

Intake Air Distribution and Filtering - TDV6 3.0L Diesel -**Torque Specification**

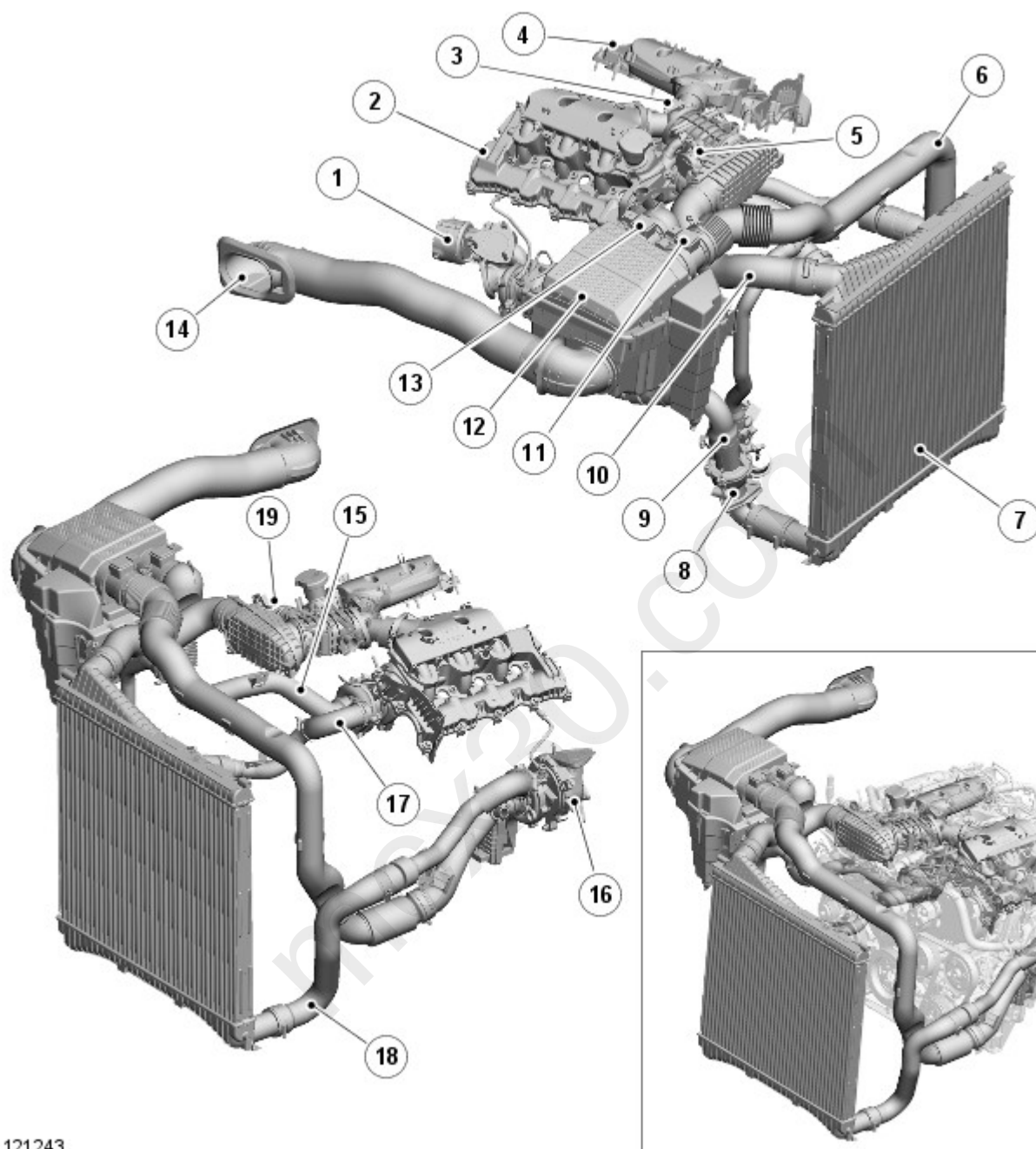
Description	Nm	lb-ft	lb-in
Air cleaner outlet pipe circlip	3.5	-	31
Charge air cooler to radiator bolts	15	11	-

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Intake Air Distribution and Filtering - TDV6 3.0L Diesel - Intake Air Distribution and Filtering - Component Location

Description and Operation

Component Location



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ItemDescription

1	Secondary turbocharger
2	RH (right-hand) intake manifold
3	Charge air MAPT (manifold absolute pressure and temperature) sensor
4	LH (left-hand) intake manifold
5	Intake manifold throttle actuator
6	Intake air to primary turbocharger pipe
7	Charge air cooler
8	Compressor shut-off and recirculation valve assembly
9	Pipe - Compressed air from secondary turbocharger to charge air cooler
10	Charge air cooler to throttle intake manifold pipe
11	MAF (mass air flow) / IAT (intake air temperature) sensor (primary turbocharger)
12	Air cleaner housing

MAF sensor (secondary turbocharger)	
14	Air intake
15	Intake air to secondary turbocharger pipe
16	Primary turbocharger
17	Pipe - Compressed air from secondary turbocharger to charge air cooler
18	Pipe - Compressed air from primary turbocharger to charge air cooler
19	Charge air temperature sensor

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Intake Air Distribution and Filtering - TDV6 3.0L Diesel - Intake Air Distribution and Filtering - Overview

Description and Operation

Authoring Template

OVERVIEW

The intake air distribution and filtering system comprises:

- Two [MAF \(mass air flow\)](#) / [IAT \(intake air temperature\)](#) sensor
- Charge air temperature sensors
- Air cleaner and housing
- Charge air cooler
- Primary and secondary turbochargers.

The system cleans, cools and compresses the intake air. The turbochargers compress the air which is then cooled in the charge air cooler before being mixed with the injected fuel in the cylinder producing a high energy combustion increasing engine performance.

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Intake Air Distribution and Filtering - TDV6 3.0L Diesel - Intake Air Distribution and Filtering - System Operation and Component Description

Description and Operation

System Operation

OPERATION

Air is drawn into the air intake system via the air intake vent located on the front [RH \(right-hand\)](#) fender of the vehicle. The air passes into the air cleaner housing and passes through the air cleaner. The air cleaner is a pleated, paper type filter which removes dust, pollen etc. from the intake air.

The filtered clean air passes from the air cleaner housing to the turbocharger inlet valve assembly. Depending on engine load and operating conditions, the intake air can be passed to only the primary turbocharger or to both the primary and secondary turbochargers.

Exhaust gasses leaving the exhaust manifolds are used to drive a turbine in the turbocharger which in turn drives a compressor. The rotational speed of the compressor is directly related to the speed of the exhaust gasses leaving the engine. Increased exhaust gas emission drives the turbine, and subsequently the compressor, faster, further compressing the intake air delivered to the engine.

The compression of the air by the turbocharger increases the air pressure. The intake air is passed into the charge air cooler which reduces the air temperature as it passes through the cooler. This in turn increases the volumetric efficiency by increasing intake air charge density. The cooled and compressed air is mixed with the injected fuel in the cylinder producing a high energy combustion increasing engine performance.

Component Description

DESCRIPTION

Air Cleaner and Housing

The air cleaner housing is located in the front [RH](#) side of the engine compartment. The housing has a water drain. Two [NVH \(noise, vibration and harshness\)](#) mounting grommets secure the air cleaner housing.

The air cleaner element is a pleated paper type element with a rubber seal around its perimeter. The seal locates in a groove in the housing and prevents air by-passing the element. The housing upper lid can be removed by removing 4 screws to release the lid.

Charge Air Cooler

The charge air cooler is located at the front of the engine compartment, between the [A/C \(air conditioning\)](#) condenser and the engine cooling radiator.

Turbochargers are designed to force more air mass into the engine intake manifold and combustion chambers. This compression process by the turbocharger produces heat which can reduce the performance gains of turbocharging due to reduced density of the intake air and an increase the cylinder combustion temperature. To counteract this, the charge air cooler is used to reduce the intake air temperature which increases the density of the air allowing more air molecules to be delivered to the combustion chamber.

The cooler is a cross flow type cooler and has inlet and outlet connections. The bottom [LH \(left-hand\)](#) and [RH](#) connections are the inlets for the compressed air delivered from the turbocharger compressors. The top [RH](#) connection is the outlet for the cooled compressed air to be delivered to the throttle intake manifold.

The charge air cooler is an air-to-air type cooler. Heated air from the turbochargers is passed through tubes in the cooler. Ambient air passing over the tubes cools the intake air as it passes through the cooler.

Air Intake Components

The air intake components comprise 3 main components; airbox, intake ducting and a throttle intake manifold.

Airbox

The airbox allows for the connection of the cooled intake air from the charge air cooler to the throttle intake manifold. The air cleaner housing houses a [MAF \(mass air flow\)](#) sensor incorporating a temperature sensor which measures the air entering the turbochargers and passes this information to the [ECM \(engine control module\)](#).

Refer to: [Electronic Engine Controls](#) (303-14B Electronic Engine Controls - TDV6 3.0L Diesel, Description and Operation).

There are two ducts from the airbox, one ducts air to the primary turbocharger and the other to the secondary turbocharger. Boost pressure is applied via the secondary ducting to the secondary turbocharger to maintain the correct lubrication during driving conditions where the secondary turbocharger is inactive.

Refer to: [Turbocharger](#) (303-04D Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Description and Operation).

Throttle Intake Manifold

The throttle intake manifold is located between the 2 intake manifolds and the airbox. The manifold splits the air entering the engine between the 2 intake manifolds.

The throttle intake manifold houses a [DC \(direct current\)](#) electric throttle actuator which controls a flap in the body of the manifold. The flap is controlled by the [ECM](#) and is constantly adjusted in response to driver inputs via the throttle pedal to precisely control the amount of air allowed into the intake manifolds.

Refer to: [Electronic Engine Controls](#) (303-14B Electronic Engine Controls - TDV6 3.0L Diesel, Description and Operation).

Pipe connections on either side of the throttle intake manifold allow for the attachment of the exhaust gas outlet pipes from the [EGR \(exhaust gas recirculation\)](#) valves. The ends of the [EGR](#) pipes are specially designed to mix the recirculated exhaust gas with the intake air and provide an even distribution to each side of the engine.

Refer to: [Engine Emission Control](#) (303-08B Engine Emission Control - TDV6 3.0L Diesel, Description and Operation).

A boost pressure sensor is located on the top of the manifold where the air flow splits for the 2 intake manifolds. The pressure sensor measures the pressure of the intake air as delivered from the one or both of the turbochargers and passes this information to the [ECM](#) for turbocharger control.

Refer to: [Electronic Engine Controls](#) (303-14B Electronic Engine Controls - TDV6 3.0L Diesel, Description and Operation).

Intake Manifolds

The intake manifolds are an integral part of the cylinder head covers. Each intake manifold is connected to the throttle intake manifold via a push fit, sealed connection. The intake manifolds direct intake air to the inlet valves for each combustion chamber.

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Intake Air Distribution and Filtering - TDV6 3.0L Diesel - Intake Air Distribution and Filtering

Diagnosis and Testing

Principles of Operation

For a detailed description of the intake air distribution and filtering system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (303-12B Intake Air Distribution and Filtering - TDV6 3.0L Diesel)

[Intake Air Distribution and Filtering](#) (Description and Operation),
[Intake Air Distribution and Filtering](#) (Description and Operation),
[Intake Air Distribution and Filtering](#) (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 checked and/or the donor vehicle.

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

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

Visual Inspection

Mechanical	Electrical
● Hoses and ducts condition and installation ● Air cleaner element condition and installation ● Restricted air intake ● Vacuum hoses condition and installation ● Pipework to turbocharger condition and installation ● Turbocharger condition and installation ● Charge air coolers	● Fuse(s) ● Wiring harness ● Loose or corroded electrical connector(s) ● Mass Air Flow (MAF) sensor ● Air Charge Temperature (ACT) sensor ● Manifold absolute pressure (MAP) sensor ● Intake Air Temperature (IAT) sensor ● Intake air shut-off throttle solenoid

3. **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. **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 Causes	Action
Vehicle does not start/hard starting	● Restricted/Blocked air intake ● Restricted/Blocked air cleaner element	Clear the restriction. Replace the air cleaner element as necessary.
Poor performance	● Turbocharger fault ● Throttle body fault ● Intercooler hoses	Check the turbocharger. Check the intake air shutoff throttle function (make sure the throttle body returns to the open position). Check the intercooler hoses.
Excessive intake noise	● Intake air leak after the turbocharger ● Intake pipe disconnected/damaged after the air cleaner ● Air cleaner assembly incorrectly assembled/damaged	Check the joint between the air intake elbow and the intake air shutoff throttle. Check the joints between the throttle body outlets and the intake manifolds. Check the charge air cooler seals. Check the intake system and hoses for correct installation/damage.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00. REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Engine Control Module (PCM) 3.0L TdV6 (100-00, Description and Operation).

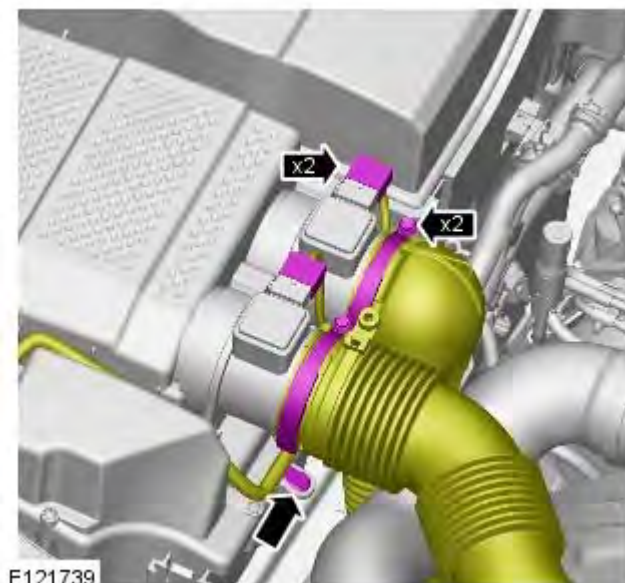
Intake Air Distribution and Filtering - TDV6 3.0L Diesel - Air Cleaner

Removal and Installation

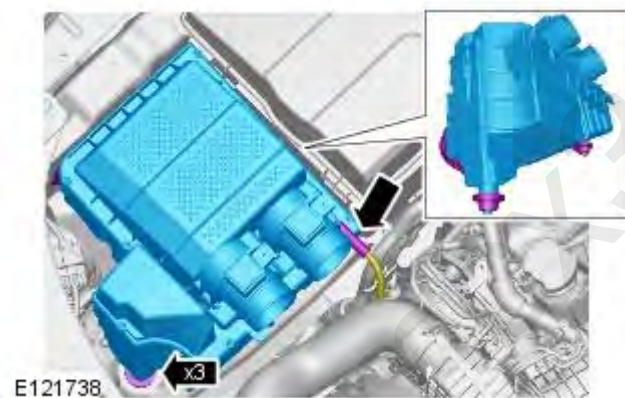
Removal

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

1.

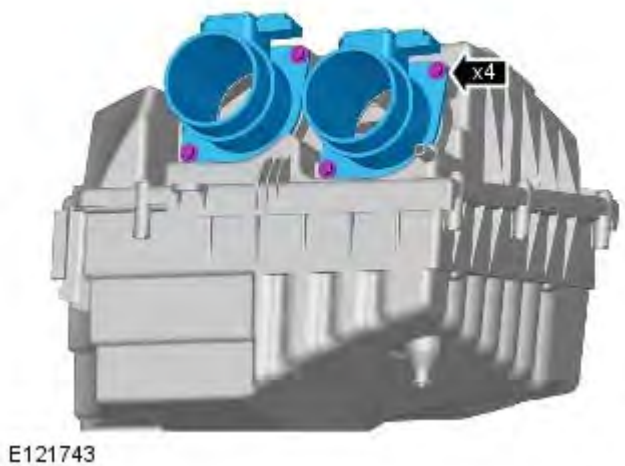


2.

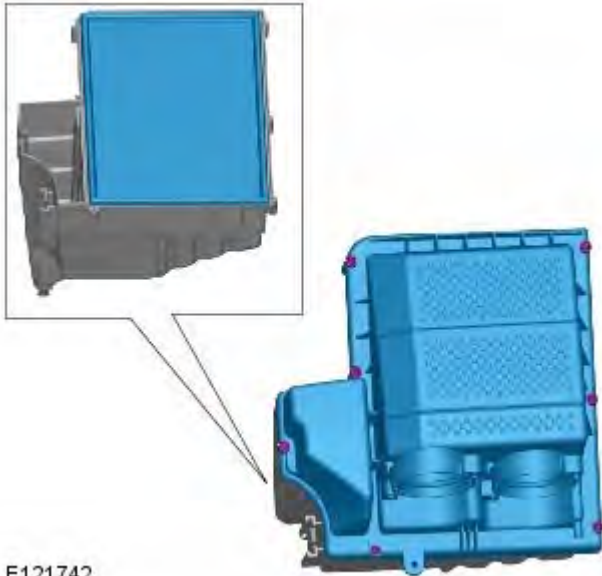


- NOTE: Do not disassemble further if the component is removed for access only.

- NOTE: Remove and discard the O-ring seals.



4.



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Installation

1. To install, reverse the removal procedure.

Intake Air Distribution and Filtering - TDV6 3.0L Diesel - Air Cleaner

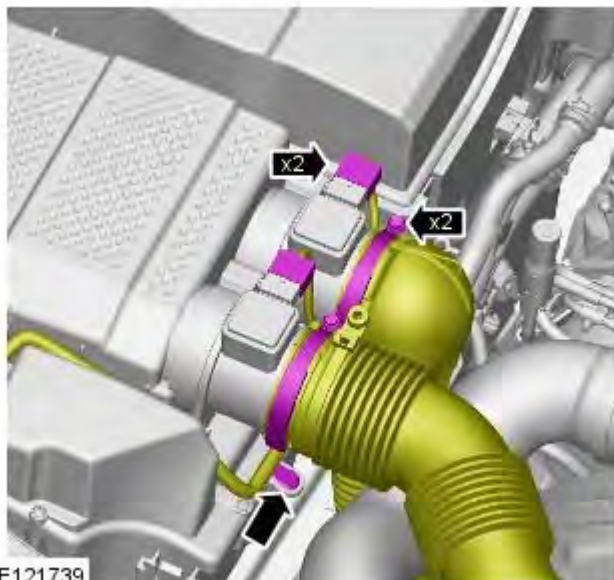
Element

Removal and Installation

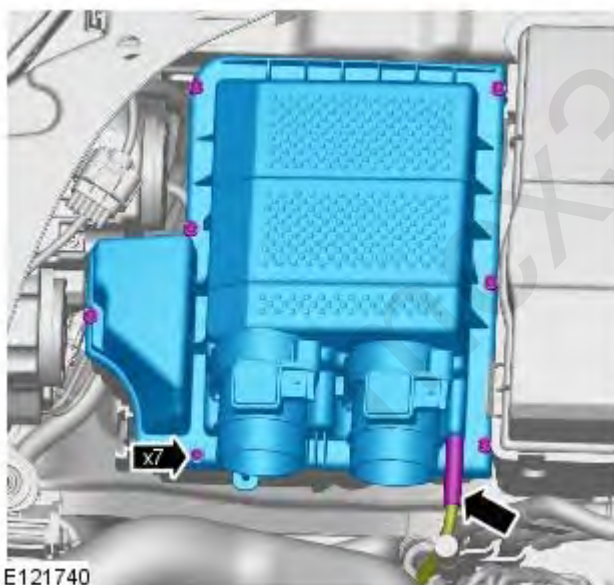
Removal

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

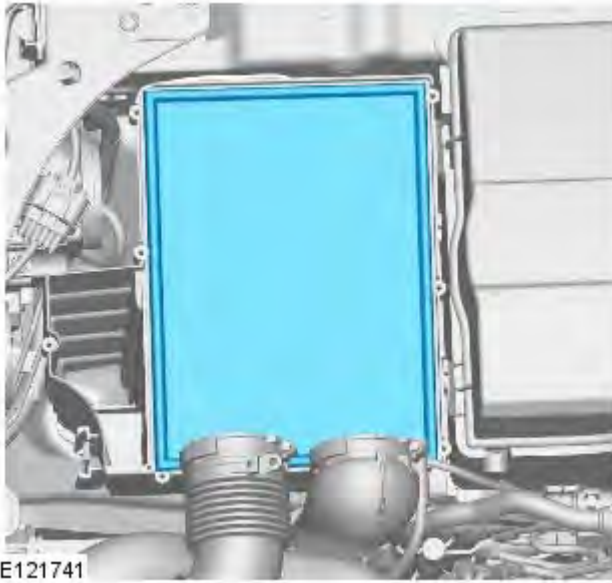
1.



2.



3.



Installation

1. To install, reverse the removal procedure.

Intake Air Distribution and Filtering - TDV6 3.0L Diesel - Charge Air Cooler

Removal and Installation

Removal

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

1. Refer to: [Radiator](#) (303-03B Engine Cooling - TDV6 3.0L Diesel, Removal and Installation).

Installation

1. Refer to: [Radiator](#) (303-03B Engine Cooling - TDV6 3.0L Diesel, Removal and Installation).

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