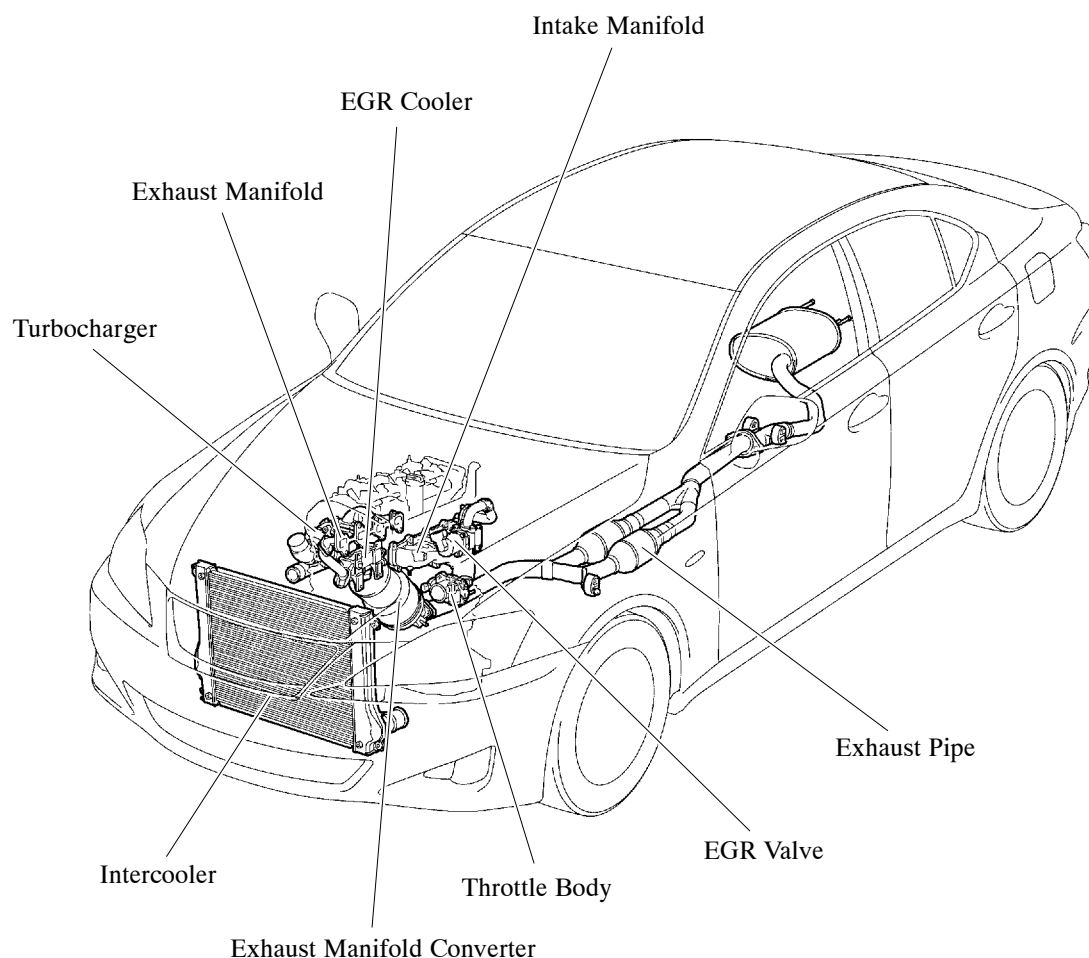


■ INTAKE AND EXHAUST SYSTEM

1. General

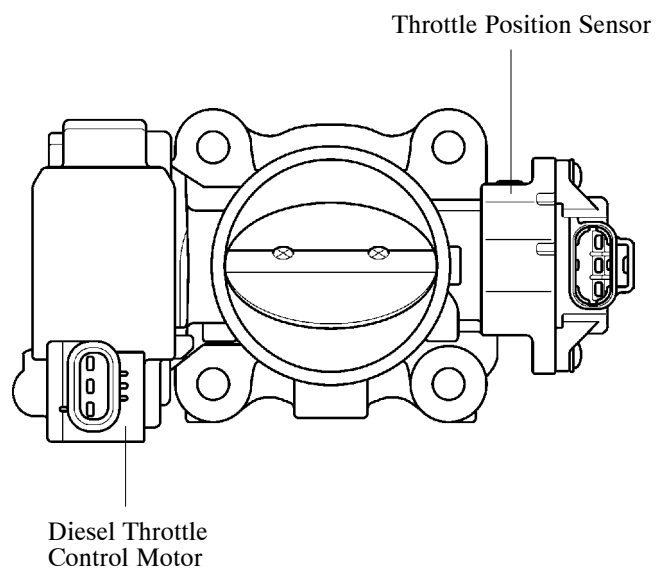
- An air-cooled intercooler is used in order to lower the intake air temperature of the compressed intake air, ensure high engine performance, and to realize cleaner exhaust emissions.
- A cable-less type throttle body in which the diesel throttle control motor and the throttle position sensor are integrated is used.
- A linear solenoid type EGR valve and a water-cooled EGR cooler are used to ensure high EGR performance.
- A variable nozzle vane type turbocharger is used.
- A CCO (Catalytic Converter Oxidation) is installed in the exhaust front pipe. The exhaust manifold converter uses NSR and DPNR (Diesel Particulate-NOx Reduction) catalysts to comply with the EURO IV regulations.



2. Throttle Body

A cable-less type throttle body in which the diesel throttle control motor and the throttle position sensor are integrated is used.

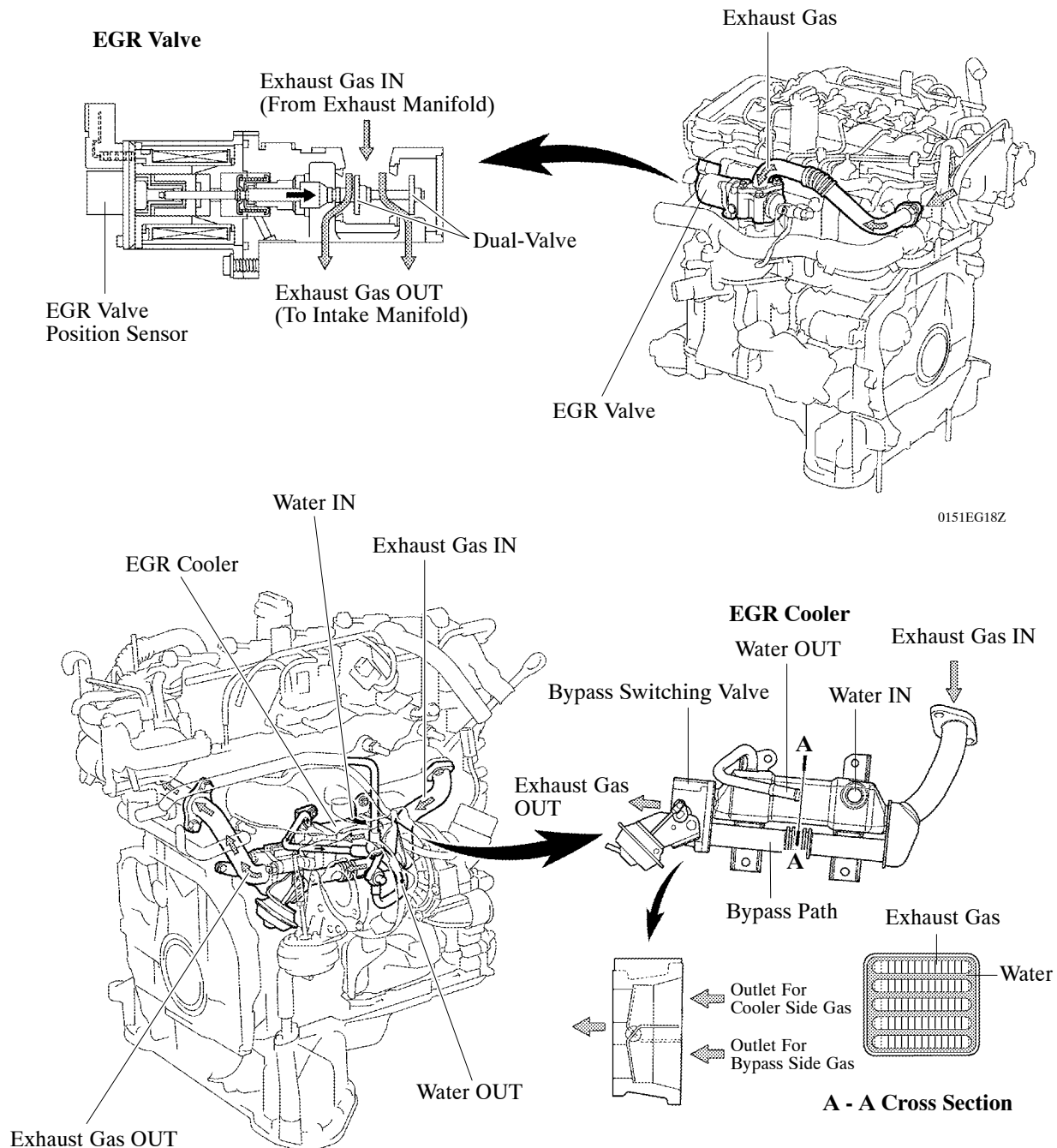
- In the diesel throttle control motor, a rotary solenoid motor is used to control the intake throttle.
- In the throttle position sensor, a non-contact type is used. For details, see [page EG-139](#).



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3. EGR Valve and EGR Cooler

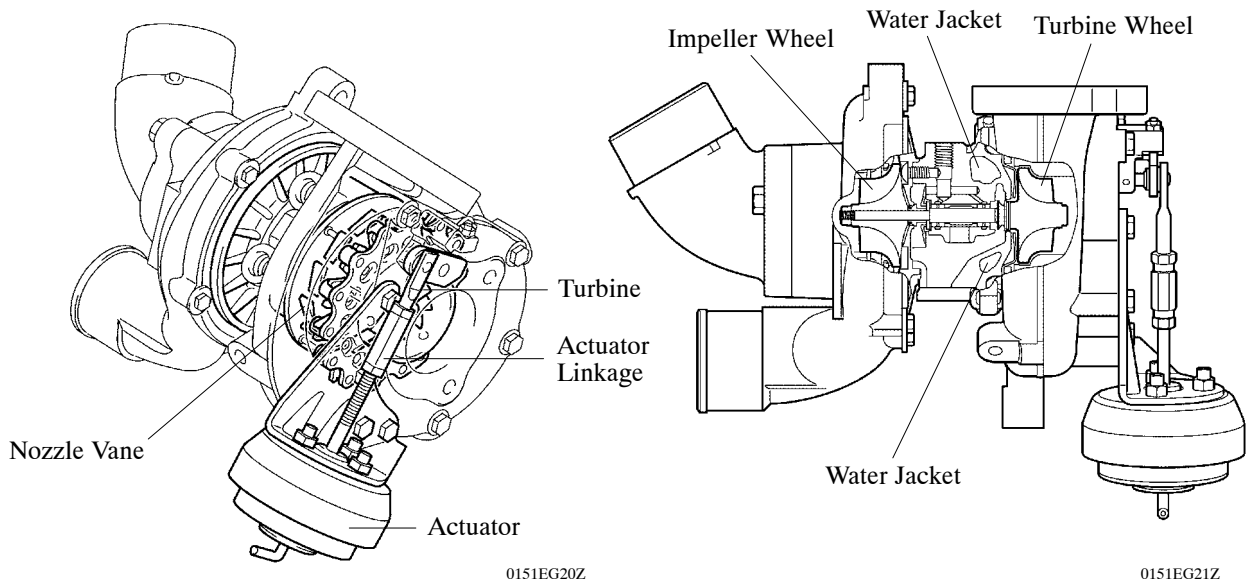
- A linear solenoid type of EGR valve is used. Also, a dual-valve mechanism is used to cancel the effects of the exhaust pressure during actuation, in order to realize quick response.
- An EGR valve position sensor is provided in the EGR valve. This sensor enables EGR valve control at a higher level of precision by detecting the amount of lift of the EGR valve.
- The EGR cooler has a 5 layered passage in order to allow the engine coolant to cool the gasses that pass through the EGR valve.
- An EGR cooler bypass with a bypass switching valve is used. If EGR gas is cooled down in the EGR cooler under a light engine load, the temperature of the compressed air in the cylinders decreases too much. To prevent this, the EGR gas passage is switched by the EGR cooler bypass switching valve.



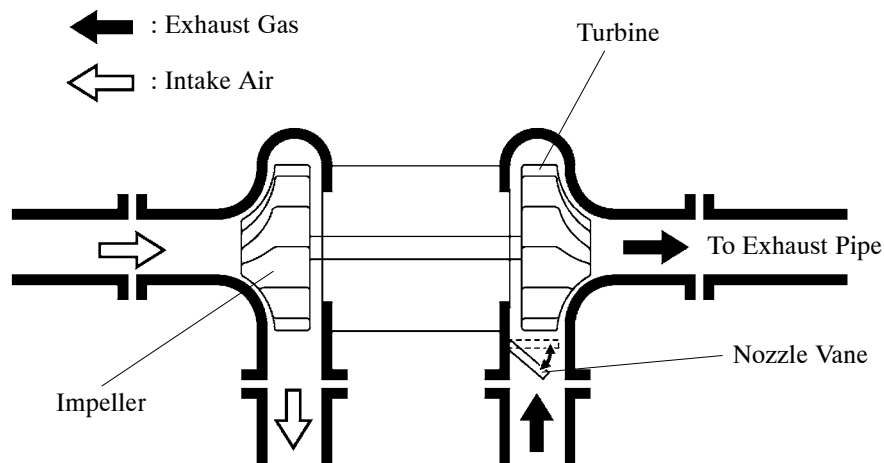
4. Turbocharger

General

- The variable nozzle vane type turbocharger drives the vacuum type actuator according to engine conditions, and controls the nozzle vanes in order to realize high engine output, low fuel consumption and low emissions. For turbo pressure control of the turbocharger, [see page EG-147](#).
- The turbocharger is cooled with engine coolant.



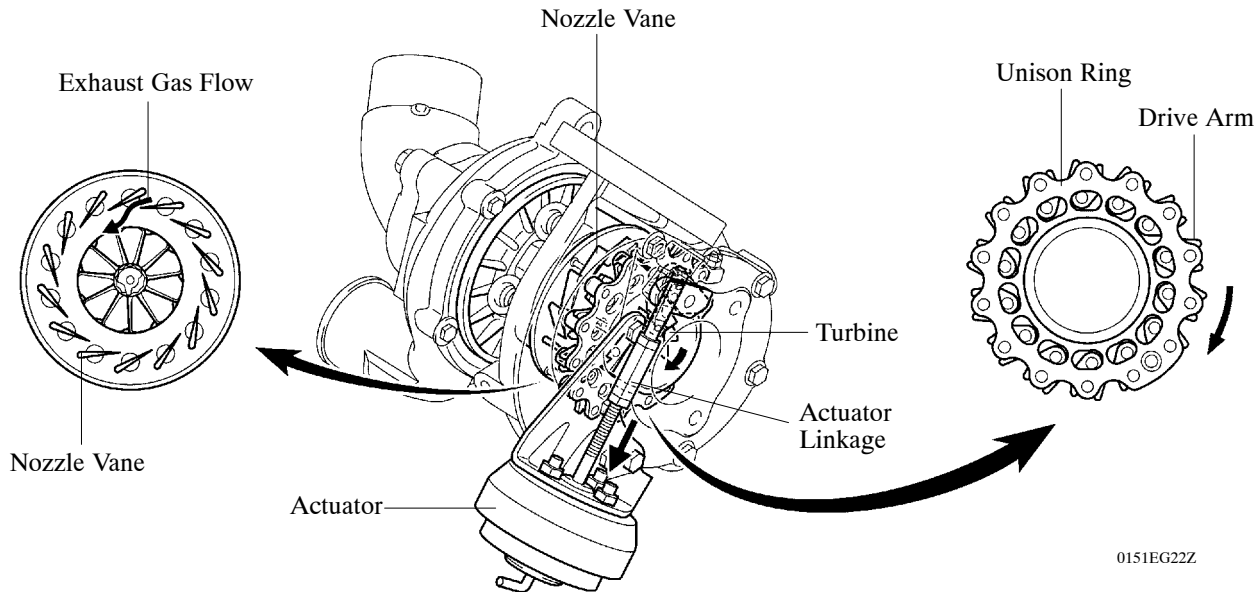
- The exhaust gas from the exhaust manifold goes through the nozzle vane inside the turbocharger housing, and flows to the exhaust pipe through the turbine. The speed of the turbine (turbocharging pressure) differs depending on the flow velocity of the exhaust gas going through the turbine and the flow velocity of the exhaust gas is controlled by the opening. At idle, the exhaust gas volume is less and the nozzle vane is 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.



Operation

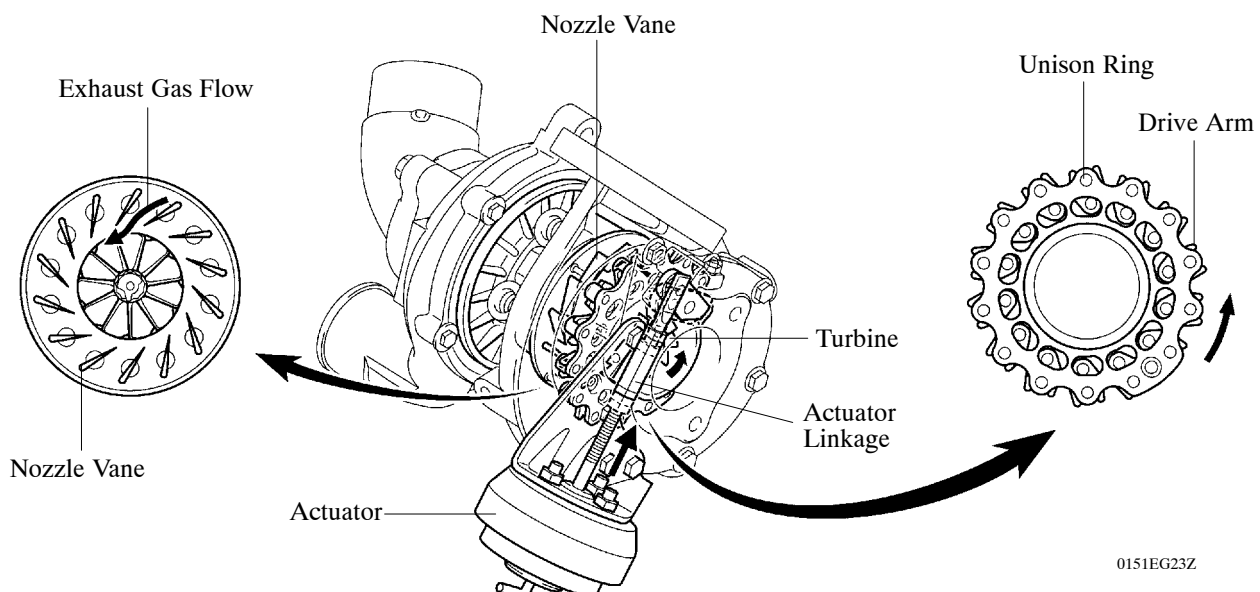
1) At Low Load Range or Low Engine Speed Range

When the engine is running in a low load range or a low speed range, the actuator will pull up on the actuator linkage. The actuator linkage is connected to the unison ring. At the same time, the drive arms installed in the unison ring move to change the nozzle vane angle toward the closed direction. As a result, the speed of the exhaust gas directed to the turbine increases, and the engine torque will be improved.



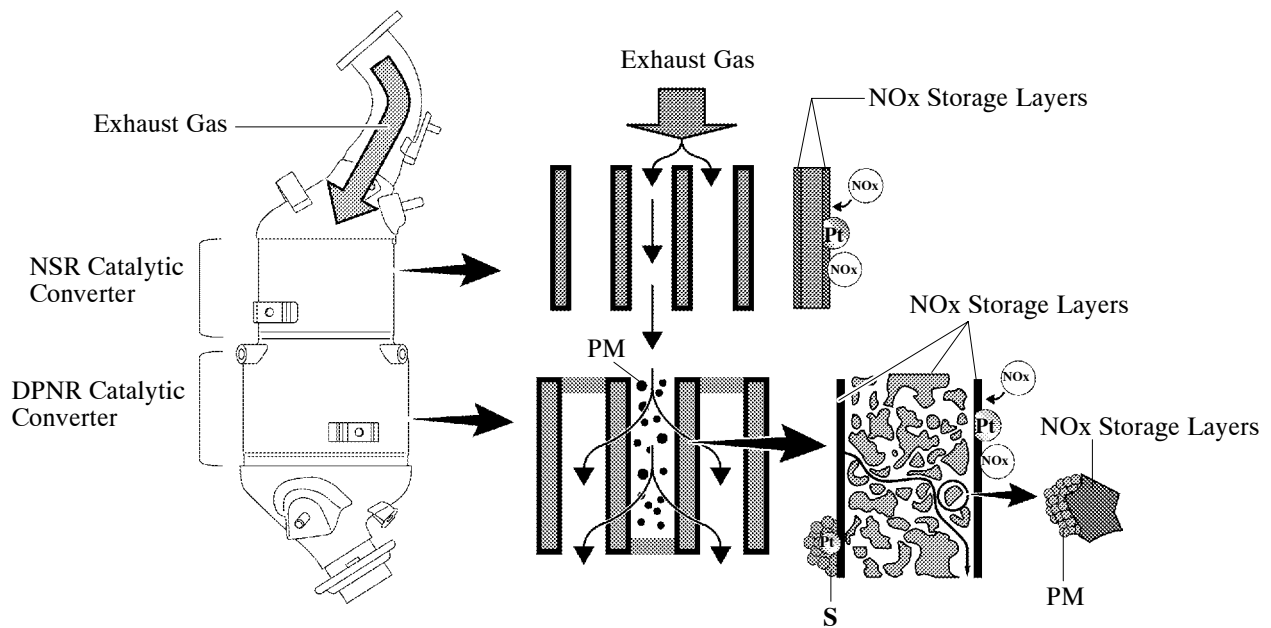
2) At High Load Range or High Engine Speed Range

When the engine is running in a high load range or a high speed range, the actuator will push down on the actuator linkage. Due to this, the drive arms move, opening the nozzle vanes, thus achieving the specified turbocharging pressure. This lowers the exhaust gas back pressure, improving engine output and reducing fuel consumption.



5. Exhaust Manifold Converter

The exhaust manifold converter consists of the NSR (NO_x Storage Reduction) and DPNR (Diesel Particulate-NO_x Reduction) catalysts.



6. Exhaust Pipe

- The exhaust pipes are made of stainless steel for improved rust resistance.
- Oxidation catalytic converters are used in the exhaust front pipe.
- Two ball joints are used, one to join the exhaust manifold to the exhaust front pipe, and the other to join the exhaust front pipe to the exhaust tail pipe. As a result, the transmission of sound and vibration to the interior of the vehicle has been minimized, and weight reduction has been realized.
- An exhaust control valve is built into the main muffler to control the exhaust gas according to engine speed. This reduces noise when the engine is running at low speed as well as reducing exhaust back pressure when the engine is running at high speed.

