

TSI 13-12-05: High-Pressure Turbocharger Cartridge Replacement

Study Guide



TMT121378

Course Code: 8441

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THE INFORMATION PROVIDED WITHIN THIS COURSE IS FOR TRAINING PURPOSES ONLY. ALWAYS CONSULT THE LATEST SERVICE, DIAGNOSTIC, AND TOOL INFORMATION, LOCATED ON NAVISTAR'S SERVICE PORTAL, PRIOR TO PERFORMING SERVICE ON NAVISTAR ENGINES, VEHICLES, AND EQUIPMENT.



SOME VEHICLES UTILIZE AN O-RING TO SEAL THE TURBOCHARGER OIL DRAIN LINE TO THE TURBOCHARGER. THIS O-RING IS NOT INCLUDED IN THE HIGH PRESSURE TURBOCHARGER CARTRIDGE KIT. IF THE VEHICLE YOU ARE SERVICING REQUIRES THIS O-RING, IT WILL NEED TO BE ORDERED SEPARATELY.



ALL FASTENERS ARE REUSED UNLESS OTHERWISE NOTED.



FOLLOW ALL CAUTIONS, WARNINGS, AND NOTES LISTED WITHIN THIS TRAINING PROGRAM. IF IN DOUBT ABOUT A PROCEDURE, CONSULT THE LATEST VERSION OF TSI-13-12-05: REPLACEMENT PROCEDURE FOR HIGH-PRESSURE TURBOCHARGER CARTRIDGE.

INTRODUCTION

Welcome to the Navistar training course for TSI-13-12-05: Replacement Procedure for High-Pressure Turbocharger Cartridge. This course is intended to guide you through the replacement procedures for the high-pressure turbocharger cartridge on MaxxForce[®] 11 and 13 EPA 10, Navistar[®] N13, and 2013 MaxxForce[®] 13 HD-OBD engines.

If you have questions or concerns regarding the playback of this program, please contact Navistar Service Education by submitting a case file (Dealer Personnel); or by calling 1-800-365-0088.

Tool List

To complete this repair, the following tools and components are required:

- 3/8 in. drive electric or air impact
- 3/8 in. drive ratchet
- 3/8 in. drive 6 in. extension
- 3/8 in. drive 12 in. extension
- 3/8 in. drive swivel
- 3/8 in. drive 8mm shallow socket
- 3/8 in. drive 10mm shallow socket
- 3/8 in. drive 11mm deep socket
- 3/8 in. drive 12mm deep socket
- 3/8 in. drive 13mm deep socket
- 3/8 in. drive 15mm deep socket
- 3/8 in. drive 11/16 in. crow's-foot socket
- 3/8 in. drive lb/ft torque wrench
- 3/8 in. drive lb/in torque wrench
- P80[®] lubricant or equivalent

- ¼ in. drive ratchet
- ¼ in. drive swivel
- ¼ in. drive 6 in. extension
- ¼ in. drive 14 in. extension
- ¼ in. drive 7mm shallow socket
- ¼ in. drive 8mm shallow socket
- ¼ in. drive 10mm shallow socket
- 9/16 in. combination wrench
- 10mm combination wrench
- Diagonal cutter
- 90° pick
- Slip-joint pliers
- Claw pick-up tool
- Navistar cap kit (ZTSE4296)
- Coolant Management Tool (KL5007NAV)

DISASSEMBLY





1. Prepare Vehicle for Service

Park the truck on a flat surface, shift transmission to PARK or NEUTRAL, set the parking brake, and chock the wheels. Open the hood and drain the engine coolant using the Navistar Coolant Management Tool KL5007NAV (1). As the coolant drains, remove the right side inner fender and place a suitable drain pan under the truck to collect any remaining coolant throughout the procedure.

2. Loosen Air Inlet and Compressor **Hose Clamps**

Loosen the clamp at the air filter housing boot (1). Use hose clamp pliers to slide the spring clamp (2) down the air compressor hose and then remove the hose from the pipe. Install a protective cap in the hose to prevent entry of foreign material.









3. Remove Air Inlet Duct

Loosen the air inlet duct clamp (1) at the Low-Pressure (LP) turbocharger air inlet casting. Remove the air inlet duct from the casting and the air filter housing boot. Install a protective cap into the casting and the filter housing boot.

4. Remove HPCAC Pipe

Remove the clamp (3) securing the A/C hoses to the High-Pressure Charge Air Cooler (HPCAC) pipe (2). Loosen the front and rear HPCAC pipe clamps (1).

Remove the pipe and install a protective cap into the HPCAC inlet.

5. Reposition Engine Harness

Disconnect the engine harness connectors at the Turbocharger-2 Compressor Inlet Pressuresensor (1), Engine Oil Pressure sensor (2), Air Inlet Temperature sensor (3), and if equipped, the Mass Air Flow sensor (4).

6. Reposition Engine Harness (cntd.)

Remove the engine harness nut (1) on the Coolant Control Valve (CCV) mounting bolt, and move the engine harness to the side.









7. Remove HP Turbocharger Outlet Duct

Remove the two nut-bolts (1) from the High-Pressure (HP) Turbocharger outlet duct (2). Pull the outlet duct down until disengaged from the turbocharger and then remove the duct. Remove and discard the outlet duct O-ring.

8. Remove LP Turbocharger Inlet Duct

Remove the two LP-turbocharger inlet duct bolts (1). Remove the inlet duct (2) and install a protective cap into the LP-turbocharger compressor inlet. Discard the inlet duct O-ring.

9. Remove Air Supply Line from ACV

Loosen the air supply line (1) from the Air Control Valve (ACV) while using a back-up wrench on the ACV fitting (2). Remove the line and position aside.

NOTE

VEHICLES WITH A REMOTE-MOUNT COOLANT FILTER MAY REQUIRE THE HOSE BETWEEN THE COOLANT FILTER AND THE CAB HEATER COOLANT RETURN PIPE BE DISCONNECTED BEFORE MOVING THE COOLANT RETURN PIPE ASIDE.

10. Remove Coolant Pipes

Remove two bolts (1) securing the cab-heater coolant return pipe P-clamps and the Low-Pressure Charge-Air-Cooler (LPCAC) coolant supply pipe tab to the HP- turbocharger air inlet duct (3).









11. Remove Coolant Pipes (cntd.)

Remove the bolt (1) securing the lower end of the cab coolant-return pipe (2). Pull the pipe out of the casting and discard the O-ring. Position the pipe aside.

12. Remove Coolant Pipes (cntd.)

Loosen the upper clamp (1) securing the LPCAC coolant supply pipe (2) to the EGR cooler. Remove the hose from the EGR cooler.

13. Remove Coolant Pipes (cntd.)

Loosen the lower clamp (1) securing the LPCAC coolant supply pipe hose. Remove the pipe assembly.

NOTE

DEPENDING ON CHASSIS APPLICATION, THE LOWER AIR-INLET DUCT BOLT CANNOT BE FULLY REMOVED UNTIL THE DUCT IS REMOVED FROM THE VEHICLE.

14. Remove HP Turbocharger Inlet Duct Fasteners and Hoses

Loosen the lower air inlet duct bolt (1) completely. Loosen the two hose clamps (2) and remove both hoses from the LPCAC coolant return duct.











DO NOT ATTEMPT TO REMOVE THE HP-TURBOCHARGER AIR INLET DUCT FROM TURBOCHARGER AT THIS POINT IN THE PROCEDURE.

15. Remove HP Turbocharger Inlet Duct Fasteners and Hoses (cntd.)

Remove the upper HP-turbocharger air inlet duct mounting bolt (1).

16. Remove Cable Lock Straps

Remove cable lock straps (1) securing the HPturbocharger actuator hose to the HPturbocharger oil supply line.

17. Remove Bolt Securing HP Turbocharger Oil Supply Line

Remove the bolt (1) securing the HPturbocharger oil supply line.



THE OIL LINE IS ONE-TIME-USE ONLY AND MUST BE REPLACED. IF THE OIL LINE CANNOT BE EASILY REMOVED FROM THE HP-TURBOCHARGER, CUT THE LINE INTO TWO PARTS TO AID REMOVAL.

18. Remove Bolt Securing LP Turbocharger Oil Supply Line

Assemble a long ¼ inch extension, ratchet, and magnetic 8mm socket to pass behind the HP-turbocharger and reach the bolt on the LP-turbocharger oil supply line.









19. Remove Bolt Securing LP Turbocharger Oil Supply Line (cntd.)

Remove the bolt (1) securing the LPturbocharger oil supply line to the turbocharger.

20. Remove Turbocharger Oil Line

Use a 5/8 inch crows-foot socket to loosen the lower turbocharger oil line fitting (1) at the crankcase. Remove the line and discard.



DEPENDING UPON BUILD DATE, THE TURBOCHARGER OIL RETURN LINE WILL SEAL AT THE TURBOCHARGER WITH EITHER A GASKET OR AN O-RING.

21. Disconnect Oil Return Line from HP Turbocharger

Remove two bolts attaching the oil return line to the HP-turbocharger. Disconnect the oil return line (1) from the HP turbocharger only. Discard the gasket or O-ring.

22. Remove HP Turbocharger V-band Clamp

Loosen the HP-turbocharger turbine housing Vband clamp nut (1). Remove the clamp and discard.





23. Remove HP Turbocharger Center Section from Turbine Housing

Use a soft-blow mallet to gently tap the HPturbocharger loose. Pull the HP-turbocharger center section straight out until the turbine wheel clears the turbine housing.

24. Separate HP Turbocharger from Air Inlet Duct

With the center section of the turbocharger partially removed from the turbine housing, separate the HP-turbocharger air inlet duct (1) from the turbocharger (2).

Install a protective cap into the LPCAC opening. Discard the rubberized pipe connector at the lower opening of the duct.

INSTALLATION



CAUTION

THE NEW HP-TURBOCHARGER MUST BE PRIMED BEFORE IT IS INSTALLED. FAILURE TO DO SO MAY RESULT IN DAMAGE TO THE TURBOCHARGER.

1. Prime New High-Pressure Turbocharger

Set the new HP-turbocharger on the bench. Use an oil squirt can to pump clean oil into lube port as you rotate the turbine shaft.









2. Clean HP Turbocharger Turbine Housing

Clean the inside of the HP-turbocharger turbine housing (1) and the exterior flange with a suitable solvent and clean emery cloth. Note alignment dowel locations.

3. Insert New HP Turbocharger Cartridge into HP Turbine Housing

Carefully guide the new HP-turbocharger assembly into the turbine housing and let it rest freely.

NOTE

LUBRICATE RUBBER FITTINGS AND O-RINGS WITH P-80[®] OR EQUIVALENT LUBRICANT BEFORE INSTALLATION.

4. Install New O-Ring on HP Turbocharger Housing

Lubricate and Install a new O-ring (1) onto the HP-turbocharger housing.

5. Install New Rubberized Pipe Connector in HP Turbocharger Air Inlet Duct

Lubricate and Install a new rubberized pipe connector (1) to the HP-turbocharger air inlet duct.











ON SOME APPLICATIONS THE LOWER HP-TURBOCHARGER AIR-INLET DUCT MOUNTING BOLT MUST BE INSTALLED BEFORE INSTALLING THE AIR INLET DUCT ON THE ENGINE.

6. Install HP Turbocharger Air Inlet Duct

Position the lower HP-turbocharger air inlet duct bolt in place. Remove the LPCAC protective cap and insert the duct with pipe connector into the LPCAC opening.

7. Install HP Turbocharger Air Inlet Duct (cntd.)

Carefully pull the HP-turbocharger away from the turbine housing until the turbocharger can be tilted outward enough to allow the compressor housing to slip into the air inlet duct (1). Carefully set the turbocharger back into the turbine housing after the compressor housing and air inlet duct are assembled.

8. Seat HP Turbocharger Center Section in Turbine Housing

Align and fully seat the HP-turbocharger on the dowels of turbine housing. Install the new V-band clamp (1) and tighten to 110 lb-in (12.4 $N \bullet m$).

9. Tighten HP Turbocharger Air Inlet Duct Mounting Bolts

Install and tighten the upper and lower HPturbocharger air inlet duct mounting bolts (1) to 45 lb-ft (62 N•m).









10. Install Coolant Hoses on HP Turbocharger Air Inlet Duct

Install the water distribution housing hose (1) with clamp to the HP turbocharger air inlet duct. Tighten the clamp. Install the LPCAC coolant return hose (2) with clamp to the air inlet duct. Tighten the clamp.

CAUTION

USE CAUTION WHILE INSTALLING NEW OIL SUPPLY LINE TO AVOID DAMAGE TO HP-TURBOCHARGER. DAMAGED, DISTORTED, OR BENT OIL SUPPLY LINE MUST BE REPLACED.

11. Install HP Turbocharger Oil Supply Line

Insert the new turbocharger oil line with lubricated O-rings into the two turbocharger lube ports. Insert the bolt into the HPturbocharger oil line flange (1) and tighten the bolt.

12. Install LP Turbocharger Oil Supply Line

Assemble a long ¼ in. extension, ratchet, and magnetic 8mm socket. Use the assembled tool to insert the bolt into the LP-turbocharger oil line flange. Tighten the bolt

13. Connect Turbocharger Oil Line

Start the oil line nut (1) to the crankcase fitting by hand. Use a 5/8 inch crows-foot socket to tighten the fitting.









14. Secure HP Turbocharger Actuator Hose

Install two cable lock straps (1) to secure the HP-turbocharger actuator hose (3) to the HP-turbocharger oil supply line (2).

15. Install Coolant Pipes

Assemble the LPCAC coolant supply pipe (1) hoses with clamps to the EGR cooler and LPCAC. Align the pipe tab (2) and start the bolt in the air supply HP-turbocharger duct. Do not tighten the bolt.

16. Install Coolant Pipes (cntd.)

Tighten the upper coolant supply pipe clamp (1) at the EGR cooler.

17. Install Coolant Pipes (cntd.)

Tighten the coolant supply pipe clamp (1) at the LPCAC.







18. Install Coolant Pipes (cntd.)

Remove the loose bolt securing the LPCAC coolant supply pipe tab (1) to the HP-turbocharger duct.

19. Install Coolant Pipes (cntd.)

Lubricate and install a new O-ring on the lower end of the cab-heater coolant-return pipe.

20. Install Coolant Pipes (cntd.)

Set the cab-heater coolant-return pipe into the coolant return duct. Install and tighten the bolt (1).



21. Install Coolant Pipes (cntd.)

Align the cab-heater coolant-return pipe Pclamp and the LPCAC coolant supply pipe tab to the HP-turbocharger duct. Start the bolt (1).

Install the upper bolt (2) through the coolant return duct P-clamp. Tighten both P-clamp bolts (1&2) to secure the pipes to the HPturbocharger duct.









22. Connect Air Supply Line to ACV

Install the air supply line (1) to the ACV and tighten while using a back-up wrench on the ACV fitting (2).

23. Install New O-Ring on LP Turbocharger Compressor Inlet

Lubricate and install a new O-ring (1) on the LP-turbocharger compressor inlet.

24. Install LP Turbocharger Air Inlet Duct

Remove the protective cap from LPturbocharger and install the air inlet duct with cap to the turbocharger. Install and tighten the two bolts (1).

25. Connect Engine Harness Sensor Connectors

Connect the engine harness to the Turbocharger-2 Compressor Inlet Pressuresensor (1), Engine Oil Pressure sensor (2), Air Inlet Temperature sensor (3), and if equipped, the Mass Air Flow sensor (4).









26. Secure Engine Harness

Secure the engine harness to the Coolant Control Valve stud with the nut (1).

27. Install HPCAC Pipe

Remove the protective cap from the HPCAC inlet. Install the HPCAC pipe (1) and clamps to the HP-turbocharger outlet duct and HPCAC inlet. Tighten the clamps. Install and tighten the A/C line clamp bolt (2).

28. Install Air Inlet Duct

Remove the protective caps from the air filter housing and the air inlet duct casting. Install the air inlet duct hose and pipe (1) with clamps to the filter housing and the inlet casting. Tighten both clamps (2).

29. Connect Air Compressor Hose to Air Inlet Duct

Remove the protective cap from the air compressor hose. Slide the hose with clamp over the pipe. Use hose clamp pliers to slide the spring clamp into position.







30. Fill the Cooling System

Fill the cooling system using the Navistar Coolant Management Tool (KL5007NAV).

31. Verify Proper Operation of the Vehicle

Start the engine to verify proper operation, check for leaks, and verify there are no fault codes present.

32. Before Returning the Vehicle to Service...

Install the inner fender, close and latch the hood, remove the wheel chocks, and the job is complete.

CONCLUSION

This concludes the High-Pressure Turbocharger Cartridge Replacement Procedure for TSI 13-12-05.

NOTES

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