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Intake Air Distribution and Filtering - TD4 2.2L Diesel -

Torque Specifications

Description	Nm	lb-ft
Charge air cooler bolts	10	7
Intake air resonator	10	7

Part Number

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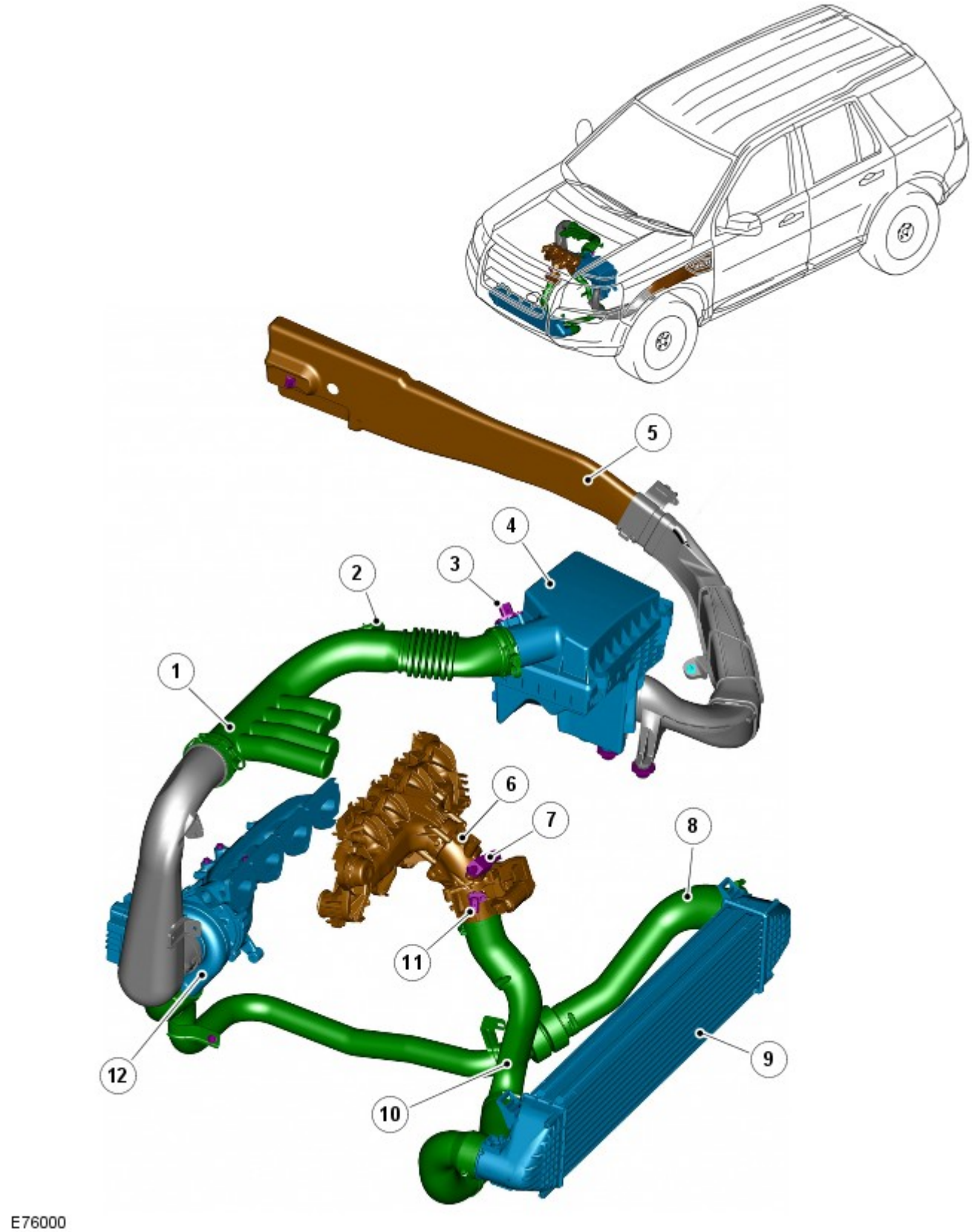
Intake Air Distribution and Filtering - TD4 2.2L Diesel - Intake Air Distribution and Filtering

Description and Operation

COMPONENT LOCATION



E76000

Item	Part Number	Description
1	-	Clean air duct

2		Crankcase ventilation connection
3		Mass Air Flow (MAF) sensor
4		Air filter housing
5		Dirty air intake duct
6		Electronic throttle and intake manifold assembly
7		Manifold Absolute Pressure (MAP) sensor
8		Hose - turbocharger to charge air cooler
9		Charge air cooler
10		Hose - charge air cooler to electronic throttle (3 piece)
11		Intake Air Temperature (IAT) sensor
12		Turbocharger and exhaust manifold

OVERVIEW

The TD4 engine intake air system provides filtered and pressurized air to the engine cylinders, to promote complete combustion of the injected fuel under all engine conditions.

A dirty air intake duct is located behind the Left-Hand (LH) front fender and is connected to the air filter housing. Air is drawn into the intake air duct and directed through an oil impregnated replaceable filter element, located within the air filter housing. The filtered intake air is then directed through the clean air duct to the compressor side of the turbocharger.

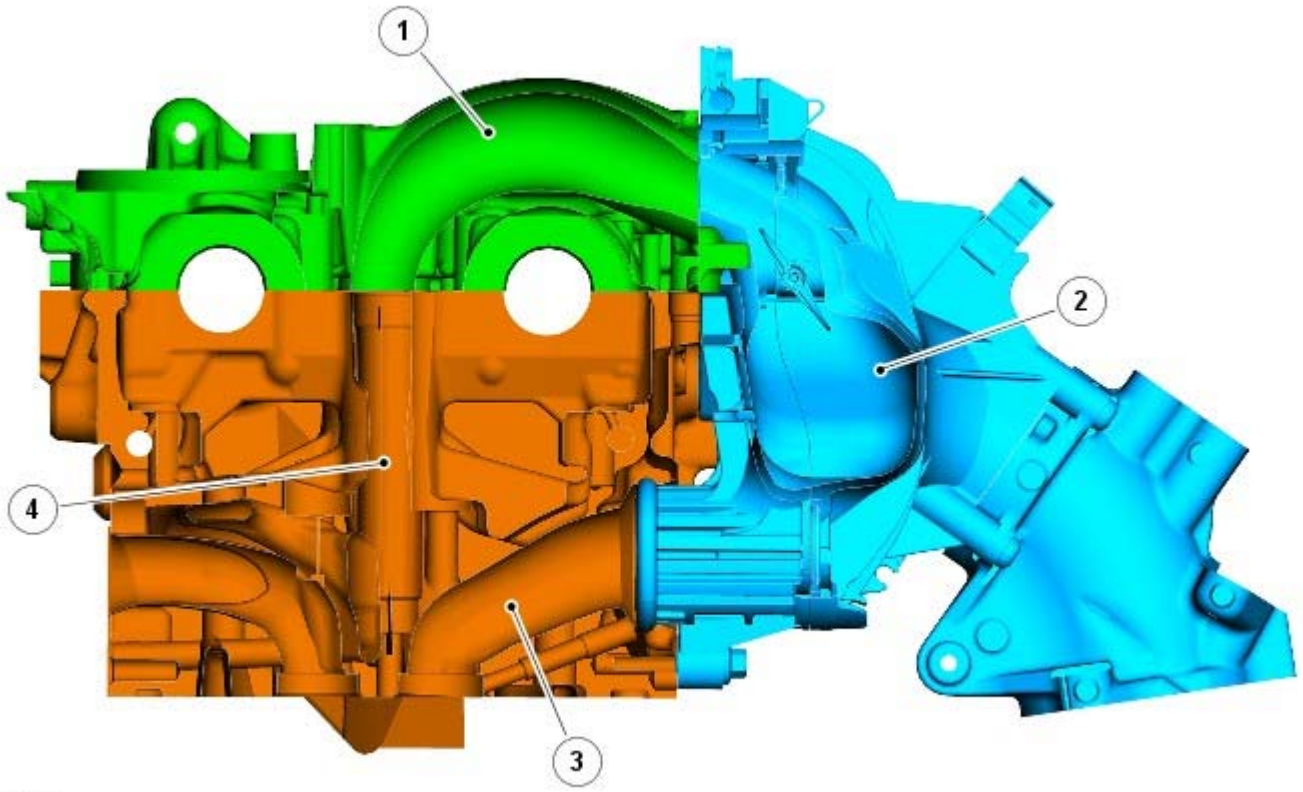
The clean air duct is manufactured to incorporate 4-quarter wave tubes and a connection to the crankcase ventilation system. The quarter wave tubes reduce the Noise, Vibration and Harshness (NVH) levels created by the air traveling through the duct. The connection to the crankcase ventilation system allows environmentally harmful gases and vapors to be drawn from the engine crankcase, and into the clean air duct. The gases and vapors are mixed with the filtered intake air and burned in the cylinders.

The turbocharger compresses and directs the pressurized hot intake air through a large bore connecting hose to the charge air cooler. The air passes through the charge air cooler and is subsequently cooled to increase the intake air density. The output side of the charge air cooler directs the cool dense air through a large bore connecting hose to the electronic throttle and intake manifold, where the air is then distributed via the intake manifold ports to the individual engine cylinders.

Exhaust gas via the Exhaust Gas Recirculation (EGR) system is also directed into the intake air system to reduce Oxides Of Nitrogen (NOX) emissions. A pipe connects the EGR valve located at the Right-Hand (RH) side of the engine, to the intake manifold located at the Left-Hand (LH) side of the engine. The exchange of exhaust gas into the intake manifold is controlled by the Engine Control Module (ECM) during certain engine operating conditions.
For additional information, refer to: Engine Emission Control (303-08B Engine Emission Control - TD4 2.2L Diesel, Description and Operation).

Electronic sensors are strategically located around the intake air system and constantly provide information of IAT, MAF and MAP to the ECM. This information is processed and used by the ECM for adjusting engine performance to meet the current operating conditions, and driver demands.
For additional information, refer to: Electronic Engine Controls - 2.2L Diesel (303-14 Electronic Engine Controls - 2.2L Diesel, Description and Operation).

INTAKE MANIFOLD



E82800

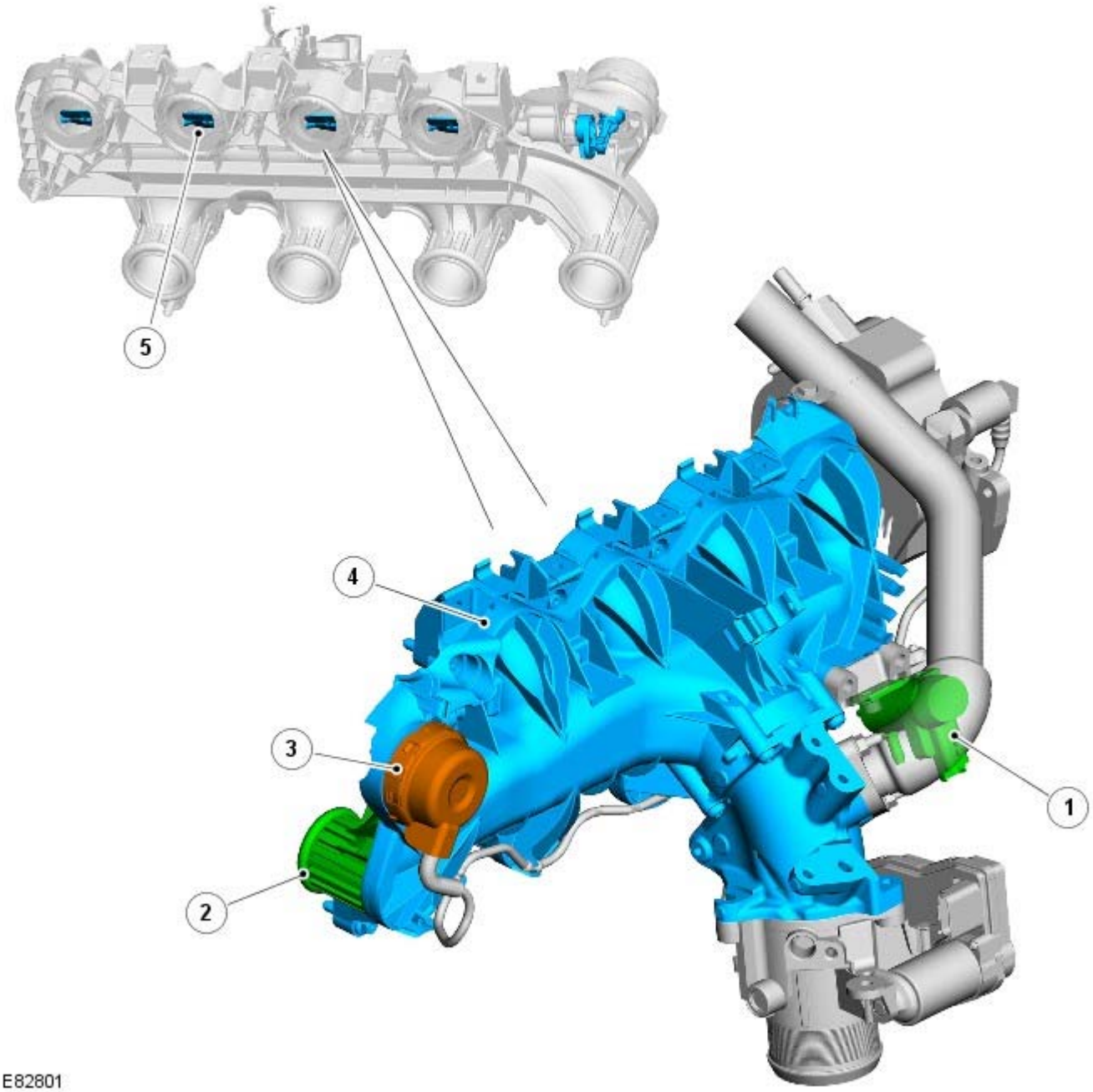
Item		Description
1		Intake air filling tract
2		Intake manifold
3		Cylinder head swirl port
4		Cylinder head filling port

The TD4 cylinder head and intake manifold are designed to optimize levels of swirl across the engines speed range, and provide a high volume of air into the cylinders. The intake manifold is designed with a lower row of 4 helical swirl ports, and an upper row of 4 filling ports with port-deactivation device. The 8 ports are sealed to the cylinder head and structural camshaft cover mating ports with a shaped sealing ring. The helical swirl port is configured to create optimum swirl for efficient combustion; while the filling port is provided to supply high volumes of air without disturbing in-cylinder swirl. The intake manifold port de-activation device is controlled by the ECM.
For additional information, refer to: Electronic Engine Controls - 2.2L Diesel (303-14 Electronic Engine Controls - 2.2L Diesel, Description and Operation).

Each cylinder is supplied air through the helical swirl port, and when activated, through the filling port. The helical swirl port is always open and directs air from the intake manifold lower port at a tangent into the combustion chamber. The filling port is normally closed, and is only opened during certain engine operating conditions by the ECM. When opened the filling port directs air from the intake manifold upper port, and through the curved intake tracts into the combustion chamber. The intake tracts are cast with the structural camshaft cover, and join the intake manifold upper filling ports to the cylinder head machined filling ports.

At low engine loads gas flow is so low that the filling port is closed off. This has the effect of raising gas velocity through the helical port and increasing in-cylinder swirl to the optimum rate. To avoid the risk of the high gas flow creating excessive swirl, the ECM opens the filling port under high gas-flow conditions to maintain consistent optimum swirl across the engines operating range.

Intake Manifold Port De-Activation



E82801

Item		Description
1		Solenoid-operated valve
2		Intake manifold helical swirl port
3		Vacuum-operated actuator
4		Intake manifold filling port
5		Butterfly valve (4 off)

Port de-activation is operated by 4-butterfly valves connected on a common shaft within the intake manifold. Each butterfly valve is housed within a corresponding intake manifold upper filling port. The common shaft is connected to a vacuum-operated actuator, and is operated by a solenoid valve under the control of the ECM. The vacuum required for port de-activation is supplied from the engine mounted vacuum pump.

For additional information, refer to:

Engine (303-01B Engine - TD4 2.2L Diesel, Description and Operation),
Electronic Engine Controls - 2.2L Diesel (303-14 Electronic Engine Controls - 2.2L Diesel, Description and Operation).

Port de-activation (opening of the filling ports) only occurs when the coolant temperature is greater than 10°C, and under the following conditions:

- Engine speed is greater than 1,800 rpm.
- Engine load is greater than 15%.

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Intake Air Distribution and Filtering - TD4 2.2L Diesel - Intake Air Distribution and Filtering

Diagnosis and Testing

Principles of Operation

For a detailed description of the intake air distribution and filtering system, refer to the relevant Description and Operation section in the workshop manual.
REFER to: Intake Air Distribution and Filtering (303-12B Intake Air Distribution and Filtering - TD4 2.2L Diesel, Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
• Hoses and ducts (damage/connections) • Air cleaner element (contaminated/blocked) • Restricted air intake • Seals and gaskets	• Mass Air Flow (MAF) sensor • Secondary Air Injection (AIR) Manifold Absolute Pressure (MAP) sensor • Throttle body • Harness (security/damage) • Connections (security/damage)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Vehicle does not start/hard starting/poor performance	• Restricted/blocked air intake • Restricted/blocked air cleaner element	• Ensure the air intake system is free from blockage and is correctly installed • Install a new air cleaner element as necessary. REFER to: Air Cleaner Element (303-12, Removal and Installation).
Excessive intake noise	• Intake pipe disconnected/damaged after the air cleaner • Air cleaner assembly incorrectly assembled/damaged	• Check for correct installation and integrity of air intake system • Check for correct installation and integrity of the air cleaner assembly. REFER to: Air Cleaner Element (303-12, Removal and Installation).

DTC Index

NOTE: If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

NOTE: Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).

NOTE: When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the DMM leads into account.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

NOTE: Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.

NOTE: If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Causes	Action
P006900	MAP - Barometric Pressure Correlation	• Boost pressure sensor circuit - short to ground, power, open circuit • Barometric pressure sensor failure	Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
P007200	Ambient Air Temperature Sensor Circuit Low	• Ambient air temperature sensor circuit - short to ground, open circuit	Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
P007300	Ambient Air Temperature Sensor Circuit High	• Ambient air temperature sensor circuit - short to power	Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
P009700	Intake Air Temperature Sensor 2 Circuit Low	• Intake air temperature sensor voltage below lower limit	Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
P009800	Intake Air Temperature Sensor 2 Circuit High	• Intake air temperature sensor voltage above upper limit	Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
P010000	Mass or Volume Air Flow A Circuit	• MAF Sensor signal circuit - short to ground, power, open circuit	Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
P010221	Mass or Volume Air Flow A Circuit Low	• Air flow PWM raw signal above upper limit	Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
P010226	Mass or Volume Air Flow A Circuit Low	• Air flow PWM corrected signal above upper limit	Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
P010322	Mass or Volume Air Flow A Circuit High	• Air flow PWM raw signal above upper limit	Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
P010327	Mass or Volume Air Flow A Circuit High	• Air flow PWM corrected signal above upper limit	Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
P011200	Intake Air Temperature Sensor 1 Circuit Low	• Intake air temperature sensor 1 circuit - short to ground	Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
P110222	Mass Air Flow Sensor in Range But Lower Than Expected	• Air Mass (measured) is too low (not plausible) with calculated reference air mass during overrun: ratio of calculated/actual too high	Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
P110321	Mass Air Flow Sensor in Range But Higher Than Expected	• Air Mass (measured) is too high (not plausible) with calculated reference air mass during overrun: ratio of calculated/actual too low	Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
P222700	Barometric Pressure Circuit Range/Performance	• Atmospheric Pressure Sensor defective	Install a new module, refer to the new module/component installation note at the top of the DTC Index. REFER to: Powertrain Control Module (PCM) (303-14, Removal and Installation).

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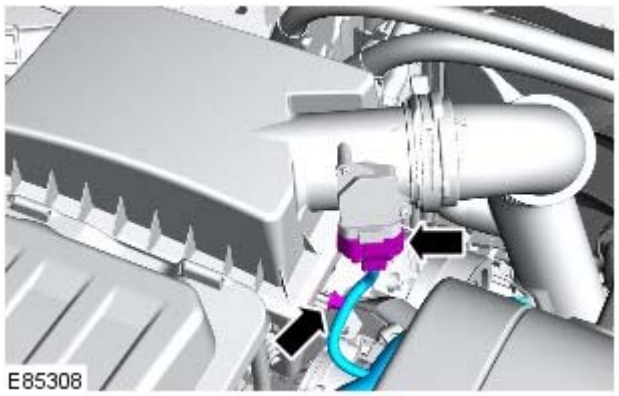
Intake Air Distribution and Filtering - TD4 2.2L Diesel - Air Cleaner

Removal and Installation

Removal

NOTE: Petrol model shown, diesel similar.



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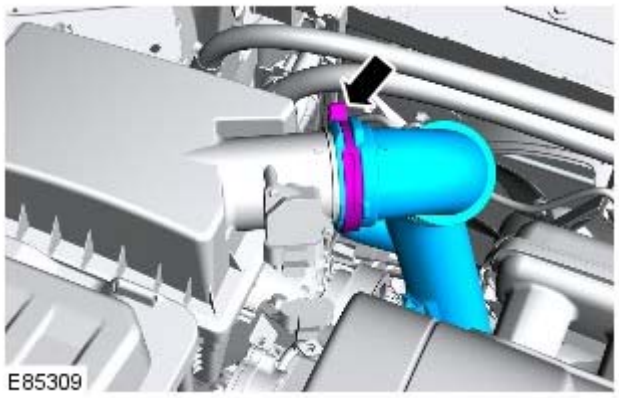

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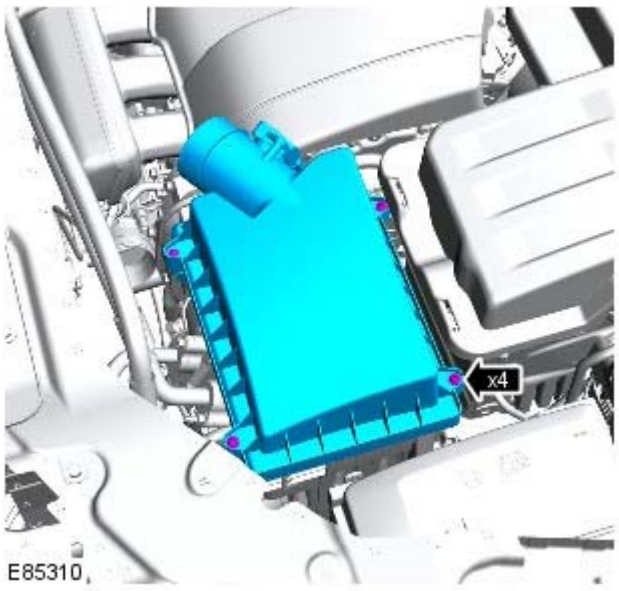

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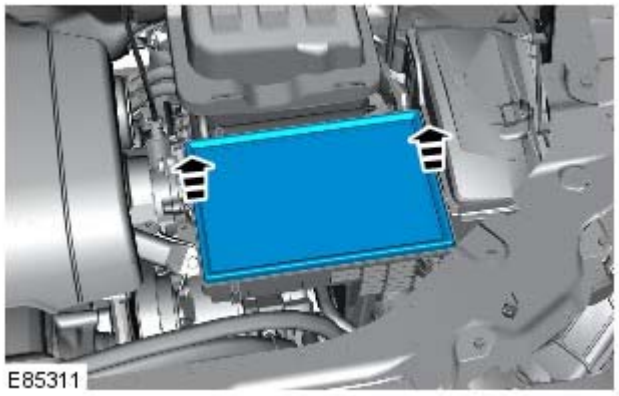

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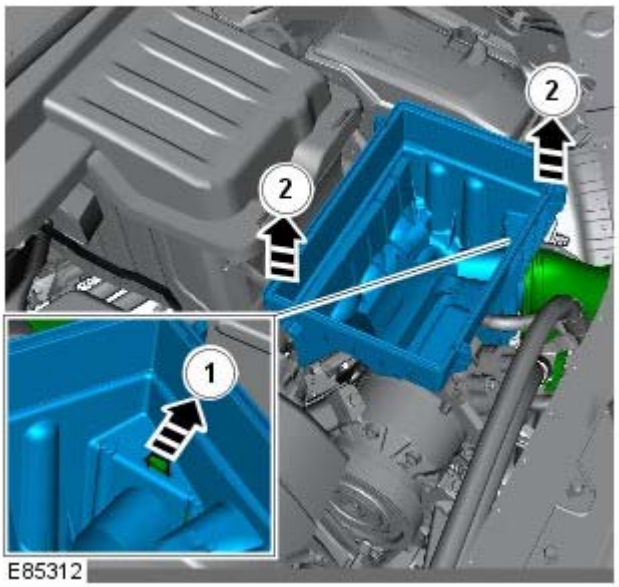
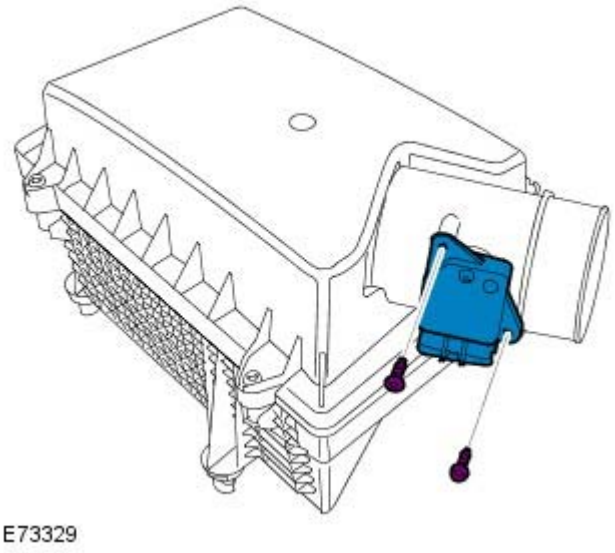


5. NOTE: Note the fitted position.



6. NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. Install the air cleaner element.
2. Install the MAF sensor.

3. NOTE: Align to the position noted on removal.

   Install the air cleaner housing.

4. Install the air cleaner outlet pipes.

5. Connect the MAF sensor electrical connector.

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Intake Air Distribution and Filtering - TD4 2.2L Diesel - Charge Air Cooler

Removal and Installation

Removal

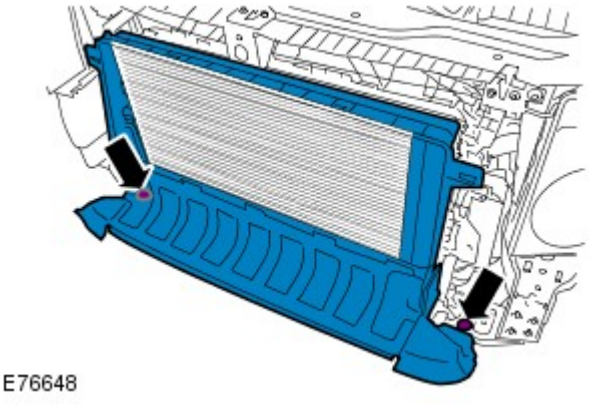
NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Remove the front bumper.

   Refer to: Front Bumper (501-19 Bumpers, Removal and Installation).



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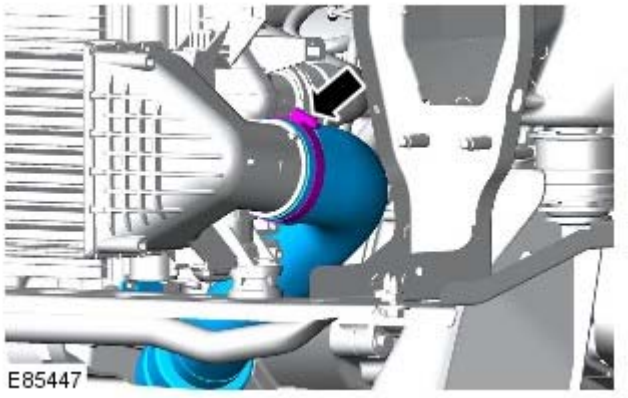
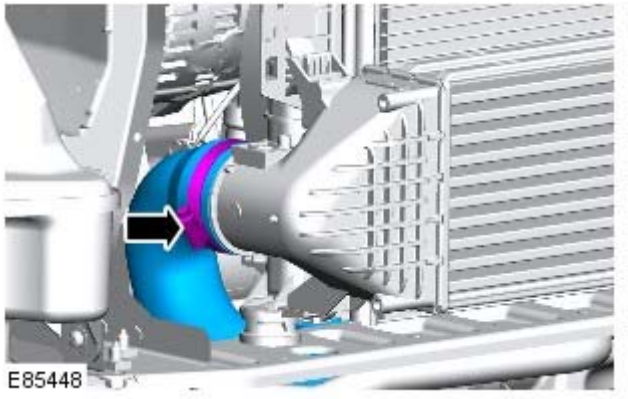
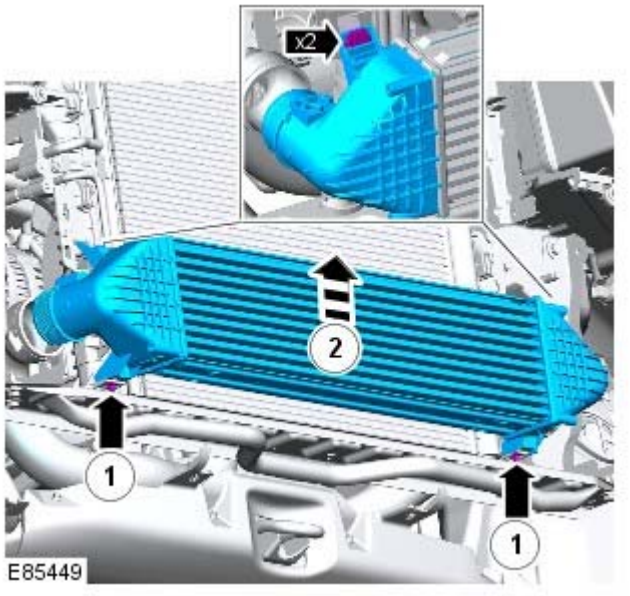


4. *Torque:* 5 Nm



5. *Torque:* 5 Nm



6. *Torque:* 10 Nm

Installation

1. To install, reverse the removal procedure.

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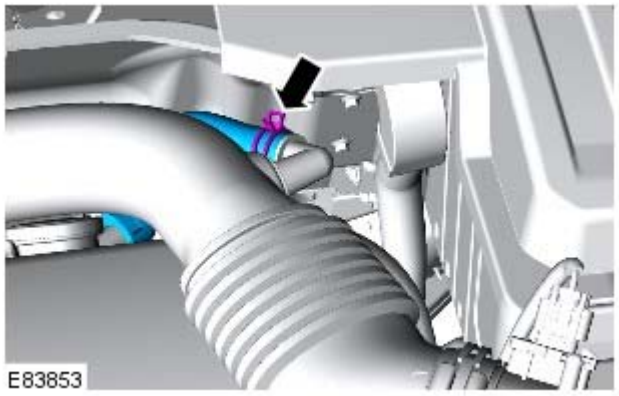
Intake Air Distribution and Filtering - TD4 2.2L Diesel - Intake Air Resonator

Removal and Installation

Removal



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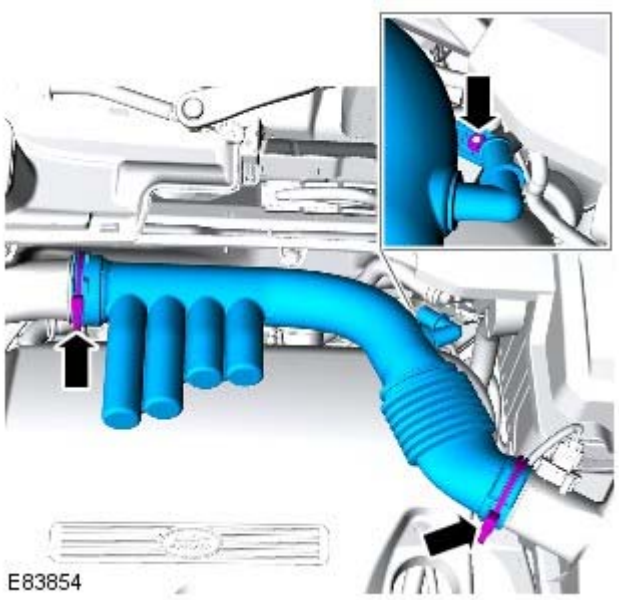

2. *Torque:* 10 Nm

Installation

1. To install, reverse the removal procedure.