



N O S T R U M
HIGH PERFORMANCE



2019-23 Ford Ranger (truck) 2.3L EcoBoost High Flow GDI Injector Set Install Guide

PRODUCT PART SKU#: H750-1584

Warning! Please follow all warnings and instructions found in your vehicle service manual. The following instructions must be read and fully understood before beginning installation. Failure to follow these instructions may result in vehicle damage, personal injury, or death. If these instructions are not fully understood, do not attempt installation.

Please note that this product does require vehicle calibration. Please ensure provisions are made prior to installation. Nostrum Tuning Guides are available upon request. If you are already in touch with a tuner, please have them reach out to support@nostrumshop.com or access the Tuning Guide via the dealer portal on the Nostrum website. If you do not currently have a tuner, we will gladly connect you with someone within the Nostrum dealer network.

Required tools:

- 7 mm socket
- 8 mm socket, deep well
- 10 mm socket, deep well
- Ratchet wrench
- Torque wrench capable of 2 to 25 Nm (20-220 in-lb) **NOTE IMPERIAL UNITS ARE IN INCH-LB.**
- Torque-angle gauge or torque wrench with torque angle capability
- Socket extensions of various lengths
- 10 mm wrench
- 17 mm open end wrench
- 17 mm crow's foot attachment
- Trim removal tool
- Pick tools (may be needed to assist in disconnecting/removing electrical connectors)
- Fuel injector removal tool kit: T10133B or equivalent
- Injector combustion seal compression tool: 0 986 616 097 or equivalent
- 5/16" Quick-Connect fuel line disconnect tool, low profile
 - **Recommend Ford Rotunda tool P/N: 310-250 (includes 3/8" & 5/16" on same tool)**
- ECU programming interface or other calibration delivery method
- Safety glasses
- Fire extinguisher (Class B minimum recommended)

Consumables:

- Clean engine oil
- Lint free absorbent towels
- Disposable rubber gloves

Additional recommended OEM Ford parts (not included but considered "one-time use" by Ford):

Description	Quantity	Part #
High-pressure fuel line, (verify this is the correct part number for your vehicle)	1	K2GZ-9J323-B
EGR tube gasket, (verify this is the correct part number for your vehicle)	1	LB5Z-9E464-C
Fuel injector spring clip, (verify this is the correct part number for your vehicle)	4	AA5Z-9C995-A
Fuel rail mounting bolt, (verify this is the correct part number for your vehicle)	4	W500313-S437

NHP 2019-23 Ford Ranger (truck) 2.3L EcoBoost High Flow GDI Injector Set Parts List:

Description	Quantity	Part #
2.3L EcoBoost injector set (batched set of four H650-1409 GDI injectors)	1	H750-1466
Electrical adapter harness, Tyco Amp 2 pin, male	4	E066-0737

1. Using a 10 mm socket disconnect the negative battery terminal.



Figure 1

2. Insulate the negative terminal with a rag or something equivalent to prevent it from contacting the negative post on the battery and restoring power to the vehicle.



Figure 2

3. Disconnect the four (4) coil pack electrical connectors by pulling back the white locking tabs. Then push down the rear of the tabs and pull the connectors off the coil packs.

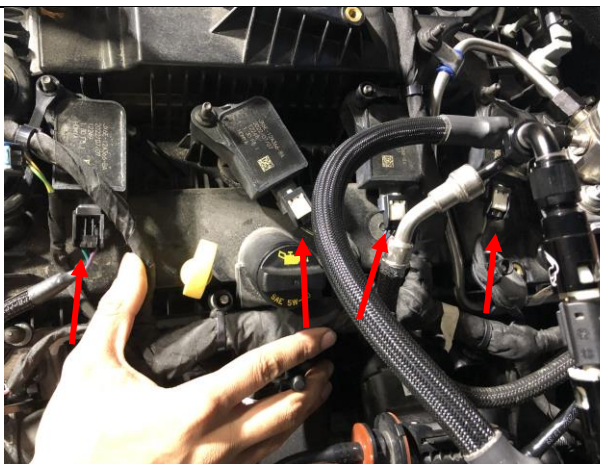


Figure 3

4. Disconnect the two connectors from the VCT oil control solenoids by pulling back the white locking tabs. Then push down the rear of the tabs and pull the connectors off the solenoids.

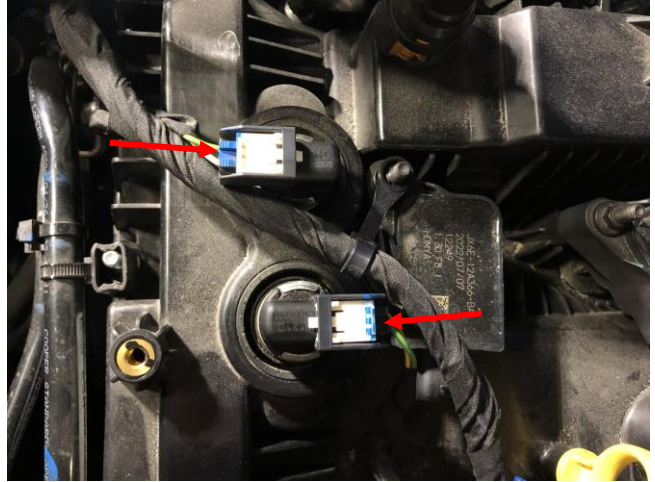


Figure 4

5. Remove the two (2) vacuum hoses from the purge valve solenoid by pushing the protruding fingers on the green tab outward. While doing so, push down the tabs to release the hoses from its locks.

Red arrows indicate fingers.



Figure 5

6. Disconnect the connector from the purge solenoid by pulling back the white locking tab. Then push down the rear of the tab and pull the connector off.

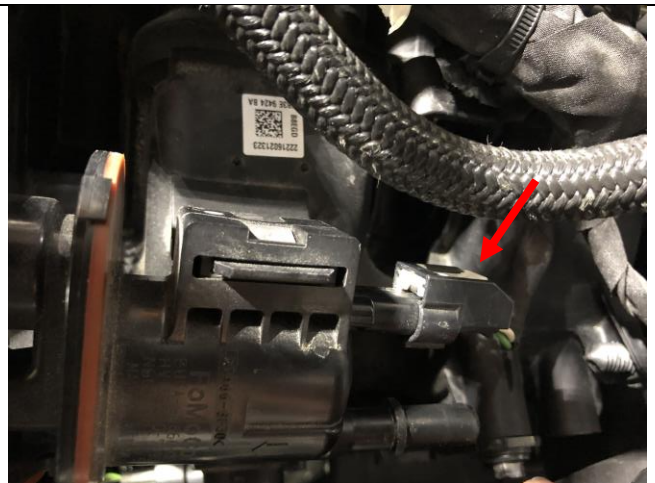


Figure 6

7. Lift the purge solenoid up from its mounting bracket, then remove the solenoid from the vehicle.



Figure 7

8. Remove the vacuum hose connected to the intake manifold by pushing in the white tab beneath the hose then pulling the hose off.

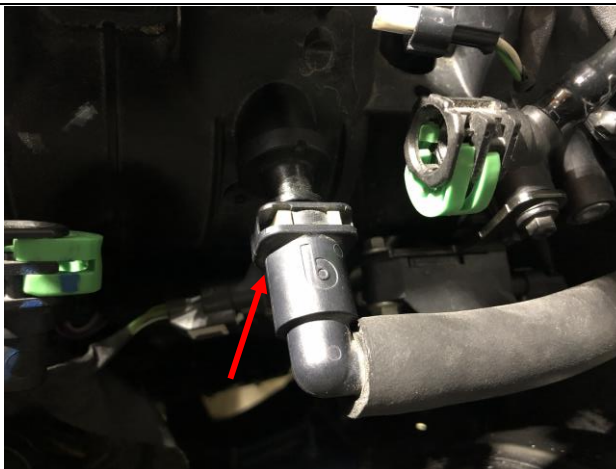


Figure 8

9. Remove the MAP sensor connector and the EGR transducer connector by pulling back the white locking tabs. Then push down the rear of the tabs and pull out the connectors.

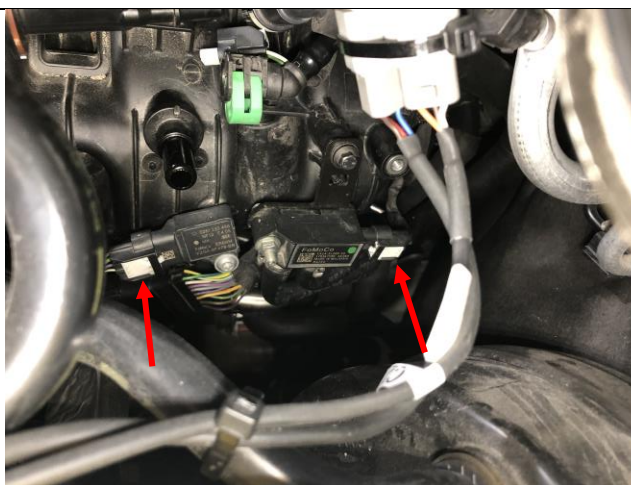


Figure 9

10. Using a 7 mm socket, loosen the worm gear clamp holding the silicone coupler to the throttle body. Then pull the coupler off the throttle body.



Figure 10

11. Release the five (5) wire harness retaining clips from the valve cover.

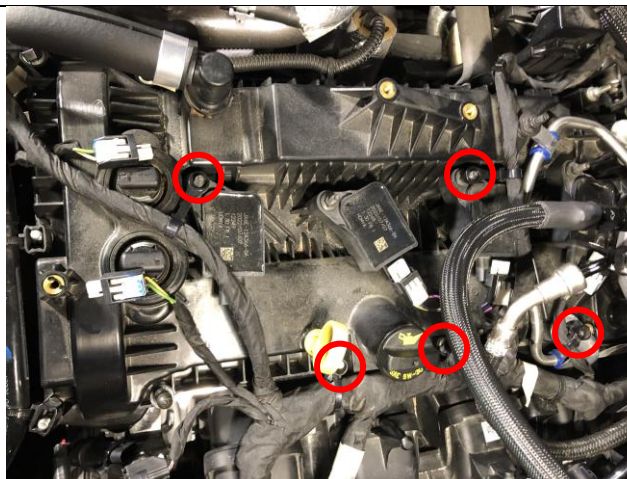


Figure 11

12. Carefully disconnect the four (4) wire harness retaining clips on the front of the intake manifold. A trim removal tool may help with this process.



Figure 12

13. Disconnect the retaining clip from the rear of the intake manifold.



Figure 13

14. Disconnect the throttle body electrical connector by pulling back the red locking tab. Then push down the rear of the connector and pull the connector off.

The red circle shows the location of the connector. See Step 15 for a close up view of the connector location.



Figure 14

15. A close-up of the connector.

The red arrow points toward the part of the connector that needs to be pressed down to pull off the connector after the locking tab has been released.



Figure 15

16. Disconnect the fuel injector harness connectors by pushing in the black tab in the middle of the connectors then pulling them away from each other.

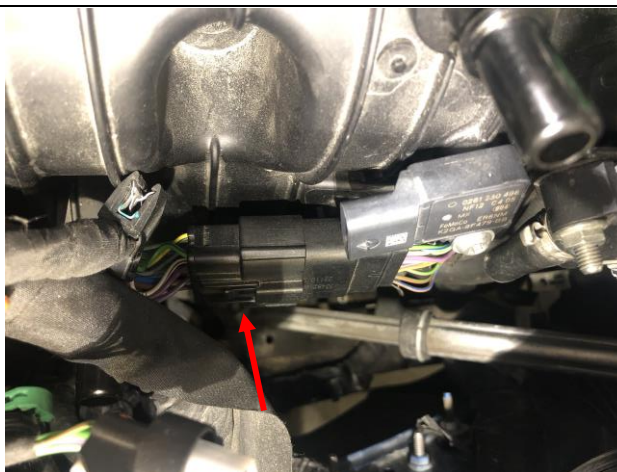


Figure 16

17. Disconnect the retaining clip holding the fuel injector harness connector to the intake manifold.

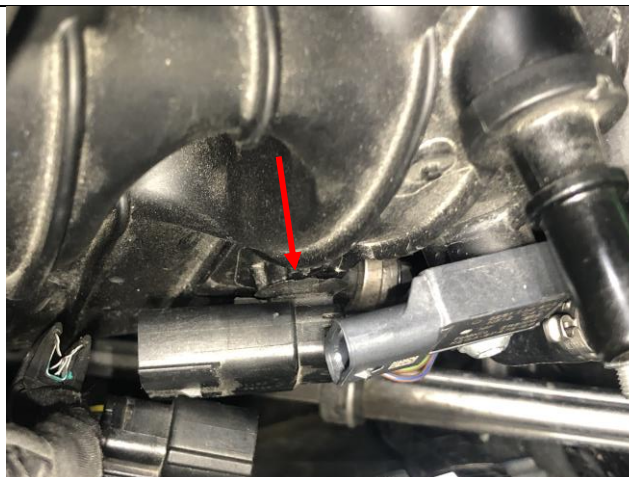


Figure 17

18. Using an 8 mm socket remove the bolt mounting the EGR transducer sensor bracket to the intake manifold.

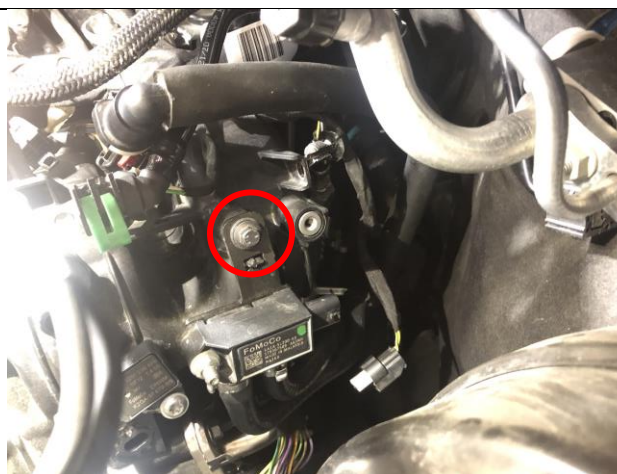


Figure 18

19. Using a 10 mm socket and/or wrench, remove the two 10 mm nuts and one 10 mm bolt connecting the EGR tube to the intake manifold. The 10 mm bolt may be difficult to access. The studs are connected to the nuts, once they are removed, the studs will come out with them.

Ford recommends replacing the EGR gasket after removal of the tube.
Ford P/N: LB5Z-9E464-C

Torque: 11 Nm (97 in-lb)

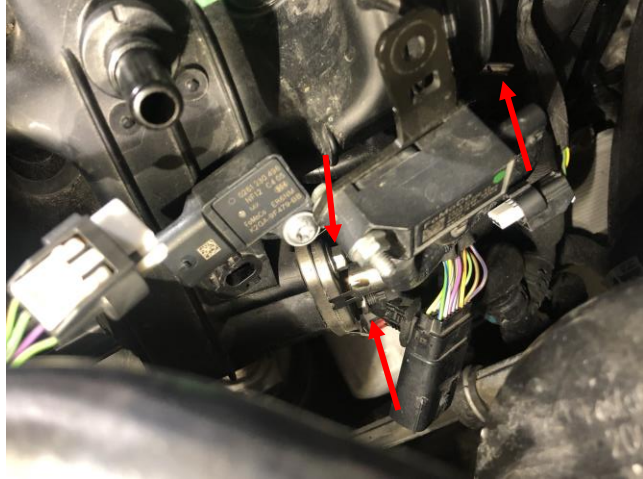


Figure 19

20. Using a 10 mm socket remove the five (5) intake manifold bolts, then position the manifold slightly toward the driver's side fender.

Torque spec: 25 Nm (220 in-lb)

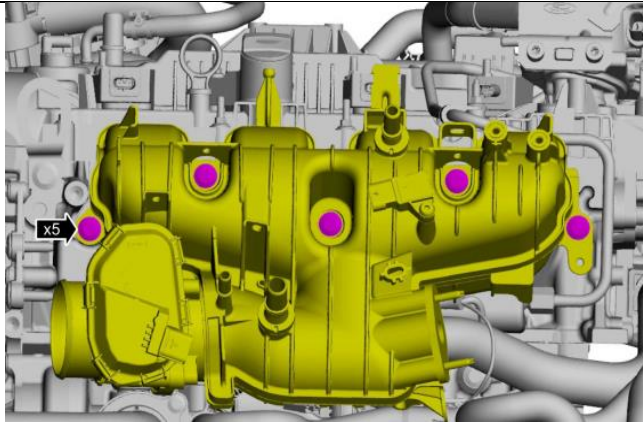


Figure 20

21. Release the two (2) retaining clips holding the knock sensor electrical connectors to the back of the intake manifold.

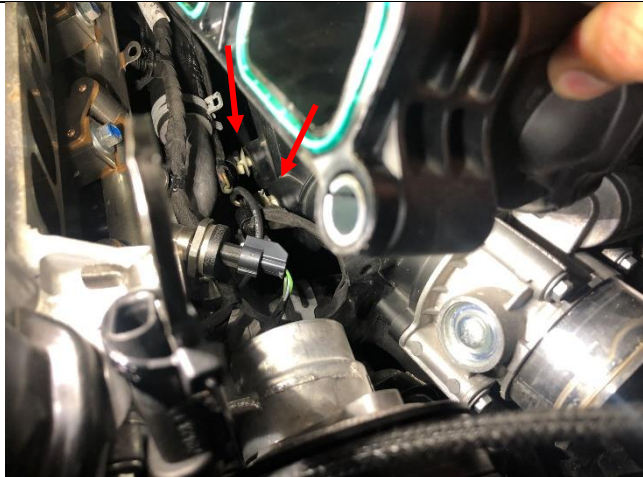


Figure 21

22. Remove the intake manifold by routing it beneath the engine wiring harness and pulling it out from the front of the engine bay.



Figure 22

23. Remove the fuel rail sound dampening foam.



Figure 23

24. Using a 17 mm wrench, loosen the high-pressure line compression nut from the fuel rail. Use an absorbent towel to capture any fuel that leaks from the line during and after removal.

This high-pressure line is categorized as "one-time use" by Ford. Ford recommends replacing the line. Ford P/N: K2GZ-9J323-B

Safety glasses are recommended for this step.

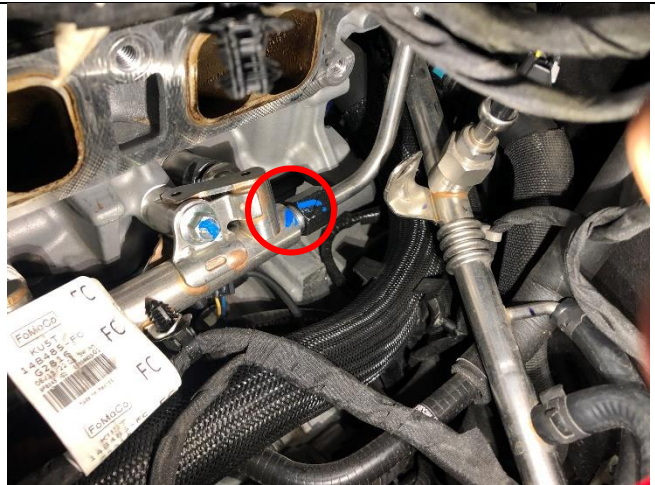


Figure 24

25. This image shows the disconnected high-pressure fuel line with an absorbent towel underneath.

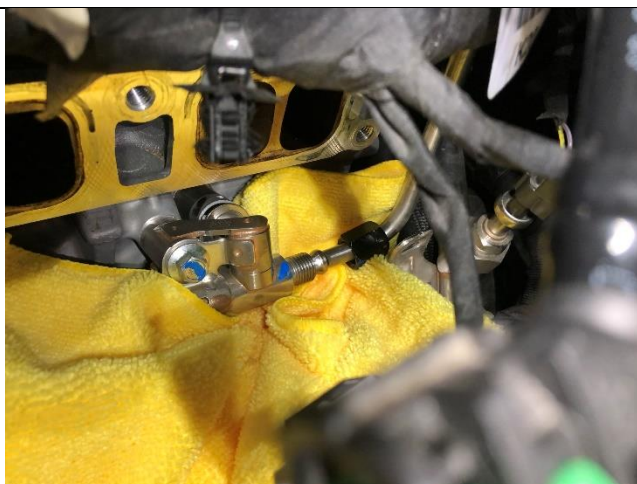


Figure 25

26. Disconnect the electrical connector from the fuel rail pressure sensor by pulling back the white locking tab. Then push down the rear of the tab and pull the connector off.

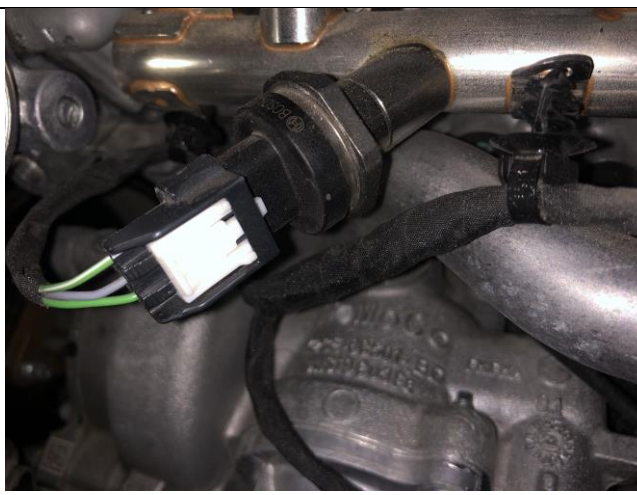


Figure 26

27. Release the three (3) retaining clips mounting the fuel injector connector harness to the fuel rail.



Figure 27

28. Using a 10 mm socket remove the four (4) bolts mounting the fuel rail to the cylinder head.

These bolts are categorized as “one time use” by Ford. Ford recommends replacing the bolts.

Ford P/N: W500313-S437

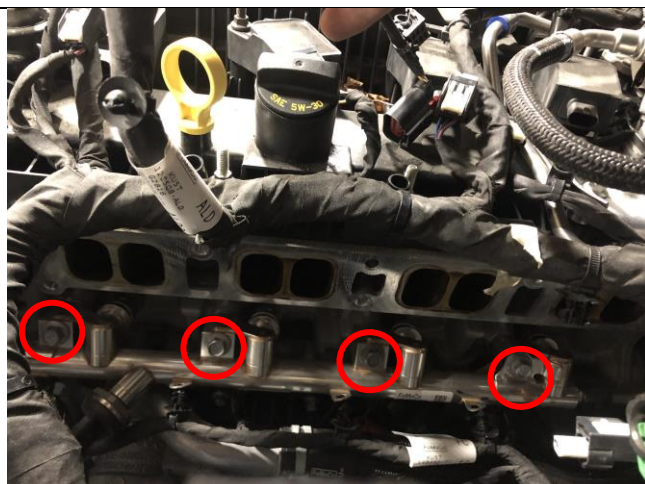


Figure 28

29. Grab both ends of the fuel rail and remove the rail from the vehicle.

Make sure no debris gets into the engine via the intake ports or the injector locations.



Figure 29

30. Remove the fuel injector electrical connectors by pulling back the white locking tabs. Then pushing down the rear of the tabs and pulling the connectors off. Repeat for all four (4) injectors.



Figure 30

31. Cap the fuel rail inlet to prevent debris from entering the fuel system.



Figure 31

32. Put a cap on the high-pressure tube outlet to prevent contamination.



Figure 32

33. If the injectors did not come out of the cylinder head with the fuel rail you will need an injector removal tool (as shown in Step 34) to take them out. We recommend injector removal tool set T10133B (shown in Step 30) or OEM equivalent tools.

Remove injector connectors in the same fashion as Step 30.



Figure 33

34. Injector removal tool set: T10133B

Remove Section 1 and Section 2 from the set.

Section 1 highlighted in yellow.

Section 2 highlighted in green.



Figure 34

35. Slide the open-ended side of Section 2 onto the injector in between the O-ring and the injector inlet.

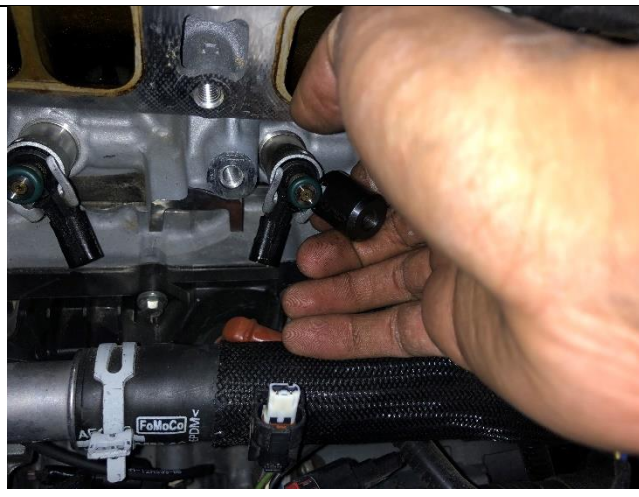


Figure 35

36. Thread Section 1 onto Section 2.

Then use an up and down sliding motion with the tool to remove the injector from the cylinder head.

Be careful not to bend the connection to the rail.



Figure 36

37. Place the fuel rail on a clean, lint-free towel or similar surface.

Once removed, put a cap on the inlet and outlet of the stock injectors to prevent them from being contaminated then set them aside for storage.

WARNING – GDI fuel systems are very sensitive to debris. Pay careful attention to not allow debris to get on injectors, O-rings, fuel fittings etc. Make sure your work environment is clean.



Figure 37

38. Install the new fuel injector spring clips (not included) onto the back of your Nostrum injectors.

These clips are categorized as “one time use” by Ford. Ford recommends replacing the clips.

Ford P/N: AA5Z-9C995-A



Figure 38

39. Figure 39 shows the injector spring clip correctly installed.

Note: These spring clips are important to maintain the injector against the cylinder head pocket and to provide the correct axial position in the injector bore relative to the combustion chamber.



Figure 39

40. Remove the red caps from the injector inlets and then use clean engine oil to lubricate the O-ring radially (don't get any inside the injector if you can avoid it!).

Note – do not apply oil or other lubricants to the combustion seals on the outlet end of the fuel injector.



Figure 40

41. Place your Nostrum fuel injectors into the fuel rail. We recommend documenting which serial number injector is in which cylinder location for future reference. The plastic protruding “fingers” (orientation pin) on the injector over-mold should be placed into the slots on the fuel rail.

Note: these “fingers”, or radial error proof pins, provide the correct clocking position for the injectors to position the injector spray correctly in the combustion chamber.



Figure 41

42. The Nostrum kit supplies you with four (4) injector harness adapters (PN E066-0737) that you will need to connect to the Nostrum fuel injectors and the factory fuel rail harness connectors.



Figure 42

43. Connect the female end of the injector harness adapters to the male connector housing on the Nostrum fuel injectors. Be sure to feel or listen for the “click” to be sure you have seated the male and female housings together correctly.



Figure 43

44. You must now use a combustion seal compression tool to compress the combustion seals on the tip of the injectors before installation. Slide the compression cylinder over the injector stem and gently spin it as you push the cylinder toward the injector body. Note that the tools are directional! Allow the seals on the injectors to compress for at least 15 seconds.

Recommended combustion seal tool set:
0 986 616 097 (or OEM equivalent)



Figure 44

45. This is how the combustion seal compression tool will look when it is fully seated on the injector.

The fuel rail with the injectors attached must be installed immediately after the seals have been compressed.

This step is important to avoid damaging, scoring, or tearing the Teflon seal which can then propagate a total Teflon seal failure later. Plus it makes them easier to push into the injector bore! Note if you are re-installing used injectors you should change the combustion seals prior to this.



Figure 45

46. Carefully place the fuel rail with the injectors attached back into the engine by hand (do not use impact force to seat the rail). Hand tighten the new bolts in location 3 & 4 (either end) to seat the rail and then release the torque on these fasteners. With a 10 mm socket and torque/angle wrench follow the torque angle sequence below. These bolts have a 5-step torquing procedure. Torque-angle wrench required.

Tightening Sequence: 1, 2, 3 & 4. See image to the right for the fastener position #s.

Stage 1: 10 Nm (89 in-lb)

Stage 2: Back off to 0 Nm (0 in-lb)

Stage 3: Wait 5 seconds

Stage 4: 14 Nm (124 in-lb)

Stage 5: Tighten an additional 30 degrees

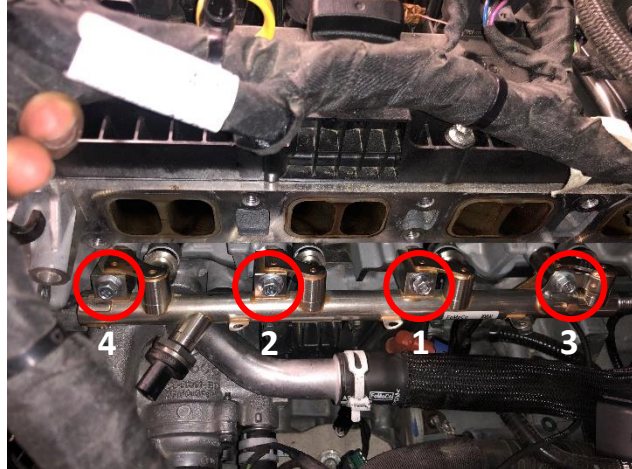


Figure 46

47. Connect the male end of the NHP injector harness adapter to the female housing of the factory fuel injector harness connector.

Be sure to connect the correct cylinder assignment to the correct injector!

After pushing the male and female housings together and feeling the click, push the white locking tab forward to secure them together.

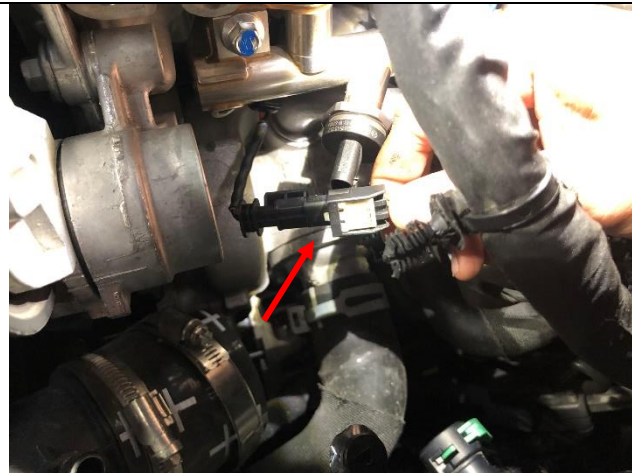


Figure 47

48. Clip the fuel injector harness retainers back into the rail and tuck the extra injector harness wiring behind the coolant hose beneath the fuel rail.



Figure 48

49. Reconnect the electrical connector to the fuel rail pressure sensor. Once you have heard/felt the connector click in place then push in the white locking tab to secure the connector.

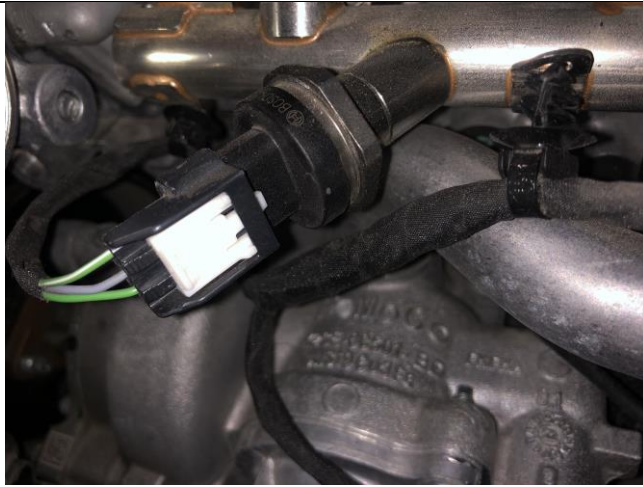


Figure 49

50. If you are installing a new high-pressure fuel line, follow Steps 50 to 54. If you are not doing so skip to Step 55.

Using 8 mm and 10 mm deep well sockets, remove the 8 mm and 10 mm studs that secure the high-pressure fuel line to the valve cover.

The 8 mm stud is circled in green.

The 10 mm stud is circled in yellow.



Figure 50

51. Using a 17 mm wrench, disconnect the high-pressure line from the high-pressure fuel pump, then remove the high-pressure fuel line.

Use clean, lint free towels to capture and soak up the spilled fuel once the line is removed.



Figure 51

52. Install the new high-pressure line in place of the used line you just removed. Align the fittings with the pump and the rail on the engine.



Figure 52

53. Tighten both the 10 mm and 8 mm high pressure line mounting studs to **10 Nm (89 lb.in)**.

With your fingers, tighten the high-pressure line compression nuts to the high pressure pump and fuel rail. **The compression nuts should thread on easily by hand. Do not force them. If they will not thread on easily re-adjust the alignment of the high pressure line and try again. Forcing the nuts in place could damage the fuel rail and/or the pump.**



Figure 53

54. Using a 17 mm crow's foot adapter or similar tool and a torque-angle wrench, torque the high-pressure line compression nut on the fuel pump. The compression nut has a 3-step tightening procedure.

Stage 1: 7 Nm (62 in-lb)

Stage 2: 10 Nm (89 in-lb)

Stage 3: Tighten an additional 38 degrees



Figure 54

55. Torque the high-pressure line compression nut on the fuel rail. The compression nut has a 3-step tightening procedure.

Stage 1: 7 Nm (62 in-lb)

Stage 2: 10 Nm (89 in-lb)

Stage 3: Tighten an additional 38 degrees

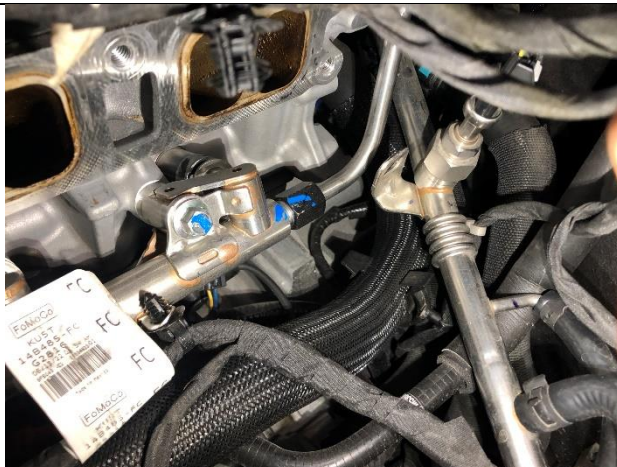


Figure 55

56. Reverse the remainder of the steps to re-assemble the vehicle. Start at Step 23 and work your way back.



Figure 56

Hardware installation is complete.**Calibration**

Do not start your vehicle, this product requires calibration. Please contact your tuner or refer to the Nostrum Tuning Guide to make the necessary changes prior to starting the vehicle. Once calibration is complete, please proceed to the next step.

First Start-Up

1. Be sure to remove all installation tools and loose items from the engine compartment. Follow good, safe practices when working on your vehicle. Be sure to reassemble all parts and components according to your OE service manual.
2. Key cycle the vehicle into the “Accessory On” position (do not go to the Start position). The low-pressure fuel pump will activate and the fuel system will pressurize. Check the high-pressure fuel pump and the low-pressure system for leaks. If no leaks are found, proceed to Step 3.
3. Cycle the key to the Start position and let the vehicle attempt several start cycles. Remember that the fuel lines, pump, and part of the fuel rail are filled with air, therefore this step is necessary to evacuate that air and get the system charged. If it starts, continue with the following steps. If it does not, key off the vehicle. Check the high-pressure lines to the fuel rail, to the pump and the pump itself for leaks. If no leaks are found, proceed to step 4.
4. Key cycle one more time to Start. Engine should start-up and idle. If so, continue with the following steps. If not, repeat Steps 2-4 again.
5. Let the car idle for a few minutes. Check for leaks in the low and high-pressure systems again.
6. Installation is complete!

NOTE: a fault code may appear at the first key cycle due to the extended cranking time or the low-pressure in the fuel rail, both due to the air in the fuel system.

This code should self-clear after the OEM defined quantity of key cycles.

NOTE: Please check for fuel leaks after driving the vehicle and letting it cool for an extended period of time. Fittings may loosen after the first heat cycle due to thermal expansion and contraction.

Retighten fittings if needed.

For additional technical & software support please contact:

Email: support@nostrumshop.com

Phone: 734-548-8677 (during normal business hours)

Revision	Notes	Date
1.0	Initial Release	4/05/2024
1.1	Updated tools and parts list. Other misc updates	4/17/2024
1.2	Production release	4/17/2024