■ ENGINE CONTROL

1. Function of Main Components

The main components of the engine control system are as follows:

Components		Function
ECM		The ECM performs overall control of the engine control system to suit the operating conditions of the engine in accordance with the signals provided by the sensors.
Crank Position Sensor		This sensor detects the engine speed and performs cylinder identification.
Cam Position Sensor (Crank Position Sensor)		This sensor performs cylinder identification.
Fuel Pressure Sensor		This sensor uses built-in semiconductors to detect the internal pressure of the common-rail.
Intake Mass Air Flow Meter Sub-assembly		This sensor uses a built-in silicon chip to directly detect the intake air mass.
Intake Air Temperature Sensor (Turbo)		This sensor detects the intake air temperature past the intercooler.
Diesel Throttle Body Assembly	Diesel Throttle Position Sensor	This sensor detects the diesel throttle valve opening angle.
	Throttle Motor	Controls the throttle valve opening according to signals from the ECM.
Turbo Pressure Sensor		This sensor uses built-in semiconductors to detect the intake manifold pressure.
Turbocharger Sub-assembly	Nozzle Vane Position Sensor	This sensor detects the nozzle vane position.
	DC Motor	Controls the variable nozzle vane according to signals from the ECM.
Engine Coolant Temperature Sensor		This sensor detects the engine coolant temperature by means of an internal thermistor.
Engine Coolant Temperature Sensor (Radiator)		This sensor detects the water temperature at the radiator outlet by means of an internal thermistor.
Glow Plug Controller		The glow plug controller controls the operating temperature and the length of time for which the current is applied to the glow plug assemblies in accordance with the ECM signal.
Injector Assembly		The injector injects the fuel to the combustion chamber in accordance with the ECM signals.
Pre-stroke Control Valve		Regulates the pre-stroke quantity according to signals from the ECM.
Pressure Discharge Valve		The pressure discharge valve regulates the fuel pressure.
EGR Valve Position Sensor		Detects the EGR valve position and sends signals to the ECM.
Exhaust Gas Temperature Sensor		Detects the temperature of the exhaust gas.
No. 2 Exhaust Gas Temperature Sensor		
No. 3 Exhaust Gas Temperature Sensor		
No. 4 Exhaust Gas Temperature Sensor		
Air Fuel Ratio Sensor		Detects the oxygen concentration in exhaust gas.

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Components	Function
NOx Sensor (Nitrogen Oxides Sensor)	Detects the concentration of NOx in the exhaust gas.
Differential Pressure Sensor	Detects the difference in pressure before and after the converter assembly.
Exhaust Fuel Addition Injector Assembly	Adds fuel inside the exhaust manifold.
Urea Pump Control ECU	Controls the UREA SCR system based on various signals.

2. System Control

The engine control system has the following features. The ECM controls these systems:

Components	Function
Fuel Injection Volume Control	Based on the signals received from the sensors, the ECM determines the fuel injection volume in accordance with the engine condition.
Fuel Injection Timing Control	Based on the signals received from the sensors, the ECM determines the fuel injection timing in accordance with the engine condition.
During Starting Control	To facilitate startability, the ECM optimally controls the injection volume and injection timing during starting.
Idle Speed Control	The ECM determines the idle speed in accordance with the engine condition, and controls the fuel injection volume in order to maintain the target idle speed.
Fuel Pressure Control	Based on the signals received from the sensors, the ECM controls fuel pressure using the prestroke control valve in accordance with engine operating conditions.
Pilot Injection Control	Based on the signals received from the sensors, the ECM determines pilot injection volume/timing and interval (between pilot injection and main injection) in accordance with the engine condition.
Glow Plug Control	The ECM controls the operating temperature and the length of time for which current is applied to the glow plug assemblies, in accordance with the engine coolant temperature.
Diesel Throttle Control	• Controls the diesel throttle valve opening angle in accordance with the engine condition. • Fully closes the diesel throttle valve in order to reduce vibrations when the engine is stopped.
Turbocharger Control	Based on the signals received from the sensors, the ECM controls the actuator in accordance with the engine condition.
Swirl Control	Based on the signals received from the sensors, the ECM controls the vacuum that is directed to the actuator via the VSV, in order to open and close the valve. Controls the valve opening in 2 stages: fully open and fully closed.
EGR System	Based on the signals received from the sensors, the ECM determines the EGR volume via the electric EGR control valve assembly and No. 2 EGR valve assembly in accordance with the engine condition. For details, see page 74.
Catalyst Support Control	Based on the signals received from the sensors, the ECM controls the exhaust fuel addition injector assembly to purify the Particulate Matter (PM). For details, see page 74.

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Components	Function
UREA SCR System	The ECM operates the urea pump according to signals from various sensors to control the urea addition amount. Also, the ECM determines how much urea solution is remaining and whether urea solution needs to be refilled or not according to signals from the urea level sensor, and sends display signals to the combination meter assembly depending on the situation. For details, see page 74.
Air Conditioning Cut-off Control	By controlling the air conditioning compressor on or off in accordance with the engine condition, driveability is maintained.
Brake Override System	When the accelerator and brake pedals are depressed at the same time, the motive force may be restrained. (For the Activation Conditions and Inspection Method, refer to the repair manual.)
Diagnosis	When the ECM detects a malfunction, it diagnoses and memorizes the failed section.
Fail-safe	When the ECM detects a malfunction, it stops or controls the engine in accordance with the data already stored in the memory.