning values write</li> </ul>	Engine starting	w/o DPF (  ) w/ DPF (  )
	<b>for RC61:</b> Performing iMT installation information reset	<ul style="list-style-type: none"> <li>iMT system</li> <li>DTCs are output</li> </ul>	(  )
	Code registration (Immobiliser system)	Engine start function	See the Service Bulletin for the registration method.
Replacement of engine assembly	<ul style="list-style-type: none"> <li>Injector compensation code registration</li> <li>Pilot quantity learning</li> </ul>	Engine starting	w/o DPF (  ) w/ DPF (  )
	Clear Crank Time Compensation Data	Engine starting	w/o DPF (  ) w/ DPF (  )
<b>for AC60E:</b> Replacement of automatic transmission assembly	Reset memory	<ul style="list-style-type: none"> <li>Large shift shock</li> <li>Engine overruns</li> </ul>	(  )
<b>for AC60E:</b> 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	
<b>for AC60F:</b> Replacement of automatic transmission assembly	Reset memory	<ul style="list-style-type: none"> <li>Large shift shock</li> <li>Engine overruns</li> </ul>	(  )
<b>for AC60F:</b> 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	
<b>w/ Automatic Headlight Beam Level Control</b>			

<b>System:</b> 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	(  )
<b>for 4WD:</b> Front wheel alignment adjustment	<ul style="list-style-type: none"> <li>· Clearing zero point calibration data</li> <li>· Yaw rate and acceleration sensor zero point calibration</li> </ul>	VSC malfunctioning	(  )

## PROCEDURE

### 1.REMOVE MANUAL TRANSMISSION UNIT ASSEMBLY (for Manual Transmission) 33030

- for R151:  
Click here [Drivetrain>R151 MANUAL TRANSMISSION / TRANSAXLE>MANUAL TRANSMISSION ASSEMBLY>REMOVAL](#)
- for RC61:  
Click here [Drivetrain>RC60 / RC61 MANUAL TRANSMISSION / TRANSAXLE>MANUAL TRANSMISSION ASSEMBLY>REMOVAL](#)
- for RC61F:  
Click here [Drivetrain>RC60F / RC61F MANUAL TRANSMISSION / TRANSAXLE>MANUAL TRANSMISSION ASSEMBLY>REMOVAL](#)

### 2.REMOVE AUTOMATIC TRANSMISSION ASSEMBLY (for Automatic Transmission) 35000

- for AC60E:  
Click here [Drivetrain>AC60E AUTOMATIC TRANSMISSION / TRANSAXLE>AUTOMATIC TRANSMISSION ASSEMBLY\(for 1GD-FTV, 2GD-FTV\)>REMOVAL](#)
- for AC60F:  
Click here [Drivetrain>AC60F AUTOMATIC TRANSMISSION / TRANSAXLE>AUTOMATIC TRANSMISSION ASSEMBLY\(for 1GD-FTV, 2GD-FTV\)>REMOVAL](#)

### 3.REMOVE CLUTCH COVER ASSEMBLY (for Manual Transmission) 31210

- for R151:  
Click here [Drivetrain>CLUTCH>CLUTCH UNIT\(for R151\)>REMOVAL](#)
- for RC61:  
Click here [Drivetrain>CLUTCH>CLUTCH UNIT\(for RC60, RC61\)>REMOVAL](#)

### 4.REMOVE CLUTCH DISC ASSEMBLY (for Manual Transmission) 31250

- for R151:  
Click here [Drivetrain>CLUTCH>CLUTCH UNIT\(for R151\)>REMOVAL](#)
- for RC61:  
Click here [Drivetrain>CLUTCH>CLUTCH UNIT\(for RC60, RC61\)>REMOVAL](#)

### 5.REMOVE FLYWHEEL SUB-ASSEMBLY 13405

Click here [Engine / Hybrid System>1GD-FTV ENGINE MECHANICAL>ENGINE ASSEMBLY>REMOVAL](#)

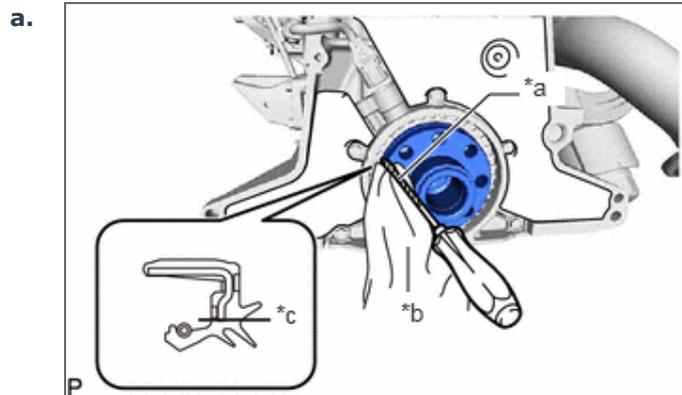
## 6. REMOVE REAR END PLATE

11355

Click here [Engine / Hybrid System > 1GD-FTV ENGINE MECHANICAL > ENGINE ASSEMBLY > REMOVAL](#)

## 7. REMOVE REAR ENGINE OIL SEAL

11381A



*a	Protective Tape
*b	Cloth
*c	Cut

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.

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