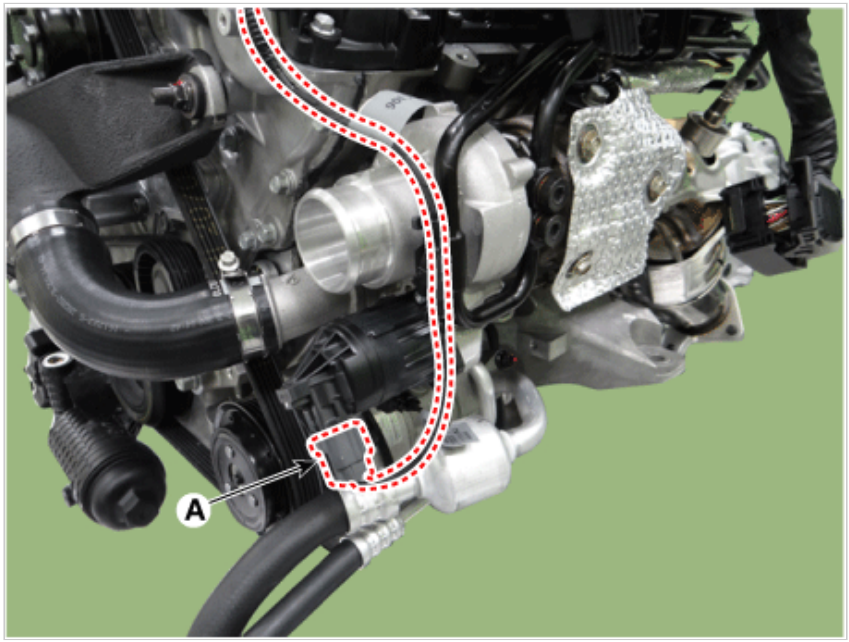
Removal and Installation

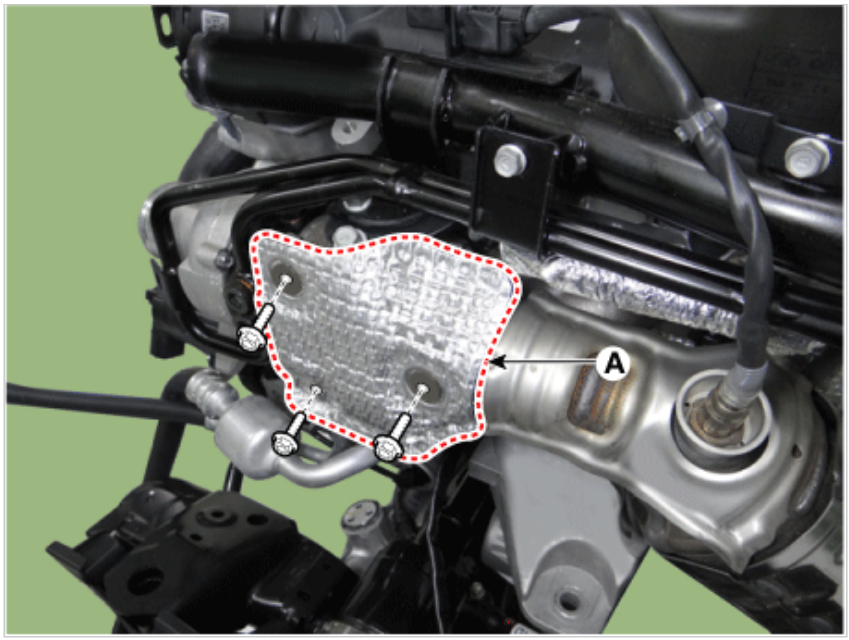
LH Turbo Manifold Module

1. Remove the engine and transmission assembly.
   (Refer to Engine and Transmission Assembly - "Engine and Transmission Assembly")
2. Disconnect the LH electric waste gate actuator (EWGA) connector (A).

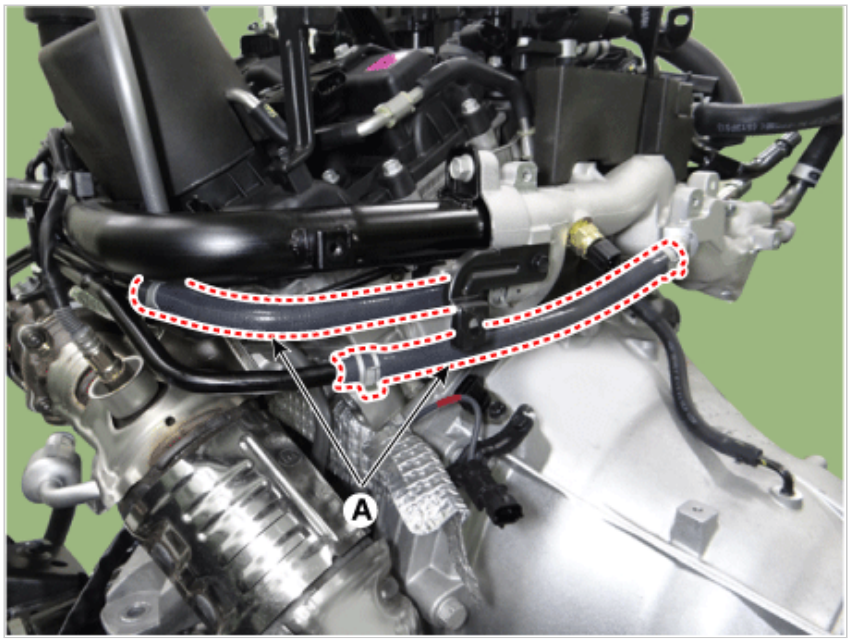


3. Remove the LH turbo manifold module heat protector (A).

Tightening torque :
9.8 - 11.8 N·m (1.0 - 1.2 kgf·m, 7.2 - 8.7 lb·ft)



4. Disconnect the LH turbocharger water hose (A).



5. Remove the LH turbocharger water hose & pipe (A)

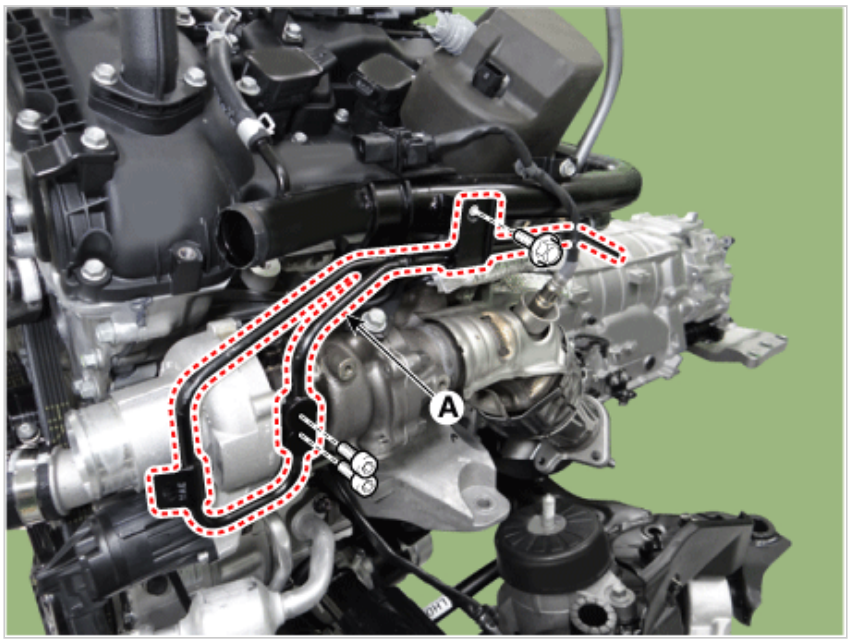
Tightening torque

Eye bolts :

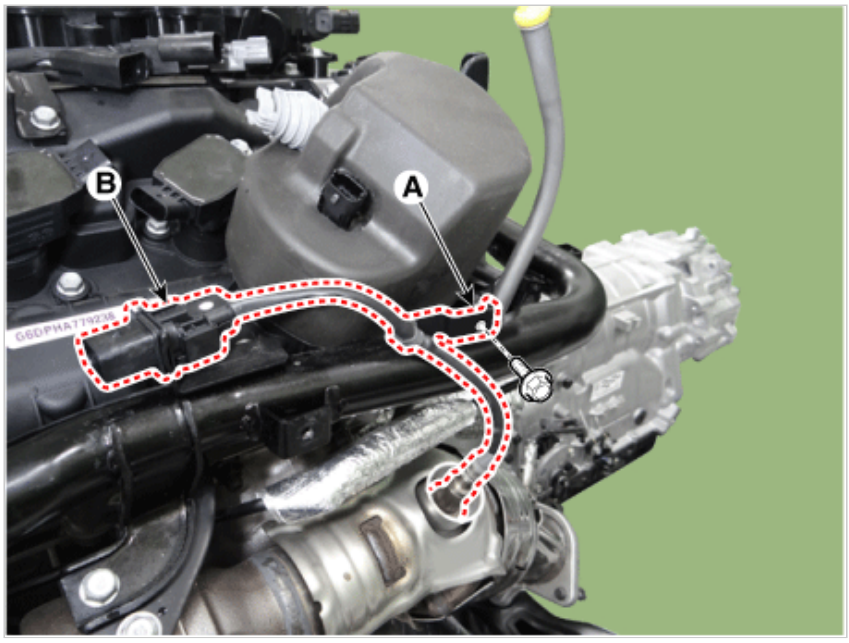
33.3 - 39.2 N·m (3.4 - 4.0 kgf·m, 26.6 - 28.9 lb·ft)

Bolt :

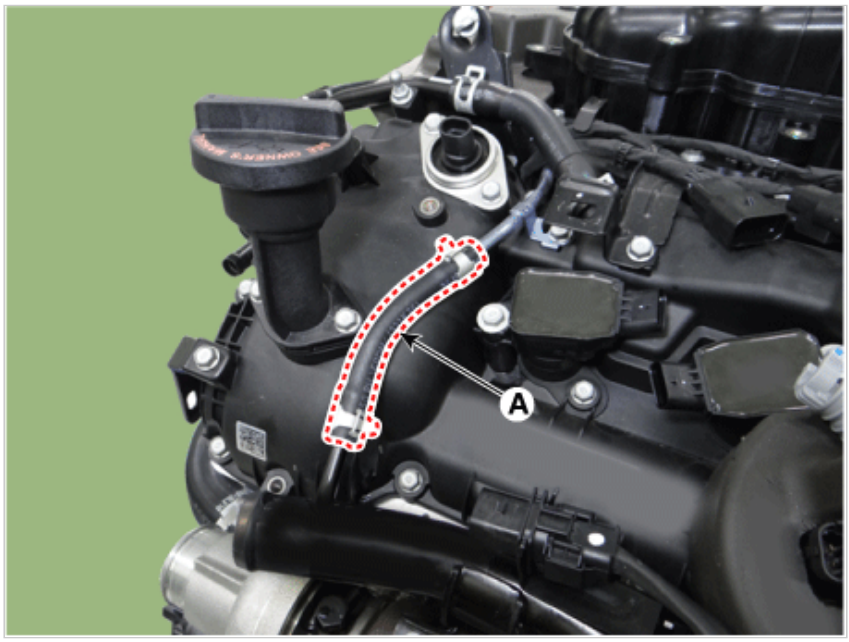
9.8 - 11.8 N·m (1.0 - 1.2 kgf·m, 7.2 - 8.7 lb·ft)



6. Remove the heated oxygean sensor (HO2S) wiring bracket (A) and then remove the heated oxygean sensor (HO2S) connector (B).

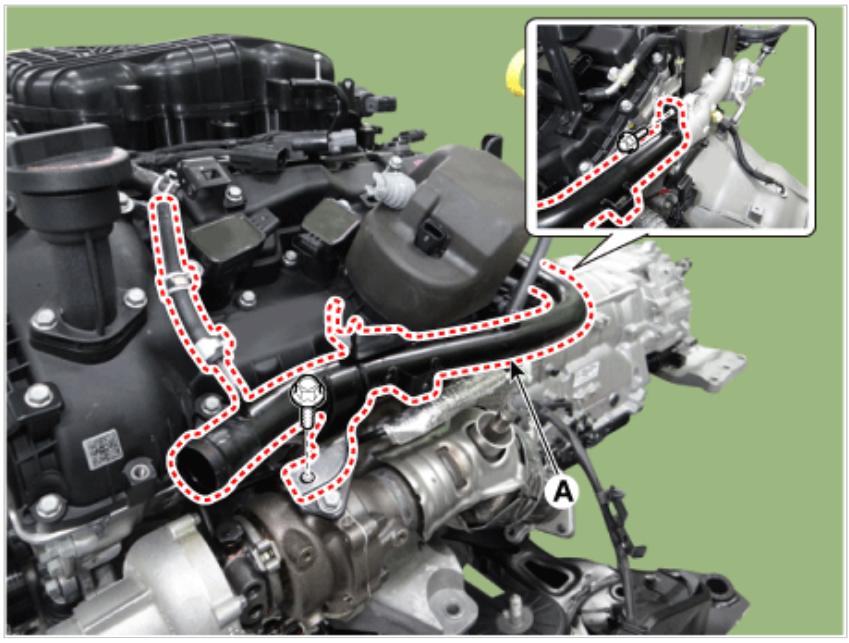


7. Disconnect the water hose (A).



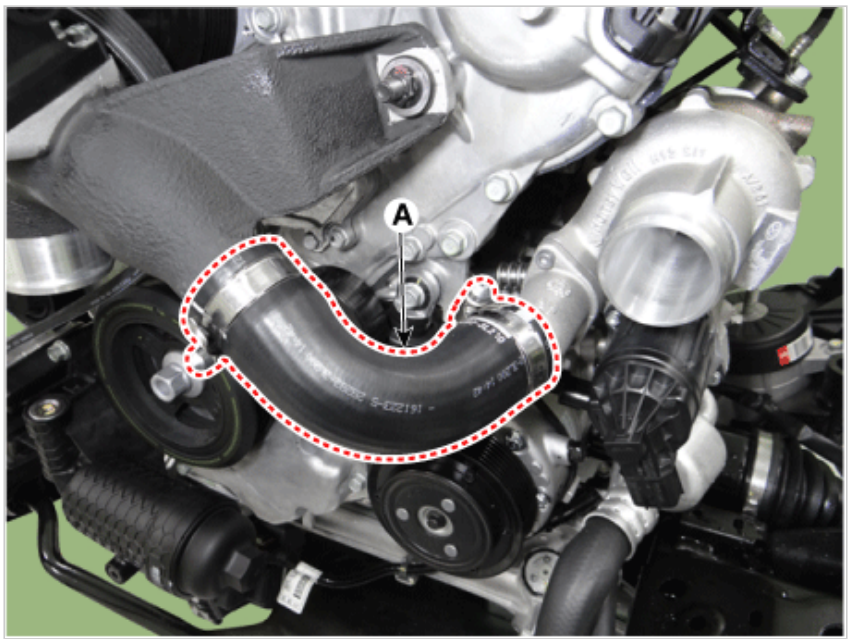
8. Remove the water outlet pipe (A).

Tightening torque :
24.5 - 28.4 N·m (2.5 - 2.9 kgf·m, 18.1 - 21.0 lb·ft)



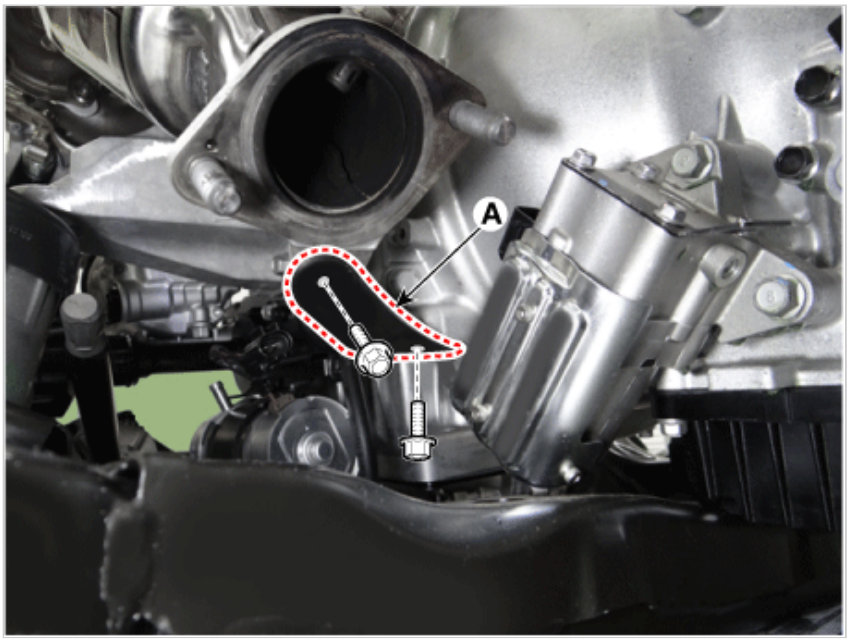
9. Disconnect the LH intercooler inlet hose (A).

Tightening torque :
4.9 - 6.9 N·m (0.5 - 0.7 kgf·m, 3.6 - 5.1 lb·ft. 43.4 - 60.8 lb·in)
(If equipped with a cap, tighten it until the cap is removed.)



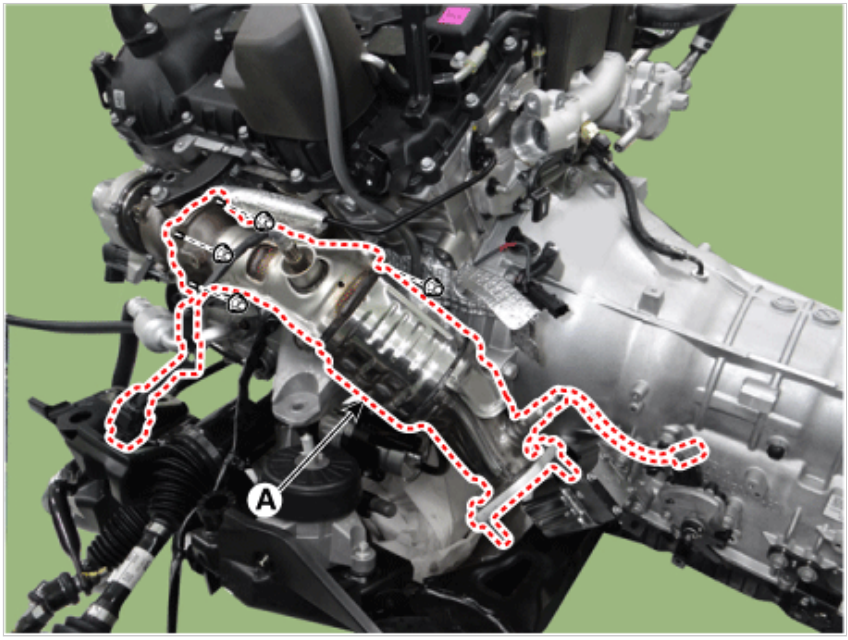
10. Remove the LH warm-up catalytic converter (WCC) stay (A).

Tightening torque :
34.3 - 41.2 N·m (3.5 - 4.2 kgf·m, 25.3 - 30.4 lb·ft)

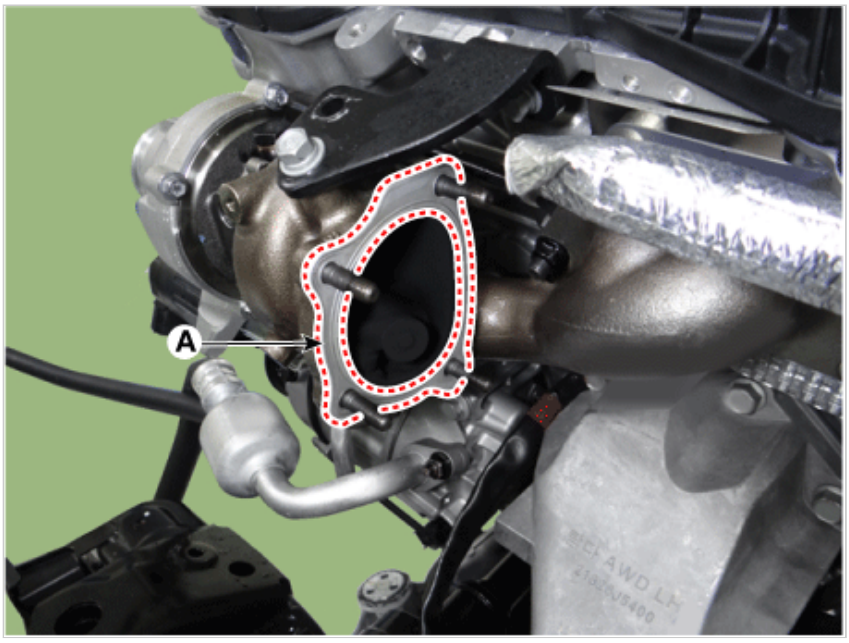


11. Remove the LH warm-up catalytic converter (WCC) (A).

Tightening torque :
35.3 - 41.2 N·m (3.6 - 4.2 kgf·m, 26.0 - 30.4 lb·ft)



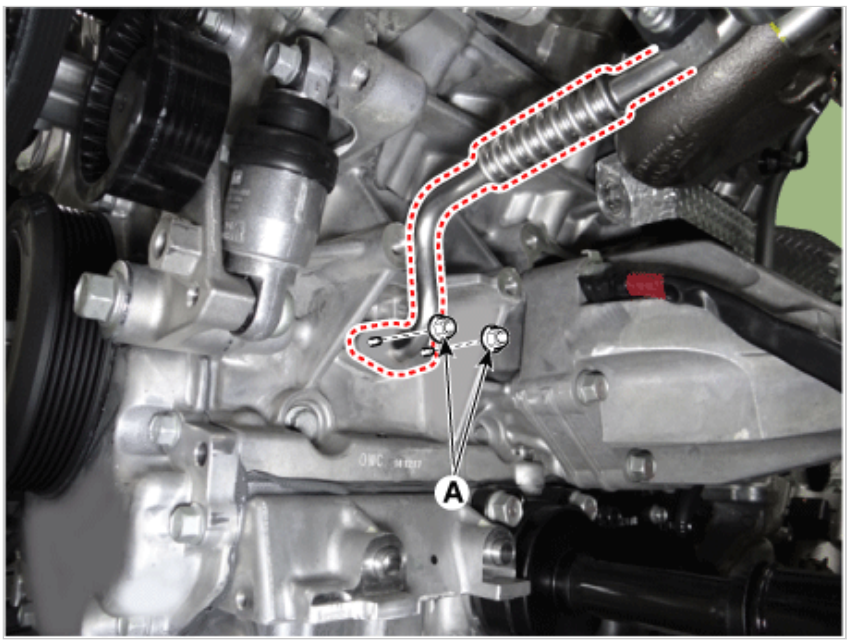
12. Remove the LH warm-up catalytic converter (WCC) gasket (A).



13. Remove the A/C comperssor.
(Refer to Heating, Ventilation, Air Conditioning - "Compressor")

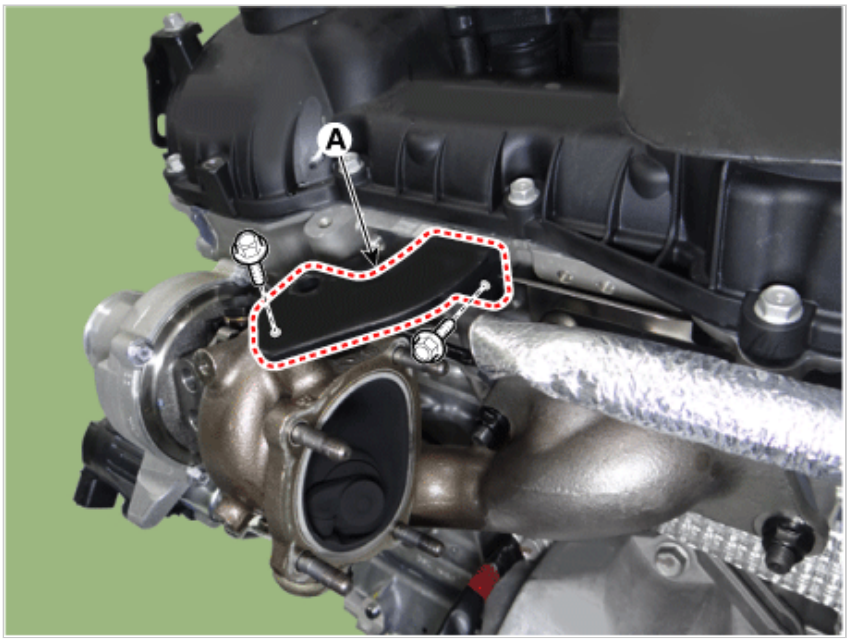
14. Remove the LH turbocharger oil drain pipe mounting nuts (A).

Tightening torque :
9.8 - 11.8 N·m (1.0 - 1.2 kgf·m, 7.2 - 8.7 lb·ft)



15. Remove the LH turbo manifold module stay (A).

Tightening torque :
26.5 - 31.4 N·m (2.7 - 3.2 kgf·m, 19.5 - 23.1 lb·ft)



16. Remove the LH turbocharger oil feed pipe (A).

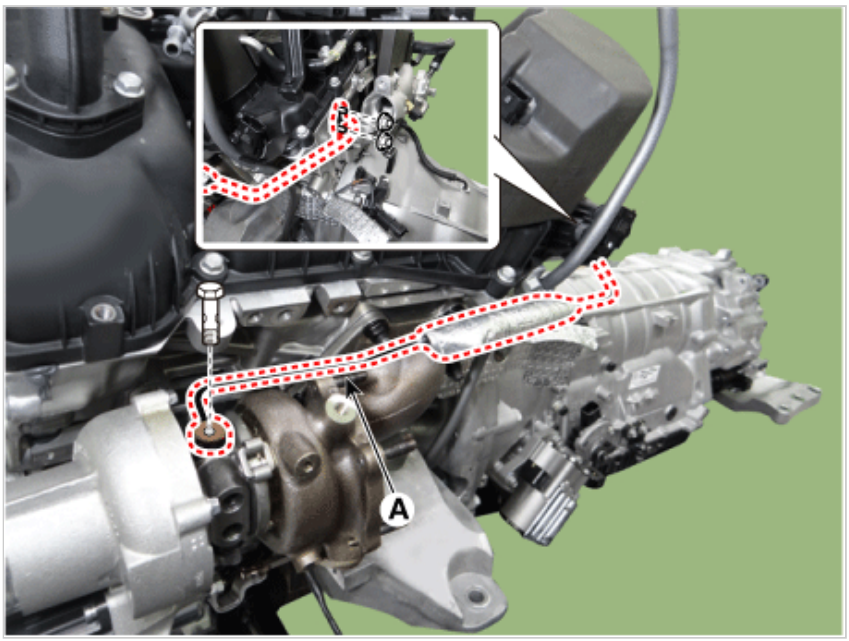
Tightening torque

Eye bolts :

11.8 - 17.7 N·m (1.2 - 1.8 kgf·m, 8.7 - 13.0 lb·ft)

Bolt :

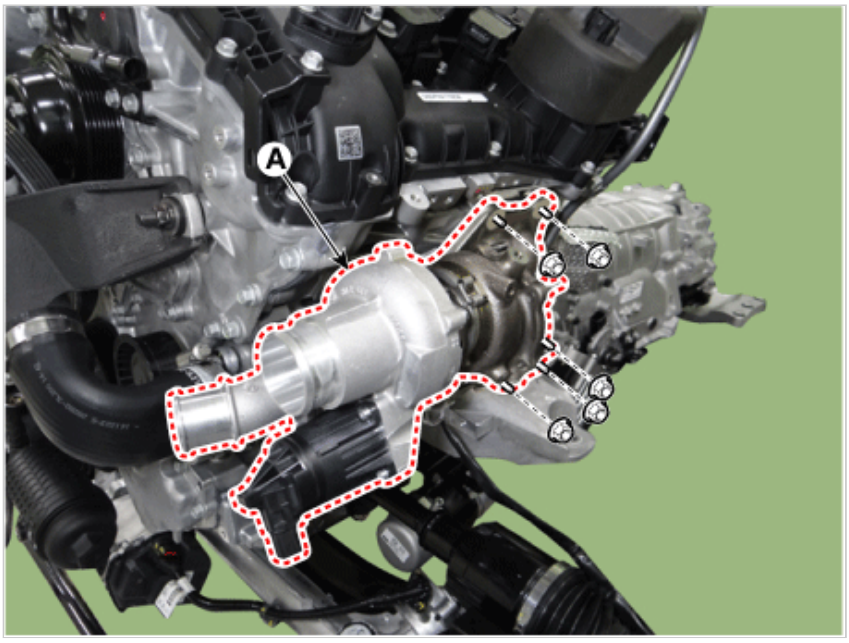
9.8 - 11.8 N·m (1.0 - 1.2 kgf·m, 7.2 - 8.7 lb·ft)



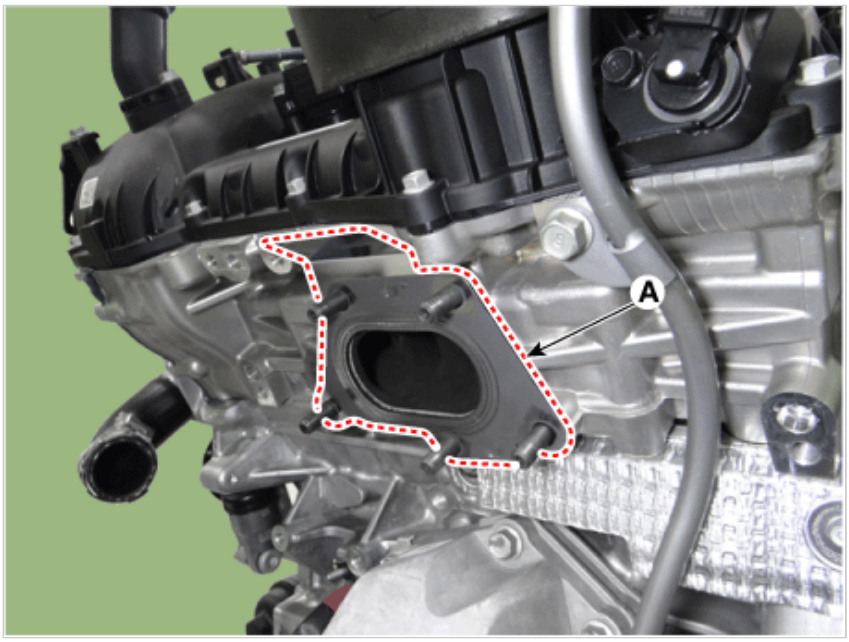
17. Remove the LH turbo manifold module (A).

Tightening torque :

58.8 - 63.7 N·m (6.0 - 6.5 kgf·m, 43.4 - 47.0 lb·ft)

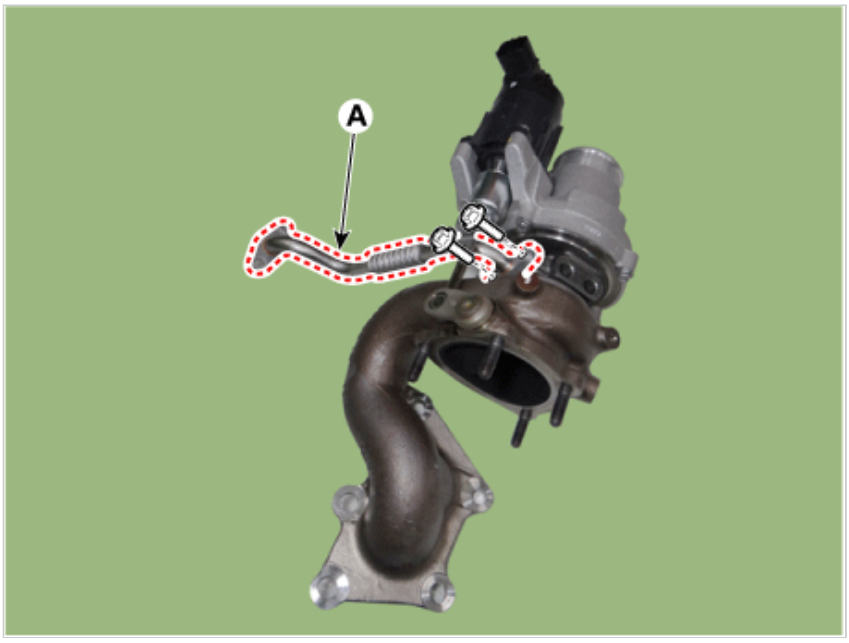


18. Remove the LH turbo manifold module gasket (A).



19. Remove the LH turbocharger oil drain pipe (A).

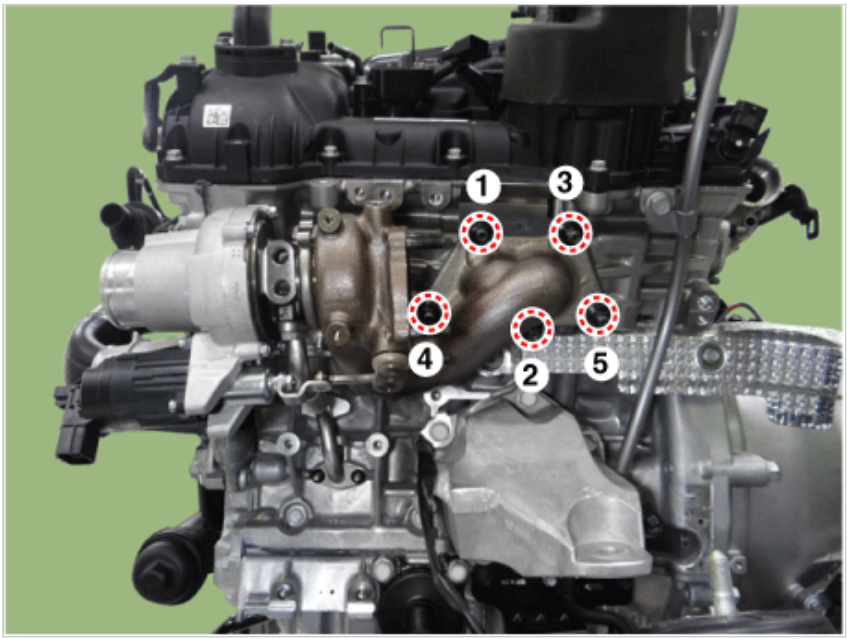
Tightening torque :
9.8 - 11.8 N·m (1.0 - 1.2 kgf·m, 7.2 - 8.7 lb·ft)



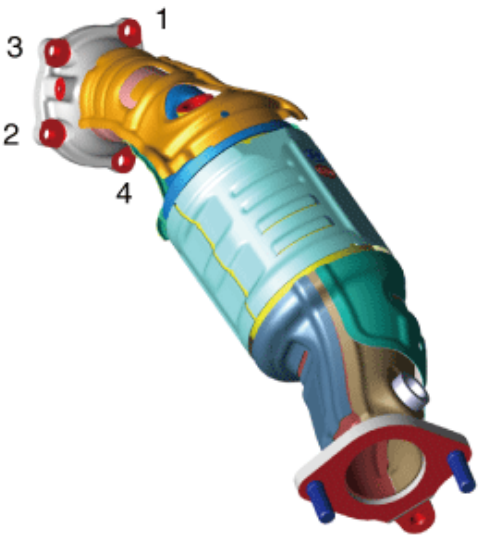
20. Install in the reverse order of removal.

NOTICE

- Always use a new LH turbo manifold module gasket.
- Take care whether the oil feed pipe & hose assembly is interfered with turbo manifold module and any surrounding parts.
- If the oil feed pipe & hose is damaged, engine oil is not supplied sufficiently to the turbocharger then it may damage the turbocharger. If the oil drain pipe & hose is damaged and clogged, engine oil is not drained smoothly then it may cause oil leaks from the turbocharger. Be care full the oil feed pipe & hose not to damage.(bent, crushed, torn or cracked).
- When installing the LH turbo manifold module , tighten the nuts with pre-torque first, and then tighten the nuts with specified torque in the sequence shown.

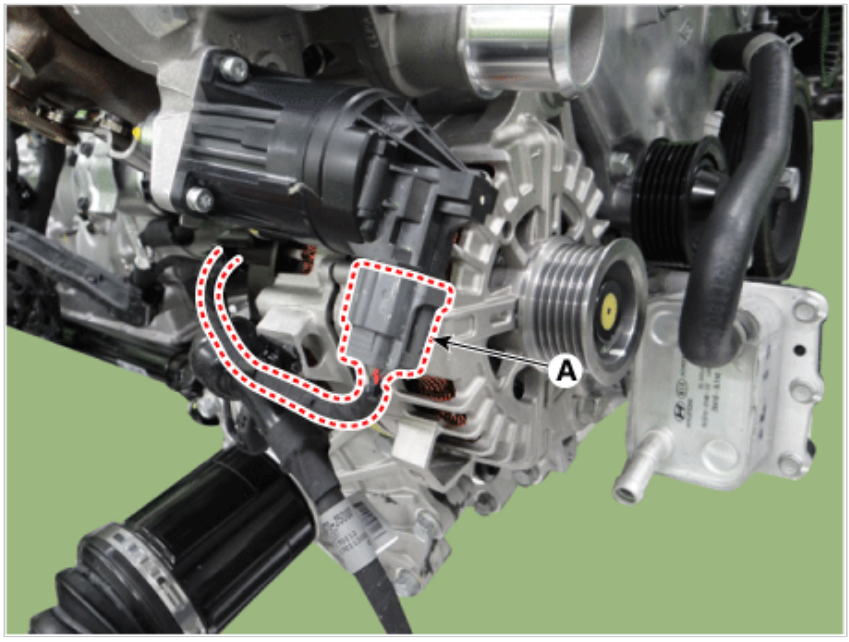


- When installing the LH warm-up catalytic converter (WCC), tighten the nuts with pre-torque first, and then tighten the nuts with specified torque in the sequence shown.



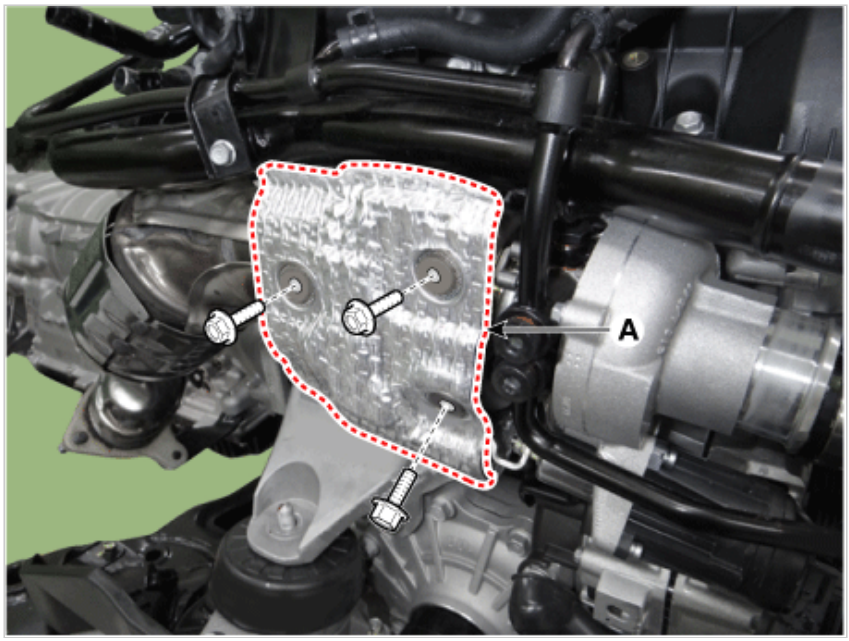
RH Turbo Manifold Module

1. Remove the engine and transmission assembly.
   (Refer to Engine and Transmission Assembly - "Engine and Transmission Assembly")
2. Disconnect the RH electric waste gate actuator (EWGA) connector (A).

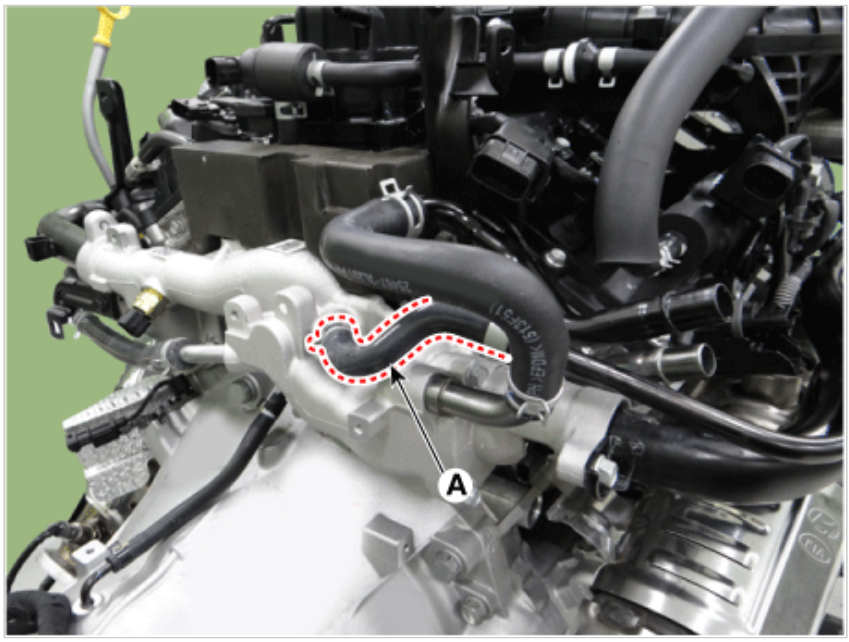


3. Remove the RH turbo manifold module heat protector (A).

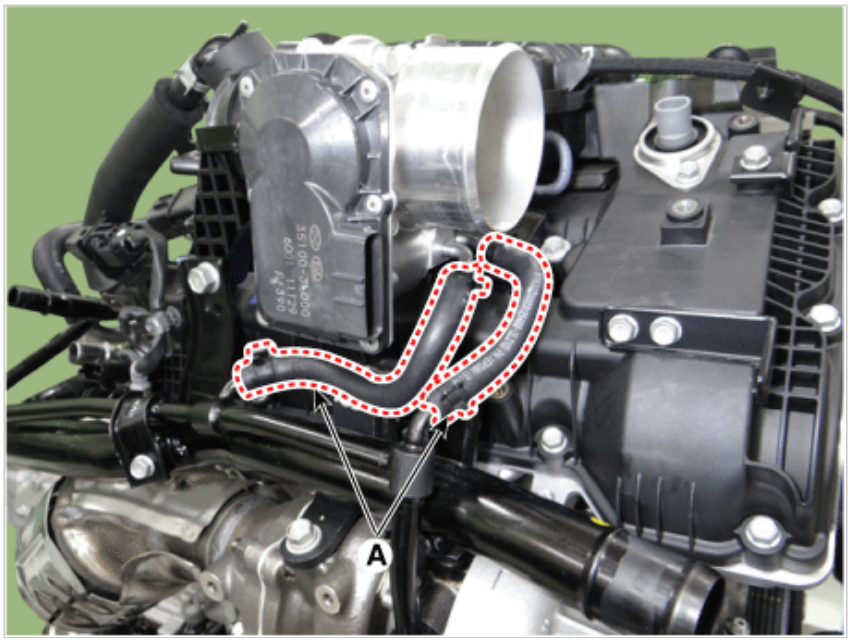
Tightening torque :
9.8 - 11.8 N·m (1.0 - 1.2 kgf·m, 7.2 - 8.7 lb·ft)



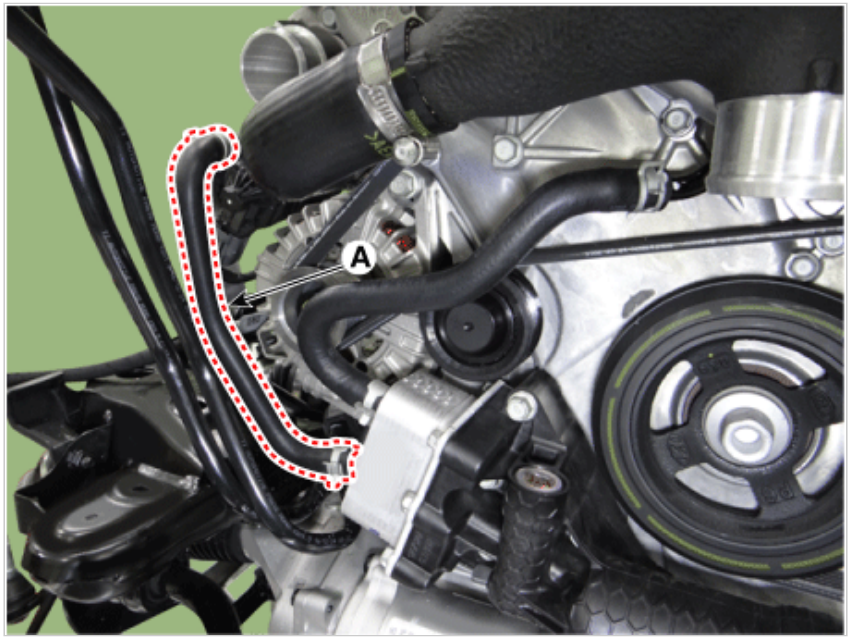
4. Disconnect the RH turbocharger water hose (A).



5. Disconnect the electric throttle control (ETC) module water hose (A).



6. Disconnect the oil cooler water hose B (A).



7. Remove the RH turbocharger water hose & pipe (A)

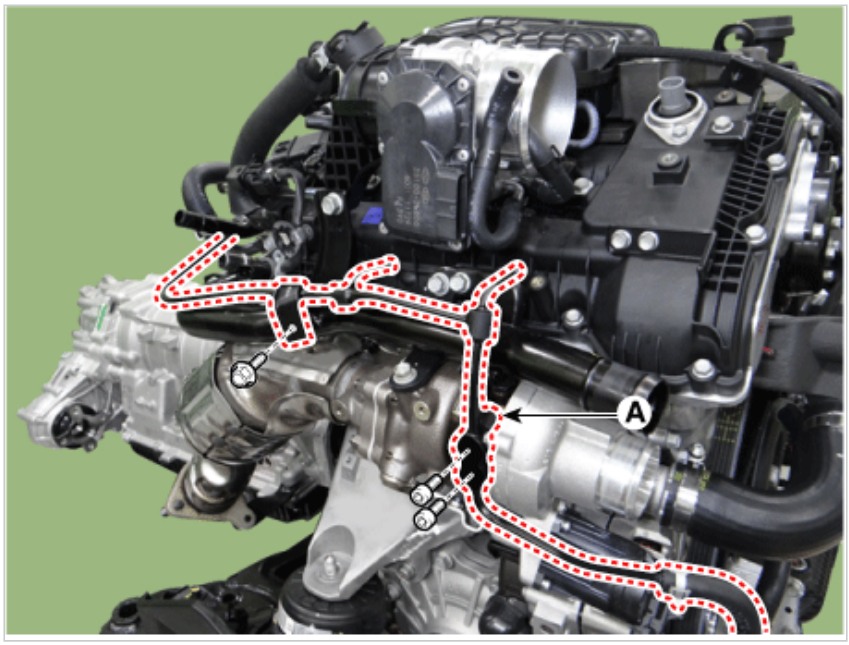
Tightening torque

Eye bolts :

33.3 - 39.2 N·m (3.4 - 4.0 kgf·m, 26.6 - 28.9 lb·ft)

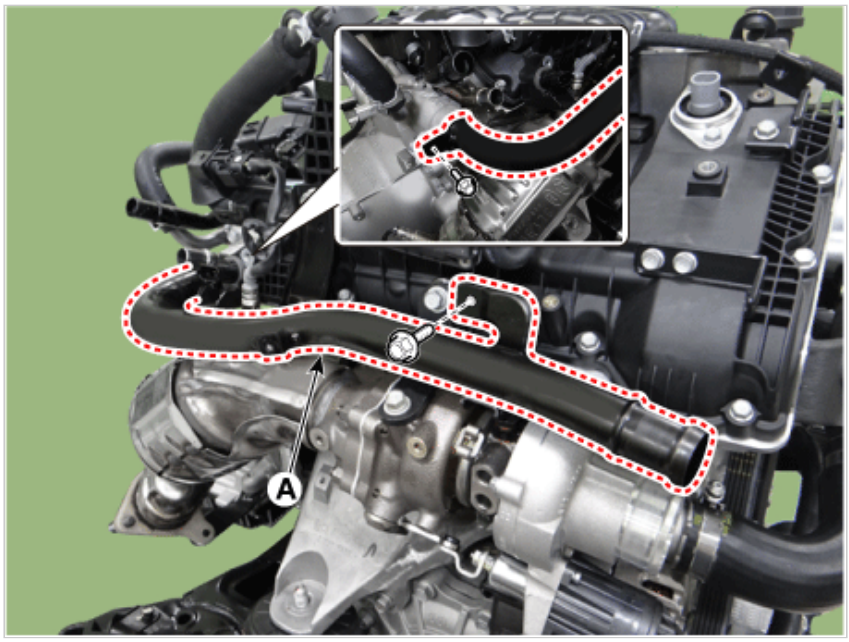
Bolt :

9.8 - 11.8 N·m (1.0 - 1.2 kgf·m, 7.2 - 8.7 lb·ft)



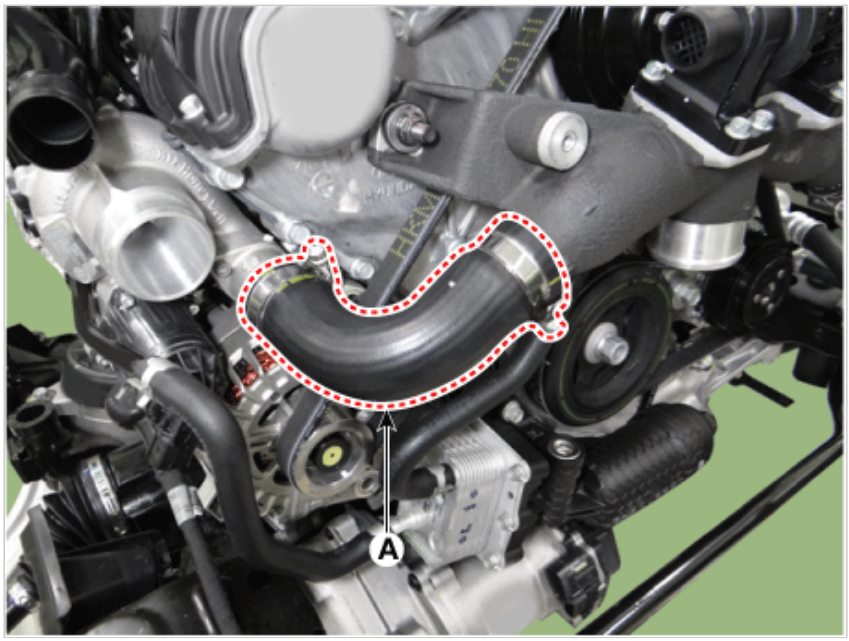
8. Remove the water inlet pipe (A).

Tightening torque :
24.5 - 28.4 N·m (2.5 - 2.9 kgf·m, 18.1 - 21.0 lb·ft)



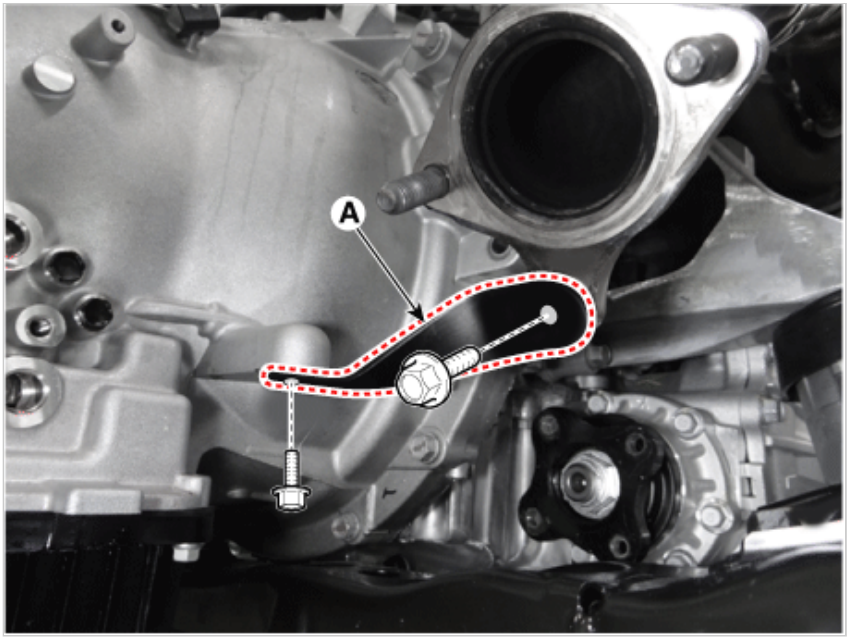
9. Disconnect the RH intercooler inlet hose (A).

Tightening torque :
4.9 - 6.9 N·m (0.5 - 0.7 kgf·m, 3.6 - 5.1 lb·ft, 43.4 - 60.8 lb·in)
(If equipped with a cap, tighten it until the cap is removed.)



10. Remove the RH warm-up catalytic converter (WCC) stay (A).

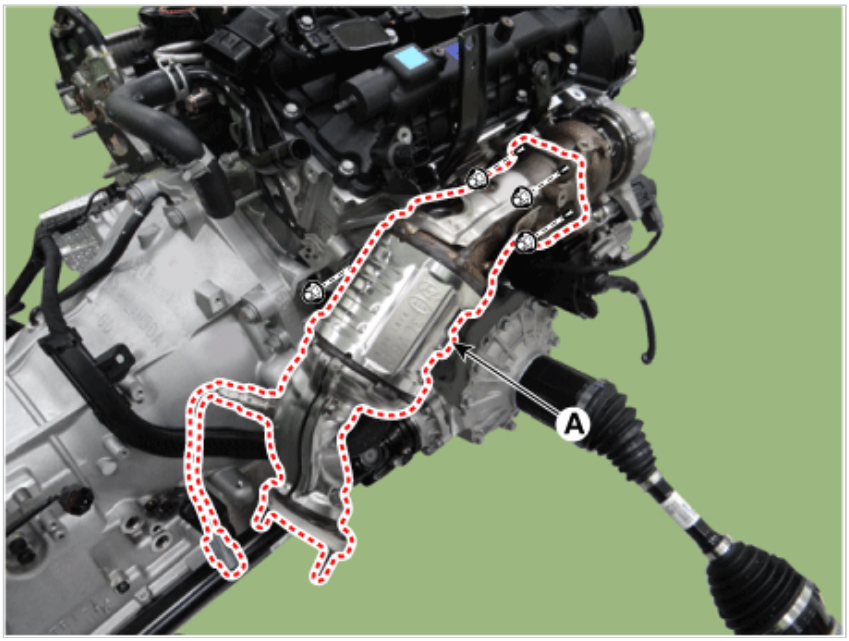
Tightening torque :
34.3 - 41.2 N·m (3.5 - 4.2 kgf·m, 25.3 - 30.4 lb·ft)



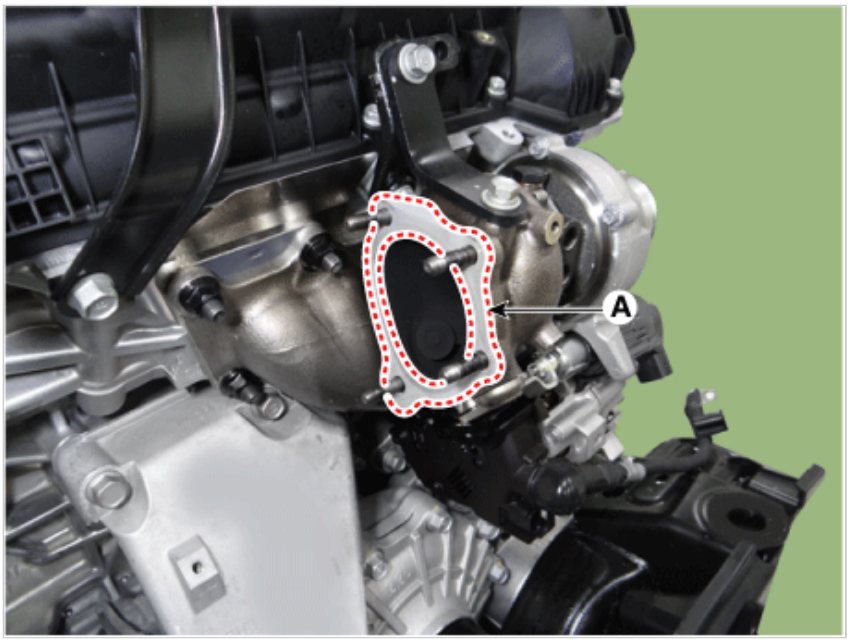
11. Remove the heated oxygen sensor (HO2S).
(Refer to Engine Control/ Fuel System - "Heated Oxygen Sensor (HO2S)")

12. Remove the RH warm-up catalytic converter (WCC) (A).

Tightening torque :
35.3 - 41.2 N·m (3.6 - 4.2 kgf·m, 26.0 - 30.4 lb·ft)



13. Remove the RH warm-up catalytic converter (WCC) gasket (A).

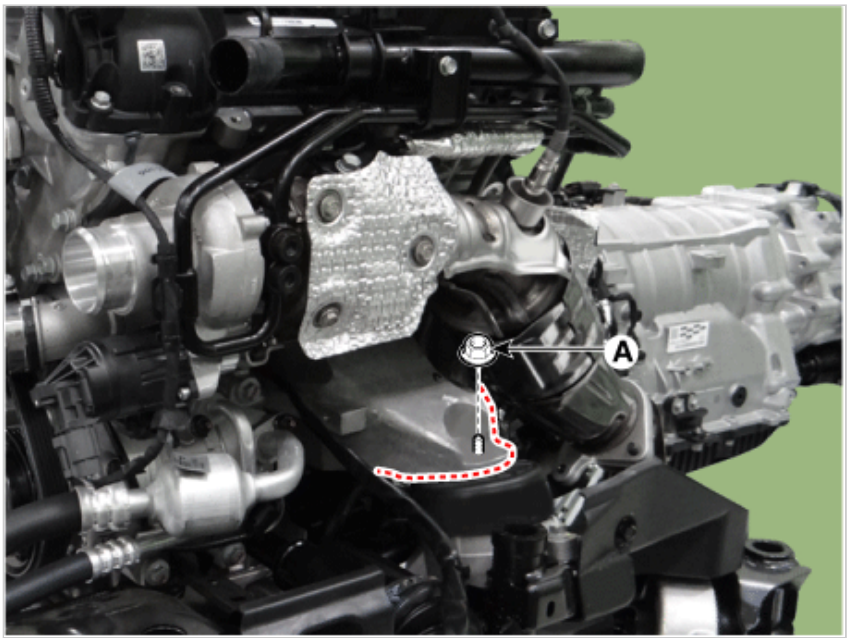


14. Remove the LH/RH engine mounting insulator nut (A).

Tightening torque :

63.7 - 83.4 N·m (6.5 - 8.5 kgf·m, 47.0 - 61.5 lb·ft)

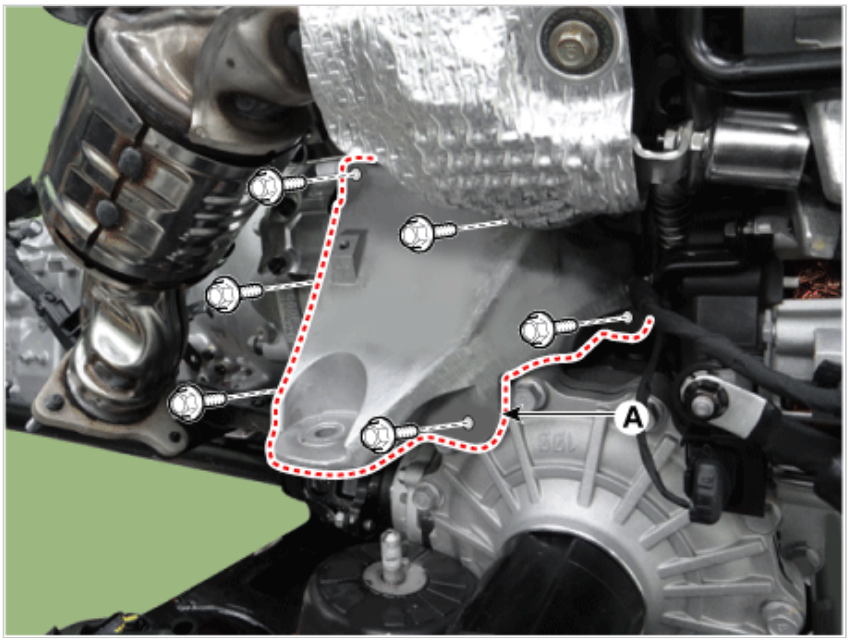
[LH]



[RH]

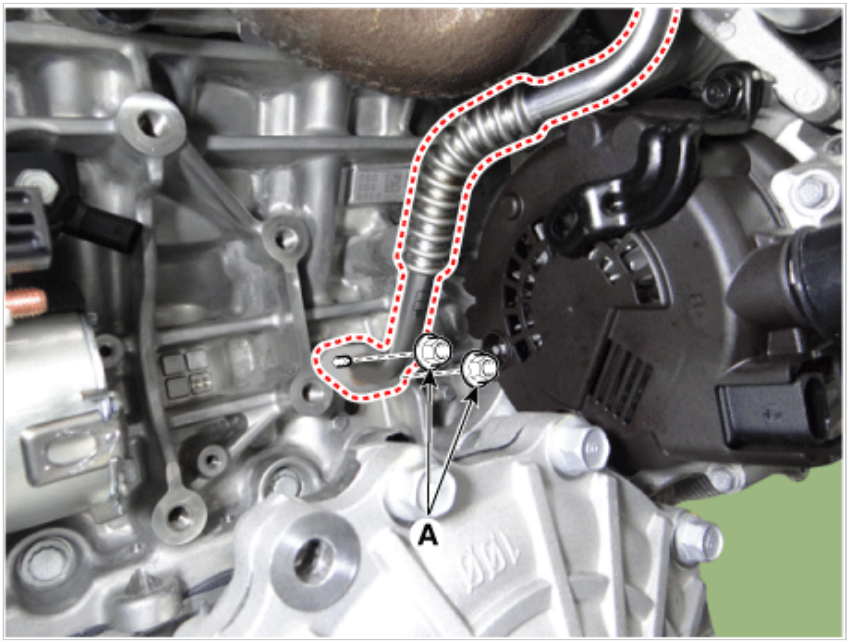
15. Hook the engine hoist to the hole of engine hanger.
16. Lift the engine slightly using the hoist to obtain space for removing the RH engine mounting support bracket.
17. Remove the engine mounting support bracket (A).

Tightening torque :
49.0 - 58.8 N·m (5.0 - 6.0 kgf·m, 36.2 - 43.4 lb·ft)



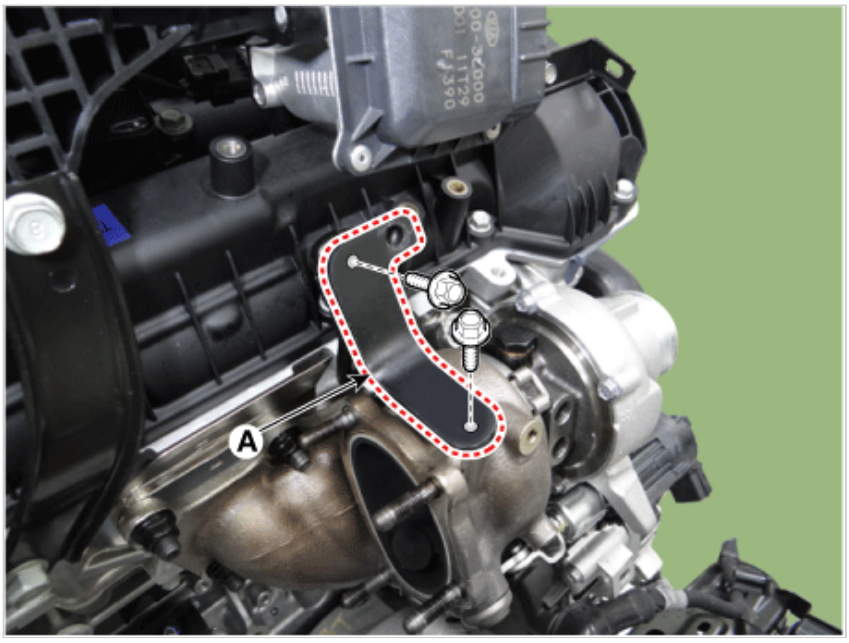
18. Remove the RH turbocharger oil drain pipe mounting nuts (A).

Tightening torque :
9.8 - 11.8 N·m (1.0 - 1.2 kgf·m, 7.2 - 8.7 lb·ft)



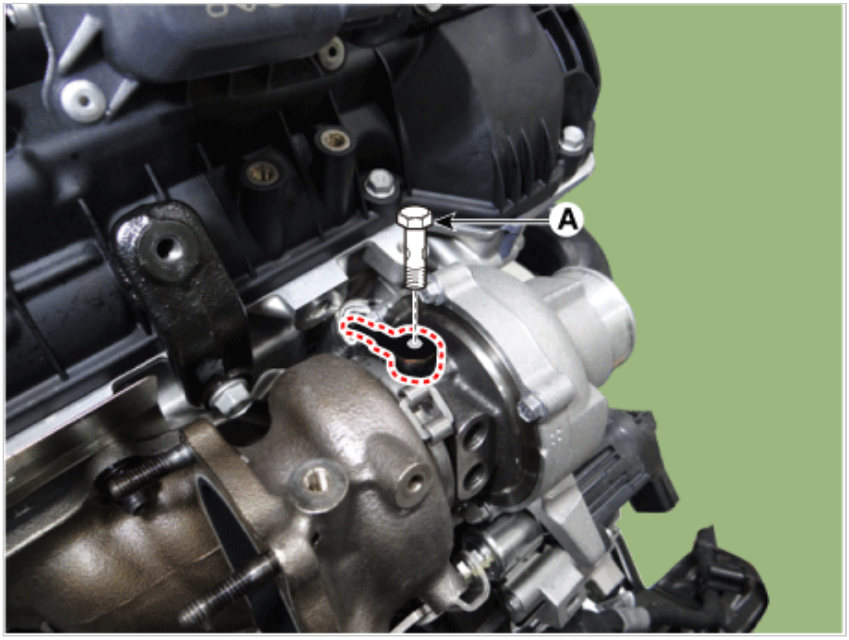
19. Remove the RH turbo manifold module stay (A).

Tightening torque :
26.5 - 31.4 N·m (2.7 - 3.2 kgf·m, 19.5 - 23.1 lb·ft)



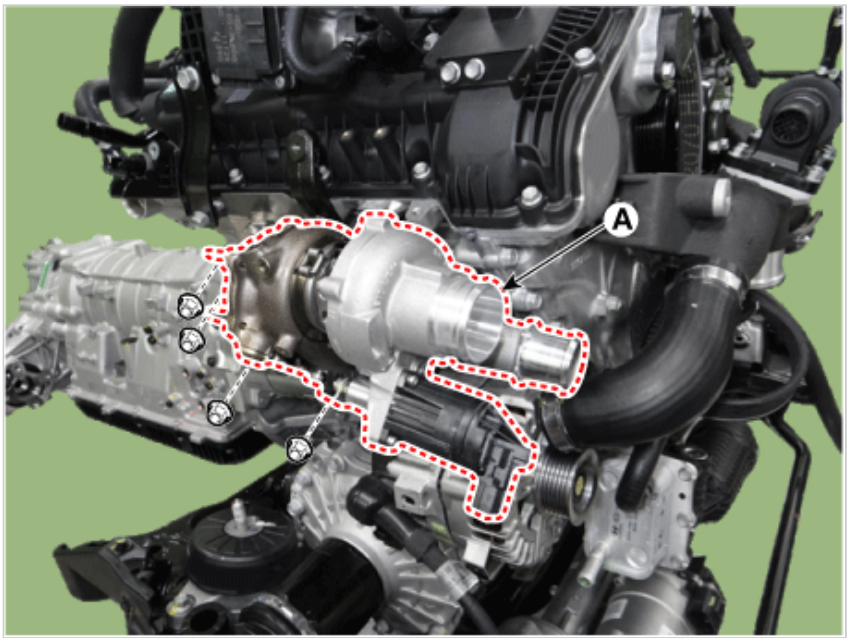
20. Remove the RH turbocharger oil feed pipe eye bolt (A).

Tightening torque :
11.8 - 17.7 N·m (1.2 - 1.8 kgf·m, 8.7 - 13.0 lb·ft)

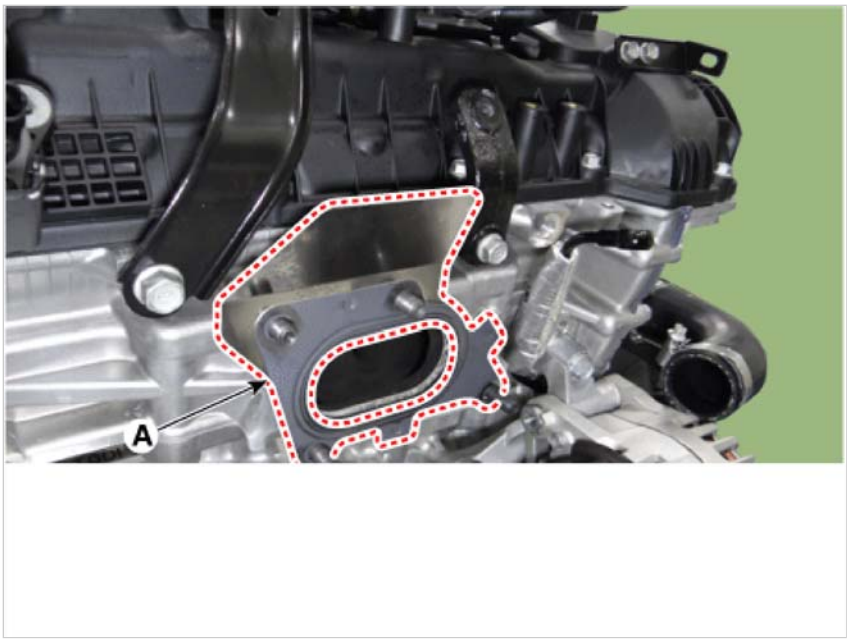


21. Remove the RH turbo manifold module (A).

Tightening torque :
58.8 - 63.7 N·m (6.0 - 6.5 kgf·m, 43.4 - 47.0 lb·ft)



22. Remove the RH turbo manifold module gasket (A).



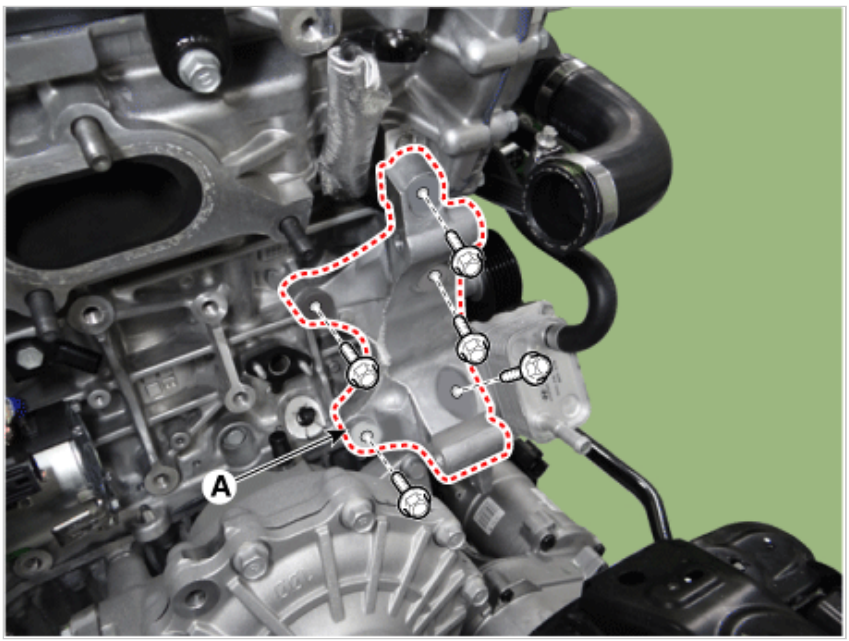
23. Remove the RH turbocharger oil drain pipe (A).

Tightening torque :
9.8 - 11.8 N·m (1.0 - 1.2 kgf·m, 7.2 - 8.7 lb·ft)

24. Remove the alternator.
(Refer to Engine Electrical System - "Alternator")

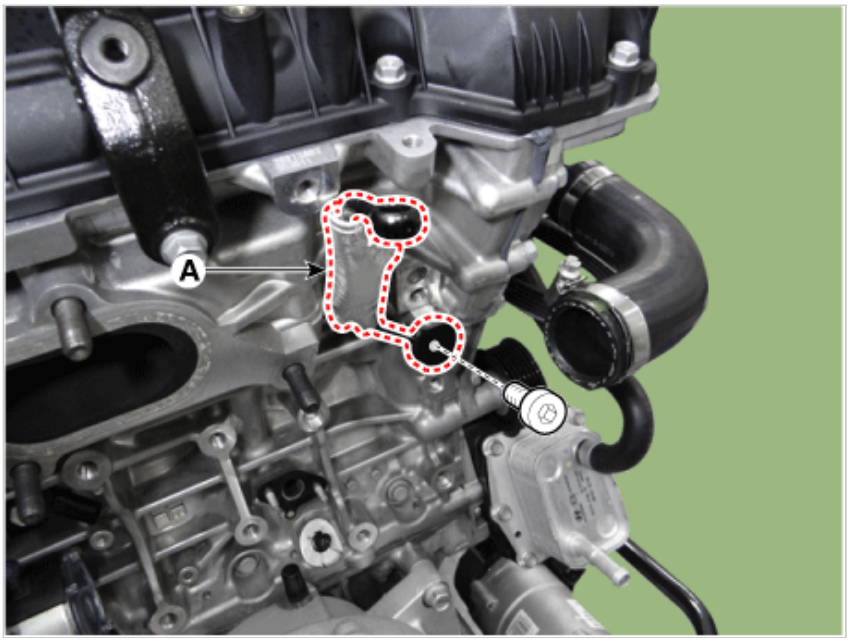
25. Remove the alternator bracket (A).

Tightening torque :
49.0 - 63.7 N·m (5.0 - 6.5 kgf·m, 36.2 - 47.0 lb·ft)



26. Remove the RH turbocharger oil feed pipe (A).

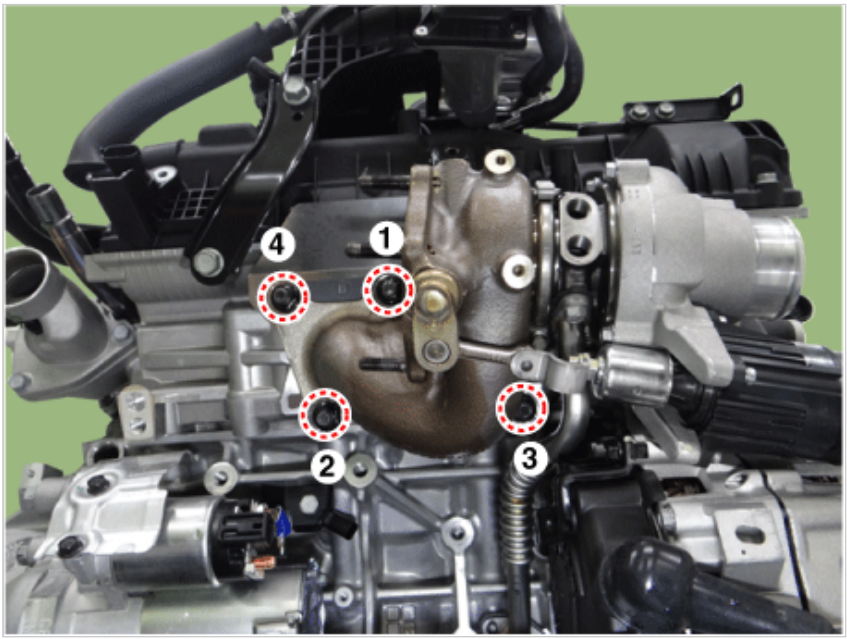
Tightening torque :
66.7 - 70.6 N·m (6.8 - 7.2 kgf·m, 49.2 - 52.1 lb·ft)



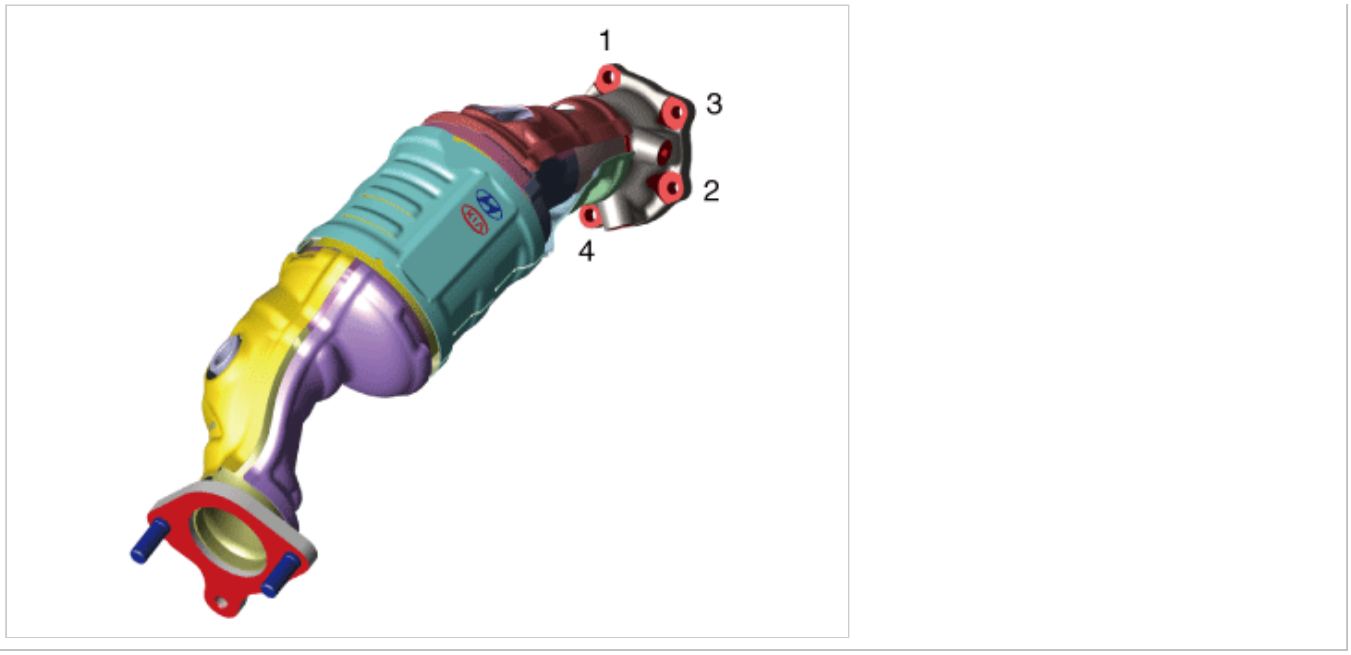
27. Install in the reverse order of removal.

NOTICE

- Always use a new RH turbo manifold module gasket.
- Take care whether the oil feed pipe & hose assembly is interfered with turbo manifold module and any surrounding parts.
- If the oil feed pipe & hose is damaged, engine oil is not supplied sufficiently to the turbocharger then it may damage the turbocharger. If the oil drain pipe & hose is damaged and clogged, engine oil is not drained smoothly then it may cause oil leaks from the turbocharger. Be care full the oil feed pipe & hose not to damage.(bent, crushed, torn or cracked).
- When installing the RH turbo manifold module , tighten the nuts with pre-torque first, and then tighten the nuts with specified torque in the sequence shown.

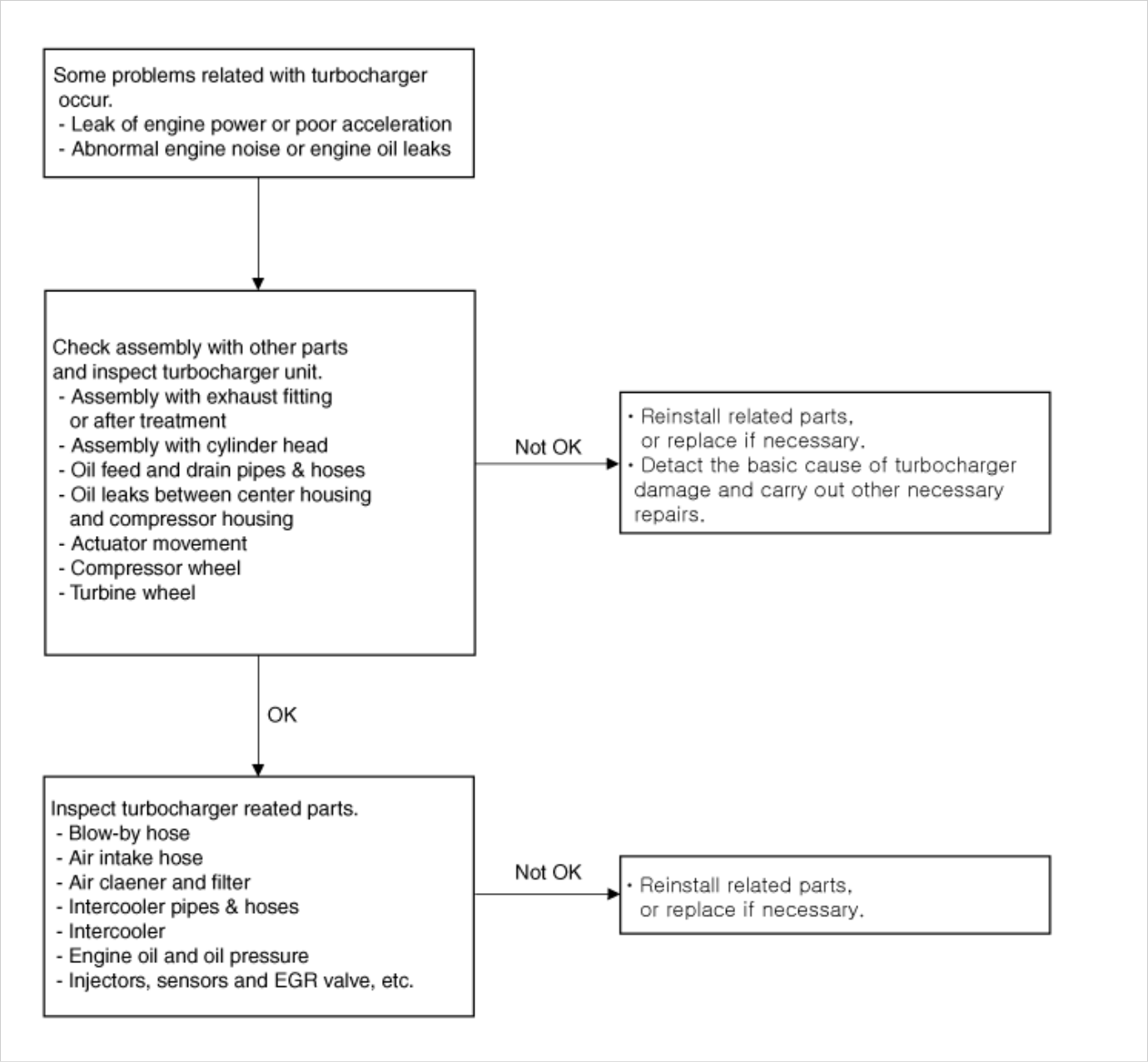


- When installing the RH warm-up catalytic converter (WCC), tighten the nuts with pre-torque first, and then tighten the nuts with specified torque in the sequence shown.



On-vehicle Inspection

Turbocharger Diagnostic Flow



If any problem related with turbocharger, such as lack of engine power, poor acceleration, abnormal engine noise or oil leaks, may occur, check the turbocharger according to the procedure as follows.

1. Check for assembling of the turbocharger and the exhaust fitting (or the after treatment).
   – Check if a gasket is installed.
   – Check if mounting bolts (or nuts) are tightened properly.
   – Check if there is a gas leak.
   – Check if there is any damage, such as crack, on the parts.

   If a gas leak occur as a gasket was not installed or mounting bolts (or nuts) were tightened inadequately, it may cause abnormal engine noise.
   If the cause of the problem is detected, retighten the mounting bolts (or nuts) as the specified torque or replace the gasket or damaged parts with new ones if necessary.
2. Check for assembling of the exhaust manifold and the cylinder head.
   – Check if a gasket is installed.
   – Check if the mounting bolts (or nuts) are tightened properly.
   – Check if there is a gas leak.

   If a gas leak occur as a gasket was not installed or mounting bolts (or nuts) were tightened inadequately, it may cause abnormal engine noise.
   If the cause of the problem is detected, retighten the mounting bolts (or nuts) as the specified torque or install a new gasket if necessary.
3. Check the turbocharger oil feed pipe & hose and oil drain pipe & hose.
   – Check if a gasket is installed.
   – Check if the mounting bolts are tightened properly.
   – Check if the clamps are positioned in place.

– Check if the oil pipes & hoses are damaged (bent, crushed, torn or cracked).

If a gas leak occur as a gasket was not installed or mounting bolts were tightened inadequately, it may cause oil leaks.

If the oil feed pipe & hose is damaged, engine oil is not supplied sufficiently to the turbocharger then it may damage the turbocharger. If the oil drain pipe & hose is damaged and clogged, engine oil is not drained smoothly then it may cause oil leaks from the turbocharger.

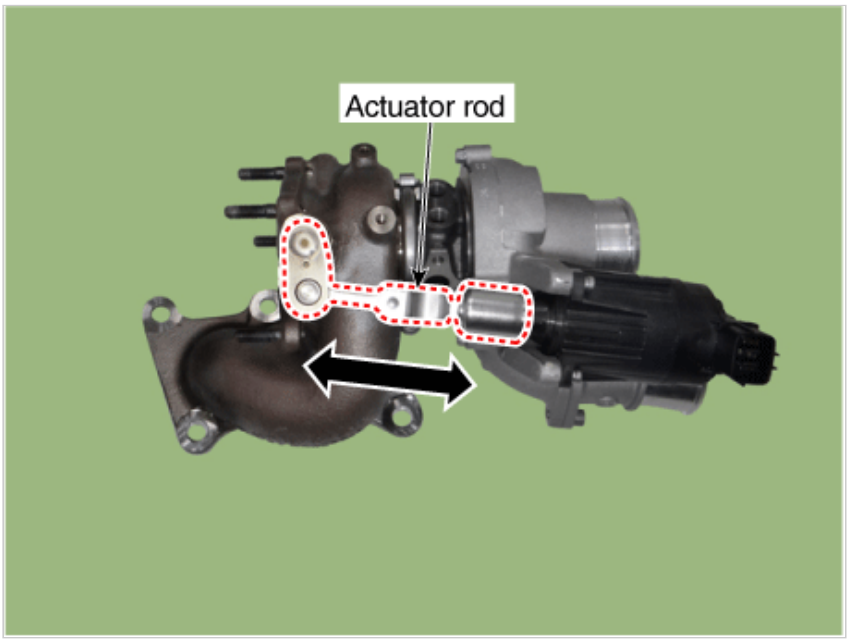
If the cause of the problem is detected, retighten the mounting bolts (or nuts) as the specified torque or replace the gasket or damaged parts with new ones if necessary.

4. Check for oil leaks between center housing and compressor housing.
   – Check if the mounting bolts are tightened properly.
   – Check if there is an oil leak.

   If the O-ring (gasket) between the center housing and the compressor housing is damaged, it may cause oil leaks.

   If an oil leak is detected, replace the turbocharger with a new one.

5. Check the turbocharger actuator.
   – Electronic actuator: Check for movement of the actuator rod when a forced actuator operating mode is performed by KDS. (Refer to DTC guide)

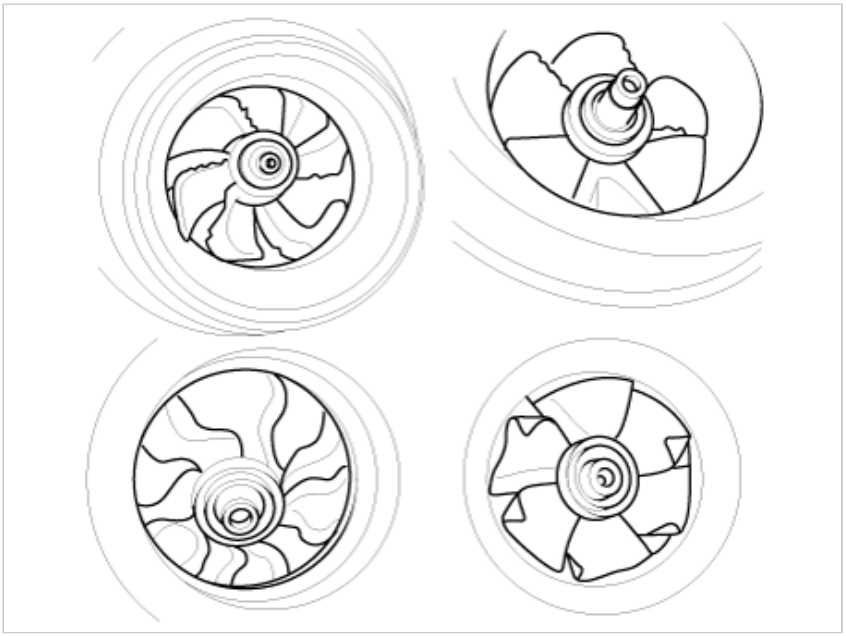


   If the turbocharger actuator is damaged, it may cause lack of engine power and poor acceleration.

   If the actuator rod does not move, replace the turbocharger with a new one.

6. Check the turbocharger compressor wheel.
   – Check if the compressor wheel is damaged (bent or deformed).
   – Check if the compressor wheel rotates smoothly.

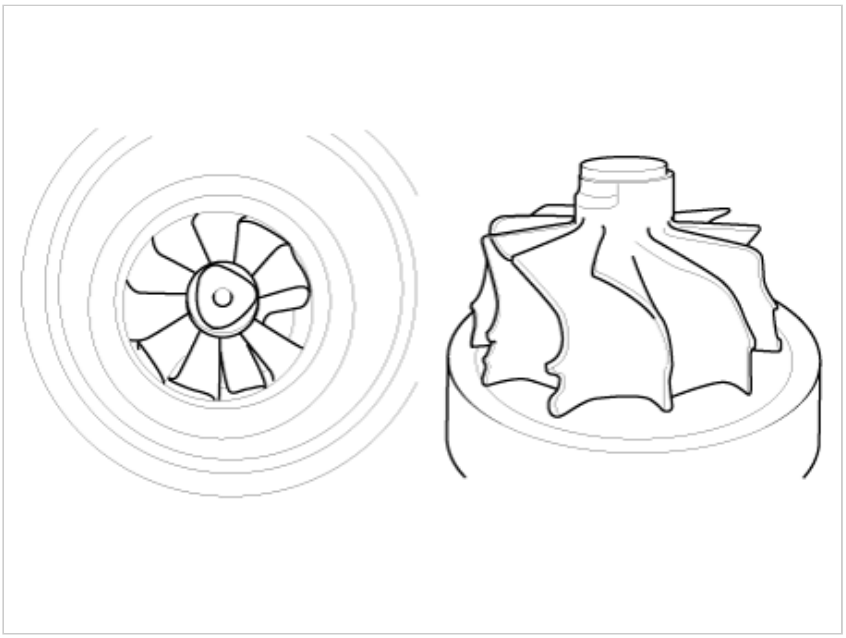
   EX)



If the compressor wheel are damaged, it may cause abnormal noise from the turbocharger and poor acceleration.
If the compressor wheel are damaged or deformed, replace the turbocharger with new ones.

7. Check the turbocharger turbine wheel.
   – Check if the turbine wheel is damaged.
   – Check if the turbine wheel rotates smoothly.

   EX)



If the turbine wheel are damaged, it may cause abnormal noise from the turbocharger and poor acceleration.
If the turbine wheel are damaged or deformed, replace the turbocharger with new ones.

If any problem is not detected in the turbocharger, check the turbocharger-related parts according to the procedure as follows.

1. Check the blow-by hose. (Refer to FL group)
   – Check if the breather hose is damaged (bent, clogged).
   – Check if the positive crankcase ventilation (PCV) valve is clogged.

   If the breather hose is bent or clogged, the internal pressure in the engine increases then engine oil is not supplied smoothly to the turbocharger. So it may cause damage of the turbocharger and oil leaks.
   If the cause of the problem is detected, replace the breather hose or the related parts with new ones.

2. Check the air intake hose connected to the turbocharger.
   – Check if the air intake hose is damaged (bent, crushed, detached or torn).

   If a cross-section of the hose diminishes as the air intake hose is bent or crushed, intake air to the turbocharger reduces and the pressure in front of turbocharger drops. So it may cause damage of the turbocharger and oil leaks. If the air intake hose is detached or torn, a foreign substance goes into the turbocharger and causes damage of it.
   If the air intake hose is damaged, replace it with a new one.

3. Check the air cleaner.
   – Check the air cleaner filter for pollution state.
   – Check the air cleaner filter for water influx.
   – Check the air cleaner cover for dirtiness.
   – Check if the air cleaner filter is a genuine part..

   If the air cleaner filter is moistened or polluted excessively or a non-genuine part is used, intake air to the turbocharger reduces and the pressure in front of turbocharger drops. So it may cause damage of the turbocharger and oil leaks. .
   If the air cleaner filter is moistened or polluted excessively, replace it with a new one.

> **NOTICE**
> Replace the air cleaner filter according to the maintenance schedule.

4. Check the intercooler hoses & pipes.
   – Check if the intercooler hoses & pipes are connected properly.
   – Check if the intercooler hoses & pipes are damaged (bent, detached or torn).
   – Check if there is any damage, such as crack, on the intercooler pipes.
   – Check if the clamps are positioned in place.

If the intercooler hoses & pipes are damaged or disconnected, oil leaks may occur from the hoses & pipes and the turbocharger may exceed the permissible speed then it may cause damage of the turbocharger.

If the intercooler hoses & pipes are damaged, replace them with new ones.

> **NOTICE**
> Use new clamps when replacing the hoses & pipes.

5. Check the intercooler.
   – Check if the intercooler tubes and tanks are damaged (oil leak or crack).

   If the intercooler is damaged, the turbocharger may exceed the permissible speed then it may cause damage of the turbocharger.

   If the intercooler is damaged, replace them with a new one.

> **NOTICE**
> Use new clamps when replacing the intercooler.

6. Check the engine oil.
   – Check the engine oil level.
   – Check the engine oil for discoloration, water influx and viscosity degradation.
   – Check the engine oil grade.

   If the engine oil level is low, amount of engine oil fed to turbocharger reduces then the bearings in the turbocharger may adhere due to insufficient lubrication and cooling.

   If the cause of the problem is detected, add or change engine oil.

> **NOTICE**
> Change the engine oil according to the maintenance schedule.

7. Check the engine oil pressure.
   – Engine oil pressure: Check the oil pressure using an oil pressure gauge after removing the oil pressure switch on the cylinder block.
   – Check the engine oil screen in the oil pan if the engine oil level is low. Then check the injectors for gas leaks if foreign substances are accumulated on the oil screen.

   If the engine oil level is low, amount of engine oil fed to turbocharger reduces then the bearings in the turbocharger may adhere due to insufficient lubrication and cooling.

   If the cause of the problem is detected, add or change engine oil. If foreign substances are accumulated on the oil screen, wash the oil screen and replace the injector's washer with a new one after checking the injectors for gas leaks. Check the engine oil-related parts, such as oil pump, if necessary.

> **NOTICE**
> As the turbocharger rotates at high speed of 100,000 rpm or above, deterioration of engine oil can cause damage of the turbocharger bearings. Check engine oil for discoloration, water influx, viscosity degradation and oil pressure lowering.

8. Check the injectors, sensors, etc. (Refer to FL group)
   – Check if the injectors operate properly.
   – Check if the sensors, such as the mass air flow sensor (MAFS), intake air temperature sensor (IATS), boost pressure sensor (BPS), operate properly.
   –

   If the injectors, sensors and etc. don't work properly, it may cause lack of engine power.

   If the cause of the problem is detected, replace the related parts with new ones.