DENSO

J05D/J08E Engine

COMMON RAIL SYSTEM (CRS) SERVICE MANUAL: Operation

Issued : September 2007
Revised : May 2010

DENSO CORPORATION

00400041EB

Revision History

Date	Revision Contents
2007.09	• Basic CRS content omitted, March 2007 model CRS content added. Items added are as per the following: ✓ Applicable Vehicles and Product Information ✓ Main Components and Sensors ✓ Exhaust Gas Control System (DPF System) ✓ Engine ECU Diagnostic Trouble Codes (DTC) ✓ Engine ECU External Wiring Diagram and Connector Terminal Layout
2010.05	• March 2010 model CRS content added. Items added are as per the following: ✓ Applicable Vehicles and Product Information ✓ CRS Outline (Diagram) ✓ Supply Pump ✓ Rail ✓ Injector ✓ Engine ECU ✓ Selective Catalytic Reduction (SCR) System ✓ Engine ECU Diagnostic Trouble Codes (DTC) ✓ Engine ECU External Wiring Diagrams and Connector Terminal Layout

Operation Section

1. APPLICABLE VEHICLE AND PRODUCT INFORMATION

1.1 Introduction

- This manual describes the Common Rail System (CRS) equipped with J05D/J08E engines used in the HINO Medium Truck.

  For information on items common to all CRSs, refer to the previously published CRS general addition manual (Doc ID: 00400076E). [Items common to all CRSs: CRS development process, system control, construction and operation of main components (supply pump, rail, injectors), sensors and actuators]
- Minor changes have been made to the HINO medium truck as of June 2010. With this minor change, the CRS equipped with the J08E engine has also changed, and now this engine uses the Selective Catalytic Reduction (SCR) system. The SCR system dramatically reduces the quantity of NOx exhaust, and achieves superior environmental protection functionality suited to the stringent emission standards stipulated in the "US10" regulations.

  Changes to the CRS are shown below.
  - Maximum injection pressure increased to 200 MPa.
  - Fuel path related with the supply pump changed.
  - Rail is compliant with a pressure of 200 MPa.
  - Engine ECU changed to a direct-mount type.
  - CRS now equipped with G3 type injectors.
  - The J08E engine now uses the Selective Catalytic Reduction (SCR) system.

1.2 Applicable Vehicles

2004 model

Vehicle Type	Vehicle Model	Engine Model	Engine Displacement	Release Date
Medium Truck	HINO145 HINO165 HINO185	J05D	4.73 L	April 2004
	HINO238 HINO268 HINO308 HINO338	J08E	7.68 L	

2007 model

Vehicle Type	Vehicle Model	Engine Model	Engine Displacement	Release Date
Medium Truck	HINO145 HINO165 HINO185	J05D	4.73 L	March 2007
	HINO238 HINO258 HINO268 HINO338	J08E	7.68 L	

2010 model

Vehicle Type	Vehicle Model	Engine Model	Engine Displacement	Release Date
Medium Truck	HINO238 HINO258 HINO268 HINO338	J08E	7.68 L	June 2010

1.3 Applicable Products List

2004 model

Part Name	DENSO Part Number	Manufacturer Part Number	Remarks
Supply Pump	294000-025#	S2273-01321	J05D, HP3
	294050-001#	S2273-01311	J08E, HP4
Rail	095440-053#	S2276-01221	J05D
	095440-048#	S2276-01181	J08E
Injector	095000-539#	S2391-01311	J05D, G2
	095000-528#	S2391-01361	J08E, G2
Engine ECU	102758-301#	S8956-06540	
Accelerator Position Sensor	198800-316#	S7801-E0010	
Coolant Temperature Sensor	071560-011#	S8342-01250	
Crankshaft Position Sensor	029600-057#	S8941-11280	
Camshaft Position Sensor	949979-136#	S8941-01590	J08E
	949979-131#	S8941-01570	J05D
Manifold Absolute Pressure (MAP) Sensor	079800-589#	S8939-01080	
Exhaust Gas Recirculation (EGR) Valve	135000-707#	S1735-01210	J05D, 2004 Model Only
	135000-709#	S1735-01220	J08E, 2004 Model Only
Mass Air Flow (MAF) Meter	197400-200#	22204-21010	For EGR Control

2007 model

Part Name	DENSO Part Number	Manufacturer Part Number	Remarks
Supply Pump	294000-065#	22100-E0110	J05D, HP3
	294050-015#	22100-E0101	J08E, HP4
Rail	095440-125#	23810-E0130	J05E
	095440-124#	23810-E0120	J08D
Injector	095000-692#	23670-E0231	J05D, G2 Four Injectors
	095000-681#	23670-E0201	J08E, G2 Six Injectors
Engine ECU	275800-422#	89661-E0030	Without Bracket
	102758-422#	98660-E0100	With Bracket
Accelerator Pedal Module	198800-316#	S7801-E0010	
Crankshaft Position Sensor	949979-131#	S8941-01570	J05D
	949979-136#	S8941-01590	J08E
Camshaft Position Sensor	029600-057#	S8941-11280	
Manifold Absolute Pressure (MAP) Sensor	079800-589#	S8939-01080	
Differential Pressure Sensor	104990-106#	S8939-01090	DPF
Exhaust Gas Temperature Sensor	265600-060#	S8944-16511	Two DPF Sensors

2010 model

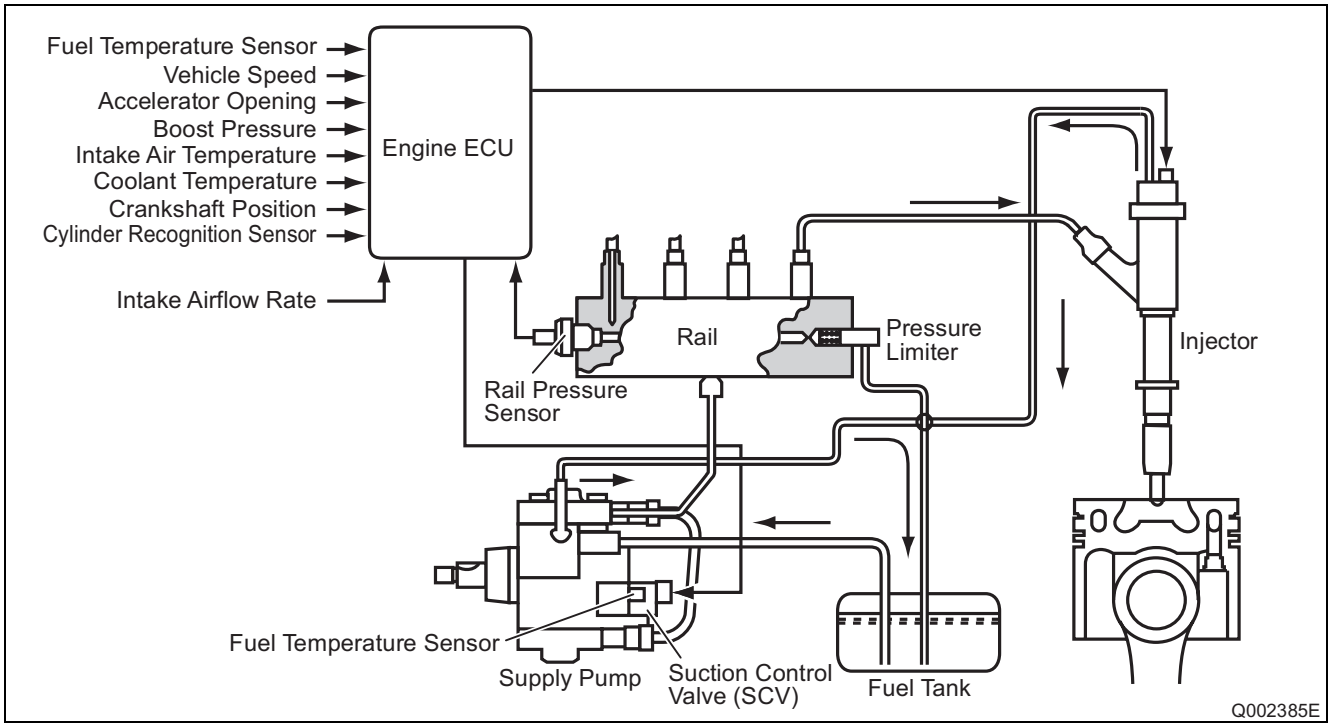
Part Name	DENSO Part Number	Manufacturer Part Number	Remarks
Supply Pump	294050-036#	22100-E0351-B	HP4
Rail	095440-156#	23810-E0170	
Injector	294050-023#	23670-E0400	G3
Engine ECU	112500-100#	89661-E0041	Direct mount type
Accelerator Pedal Module	198800-316#	78010-E0010	
Crankshaft Position Sensor	029600-057#	S8941-11280-A	
Manifold Absolute Pressure (MAP) Sensor	079800-941#	89421-E0050	
Differential Pressure Sensor	104990-106#	S8939-01090-B	
Intake Air Temperature Sensor	072800-040#	89424-E0030	

2. COMMON RAIL SYSTEM (CRS) OUTLINE

2.1 CRS Outline (Diagram)

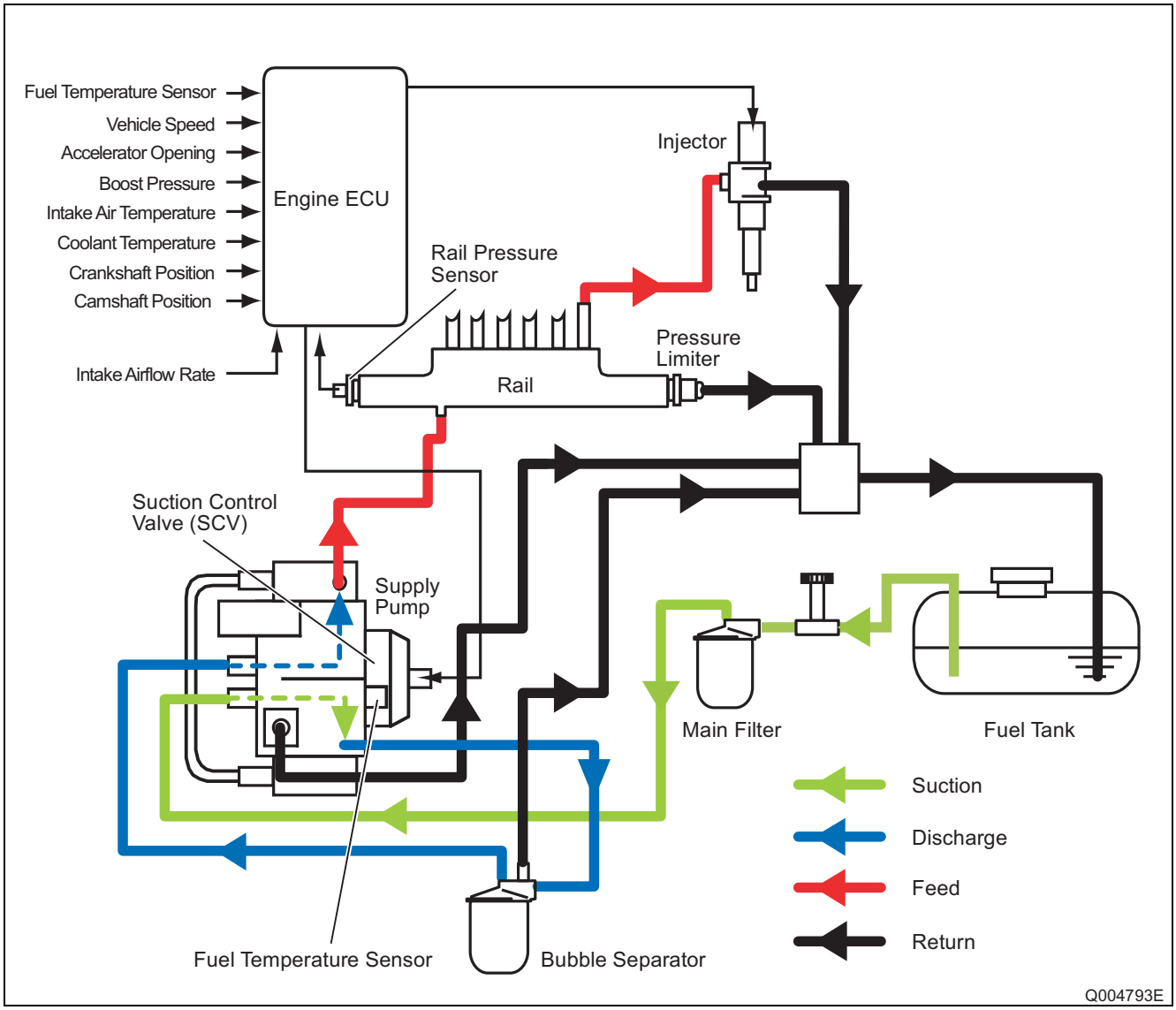
2004, 2007 model

- The CRS consists primarily of a supply pump, rail, injectors, and engine ECU.



2010 model

- The fuel flow path in the 2010 model year CRS has changed as per the figure below to inhibit air mixing.

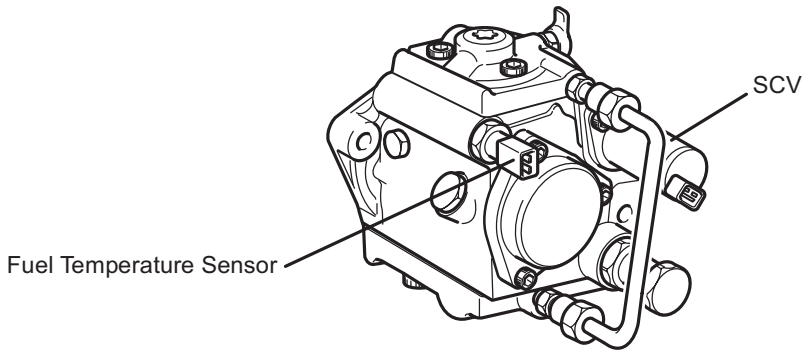


3. SUPPLY PUMP

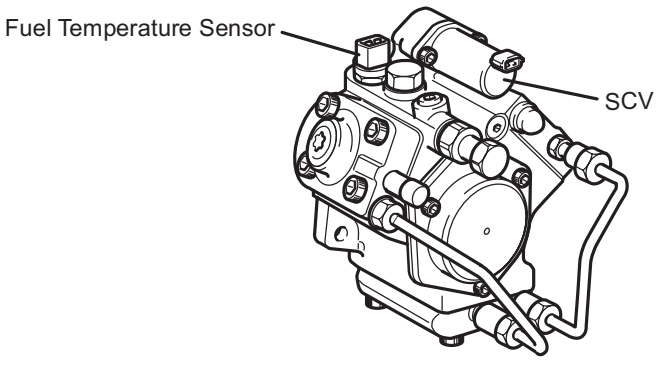
3.1 Outline

- The HP3 and HP4 supply pumps have the same construction and operational characteristics as the conventional supply pumps. Supply pumps place fuel suctioned from the fuel tank under high pressure for delivery to the rail.
- A feed pump outlet, and pump inlet have been added to the 2010 model supply pump to inhibit air mixing. As a result of this change, the fuel flow has been altered to travel through the following path: main filter, feed pump, bubble separator, pump unit.

(1) 2004 model

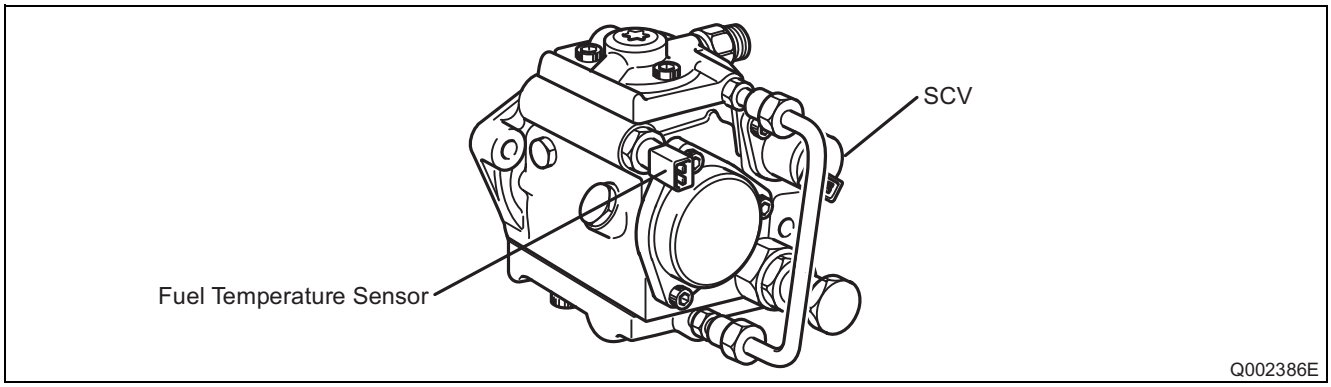


HP3 (294000-025#)

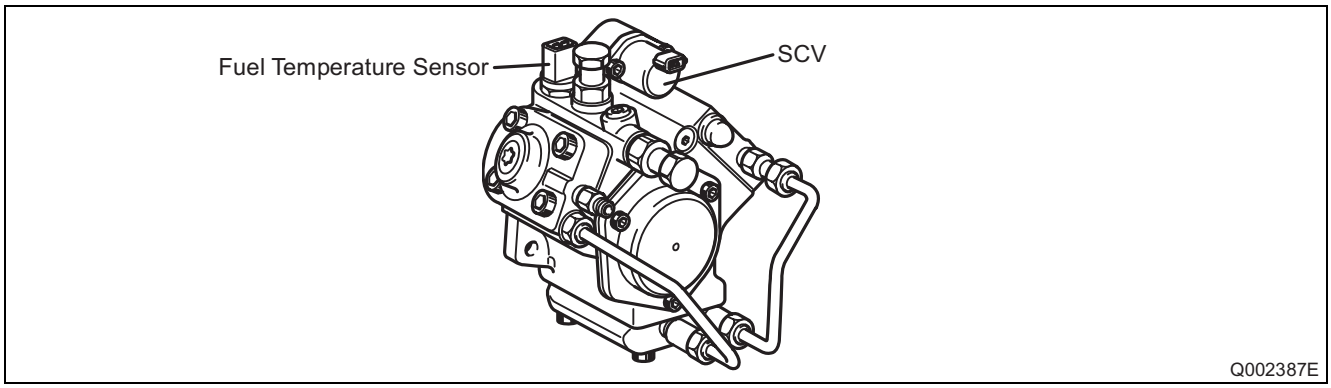


HP4 (294050-001#)

(2) 2007 model

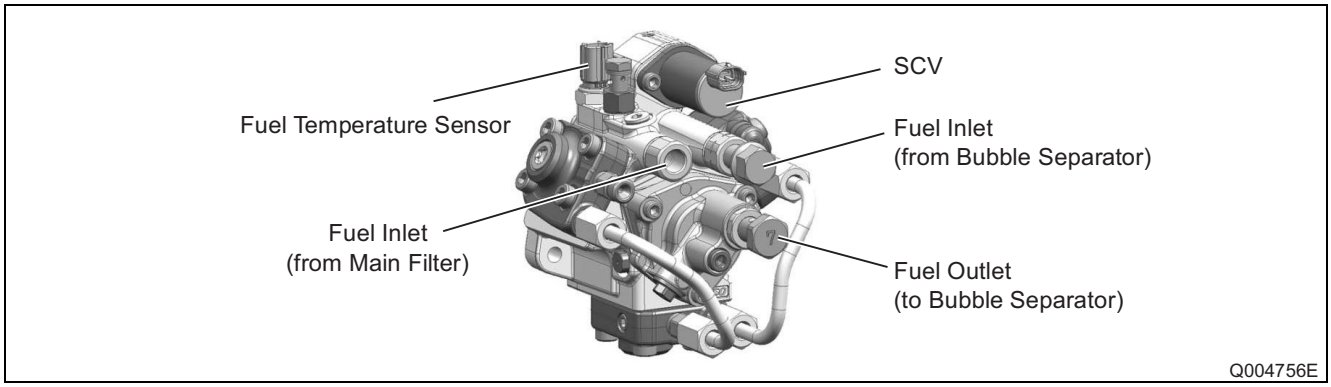


HP3 (294000-065#)



HP4 (294050-015#)

(3) 2010 model

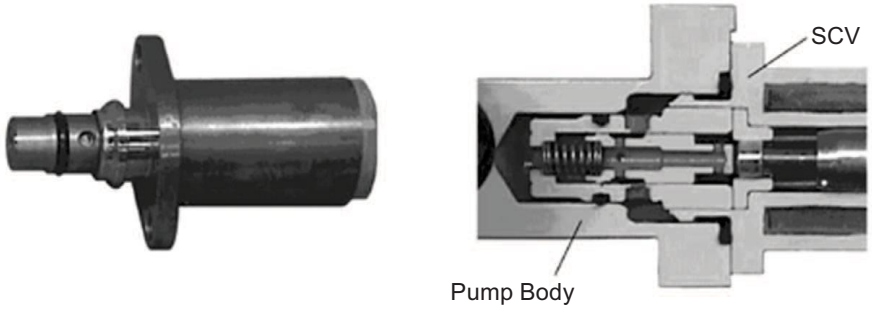


HP4 (294050-036#)

3.2 Suction Control Valve (SCV)

(1) 2004, 2010 model

- The 2004 and 2010 model SCV is a normally open type valve.



< External View > < Cross-Section >

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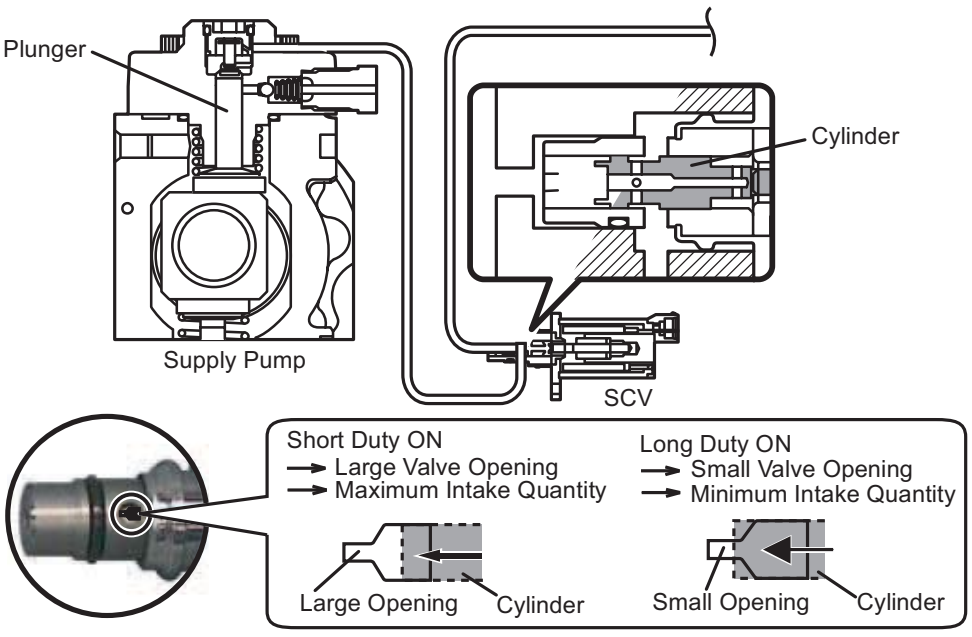

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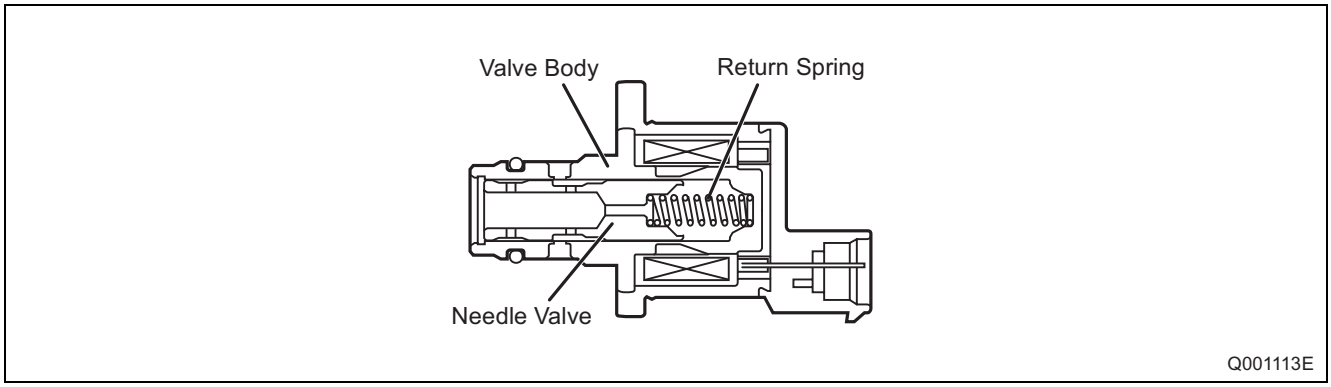
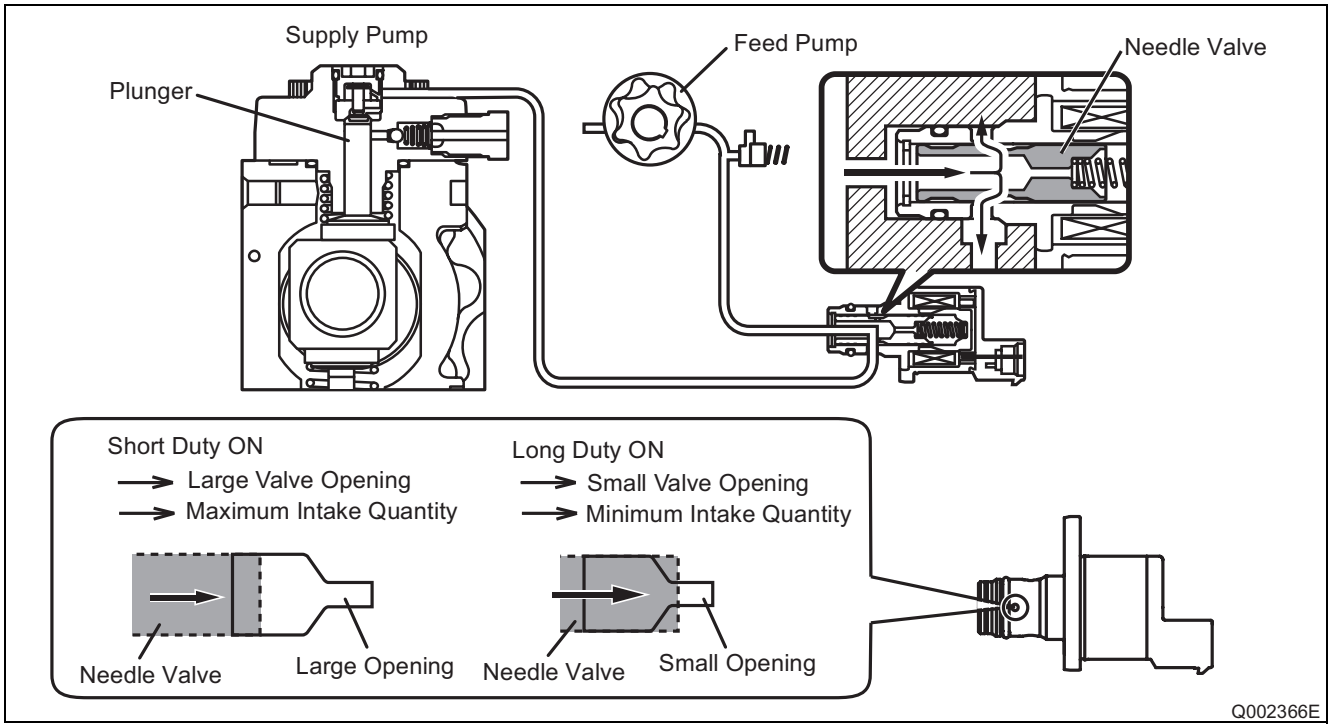
Operation Concept Diagram

(2) 2007 model

- The 2007 model SCV is a compact, normally open type valve.

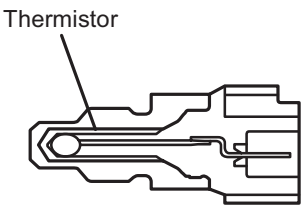




Operation Concept Diagram

3.3 Fuel Temperature Sensor

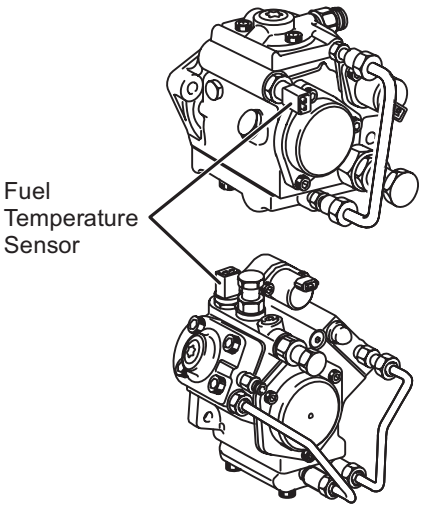
- The fuel temperature sensor is a conventional type sensor. Sensor resistance values in relation to fuel temperature are provided below.



[Resistance Value Characteristics]

Temperature (°C)	Resistance Value (kΩ)
- 30	(25.4)
- 20	15.0 ± 1.5
- 10	(9.16)
0	(5.74)
10	(3.70)
20	2.54 ± 0.24
30	(1.66)
40	(1.15)
50	(0.811)
60	(0.584)
70	(0.428)
80	0.318 ± 0.031
90	(0.240)
100	(0.1836)
110	(0.1417)
120	(0.1108)

Reference values are shown in brackets.



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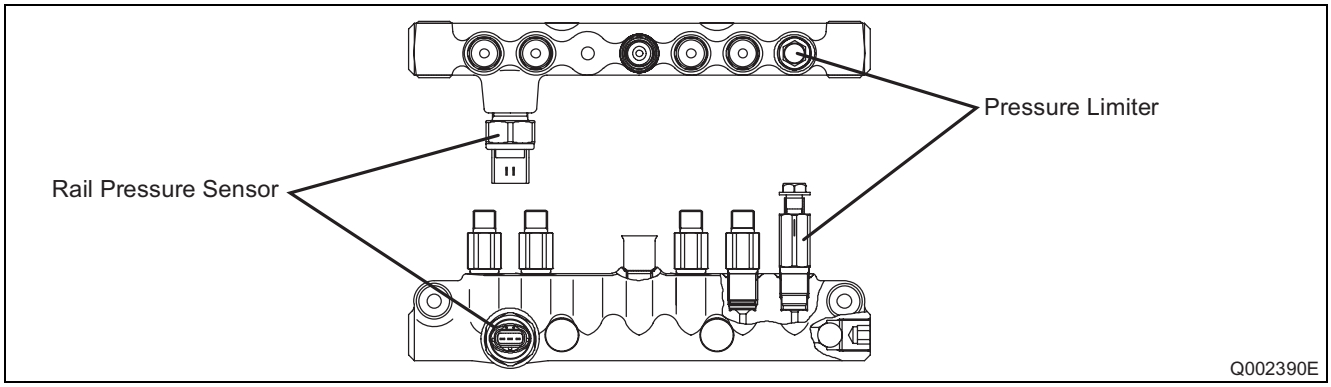
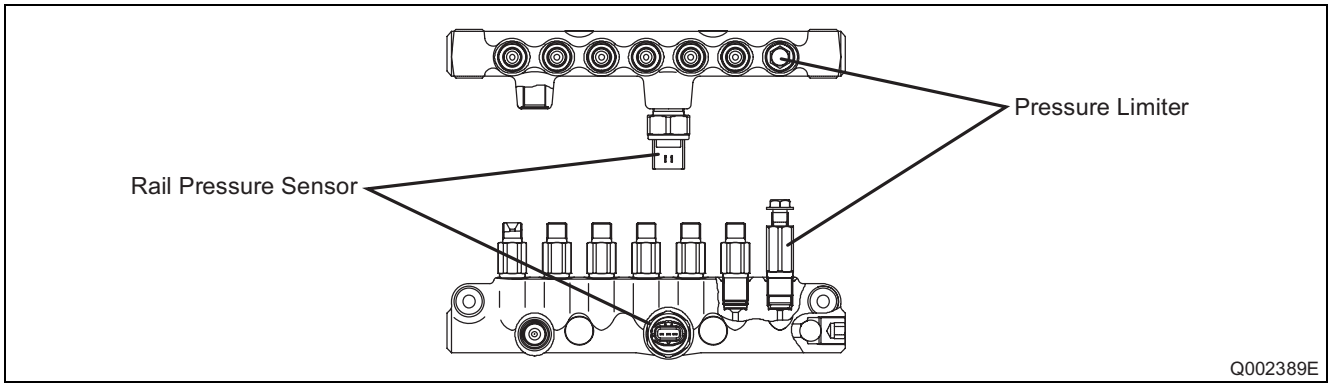
4. RAIL

4.1 Outline

- The construction and operational characteristics of the rail equipped with the J05D/J08E engines are identical to the conventional rail. The rail distributes fuel delivered from the supply pump to each injector.
- The rail detailed herein is equipped with both a pressure limiter and pressure sensor.
- In the 2010 model CRS, the rail pressure sensor and flow damper have changed.



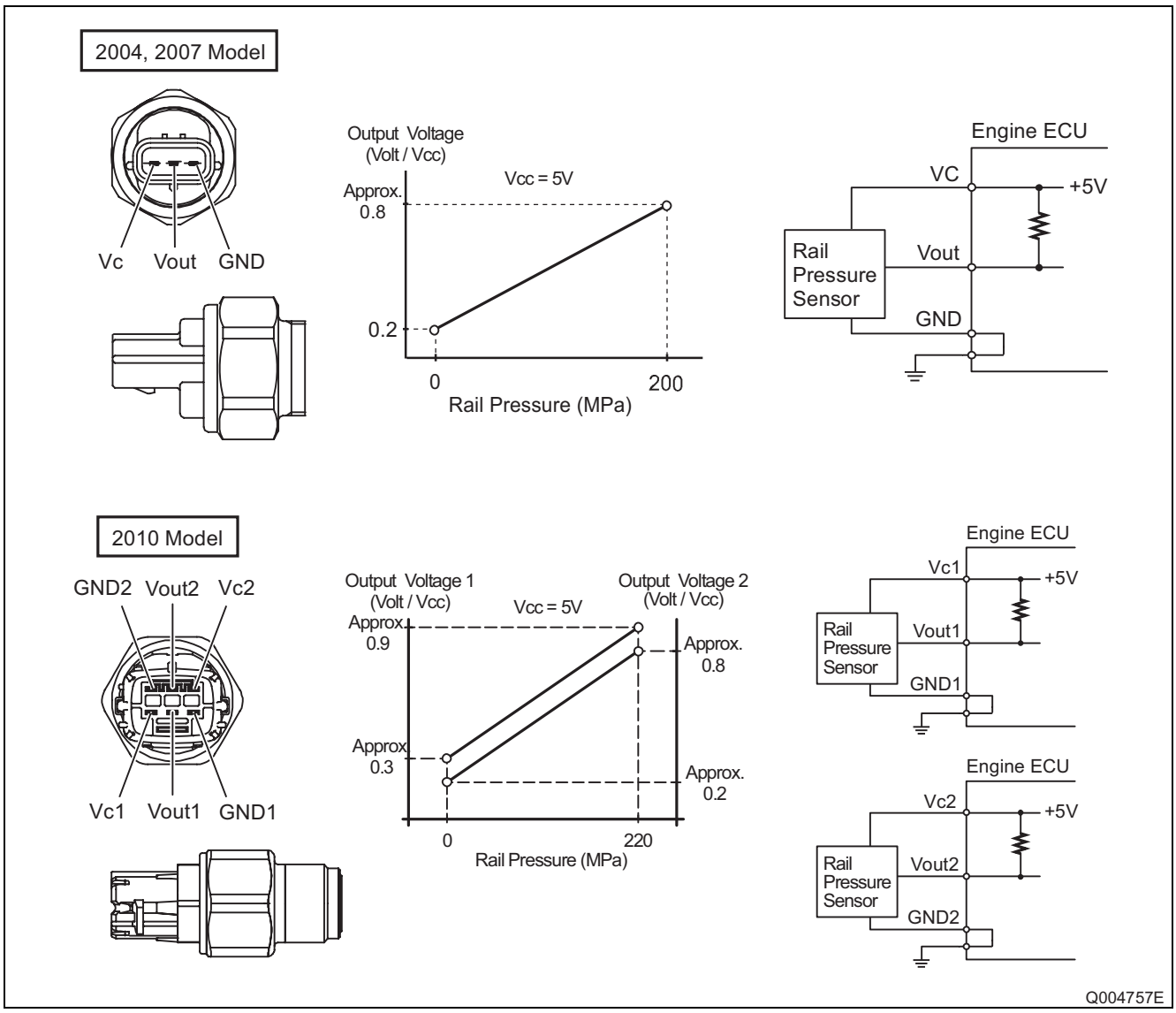
J05D Engine (095440-053#, -125#)



J08E Engine (095440-048#, -124#, -156#)

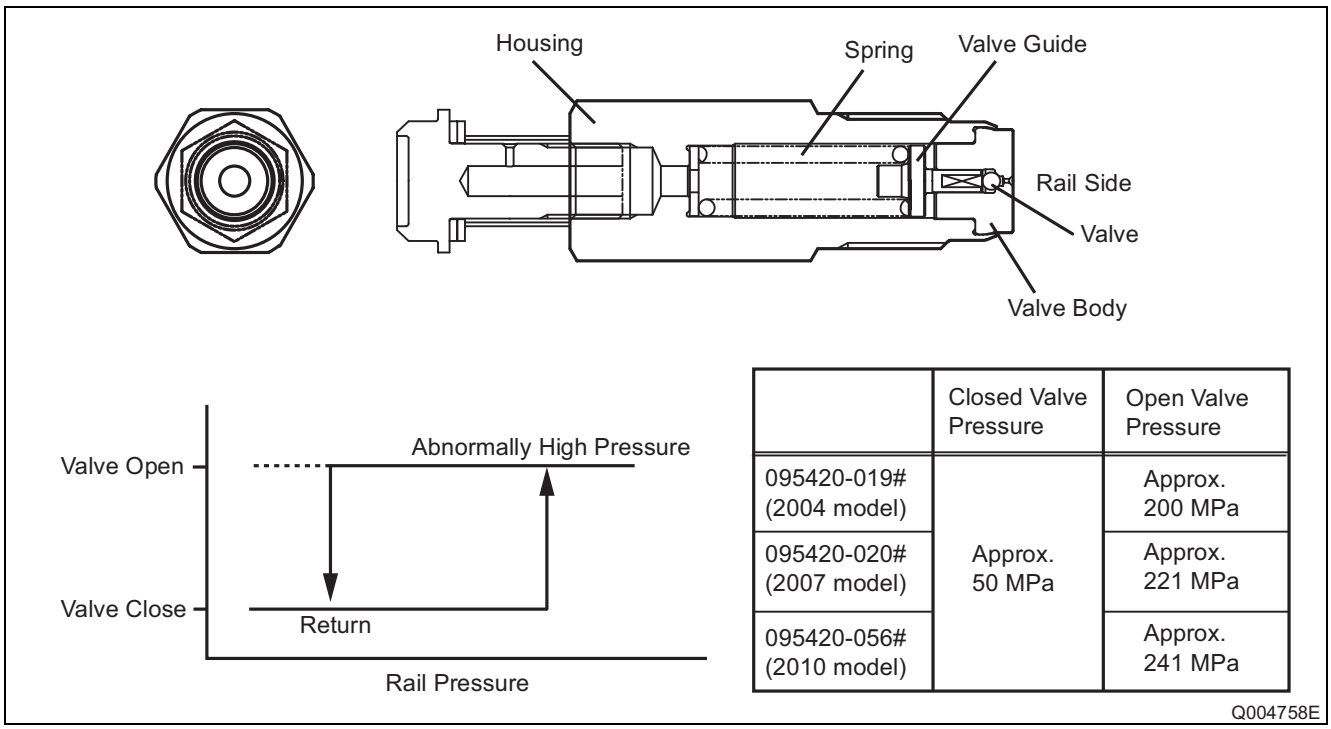
(1) Rail pressure sensor

- The construction and operational characteristics of the rail pressure sensor equipped with the J05D/J08E engines are identical to the conventional sensor. The rail pressure sensor detects fuel pressure inside the rail.
- The 2010 model year CRS has redundant rail pressure sensors.



(2) Pressure limiter

• The construction and operational characteristics of the pressure limiter equipped with the J05D/J08E engines are identical to the conventional limiter. In the event that pressure inside the rail becomes abnormally high, the valve inside the pressure limiter opens to discharge a portion of the fuel. Pressure limiter characteristics are as per the chart below.



	Closed Valve Pressure	Open Valve Pressure
095420-019# (2004 model)	Approx. 50 MPa	Approx. 200 MPa
095420-020# (2007 model)		Approx. 221 MPa
095420-056# (2010 model)		Approx. 241 MPa

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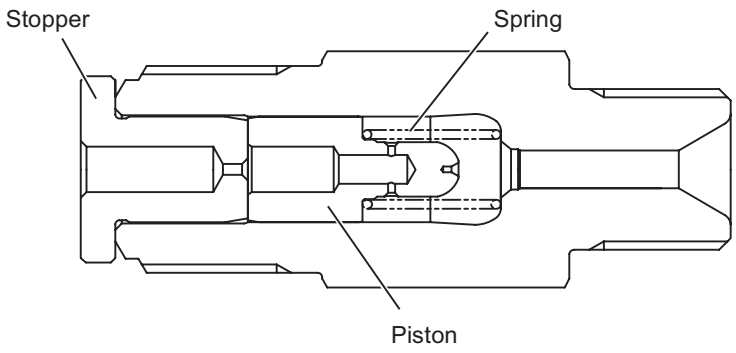
(3) Flow damper (2010 model)

• The specifications for the 2010 model year flow damper are compliant with a pressure of 200 MPa.



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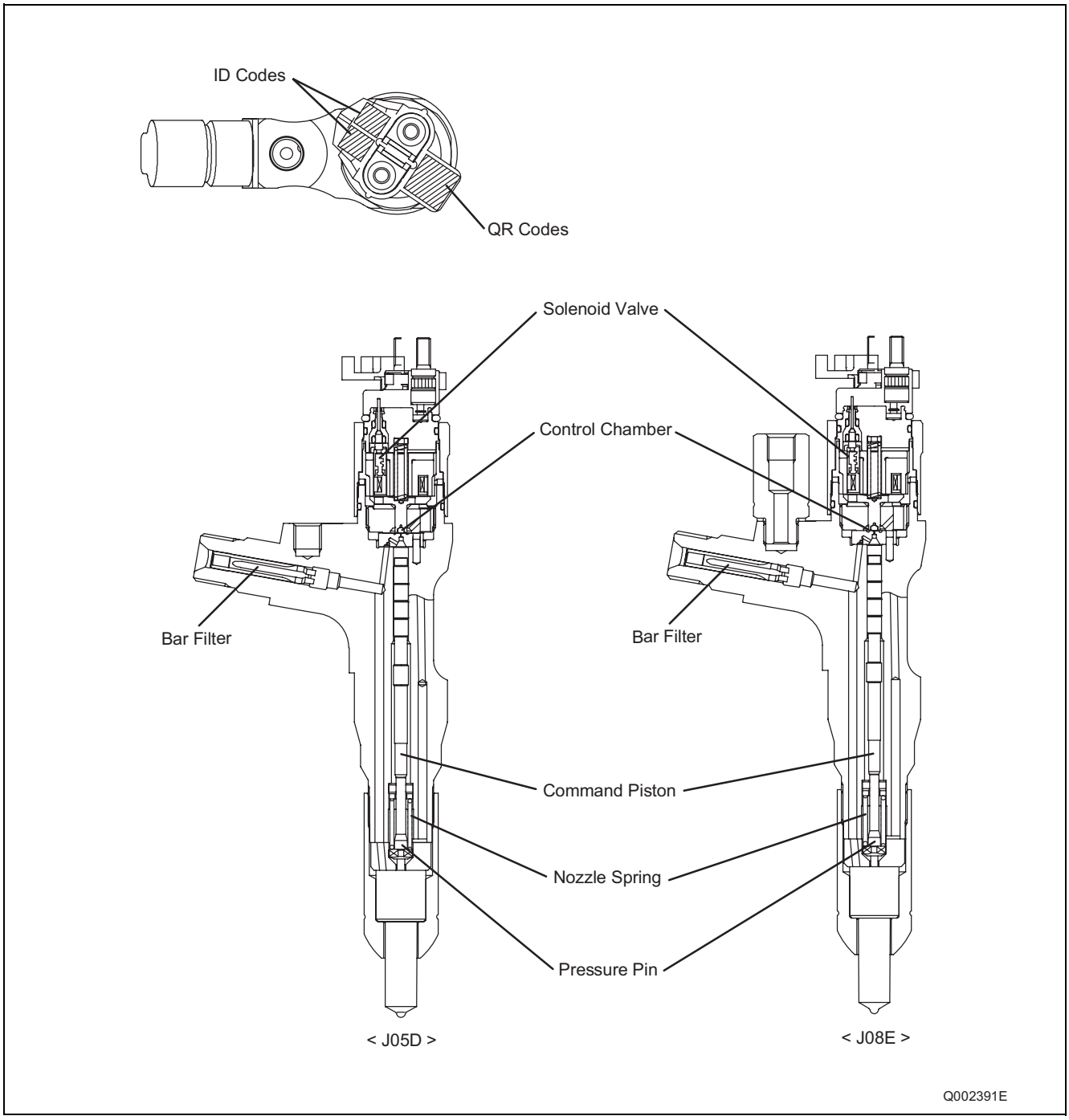
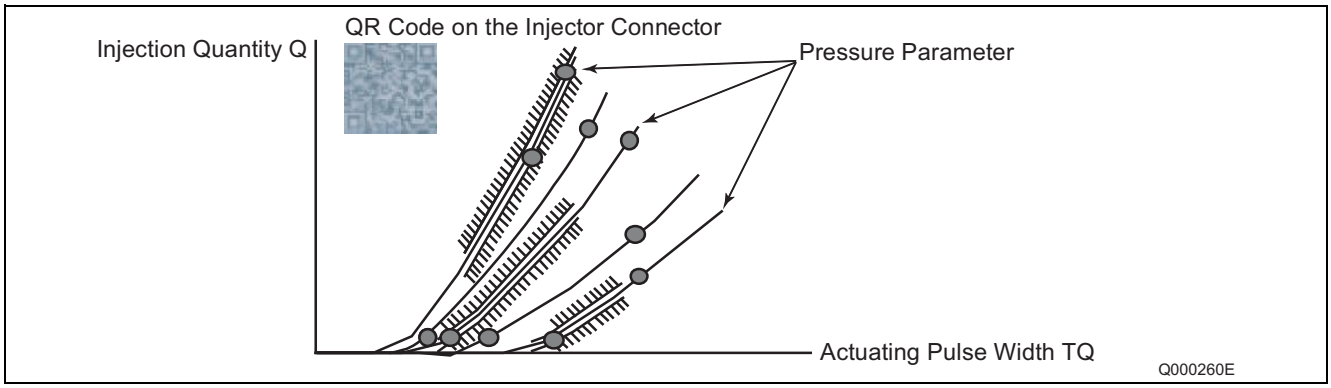
5. INJECTOR

5.1 Outline

- The 2004 and 2007 model year CRSs use G2 injectors. The construction and operational characteristics of the G2 injectors are identical to the conventional injector. The G2 injector injects fuel into the engine combustion chamber in accordance with signals from the engine ECU.
- As of the 2007 model year CRS, the injectors use a mutli-hole filter.
- The 2010 model year CRS uses G3 injectors. G3 injectors are compliant with a pressure of 200 MPa, and show improved responsiveness, as well as an increased resistance to foreign material adherence.

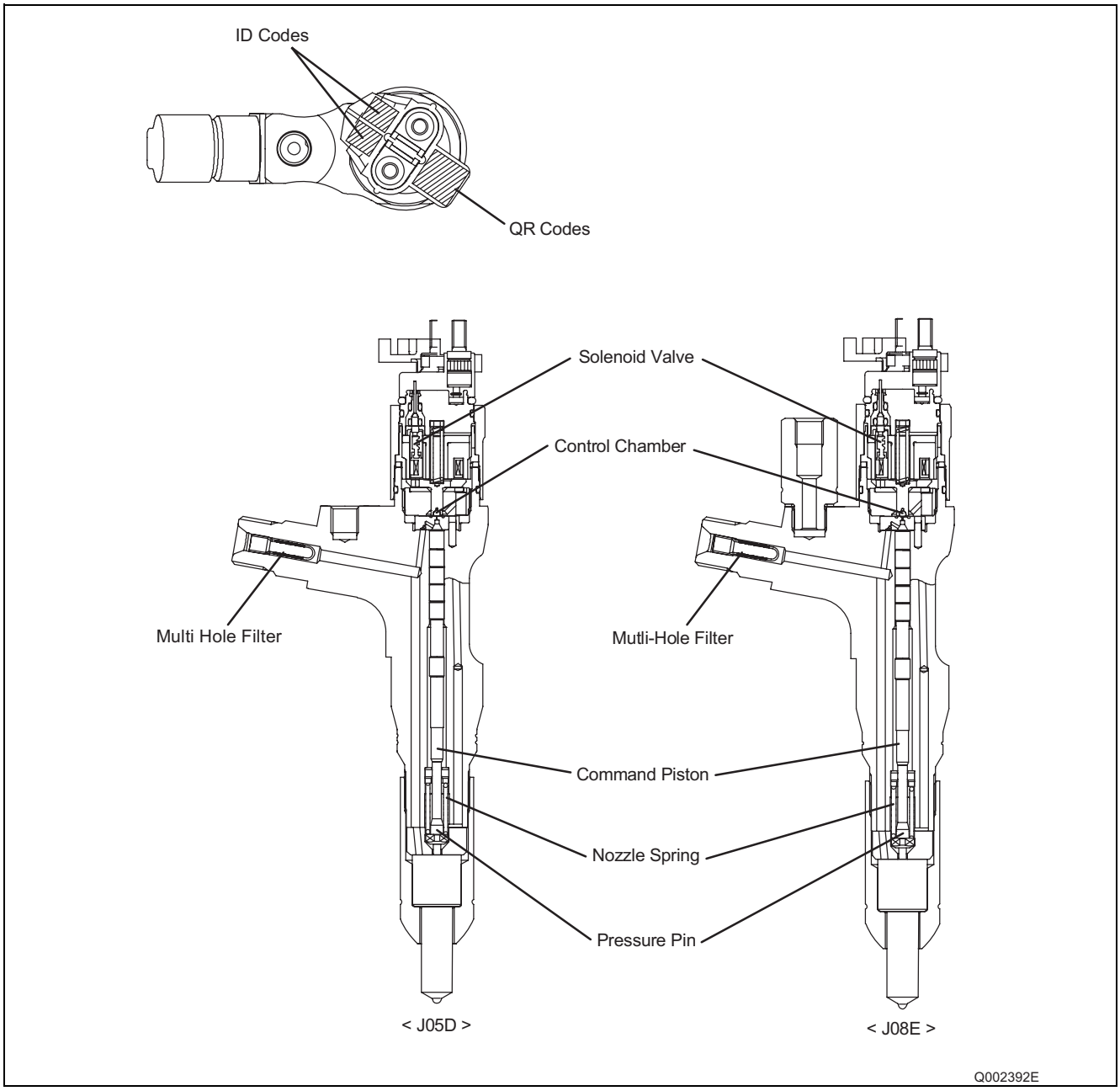
(1) 2004 model

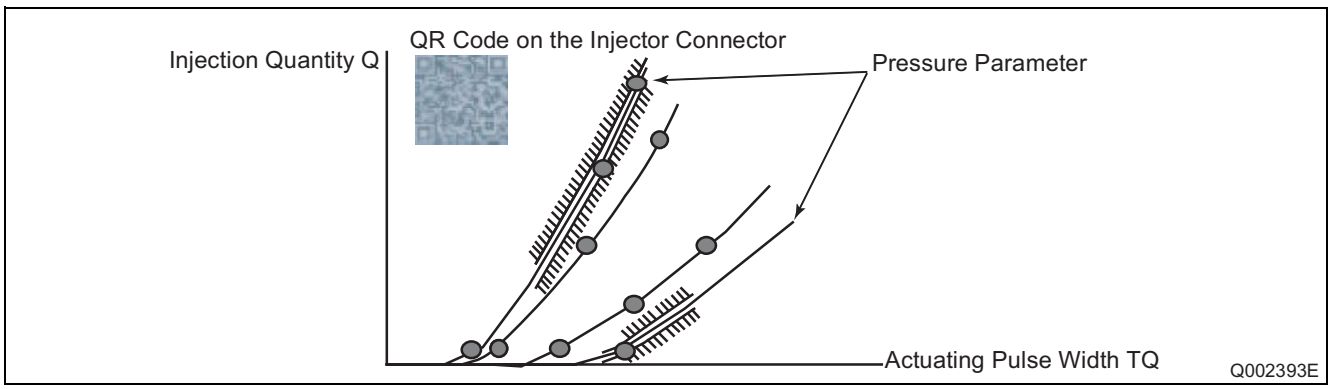




Correction Points Using QR Codes

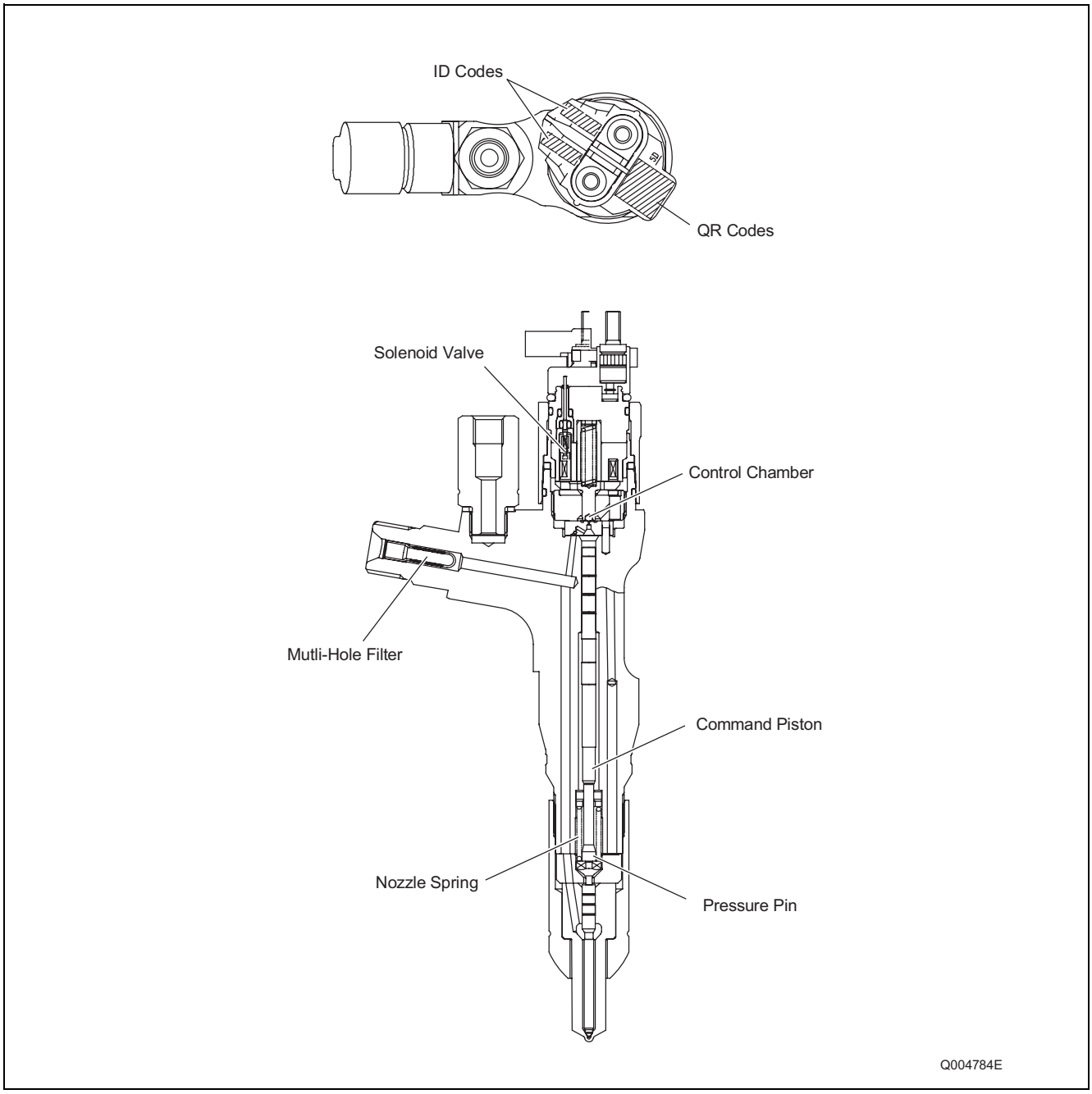
(2) 2007 model

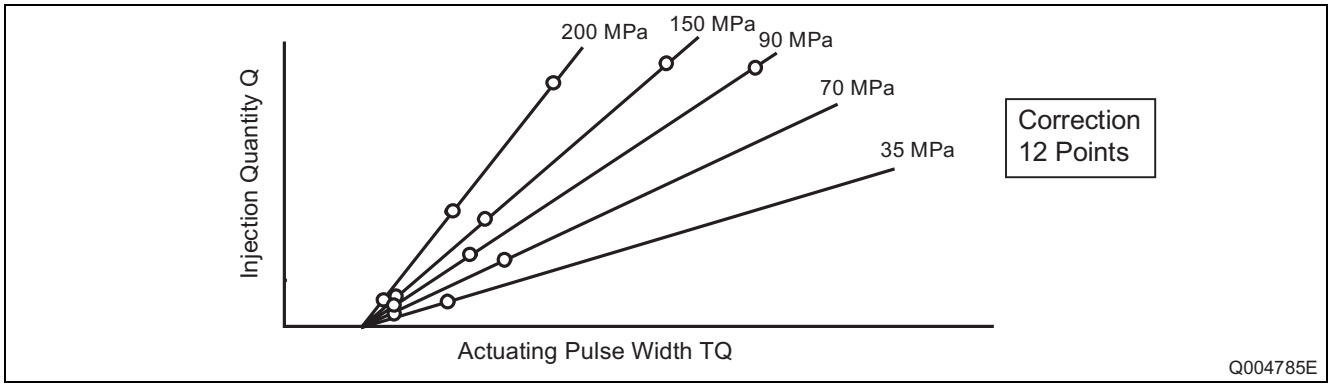




Correction Points Using QR Codes

(3) 2010 model





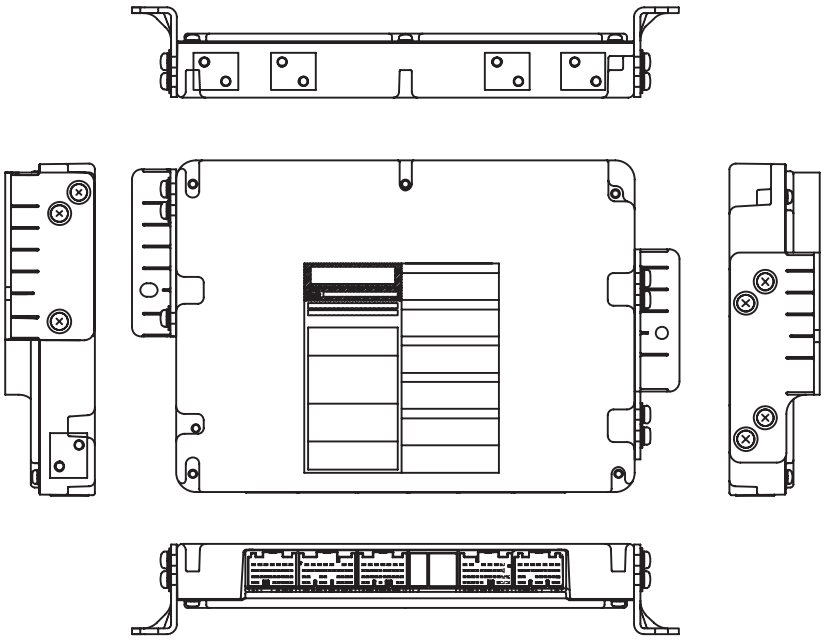
Correction Points Using QR Codes

6. CONTROL SYSTEM

6.1 Engine ECU

2004, 2007 model

- The construction and operational characteristics of the engine ECU equipped with the J05D/J08E engines are identical to the conventional engine ECU. The engine ECU determines engine status based on signals from each sensor. The engine ECU then controls various actuators so that the engine runs under optimal conditions.



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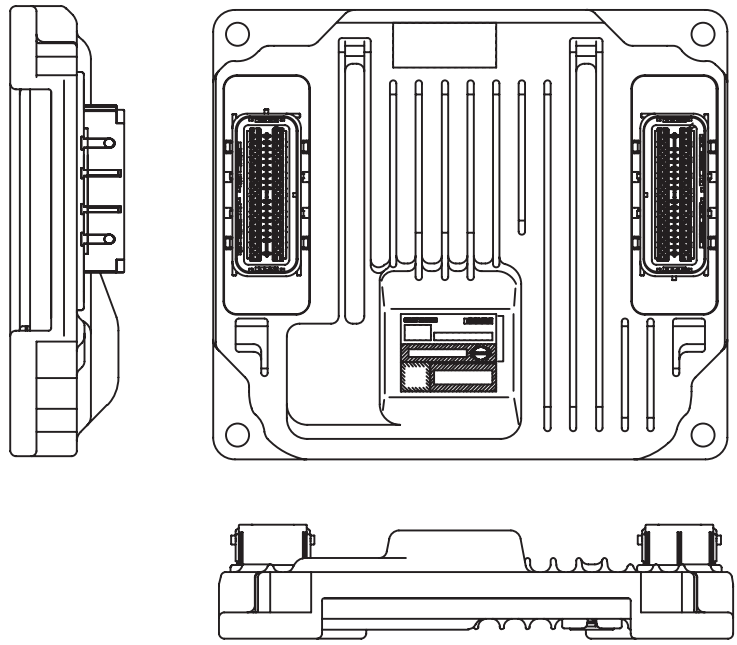
2010 model

- The 2010 model year engine ECU mounts directly to the engine (direct mount type.)



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6.2 Sensors

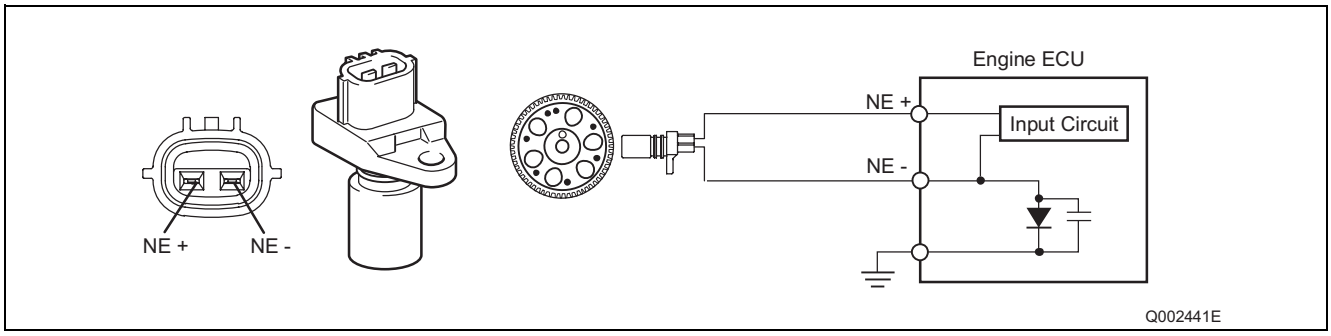
(1) Crankshaft position sensor and camshaft position sensor

• The construction and operational characteristics of both the crankshaft position sensor and camshaft position sensor equipped with the J05D/J08E engines are identical to the conventional sensors.

Crankshaft position sensor

✓ A Magnetic Pick Up (MPU) type sensor is attached to the flywheel housing. Pulses are detected when the signal holes established on the side of the flywheel pass the sensor.

✓ Signal holes are established every 6° on the side of the flywheel. However, there are no signal holes in four locations. As a result, there are 56 signal holes on the outer diameter of the flywheel, resulting in the detection of 112 pulses for every two revolutions of the flywheel.

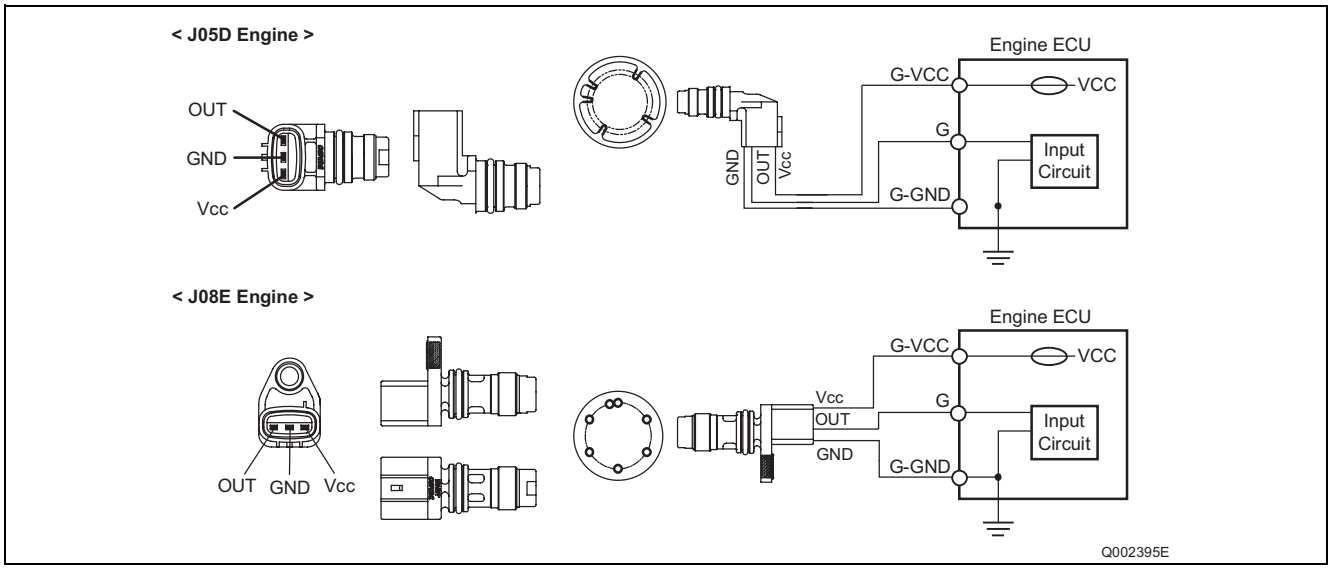


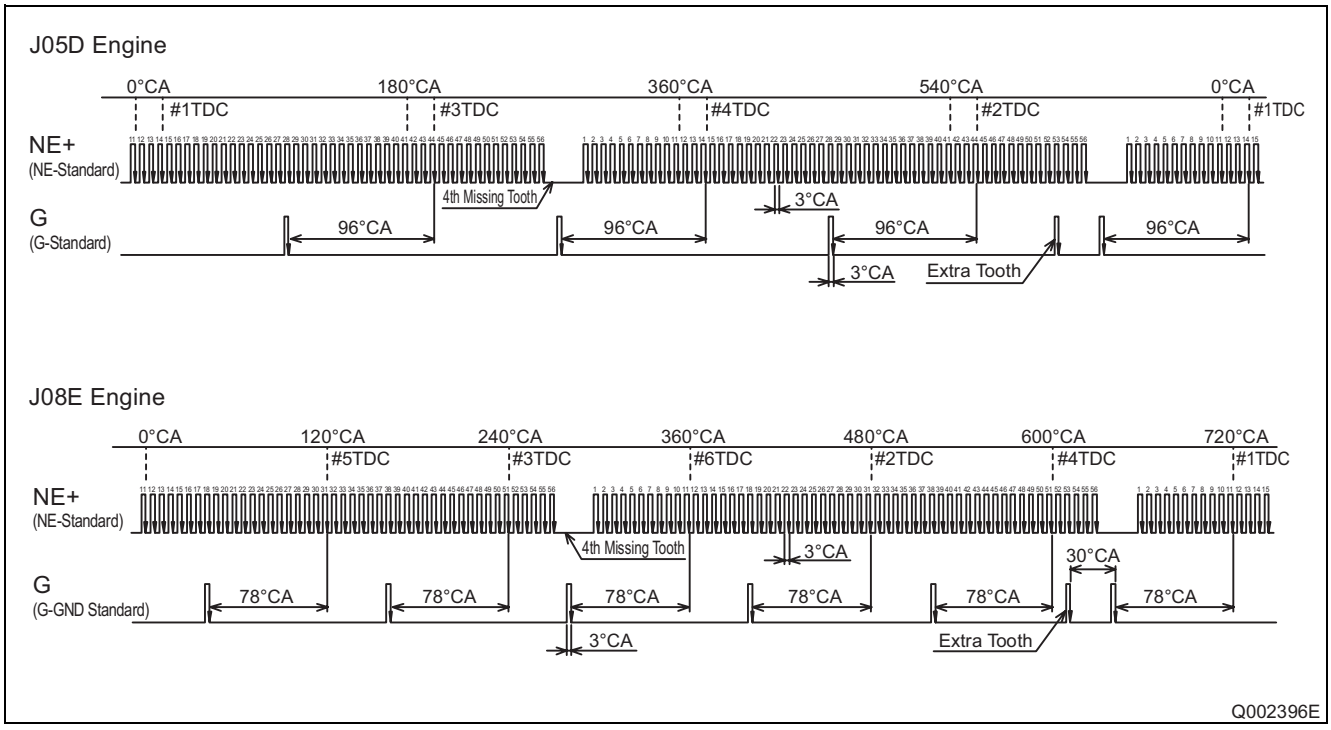
Camshaft position sensor (2004, 2007 model)

✓ A Magnetic Resistance Element (MRE) type sensor is attached to the back end of the driveshaft housing. When the pulsar attached to the driveshaft gear passes the sensor, the MRE internal resistance value changes due to a change in magnetic flux density. As a result, the voltage passing through the sensor also changes. This change in voltage is amplified by the IC circuit within the sensor, and then outputted to the engine ECU.

✓ On the J05D engine driveshaft gear, there is one pulsar every 90°, plus one irregularly-placed pulsar. As a result, five pulses are output for every two revolutions of the engine (or one revolution of the pump). Top dead center of compression for the first cylinder occurs after the irregular pulse at 96°CA (refer to the chart on the following page.)

✓ On the J08E engine driveshaft gear, there is one pulsar every 60°, plus one irregularly placed pulsar. As a result, seven pulses are output for every two revolutions of the engine (or one revolution of the pump). Top dead center of compression for the first cylinder occurs after the irregular pulse at 78°CA (refer to the chart on the following page.)



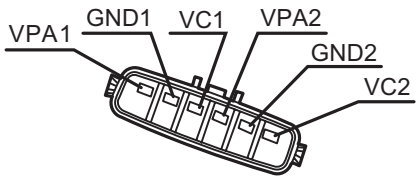


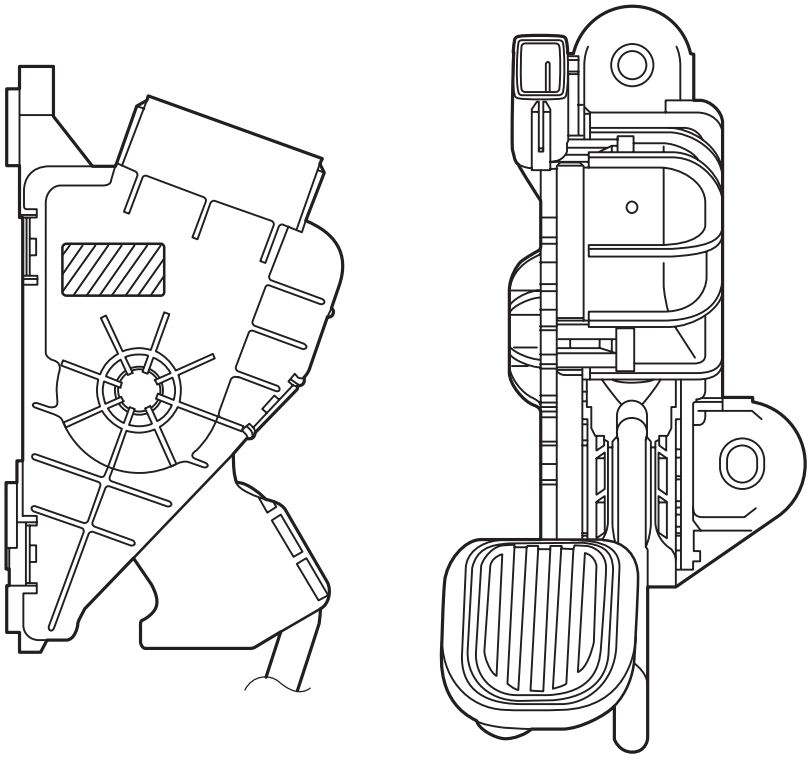
Pulse Chart

(2) Accelerator position sensor (built-in accelerator pedal module)

- The accelerator position sensor is a conventional hall element type sensor.

< Connector Pin Layout >





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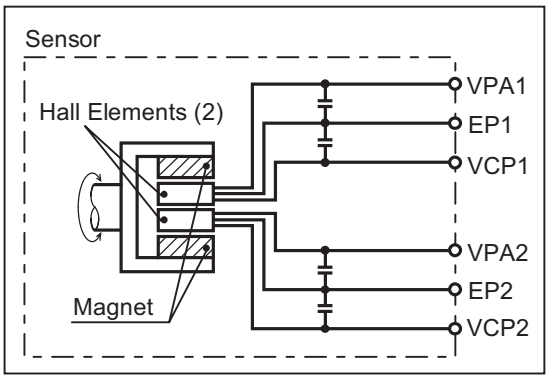

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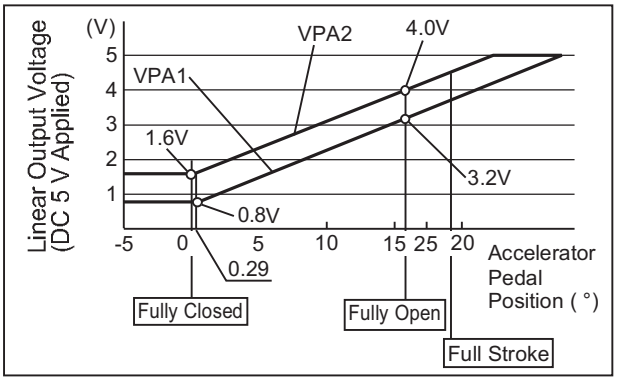

< Linear Output Characteristics Graph >

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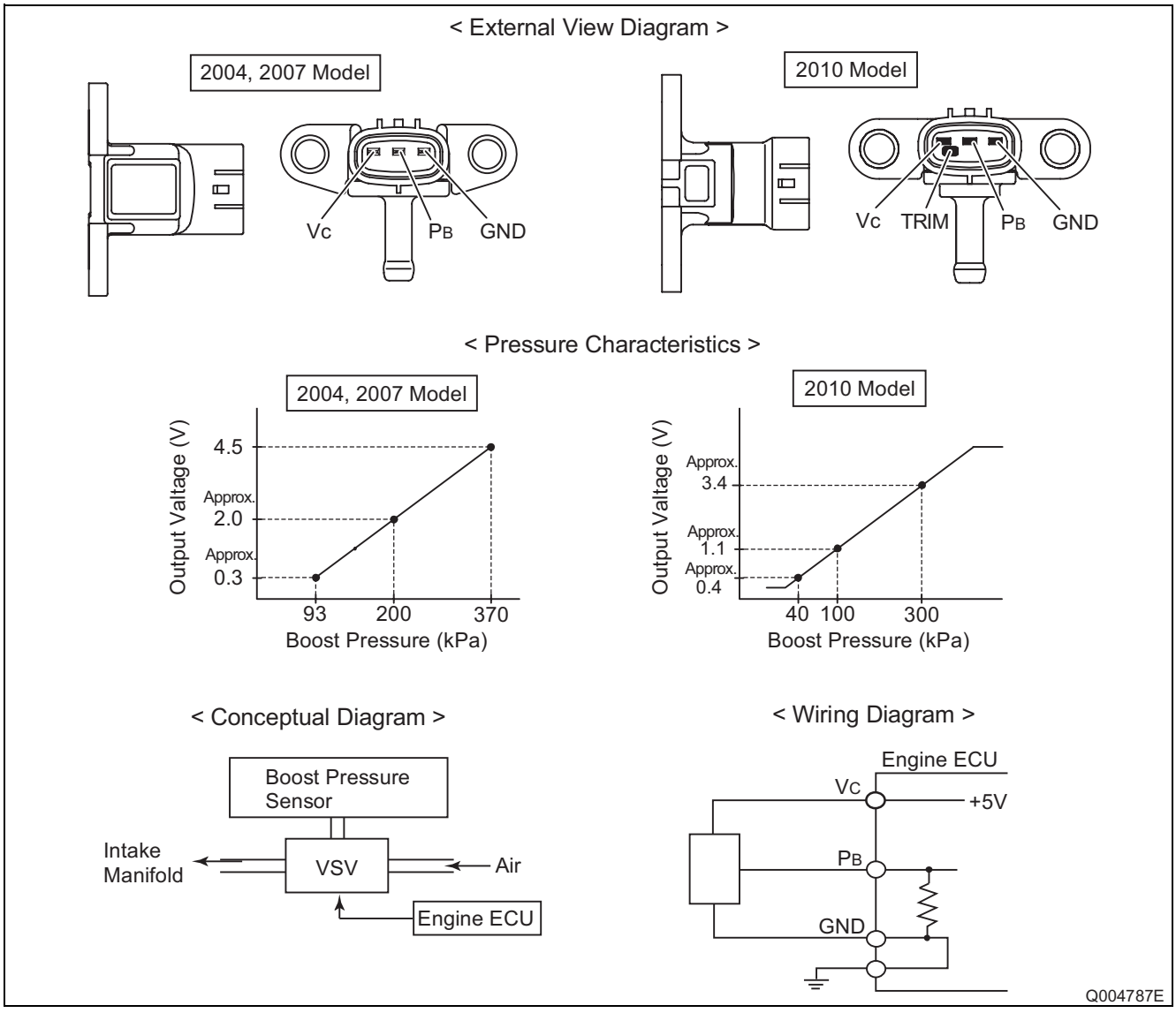
(3) Manifold Absolute Pressure (MAP) sensor

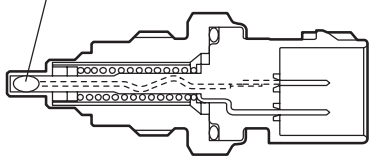
• The construction and operational characteristics of the MAP sensor equipped with the J05D/J08E engines are identical to the conventional sensor. The MAP sensor uses the "Piezoelectric Resistance Effect" to detect air pressure inside the intake manifold. Under the Piezoelectric Resistance Effect, changes in electrical resistance accompany changes in voltage applied to the silicon element inside the sensor.



(4) Coolant temperature sensor (2004 model only)

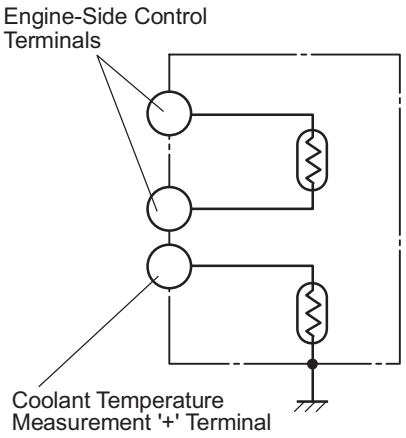
• The construction and operational characteristics of the coolant temperature sensor equipped with the J05D/J08E engines are identical to the conventional sensor. Sensor resistance values in relation to coolant temperature are provided below.

[Resistance Value Characteristics]



Temperature (°C)	Resistance Value (kΩ)
-30	(25.4)
-20	$15.04^{+1.29}_{-1.20}$
-10	(9.16)
0	(5.74)
10	(3.70)
20	$2.45^{+0.14}_{-0.13}$
30	(1.66)
40	(1.15)
50	(0.811)
60	(0.584)
70	(0.428)
80	0.318±0.008
90	(0.240)
100	(0.1836)
110	0.1417±0.0018
120	(0.1108)

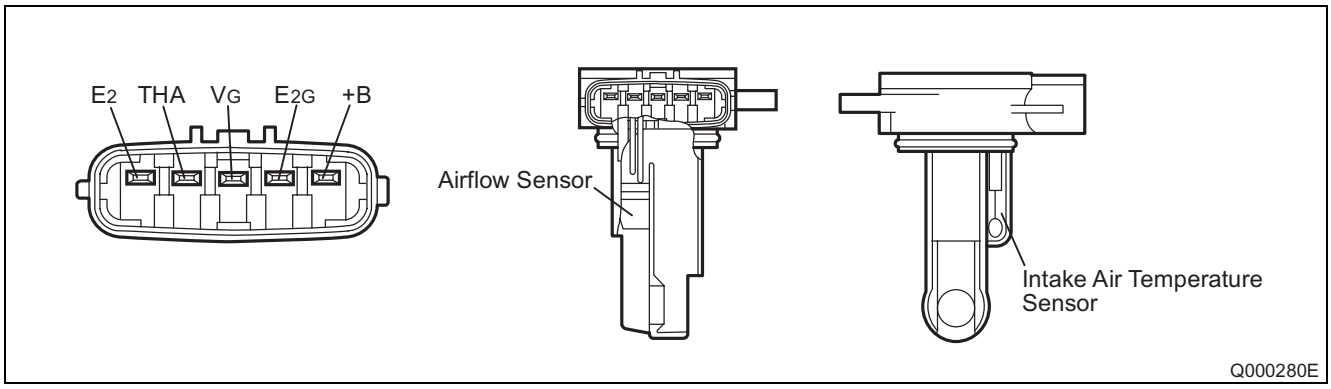
Reference values are shown in brackets.



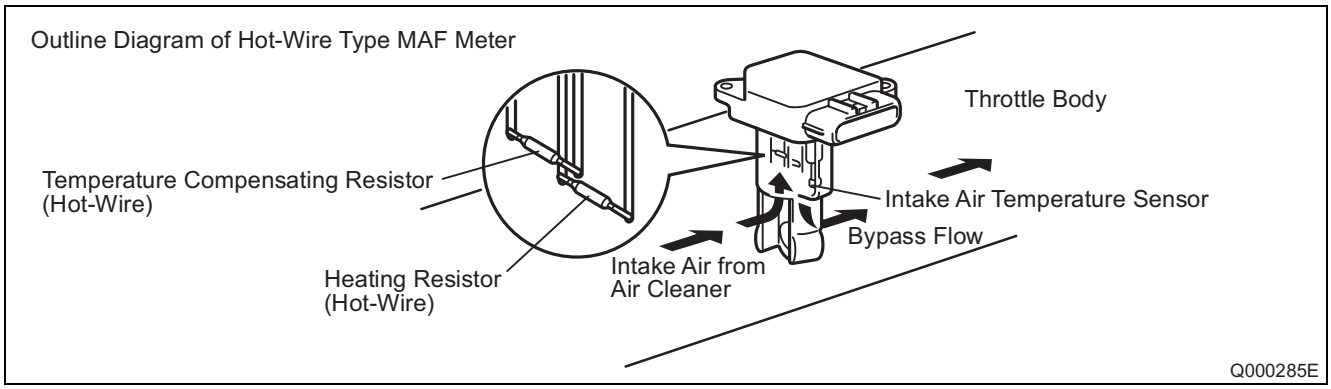
Q000406E

(5) Mass Air Flow (MAF) meter (2004 model only)

• The MAF sensor detects the intake air flow (mass flow rate) in the hot-wire type air flow meter. The intake air flow is converted to a voltage value, and this signal is then transmitted to the ECU.

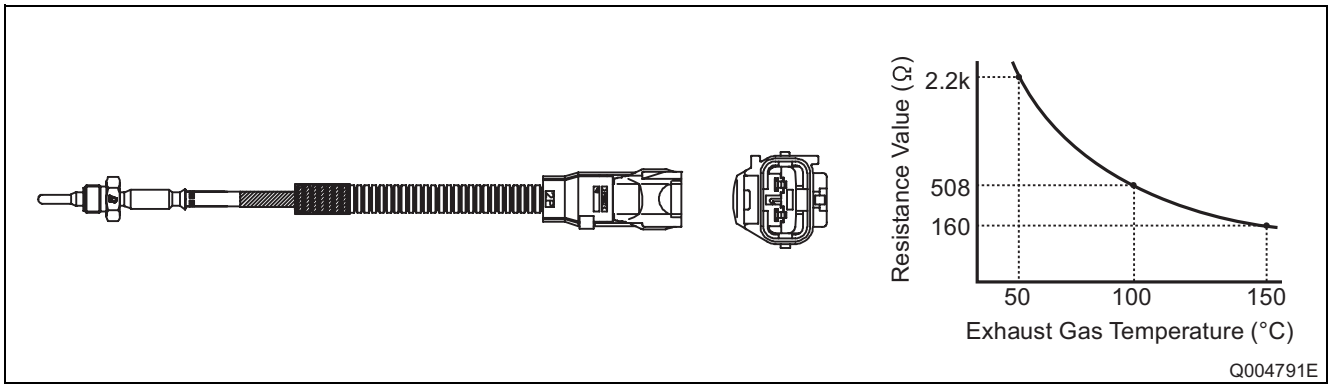


• The MAF meter is installed to the rear of the air cleaner, and consists of a heater, thermometer, intake air temperature sensor, and control circuit (base). The MAF meter diverts a portion of the air from the cleaner, and measures the intake air flow at the hot-wire measuring section.



(6) Intake air temperature sensor (2010 model only)

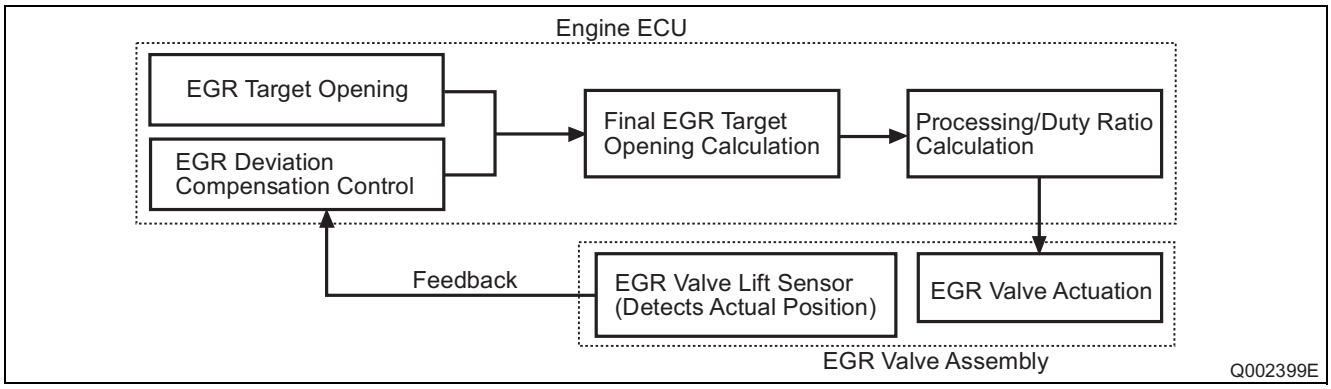
• The intake air temperature sensor detects the temperature of the intake air after passing through the turbocharger.



7. EXHAUST GAS CONTROL SYSTEM

7.1 Exhaust Gas Recirculation (EGR) System (2004 Model Only)

(1) Control system

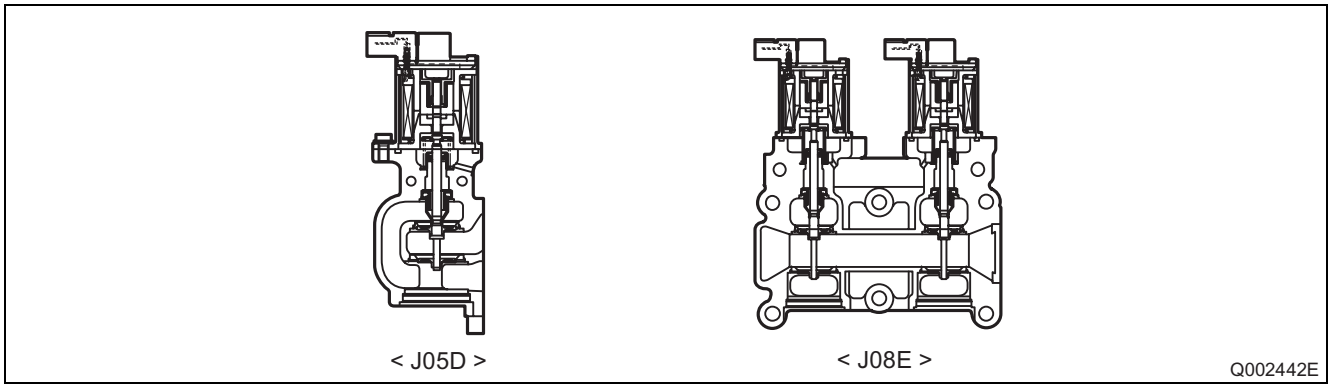


(2) Related sensors

- Air volume sensor: Detects the volume of air flowing into the engine.
- Coolant temperature sensor: Detects the engine coolant temperature.
- Atmospheric pressure sensor: Detects the atmospheric pressure around the engine (built into the ECU.)

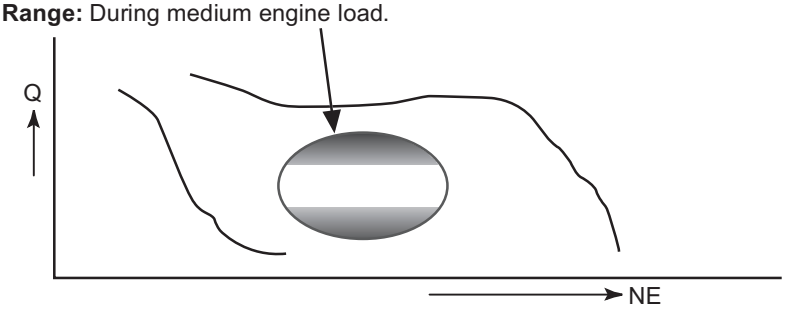
(3) EGR valve

- An EGR valve is used as the system actuator for the Electric-Exhaust Gas Recirculation (E-EGR) system. The EGR valve consists of an upper section and a lower section. The upper section receives output signals from the engine ECU, and contains a solenoid that generates electromagnetic force. The lower section is constructed of a nozzle that moves up and down in response to the electromagnetic force, and a valve with an opening that changes in response to the nozzle position.



(4) Control operation

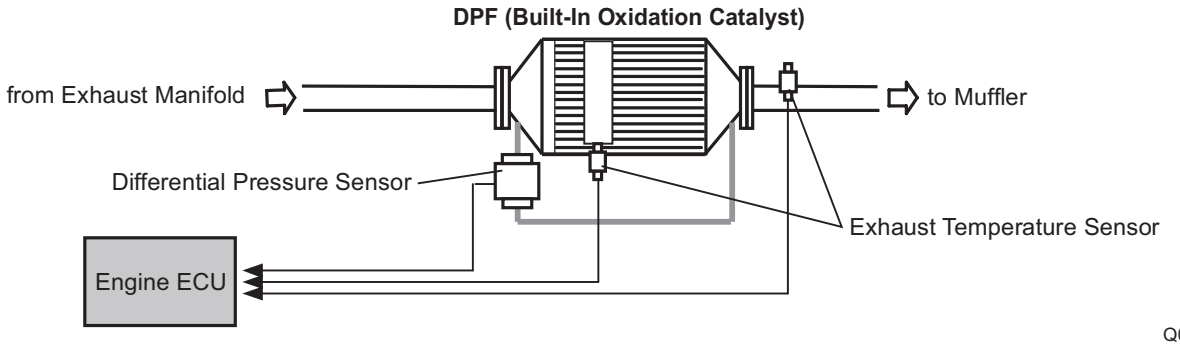
Operation Start Conditions: During engine warm-up, other than start-up, when not overheating (etc.).
EGR Operating Range: During medium engine load.



Q000269E

7.2 Diesel Particulate Filter (DPF) System (2007, 2010 Model)

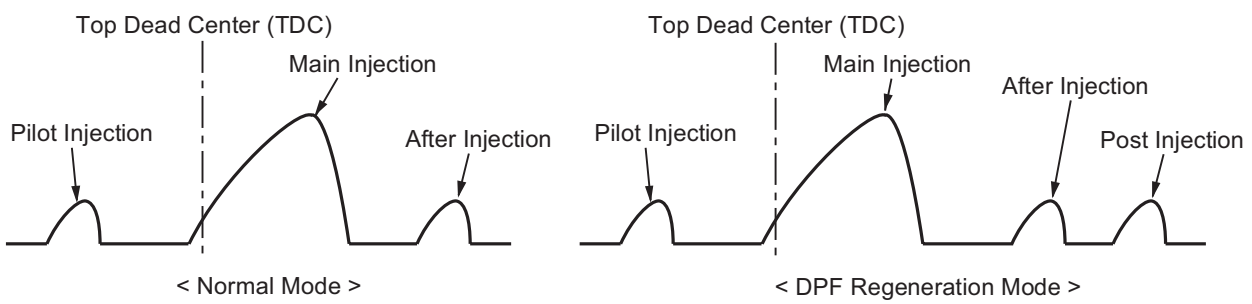
- A DPF system has been installed in the North American HINO J05D/J08E engines to comply with North American exhaust gas regulations for 2007 and 2010 model vehicles. While the DPF itself is made by another manufacturer, both the exhaust gas temperature and differential pressure sensors are DENSO products.



Q002383E

(1) Control

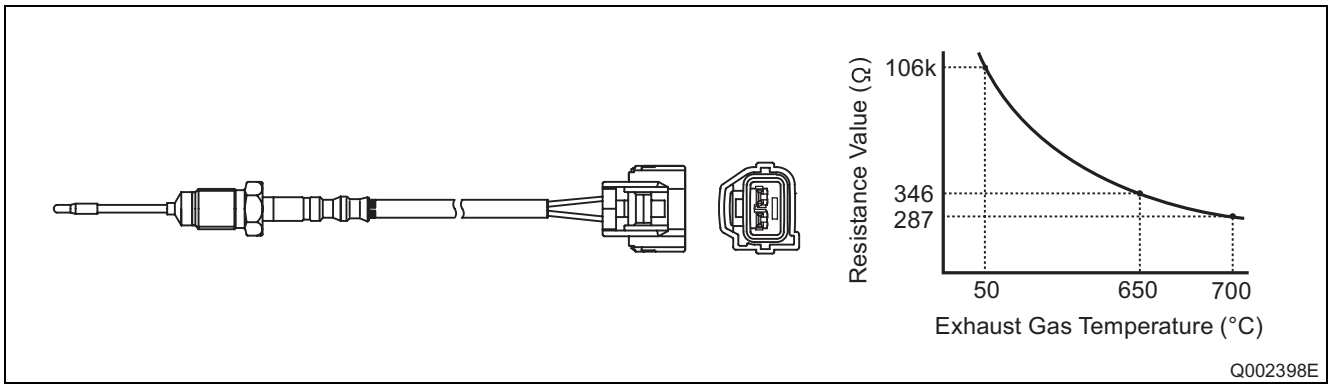
- In the DPF system regeneration mode, a post-injection is added to the normal injection pattern (pilot-injection, main-injection, after-injection). After-injection causes exhaust temperature to increase, promoting PM oxidation. Catalyst temperature is increased to the self-ignition temperature for PM by the post-injection, causing the PM accumulated in the filter to combust.



Q002384E

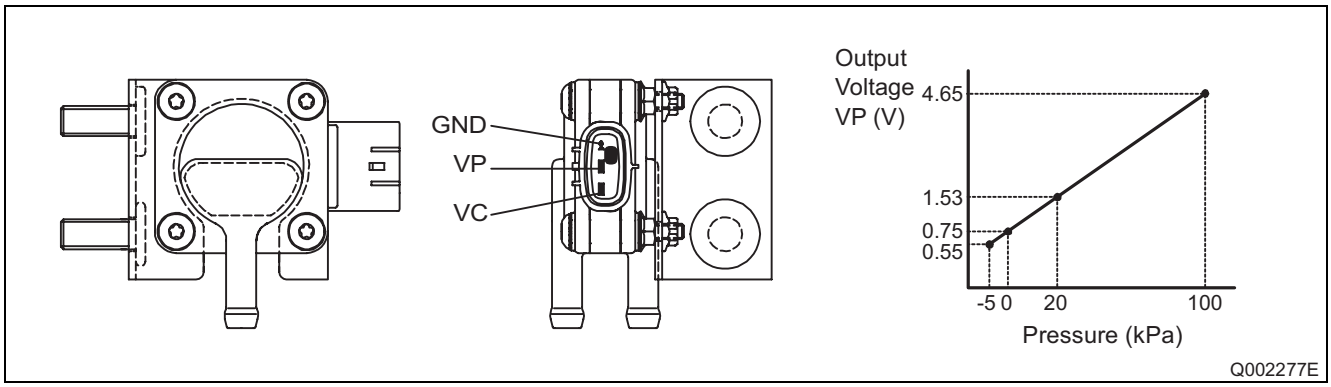
(2) Exhaust gas temperature sensor (2007 model only)

• The construction and operational characteristics of the exhaust gas temperature sensor equipped with the J05D/J08E engines are identical to the conventional sensor. The exhaust gas temperature sensor detects the temperature of the exhaust gas both before and after the DPF.



(3) Differential pressure sensor

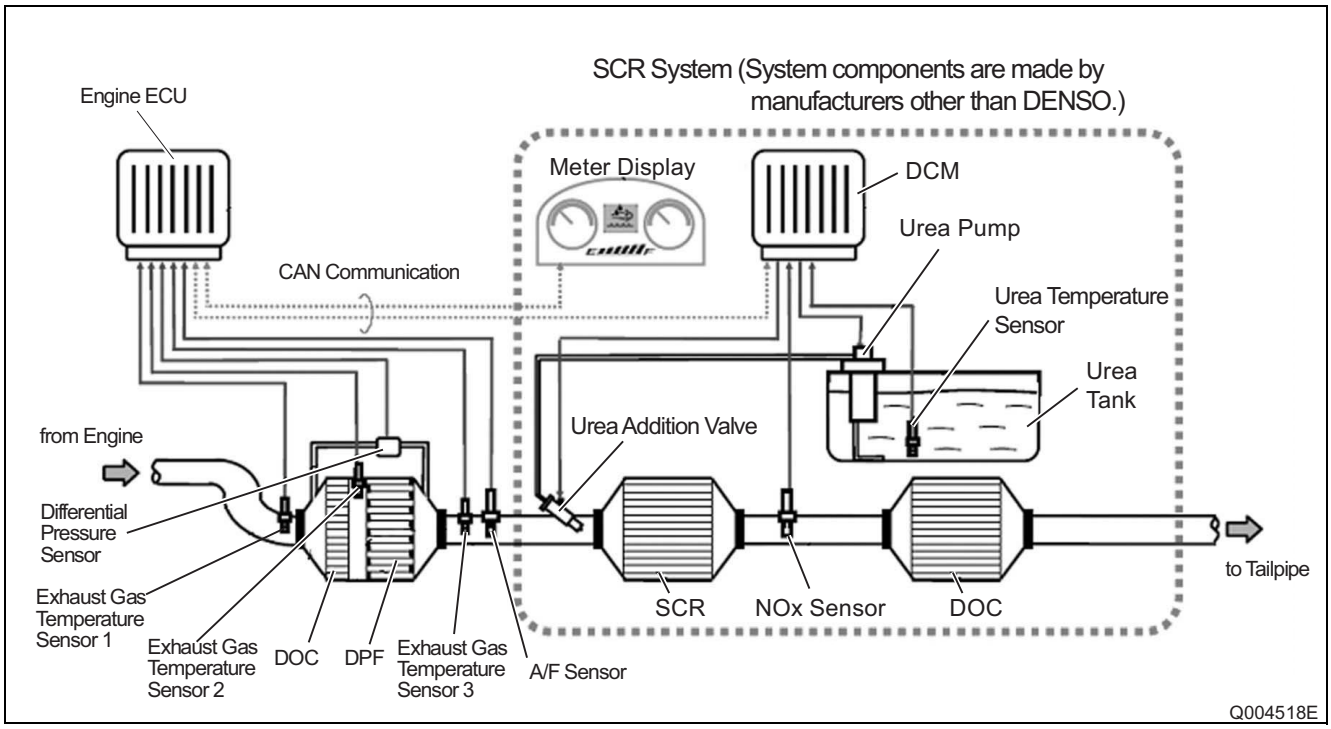
• The construction and operational characteristics of the differential pressure sensor equipped with the J05D/J08E engines are identical to the conventional sensor. The differential pressure sensor detects the difference in exhaust gas pressure across the DPF.



7.3 Selective Catalytic Reduction (SCR) System (2010 Model Only)

Outline

- The SCR system is an exhaust gas cleaning system that injects an aqueous solution of urea known as "AdBlue" into the exhaust pipe just before the catalyst to create a chemical reaction with the exhaust gas. As a result, approximately 40% of the NOx contained in the exhaust gas is converted into non-hazardous nitrogen. Until now, the SCR system was large, and was therefore only equipped in heavy-duty vehicles.



SCR

- The SCR is a urea selective type reduction catalyst. Urea is used to chemically decompose and convert the NOx contained in the exhaust gas into non-hazardous materials. Urea is added to the exhaust gas via injection, causing NOx decomposition. The resulting non-hazardous water (H_20) and nitrogen gas (N_2) are then discharged.

8. ENGINE ECU DIAGNOSTIC TROUBLE CODES (DTC)

8.1 DTC Table

(1) 2004, 2007 Model

DTC Code	Detection Item	DTC Description	Remarks
P0045	Variable Nozzle Turbo (VNT) Malfunction	Issued when the VNT actuator is malfunctioning.	
P0087	Rail Pressure Control Abnormality (Continuously Below the Standard Value)	Issued when actual rail pressure in relation to the command rail pressure is continuously low. Check the fuel filter for clogging, the supply of fuel to the pump, as well as for any foreign matter intrusion.	
P0088	Rail High-Pressure Control Abnormality (Pressure is Continuously Above the Standard Value or Pressure Momentarily Becomes Abnormally High)	Issued when rail fuel pressure is abnormally high, or when actual rail pressure in relation to the command rail pressure is continuously high. Possible causes include faulty contacts in the rail pressure sensor line, noise, lack of injection, and/or a supply pump malfunction.	
P0102	Mass Air Flow (MAF) Meter Malfunction (Lo)	Issued when the MAF meter is malfunctioning. Possible causes include a sensor malfunction, or an open/short circuit to ground in the wiring harness.	
P0103	MAF Meter Malfunction (Hi)	Issued when the MAF meter is malfunctioning. Possible causes include a sensor malfunction, and/ or a short circuit to +B in the wiring harness.	
P0108	Boost Pressure Abnormality	Issued when boost pressure cannot be correctly detected. Possible causes include a sensor malfunction and/or a short circuit in the wiring harness.	
P0112	Intake Air Temperature Sensor Malfunction (Lo)	Issued when temperature cannot be correctly detected. Possible causes include a sensor malfunction, and/or a short circuit to ground in the wiring harness.	
P0113	Intake Air Temperature Sensor Malfunction (Hi)	Issued when temperature cannot be correctly detected. Possible causes include a sensor malfunction, or an open/short circuit to +B in the wiring harness.	
P0117	Coolant Temperature Sensor Malfunction (Lo)	Issued when temperature cannot be correctly detected. Possible causes include a sensor malfunction and/or a short circuit to ground in the wiring harness.	

DTC Code	Detection Item	DTC Description	Remarks
P0118	Coolant Temperature Sensor Malfunction (Hi)	Issued when temperature cannot be correctly detected. Possible causes include a sensor malfunction, or an open/short circuit to +B in the wiring harness.	
P0122	Electronic Control Throttle Position Sensor Malfunction (Lo)	Issued when the signal from the electronic control throttle position sensor cannot be correctly detected. Possible causes include an open circuit within the sensor or wiring harness, and/or a ground short.	
P0123	Electronic Control Throttle Malfunction (Hi)	Issued when the signal from the electronic control throttle position sensor cannot be correctly detected. Possible causes include a malfunction within the sensor and/or a Vcc short within the wiring harness.	
P0182	Fuel Temperature Sensor Malfunction (Lo)	Issued when temperature cannot be correctly detected. Possible causes include a sensor malfunction, and/or a short circuit to ground in the wiring harness.	
P0183	Fuel Temperature Sensor Malfunction (Hi)	Issued when temperature cannot be correctly detected. Possible causes include a sensor malfunction, or an open/short circuit to +B in the wiring harness.	
P0191	Rail Pressure Sensor Malfunction (Abnormal Sensor Characteristics)	Issued when rail pressure cannot be correctly detected. Possibility of a sensor malfunction.	
P0192	Rail Pressure Sensor Malfunction (Lo)	Issued when rail pressure cannot be correctly detected. Possible causes include a sensor malfunction and/or a short circuit to ground in the wiring harness.	
P0193	Rail Pressure Sensor Malfunction (Hi)	Issued when rail pressure cannot be correctly detected. Possible causes include a sensor malfunction, or an open/short circuit to +B in the wiring harness.	
P0200	Faulty Engine ECU Charge Circuit (Hi)	Issued when the injector activation voltage is too high. Replace the ECU.	
P0201	Injector 1 Open Circuit	Possible causes include an injector 1 malfunction and/or an open circuit in the wiring harness.	
P0202	Injector 2 Open Circuit	Possible causes include an injector 2 malfunction and/or an open circuit in the wiring harness.	
P0203	Injector 3 Open Circuit	Possible causes include an injector 3 malfunction and/or an open circuit in the wiring harness.	
P0204	Injector 4 Open Circuit	Possible causes include an injector 4 malfunction and/or an open circuit in the wiring harness.	

DTC Code	Detection Item	DTC Description	Remarks
P0205	Injector 5 Open Circuit	Possible causes include an injector 5 malfunction and/or an open circuit in the wiring harness.	
P0206	Injector 6 Open Circuit	Possible causes include an injector 6 malfunction and/or an open circuit in the wiring harness.	
P0217	Overheat	Issued when an over temperature condition is detected. Check the cooling system.	
P0219	Engine Overrun	Issued when the engine speed exceeds the rated value.	
P0234	Turbo Overboost	Issued when the boost pressure is higher than the specified value.	
P0237	Manifold Absolute Pressure (MAP) Sensor Malfunction (Lo)	Issued when the intake air pressure cannot be correctly detected. Possible causes include a sensor malfunction, or an open/short circuit in the wiring harness.	
P0263	Cylinder Comparative Correction Error #1 (Cylinder Injection Quantity, Rotational Fluctuation)	Issued when the rotational fluctuation in cylinder 1 is larger than the other cylinders. There is a possibility that the flow damper is operating.	
P0266	Cylinder Comparative Correction Error #2 (Cylinder Injection Quantity, Rotational Fluctuation)	Issued when the rotational fluctuation in cylinder 2 is larger than the other cylinders. There is a possibility that the flow damper is operating.	
P0269	Cylinder Comparative Correction Error #3 (Cylinder Injection Quantity, Rotational Fluctuation)	Issued when the rotational fluctuation in cylinder 3 is larger than the other cylinders. There is a possibility that the flow damper is operating.	
P0272	Cylinder Comparative Correction Error #4 (Cylinder Injection Quantity, Rotational Fluctuation)	Issued when the rotation fluctuation in cylinder 4 is larger than the other cylinders. There is a possibility that the flow damper is operating.	
P0275	Cylinder Comparative Correction Error #5 (Cylinder Injection Quantity, Rotational Fluctuation)	Issued when the rotational fluctuation in cylinder 5 is larger than the other cylinders. There is a possibility that the flow damper is operating.	
P0278	Cylinder Comparative Correction Error #6 (Cylinder Injection Quantity, Rotational Fluctuation)	Issued when the rotational fluctuation in cylinder 6 is larger than the other cylinders. There is a possibility that the flow damper is operating.	
P0335	Crankshaft Position Sensor and Camshaft Position Sensor Malfunction	Issued when the pulse from the crankshaft position sensor cannot be detected. Possible causes include sensor and/or harness malfunctions.	

DTC Code	Detection Item	DTC Description	Remarks
P0336	Crankshaft Position Sensor Pulse Number Abnormality	Possible causes include the use of an incorrect pulsar, and/or an abnormality in the wiring harness (intermittent open circuits, etc.)	
P0340	Camshaft Position Sensor Malfunction	Issued when the pulse from the engine speed sensor cannot be detected. Possible causes include sensor and/or harness malfunctions.	
P0341	Camshaft Position Sensor Pulse Number Abnormality	Possible causes include the use of an incorrect pulsar, and/or an abnormality in the wiring harness (open circuit, modifications, etc.)	
P0400	Excessive Exhaust Gas Recirculation (EGR) Rate	Issued when the EGR rate is excessive in relation to the intake quantity. Possible causes include a malfunction in the MAF meter, EGR valve, EGR actuation ECU, and/or an open or short circuit in the wiring harness.	
P0400	Insufficient EGR Rate	Issued when the EGR rate is insufficient in relation to the intake quantity. Possible causes include a malfunction in the MAF meter, EGR valve, EGR actuation ECU, and/or an open or short circuit in the wiring harness.	
P0500	Vehicle Speed Sensor Malfunction (Lo)	Issued when the pulse from the vehicle speed sensor cannot be detected. Possible causes include sensor and/or harness malfunctions.	
P0501	Vehicle Speed Sensor Malfunction (Hi)	Issued when the pulse from the vehicle speed sensor cannot be detected. Possible causes include sensor and/or harness malfunctions.	
P0504	Brake Switch Malfunction	Issued when the brake switch cannot be correctly detected. Monitor brake switch status, and verify ON/OFF judgments.	
P0510	Idle Switch (Stuck ON)	Issued when the idle switch is malfunctioning. Monitor switch status and check the ON/OFF judgment.	
P0524	Engine Oil Pressure Abnormality	Issued when engine oil pressure is too low.	
P0540	Preheat Device Malfunction (Ground Short, +B Short, Open)	Issued when the intake heater relay is malfunctioning. Possible causes include relay and/ or wiring harness malfunctions.	
P0545	Exhaust Gas Temperature Sensor 1 Malfunction (Lo)	Issued when temperature cannot be correctly detected. Possible causes include a sensor malfunction and/or a short circuit to ground in the wiring harness.	Vehicles with DPF Installed

DTC Code	Detection Item	DTC Description	Remarks
P0546	Exhaust Gas Temperature Sensor 1 Malfunction (Hi)	Issued when temperature cannot be correctly detected. Possible causes include a sensor malfunction, or an open/short circuit to +B in the wiring harness.	Vehicles with DPF Installed
P0605	Flash ROM Malfunction	Issued when there is a malfunction internal to the engine ECU. Replace the engine ECU.	
P0606	Engine ECU Malfunction (Detected in the Hardware)	Issued when there is a malfunction internal to the engine ECU. Replace the engine ECU.	
P0607	Engine ECU Monitor IC Abnormality	Issued when there is a malfunction internal to the engine ECU. Replace the engine ECU.	
P0611	Faulty Engine ECU Charge Circuit (Lo)	Issued when injector activation voltage is too low. Replace the engine ECU.	
P0617	Starter Switch Malfunction	Issued when there is a short in the starter switch circuit. Monitor switch status and check the ON/OFF judgment.	
P0628	Suction Control Valve (SCV) GND Short	Possible causes include an open circuit in the wiring harness connecting the engine ECU and SCV, or a ground short.	
P0629	SCV +B Short	Possible causes include a +B short in the wiring harness connecting the engine ECU and SCV.	
P0686	Main Relay Malfunction	Issued when the main relay cannot be turned OFF. Check the relay.	
P0704	Clutch Switch Malfunction	Issued when the clutch switch cannot be correctly detected. Monitor switch status and check the ON/ OFF judgment.	
P0850	Neutral Switch Malfunction	Issued when the neutral switch cannot be correctly detected. Monitor switch status and check the ON/ OFF judgment.	
P1133	Vehicle-External Accelerator Position Sensor Malfunction (Hi)	Issued when the vehicle-external accelerator position sensor cannot be correctly detected. Check the sensor voltage. Possible short circuit to +B.	
P1143	Idle Volume (Hi)	Issued when the idle volume cannot be correctly detected. Check the sensor voltage. Possible short circuit to +B.	
P1211	Injector Common 1 GND Short	Possible short circuit to ground. Check the injector and wiring.	
P1212	Injector Common 1 +B Short	Possible open or short circuit to +B. Check the injector and wiring.	
P1212	Injector Common 1 Open	Possible open or short circuit to +B. Check the injector and wiring.	

DTC Code	Detection Item	DTC Description	Remarks
P1214	Injector Common 2 GND Short	Possible short circuit to ground. Check the injector and wiring.	
P1215	Injector Common 2 +B Short	Possible open or short circuit to +B. Check the injector and wiring.	
P1215	Injector Common 2 Open	Possible open or short circuit to +B. Check the injector and wiring.	
P1426	Differential Pressure Sensor Malfunction (Abnormal Sensor Characteristics)	Issued when the differential pressure sensor cannot be correctly detected. Possible causes include clogging in the pressure piping, leaks, a sensor malfunction, a wiring harness open/short circuit, and/or poor terminal contact in the connector.	Vehicles with DPF Installed
P1427	Differential Pressure Sensor Malfunction (Lo)	Issued when exhaust pressure cannot be correctly detected. Possible causes include a sensor malfunction, or an open/short circuit to ground in the wiring harness.	Vehicles with DPF Installed
P1428	Differential Pressure Sensor Malfunction (Hi)	Issued when exhaust pressure cannot be correctly detected. Possible causes include a sensor malfunction and/or a short circuit to +B in the wiring harness.	Vehicles with DPF Installed
P1458	EGR Actuator Malfunction 1	Issued when the EGR controller is malfunctioning.	
P1459	EGR Actuator Malfunction 2	Issued when the EGR controller is malfunctioning.	
P1530	Engine Stop Switch Closing Malfunction	Issued when the engine stop switch is malfunctioning or there is short circuit in the wiring. Monitor switch status and check the ON/OFF judgment.	
P1601	QR Code Malfunction (Unreadable)	Issued when there is an error in the QR code. Check the QR code.	
P1601	QR Code Malfunction (EEPROM Error)	Issued when there is an error in the QR code. Check the QR code.	
P1601	QR Code Malfunction (Out of Range)	Issued when there is an error in the QR code. Check the QR code.	
P1681	Exhaust Brake Solenoid Valve Malfunction (Open, Ground Short)	Issued when the exhaust brake solenoid valve is malfunctioning. Possible causes include a solenoid valve malfunction, and/or an open/short circuit to ground in the wiring harness.	Vehicles with DPF Installed
P1682	Exhaust Brake Solenoid Valve Malfunction (+B Short)	Issued when the exhaust brake solenoid valve is malfunctioning. Possible causes include a solenoid valve malfunction and/or a short to +B in the wiring harness.	Vehicles with DPF Installed
P2002	Diesel Particulate Filter (DPF) System Malfunction	Issued when the DPF system is malfunctioning. Possible causes include melt down and clogging. Perform the DPF system check.	Vehicles with DPF Installed

DTC Code	Detection Item	DTC Description	Remarks
P2032	Exhaust Gas Temperature Sensor 2 Malfunction (Lo)	Issued when temperature cannot be correctly detected. Possible causes include a sensor malfunction and/or a short circuit to ground in the wiring harness.	Vehicles with DPF Installed
P2033	Exhaust Gas Temperature Sensor 2 Malfunction (Hi)	Issued when temperature cannot be correctly detected. Possible causes include a sensor malfunction, or an open/short circuit to +B in the wiring harness.	Vehicles with DPF Installed
P2080	Exhaust Gas Temperature Sensor 1 Malfunction (Abnormal Sensor Characteristics)	Issued when the temperature from exhaust gas temperature sensor 1 cannot be correctly detected. Possible causes include a sensor malfunction, short/open circuit in the wiring harness and/or a faulty connector. DPF inlet temperature and coolant temperature sensor abnormalities may also cause this code to be issued. Check both of these items.	Vehicles with DPF Installed
P2084	Exhaust Gas Temperature Sensor 2 Malfunction (Abnormal Sensor Characteristics)	Issued when the temperature from exhaust gas temperature sensor 2 cannot be correctly detected. Possible causes include a sensor malfunction, short/open circuit in the wiring harness and/or a faulty connector. DPF inlet temperature and coolant temperature sensor abnormalities may also cause this code to be issued. Check both of these items.	Vehicles with DPF Installed
P2100	Electronic Control Throttle Ground Short (*Diagnosis Cannot be Performed on the Circuit)	A possible ground short in the wiring harness connecting the engine ECU and electronic control throttle.	
P2101	Electronic Control Throttle Seizure	Issued when seizure in the electronic control throttle is detected.	
P2103	Electronic Control Throttle Open Circuit	Possible causes include an open circuit in the wiring between the engine ECU and SCV, a ground short, and/or a malfunction in the electronic control throttle driver.	
P2120	Accelerator Position Sensor 1 and 2 Malfunction	Issued when both accelerator position sensors 1 and 2 are malfunctioning. Possible causes include sensor and/or harness malfunctions.	
P2122	Accelerator Position Sensor 1 Malfunction (Lo)	Issued when accelerator position sensor 1 cannot be correctly detected. Check the sensor voltage.	
P2123	Accelerator Position Sensor 1 Malfunction (Hi)	Issued when accelerator position sensor 1 cannot be correctly detected. Check the sensor voltage. Possible short circuit to +B.	
P2127	Accelerator Position Sensor 2 Malfunction (Lo)	Issued when accelerator position sensor 2 cannot be correctly detected. Check the sensor voltage.	

DTC Code	Detection Item	DTC Description	Remarks
P2128	Accelerator Position Sensor 2 Malfunction (Hi)	Issued when accelerator position sensor 2 cannot be correctly detected. Check the sensor voltage. Possible short circuit to +B.	
P2228	Atmospheric Pressure Sensor Malfunction (Lo)	Issued when the atmospheric pressure sensor (built into the engine ECU) is malfunctioning. If the malfunction occurs frequently, it is necessary to repair or replace the engine ECU.	
P2229	Atmospheric Pressure Sensor Malfunction (Hi)	Issued when the atmospheric pressure sensor (built into the engine ECU) is malfunctioning. If the malfunction occurs frequently, it is necessary to repair or replace the engine ECU.	
P2635	SCV Seizure	Possible causes include an open circuit in the wiring between the engine ECU and SCV, and/or an SCV internal malfunction (seizure.)	
P2635	Pump Replacement	Possible causes include an open circuit in the wiring between the engine ECU and SCV, and/or an SCV internal malfunction (seizure.)	
U0073	CAN 1 Abnormality (Engine)	Issued when there is a communication malfunction with the VNT.	
U0101	Communication Disruption (Automatic Transmission)	Issued when communication with the transmission ECU is lost.	
U0101	Communication Disruption (Transmission)	Issued when communication with the transmission ECU is lost	
U0104	Communication Disruption (Cruise)	Issued when communication with the cruise ECU is lost.	
U0121	Communication Disruption (ABS)	Issued when communication with the ABS ECU is lost.	
U0132	Communication Disruption (Air Suspension)	Issued when communication with the air suspension ECU is lost.	
U0155	Communication Disruption (Meter)	Issued when communication with the meter ECU is lost.	
U1001	CAN 2 Abnormality (Vehicle)	Issued when there is a communication malfunction with other computers equipped in the vehicle.	
U1122	Communication Disruption (EGR)	Detected when there is a communication abnormality with the EGR actuation ECU.	
U1123	Communication Disruption (VNT)	Possible causes include a malfunction in the VNT control unit, or a short/open circuit in the communication line between the control unit and engine ECU.	

(2) 2010 Model

DTC Code	Detection Item	Remarks
P0016	Crank/Cam Signal Synchronization Error	
P0045	DIAG Information 1 from Variable Nozzle Turbo (VNT) Controller	
	DIAG Information 2 from VNT Controller	
P007B	Intercooler Temperature Sensor Performance Invalid (Cranking)	
	Intercooler Temperature Sensor Performance Invalid Low (Driving)	
	Intercooler Temperature Sensor Performance Invalid High (Driving)	
P007C	Intercooler Temperature Sensor Signal Too Low	
P007D	Intercooler Temperature Sensor Signal Too High	
P0087	Rail Pressure Falls Below the Control Limit of the Target Pressure	
P0088	Rail Pressure Exceeds Upper Limit	
	Rail Pressure Exceeds High Upper Limit	
	Rail Pressure Exceeds the Control Limit of the Target Pressure	
P0096	Intake Air Temperature Sensor Performance Invalid (Cranking)	
	Intake Air Temperature Sensor Performance Invalid Low (Driving)	
	Intake Manifold Temperature Sensor Performance Invalid High (Driving)	
P0097	Intake Air Temperature Sensor Signal Too Low	
P0098	Intake Air Temperature Sensor Signal Too High	
P00AF	DIAG Information 1 (Controller) From VNT Controller	
	DIAG Information 2 (Controller) From VNT Controller	
P0101	Mass Air Flow (MAF) Meter Performance Invalid	
P0104	MAF Meter Signal Frequency Too Low	
	MAF Meter Signal Frequency Too High	
P0106	Manifold Absolute Pressure (MAP) Sensor Performance Invalid	
P0108	MAP Sensor Signal Too High	
P0112	Intake Air Temperature Sensor Signal Too Low	
P0113	Intake Air Temperature Sensor Signal Too High	

DTC Code	Detection Item	Remarks
P0116	Coolant Temperature Sensor Performance Invalid 1	
	Coolant Temperature Sensor Performance Invalid 2	
P0117	Coolant Temperature Sensor Signal Too Low	
P0118	Coolant Temperature Sensor Signal Too High	
P011C	Intake Air Temperature Sensor Performance Invalid	
P0122	Intake Throttle Position Sensor 1 Signal Too Low	
P0123	Intake Throttle Position Sensor 1 Signal Too High	
P0128	Thermostat Failure	
P0182	Fuel Temperature (Pump) Sensor Signal Too Low	
P0183	Fuel Temperature (Pump) Sensor Signal Too High	
P0192	Rail Pressure Sensor Signal Too Low	
P0193	Rail Pressure Sensor Signal Too High	
P0200	Capacitor Charge-up Circuit Malfunction (Excessive Charge)	
P0201	TWV1 Output Open Load, Injector Coil Open	
P0202	TWV3 Output Open Load, Injector Coil Open	
P0203	TWV5 Output Open Load, Injector Coil Open	
P0204	TWV2 Output Open Load, Injector Coil Open	
P0205	TWV6 Output Open Load, Injector Coil Open	
P0206	TWV4 Output Open Load, Injector Coil Open	
P0217	Coolant Temperature Exceeds Upper Limit	
P0219	Engine Overrun	
P0222	Intake Throttle Position Sensor 2 Signal Too Low	
P0223	Intake Throttle Position Sensor 2 Signal Too High	
P0234	Turbo Control System (Positive Deviation)	
	MAP Sensor Exceeds Upper Limit	
P0237	MAP Sensor Signal Too Low	
P0263	Flow Damper #1 Activated	
	Cylinder 1 Fuel System Failure	
P0266	Flow Damper #3 Activated	
	Cylinder 3 Fuel System Failure	
P0269	Flow Damper #5 Activated	
	Cylinder 5 Fuel System Failure	
P0272	Flow Damper #2 Activated	
	Cylinder 2 Fuel System Failure	

DTC Code	Detection Item	Remarks
P0275	Flow Damper #6 Activated	
	Cylinder 6 Fuel System Failure	
P0278	Flow Damper #4 Activated	
	Cylinder 4 Fuel System Failure	
P0299	Turbo Control System (Negative Deviation)	
P0300	Engine Speed Error	
P0301	#1 Misfire	
P0302	#3 Misfire	
P0303	#5 Misfire	
P0304	#2 Misfire	
P0305	#6 Misfire	
P0306	#4 Misfire	
P0335	Crankshaft Position Sensor No Pulse	
	Crankshaft Position Sensor Signal Invalid	
P0336	Crankshaft Position Sensor Signal Invalid	
P0340	Camshaft Position Sensor No Pulse	
P0341	Camshaft Position Sensor Signal Invalid	
P0381	SOUT4 (Glow Lamp) Output Short to GND	
	SOUT4 (Glow Lamp) Output Open Load/Short to Battery	
P0401	EGR Insufficient Flow (EGR Negative Deviation)	
P0402	EGR Excessive Flow (EGR Positive Deviation)	
	EGR Feedback Failure	
P041B	EGR Cooler Outlet Temp 2 Performance Invalid (Cranking)	
	EGR Cooler Outlet Temp 2 Performance Invalid (Driving)	
P041C	EGR Cooler Outlet Temp 2 Too Low	
P041D	EGR Cooler Outlet Temp 2 Too High	
P0420	Oxidation Catalyst Deterioration	
P0500	Vehicle Speed Sensor Input Open/Short	
P0501	Vehicle Speed Sensor Frequency Too High	
P0504	Brake Switch Stuck Open	
P0519	Idle Speed Control Error	
P0524	Engine Oil Pressure Too Low	
P0562	Vehicle System Voltage Too Low	
P0563	Vehicle System Voltage Too High	
P05F1	Closed Breather Failure	

DTC Code	Detection Item	Remarks
P0605	Check Sum Error - Flash Area	
P0606	CPU Fault; -Main CPU Fault	
P0607	CPU Fault; -Watchdog IC Fault	
P0610	Vehicle ECU Response Failure	
	EOLP Data Error	
	EOLP Data is Not Written	
P0611	Capacitor Charge-up Circuit Malfunction (Insufficient Charge)	
P0617	Starter Switch Short to Battery	
P0628	SCV (+) Output Open Load/Short to GND; SCV (-) Output Open Load/Short to GND; SCV Coil Open; SCV Coil Short	
P0629	SCV (+) Output Short to BATT; SCV (-) Output Short to BATT	
P0642	Battery 5 V Reference 1 Circuit Low	
P0643	Battery 5 V Reference 1 Circuit High	
P064C	Glow Control Unit Malfunction	
P0652	Battery 5 V Reference 2 Circuit Low	
P0653	Battery 5 V Reference 2 Circuit High	
P0671	Glow Plug 1 Open/Short Failure	
P0672	Glow Plug 2 Open/Short Failure	
P0675	Glow Plug 3 Open/Short Failure	
P0676	Glow Plug 4 Open/Short Failure	
P0683	Glow Control Unit Communication Error	
P0686	Main Relay Diagnostics; Main Relay Stuck Closed	
P06D3	MAF Sensor Power Supply Failure, Short to GND	
P06D4	MAF Sensor Power Supply Failure, Short to Battery	
P0704	Clutch Switch Circuit Malfunction (Manual Transmission Only)	
P073D	Transmission Malfunction (AT or AMT Transmission Only)	
P081A	Starter Block Relay Output Short to GND	
P081B	Starter Block Relay Output Open/Short to Battery	
P0850	Neutral Switch Circuit Malfunction (Manual Transmission Only)	
P1133	ASC (PTO) Accelerator Pedal Sensor Signal Too High	
P1197	Rail Pressure Sub Sensor Signal Too Low	
P1198	Rail Pressure Sub Sensor Signal Too High	

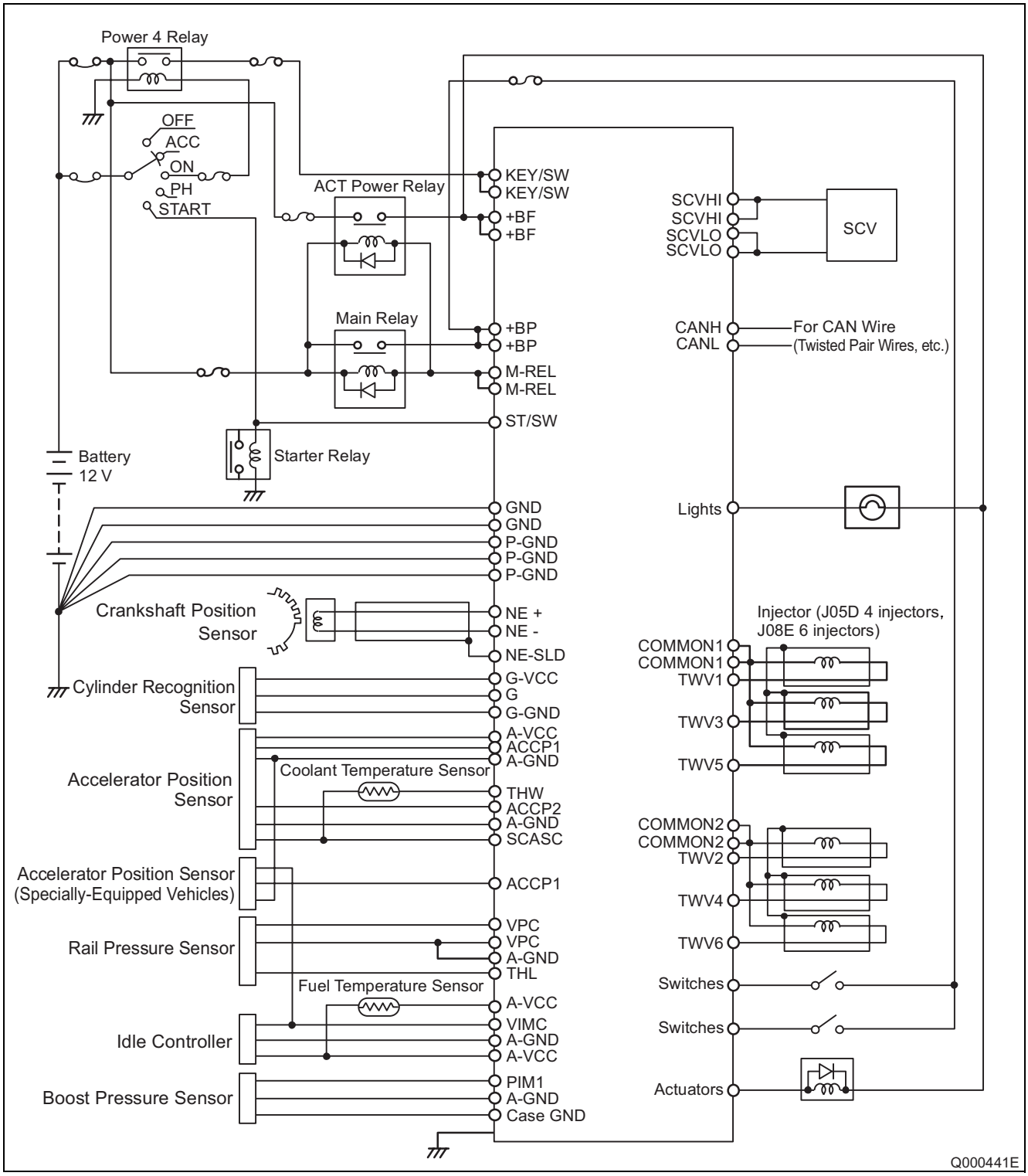
DTC Code	Detection Item	Remarks
P119F	Rail Pressure Sensor Signal Rationality Check	
P1211	COM1 Output Short to GND; TWV1, 3, or 5 Output Short to GND	
P1212	COM1 Output Short to Battery; TWV1, 3, or 5 Output Short to Battery	
	COM1 Output Open Load; TWV1, 3 and 5 Open Load	
P1214	COM2 Output Short to GND; TWV2, 4, or 6 Output Short to GND	
P1215	COM2 Output Short to Battery; TWV2, 4, or 6 Output Short to Battery	
	COM1 Output Open Load; TWV2, 4 and 6 Open Load	
P141F	Thermal Regenerator (BCU) Failure 1	
	Thermal Regenerator (BCU) Failure 2	
	Thermal Regenerator (BCU) Failure 3	
	Thermal Regenerator (BCU) Failure 4	
P1426	Exhaust Gas Pressure Sensor 1; Signal Performance Invalid 1	
P1427	Exhaust Gas Pressure Sensor 1; Signal Too Low	
P1428	Exhaust Gas Pressure Sensor 1; Signal Too High	
P1458	DIAG Information 1 from EGR Controller	
P1459	DIAG Information 2 from EGR Controller	
P1515	Inter Cooler Efficiency Low	
P1530	Engine Stop Switch Stuck Closed	
P1601	QR Data is Not Written	
	QR Data Error	
	QR Definition Error (Definition Concerning QR Correction is Incorrect)	
P1676	MEIIR Switch Open Load/Short to GND	
P1681	OUTE7 Output Open Short to GND	
P1682	OUTE7 Output Open/Short to Battery	
P200C	Diesel Particulate Filter (DPF) Meltdown 1	
P203F	Urea Level Low 1	
	Urea Level Low 2	

DTC Code	Detection Item	Remarks
P204F	Dosing System Failure 1	
	Dosing System Failure 2	
	Dosing System Failure 3	
	Dosing System Failure 4	
	Dosing System Failure 5	
	Dosing System Failure 6	
	Dosing System Failure 7	
	Dosing System Failure 8	
	Urea Dosing System Malfunction	
	Dosing System Failure 9	
	Dosing System Failure 10	
	Dosing System Failure 11	
	Dosing System Failure 12	
P207F	Urea Solution Deterioration 2	
P20EE	Urea Selective Catalytic Reduction (SCR) Catalyst Deterioration	
P2100	Diesel Throttle Control DC Motor Output 1 Open Load; Output 2 Open Load; Motor Open Load	
P2101	Diesel Throttle Open/Close Stuck	
P2103	Diesel Throttle Control DC Motor Out 1 Short to Battery/GND; Out 2 Short to Battery/GND; Motor Short	
P2120	Both Accelerator Pedal Sensor Signals Invalid	
P2122	Accelerator Pedal Sensor No.1 Signal Too Low	
P2123	Accelerator Pedal Sensor No.1 Signal Too High	
P2127	Accelerator Pedal Sensor No.2 Signal Too Low	
P2128	Accelerator Pedal Sensor No.2 Signal Too High	
P2135	Intake Throttle Position Sensor Performance	
P2138	Accelerator Pedal Sensor Performance Invalid	
P2214	NOx Sensor (SCR Catalyst Downstream) Performance Failure	
P2227	Barometric Pressure Sensor Invalid	
P2228	Atmospheric Pressure Sensor Signal Too Low	
P2229	Atmospheric Pressure Sensor Signal Too High	
P2269	Water in Fuel	
P226C	VNT Response Failure	
P240F	EGR Slow Response	

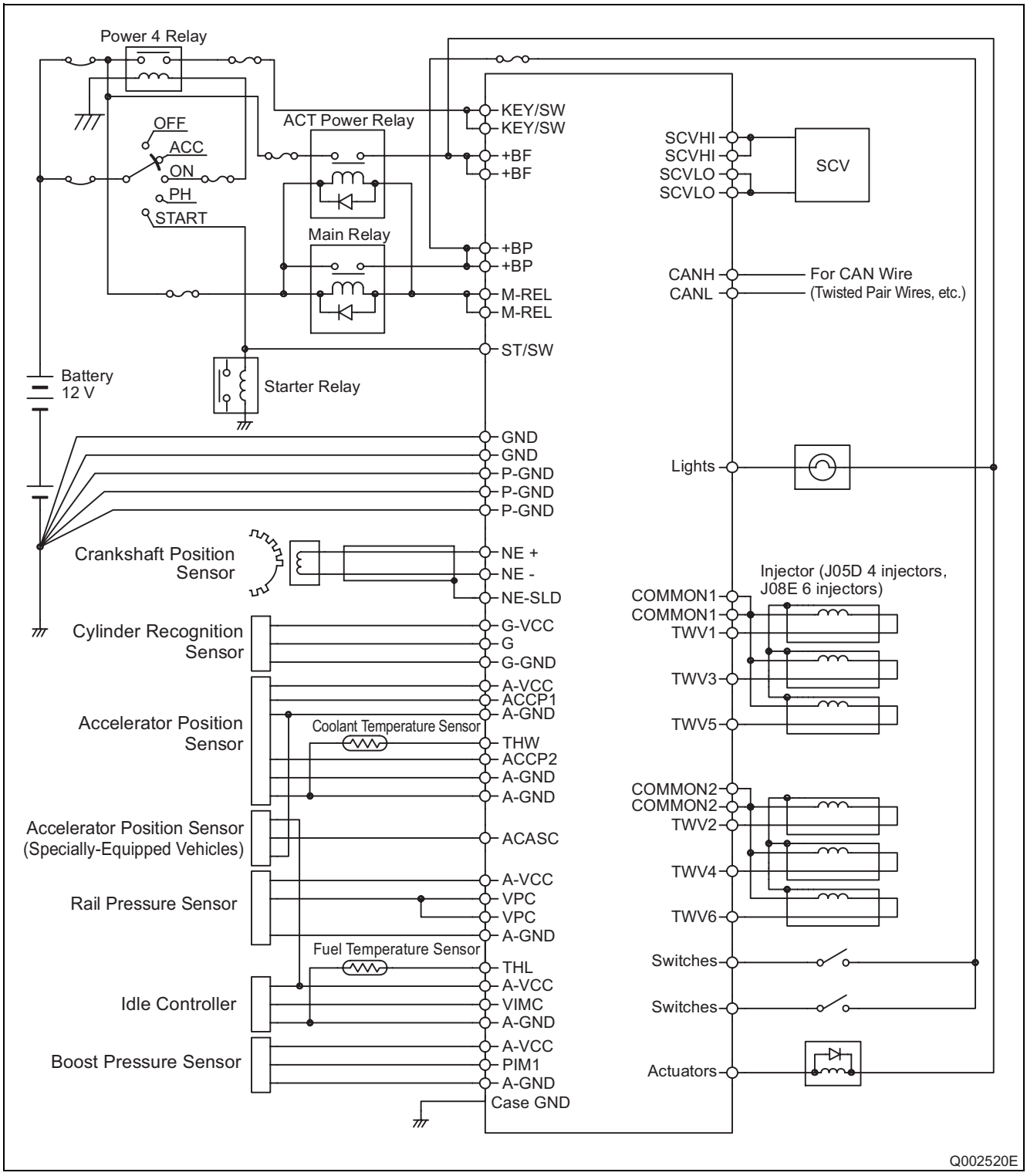
DTC Code	Detection Item	Remarks
P242B	Exhaust Gas Catalyst Temperature 0 Sensor Performance Malfunction (Cranking)	
	Exhaust Gas Catalyst Temperature 0 Sensor Performance Malfunction (Driving)	
P242C	Exhaust Gas Temperature Sensor 2; Signal Too Low	
P242D	Exhaust Gas Temperature Sensor 2; Signal Too High	
P244A	DPF Filtering Performance	
P244B	DPF Choked 2	
	DPF Regeneration Incomplete	
P2457	EGR Cooler Efficiency Low	
P2459	DPF Regeneration Frequency	
P2463	DPF Choked 1	
P246F	Exhaust Gas Catalyst Temperature 2 Sensor: Performance Malfunction (Cranking)	
	Exhaust Gas Catalyst Temperature 2 Sensor: Performance Malfunction (Driving)	
P2470	Exhaust Gas Catalyst Temperature 0 Sensor: Signal Too Low	
P2471	Exhaust Gas Catalyst Temperature 0 Sensor: Signal Too High	
P2635	Supply Pump Exchange	
U0073	CAN2 Node Error	
U010E	CAN Bus-Line Open From DCU	
U029D	CAN Bus-Line Open From After Treatment 1 Inlet NOx Sensor	
U029E	CAN Bus-Line Open From After Treatment 1 Outlet NOx Sensor	
U1001	CAN1 Node Error	
U110A	CAN Bus-Line Open From Vehicle	
	CAN Bus-Line Open TSC1 From Vehicle	
	CAN Bus-Line Open EEC2 From Vehicle	
U111E	CAN Bus-Line Open From BCU	
U1122	CAN Bus-Line Open From EGR	
U1123	CAN Bus-Line Open From VNT	

9. ATTACHED MATERIALS

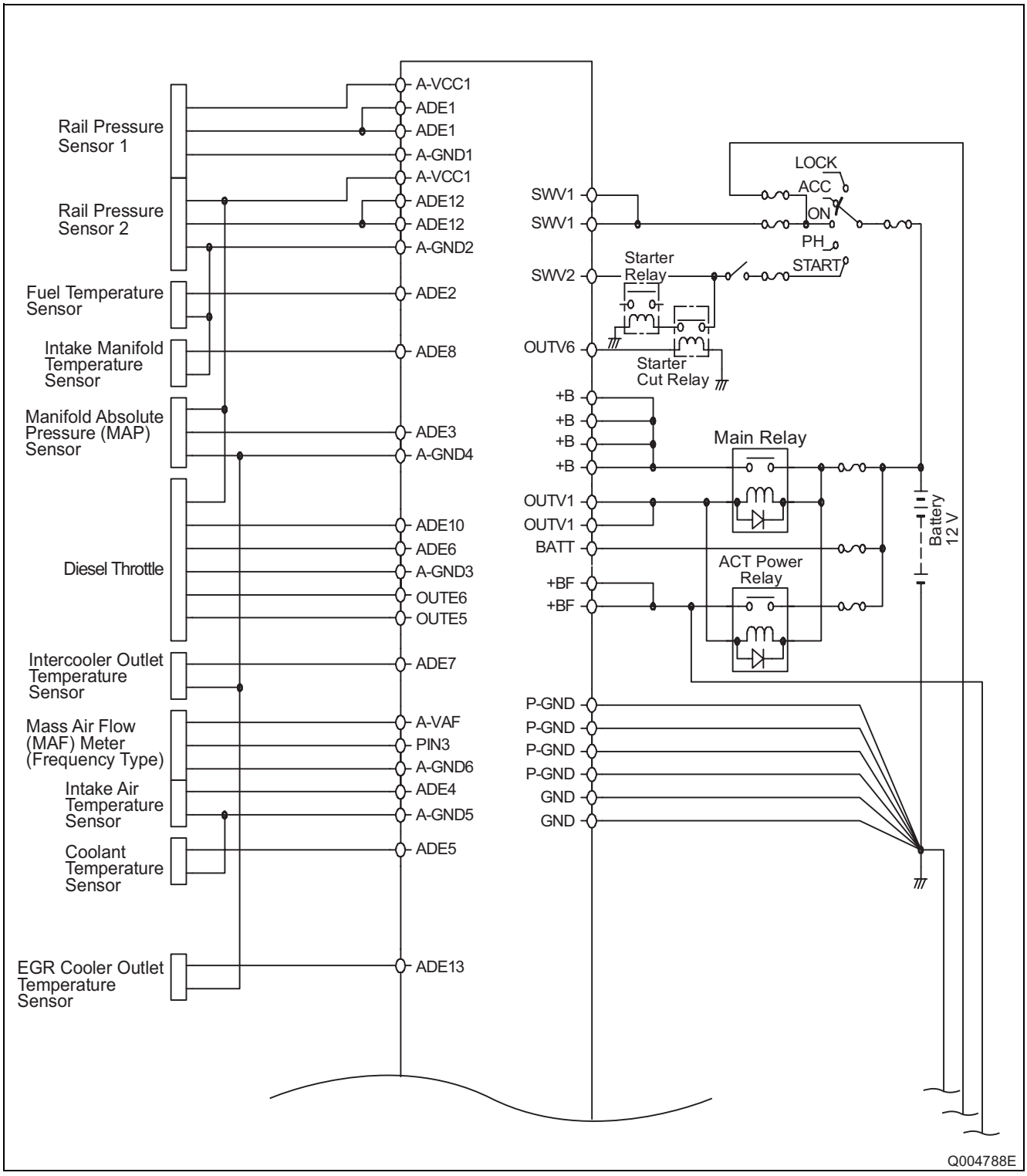
9.1 Engine ECU External Wiring Diagrams



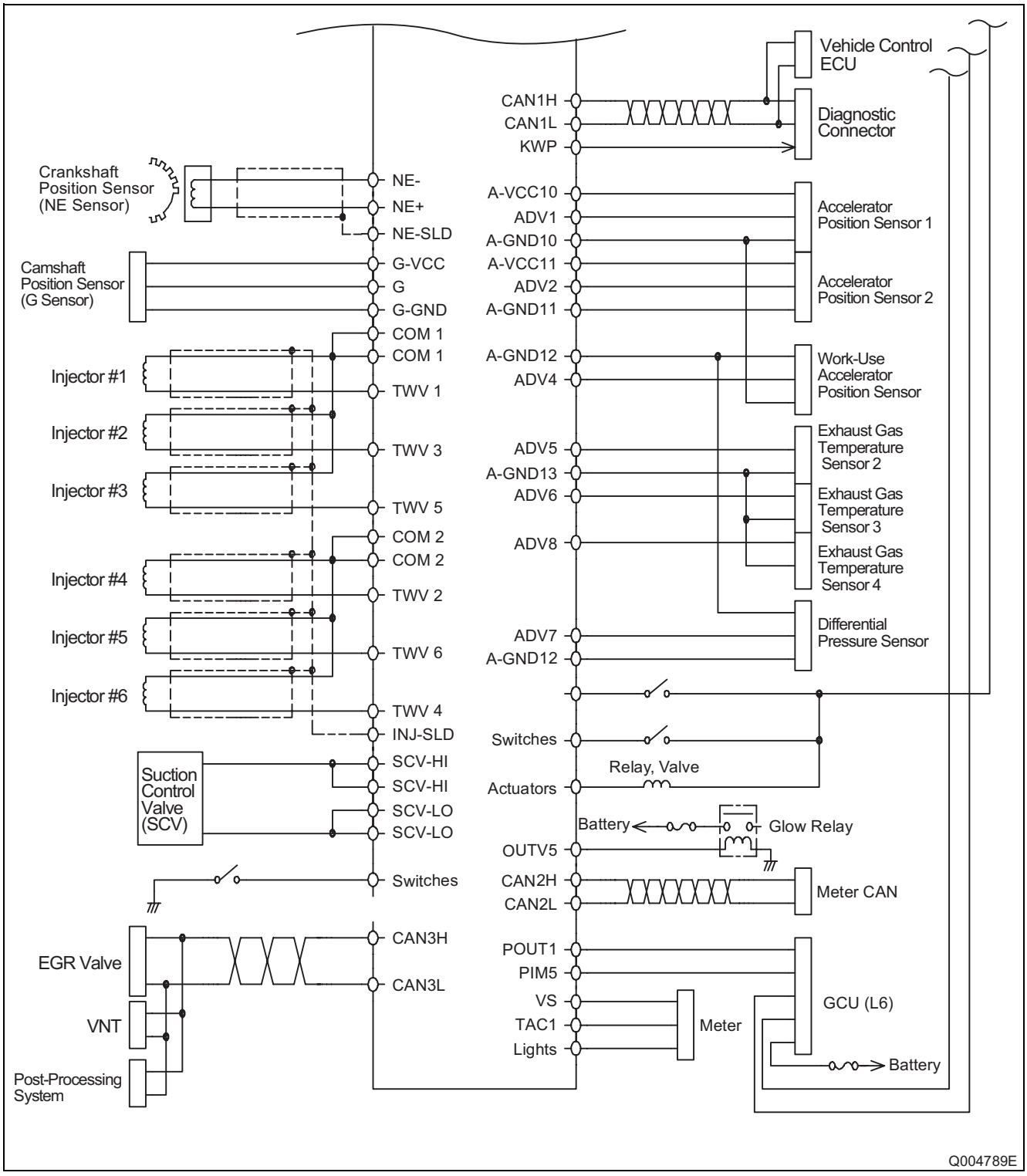
2004 Model



2007 Model



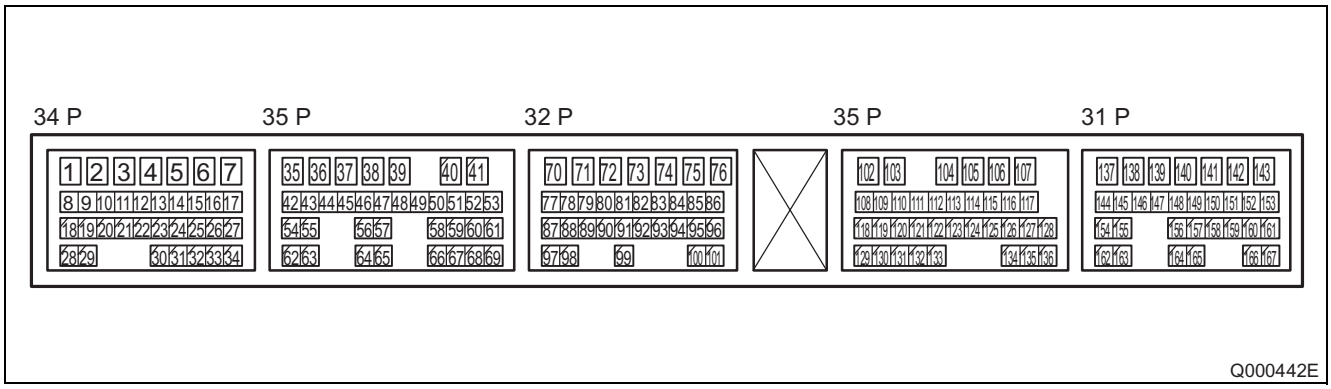
2010 Model (1)



2010 Model (2)

9.2 Connector Terminal Layout

(1) 2004, 2007 model



Connector terminal layout

No.	Code	Terminal Description	Remarks
1	(GND)	Engine ECU ground (spare)	
2	(GND)	Engine ECU ground (spare)	
3	IN3	-	
4	IN3-	-	
5	+B	Power	
6	+B	Power	
7	+B	Power	
8	TAC1	-	
9	TAC2	Tachometer signal (SINK)	
10	POUT1	Rotary solenoid actuation signal	2007 model only
11	POUT2	-	
12	POUT3	-	
13	POUT4	-	
14	PIN1	-	
15	PIN2	-	
16	-	-	
17	(BATT)	–	
18	(CASE GND)	Case ground (spare)	
19	KWP2000	ISO9141-K	
20	IN1	-	
21	AD1	Accelerator position sensor 1	
22	AD2	Accelerator position sensor 2	
23	AD10	Vehicle-external accelerator position sensor	
24	AD12	Differential pressure sensor	2007 model only
25	AD19	Exhaust gas temperature sensor 1	2007 model only
26	AD20	Exhaust gas temperature sensor 2	2007 model only

No.	Code	Terminal Description	Remarks
27	VS1	Vehicle speed sensor	
28	CASE GND	Case ground	
29	IN2	-	
30	AD14	IMC volume	
31	AD15	Electronic control throttle position sensor 1	2007 model only
32	AD16	Intake air temperature sensor (built-into the MAF meter)	
33	AD17	-	
34	AD18	-	
35	+BF	+BF	
36	OUT5	Exhaust brake solenoid valve	
37	OUT6	-	
38	OUT7	-	
39	NE-SLD	Crankshaft position sensor shield ground	
40	NE+	Crankshaft position sensor +	
41	NE-	Crankshaft position sensor -	
42	OUT1	-	
43	OUT2	-	
44	OUT3	Exhaust brake light	
45	OUT4	Glow indicator light	
46	SW1	Key switch	
47	OUT8	-	
48	SW2	Starter switch	
49	SW3	Exhaust brake switch	
50	SW4	Engine stop switch	
51	SW5	-	
52	SW6	-	
53	SW7	Brake switch	
54	A-GND4	Sensor ground 4	
55	A-GND5	Sensor ground 5	
56	SW1	Key switch	
57	A-VCC4	Sensor (power supply) 4	
58	SW8	Accelerator pedal switch	
59	SW10	-	
60	SW12	Constant speed switch	
61	SW17	Stop light switch	
62	AD21	-	
63	AD22	EGR valve lift sensor 2	
64	-	-	
65	A-VCC5	Sensor (power supply) 5	

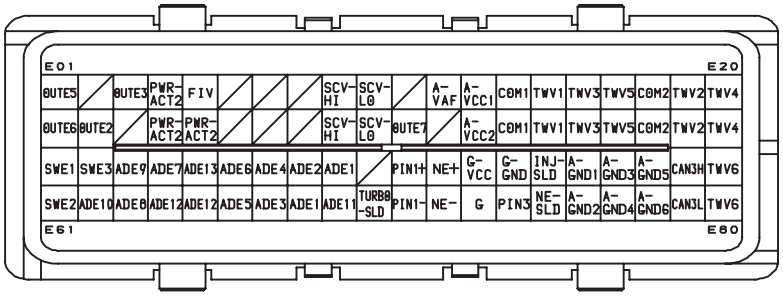
No.	Code	Terminal Description	Remarks
66	SW9	Neutral switch	
67	SW11	-	
68	SW16	Diagnosis switch	
69	SW18		
70	OUT19	Glow relay	
71	OUT20	Glow relay	
72	GND	Engine ECU ground	
73	GND	Engine ECU ground	
74	OUT17	Engine ECU main relay	
75	OUT18	Engine ECU main relay	
76	+BF	+BF	
77	SW27	Clutch switch	
78	SW19	-	
79	SW14	Cruise switch 2	
80	SW15	Stop light switch 2	
81	SW24	Idle-up switch	2007 model only
82	S-OUT1	Check engine light 1	
83	S-OUT2	-	
84	S-OUT3	DPF regeneration indicator light	2007 model only
85	S-OUT4	-	
86	-	-	
87	SW31	AT identification signal	
88	SW20	PTO 2 switch	2007 model only
89	SW21	PTO switch	
90	SW25	-	
91	SW26	Idle stop switch	2007 model only
92	SW13	Cruise switch 1	
93	SW28	Clutch stroke switch	(2003 model only)
94	SW29	Forced regeneration switch	2007 model only
95	CANH	CAN 2 high	
96	CANL	CAN 2 low	
97	SW32	Hydraulic pressure switch	
98	SW22	Warm-up switch	
99	SW23	-	
100	SW30	-	
101	CAN-SLD	CAN 2 shield ground	
102	P-GND	Power ground	
103	TWV1	Injector drive signal 1	
104	TWV3	Injector drive signal 3	

No.	Code	Terminal Description	Remarks
105	TWV5	Injector drive signal 5	J08E engine only
106	COMMON1	Injector drive power 1	
107	COMMON1	Injector drive power 1	
108	OUT9	EGR linear solenoid drive 1	
109	OUT10	EGR linear solenoid drive 2	
110	OUT11	-	
111	OUT12	-	
112	OUT13	Cruise light	
113	OUT14	Constant speed light	
114	OUT15	-	
115	OUT16	-	
116	-	-	
117	-	-	
118	A-GND6	MAF meter ground	
119	NE (MRE)	-	
120	G	Camshaft position sensor	
121	AD4	Rail pressure sensor 1	
122	AD11	MAF meter	
123	A-VCC3	Sensor (power supply) 3	
124	NE-VCC	-	
125	A-VCC2	Sensor (power supply) 2	
126	A-VCC1	Sensor (power supply) 1	
127	AD13	EGR valve lift sensor 1	
128	AD3	Boost pressure sensor	
129	(GND)	Engine ECU ground (spare)	
130	(GND)	Engine ECU ground (spare)	
131	G-GND	Camshaft position sensor ground	
132	AD5	Rail pressure sensor 2	
133	G-VCC	Camshaft position sensor VCC (5 V)	
134	A-GND1	Sensor ground 1	
135	A-GND2	Sensor ground 2	
136	A-GND3	Sensor ground 3	
137	TWV2	Injector drive signal 2	
138	TWV4	Injector drive signal 4	
139	TWV6	Injector drive signal 6	
140	P-GND	Power ground	
141	P-GND	Power ground	
142	COMMON2	Injector drive power 2	
143	COMMON2	Injector drive power 2	

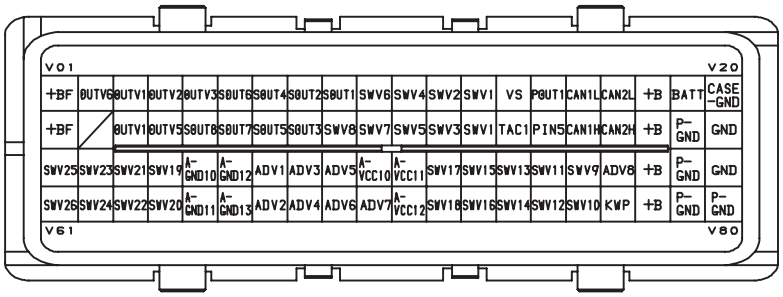
No.	Code	Terminal Description	Remarks
144	SCVLO	SCV drive signal	
145	SCVLO	SCV drive signal	
146	SCVHI	SCV power	
147	SCVHI	SCV power	
148	-	-	
149	-	-	
150	PCV2	-	
151	PCV2	-	
152	PCV1	-	
153	PCV1	-	
154	AD6	-	
155	AD7	Coolant temperature sensor	
156	-	-	
157	CAN1H	CAN 1 high	
158	CAN1L	CAN 1 low	
159	-	-	
160	-	-	
161	(CASE GND)	Case ground (spare)	
162	AD8	-	
163	AD9	Fuel temperature sensor 2	
164	-	-	
165	CAN1-SLD	-	
166	-	-	
167	(CASE GND)	Case ground (spare)	
-	PATM	Atmospheric pressure sensor (built-into the engine ECU)	

(2) 2010 model

Engine Side



Vehicle Side



Q004790E

Connector terminal layout

Service Department DENSO CORPORATION
1-1, Showa-cho, Kariya-shi, Aichi-ken, 448-8661, Japan