



DENSO

Diesel Injection Pump

SERVICE MANUAL

**New Common Rail System (HP3)
for MAZDA**

OPERATION

June, 2005

DENSO CORPORATION

00400517E

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1. PRODUCT APPLICATION INFORMATION

1.1 Outline

- The common rail system for the MZR-CD engine has been newly installed in the Mazda 5 and Mazda 6. The contents for the common rail system are basically the same as those published in the previous Service Bulletin, "S/B Code: ECD02-06, Subject: New Common Rail System (ECD-U2P) for Mazda." The two major points that have changed for this system are the addition of the DPF system, and injectors equipped with the QR code. Please be sure to use this Service Manual together with the Service Bulletin as this edition explains only points that have changed.

1.2 Application

Model Name	Engine	Destination	Line Off Period
MAZDA 5	MZR-CD	Europe	March, 2005
MAZDA 6			April, 2005

1.3 System Components Parts Number

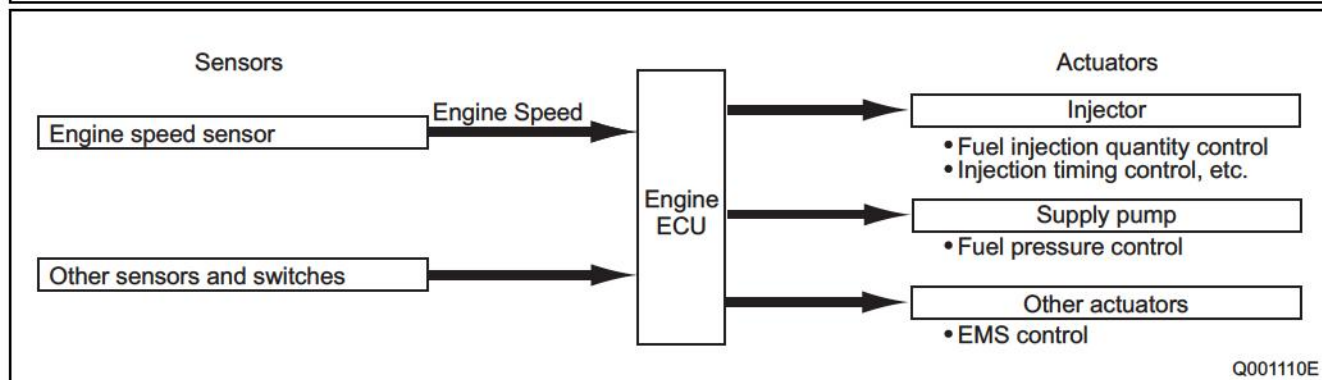
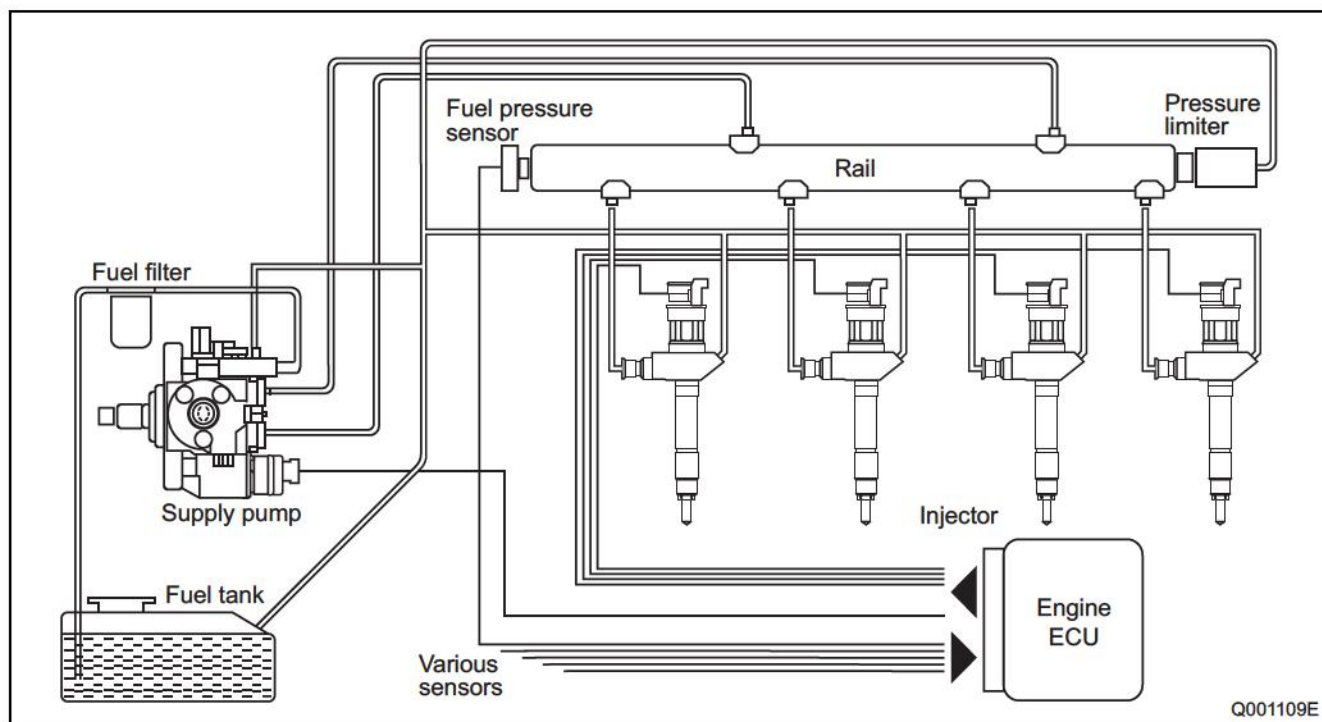
Parts Name	DENSO P/N	Manufacturer P/N	Remarks
Engine ECU	275800-6401	RF7J 18 881B	MAZDA 6
	275800-6441	RF7K 18 881B	MAZDA 6 High Output Engine
	275800-6450	RF7N 18 881A	MAZDA 5
	275800-6460	RF7P 18 881A	MAZDA 5 High Output Engine
Turbo pressure sensor (MAPS)	079800-7440	RF7J 18 211	
Injector	095000-5780	RF7J 13 H50	
Crankshaft position sensor (NE)	949979-0200	RF7J 18 221	
Cylinder recognition sensor (TDC)	949979-1520	RF7J 18 230	
Rail	095440-0740	RF7J 13 GC0	
Rail pressure sensor	499000-6210	—	
Pressure limiter	095420-0201	—	
Supply pump	294000-0420	RF7J 13 800A	
Suction control valve	294200-0160	—	
Fuel temperature sensor	179730-0020	RF1L 18 840	
Mass air flow meter	197400-2010	ZL01 13 215	
Coolant temperature sensor	179700-0220	B593 18 840A	
Engine compartment temperature sensor	170400-6020	BP4W 18 845	
Exhaust temperature sensor 1	265600-1050	RF7N 18 7G0	MAZDA 6
	265600-1090	RF7K 18 7G0A	MAZDA 5
Exhaust temperature sensor 2	265600-1060	RF7P 18 7G0	MAZDA 6
	265600-1080	RF7J 18 7G0A	MAZDA 5

Parts Name	DENSO P/N	Manufacturer P/N	Remarks
Exhaust temperature sensor 3	265600-1070	RF7R 18 7G0	MAZDA 6
	265600-1101	RF7L 18 7G0C	MAZDA 5
A/F sensor (UHEGO)	211200-4260	RF7N 18 8G1	
Differential pressure sensor	104990-1160	RF7N 18 2B5	MAZDA 6
	104990-1150	RF7J 18 2B5	MAZDA 5
Accele pedal module	198800-3480	CC30 41 600	MAZDA 6
	198800-3490	CC34 41 600	
	198800-3400	GR1L 41 600A	MAZDA 5
	198800-3410	GR1M 41 600A	
	198800-3440	GR3D 41 600A	
	198800-3450	GR3E 41 600A	

2. OUTLINE OF SYSTEM

2.1 Outline of Composition and Operation

- This system is basically the same as that in Service Bulletin ECD02-06. However the EDU has been discontinued. Please refer to the Service Bulletin for Operation.

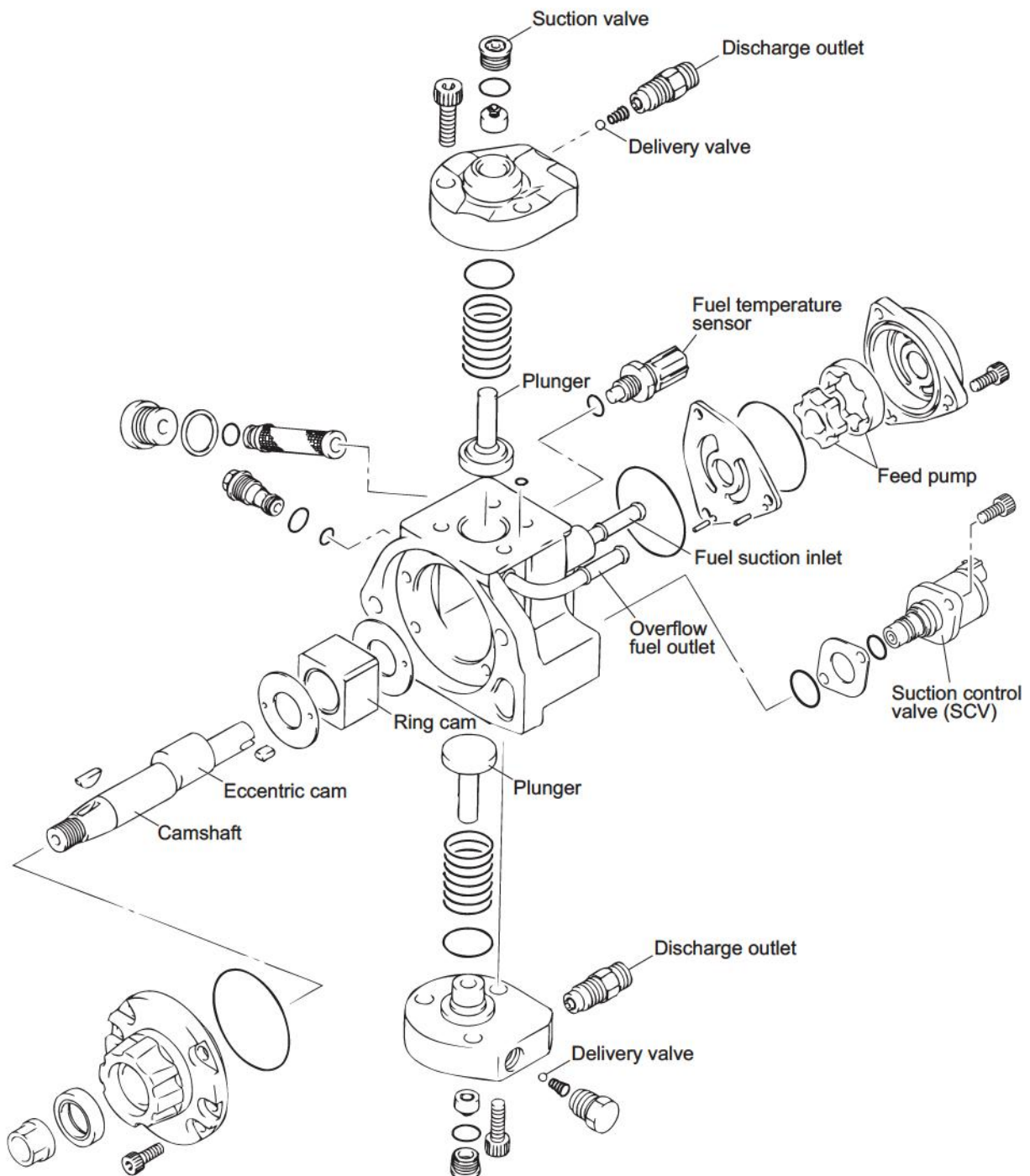


3. SUPPLY PUMP

3.1 Outline

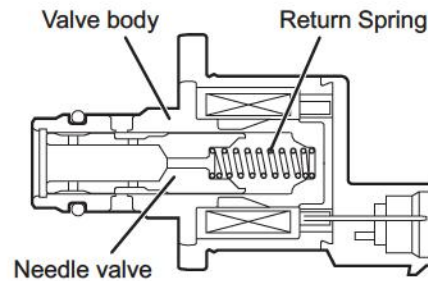
- The HP3 supply pump comes with the compact SCV (Suction Control Valve) installed. Please refer to Service Bulletin ECD02-06 as only the SCV has changed.

3.2 Explode View



3.3 SCV (Suction Control Valve)

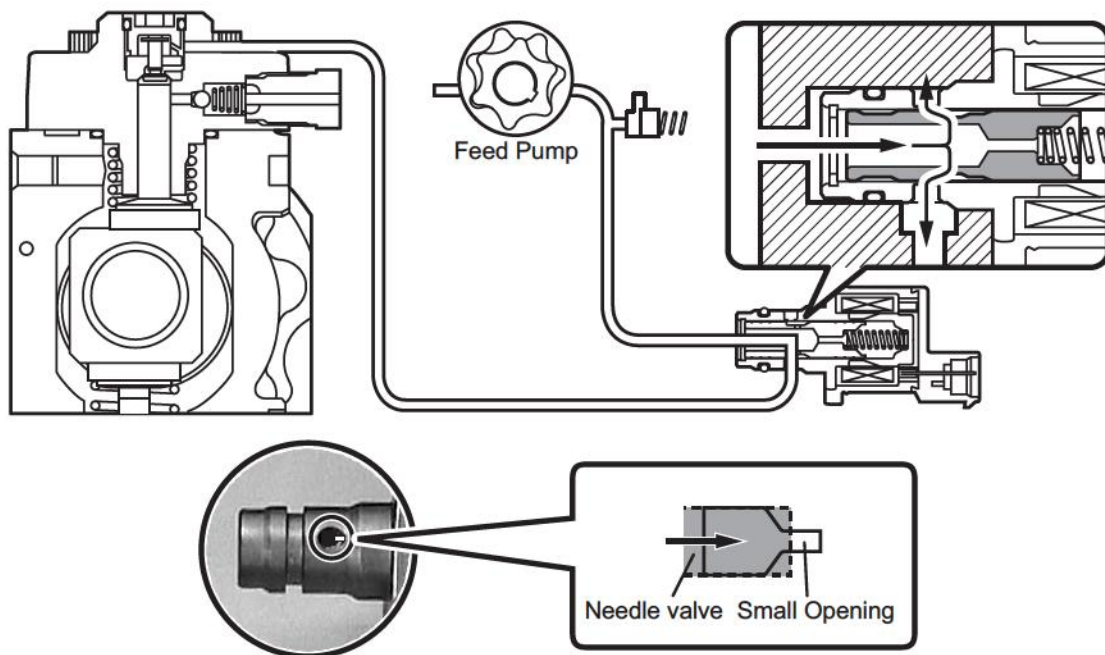
- A linear solenoid type solenoid valve has been adopted. The length of time in which the ECU applies current to the SCV is controlled (duty cycle control) in order to regulate the volume of suction of fuel into the pumping area. Because only the volume of fuel that is required by the target rail pressure is drawn in, the drive load on the supply pump decreases, thus resulting in improved fuel economy.



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(1) SCV Opening Small (Duty ON time long - Refer to the "Relationship Between Actuation Signal and Current" Diagram.)

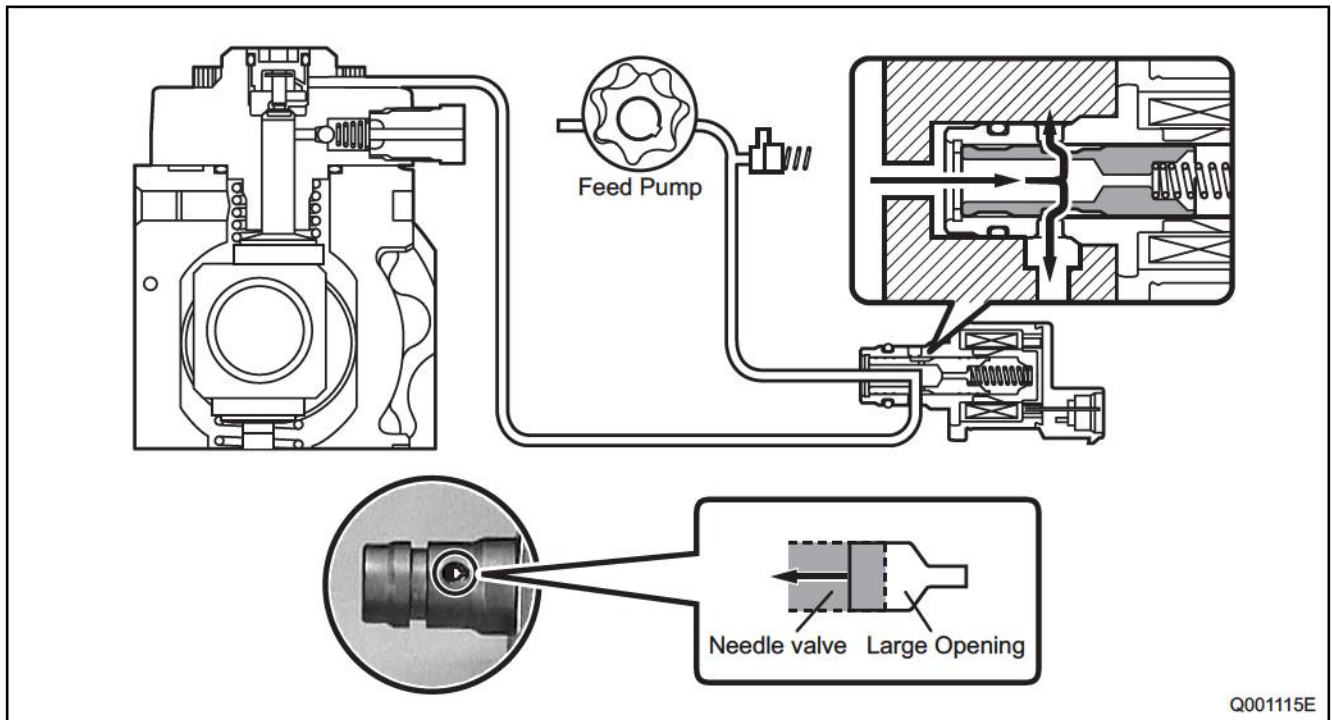
- When the opening of the SCV is small, the fuel suction area is kept small, which decreases the transferable fuel volume.



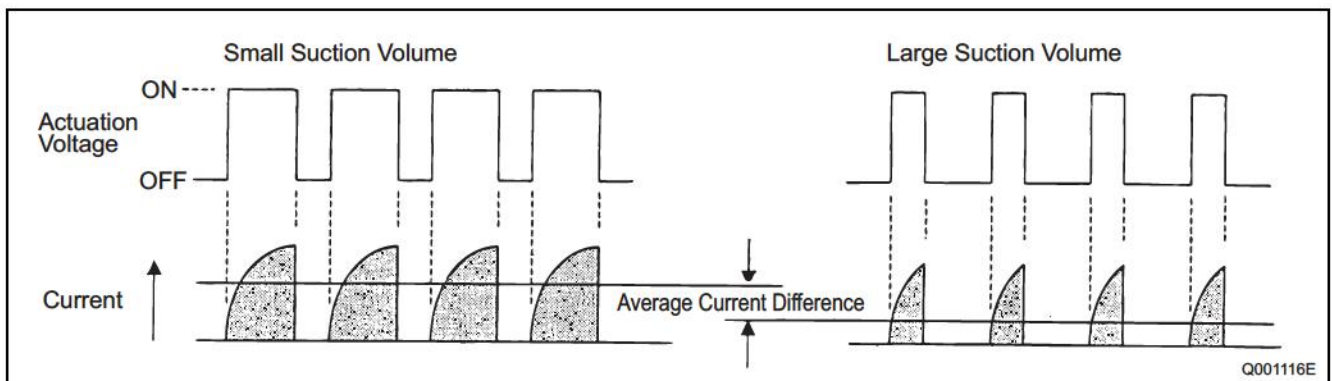
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(2) SCV Opening Large (Duty ON time short - Refer to the "Relationship Between Actuation Signal and Current" Diagram.)

- When the opening of the SCV is large, the fuel suction area is kept large, which increases the transferable fuel volume.



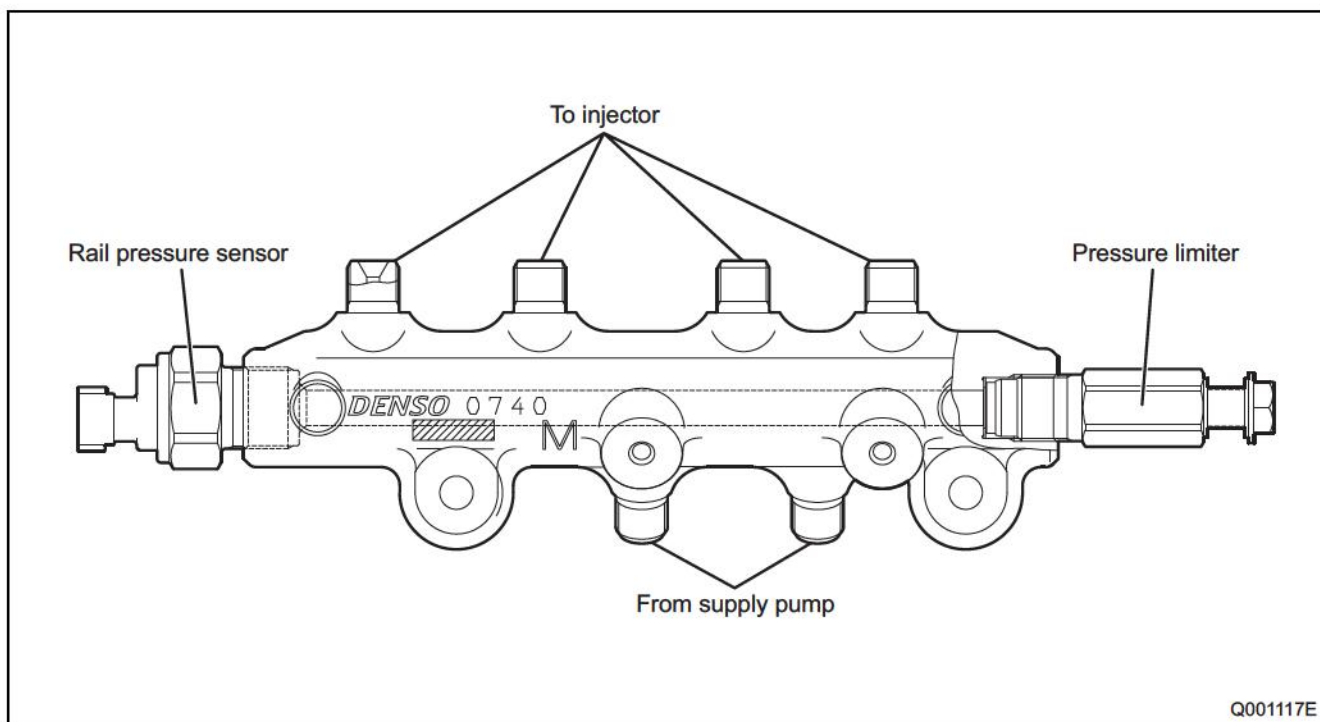
(3) Diagram of Relationship Between Actuation Signal and Current (Magnetomotive Force)



4. RAIL

4.1 Outline

- Although the characteristics of both the Fuel Pressure Sensor and Pressure limiter have not changed, the shape of the Rail Pressure Sensor has been altered. Please refer to Service Bulletin ECD02-06.



5. INJECTOR

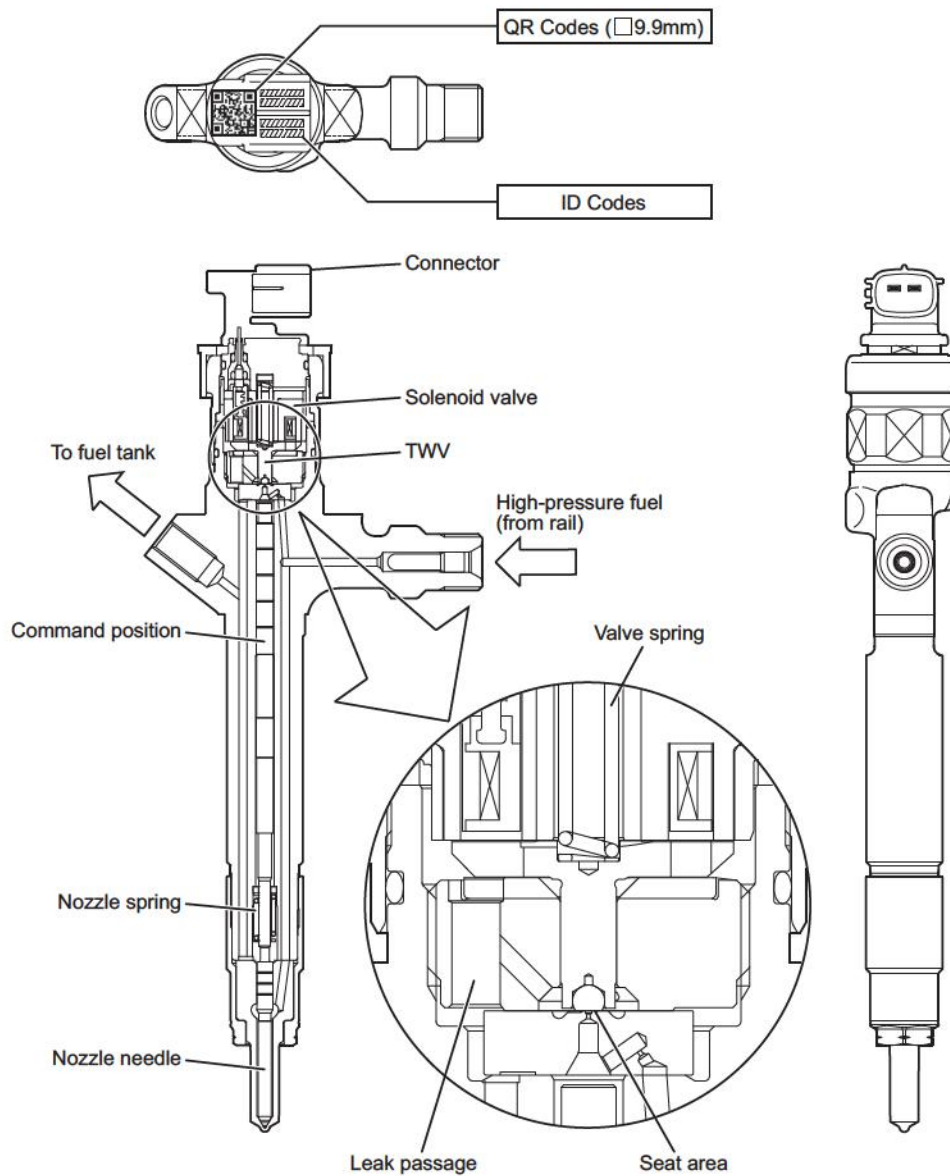
5.1 Outline

- The injectors inject the high-pressure fuel from the rail into the combustion chambers at the optimum injection timing, rate, and spray condition in accordance with the commands received from the ECU. In addition, the correction resistor has been discontinued and replaced by a QR code injector.

5.2 Characteristics

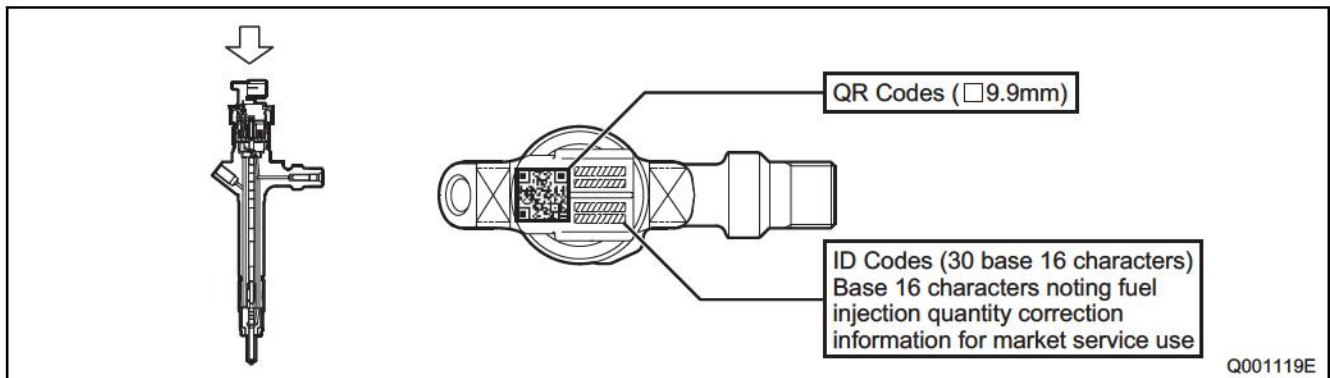
- A compact, energy-saving, solenoid-control type TWV (Two-Way Valve) injector has been adopted.

5.3 Construction

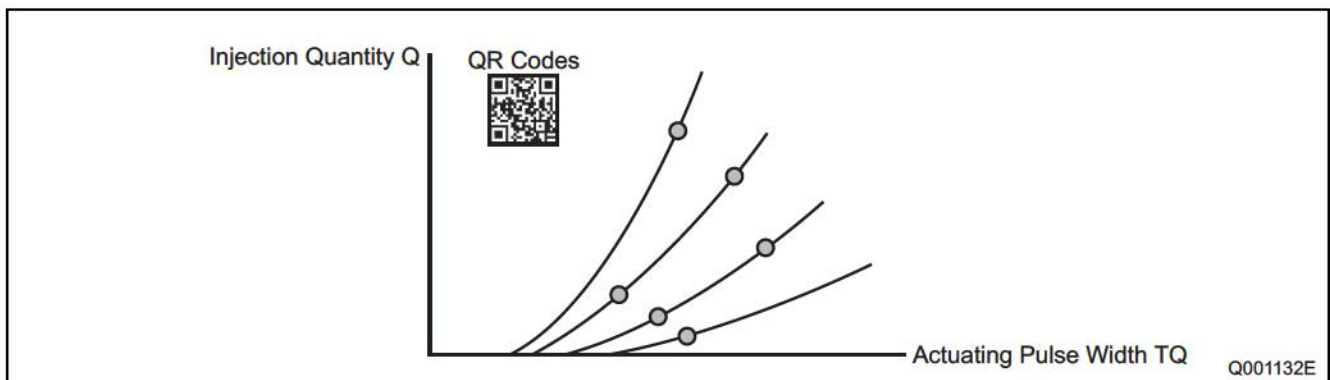


5.4 QR Codes

- Conventionally the whole injector Ass'y was replaced during injector replacement, but QR (Quick Response) codes have been adopted to improve injector quantity precision.



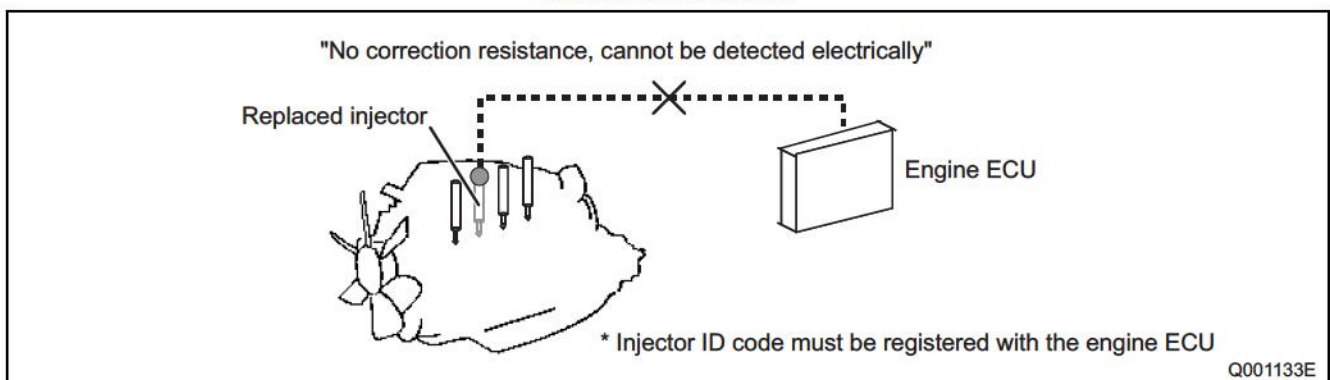
- QR codes have resulted in a substantial increase in the number of fuel injection quantity correction points, greatly improving precision. The characteristics of the engine cylinders have been further unified, contributing to improvements in combustion efficiency, reductions in exhaust gas emissions and so on.



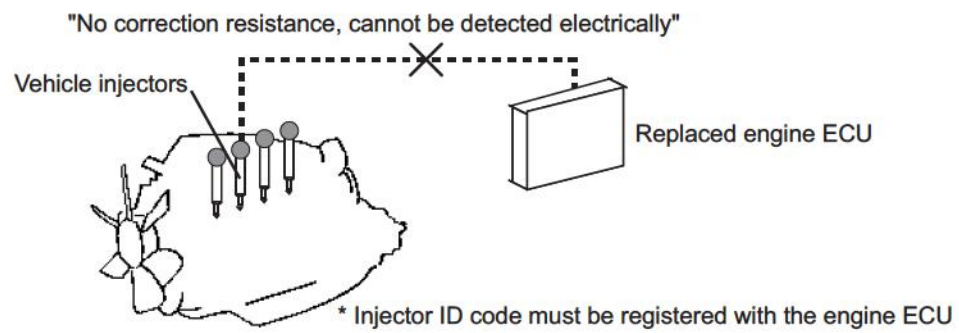
(1) Repair Procedure Changes (Reference)

- When replacing injectors with QR codes, or the engine ECU, it is necessary to record the ID codes in the ECU. (If the ID codes for the installed injectors are not registered correctly, engine failure such as rough idling and noise will result). The ID codes will be registered in the ECU at a MAZDA dealer using approved MAZDA tools.

Replacing the Injector



Replacing the Engine ECU



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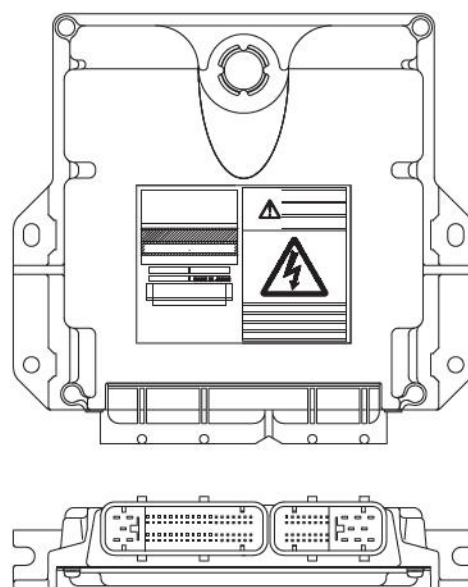
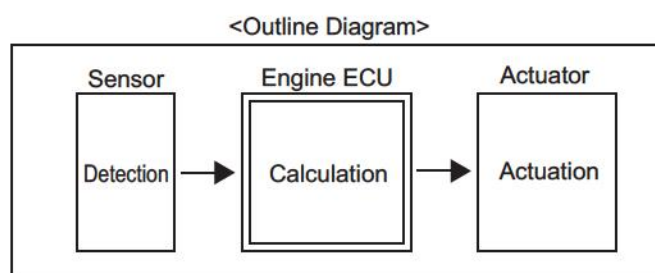
6. OPERATION OF CONTROL SYSTEM COMPONENTS

6.1 Outline

- The EDU (Electronic Driving Unit) functions have been built into the Engine ECU (Electronic Control Unit). Therefore the EDU has been done away with. In addition the system sensor has been changed. Please refer to Service Bulletin ECD02-06 as only this sensor has changed.

6.2 Engine ECU (Electronic Control Unit)

- This is the command center that controls the fuel injection system and the engine operation in general.



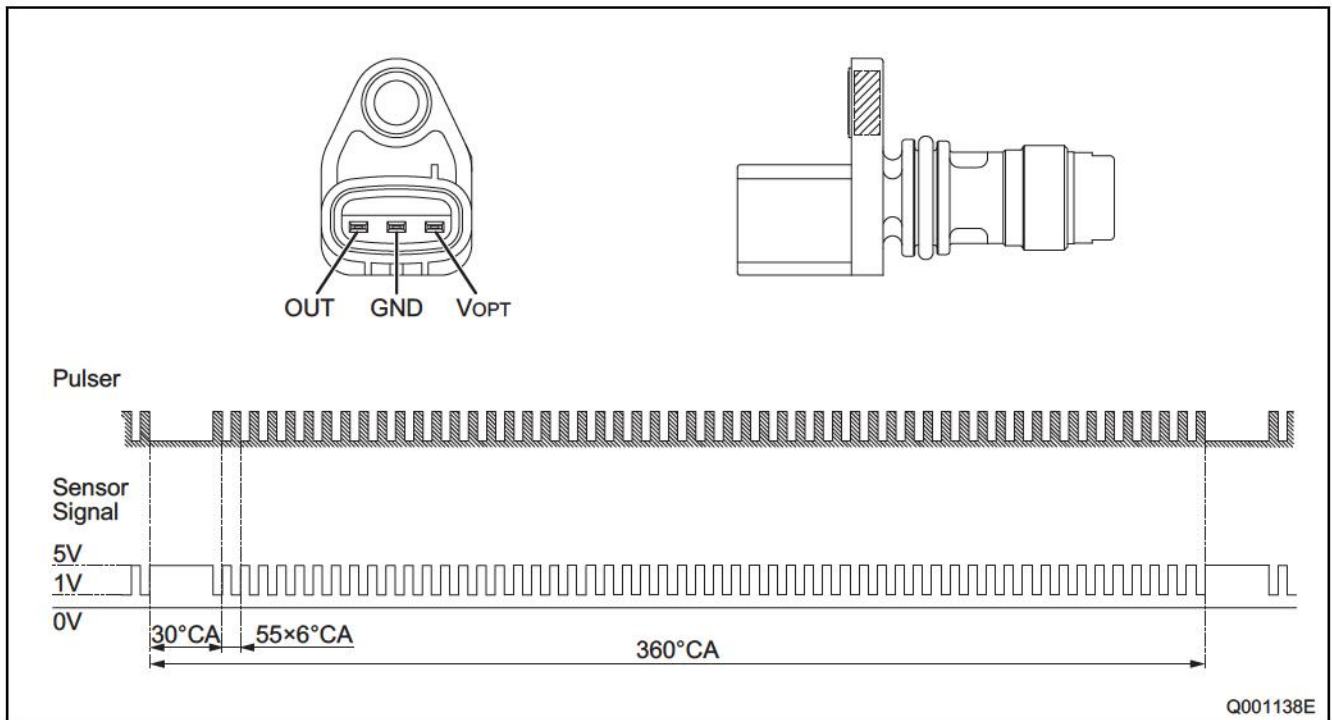
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6.3 Operation of Sensors

- The Crankshaft Position Sensor (NE Sensor) as well as the Cylinder Recognition Sensor (TDC Sensor) have been changed to the MRE (Magnetic Resistance Element) type. For the MRE type, when the pulsar passes the sensor, the magnetic resistance changes and the voltage passing through the sensor changes. The change in voltage is amplified by the internal IC circuit and is output to the engine ECU. In addition the Intake Air Pressure Sensor (MAPS) output characteristics have also changed.

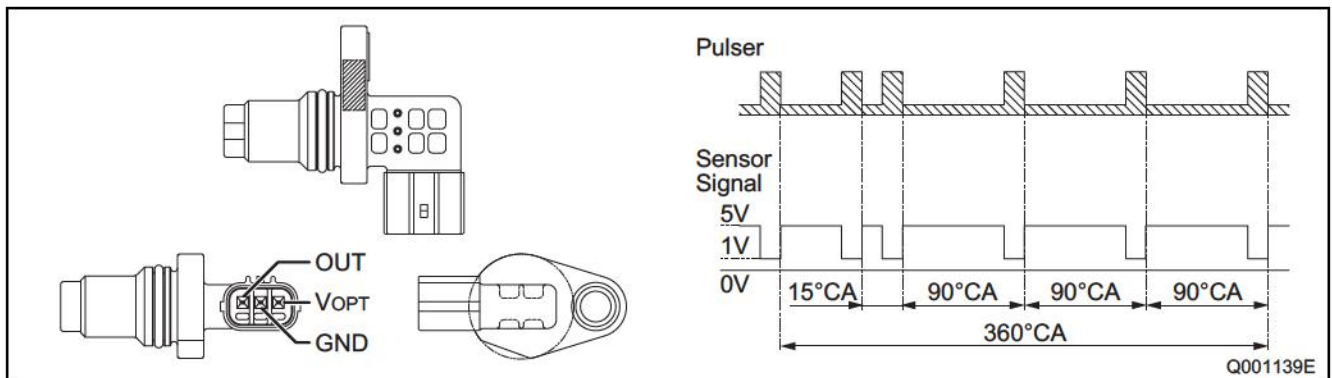
(1) Crankshaft Position Sensor (NE Sensor)

- An NE pulsar is mounted on the crankshaft timing gear in order to output the signals that are used for detecting the crankshaft position. The pulsar gear consists of 55 teeth and 5 missing tooth per pulse, thus enabling the sensor to output 55 pulses for every revolution (360°CA) of the crankshaft.



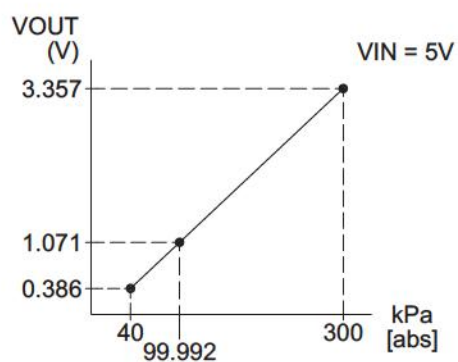
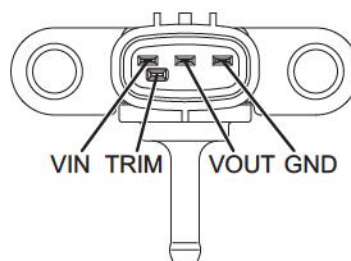
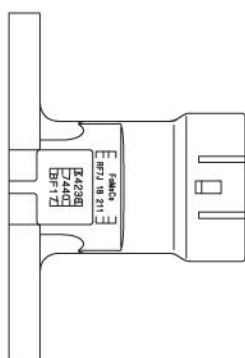
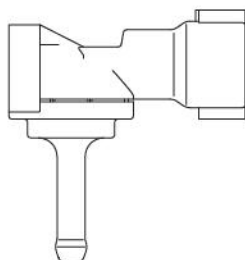
(2) Cylinder Recognition Sensor (TDC Sensor)

- Outputs a cylinder identification signal. The sensor outputs 5 pulses for every two revolutions (720°CA) of the engine.



(3) Turbo Pressure Sensor

- This is a semiconductor type pressure sensor, which utilizes the electrical resistance of the silicon element that changes with the changes in the pressure that is applied to the silicon element.



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7. CONTROL SYSTEM

7.1 Outline

- A new DPF (Diesel Particulate Filter) has been added to the control system. In addition, control regarding the system has been changed. Please refer to Service Bulletin ECD02-06 as only these controls have changed.

(1) Sensor System

Sensor Name	Function	Fuel Injection	Rail Pressure	Intake Restriction	EGR	VGT	DPF
Airflow meter	Uses a hot wire to detect the intake airflow rate.				○		
Air temperature sensor	Located in the airflow meter, this sensor detects the intake air temperature.	○	○	○	○		
Intake air temperature sensor	Detects the intake air temperature past the turbocharger.	○					○
Coolant temperature sensor	Detects the water temperature.	○	○		○		○
Rail pressure sensor	Detects the fuel pressure in the rail.	○	○				○
Fuel temperature sensor	Detects the fuel temperature in the supply pump	○	○				
Turbo pressure sensor	Detects the intake air pressure.	○			○	○	○
Air pressure sensor	Detects the air pressure.	○	○	○	○	○	○
Accelerator position sensor	Attached to the accelerator pedal, this sensor detects the travel of the accelerator pedal.	○		○	○		
Crankshaft position sensor (NE sensor)	Detects the engine speed based on the crankshaft position.	○	○	○	○	○	○
Cylinder recognition sensor (TDC sensor)	Identifies the cylinder based on the rotation of the rotor attached to the camshaft.	○	○				
Starter signal	This is the starter voltage signal during starting.	○	○	○	○	○	
Vehicle speed sensor	Detects the vehicle speed.	○		○			○
A/F Sensor (UHEGO)	Detects the exhaust gas A/F value.				○		○
Differential Pressure Sensor	Detects pressure both before and after the DPF.						○
Exhaust Temperature Sensor 1	Detects the exhaust temperature before the DPF.						○
Exhaust Temperature Sensor 2	Detects the exhaust temperature inside the DPF.						○
Exhaust Temperature Sensor 3	Detects the exhaust temperature after the DPF.				○		○
Engine Compartment Temperature Sensor	Detects the ambient temperature in the vicinity of the engine compartment differential pressure sensor.						○

(2) Actuator System

Actuator Name	Function	Fuel Injection	Rail Pressure	Intake Restriction	EGR	VGT	DPF
Main relay	Supplies power to the system.	○	○	○	○	○	○
Injector	Precisely injects fuel.	○					
Suction control valve	Controls the volume of fuel that is supplied to the supply pump.	○	○				
EGR Valve DC Motor	Controls the vacuum that is applied to the EGR valve.				○		
VGT E-VRV	Controls the vacuum that is applied to the turbo.					○	
Electronic Control Throttle DC Motor	Controls the vacuum that is applied to the intake suction valve.			○			○
Fan relay	Controls the duration of time in which the current is applied to the electric fan.						

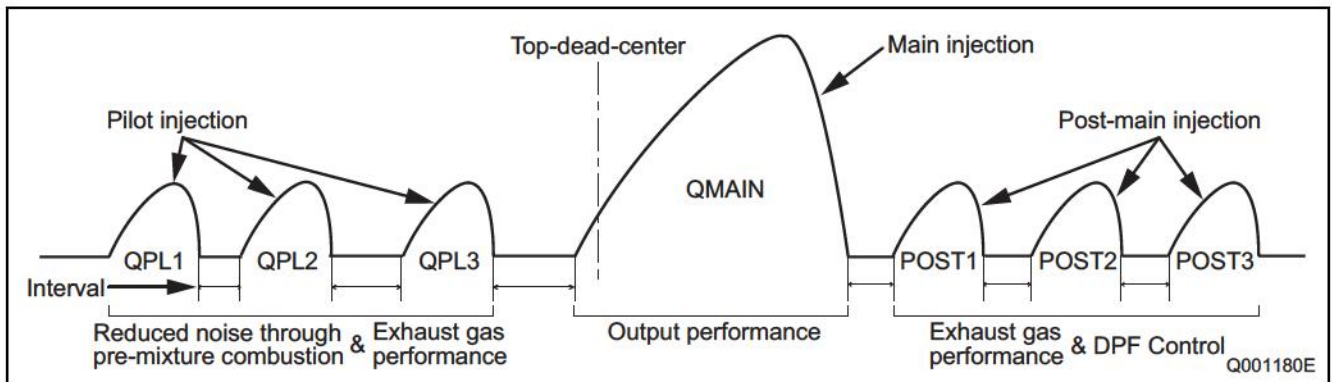
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(3) Control System

Control Name	Function
Fuel injection control	Controls the injectors' fuel injection timing and injection quantity by adding corrections based on the signals from the sensors to the basic injection duration, which is calculated in accordance with the conditions of the engine.
Rail pressure control	Controls the rail pressure by sending signals to the suction control valve of the supply pump in accordance with the conditions of the engine.
VGT control	Controls the boost pressure by calculating the signals that are output to the E-VRV in accordance with the operating conditions.
Intake restriction control	Controls the opening of the intake restriction mechanism in accordance with the driving conditions.
EGR control	Controls the opening of the EGR valve by calculating the signals that are output in accordance with the operating conditions.
Glow plug relay control	Controls the duration of the current that is applied to the glow plug relay in accordance with the water temperature during the starting of the engine.
Air conditioner cutoff control	Cuts off the air conditioner during acceleration to improve drivability.
Diagnosis	Illuminates a warning light to alert the driver if a failure occurs in the computer.
Auto cruise control	Effects feedback control of the actual vehicle speed to match the speed that is set in accordance with the cruise control switch.
DSC control	Effects traction control and ABS control in accordance with the driving conditions.
DPF Control	Data from the differential pressure sensor, exhaust temperature sensor, airflow sensor, etc, are accumulated in the DPF and used to estimate the PM (Particulate Matter) volume as well as perform proper combustion (PM combustion).

7.2 Fuel Injection Timing Control

- Multi-Injection Control has changed due to the items attached to the DPF. Post2 and Post3 injections have been added due to the state of the DPF.



8. DIAGNOSTIC TROUBLE CODES (DTC)

8.1 About the Codes Shown in the Table

- The "SAE" diagnostic trouble code indicates the code that is output through the use of the STT (WDS). (SAE: Society of Automotive Engineers)

8.2 Diagnostic Trouble Code Details

< NOTE >

- *1 : In the event that the code "DTC0088" is displayed when using a diagnostic tool, there is a possibility that the injectors have exceeded the guarantee limit (engine speed and fuel pressure parameters). Replace all injectors.
- *2 : In the event that the code "DTC0089" is displayed when using a diagnostic tool, there is a possibility that the pressure limiter is open. Replace the rail.
- *3 : In the event that the code "DTC1211" is displayed when using a diagnostic tool, there is a possibility of damage to one of the pump cylinders. However, if the MIL lamp is on, verify that the vehicle is not out of gas. If there is even a small amount of residual fuel, refill the tank and check the MIL lamp again. If the MIL lamp is still on, replace the pump.
- *4 : In the event that the code "DTC1281" is displayed when using a diagnostic tool, there is a possibility that the pump has exceeded the guarantee limit (engine speed and fuel pressure parameters). Replace the pump.
- *5 : In the event that the code "DTC1329" is displayed when using a diagnostic tool, there is a possibility that the pump has exceeded the guarantee limit (engine speed and fuel pressure parameters). Replace the pump.

DTC Number SAE	Diagnosis Item [Terminal]	Description of Diagnosis 1: Diagnosis condition 2: Failure state	Light ON	Main Malfunction Symptom	Inspection Area
P0563	Battery voltage high [Battery terminal]	1: Key ON and starter OFF 2: Out of range	Yes	ECU, sensor(s), actuator damage	Battery, ECU, ECU-battery wiring harness, connector
P0562	Battery voltage low [Battery terminal]	1: Key ON and starter OFF 2: Out of range	Yes	ECU reset, sensor, poor actuator operation, poor emissions, poor driveability	Battery, ECU, ECU-battery wiring harness, connector
P0118	Coolant temperature sensor high [Coolant temperature sensor terminal]	1: Key On and battery normal 2: Out of range	Yes	Worsening emissions, decrease in low temperature startability, decrease in driveability	Coolant temperature sensor, ECU, ECU-sensor wiring harness, connector
P0117	Coolant temperature sensor low [Coolant temperature sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	Worsening emissions, decrease in low temperature startability, decrease in driveability	Coolant temperature sensor, ECU, ECU-sensor wiring harness, connector
P0116	Abnormal coolant temperature sensor characteristics [Coolant temperature sensor terminal]	When in an expected temperature rise situation, a small change in output detected.	Yes	Worsening emissions, decrease in low temperature startability, decrease in driveability	Coolant temperature sensor, ECU, ECU-sensor wiring harness, connector

DTC Number SAE	Diagnosis Item [Terminal]	Description of Diagnosis 1: Diagnosis condition 2: Failure state	Light ON	Main Malfunction Symptom	Inspection Area
P0098	Intake air temperature sensor high [Intake air temperature sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	Worsening emissions, decrease in low temperature startability, decrease in driveability	Intake air temperature sensor, ECU, ECU-sensor wiring harness, connector
P0097	Intake air temperature sensor low [Intake air temperature sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	Worsening emissions, decrease in low temperature startability, decrease in driveability	Intake air temperature sensor, ECU, ECU-sensor wiring harness, connector
P0096	Abnormal intake air sensor characteristics [Intake air temperature sensor terminal]	When in an expected temperature rise situation, a small change in output detected.	Yes	Worsening emissions, decrease in low temperature startability, decrease in driveability	Intake air temperature sensor, ECU, ECU-sensor wiring harness, connector
P0113	Ambient temperature sensor high [Ambient temperature sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	Worsening emissions, decrease in low temperature startability, decrease in driveability	Ambient temperature sensor, ECU, ECU-sensor wiring harness, connector
P0112	Ambient temperature sensor low [Ambient temperature sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	Worsening emissions, decrease in low temperature startability, decrease in driveability	Ambient temperature sensor, ECU, ECU-sensor wiring harness, connector
P0111	Abnormal ambient temperature sensor characteristics [Ambient temperature sensor terminal]	When in an expected temperature rise situation, a small change in output detected.	Yes	Worsening emissions, decrease in low temperature startability, decrease in driveability	Ambient temperature sensor, ECU, ECU-sensor wiring harness, connector
P0183	Fuel temperature sensor high [Fuel temperature sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	Worsening emissions	Fuel temperature sensor, ECU, ECU-sensor wiring harness, connector
P0182	Fuel temperature sensor low [Fuel temperature sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	Worsening emissions	Fuel temperature sensor, ECU, ECU-sensor wiring harness, connector
P0181	Abnormal fuel temperature sensor characteristics [Fuel temperature sensor terminal]	When in an expected temperature rise situation, a small change in output detected.	No	Worsening emissions	Fuel temperature sensor, ECU, ECU-sensor wiring harness, connector

DTC Number SAE	Diagnosis Item [Terminal]	Description of Diagnosis 1: Diagnosis condition 2: Failure state	Light ON	Main Malfunction Symptom	Inspection Area
P0193	Rail pressure sensor high [Rail pressure sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	PC control impossible, poor driveability, worsening emissions	Rail pressure sensor, ECU, ECU-sensor wiring harness, connector
P0192	Rail pressure sensor low [Rail pressure sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	PC control impossible, poor driveability, worsening emissions	Rail pressure sensor, ECU, ECU-sensor wiring harness, connector
P0191	Abnormal rail pressure sensor characteristics [Rail pressure sensor terminal]	When rail pressure sensor output should be changing, sensor output change is small.	Yes	PC control impossible, poor driveability, worsening emissions	Rail pressure sensor, ECU, ECU-sensor wiring harness, connector
P0108	Turbo pressure sensor high [Turbo pressure sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	Worsening emissions, decrease in driveability	Turbo pressure sensor, ECU, ECU-sensor wiring harness, connector
P0107	Turbo pressure sensor low [Turbo pressure sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	Worsening emissions, decrease in driveability	Turbo pressure sensor, ECU, ECU-sensor wiring harness, connector
P0106	Abnormal turbo pressure sensor characteristics [Turbo pressure sensor terminal]	When turbo pressure sensor output should be changing, sensor output change is small.	Yes	Worsening emissions, decrease in driveability	Turbo pressure sensor, ECU, ECU-sensor wiring harness, connector
P2229	Atmospheric pressure sensor high [Atmospheric pressure sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	Worsening emissions, decrease in driveability	Atmospheric pressure sensor (built into the ECU), ECU, ECU-sensor wiring harness, connector
P2228	Atmospheric pressure sensor low [Atmospheric pressure sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	Worsening emissions, decrease in driveability	Atmospheric pressure sensor (built into the ECU), ECU, ECU-sensor wiring harness, connector
P2227	Abnormal atmospheric pressure sensor characteristics [Atmospheric pressure sensor terminal]	1: During engine operation 2: Large difference in standard value and atmospheric pressure	Yes	Worsening emissions, decrease in driveability	Atmospheric pressure sensor (built into the ECU), turbo pressure sensor, ECU, ECU-sensor wiring harness, connector
P0123	Accelerator sensor 1 high [Accelerator sensor 1 (TV01) terminal]	1: Key ON and battery normal 2: Out of range	Yes	Accelerator control not possible	Accelerator sensor, ECU, ECU-sensor wiring harness, connector
P0122	Accelerator sensor 1 low [Accelerator sensor 1 (TV01) terminal]	1: Key ON and battery normal 2: Out of range	Yes	No acceleration	Accelerator sensor, ECU, ECU-sensor wiring harness, connector
P2135	Accelerator 1 intermediate malfunction [Accelerator sensor 1, 2 (TV01, 2) terminal]	1: Key ON and battery normal 2: Voltage difference detected	Yes	Accelerator control not possible	Accelerator sensor, ECU, ECU-sensor wiring harness, connector

DTC Number SAE	Diagnosis Item [Terminal]	Description of Diagnosis 1: Diagnosis condition 2: Failure state	Light ON	Main Malfunction Symptom	Inspection Area
P0121	Accelerator sensor 1 abnormal characteristics [Accelerator sensor 1, 2 (TV01, 2) terminal]	1: Key ON and battery normal 2: Sensor 1, 2 voltage difference observed	Yes	Accelerator control not possible, no acceleration	Accelerator sensor, ECU, ECU-sensor wiring harness, connector
P0223	Accelerator sensor 2 high [Accelerator sensor 2 (TV02) terminal]	1: Key ON and battery normal 2: Out of range	Yes	Heavy idle vibration	Accelerator sensor, ECU, ECU-sensor wiring harness, connector
P0222	Accelerator sensor 2 low [Accelerator sensor 2 (TV02) terminal]	1: Key ON and battery normal 2: Out of range	Yes	Heavy idle vibration	Accelerator sensor, ECU, ECU-sensor wiring harness, connector
P0103	Mass airflow sensor high [Mass airflow sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	Output insufficient, worsening emissions	Mass airflow sensor, ECU, ECU-sensor wiring harness, connector
P0102	Mass airflow sensor low [Mass airflow sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	Worsening emissions	Mass airflow sensor, ECU, ECU-sensor wiring harness, connector
P0101	Abnormal mass airflow sensor characteristics [Mass airflow sensor terminal]	1: During engine operation 2: Abnormal flow volume value detected	Yes	Output insufficient, worsening emissions	Mass airflow sensor, intake air temperature sensor, turbo pressure sensor, EGR actuator, ECU, ECU-sensor wiring harness, connector
P0406	EGR lift sensor high [EGR lift sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	Output insufficient, worsening emissions	EGR actuator, ECU, ECU-sensor wiring harness, connector
P0405	EGR lift sensor low [EGR lift sensor terminal]	1: Key ON and battery normal 2: Out of range	Yes	Worsening emissions	EGR actuator, ECU, ECU-sensor wiring harness, connector
P0545	Exhaust temperature sensor U low [Exhaust temperature sensor 1 terminal (before DOC)]	1: Key ON and battery normal 2: Out of range	Yes	Output insufficient, worsening emissions	Exhaust temperature sensor 1, ECU, ECU-sensor wiring harness, connector
P0546	Abnormal exhaust temperature sensor U characteristics [Exhaust temperature sensor 1 terminal (before DOC)]	1: Key ON and battery normal 2: Out of range observed	Yes	Output insufficient, worsening emissions	Exhaust temperature sensor 1, 2, 3, ECU, ECU-sensor wiring harness, connector
P0548	Exhaust temperature sensor M low [Exhaust temperature sensor 2 terminal (before DPF)]	1: Key ON and battery normal 2: Out of range observed	Yes	Output insufficient, worsening emissions	Exhaust temperature sensor 2, ECU, ECU-sensor wiring harness, connector
P0549	Abnormal exhaust temperature sensor M characteristics [Exhaust temperature sensor 2 terminal (before DPF)]	1: Key ON and battery normal 2: Out of range observed	Yes	Output insufficient, worsening emissions	Exhaust temperature sensor 1, 2, 3, ECU, ECU-sensor wiring harness, connector

DTC Number SAE	Diagnosis Item [Terminal]	Description of Diagnosis 1: Diagnosis condition 2: Failure state	Light ON	Main Malfunction Symptom	Inspection Area
P2032	Exhaust temperature sensor L low [Exhaust temperature sensor 3 terminal (before DPF)]	1: Key ON and battery normal 2: Out of range observed	Yes	Output insufficient, worsening emissions	Exhaust temperature sensor 3, ECU, ECU-sensor wiring harness, connector
P2033	Abnormal exhaust temperature sensor L characteristics [Exhaust temperature sensor 3 terminal (before DPF)]	1: Key ON and battery normal 2: Out of range observed	Yes	Output insufficient, worsening emissions	Exhaust temperature sensor 1, 2, 3, ECU, ECU-sensor wiring harness, connector
P2455	Exhaust pressure sensor M high [Exhaust pressure sensor terminal]	1: Key ON and battery normal 2: Out of range observed	Yes	Output insufficient, worsening emissions	Exhaust pressure sensor, ECU, ECU-sensor wiring harness, connector
P2454	Exhaust pressure sensor M low [Exhaust pressure sensor terminal]	1: Key ON and battery normal 2: Out of range observed	Yes	Output insufficient, worsening emissions	Exhaust pressure sensor, ECU, ECU-sensor wiring harness, connector
P1392	Glow plug voltage high [Glow plug relay terminal, glow plug terminal]	1: Key ON and battery normal 2: Out of range observed	No	Dead battery, burnt heater	Glow plug, glow plug relay, ECU, ECU-sensor wiring harness, connector
P1391	Glow plug voltage low [Glow plug relay terminal, glow plug terminal]	1: Key ON and battery normal 2: Out of range observed	No	Decreased startability	Glow plug, glow plug relay, ECU, ECU-sensor wiring harness, connector
P0132	A/F sensor + voltage high [A/F output terminal (+ side)]	1: Key ON and battery normal 2: Out of range observed	Yes	Poor DPF recovery, declining output, worsening emissions	A/F sensor, ECU, ECU-sensor wiring harness, connector
P0131	A/F sensor + voltage low [A/F output terminal (+ side)]	1: Key ON and battery normal 2: Out of range observed	Yes	Poor DPF recovery, declining output, worsening emissions	A/F sensor, ECU, ECU-sensor wiring harness, connector
P0152	A/F sensor - voltage high [A/F output terminal (- side)]	1: Key ON and battery normal 2: Out of range observed	Yes	Poor DPF recovery, declining output, worsening emissions	A/F sensor, ECU, ECU-sensor wiring harness, connector
P0151	A/F sensor - voltage low [A/F output terminal (- side)]	1: Key ON and battery normal 2: Out of range observed	Yes	Poor DPF recovery, declining output, worsening emissions	A/F sensor, ECU, ECU-sensor wiring harness, connector
P0134	A/F sensor + - terminal short [A/F output terminal (+ - side)]	1: Key ON and battery normal 2: Sensor + - terminal voltage difference observed	Yes	Poor DPF recovery, declining output, worsening emissions	A/F sensor, ECU, ECU-sensor wiring harness, connector
P0030	A/F sensor heater abnormality [A/F output terminal]	1: During engine operation 2: Current condition observed	Yes	Poor DPF recovery, declining output, worsening emissions	A/F sensor, ECU, ECU-sensor wiring harness, connector

DTC Number SAE	Diagnosis Item [Terminal]	Description of Diagnosis 1: Diagnosis condition 2: Failure state	Light ON	Main Malfunction Symptom	Inspection Area
P0133	Poor A/F sensor activation [A/F output terminal (+ - side)]	1: During engine operation 2: Sensor output value observed	Yes	Poor DPF recovery, declining output, worsening emissions	A/F sensor, ECU, ECU-sensor wiring harness, connector
P2148	Injector COM1 TMV actuation system +B short [Injector terminal, Injector common terminal]	1: During engine operation 2: Abnormal voltage at unenergized terminal	Yes	Poor driveability, worsening emissions or engine stall	Injector, ECU, ECU-sensor wiring harness, connector
P2147	Injector COM1 TMV actuation system ground short [Injector terminal, Injector common terminal]	1: During engine operation 2: Abnormal voltage at unenergized terminal	Yes	Poor driveability, worsening emissions or engine stall	Injector, ECU, ECU-sensor wiring harness, connector
P1378	Injector low charge [Injector terminal, Injector common terminal]	1: During engine operation 2: Voltage observed	Yes	Poor driveability, worsening emissions or engine stall	Injector, ECU, ECU-sensor wiring harness, connector
P0201	Injector TMV1 actuation system open circuit [Injector terminal, Injector common terminal]	1: During engine operation 2: No peak current	Yes	Poor driveability, worsening emissions or engine stall	Injector, ECU, ECU-sensor wiring harness, connector
P0203	Injector TMV2 actuation system open circuit [Injector terminal, Injector common terminal]	1: During engine operation 2: No peak current	Yes	Poor driveability, worsening emissions or engine stall	Injector, ECU, ECU-sensor wiring harness, connector
P0204	Injector TMV3 actuation system open circuit [Injector terminal, Injector common terminal]	1: During engine operation 2: No peak current	Yes	Poor driveability, worsening emissions or engine stall	Injector, ECU, ECU-sensor wiring harness, connector
P0202	Injector TMV4 actuation system open circuit [Injector terminal, Injector common terminal]	1: During engine operation 2: No peak current	Yes	Poor driveability, worsening emissions or engine stall	Injector, ECU, ECU-sensor wiring harness, connector
P2146	Injector common 1 system open circuit [Injector terminal, Injector common terminal]	1: During engine operation 2: No peak current	Yes	Poor driveability, worsening emissions or engine stall	Injector, ECU, ECU-sensor wiring harness, connector
P2149	Injector common 2 system open circuit [Injector terminal, Injector common terminal]	1: During engine operation 2: No peak current	Yes	Poor driveability, worsening emissions or engine stall	Injector, ECU, ECU-sensor wiring harness, connector
P1379	Injector overcharge [Injector terminal, Injector common terminal]	1: During engine operation 2: Condensor voltage surplus	Yes	Poor driveability, worsening emissions or engine stall	Injector, ECU, ECU-sensor wiring harness, connector
P0629	SCV +B short [SCV terminal (+ - side)]	1: During engine operation 2: High current detected	Yes	Poor pumping	SCV, ECU, ECU-sensor wiring harness, connector

DTC Number SAE	Diagnosis Item [Terminal]	Description of Diagnosis 1: Diagnosis condition 2: Failure state	Light ON	Main Malfunction Symptom	Inspection Area
P0628	SCV actuation system abnormality [SCV terminal (+ - side)]	1: During engine operation 2: Low current detected	Yes	Poor pumping	SCV, ECU, ECU-sensor wiring harness, connector
P0093	Fuel leak [Rail pressure sensor terminal]	Consumption volume is beyond the predicted scope	Yes	Fuel leak	Rail pressure sensor, injector, pump, rail, pressure limiter, fuel piping, ECU, ECU-sensor wiring harness, connector
P0342	No TDC pulse input [Cylinder recognition sensor terminal]	No TDC pulse input	Yes	Poor startability	Cylinder recognition sensor, Cam angle pulse, ECU, ECU-sensor wiring harness, connector
P0341	TDC sensor pulse number abnormality [Cylinder recognition sensor terminal]	Continuous TDC pulse number excess/deficiency	Yes	Poor startability	Cylinder recognition sensor, Cam angle pulse, ECU, ECU-sensor wiring harness, connector
P0337	No speed pulse input [Crankshaft position sensor terminal]	No speed pulse input	Yes	Start failure, engine vibration, poor speed control	Crankshaft position sensor, crankshaft position pulse, ECU, ECU-sensor wiring harness, connector
P0336	Abnormal speed pulse number [Crankshaft position sensor terminal]	Continuous speed pulse number excess/deficiency	Yes	Start failure, engine vibration, poor speed control	Crankshaft position sensor, crankshaft position pulse, ECU, ECU-sensor wiring harness, connector
P0512	Starter switch battery short [Starter switch terminal, Starter relay terminal]	1: Key ON and battery normal 2: Starter signal observed	Yes	Dead battery, driveability, poor emissions	Starter relay, starter switch, starter, ECU, ECU-sensor wiring harness, connector
P0704	Clutch switch malfunction [Starter switch terminal, Starter relay terminal]	No clutch signal during clutch input situation	Yes	Heavy idle vibration, worsening emissions, poor driveability	Clutch switch, vehicle speed, ECU, ECU-sensor wiring harness, connector
P0234	Turbo system superfluity abnormality (positive denia-tion) [EVRV terminal, Turbo pressure sensor terminal]	1: During engine operation 2: Difference between standard value and output	No	Poor driveability, T/C damaged	Turbo pressure sensor, EVRV actuator, T/C acuator, ECU, ECU-sensor wiring harness, connector
P0299	Turbo system underfluity abnormality (negative denia-tion) [EVRV terminal, Turbo pressure sensor terminal]	1: During engine operation 2: Difference between standard value and output	No	Poor driveability, T/C damaged	Turbo pressure sensor, EVRV actuator, T/C acuator, ECU, ECU-sensor wiring harness, connector

DTC Number SAE	Diagnosis Item [Terminal]	Description of Diagnosis 1: Diagnosis condition 2: Failure state	Light ON	Main Malfunction Symptom	Inspection Area
P0402	EGR system excess abnormality (EGR excessive flow) [EGR lift sensor terminal, EGR DC motor output terminal, Mass airflow sensor terminal]	1: During engine operation 2: Difference between standard value and output	Yes	Poor driveability, T/C damaged	EGR actuator, mass airflow sensor, ECU, ECU-sensor wiring harness, connector
P0401	EGR system insufficiency abnormality (EGR insufficient flow) [EGR lift sensor terminal, EGR DC motor output terminal, Mass airflow sensor terminal]	1: During engine operation 2: Difference between standard value and output	Yes	Poor emissions	EGR actuator, mass airflow sensor, ECU, ECU-sensor wiring harness, connector
P1196	Main relay abnormality [Main relay terminal]	1: Key OFF and battery normal 2: Battery voltage observed	No	Dead battery	Main relay, ECU, ECU-sensor wiring harness, connector
P0016	Speed-TDC phase gap malfunction [Cylinder recognition sensor terminal, Crankshaft position sensor]	Speed-TDC phase relationship observed	Yes	Start failure, engine vibration, poor speed control	Cylinder recognition sensor, Cam angle pulse, crankshaft position sensor, crankshaft position pulse, ECU, ECU-sensor wiring harness, connector
P0301	Injector function (non-injection) 1 [Injector terminal, Injector common terminal]	1: During engine operation 2: Non-injection condition observed	Yes	Poor driveability, heavy idle vibration	Injector, fuel piping, ECU, ECU-sensor wiring harness, connector
P0302	Injector function (non-injection) 2 [Injector terminal, Injector common terminal]	1: During engine operation 2: Non-injection condition observed	Yes	Poor driveability, heavy idle vibration	Injector, fuel piping, ECU, ECU-sensor wiring harness, connector
P0303	Injector function (non-injection) 3 [Injector terminal, Injector common terminal]	1: During engine operation 2: Non-injection condition observed	Yes	Poor driveability, heavy idle vibration	Injector, fuel piping, ECU, ECU-sensor wiring harness, connector
P0304	Injector function (non-injection) 4 [Injector terminal, Injector common terminal]	1: During engine operation 2: Non-injection condition observed	Yes	Poor driveability, heavy idle vibration	Injector, fuel piping, ECU, ECU-sensor wiring harness, connector
P0219	Engine overrun abnormality [Injector terminal, injector common terminal, Crankshaft position sensor terminal, Accelerator sensor terminal]	Engine speed above prescribed value	No	Excessive speed	Rail pressure sensor, accelerator sensor, crankshaft position sensor, injector, pump, rail, pressure limiter, fuel piping, ECU, ECU-sensor wiring harness, connector

DTC Number SAE	Diagnosis Item [Terminal]	Description of Diagnosis 1: Diagnosis condition 2: Failure state	Light ON	Main Malfunction Symptom	Inspection Area
P0088*1	Rail high pressure abnormality [Rail pressure sensor terminal]	1: During engine operation 2: High pressure condition observed	Yes	Poor driveability, poor emissions, fuel leak	Rail pressure sensor, injector, pump, rail, pressure limiter, fuel piping, ECU, ECU-sensor wiring harness, connector
P0089*2	Pressure limiter opening malfunction [Rail pressure sensor terminal]	1: During engine operation 2: Pressure limiter opening condition observed	No	—	Rail pressure sensor, injector, pump, rail, pressure limiter, fuel piping, ECU, ECU-sensor wiring harness, connector
P0607	CPU abnormality (monitoring IC abnormality) [Battery terminal, etc.]	—	No	—	Battery, ECU, ECU-battery wiring harness, connector
P0606	CPU abnormality (main IC abnormality) [Battery terminal, etc.]	—	Yes	Engine stall	Battery, ECU, ECU-battery wiring harness, connector
P0605	ECU Flash-ROM abnormality [Battery terminal, etc.]	—	Yes	—	Battery, ECU, ECU-battery wiring harness, connector
P0500	CAN communication vehicle speed malfunction [CAN communication line]	When there is a CAN communication ABS ID abnormality	Yes	Insufficient output, poor driveability, poor emissions	DSC and ABS unit, ECU, ECU-unit wiring harness, connector
P0504	Cruise brake switch invalid [Brake switch terminal]	1: Key ON and battery normal 2: Brake switch output observed	No	Cruise cannot be suspended, cruise cannot be operated	Brake switch, ECU, ECU-unit wiring harness, connector
P0564	Cruise command switch abnormality [Command switch terminal]	1: During engine operation 2: Command switch output observed	No	Cruise cannot be operated, vehicle speed control impossible	Brake switch, ECU, ECU-unit wiring harness, connector
P1211*3	Single pump abnormality diagnosis [Rail pressure sensor terminal]	1: During engine operation 2: Pump injection volume abnormality observed	Yes	Insufficient output, poor emissions, poor driveability	Rail pressure sensor, injector, pump, rail, pressure limiter, fuel piping, ECU, ECU-sensor wiring harness, connector
P1281*4	Pump protective fill plug [Rail pressure sensor terminal]	1: During engine operation 2: High pressure condition observed	Yes	Insufficient output, poor driveability, poor emissions, engine stall	Rail pressure sensor, injector, pump, rail, pressure limiter, fuel piping, ECU, ECU-sensor wiring harness, connector
P1329*5	Pump exchange fill plug [Rail pressure sensor terminal]	1: During engine operation 2: High pressure condition observed	Yes	Insufficient output, poor driveability, poor emissions, engine stall	Rail pressure sensor, injector, pump, rail, pressure limiter, fuel piping, ECU, ECU-sensor wiring harness, connector

DTC Number SAE	Diagnosis Item [Terminal]	Description of Diagnosis 1: Diagnosis condition 2: Failure state	Light ON	Main Malfunction Symptom	Inspection Area
P2622	Electronic control throttle high [Electronic control throttle sensor terminal]	1: Key ON and battery normal 2: Out of range observed	Yes	Insufficient output, poor driveability, poor emissions	Electronic control throttle, ECU, ECU-sensor wiring harness, connector
P2621	Electronic control throttle low [Electronic control throttle sensor terminal]	1: Key ON and battery normal 2: Out of range observed	Yes	Insufficient output, poor driveability, poor emissions	Electronic control throttle, ECU, ECU-sensor wiring harness, connector
P1589	Electronic control throttle valve stuck [Electronic control throttle sensor terminal, Electronic control throttle DC motor output terminal]	1: During engine operation 2: Difference between standard value and output observed	Yes	Insufficient output, poor driveability, poor emissions	Electronic control throttle, ECU, ECU-sensor wiring harness, connector
P2101	Electronic control throttle DC motor overcurrent abnormality [Electronic control throttle DC motor output terminal]	1: Key ON and battery normal 2: Current value observed	Yes	Insufficient output, poor driveability, poor emissions	Electronic control throttle, ECU, ECU-sensor wiring harness, connector
P1588	Electronic control throttle spring breakage [Electronic control throttle sensor terminal, Electronic control throttle DC motor output terminal]	Spring reactivity observed	Yes	Engine stall due to throttle closure, difficulty starting	Electronic control throttle, ECU, ECU-sensor wiring harness, connector
P0404	EGR DC motor temperature abnormality [EGR lift sensor terminal, EGR DC motor output terminal]	DC motor estimated temperature is above the regular value	Yes	Insufficient output, poor driveability, poor emissions	EGR actuator, ECU, ECU-sensor wiring harness, connector
P0400	EGR DC motor feedback abnormality [EGR lift sensor terminal, EGR DC motor output terminal]	Actual lift does not operate beyond the regular position	Yes	Insufficient output, poor driveability, poor emissions	EGR actuator, ECU, ECU-sensor wiring harness, connector
P0403	EGR DC motor condition abnormality [EGR lift sensor terminal, EGR DC motor output terminal]	1: Key ON and battery normal 2: Current value observed	Yes	Insufficient output, poor driveability, poor emissions	EGR actuator, ECU, ECU-sensor wiring harness, connector
P252F	Oil dilution [Turbo pressure sensor, crankshaft position sensor, Injector terminal]	Oil quantity abnormality observed	No	Engine failure, poor driveability, poor emissions	Engine oil quantity

DTC Number SAE	Diagnosis Item [Terminal]	Description of Diagnosis 1: Diagnosis condition 2: Failure state	Light ON	Main Malfunction Symptom	Inspection Area
P0850	Neutral switch abnormality [Neutral switch terminal, CAN communication line]	No neutral signal during a neutral switch input situa- tion	Yes	Heavy idle vibra- tion, improper shift CH recognition, worsening emis- sions, poor drive- ability	Neutral switch, vehicle speed sensor, ECU, ECU- sensor wiring harness, con- nector
P0045	VNT EVRV abnormality [EVVRV terminal]	1: During engine operation 2: Voltage is below the normal value	Yes	Insufficient output, poor driveability, T/C damaged	EGR actuator, ECU, ECU- sensor wiring harness, con- nector
P0072	Engine compartment tem- perature sensor low [Differential pressure sensor temperature sensor terminal]	1: Key ON and battery nor- mal 2: Out of range observed	Yes	Poor recovery, declining output, worsening emis- sions	Engine compartment tem- perature sensor, ECU, ECU- sensor wiring harness, con- nector
P0073	Engine compartment tem- perature sensor high [Differential pressure sensor temperature sensor terminal]	1: Key ON and battery nor- mal 2: Out of range observed	Yes	Poor recovery, declining output, worsening emis- sions	Engine compartment tem- perature sensor, ECU, ECU- sensor wiring harness, con- nector
P0071	Abnormal Engine compart- ment temperature sensor characteristics [Differential pressure sensor temperature sensor terminal, Ambient temperature sensor terminal]	1: During engine operation 2: Difference between stan- dard value and output observed	No	Poor recovery, declining output, worsening emis- sions	Engine compartment tem- perature sensor, ambient temperature sensor, ECU, ECU-sensor wiring harness, connector
P2456	Differential pressure sensor intermediate malfunction [Differential pressure sensor terminal, mass airflow sen- sor terminal, Atmospheric pressure sensor terminal, exhaust temperature sensor terminal]	1: During engine operation 2: Difference between stan- dard value and output observed	No	Poor recovery, declining output, worsening emis- sions	Differential pressure sensor, mass airflow sensor, atmo- spheric pressure sensor, exhaust temperature sensor, ECU, ECU-sensor wiring harness, connector
P2002	Differential pressure sensor upstream piping malfunction [Differential pressure sensor terminal, mass airflow sen- sor terminal, Atmospheric pressure sensor terminal, exhaust temperature sensor terminal]	1: During engine operation 2: Difference between stan- dard value and output observed	Yes	Poor recovery, declining output, worsening emis- sions	Differential pressure sensor, mass airflow sensor, atmo- spheric pressure sensor, exhaust temperature sensor, differential pressure sensor piping, DPF cracking, ECU, ECU-sensor wiring harness, connector

DTC Number SAE	Diagnosis Item [Terminal]	Description of Diagnosis 1: Diagnosis condition 2: Failure state	Light ON	Main Malfunction Symptom	Inspection Area
P2453	Differential pressure sensor gain abnormality [Differential pressure sensor terminal, mass airflow sensor terminal, Atmospheric pressure sensor terminal, exhaust temperature sensor terminal]	1: During engine operation 2: Difference between standard value and output observed	No	Poor recovery, declining output, worsening emissions	Differential pressure sensor, mass airflow sensor, atmospheric pressure sensor, exhaust temperature sensor, Differential pressure sensor piping, ECU, ECU-sensor wiring harness, connector
P2452	Differential pressure sensor offset abnormality [Differential pressure sensor terminal]	1: Key OFF and battery normal 2: Difference between standard value and output observed	No	Poor recovery, declining output, worsening emissions	Differential pressure sensor, mass airflow sensor, atmospheric pressure sensor, exhaust temperature sensor, Differential pressure sensor piping, ECU, ECU-sensor wiring harness, connector
B1600	Immobilizer abnormality. No reception of signal from the transporter [Immobilizer actuation output terminal]	—	No	Starting not possible	Key, ECU, ECU-sensor wiring harness, connector
B1602	Immobilizer abnormality. Signal format error from the transporter [Immobilizer actuation output terminal]	—	No	Starting not possible	Key, ECU, ECU-sensor wiring harness, connector
B1601	Immobilizer abnormality. Signal code disunity from the transporter [Immobilizer actuation output terminal]	—	No	Starting not possible	Key, ECU, ECU-sensor wiring harness, connector
B1213	Immobilizer abnormality. Programmed key does not satisfy the minimum specified number [Immobilizer actuation output terminal]	—	No	Starting not possible	Key, ECU, ECU-sensor wiring harness, connector
B1681	Immobilizer abnormality-diagnostic reception Time Out [Immobilizer actuation output terminal]	—	No	Starting not possible	Key, ECU, ECU-sensor wiring harness, connector
B2103	Immobilizer abnormality-diagnosis, abnormal value reception [Immobilizer actuation output terminal]	—	No	Starting not possible	Key, ECU, ECU-sensor wiring harness, connector

DTC Number SAE	Diagnosis Item [Terminal]	Description of Diagnosis 1: Diagnosis condition 2: Failure state	Light ON	Main Malfunction Symptom	Inspection Area
B2431	Immobilizer abnormality-programming error [Immobilizer actuation output terminal]	—	No	Starting not possible	Key, ECU, ECU-sensor wiring harness, connector
P1260	Immobilizer abnormality-DTC at EPATS [Immobilizer actuation output terminal]	—	No	Starting not possible	Key, ECU, ECU-sensor wiring harness, connector
B1342	Immobilizer abnormality-ECU defective [Immobilizer actuation output terminal]	—	No	Starting not possible	Key, ECU, ECU-sensor wiring harness, connector
P1675	QR data failure to write malfunction	Configuration abnormality	Yes	Worsening emissions, insufficient output, decrease in driveability	ECU, wiring harness noise, etc
P1676	QR data malfunction	Configuration abnormality	Yes	Worsening emissions, insufficient output, decrease in driveability	ECU, wiring harness noise, etc
P1676	QR correction information input malfunction	Configuration abnormality	Yes	Worsening emissions, insufficient output, decrease in driveability	ECU, wiring harness noise, etc
P0154	Atmospheric observation malfunction [A/F output terminal, A/F heater terminal, atmospheric pressure sensor, Injector terminal, injector common terminal]	Gap in A/F sensor characteristics observed	Yes	DPF recovery not possible/DPF melting, insufficient output, worsening emissions	A/F sensor, atmospheric pressure sensor, injector, ECU, ECU-sensor wiring harness, connector
P253F	Oil dilution 2 [Turbo pressure sensor, Crankshaft position sensor, Injector terminal]	Oil quantity abnormality observe	No	Speed increase, insufficient output, poor driveability, poor emissions	Engine oil quantity
P1303	EGR DC motor EGR initial rise abnormality [EGR lift sensor terminal, EGR DC motor output terminal]	EGR valve voltage change observed	Yes	Insufficient output, poor driveability, poor emissions	EGR actuator, ECU, ECU-sensor wiring harness, connector

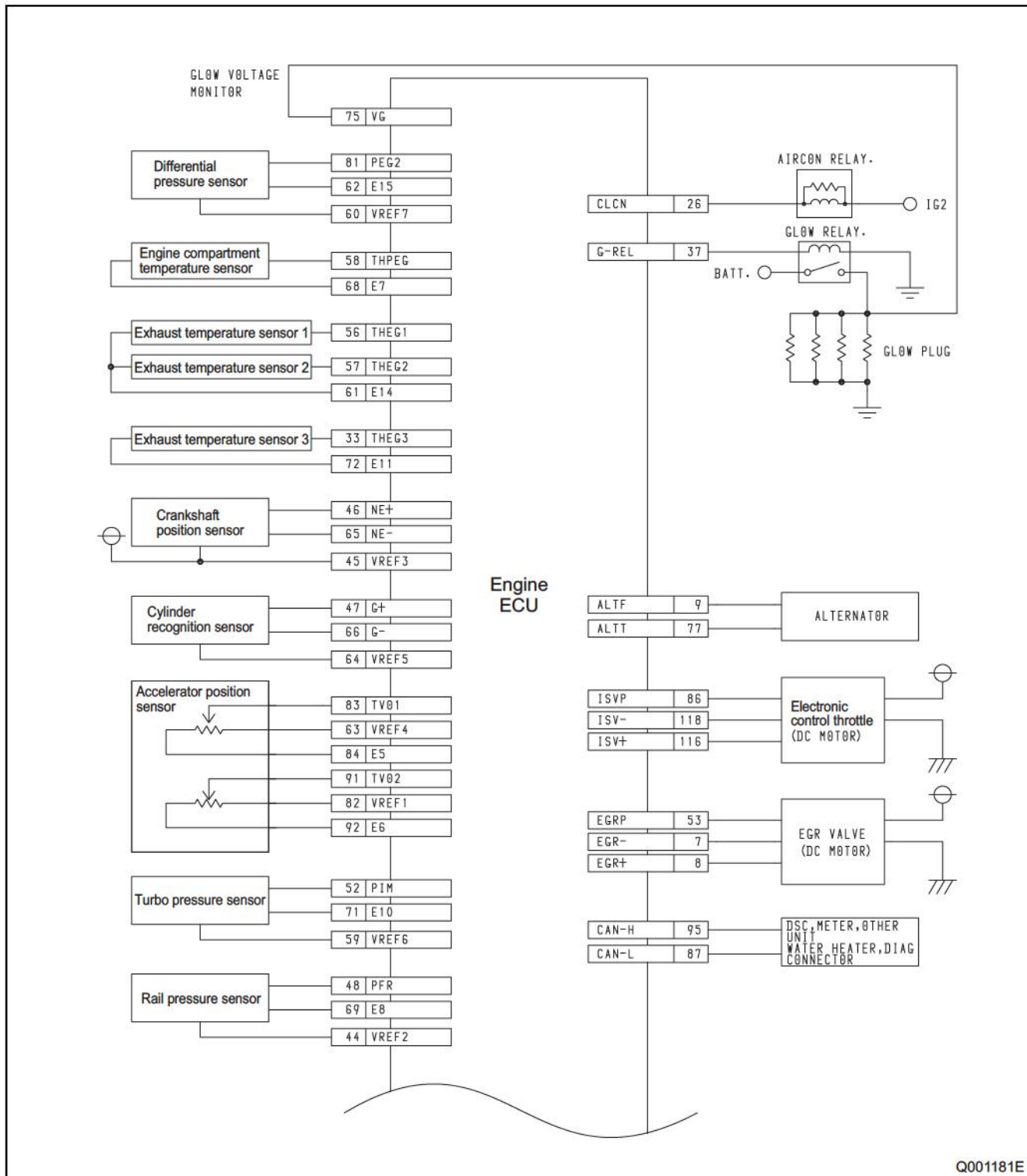
DTC Number SAE	Diagnosis Item [Terminal]	Description of Diagnosis 1: Diagnosis condition 2: Failure state	Light ON	Main Malfunction Symptom	Inspection Area
P2458	DPF PM accumulation abnormality 1 [Differential pressure sensor, Mass airflow sensor, Turbo pressure sensor, Coolant temperature sensor, Intake air temperature sensor, Atmospheric pressure sensor, Exhaust temperature sensor, Crankshaft position sensor, Engine compartment temperature sensor, Rail pressure sensor, Injector terminal, A/F sensor terminal]	Accumulation quantity abnormality observed	No	Poor recovery, declining output due to EGR quantity, worsening emissions	Differential pressure sensor, mass airflow sensor, turbo pressure sensor, coolant temperature sensor, intake air temperature sensor, atmospheric pressure sensor, exhaust temperature sensor, crankshaft position sensor, engine compartment temperature sensor, rail pressure sensor, injector, A/F sensor, differential pressure sensor piping, DPF cracking, ECU, ECU-sensor wiring harness, connector
P242F	DPF PM accumulation abnormality 2 [Differential pressure sensor, Mass airflow sensor, Turbo pressure sensor, Coolant temperature sensor, Intake air temperature sensor, Atmospheric pressure sensor, Exhaust temperature sensor, Crankshaft position sensor, Engine compartment temperature sensor, Rail pressure sensor, Injector terminal, A/F sensor terminal]	Accumulation quantity abnormality observed	Yes	Poor recovery, declining output due to EGR quantity, worsening emissions	Differential pressure sensor, mass airflow sensor, turbo pressure sensor, coolant temperature sensor, intake air temperature sensor, atmospheric pressure sensor, exhaust temperature sensor, crankshaft position sensor, engine compartment temperature sensor, rail pressure sensor, injector, A/F sensor, differential pressure sensor piping, DPF cracking, ECU, ECU-sensor wiring harness, connector
P242F	DPF PM accumulation abnormality 3 [Differential pressure sensor, Mass airflow sensor, Turbo pressure sensor, Coolant temperature sensor, Intake air temperature sensor, Atmospheric pressure sensor, Exhaust temperature sensor, Crankshaft position sensor, Engine compartment temperature sensor, Rail pressure sensor, Injector terminal, A/F sensor terminal]	Accumulation quantity abnormality observed	Yes	Poor recovery, declining output due to EGR quantity, worsening emissions	Differential pressure sensor, mass airflow sensor, turbo pressure sensor, coolant temperature sensor, intake air temperature sensor, atmospheric pressure sensor, exhaust temperature sensor, crankshaft position sensor, engine compartment temperature sensor, rail pressure sensor, injector, A/F sensor, differential pressure sensor piping, DPF cracking, ECU, ECU-sensor wiring harness, connector

DTC Number SAE	Diagnosis Item [Terminal]	Description of Diagnosis 1: Diagnosis condition 2: Failure state	Light ON	Main Malfunction Symptom	Inspection Area
P242F	DPF PM accumulation abnormality 4 [Differential pressure sensor, Mass airflow sensor, Turbo pressure sensor, Coolant temperature sensor, Intake air temperature sensor, Atmospheric pressure sensor, Exhaust temperature sensor, Crankshaft position sensor, Engine compartment temperature sensor, Rail pressure sensor, Injector terminal, A/F sensor terminal]	Accumulation quantity abnormality observed	Yes	Poor recovery, declining output, worsening emissions	Differential pressure sensor, mass airflow sensor, turbo pressure sensor, coolant temperature sensor, intake air temperature sensor, atmospheric pressure sensor, exhaust temperature sensor, crankshaft position sensor, engine compartment temperature sensor, rail pressure sensor, injector, A/F sensor, differential pressure sensor piping, DPF cracking, ECU, ECU-sensor wiring harness, connector
P2428	DPF temperature rise abnormality [Differential pressure sensor, Mass airflow sensor, Turbo pressure sensor, Coolant temperature sensor, Intake air temperature sensor, Atmospheric pressure sensor, Exhaust temperature sensor, Crankshaft position sensor, Engine compartment temperature sensor, Rail pressure sensor, Injector terminal, A/F sensor terminal]	Abnormal exhaust temperature rise observed after the DPF	No	Poor recovery, declining output, worsening emissions	Differential pressure sensor, mass airflow sensor, turbo pressure sensor, coolant temperature sensor, intake air temperature sensor, atmospheric pressure sensor, exhaust temperature sensor, crankshaft position sensor, engine compartment temperature sensor, rail pressure sensor, injector, A/F sensor, differential pressure sensor piping, DPF cracking, ECU, ECU-sensor wiring harness, connector
P0601	DPF related EEPROM abnormality	—	Yes	Poor recovery, declining output, worsening emissions	ECU, wiring harness noise, etc.
U0073	CAN communication bus off abnormality [CAN communication line]	Communication abnormality observed	No	Vehicle speed, DSC, ABS, combustion system heater, meter does not operate	ECU, ECU-unit wiring harness, connector
U0121	CAN communication DSC abnormality [CAN communication line]	Communication abnormality observed	Yes	DSC, vehicle speed does not operate	DSC and ABS unit, ECU, ECU-unit wiring harness, connector
U0166	CAN communication FFH abnormality [CAN communication line]	Communication abnormality observed	No	Combustion system heater does not operate	Combustion system heater unit, ECU, ECU-unit wiring harness, connector

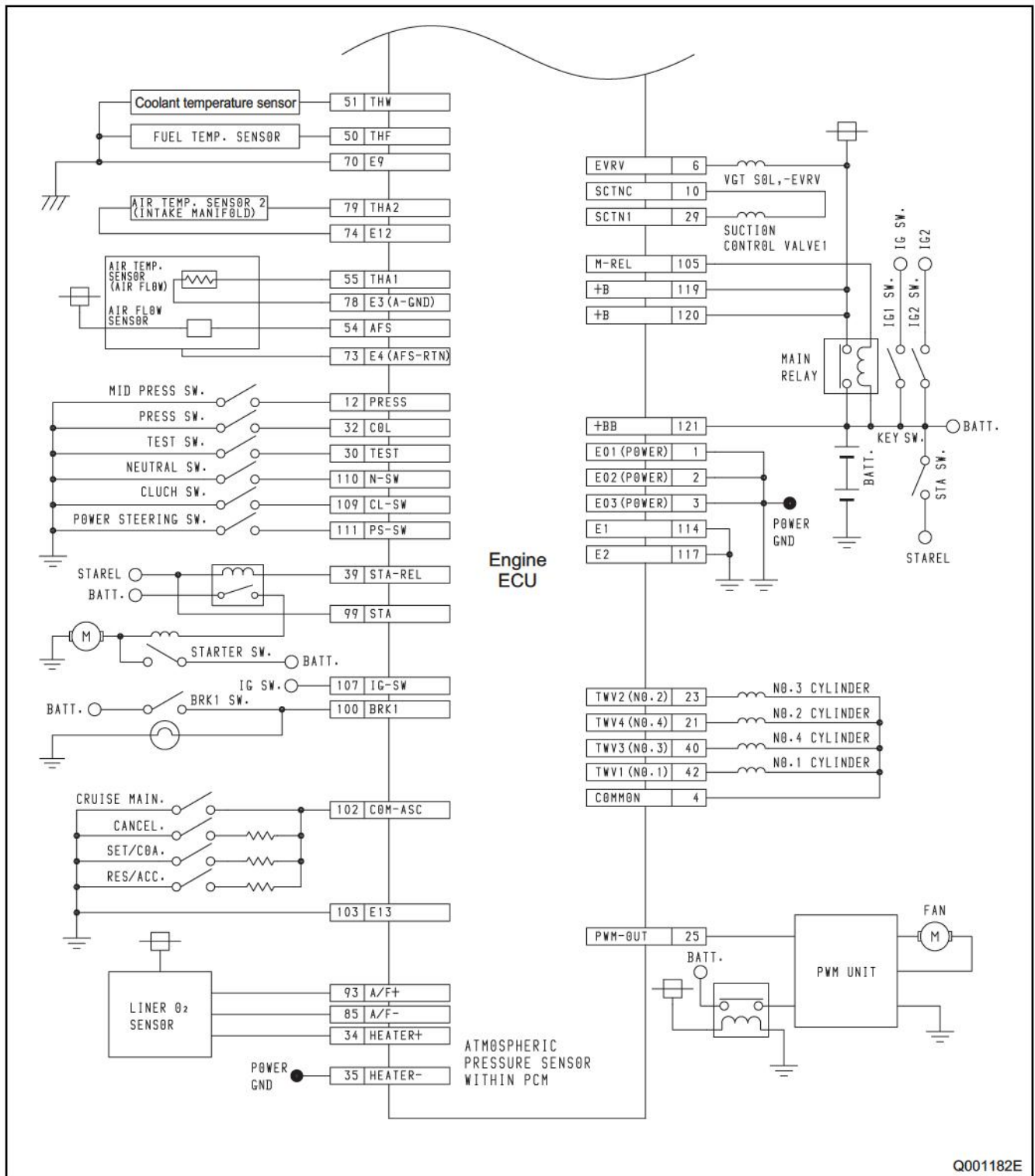
DTC Number SAE	Diagnosis Item [Terminal]	Description of Diagnosis 1: Diagnosis condition 2: Failure state	Light ON	Main Malfunction Symptom	Inspection Area
U0121	CAN communication ABS abnormality [CAN communication line]	Communication abnormality observed	Yes	ABS, vehicle speed does not operate	DSC and ABS unit, ECU, ECU-unit wiring harness, connector
U0155	CAN communication HEC abnormality [CAN communication line]	Communication abnormality observed	Yes	Meter unit does not operate	Meter unit, ECU, ECU-unit wiring harness, connector
P0602	CAN communication abnormality-VID read malfunction [CAN communication line]	Communication abnormality observed	Yes	—	ECU, ECU-unit wiring harness, connector
P0610	CAN communication abnormality-VID checksum abnormality [CAN communication line]	Communication abnormality observed	Yes	—	ECU, ECU-unit wiring harness, connector
P0104	Abnormal mass airflow sensor characteristics [Mass airflow sensor terminal]	1: During engine operation 2: Abnormal flow volume value detected	No	Output insufficient, worsening emissions	Mass airflow sensor, intake air temperature sensor, turbo pressure sensor, EGR actuator, ECU, ECU-sensor wiring harness, connector
P0140	Atmospheric observation malfunction [A/F output terminal, A/F heater terminal, atmospheric pressure sensor, Injector terminal, injector common terminal]	Gap in A/F sensor characteristics observed	No	DPF recovery not possible/DPF melting, insufficient output, worsening emissions	A/F sensor, atmospheric pressure sensor, injector, ECU, ECU-sensor wiring harness, connector

9. EXTERNAL WIRING DIAGRAM

9.1 Engine ECU External Wiring Diagram (Model Name: MAZDA 5)

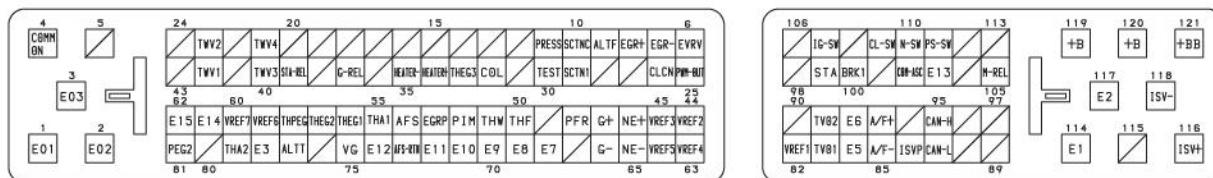


Q001181E



(1) Connector Diagram

Connector Pin Layout



Q001136E

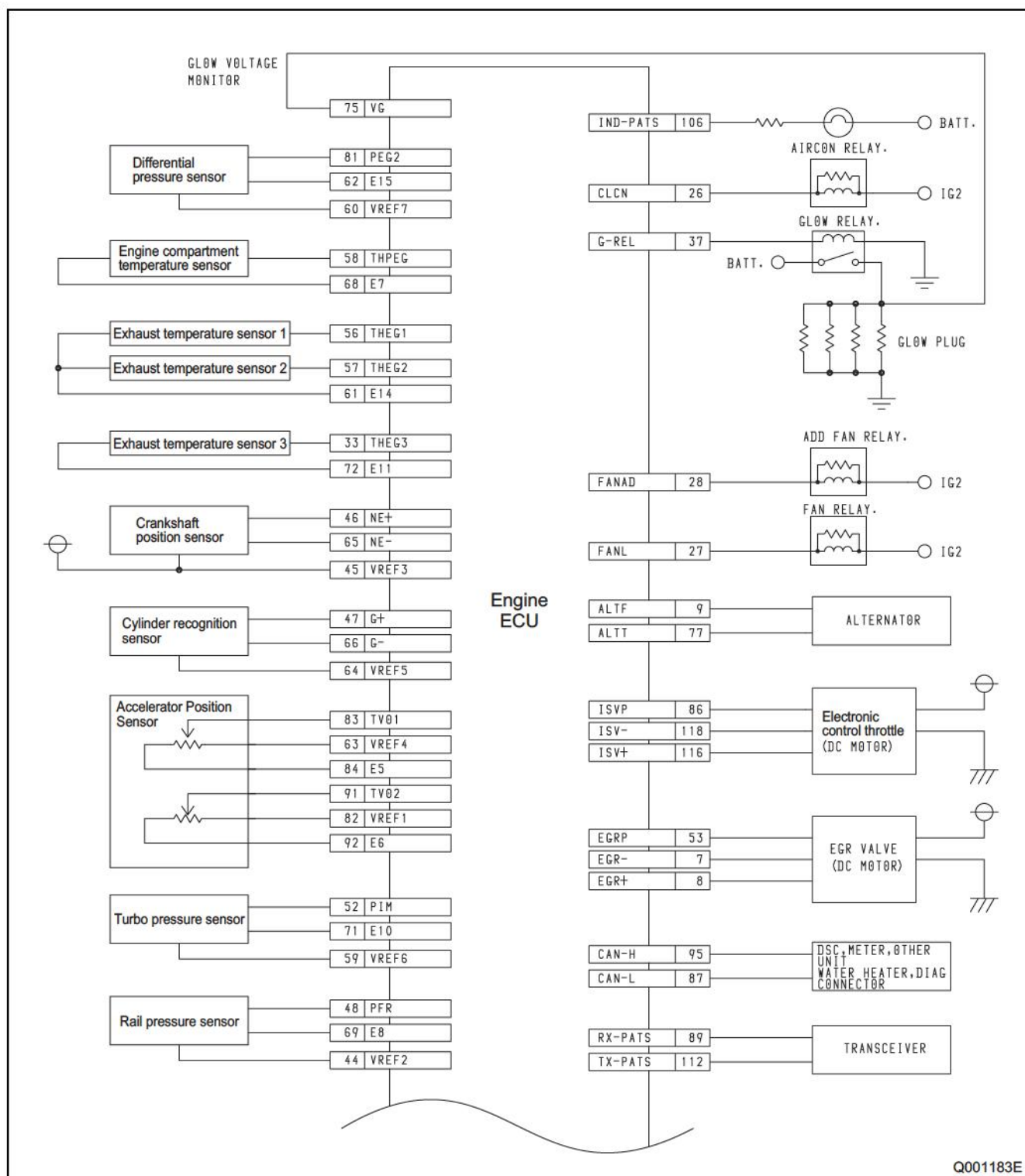
Terminal Connections (1)

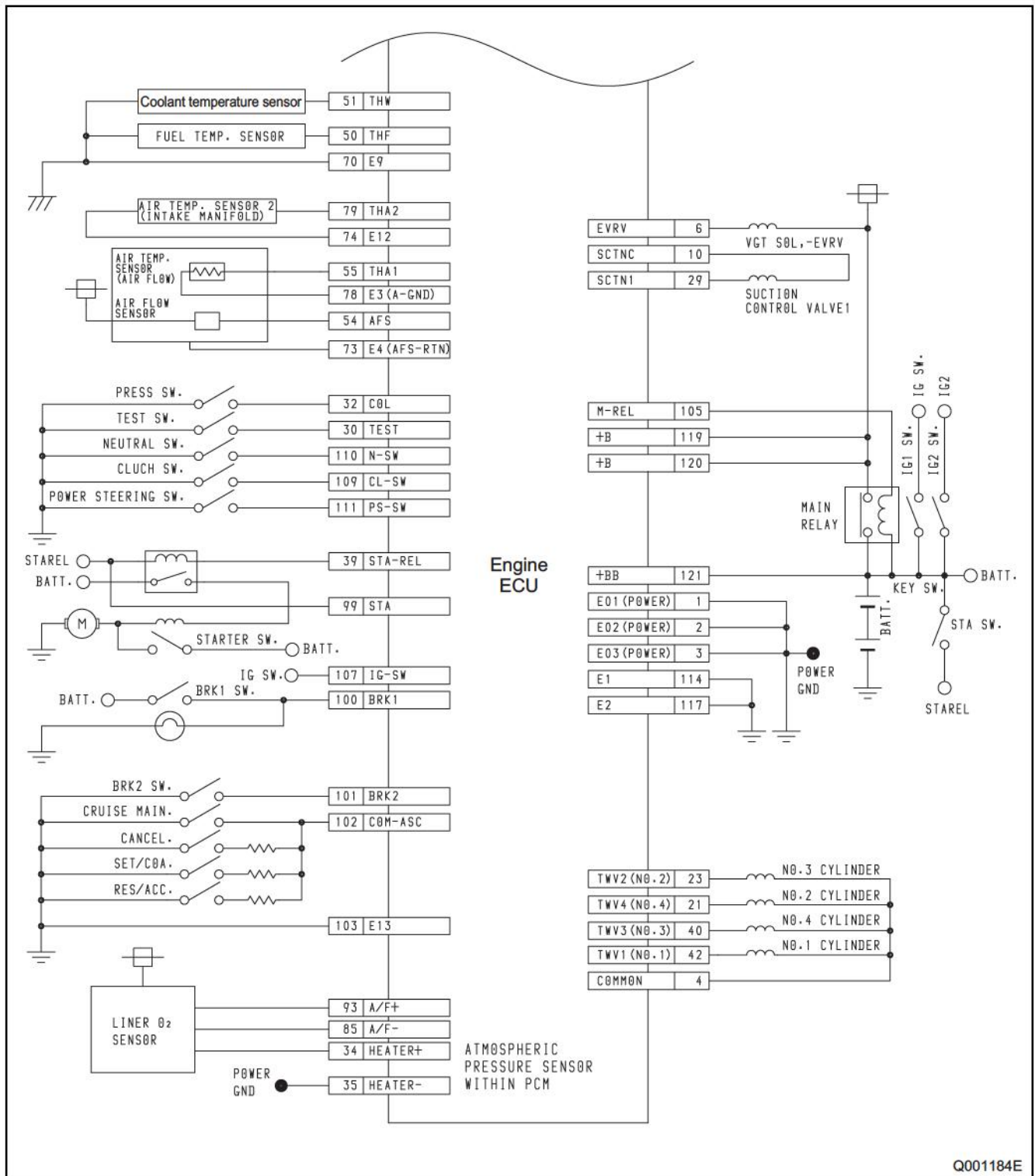
No.	Pin Symbol	Signal Name	No.	Pin Symbol	Signal Name
1	E01	Power GND	26	CLCN	Air Conditioner Relay Actuation Output
2	E02	Power GND	27	—	
3	E03	Power GND	28	—	
4	COMMON	Injection Common	29	SCTN1	Suction Control Solenoid Actuation Output 1
5	—		30	TEST	Test Switch Input
6	EV RV	VGT Solenoid (E-VRV) Actuation Output	31	—	
7	EGR-	EGR-DC Motor Actuation (-)	32	COL	Air Conditioning Switch Input
8	EGR+	EGR-DC Motor Actuation (+)	33	THEG3	Exhaust Temperature Sensor 3
9	ALTF	Alternator Field Coil Excitation	34	HEATER+	A/F Heater Actuation (+)
10	SCTNC	Suction Control Solenoid Actuation Output Common	35	HEATER-	A/F Heater Actuation (-)
11	—		36	—	
12	PRESS	Press Switch Input	37	G-REL	Glow Plug Relay Actuation Output
13	—		38	—	
14	—		39	STA-REL	Starter Permission Relay Actuation Output
15	—		40	TWV3	Injection Drive 3
16	—		41	—	
17	—		42	TWV1	Injection Drive 1
18	—		43	—	
19	—		44	VREF2	Sensor 5V Power Supply
20	—		45	VREF3	Sensor 5V Power Supply
21	TWV4	Injection Drive 4	46	NE+	Crankshaft Position Sensor Input (+)
22	—		47	G+	Cylinder Recognition Sensor Input (+)
23	TWV2	Injection Drive 2	48	PFR	Rail Pressure Sensor Input
24	—		49	—	
25	PWM-OUT	PWM Electric Fan Actuation Output	50	THF	Fuel Temperature Sensor Input

Terminal Connections (2)

No.	Pin Symbol	Signal Name	No.	Pin Symbol	Signal Name
51	THW	Coolant Temperature Sensor Input	87	CAN-L	CAN Communication Line (L)
52	PIM	Turbo Pressure Sensor Input	88	—	
53	EGRP	EGR Position Sensor	89	—	
54	AFS	Mass Air Flow Sensor Input	90	—	
55	THA1	Intake Air Temperature Sensor Input 1	91	TVO2	Accelerator Sensor Input 2
56	THEG1	Exhaust Temperature Sensor 1	92	E6	Sensor System Ground
57	THEG2	Exhaust Temperature Sensor 2	93	A/F+	A/F Sensor Input (+)
58	THPEG	Engine compartment Temperature Compensation Sensor	94	—	
59	VREF6	Sensor 5V Power Supply	95	CAN-H	CAN Communication Line (H)
60	VREF7	Sensor 5V Power Supply	96	—	
61	E14	Sensor System Ground	97	—	
62	E15	Sensor System Ground	98	—	
63	VREF4	Sensor 5V Power Supply	99	STA	Starter Switch Input
64	VREF5	Sensor 5V Power Supply	100	BRK1	Brake Switch Input 1
65	NE-	Crankshaft Position Sensor Input (-)	101	—	
66	G-	Cylinder Recognition Sensor Input (-)	102	COM-ASC	Cruise Control Switch
67	—		103	E13	Sensor System Ground
68	E7	Sensor System Ground	104	—	
69	E8	Sensor System Ground	105	M-REL	Main Relay Actuation Output
70	E9	Sensor System Ground	106	—	
71	E10	Sensor System Ground	107	IG-SW	Ignition SW
72	E11	Sensor System Ground	108	—	
73	E4 (AFS-RTN)	Mass Air Flow Sensor Special Use Ground	109	CL-SW	Clutch Switch Input
74	E12	Sensor System Ground	110	N-SW	Neutral Switch Input
75	VG	Glow Plug Voltage Monitor	111	PS-SW	Power Switch
76	—		112	—	
77	ALTT	Alternator Power Generation Detector	113	—	
78	E3	Sensor System Ground	114	E1	Signal Ground
79	THA2	Intake Air Temperature Sensor Input 2	115	—	
80	—		116	ISV+	Electronic Control Throttle DC Motor Actuation (+)
81	PEG2	Exhaust Pressure Sensor Input 2	117	E2	Signal Ground
82	VREF1	Sensor 5V Power Supply	118	ISV-	Electronic Control Throttle DC Motor Actuation (-)
83	TVO1	Accelerator Sensor Input 1	119	+B	+B Power Supply (M-REL Downstream)
84	E5	Sensor System Ground	120	+B	+B Power Supply (M-REL Downstream)
85	A/F-	A/F Sensor Input (-)	121	+BB	Battery Power Supply
86	ISVP	Electronic Control Throttle Position Sensor Input	—	—	

9.2 Engine ECU External Wiring Diagram (Model Name: MAZDA 6)

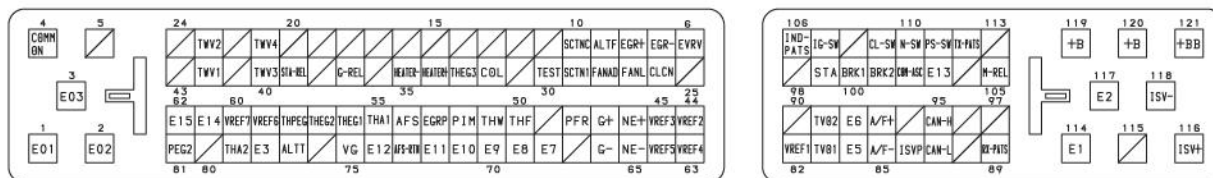




Q001184E

(1) Connector Diagram

Connector Pin Layout



Q001137E

Terminal Connections (1)

No.	Pin Symbol	Signal Name	No.	Pin Symbol	Signal Name
1	E01	Power GND	26	CLCN	Air Conditioner Relay Actuation Output
2	E02	Power GND	27	FANL	Fan Relay (Low) Actuation Output
3	E03	Power GND	28	FANAD	ADD Fan Relay Actuation Output
4	COMMON	Injection Common	29	SCTNC1	Suction Control Solenoid Actuation Output 1
5	—		30	TEST	Test Switch Input
6	EVRV	VGT Solenoid (E-VRV) Actuation Output	31	—	
7	EGR-	EGR-DC Motor Actuation (-)	32	COL	Air Conditioning Switch Input
8	EGR+	EGR-DC Motor Actuation (+)	33	THEG3	Exhaust Temperature Sensor 3
9	ALTF	Alternator Field Coil Excitation	34	HEATER+	A/F Heater Actuation (+)
10	SCTNC	Suction Control Solenoid Actuation Output Common	35	HEATER-	A/F Heater Actuation (-)
11	—		36	—	
12	—		37	G-REL	Glow Plug Relay Actuation Output
13	—		38	—	
14	—		39	STA-REL	Starter Permission Relay Actuation Output
15	—		40	TWV3	Injection Drive 3
16	—		41	—	
17	—		42	TWV1	Injection Drive 1
18	—		43	—	
19	—		44	VREF2	Sensor 5V Power Supply
20	—		45	VREF3	Sensor 5V Power Supply
21	TWV4	Injection Drive 4	46	NE+	Crankshaft Position Sensor Input (+)
22	—		47	G+	Cylinder recognition Sensor Input (+)
23	TWV2	Injection Drive 2	48	PFR	Rail Pressure Sensor Input
24	—		49	—	
25	—		50	THF	Fuel Temperature Sensor Input

Terminal Connections (2)

No.	Pin Symbol	Signal Name	No.	Pin Symbol	Signal Name
51	THW	Coolant Temperature Sensor Input	87	CAN-L	CAN Communication Line (L)
52	PIM	Turbo Pressure Sensor Input	88	—	
53	EGRP	EGR Position Sensor	89	RX-PATS	PATS Communication (Receiving)
54	AFS	Mass Air Flow Sensor Input	90	—	
55	THA1	Intake Air Temperature Sensor Input 1	91	TVO2	Accelerator Sensor Input 2
56	THEG1	Exhaust Temperature Sensor 1	92	E6	Sensor System Ground
57	THEG2	Exhaust Temperature Sensor 2	93	A/F+	A/F Sensor Input (+)
58	THPEG	Engine compartment Temperature Compensation Sensor	94	—	
59	VREF6	Sensor 5V Power Supply	95	CAN-H	CAN Communication Line (H)
60	VREF7	Sensor 5V Power Supply	96	—	
61	E14	Sensor System Ground	97	—	
62	E15	Sensor System Ground	98	—	
63	VREF4	Sensor 5V Power Supply	99	STA	Starter Switch Input
64	VREF5	Sensor 5V Power Supply	100	BRK1	Brake Switch Input 1
65	NE-	Crankshaft Position Sensor Input (-)	101	BRK2	Brake Switch Input 2
66	G-	Cylinder recognition Sensor Input (-)	102	COM-ASC	Cruise Control Switch
67	—		103	E13	Sensor System Ground
68	E7	Sensor System Ground	104	—	
69	E8	Sensor System Ground	105	M-REL	Main Relay Actuation Output
70	E9	Sensor System Ground	106	IND-PATS	Antitheft Indicator
71	E10	Sensor System Ground	107	IG-SW	Ignition SW
72	E11	Sensor System Ground	108	—	
73	E4 (AFS-RTN)	Mass Air Flow Sensor Special Use Ground	109	CL-SW	Clutch Switch Input
74	E12	Sensor System Ground	110	N-SW	Neutral Switch Input
75	VG	Glow Plug Voltage Monitor	111	PS-SW	Power Switch
76	—		112	TX-PATS	PATS Communication (Sending)
77	ALTT	Alternator Power Generation Detector	113	—	
78	E3	Sensor System Ground	114	E1	Signal Ground
79	THA2	Intake Air Temperature Sensor Input 2	115	—	
80	—		116	ISV+	Electronic Control Throttle DC Motor Actuation (+)
81	PEG2	Exhaust Pressure Sensor Input 2	117	E2	Signal Ground
82	VREF1	Sensor 5V Power Supply	118	ISV-	Electronic Control Throttle DC Motor Actuation (-)
83	TVO1	Accelerator Sensor Input 1	119	+B	+B Power Supply (M-REL Downstream)
84	E5	Sensor System Ground	120	+B	+B Power Supply (M-REL Downstream)
85	A/F-	A/F Sensor Input (-)	121	+BB	Battery Power Supply
86	ISVP	Electronic Control Throttle Position Sensor Input	—	—	

Published : June 2005

Edited and published by:

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