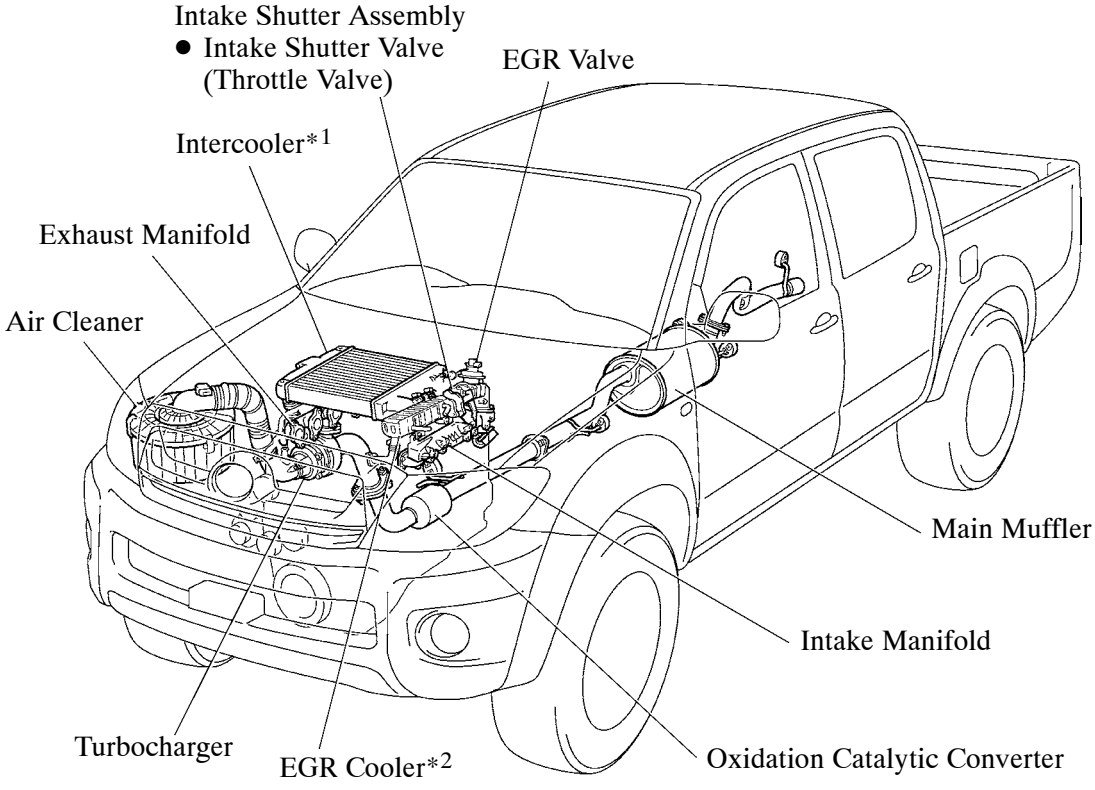
■INTAKE AND EXHAUST SYSTEM

1. General

- An intake shutter valve (throttle valve) equipped with an intake shutter valve control motor (rotary solenoid type) is used.
- On the models compliant with EURO IV emission regulations and models with variable nozzle vane type turbocharger, swirl control valves are provided in the intake manifold.
- A stainless steel exhaust pipe is used for weight reduction and improved rust resistance.
- On the models compliant with EURO IV emission regulations, models with 1KD-FTV engine, models for Thailand, Brunei Darussalam and Chile with 2KD-FTV High Version engine, an air-cooled intercooler is used.
- On the except models non-compliant with emission regulations, an EGR control is used. For details of EGR control, see page EG-242.
- On the models with 1KD-FTV engine, 4WD and SR grade of PreRunner models for Thailand and 4WD models for Europe, a variable nozzle vane type turbocharger is used.
- On the models with 2KD-FTV engine and 2KD-FTV High Version engine (except 4WD and SR grade of PreRunner models for Thailand and 4WD models for Europe), an air-cooled type turbocharger is used.
- On the models with 1KD-FTV engine compliant with EURO II, EURO III, EURO IV and Tier 1 emission regulations, models with 2KD-FTV engine compliant with EURO II and EURO III emission regulations, models with 2KD-FTV High Version engine compliant with EURO III, EURO IV and Tier 1 emission regulations and models for high altitude country, an oxidation catalytic converter is used.
- On the models compliant with EURO IV emission regulations, a water-cooled type EGR cooler that is integrated with a bypass is used.

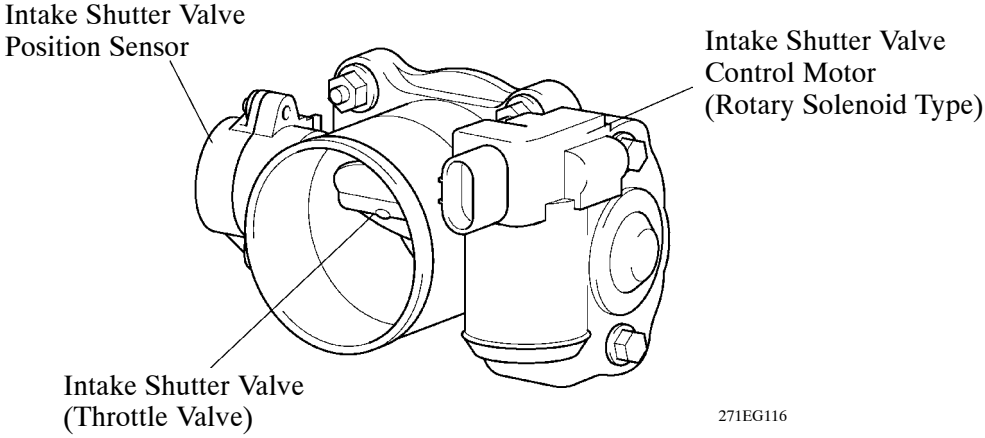


*1: Models compliant with EURO IV emission regulations, models with 1KD-FTV engine, models for Thailand, Brunei Darussalam and Chile with 2KD-FTV High Version engine

*2: Models compliant with EURO IV emission regulations

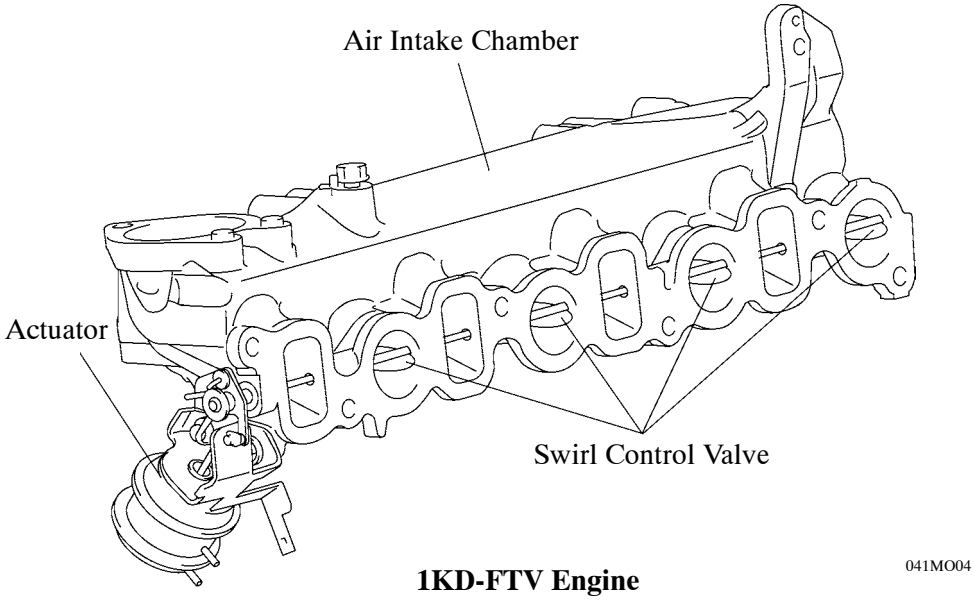
2. Intake Shutter Assembly

An intake shutter valve (throttle valve) equipped with an intake shutter valve control motor (rotary solenoid type) is used to improve EGR performance and to reduce the vibration and noise when stopping the engine. The intake shutter valve control motor (rotary solenoid type) makes the intake shutter valve (throttle valve) respond quickly.

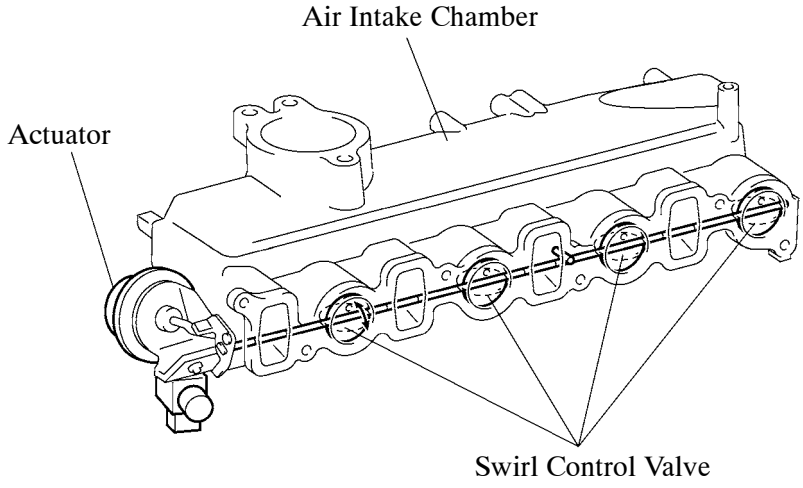


3. Intake Manifold

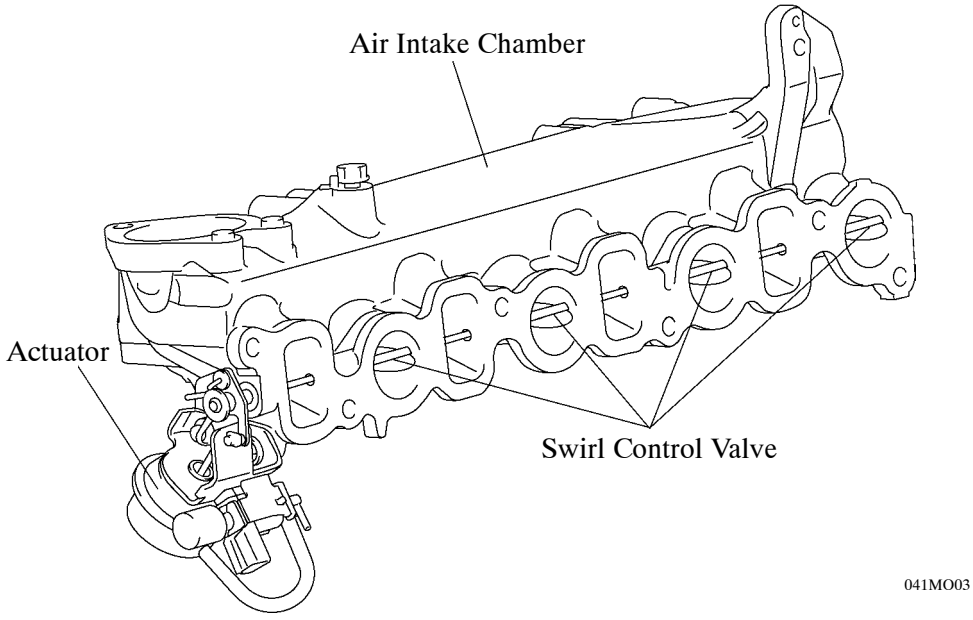
- An intake manifold provided with an air intake chamber is used in order to reduce the swirl variances between the cylinders.
- On the models compliant with EURO IV emission regulations and models with variable nozzle vane type turbocharger, a vacuum-actuated swirl control valve is provided in one of the two intake ports provided for each cylinder. The swirl control valve consists of a stainless steel shaft and an actuator, which are integrated in the valve.
- On the models with 1KD-FTV engine compliant with EURO IV emission regulations, a swirl control valve with 3-stage control is used.
- On the models with 1KD-FTV engine (except models compliant with EURO IV emission regulations), models with 2KD-FTV High Version engine compliant with EURO IV emission regulations and models with 2KD-FTV High Version engine with variable nozzle vane type turbocharger, a swirl control valve with 2-stage control is used.



1KD-FTV Engine
(Models Compliant with EURO IV Emission Regulations)



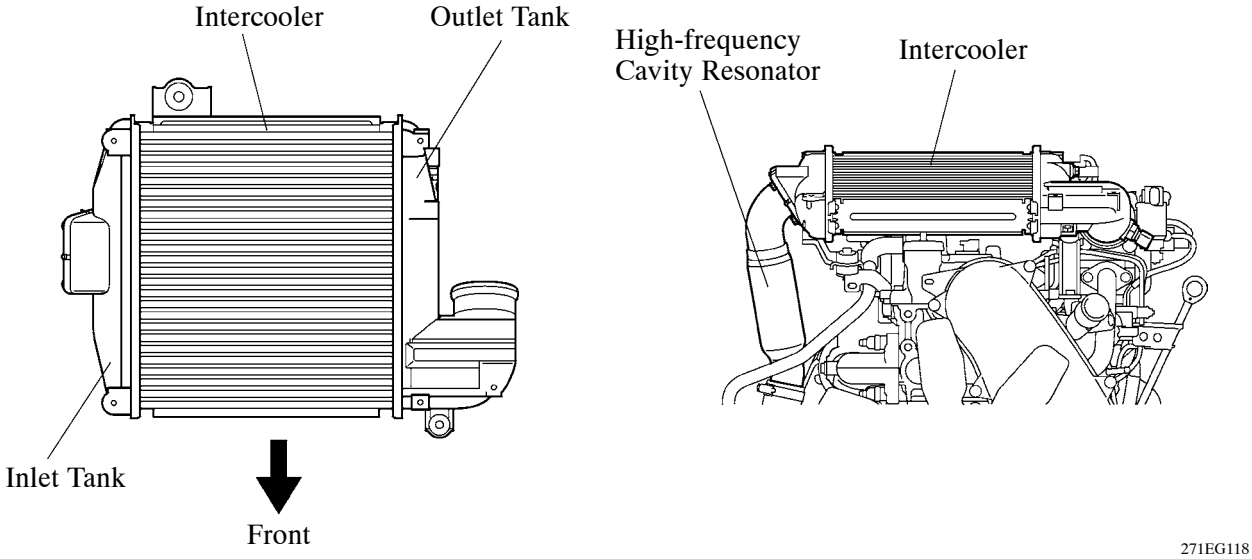
1KD-FTV Engine
(Except Models Compliant with EURO IV Emission Regulations)



2KD-FTV High Version Engine
(Models Compliant with EURO IV Emission Regulations and Models with Variable Nozzle Vane Type Turbocharger)

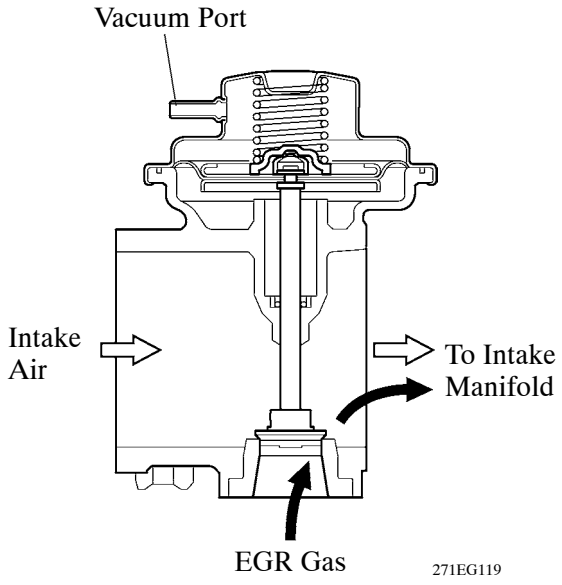
4. Intercooler

- On the models compliant with EURO IV emission regulations, models with 1KD-FTV engine, models for Thailand, Brunei Darussalam and Chile with 2KD-FTV High Version engine, an air-cooled intercooler is used in order to lower the intake air temperature, improve engine performance, and to achieve cleaner exhaust gas emissions. It is located directly on top of the engine.
- The intercooler and the inlet tank are made of aluminum and the outlet tank is made of plastic for weight reduction.
- A dual construction, high-frequency cavity resonator is used for the pipe between the turbocharger and the intercooler.

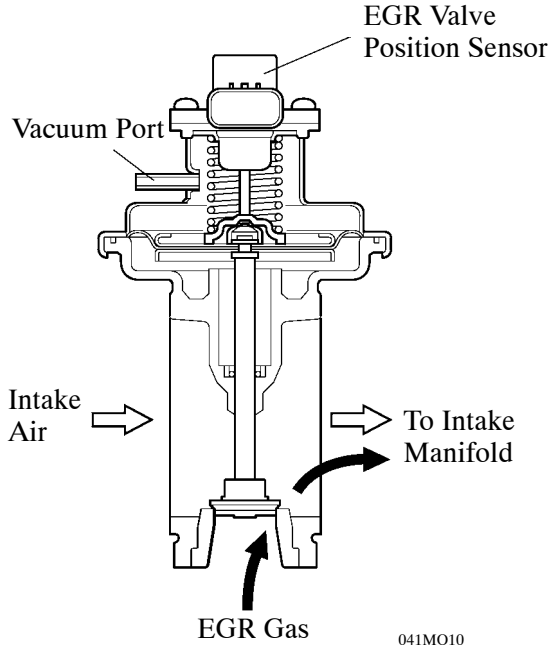


5. EGR Valve

- On the except models non-compliant with emission regulations, an EGR valve is provided midstream in the intake air passage. By cooling the EGR valve in this manner, a greater volume of exhaust gas can be processed.
- On the models with 1KD-FTV engine compliant with EURO IV emission regulations and models with 2KD-FTV and 2KD-FTV High Version engines with EGR control, an EGR valve position sensor has been provided in the EGR valve in order to directly measure the actual amount of the valve opening. This measurement is then input into the ECM in order to improve the precision of EGR control.



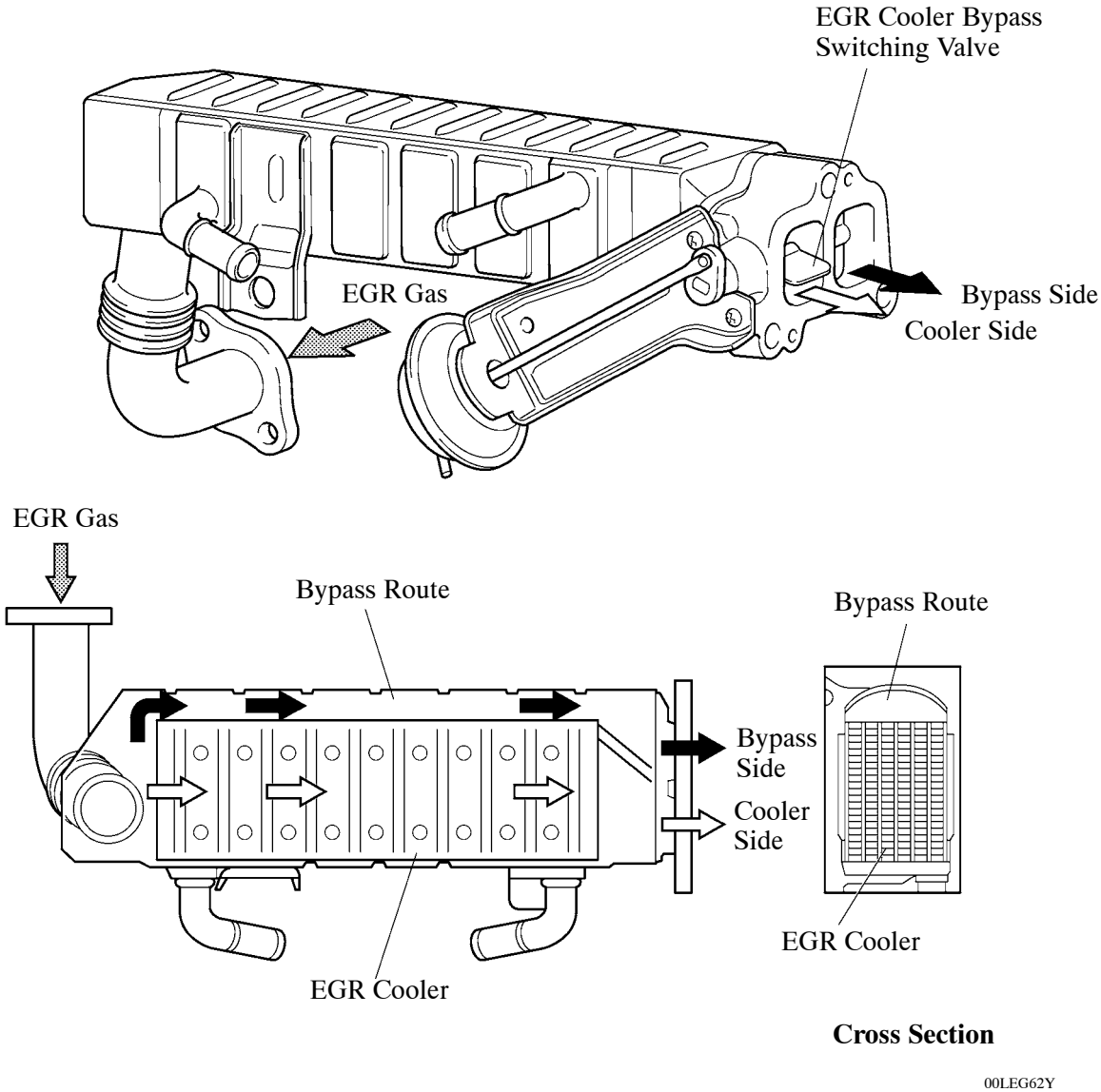
Models without EGR Valve Position Sensor



Models with EGR Valve Position Sensor

6. EGR Cooler

- On the models compliant with EURO IV emission regulations, the water-cooled type EGR cooler is used in the EGR passage between the cylinder head and EGR valve.
- In the water-cooled type EGR cooler, water flows through the six-layered gas passage to cool down the EGR gas.
- An EGR cooler bypass switching valve is used at the EGR cooler gas outlet in order to vary the EGR gas temperature.



Cross Section

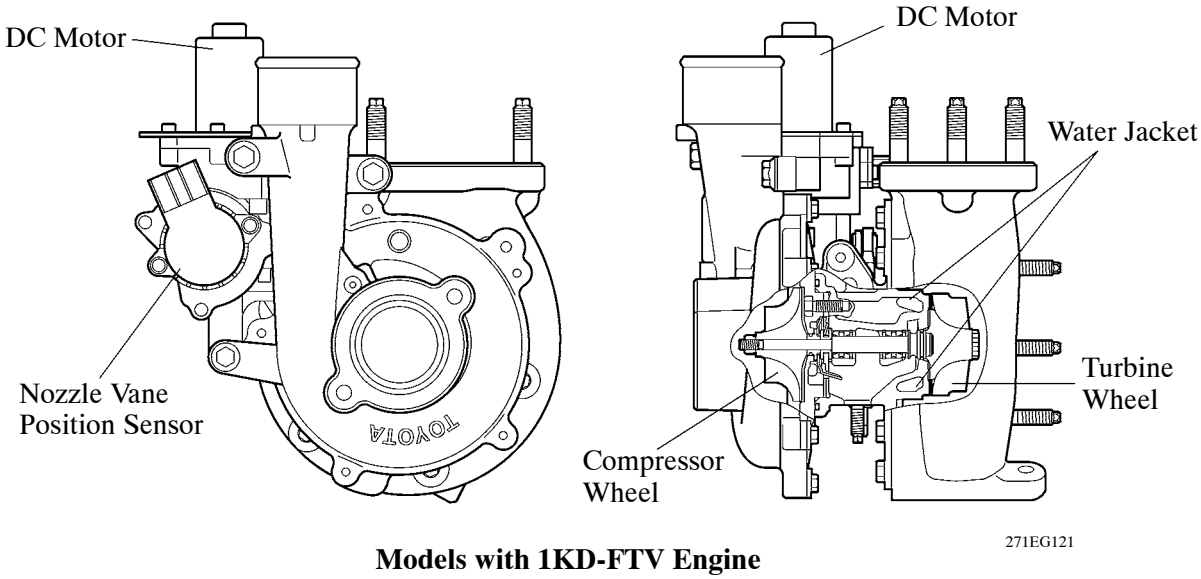
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7. Turbocharger

General

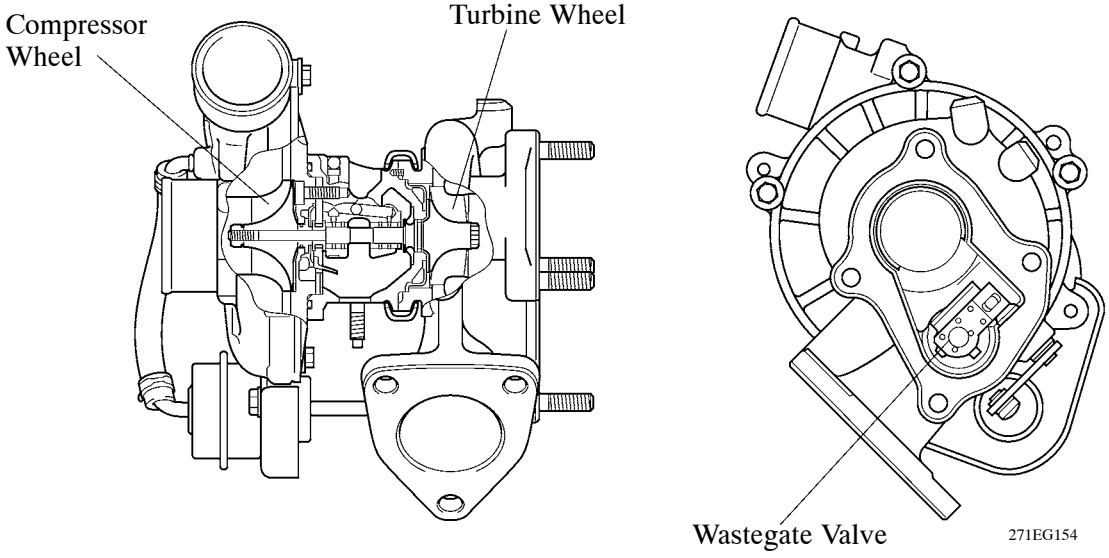
- On the models with 1KD-FTV engine, 4WD and SR grade of PreRunner models for Thailand and 4WD models for Europe, a variable nozzle vane type turbocharger is used. A water jacket is provided in the bearing housing to improve the cooling performance of the turbocharger.
- On the models with 2KD-FTV engine and 2KD-FTV High Version engine (except 4WD and SR grade of PreRunner models for Thailand and 4WD models for Europe), a lightweight and compact air-cooled type turbocharger is used. To control the turbo pressure, this turbocharger is provided with a wastegate valve and an actuator that operates mechanically in accordance with the turbo pressure.

▶ Variable Nozzle Vane Type Turbocharger ◀



Models with 1KD-FTV Engine

▶ Lightweight and Compact Air-cooled Type Turbocharger ◀



Models with 2KD-FTV Engine without Intercooler

Service Tip

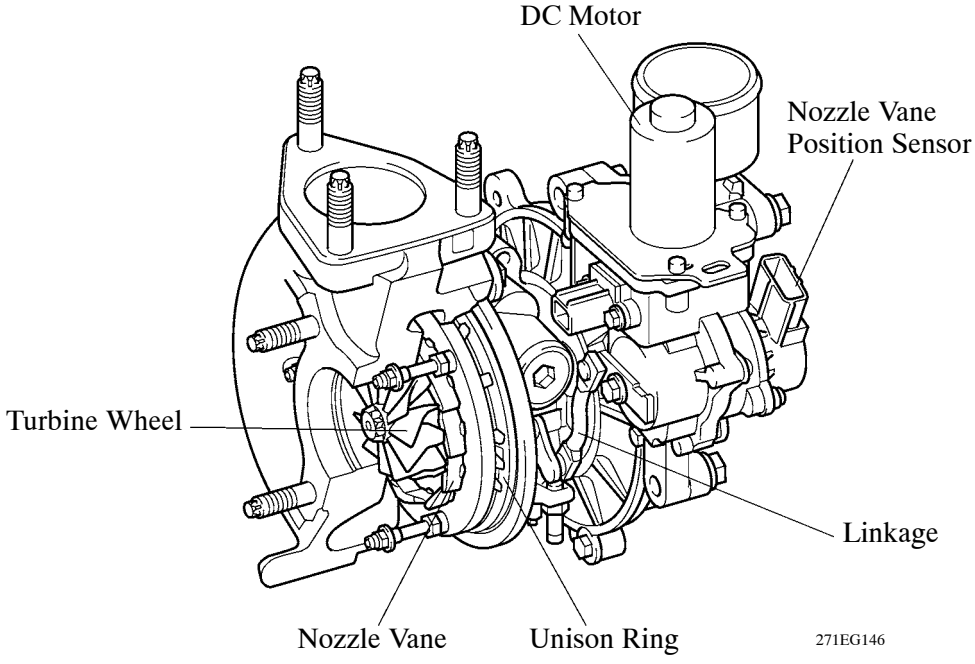
Models with Lightweight and Compact Air-cooled Type Turbocharger

The ECM determines altitude using the atmospheric pressure sensor. If the sensor indication value is approx. 85 kPa or less (altitude: higher than approximately 1500 m), the ECM lowers the preset maximum engine speed*, in order to prevent the turbine wheel from racing when the vehicle is driven in high altitude areas (where the atmospheric pressure is low). Therefore, the preset maximum engine speed is lower than standard. However, this is not an engine malfunction. For details, refer to the Hilux Repair Manual.

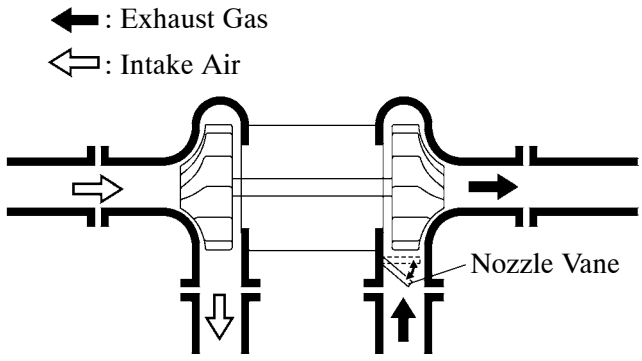
*: Varies in accordance with altitude. As the altitude increases (the atmospheric pressure sensor indication value decreases), the preset maximum engine speed is decreased.

Variable Nozzle Vane Type Turbocharger

- Variable nozzle vane type turbocharger consists primarily of an impeller, turbine, nozzle vane, unison ring, DC motor and nozzle vane position sensor.
- This turbocharger has achieved great improvements in low-speed torque, maximum output, fuel consumption, and emission reduction. These improvements have been accomplished through variable control of the nozzle vane position, and an optimal velocity of the exhaust gas inflow to the turbine at all times in response to the engine condition.
- The ECM outputs a signal to the turbo motor driver, which actuates the DC motor, to control the nozzle vane position. For details on the turbocharger control, see page EG-237.



- The exhaust gas from the exhaust manifold goes through the nozzle vane inside the turbo charger housing, and flows to the exhaust pipe through the turbine. The speed of the turbine (supercharging pressure) differs depending on the flow velocity of the exhaust gas going through the turbine and the flow velocity of the exhaust gas is controlled by the opening. In such a time of idling, when the exhaust gas is less, the nozzle vane is almost fully closed, but as there is a slight clearance between the vanes, the exhaust gas flows through this clearance to the exhaust pipe. Therefore, there is no bypass.

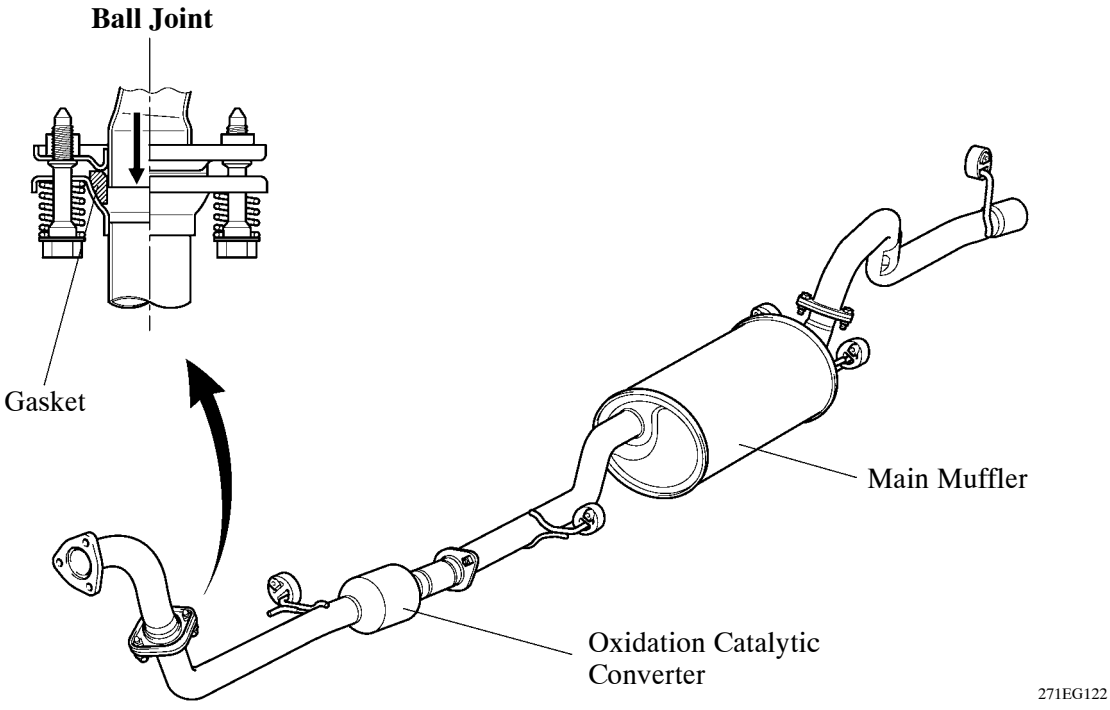


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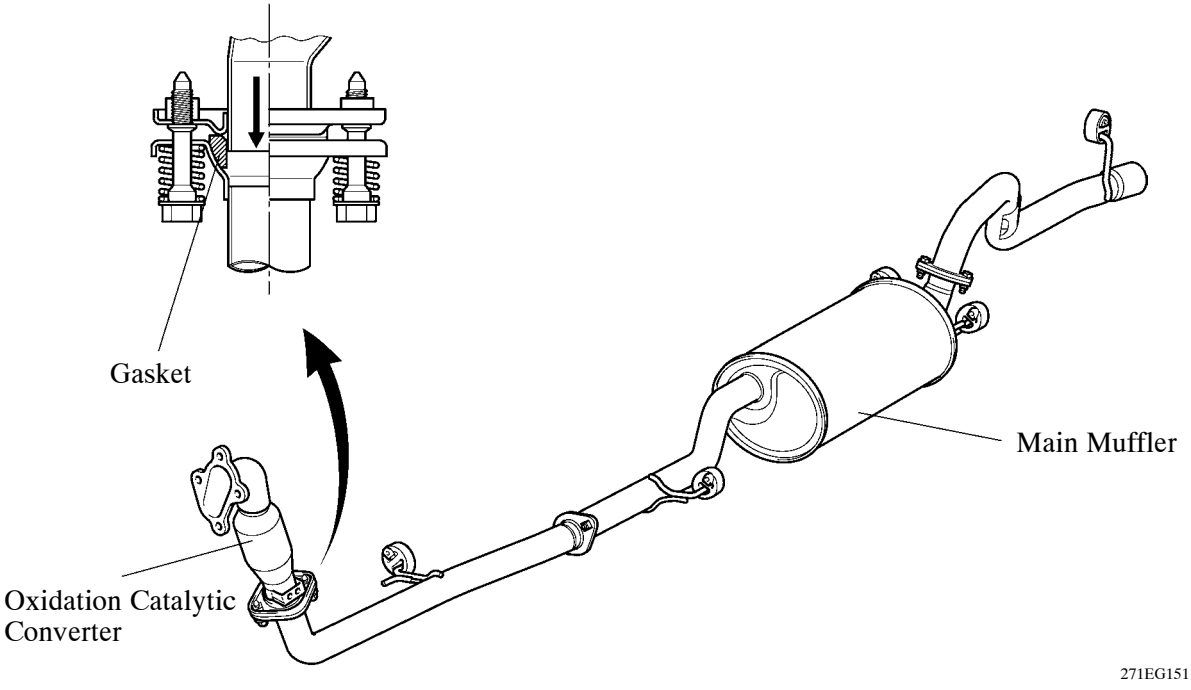
8. Exhaust Pipe

- A stainless steel exhaust pipe is used for weight reduction and improved rust resistance.
- A ball joint is used to join the front exhaust pipe and exhaust manifold. As a result, a simple and reliable construction for reducing vibration has been achieved.
- The oxidation catalytic converter is used to clean the exhaust gas particulates, HC, and CO. The table below describes the location of the converter.

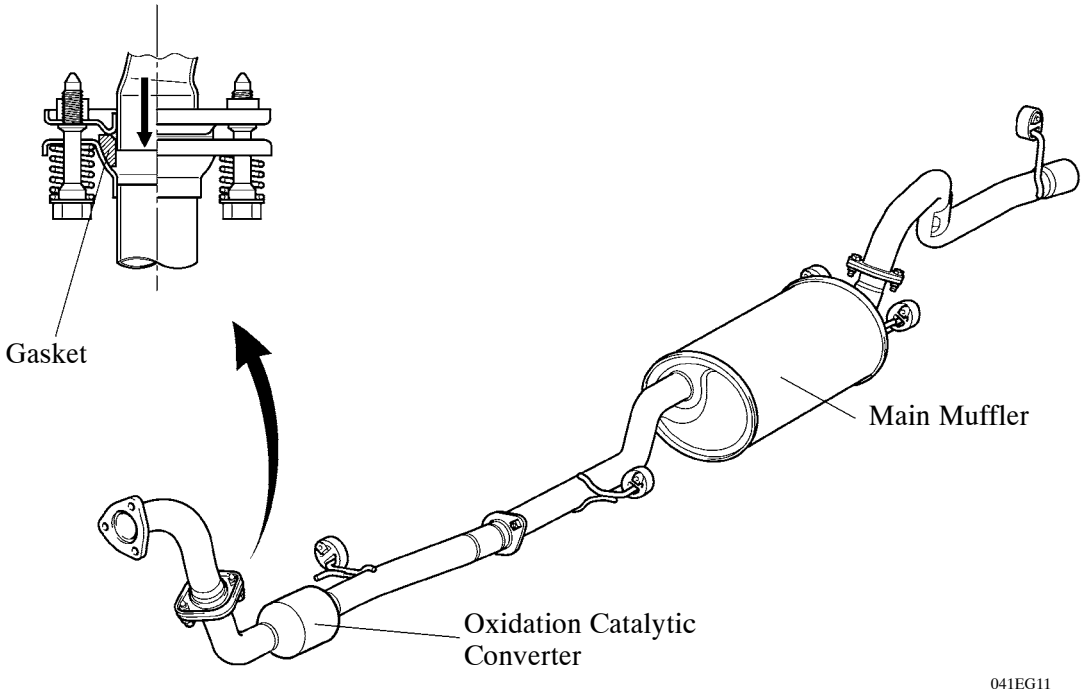
Engine	Model	Location of Converter	
		Integrated with Front Exhaust Pipe	Below Exhaust Manifold
1KD-FTV	Compliant with EURO IV	○	—
	Compliant with EURO III	○	—
	Compliant with EURO II		
	Compliant with Tier 1		
	High Altitude Country		
	Compliant with EURO I (Except High Altitude Country)	—	—
	Non-compliant emission regulations		
2KD-FTV	Compliant with EURO III	—	○
	Compliant with EURO II		
	Non-compliant with Emission Regulations	—	—
2KD-FTV High Version (without Intercooler)	High Altitude Country	○	—
	Compliant with EURO III	—	○
	Compliant with Tier 1		
	Compliant with EURO II	—	—
	Compliant with EURO I		
	Non-compliant with Emission Regulations (Except High Altitude Country)		
2KD-FTV High Version (with Intercooler)	Compliant with EURO IV	○	—
	Compliant with EURO III	○	—



Models with Converter Integrated with Front Exhaust Pipe (Except Models Compliant with EURO IV Emission Regulations)



Models with Converter Below Exhaust Manifold



Models Compliant with EURO IV Emission Regulations