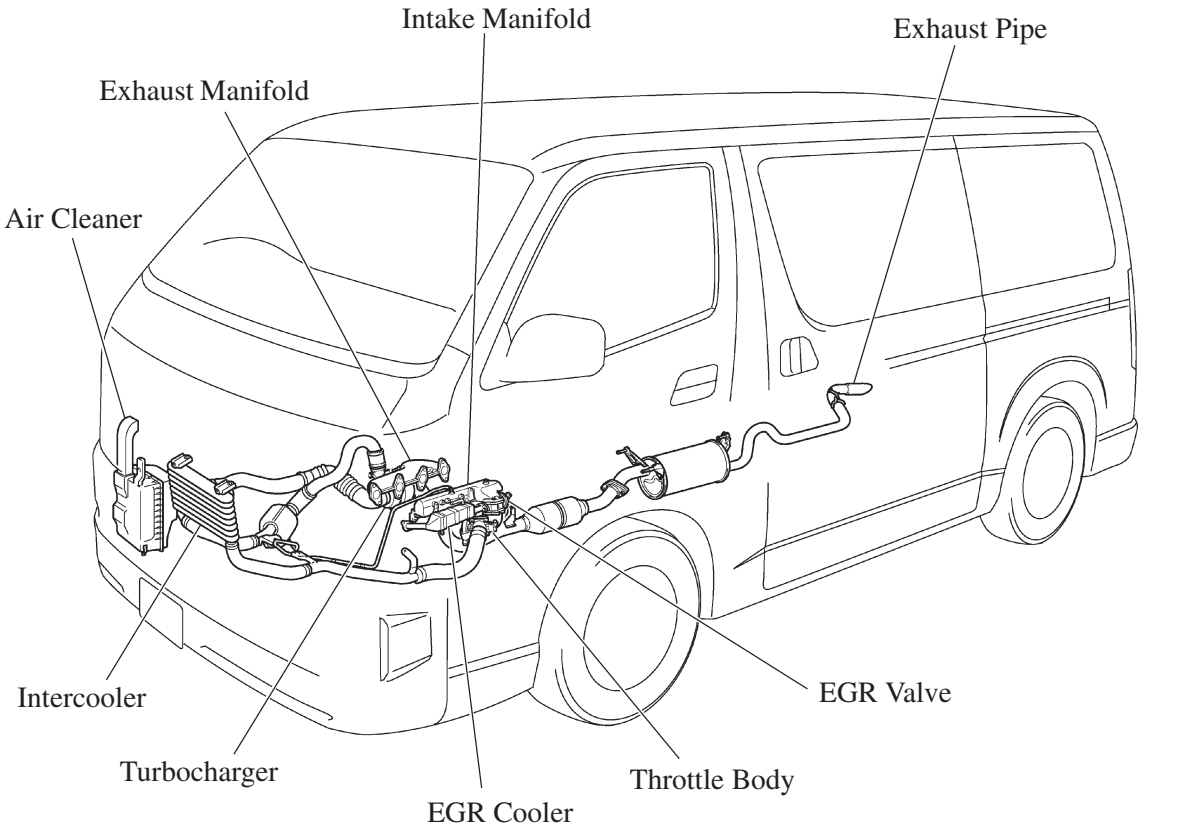
■INTAKE AND EXHAUST SYSTEM

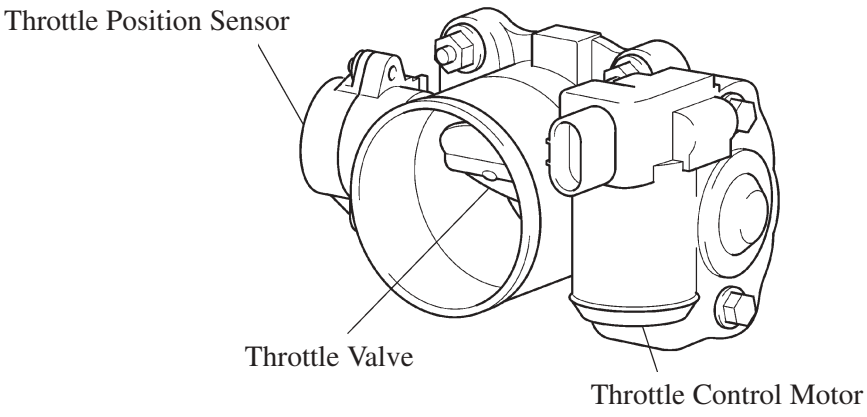
1. General

- A throttle body equipped with a rotary solenoid type throttle control motor is used.
- Swirl control valves are provided in the intake manifold.
- A stainless steel exhaust pipe is used for weight reduction and improved rust resistance.
- An air-cooled intercooler is used.
- An EGR system is used. This system is designed to reduce and control NOx formation through a slight reduction of peak temperature in the engine combustion chamber, which is accomplished by introducing a small amount of inert gas into the intake manifold. For details of EGR control, see page 78.
- A variable nozzle vane type turbocharger is used.
- An oxidation catalytic converter is used in the front pipe to comply with the EURO IV emission regulation.



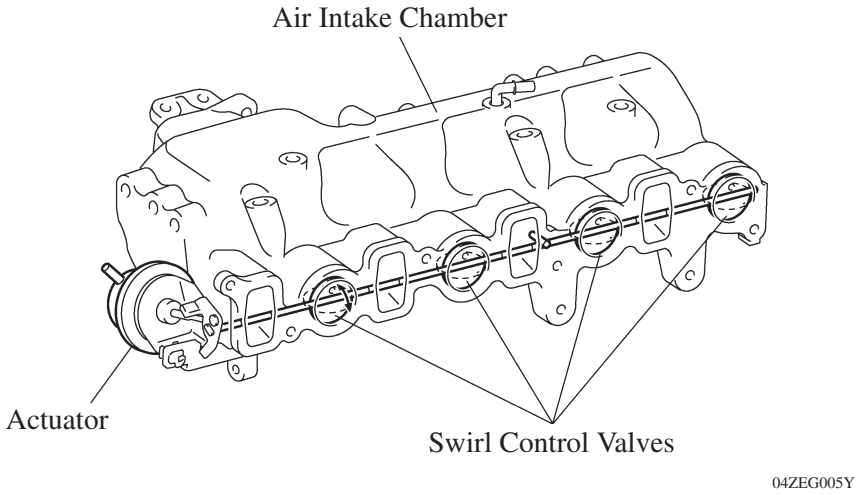
2. Throttle Body

- The throttle body equipped with a rotary solenoid type throttle control motor is used to realize high EGR performance and to reduce the vibration and noise when the engine is stopped. The rotary solenoid type throttle control motor makes the throttle valve respond quickly.
  For details of throttle control and EGR control, see pages 72 and 78.
- A non-contact type throttle position sensor is used in the throttle body. For details, see page 65.



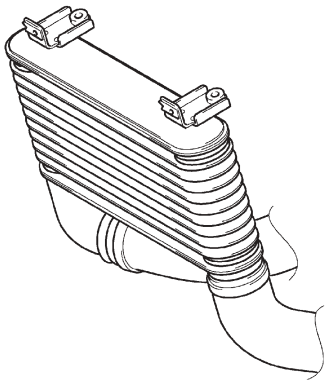
3. Intake Manifold

- An intake manifold provided with an air intake chamber is used in order to reduce the swirl variances between the cylinders.
- A vacuum-actuated swirl control valve is provided in one of the two intake ports provided for each cylinder. A swirl control valve consists of a stainless steel shaft and an actuator, which are integrated in the valve. For details of swirl control, see page 72.



4. Intercooler

An air-cooled intercooler is used in order to lower the intake air temperature, improve engine performance, and realize clean exhaust gas emissions.



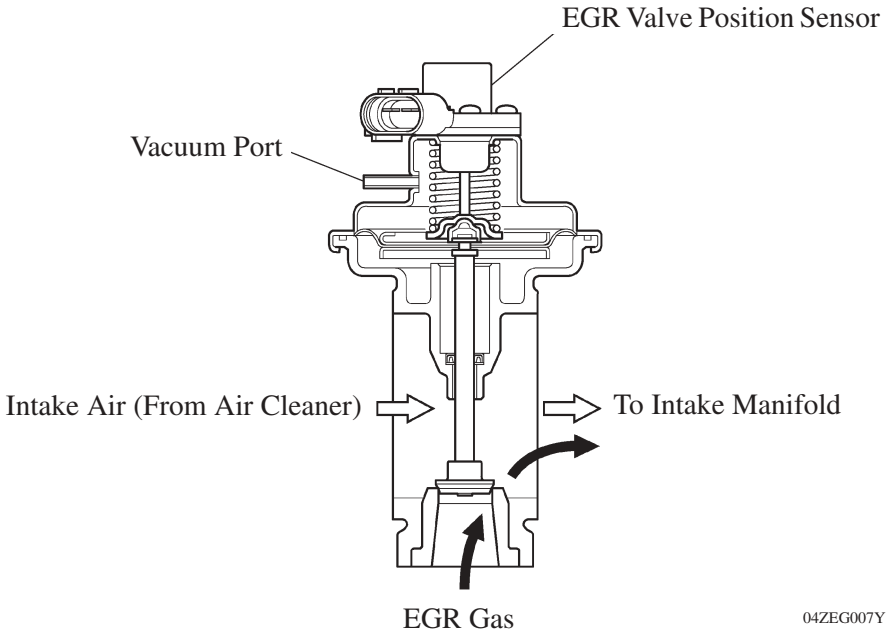
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▶ **Specification** ◀

Type		Drawn Cup
Core Size	Height	187.6 mm (7.39 in.)
	Width	250.0 mm (9.84 in.)
	Thickness	65.0 mm (2.56 in.)
Material		Aluminum

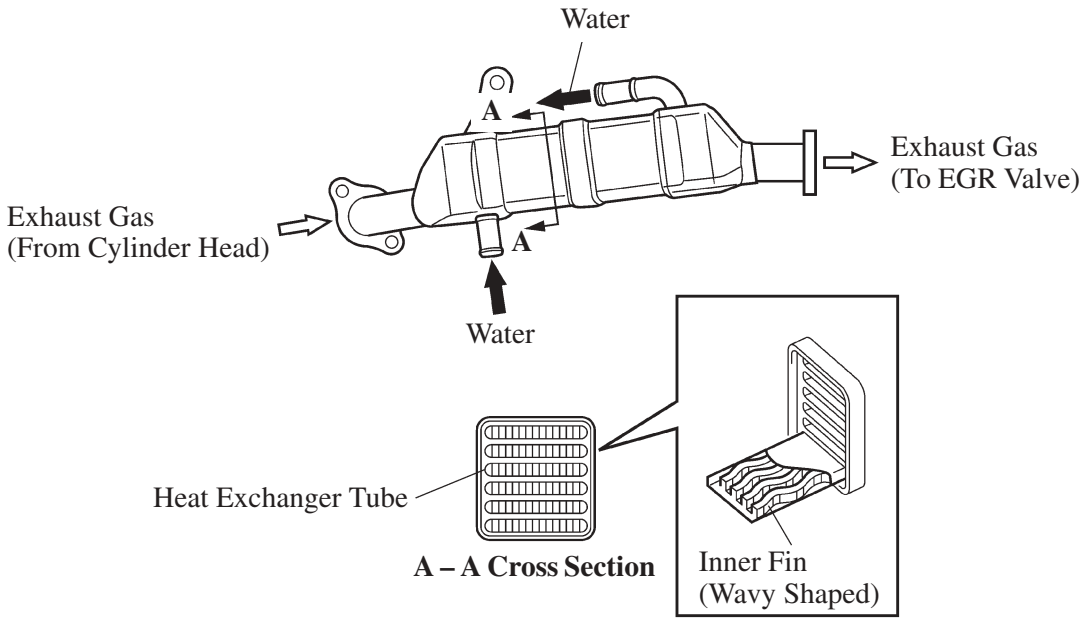
5. EGR Valve

- An EGR valve is provided in the midstream of the intake air passage. By cooling the EGR valve in this manner, a greater volume of exhaust gas can be processed.
- A vacuum port for a VSV (for EGR valve close) to cut off EGR is used to improve valve closure response.
- 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 engine ECU in order to improve the precision of EGR control.
- For details of EGR control, see page 78.



6. EGR Cooler

A water-cooled type EGR cooler is used. That lowers the exhaust gas temperature to recirculate the great amount of exhaust gas, realizing the reduction of NOx.
The EGR cooler is comprised of the six-layered heat exchanger tube, which contains the inner fins inside. The inner fins have a wavy shape to enhance cooling efficiency and prevent them from becoming clogged with carbon deposits. The water flows around the heat exchanger tubes to cool down the exhaust gas.

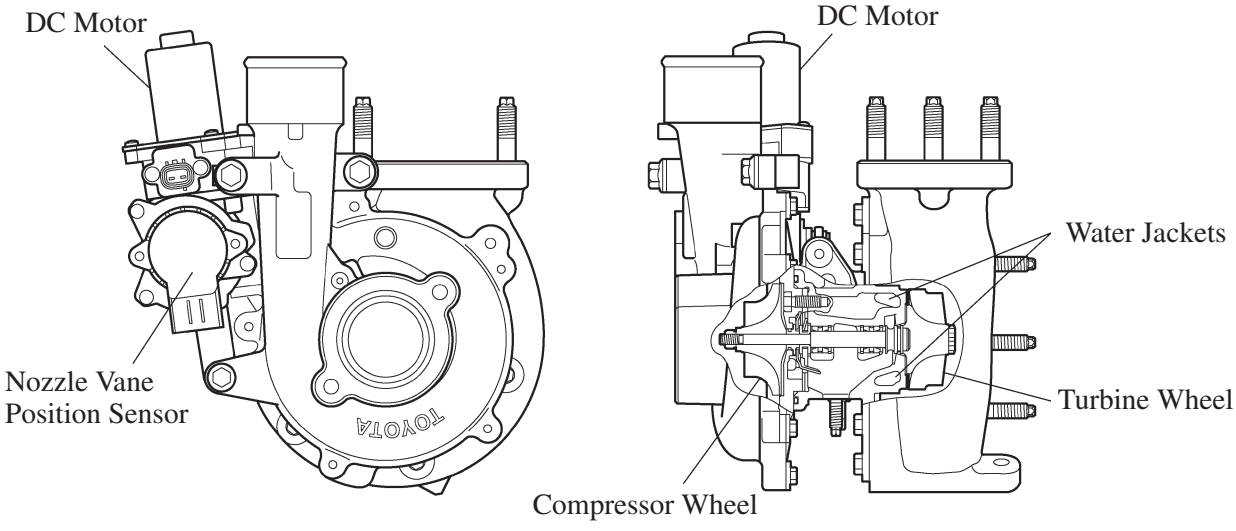


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7. Turbocharger

General

- 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.
- A DC motor for driving the variable nozzle vane is used. Also, a nozzle vane position sensor is used to detect the position of the nozzle vane. For details, see page 76.

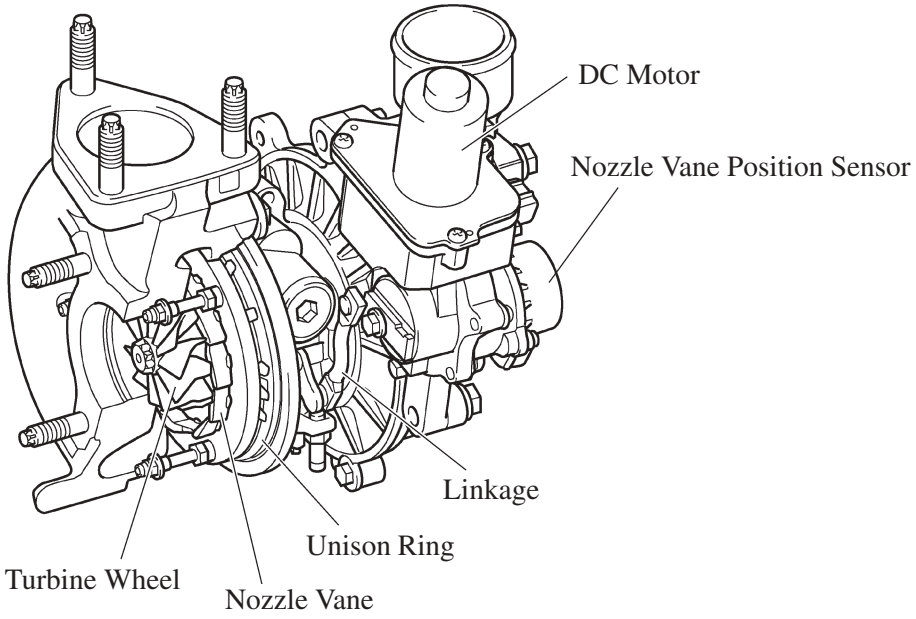


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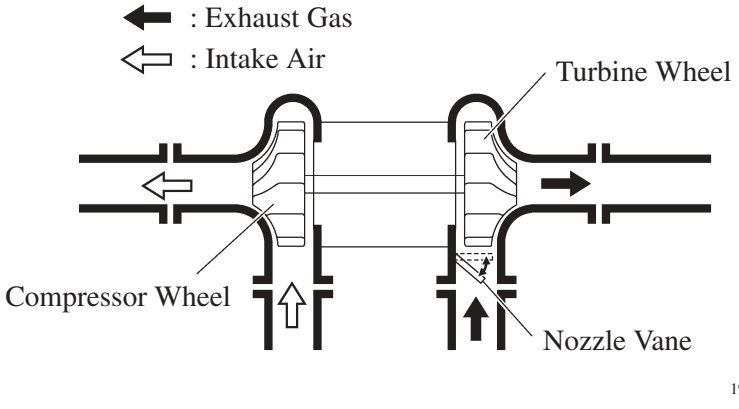
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Variable Nozzle Vane Type Turbocharger

- The variable nozzle vane type turbocharger consists primarily of a turbine wheel, compressor wheel, nozzle vane, unison ring, DC motor and nozzle vane position sensor.
- This turbocharger has realized 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 wheel at all times in response to the engine condition.
- The engine ECU 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 73.

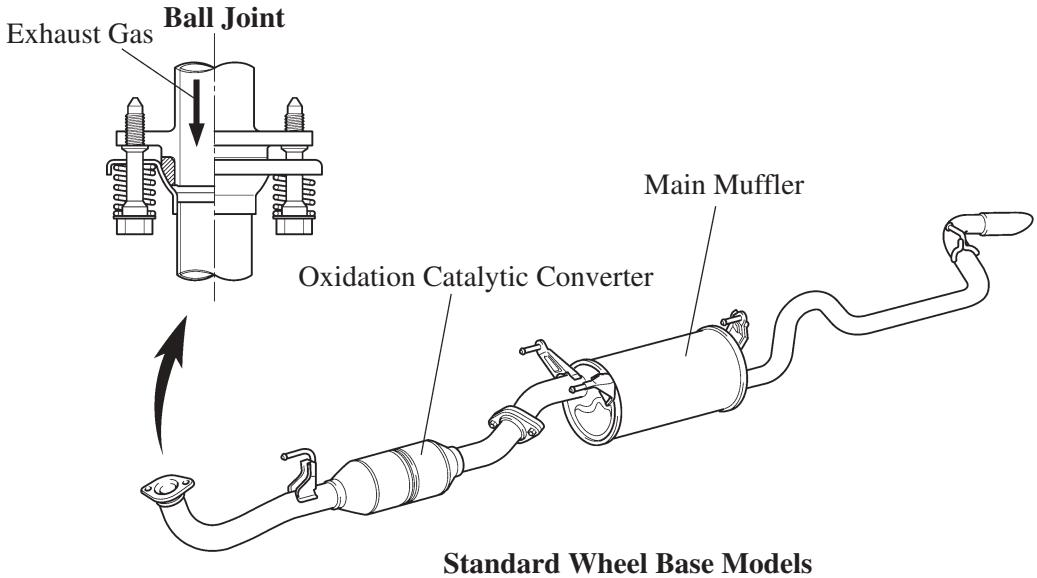


- The exhaust gas from the exhaust manifold goes through the nozzle vane inside the turbocharger housing, and flows to the exhaust pipe through the turbine wheel. The speed of the turbine wheel (supercharging pressure) differs depending on the flow velocity of the exhaust gas going through the turbine wheel and the flow velocity of the exhaust gas is controlled by the opening angle of the nozzle vane. In such a time like idling, when the exhaust gas is less, the nozzle vane is almost fully closed, but as there is a slight clearance between the nozzle vanes, the exhaust gas flows through this clearance to the exhaust pipe. As this type of turbocharger has the nozzle vane operating in these ways, there is no bypass as the conventional type turbocharger.

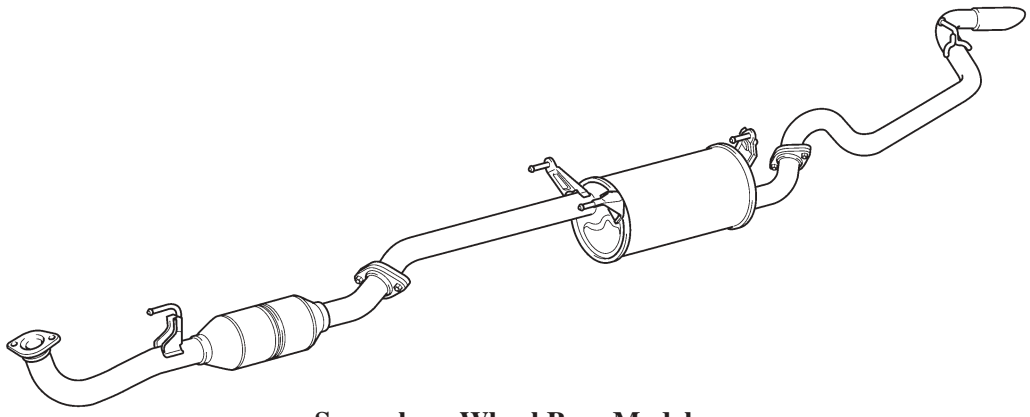


8. Exhaust Pipe

- A stainless steel exhaust pipe is used for weight reduction and rust resistance.
- A ball joint is used to join the front pipe and turbine outlet elbow. As a result, a simple and reliable construction for reducing vibration has been realized.
- The oxidation catalytic converter is used to clean the exhaust gas particulates, HC, and CO on the models complying with the EURO IV emission regulation.



Standard Wheel Base Models



Super-long Wheel Base Models

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