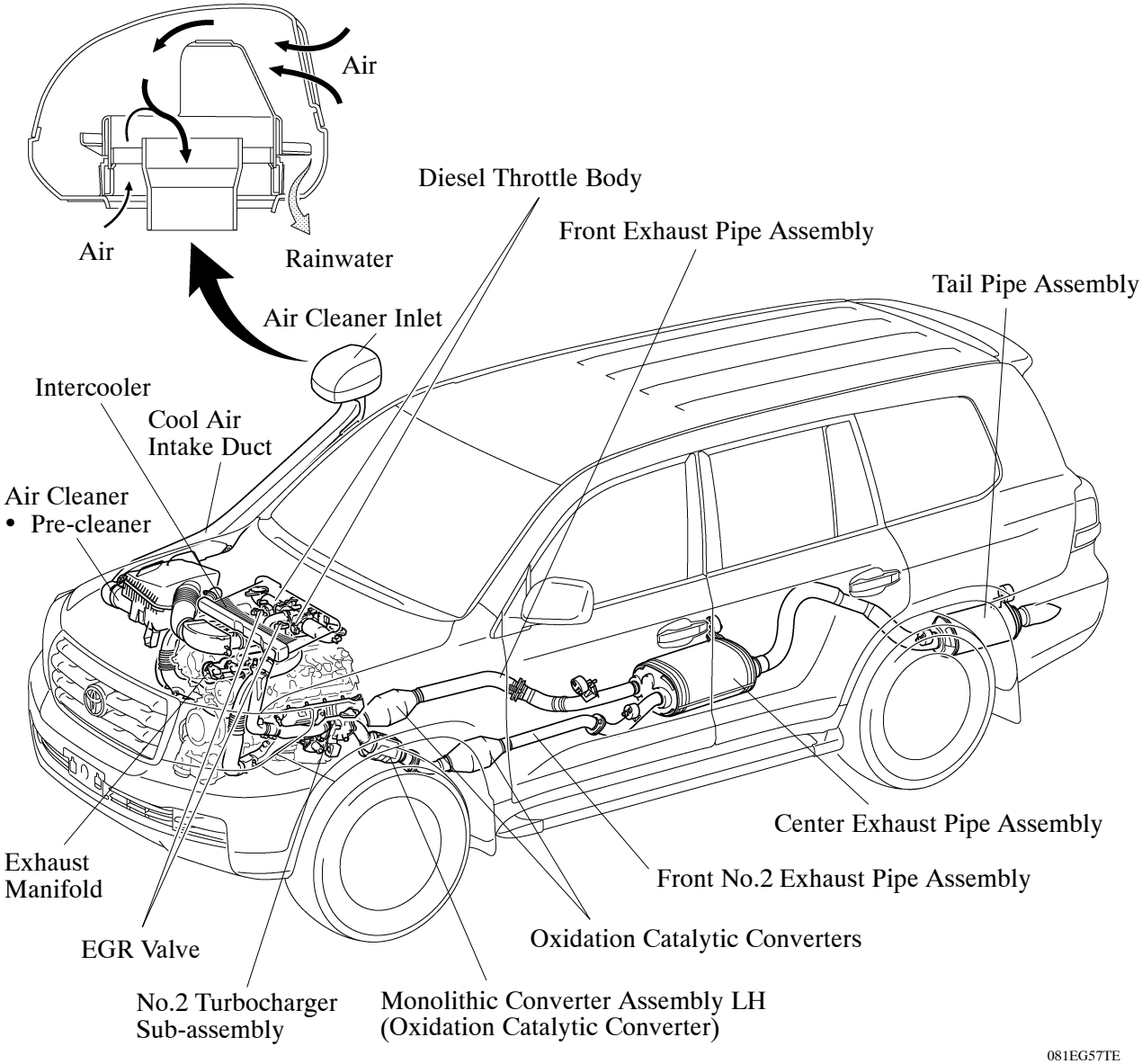
■INTAKE AND EXHAUST SYSTEM

1. General

- A cyclone pre-cleaner is provided on all models except European models*1.
- A snorkel air cleaner is available as an option on Australian and general country models. The cool air intake duct of the snorkel air cleaner uses an air cleaner inlet designed to prevent rainwater entry.
- A diesel throttle body equipped with a rotary solenoid type diesel throttle control motor is used.
- An air-cooled intercooler is used.
- An EGR system is used on the models complying with the emission regulations (EURO II, EURO III, EURO IV). For details of EGR control, see page EG-206.
- A variable nozzle vane type turbocharger driven by a DC motor is used in each bank.
- A stainless steel exhaust pipe is used for weight reduction and improved rust resistance.
- An oxidation catalytic converter is used on models complying with the emission regulations (EURO II*2, EURO III and EURO IV).

*1: European models other than package models for Russia, Turkey, Sweden, Finland and Norway
*2: Except automatic transmission models

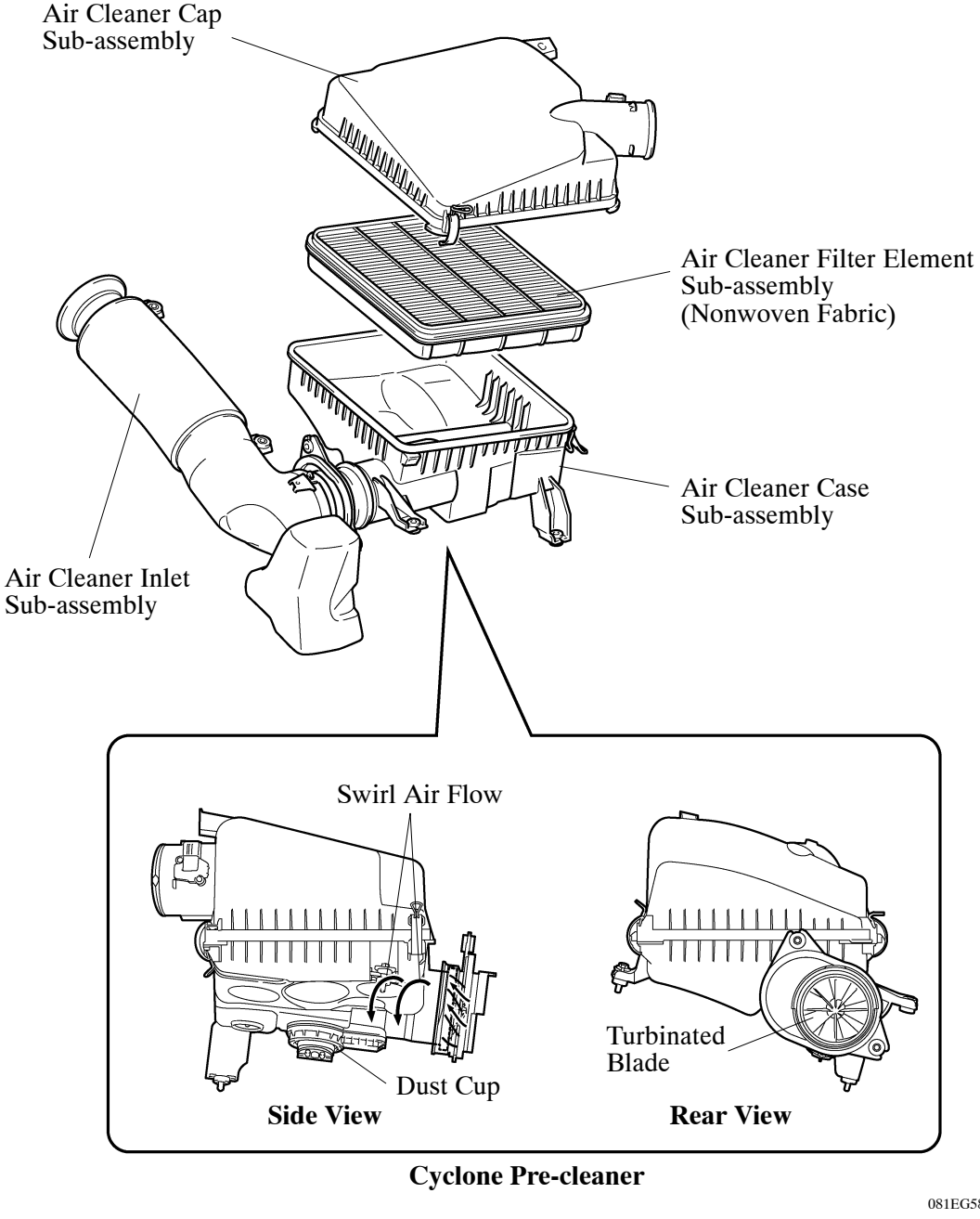


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Australian Models with Snorkel Air Cleaner

2. Air Cleaner

- A nonwoven, full-fabric type air cleaner filter element is used.
- A cyclone pre-cleaner has been provided in the air cleaner case. This cyclone pre-cleaner has a screw shape (turbinated blade) and gathers dusts which has rather big size in a dust cup by swirling the inlet air. The dust cup is removable, so the dust gathered can be disposed.

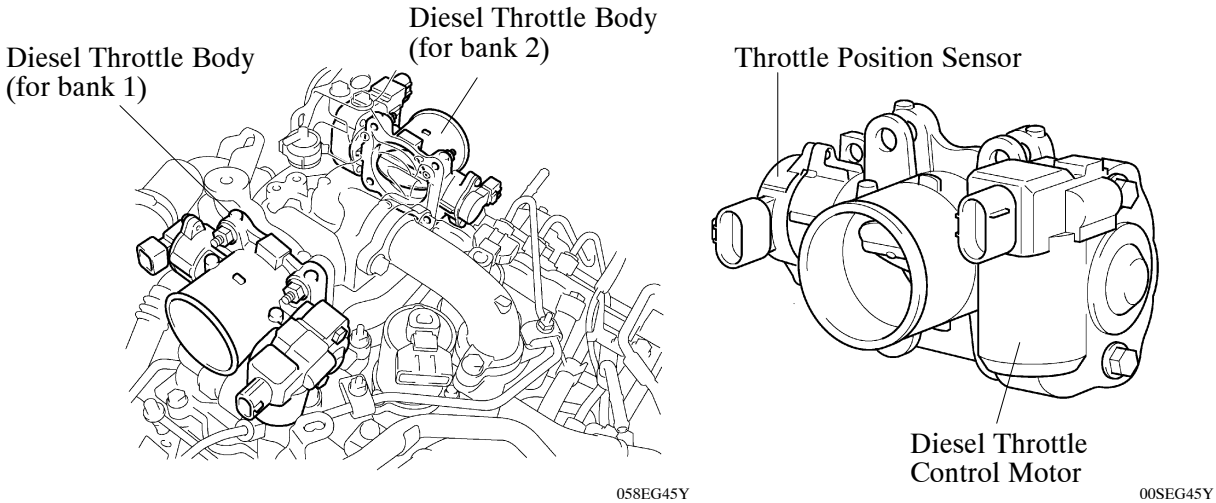


Cyclone Pre-cleaner

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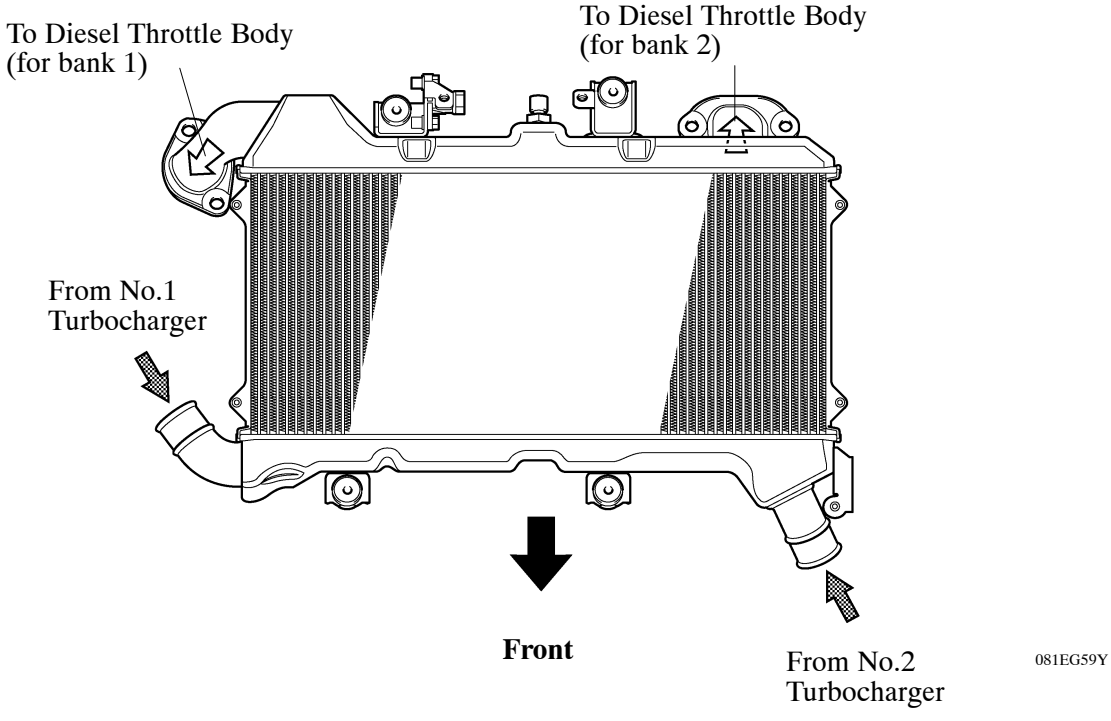
3. Diesel Throttle Body

- Two link-less type diesel throttle bodies in which the diesel throttle control motor and the throttle position sensor are integrated are used.
- In the diesel throttle control motor, a torque motor (rotary solenoid type) is used to control intake throttle.
- A non-contact type throttle position sensor is used in the throttle body. For details, see page EG-191.



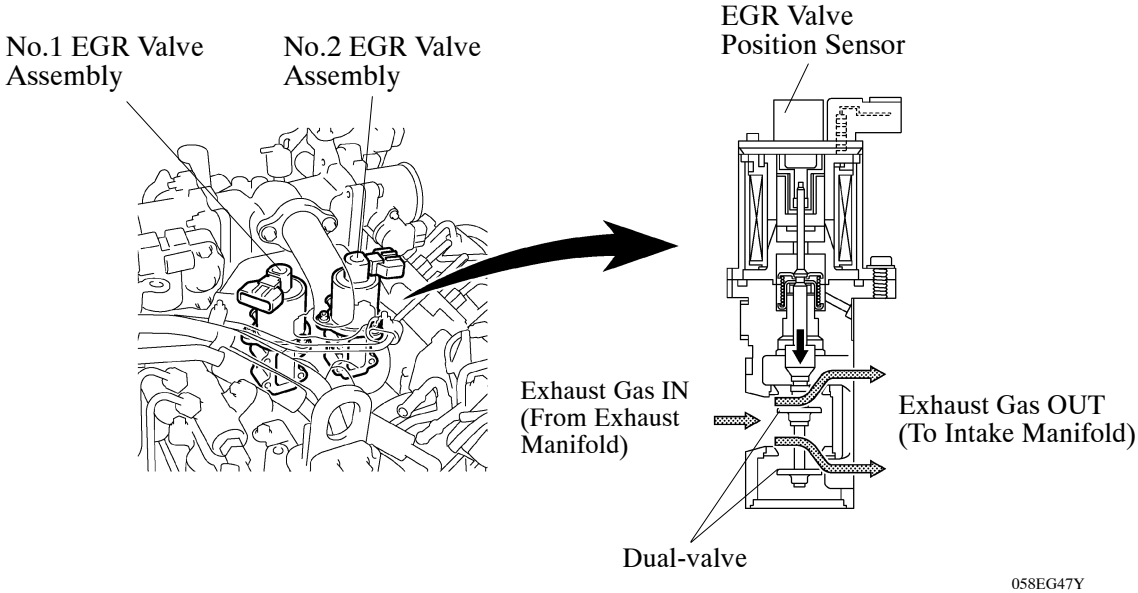
4. Intercooler

An air-cooled intercooler is used in order to lower the intake air temperature, improve engine performance, and to realize cleaner exhaust gas emissions. It is located directly on top of the engine.



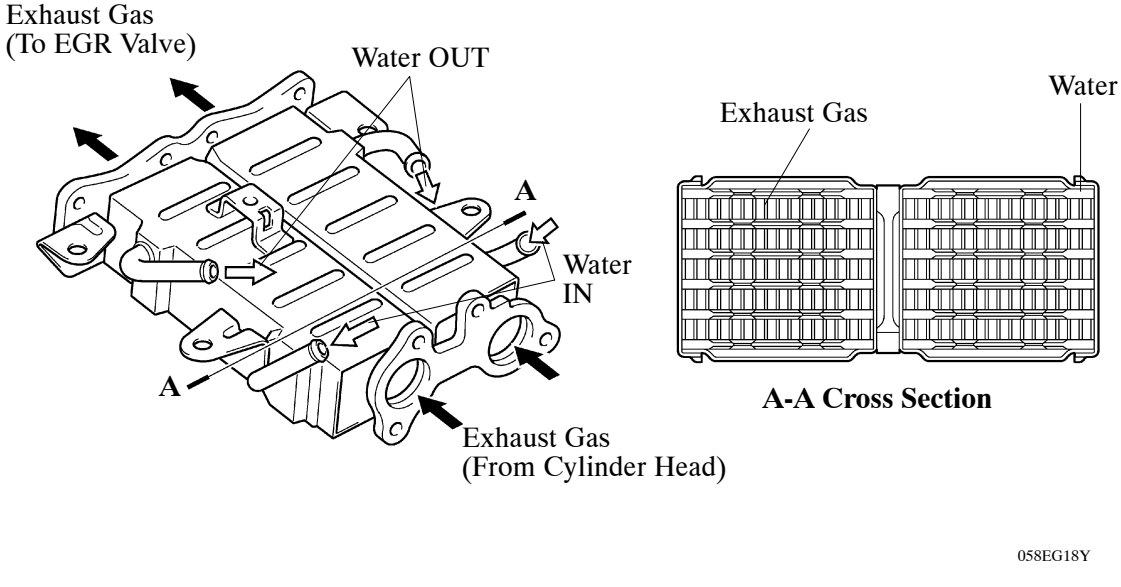
5. EGR Valve

- Two linear solenoid type EGR valves are 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.



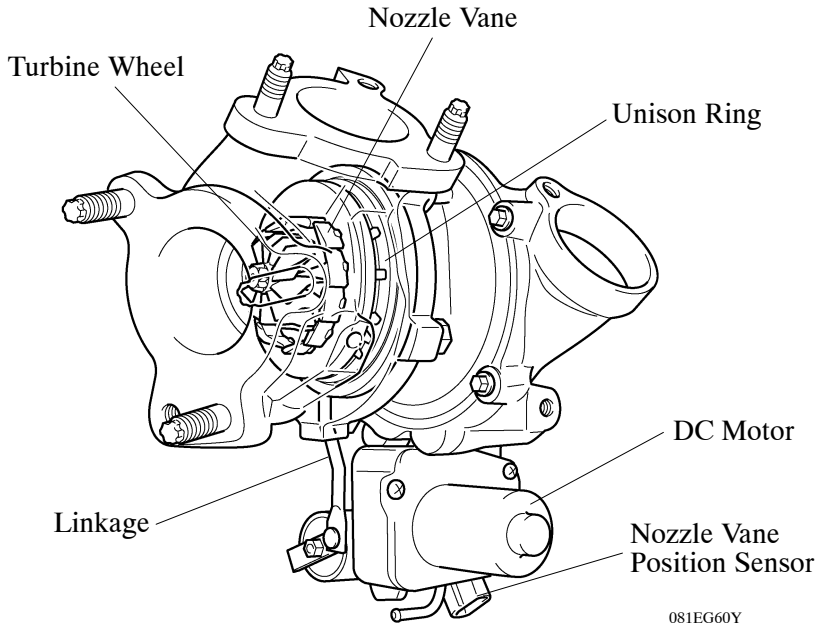
6. EGR Cooler

- 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.
- In the water-cooled type EGR cooler, water flows the five-layered gas passage to cool down.



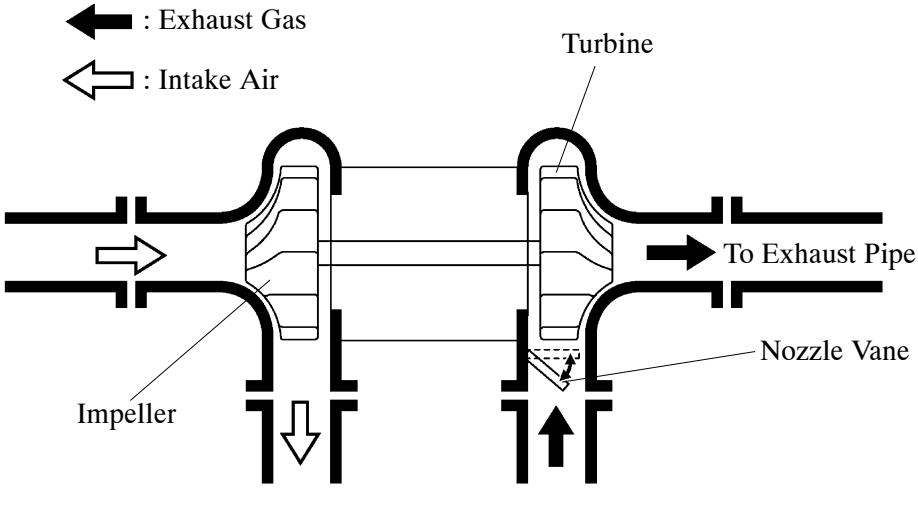
7. Turbocharger

- Variable nozzle vane type turbocharger consists primarily of a compressor wheel, turbine 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 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-201.



No.1 Turbocharger Sub-assembly (for bank 1)

- 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 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. 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 vanes, the exhaust gas flows through this clearance to the exhaust pipe. Therefore, there is no bypass.

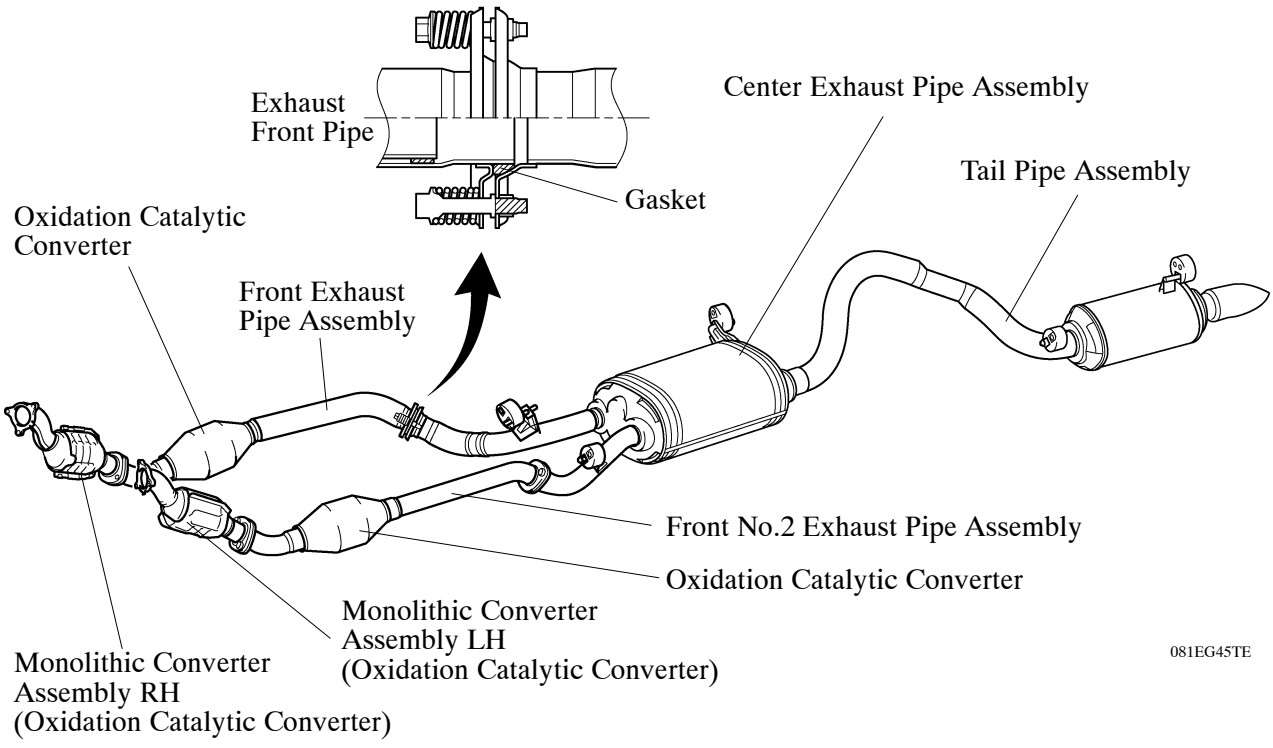


8. Exhaust Pipe

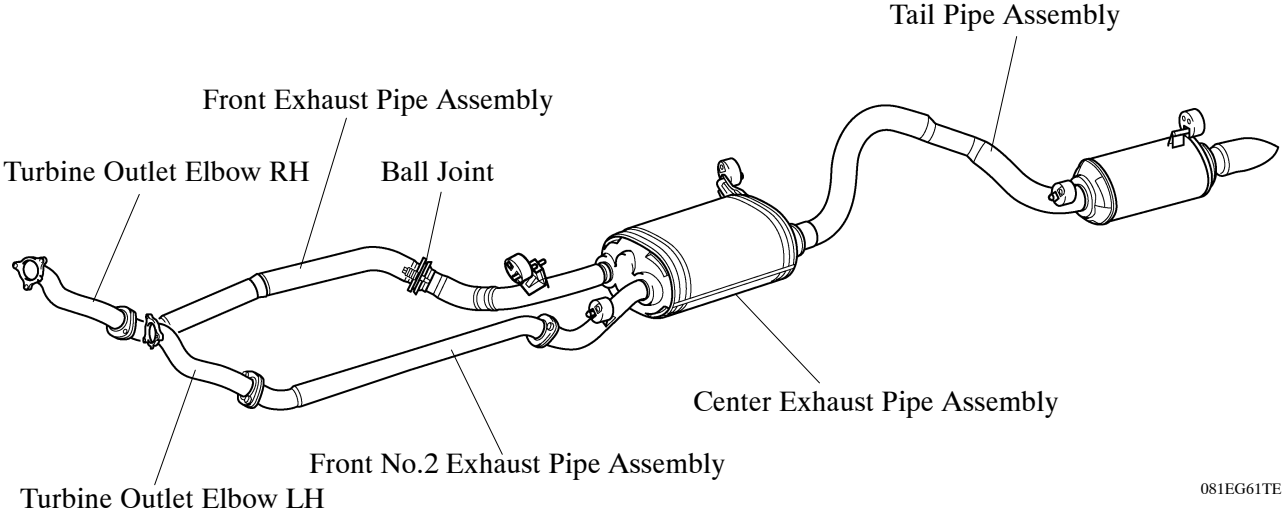
- A stainless steel exhaust pipe is used for weight reduction and rust resistance.
- On models complying with the emission regulations (EURO IV), 4 oxidation catalytic converters are used on the front exhaust pipe to clean the exhaust gas particulates, HC and CO.
- On models complying with the emission regulations (EURO II* and EURO III), 2 oxidation catalytic converters are used on the front exhaust pipe to clean the exhaust gas particulates, HC and CO.
- A ball joint is used to join the front exhaust pipe assembly and the center exhaust pipe assembly. As a result, a simple and reliable construction for reducing vibration has been realized.

*: Except automatic transmission models

Ball Joint



Models Complying with EURO IV



Models not Complying with Emission Regulations and Automatic transmission models complying with Euro II