



DENSO

For Authorized Service Dealers Only



ISUZU N-Series 4HK1 Engine
**Common Rail System (CRS) Service
Manual**



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DENSO CORPORATION

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1. Applicable Vehicles and Parts Information

1.1 Outline

- As a result of a model change to the ISUZU 4HK1 engine beginning from May 2010, the Common Rail System (CRS) has also changed. This manual describes items specific to the parts used in the CRS for the 4HK1 engine. For CRS basics, refer to the "COMMON RAIL SYSTEM SERVICE MANUAL -OPERATION (Doc ID: 00400534EA)."

Compliance with Exhaust Gas Regulations

- The CRS for the 4HK1 engine has undergone the following improvements to comply with US10 exhaust gas regulations.

Combustion Improvements

- System pressure: Increased to 200 MPa
- Supply pump: Operating pressure of 200 MPa, uses positive pressure system
- Rail: Operating pressure of 200 MPa
- Injectors: Uses the G3 type

Improved Post-Processing

- Particulate Matter (PM) reduction: Diesel Particulate Filter (DPF)
- NOx Reduction: Urea Selective Catalytic Reduction (SCR)

1.2 Applicable Vehicle

Vehicle Manufacturer	Vehicle Name	Engine Type	Exhaust Volume	Production Start Date
ISUZU	N SERIES	4HK1	5.2 L	May 2010

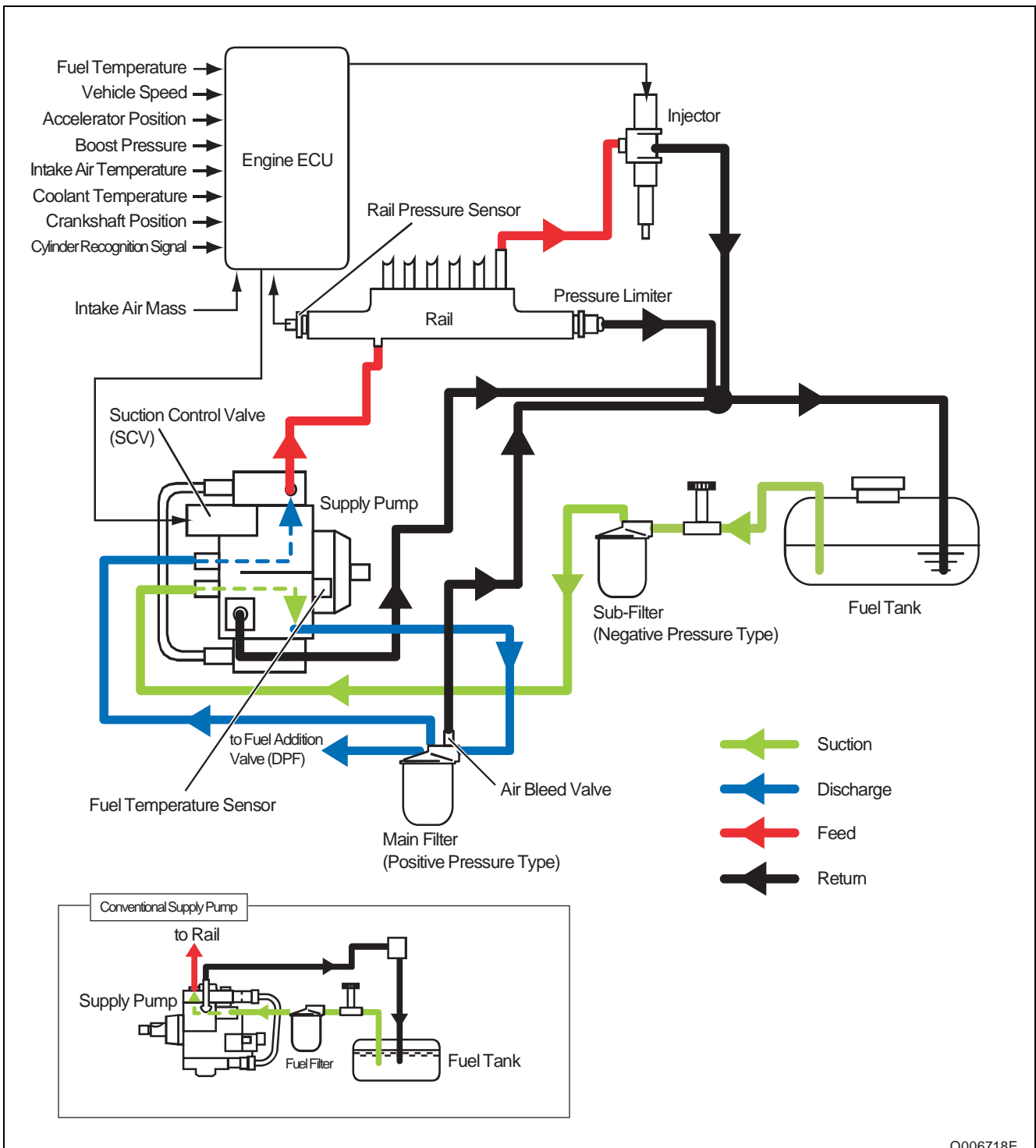
1.3 List of Primary Parts

Part Name	DENSO Part Number	Manufacturer Part Number	Remarks
Supply Pump	294000-112#	8-98081771-2	HP4 Supply Pump
Rail	095440-155#	8-98081768-0	
Injector	295050-032#	8-98110607-2	G3 Type
Engine ECU	275800-875#	8-98160981-2	
Crankshaft Position Sensor	949979-031#	8-97606943-0	
Cylinder Recognition Sensor	949979-169#	8-98019024-0	
Fuel Pressure Sensor	499000-829#	8-98105928-0	
Exhaust Gas Temperature Sensor	265600-125#	8-98004329-0	DPF Side
Exhaust Gas Temperature Sensor	265600-126#	8-98004330-0	SCR Side
Differential Pressure Sensor	104990-101#	8-97359985-2	

2. Common Rail System (CRS)

2.1 CRS Outline

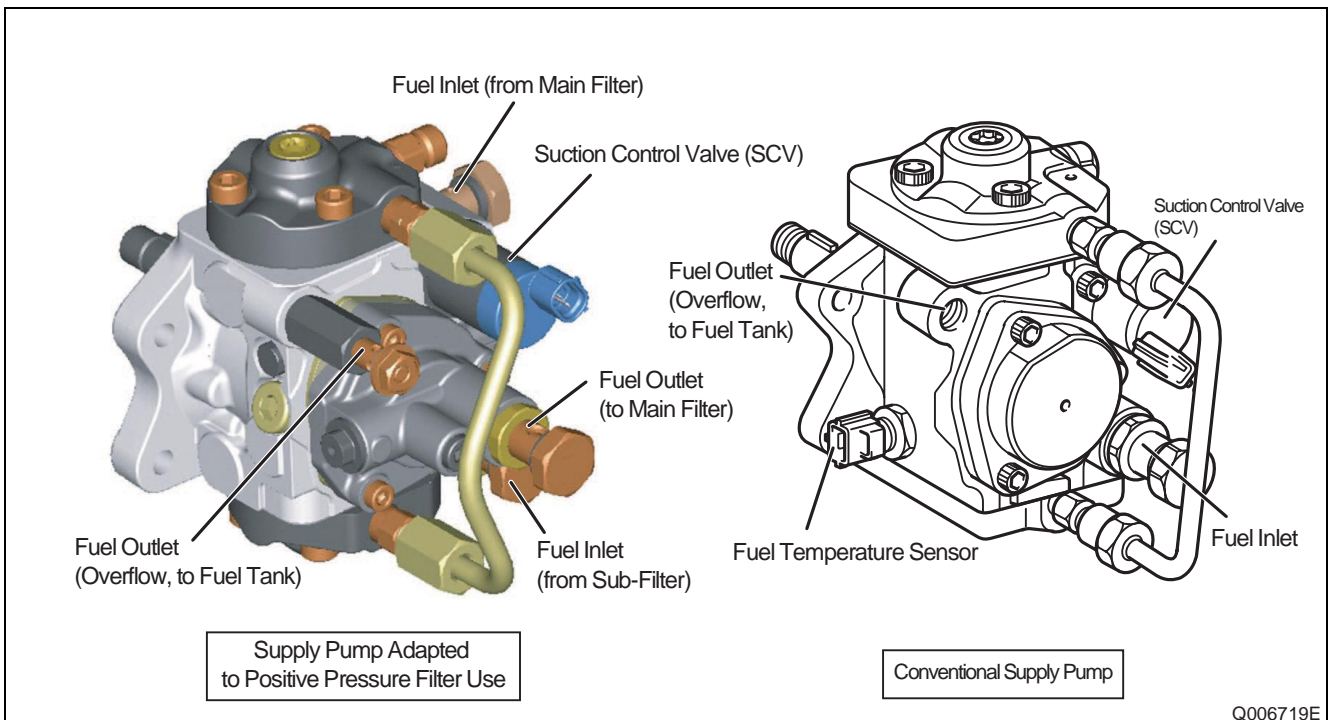
- The CRS for the ISUZU 4HK1 engine uses the following fuel flow path to prevent air from mixing with the fuel. The feed pump for the supply pump draws in fuel that is then initially sent to a main filter outside of the supply pump. Air inside the fuel is released from the air bleed valve on the main filter. Next, the fuel is returned again to the supply pump, and then sent to the rail under high pressure.



3. Supply Pump

3.1 Outline

- The supply pump used with the ISUZU 4HK1 engine is an HP3 type adapted to positive pressure filter use. In comparison to conventional supply pumps, the 4HK1 engine supply pump includes a feed pump outlet port, and main filter pump inlet port. Positive pressure is applied to the main filter by sending fuel from the feed pump to the main filter. In addition, the supply pump uses a normally open SV3 type Suction Control Valve (SCV).



3.2 CRS Adapted to Positive Pressure Filter Use

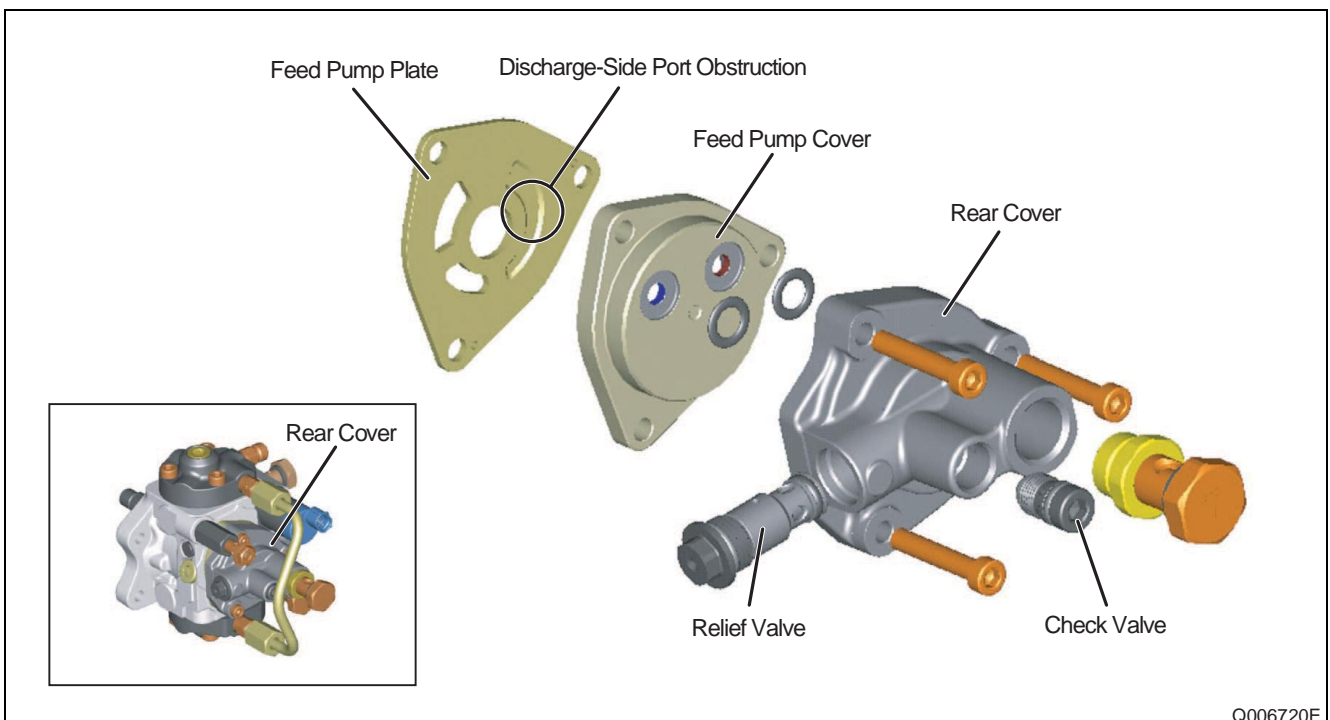
- The 4HK1 engine CRS has been adapted to positive pressure filter use to achieve the following effects:
 - Stabilize the fuel supply by placing the fuel filter under positive pressure
 - Suppress filter clogs and increasing filter life
 - Reduce diagnostic abnormalities caused by pressure fluctuations that arise when air intermixing is suppressed

Rear Cover

- A rear cover has been added to supply pumps adapted to positive pressure filters since the fuel drawn into the supply pump is sent to an external main filter. Rear cover construction features the following items:
 - A relief valve to adjust the fuel returning to the supply pump
 - A check valve to increase priming performance to the newly added fuel flow path (i.e., to the main filter)

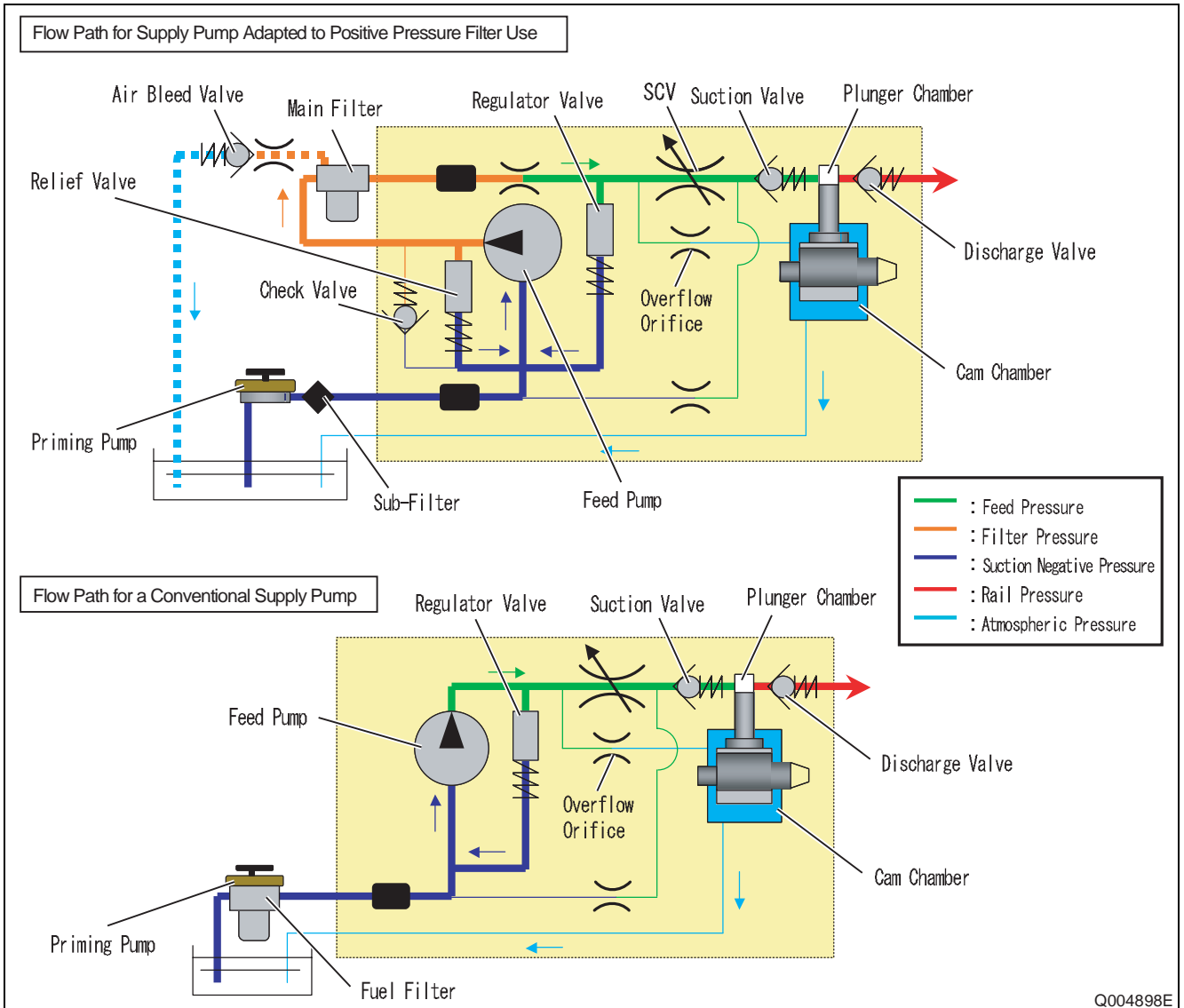
Feed Pump

- The feed pump cover and feed pump plate have changed. Moreover, the discharge port on the feed pump plate is blocked off.



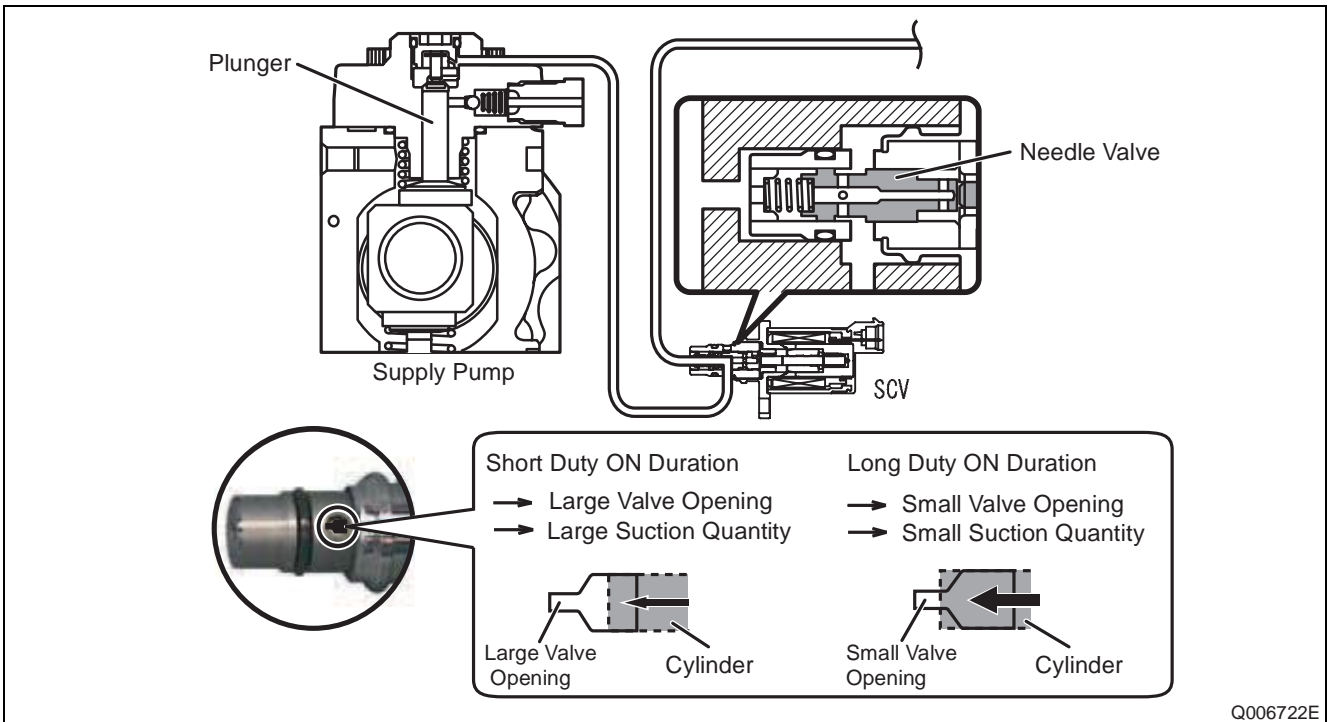
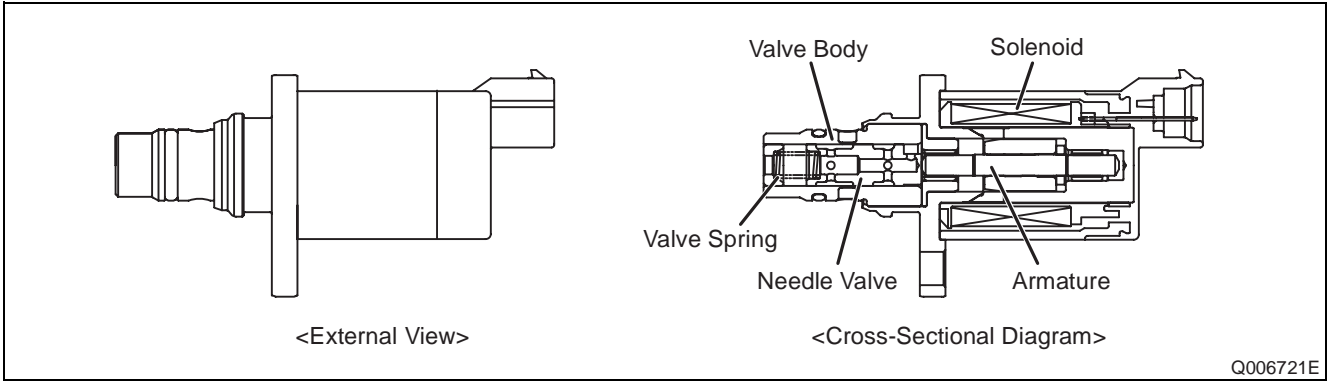
Fuel Flow Path

- In a conventional supply pump, fuel is sent directly through the following flow path: feed pump → SCV → plunger chamber → rail. However, in the supply pump adapted to positive pressure filter use, the fuel flow path is as follows: feed pump → main filter → SCV → plunger chamber → rail.



3.3 Suction Control Valve (SCV)

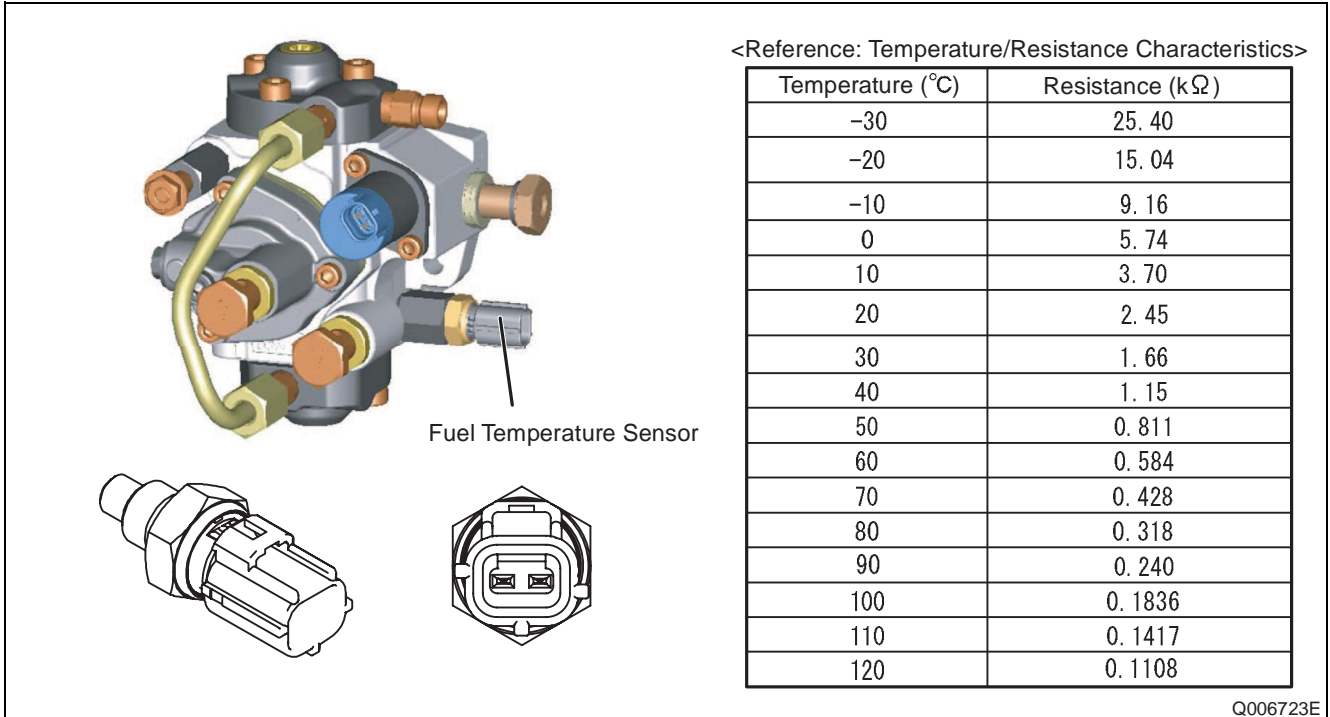
- The SCV used with the ISUZU 4HK1 engine is a normally open SV3 type. The SV3 type has the following features:
 - A more compact design compared to the SV1 type due to a smaller solenoid
 - Improved valve sliding performance



Operation Concept Diagram

3.4 Fuel Temperature Sensor

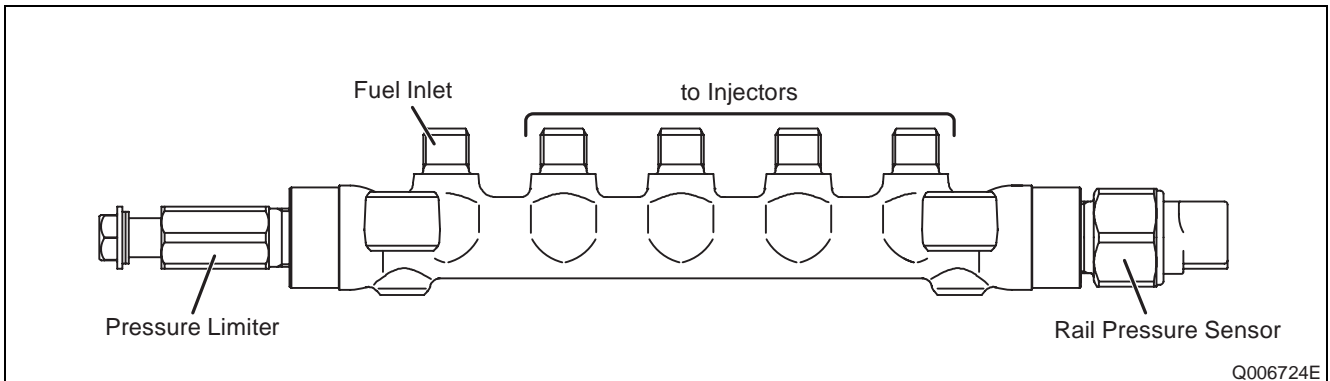
- The fuel temperature sensor detects the fuel temperature, and sends corresponding signals to the engine ECU. The ECU then uses the signal information to calculate an injection correction suited to the fuel temperature.



4. Rail

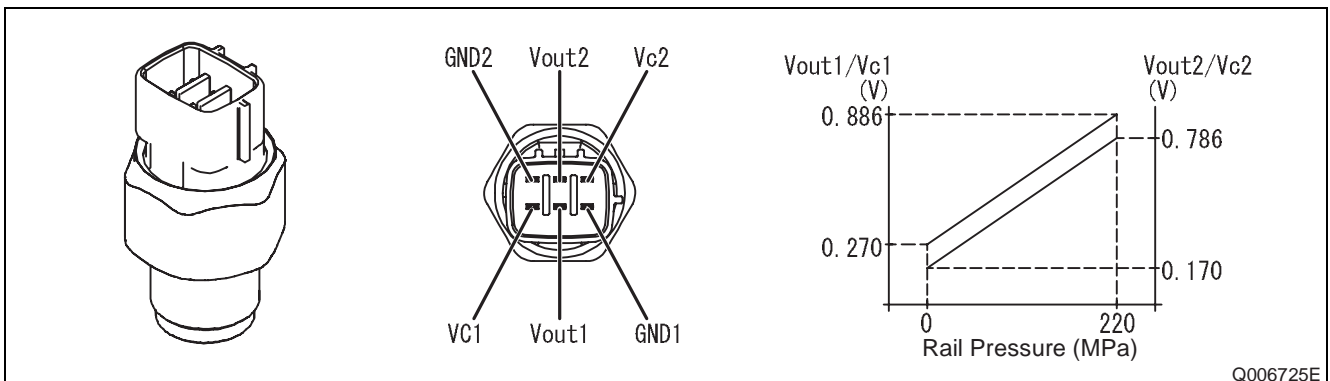
4.1 Outline

- Compared to a conventional rail, the rail used with the ISUZU 4HK1 engine is adapted to high pressure (200 MPa). The rail distributes fuel sent from the supply pump to each injector.



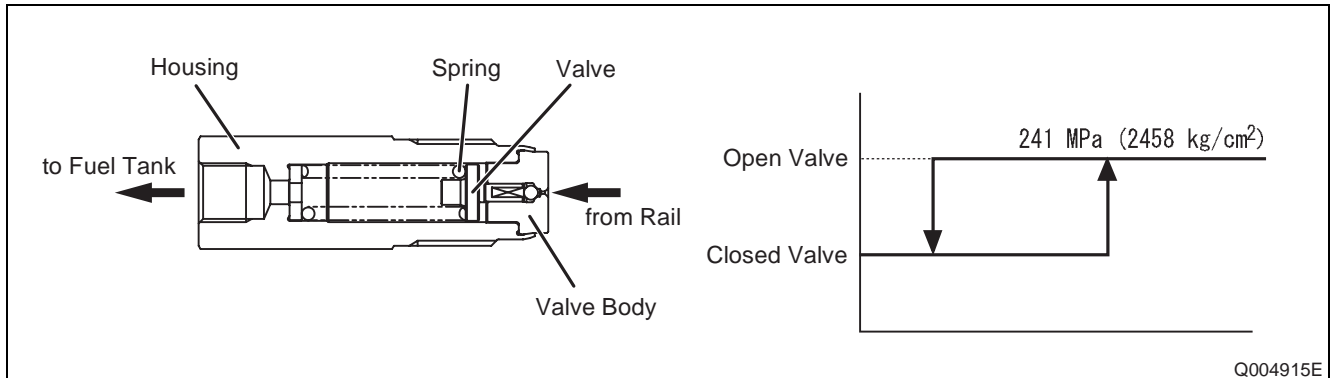
4.2 Rail Pressure Sensor

- The rail pressure sensor detects fuel pressure inside the rail. There are two rail pressure sensors to provide a backup in case of a malfunction. In addition, the output signal for each sensor system is offset.



4.3 Pressure Limiter

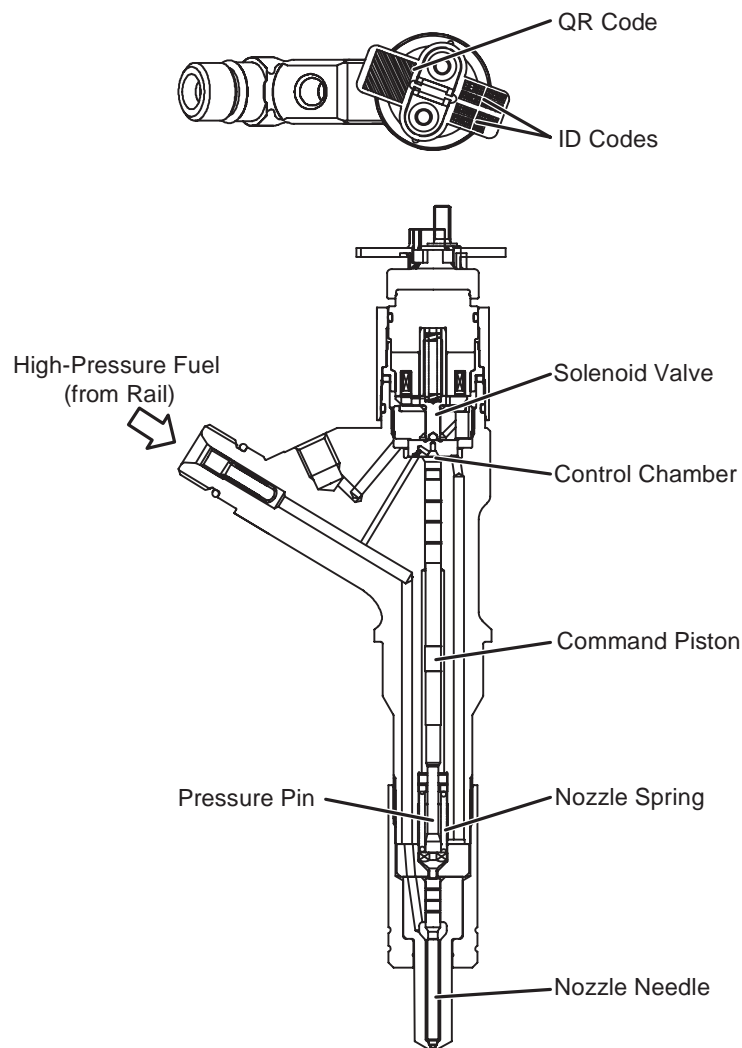
- The pressure limiter used with the ISUZU 4HK1 engine is adapted to a pressure of 200 MPa. The pressure limiter opens to release fuel from the rail when the internal pressure becomes abnormally high. Pressure limiter construction and characteristics are as shown in the figure below.



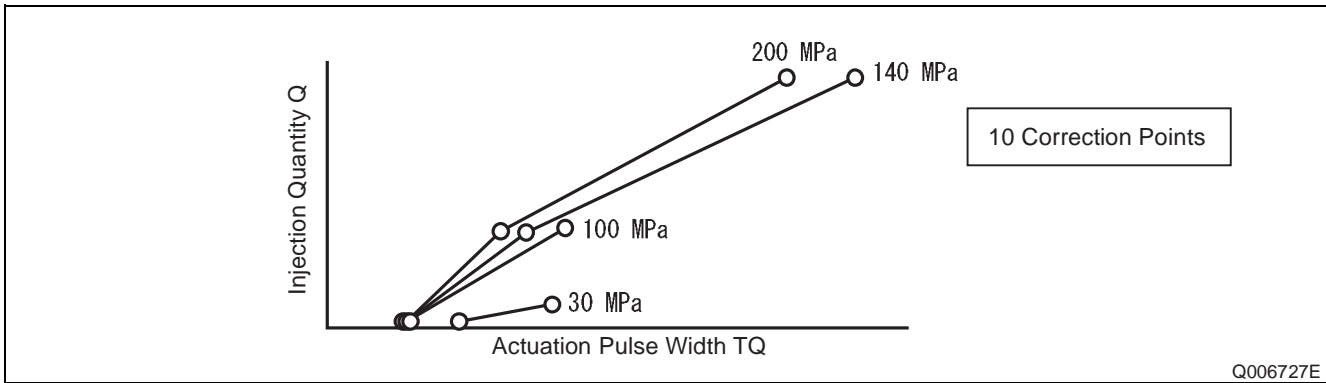
5. Injectors

5.1 Outline

- The 4HK1 engine CRS uses G3 type injectors. G3 injectors are designed to support a system pressure of 200 MPa, to improve responsiveness, and to increase resistance against foreign material adherence to the nozzle.
- G3 type operation and QR code (ID code) injection quantity corrections are the same as for G2 type with conventional QR codes. (However, the QR code correction points differ.)



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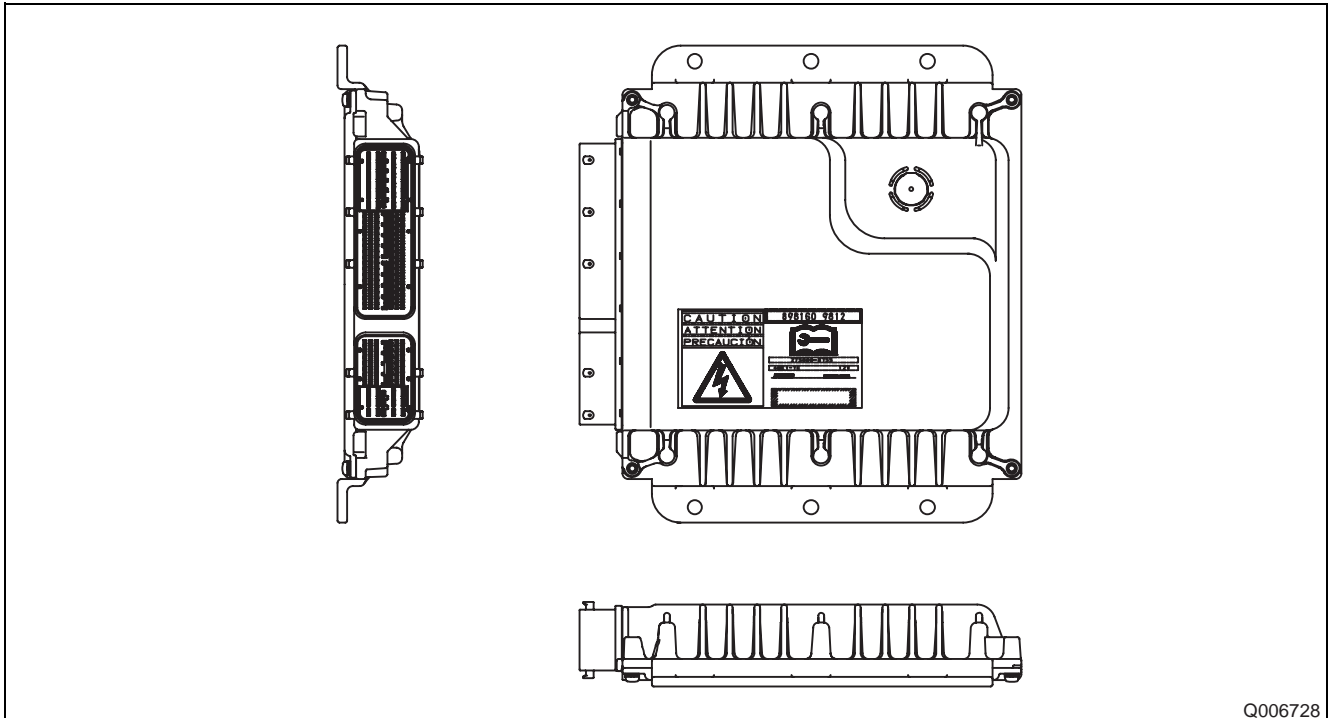


Correction Points Using QR Codes

6. Control System Parts

6.1 Engine ECU

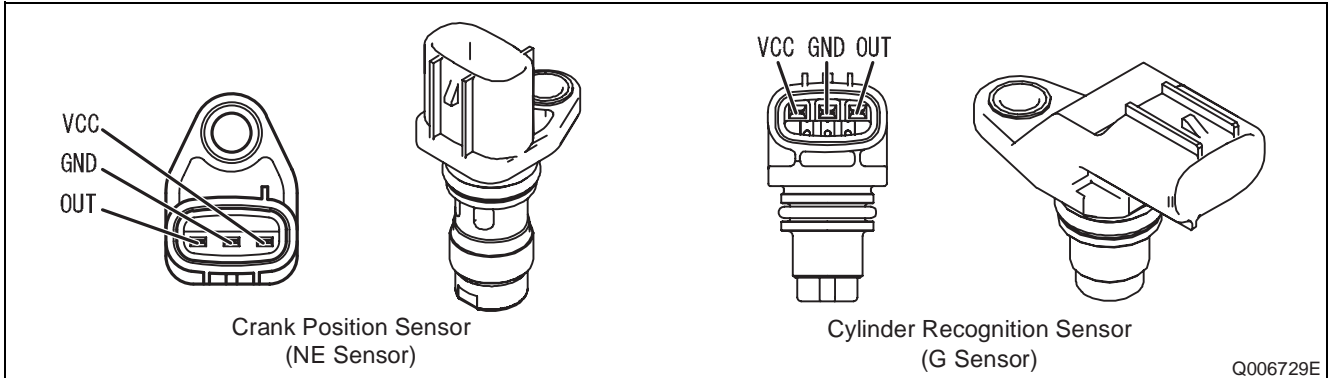
- The engine ECU conducts overall engine control. The engine ECU for the ISUZU 4HK1 engine is mounted in the cabin, and contains a built-in injector actuation circuit, thereby eliminating the Electronic Drive Unit (EDU).



6.2 Sensors

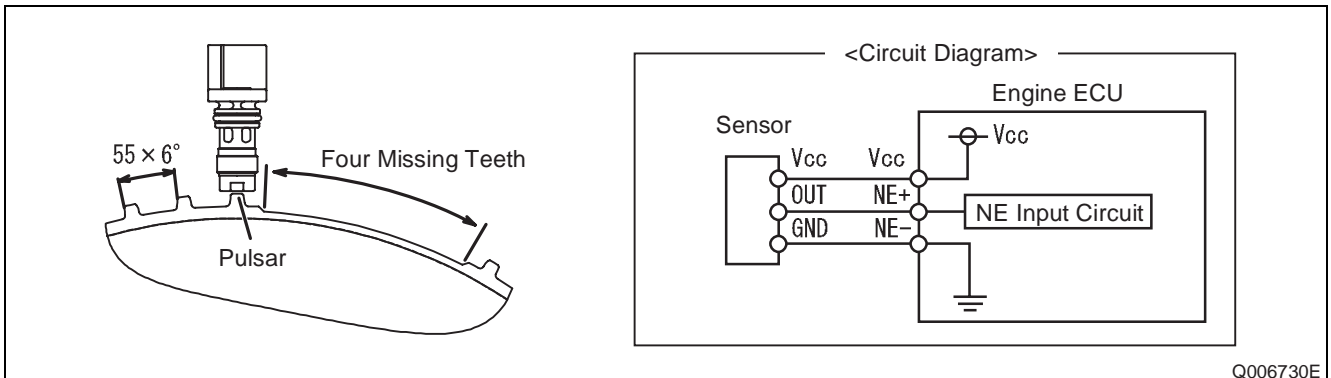
(1) Crankshaft Position Sensor (NE Sensor) and Cylinder Recognition Sensor (G Sensor)

- The 4HK1 engine CRS uses a crankshaft position sensor (NE sensor) and cylinder recognition sensor (G sensor). Both sensors are Magnetic Resistance Element (MRE) types.



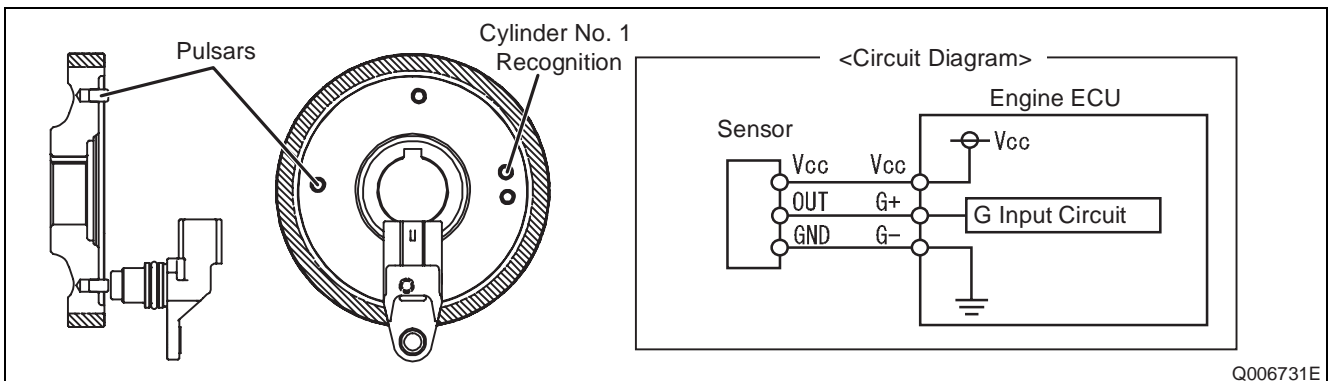
Crankshaft Position Sensor

- The crankshaft position sensor detects the crankshaft angle. The pulsar has 56 teeth (separated at 6° intervals, with four missing teeth to detect Top Dead Center [TDC] for cylinders no. 1 and no. 4).



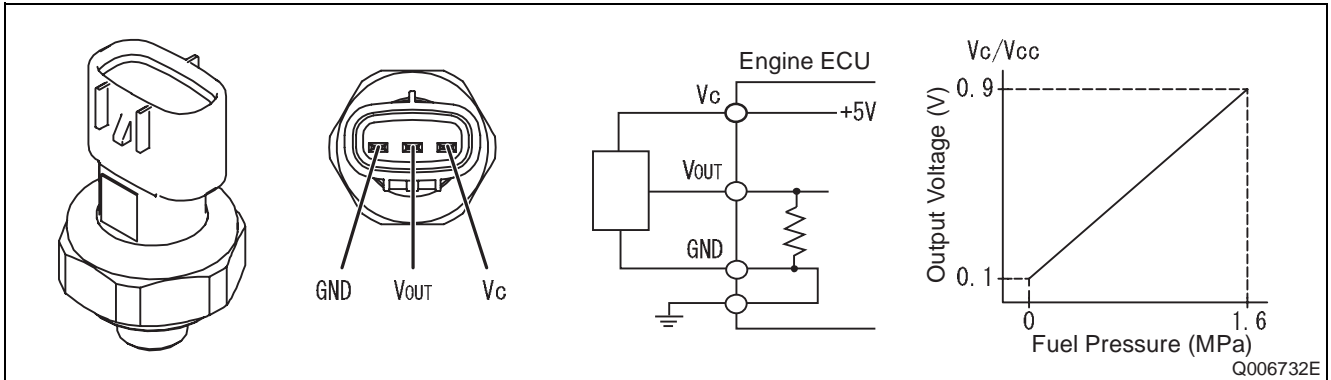
Cylinder Recognition Sensor (G)

- The cylinder recognition sensor identifies the engine cylinders. The pulsar has five teeth (recognition of TDC for each cylinder + recognition of cylinder no. 1).



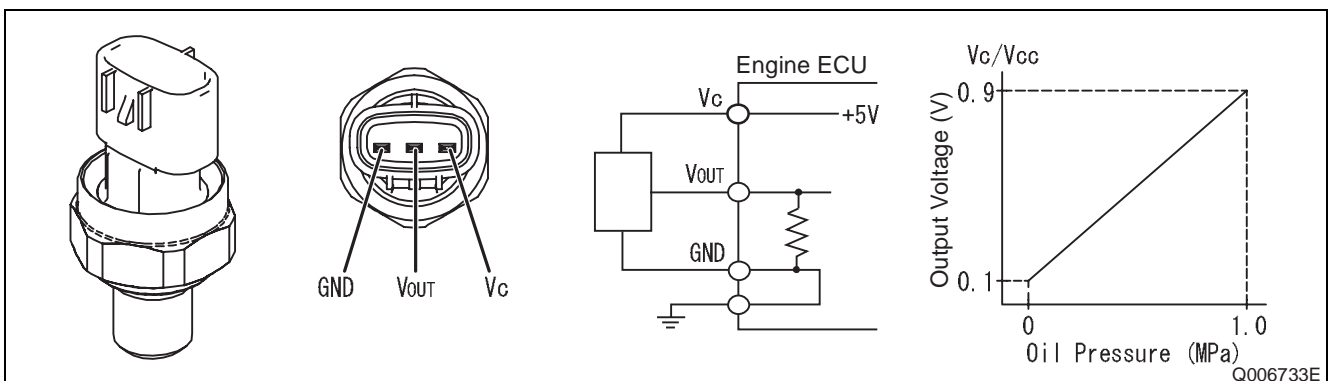
(2) Fuel Pressure Sensor

- The 4HK1 engine CRS is equipped with a fuel pressure sensor to detect fuel pressure between the feed pump outlet on the supply pump, and the main filter. Sensor output determines correction control for the fuel addition valve, and whether a main filter clog exists. The fuel pressure sensor is a semiconductor type device that uses a characteristic of silicone crystals in which electrical resistance changes when the pressure applied to the crystals is varied.



(3) Engine Oil Pressure Sensor

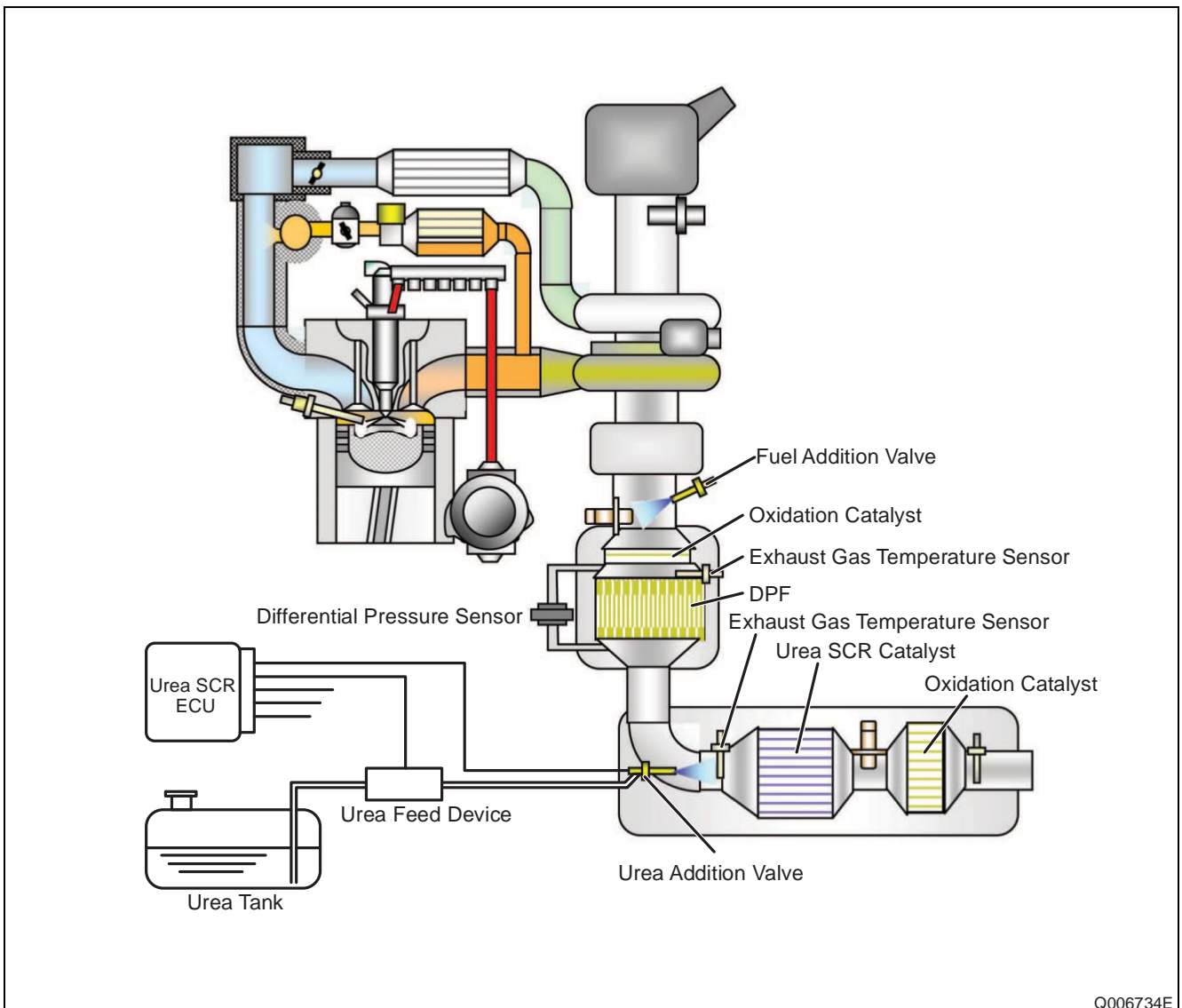
- The engine oil pressure sensor detects engine oil pressure. If engine oil pressure reaches an abnormally high value, the sensor stops the engine.



7. Exhaust Gas Treatment System

7.1 Outline

- The 4HK1 engine CRS adds a Diesel Particulate Filter (DPF) to eliminate Particulate Matter (PM), and uses urea Selective Catalytic Reduction (SCR) to reduce NO_x. Urea SCR adds urea to the exhaust gas, and the SCR catalyst reduces the NO_x. The exhaust gas temperature sensor and differential pressure sensor used in the 4HK1 engine exhaust gas treatment system are made by DENSO.



Parts and Functions

Part	Function
Oxidation Catalyst (Pre-DPF)	Conducts HC and CO purification, as well as NO _x oxidation (NO → NO ₂). (Adding NO ₂ promotes NO _x reduction.)
Diesel Particulate Filter (DPF)	Traps PM and conducts PM oxidation treatment.
Urea SCR Catalyst	Uses urea added to the exhaust gas to reduce the NO _x .
Oxidation Catalyst (Post-Urea SCR Catalyst)	Purifies any urea (ammonia) not used in NO _x reduction.
Exhaust Gas Temperature Sensor (DPF)	Measures the exhaust gas temperature at the DPF, and then outputs corresponding signals to the engine ECU. The engine ECU controls DPF regeneration based on the aforementioned signals.
Differential Pressure Sensor	Measures the difference in exhaust gas pressure across the DPF, and then outputs corresponding signals to the engine ECU. The engine ECU calculates the quantity of PM accumulated in the DPF based on the aforementioned signals, and then determines whether or not to conduct PM regeneration.
NO _x Sensor	Mounted upstream of the urea SCR catalyst to measure the NO _x concentration in the exhaust gas before passing through the catalyst.
Exhaust Gas Temperature Sensor (Urea SCR)	Mounted upstream of the urea SCR catalyst to measure the exhaust gas temperature before passing through the catalyst.
Urea Addition Valve	Adds urea to the exhaust gas based on signals from the urea SCR ECU.
Urea Feed Device	Draws urea from the urea tank that is then pumped to the urea addition valve. The pumping pressure is based on control from the urea SCR ECU.
Urea SCR ECU	Calculates the optimal urea addition quantity based on signals from the NO _x sensor, exhaust gas temperature sensor (urea SCR), etc. Controls the urea feed device and urea addition valve so that the optimal amount of urea is added to the system. In addition, outputs urea SCR system diagnosis to the engine ECU.

Exhaust Gas Temperature Sensor

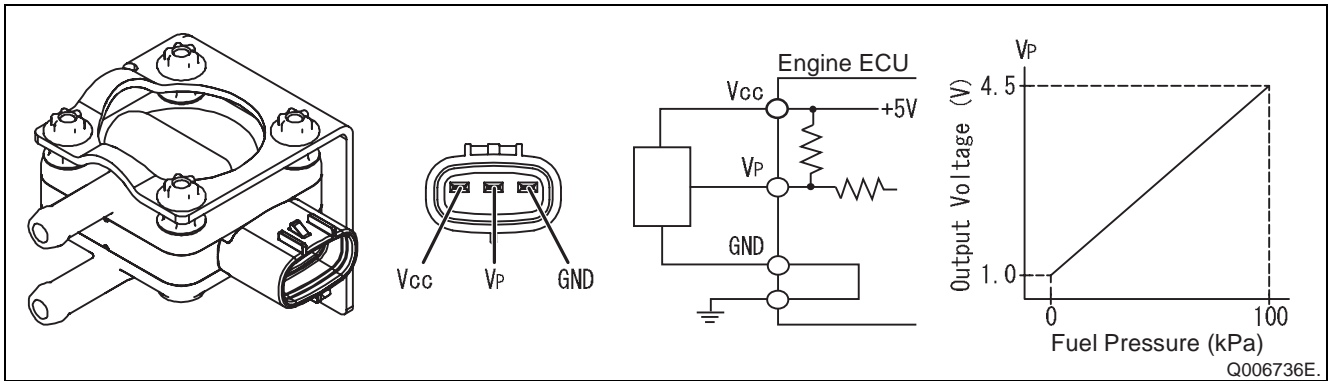
- The exhaust gas temperature sensor detects the exhaust gas temperature in the vicinity of the catalyst. A thermistor is used for actual temperature detection.

Temperature	Resistance Value
50 °C	106 kΩ
650 °C	346 kΩ
700 °C	287 kΩ

*The only difference between the two sensors is the thread pitch. (The specifications are the same.)

Differential Pressure Sensor

- The differential pressure sensor detects the difference in exhaust gas pressure across the DPF. The sensor is a semiconductor type device that uses a characteristic of silicone crystals in which electrical resistance changes when the pressure applied to the crystals is varied.

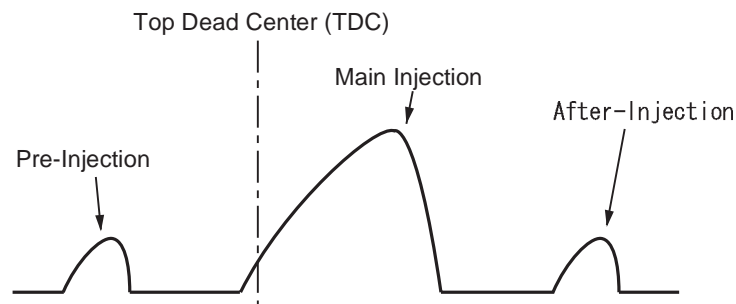


7.2 Particulate Matter (PM) Regeneration

- The following is an outline of PM regeneration control in the 4HK1 engine CRS. PM regeneration can be performed both manually and automatically.
- PM regeneration is normally conducted automatically when the system determines that a set quantity of PM has accumulated in the DPF. However, there are cases in which PM regeneration does not take place automatically due to driving conditions. When PM is not being regenerated automatically, the following two indicator lights flash: 1) the light built into the switch for the exhaust gas purification device, and 2) the exhaust gas purification device light located inside the meter panel. These indicator lights are alerts prompting the user to press the exhaust gas purification device switch and begin manual PM regeneration. When an alert occurs, press the exhaust gas purification device switch near the driver's seat to manually start PM regeneration.

Control

- The accumulated quantity of PM is inferred from the differential pressure sensor signals (difference in exhaust gas pressure across the DPF). PM regeneration occurs when the accumulated PM quantity is determined to be high (a large differential pressure across the DPF).
- In PM regeneration mode, after-injection has been added to the normal injection pattern (pre-injection, main injection). Injection is also performed from the fuel addition valve.
- The actual control sequence adds the after-injection first to raise the catalyst temperature. Next, when the catalyst temperature reaches a set value, injection occurs from the fuel addition valve, and full-scale regeneration begins.
- Regeneration judgments and injection control are conducted by inferring the catalyst temperature base on signals from the exhaust gas temperature sensors before and after each catalyst.



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7.3 Urea Selective Catalytic Reduction (SCR)

- Urea SCR adds an aqueous urea solution to the exhaust gas, and the SCR catalysts reduces the NO_x. The aqueous urea solution is not used as is during NO_x reduction. In actuality, the ammonia produced when the solution undergoes hydrolysis is used to reduce the NO_x. A system that contains an aqueous urea solution is used due to the inherent danger of mounting a source of ammonia directly on the vehicle.
- The urea SCR ECU controls the urea SCR based primarily on the exhaust gas temperature and the NO_x concentration in the exhaust gas. Ammonia is generated from the aqueous urea solution by using the exhaust gas heat to conduct hydrolysis. As such, the following values are required to add the solution from the urea addition valve into the exhaust gas: 1) the quantity of urea that will undergo hydrolysis, calculated from the exhaust gas temperature; and 2) the optimal quantity of solution to be added, calculated from the NO_x concentration in the exhaust gas.

(1) NO_x Reduction Mechanism

Oxidation Catalyst (Pre-DPF)

- An oxidation catalyst prior to the urea SCR that initially oxidizes NO into NO₂. This catalyst promotes the NO_x reduction reaction when NO₂ increases.

Urea Addition Valve

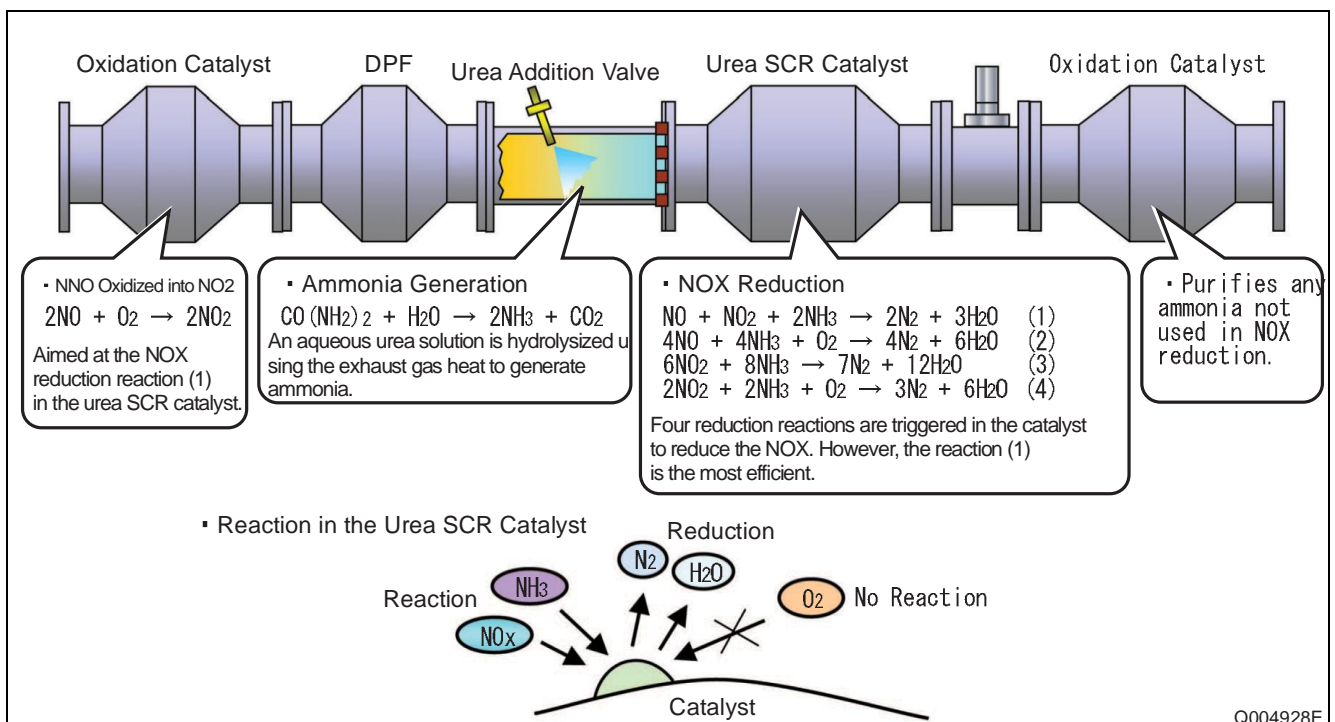
- Adds the aqueous urea solution to the exhaust gas after it has passed through the DPF. The added aqueous urea solution is hydrolyzed by exhaust gas heat and converted into ammonia and CO₂.

Urea SCR Catalyst

- Uses the ammonia generated from the aqueous urea solution to reduce and convert the NO_x into N₂ (nitrogen) and H₂O (water).

Oxidation Catalyst (Post-Urea SCR Catalyst)

- Purifies any ammonia not used in NO_x reduction.



8. Diagnostic Trouble Codes (DTC)

8.1 DTC List

DTC	Detection Item
P000F	Rail pressure too low
P0016	Crankshaft position-intake camshaft position correlation bank 1
P0027	Exhaust brake valve stick
	Exhaust throttle valve stick
P003A	Variable Geometry Turbo (VGT) module wiping too wide error
P0045	VGT module motor circuit short and GND short/position control abnormal/power supply voltage high error
P0046	VGT module control response abnormal
P006E	VGT module power supply voltage low error
P0079	Exhaust throttle GND short
P007C	Charge Air Cooler (CAC) out temperature sensor circuit low voltage
P007D	CAC out temperature sensor circuit high voltage
P0080	Exhaust throttle +B short
P0087	Rail pressure low during power enrichment
P0088	Rail pressure too high
	Fuel pressure regulator 1 performance
P0089	Rail pressure exceeds high upper limit
P0091	Rail fuel pressure regulator solenoid 1 control circuit
P0092	Rail fuel pressure regulator solenoid 1 control circuit
P0093	Rail fuel pressure low during idle or deceleration fuel cut-off
P0097	Intake manifold temperature sensor 2 circuit low
P0098	Intake manifold temperature sensor 2 circuit high
P00AF	VGT module memory access abnormal
P0101	Mass Air Flow (MAF) meter rationality low
	MAF meter rationality high
P0102	MAF meter circuit low
P0103	MAF meter circuit high
P0112	Intake air temperature sensor circuit low
P0113	Intake air temperature sensor circuit high
P0116	Engine coolant temperature sensor performance
P0117	Engine coolant temperature sensor circuit low
P0118	Engine coolant temperature sensor circuit high
P011C	CAC temperature outlet sensor surveillance
P0126	Engine coolant temperature insufficient for stable operation

DTC	Detection Item
P0128	Engine coolant temperature below thermostat regulating temperature
P0171	Injector quantity lean performance
P0172	Injector quantity rich performance
P0181	Fuel temperature sensor intermediate hold
P0182	Fuel temperature sensor A circuit low
P0183	Fuel temperature sensor A circuit high
P018B	Rail pressure sub-sensor signal keeping the middle range
	Rail pressure sub-sensor performance 1
	Rail pressure sub-sensor performance 2
P018C	Rail pressure sub-sensor circuit low voltage
P018D	Rail pressure sub-sensor circuit high voltage
P0191	Rail pressure sensor signal keeping the middle range
	Rail pressure sensor performance 1
	Rail pressure sensor performance 2
P0192	Rail pressure sensor circuit low voltage
P0193	Rail pressure sensor circuit high voltage
P0201	TWV 1 output open load injector #1 coil open
P0202	TWV 4 output open load injector #2 coil open
P0203	TWV 2 output open load injector #3 coil open
P0204	TWV 3 output open load injector #4 coil open
P020A	Injector #1 quantity increase failure
	Injector #1 quantity decrease failure
P020B	Injector #2 quantity increase failure
	Injector #2 quantity decrease failure
P020C	Injector #3 quantity increase failure
	Injector #3 quantity decrease failure
P020D	Injector #4 quantity increase failure
	Injector #4 quantity decrease failure
P0219	Engine overrun
	Engine overrun 2
P0234	Turbo/supercharger engine overboost
P0237	Turbo/supercharger boost sensor A circuit low
P0238	Turbo/supercharger boost sensor A circuit high
P0261	Injector #1 (TWV 1) load short (coil short/terminal short)
P0264	Injector #4 (TWV 4) load short (coil short/terminal short)
P0267	Injector #2 (TWV 2) load short (coil short/terminal short)
P0270	Injector #3 (TWV 3) load short (coil short/terminal short)
P0299	Turbo/supercharger engine underboost
P02E2	ITHR DC motor output open load motor open load

DTC	Detection Item
P02E3	ITHR DC motor output short to battery/short to GND motor short
P02E7	Intake throttle stuck closed
	Intake throttle stuck open
	Intake throttle open learning error
	Intake throttle closed learning error
P02E8	Intake throttle position too low
P02E9	Intake throttle position too high
P0300	Engine misfire detected
P0301	Cylinder 1 misfire detected
P0302	Cylinder 2 misfire detected
P0303	Cylinder 3 misfire detected
P0304	Cylinder 4 misfire detected
P0335	Crankshaft position sensor A circuit
P0336	Crankshaft position sensor A performance
P0340	Intake camshaft position sensor circuit bank 1
P0341	Intake camshaft position sensor performance bank 1
P0381	Wait to start light control module internal circuit (short to BATT)
	Wait to start light control module internal circuit (open load/short to GND)
P0401	MAF meter performance (Exhaust Gas Recirculation [EGR] negative deviation)
P0402	MAF meter performance (EGR positive deviation)
P0403	EGR duty error
	EGR brushless motor circuit too high
	EGR brushless motor circuit too low
	EGR brushless motor circuit too open
P0404	EGR open position performance
P0405	EGR brushless motor position sensor signal invalid low
P0406	EGR brushless motor position sensor signal invalid high
P040B	EGR gas sensor performance
P040C	EGR gas temperature too low
P040D	EGR gas temperature too high
P041B	EGR gas sensor 2 performance
P041C	EGR gas temperature 2 too low
P041D	EGR gas temperature 2 too high
P0420	DPF deterioration 2
P042E	EGR closed position performance
P046C	EGR closed learning
P0500	Vehicle speed sensor circuit
P0506	Low target idle speed
P0507	High target idle speed

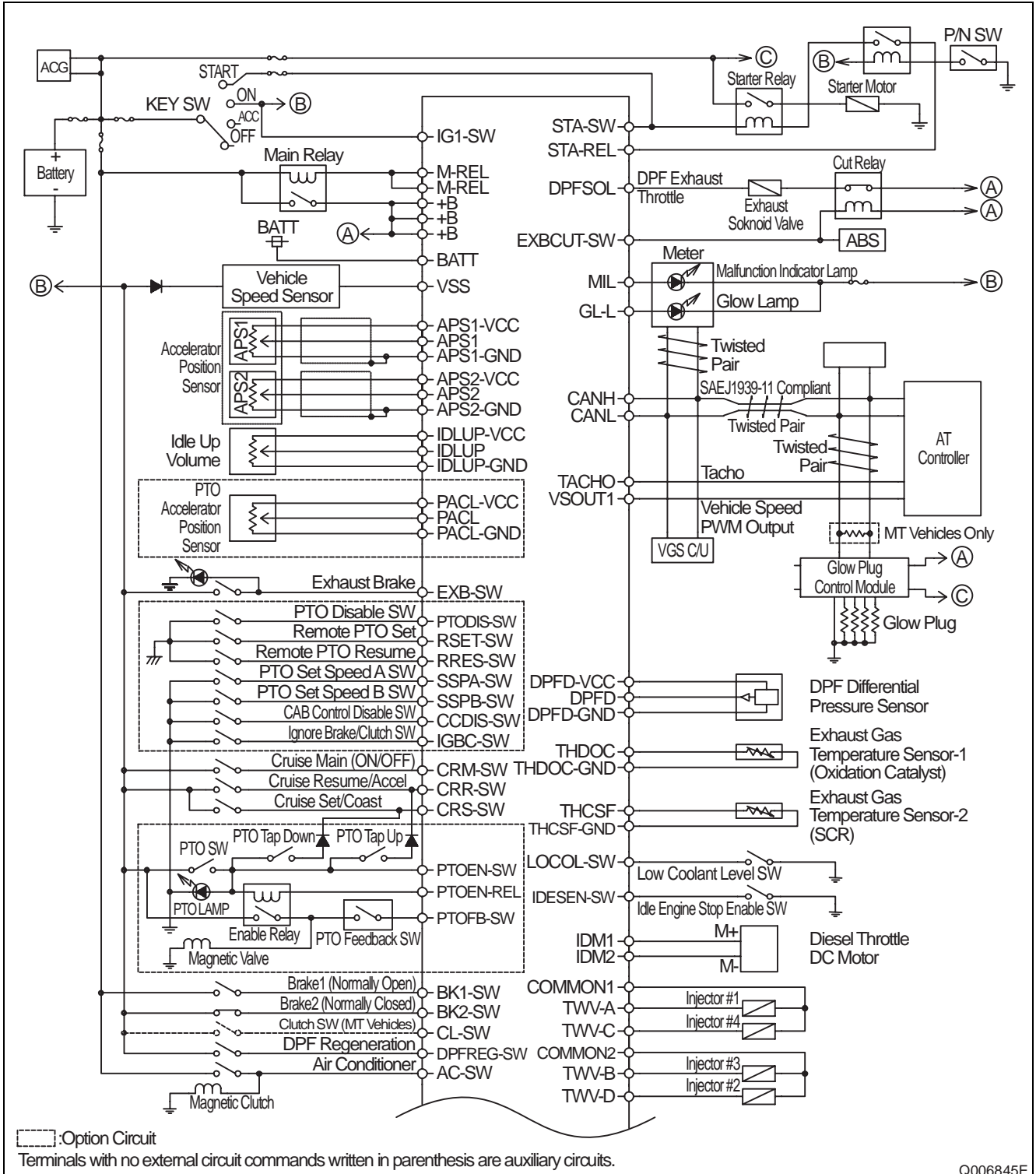
DTC	Detection Item
P0512	Starter switch short to BATT
P0522	Oil pressure sensor signal too low
P0523	Oil pressure sensor signal too high
P0545	Exhaust gas temperature before oxidation catalyst too low
P0546	Exhaust gas temperature before oxidation catalyst too high
P0562	System low voltage status determination
P0563	System high voltage status determination
P0567	Cruise control resume switch determination
P0568	Cruise control set switch determination
P0571	Cruise control brake switch determination
P0602	QR code error
P0606	Engine ECU processor (main CPU fault)
	Engine ECU processor (watchdog IC fault)
P062F	Control module long term memory performance
P0642	Battery 5 V reference 1 circuit low
P0643	Battery 5 V reference 1 circuit high
P064C	Glow plug module control circuit
	Glow plug module INTST
	Glow plug module MEEPST
P0650	Malfunction Indicator Lamp (MIL) control circuit monitoring (short to BATT)
	MIL control circuit monitoring (open load/short to GND)
P0652	Battery 5 V reference 2 circuit low
P0653	Battery 5 V reference 2 circuit high
P0671	Cylinder 1 glow plug circuit
P0672	Cylinder 2 glow plug circuit
P0673	Cylinder 3 glow plug circuit
P0674	Cylinder 4 glow plug circuit
P0687	Main relay diagnostics; main relay stuck closed
P0698	Battery 5 V reference 3 circuit low
P0699	Battery 5 V reference 3 circuit high
P0700	Transmission control module requested MIL illumination monitoring
P1072	Compressor outlet temperature sensor circuit low voltage
P1073	Compressor outlet temperature sensor circuit high voltage
P1076	CAC in temperature sensor circuit low voltage
P1077	CAC in temperature sensor circuit high voltage
P1078	CAC temperature inlet sensor surveillance
P1085	Supply pump protection
	Supply pump exchange
P1102	Rail pressure sensor performance (correlation abnormal)

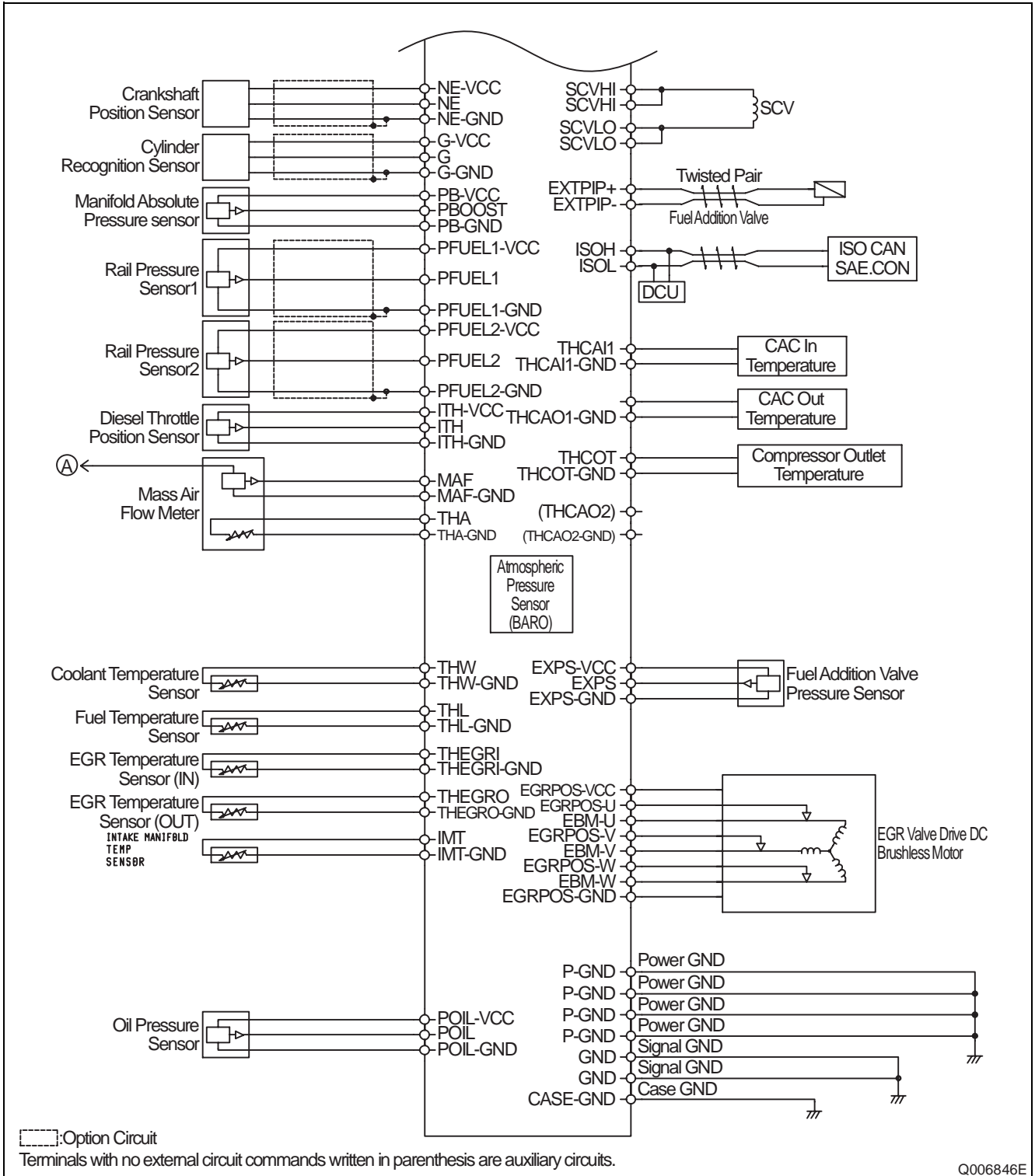
DTC	Detection Item
P1125	Accelerator Pedal Position (APP) system
P113A	O2 signal of NO _x sensor rationality
P1236	CAC performance
P1259	Rail fuel pressure low during power enrichment
P1261	Capacitor charge-up circuit malfunction (insufficient charge)
	Capacitor charge-up circuit malfunction (excessive charge)
P1463	DeNO _x -DS error for SVS lighting request
P1470	DPF exhaust presser performance
P1471	DPF regeneration insufficiency
P160B	Q DATA cross check error
P2002	DPF deterioration (II)
P2032	Exhaust gas temperature before DPF too low
P2033	Exhaust gas temperature before DPF too high
P20C9	DeNO _x -DS error for MIL lighting request
P20CB	Exhaust injector circuit GND short/open load
P20CC	Exhaust injector circuit BATT short
	Exhaust injector circuit load short
P20CF	Exhaust injector performance
P20DE	Exhaust injector pressure sensor performance high
	Exhaust injector pressure sensor performance low
P20DF	Exhaust injector pressure sensor circuit low voltage
P20E0	Exhaust injector pressure sensor circuit high voltage
P20E2	Exhaust gas temperature sensor surveillance
P2122	Accelerator pedal position sensor no. 1 low range
P2123	Accelerator pedal position sensor no. 1 high range
P2127	Accelerator pedal position sensor no. 2 low range
P2128	Accelerator pedal position sensor no. 2 high range
P2138	Accelerator pedal position sensor no. 1 & 2 correlation check
P2146	COM 1 output open load; Both TWV 1 and 3 (and 5) open load
P2147	COM 1 output short to GND; TWV 1 or 3 (or 5) output short to GND
P2148	COM 1 output short to BATT; TWV 1 or 3 (or 5) output short to BATT
P2149	COM 2 output open load; Both TWV 2 or 4 (or 6) open load
P2150	COM 2 output short to GND; TWV 2 or 4 (or 6) output short to GND
P2151	COM 2 output short to BATT; TWV 2 or 4 (or 6) output short to BATT
P2199	THA-THA 2 sensor surveillance
P2227	Barometric pressure (BARO) sensor performance
P2228	Barometric pressure (BARO) sensor circuit low voltage
P2229	Barometric pressure (BARO) sensor circuit high voltage
P2262	Turbo/supercharger engine underboost

DTC	Detection Item
P2263	VGT slow response up side
	VGT slow response down side
P226B	Turbo/supercharger engine overboost
P2413	EGR slow response ON
	EGR slow response OFF
P2428	Exhaust gas temperature sensor before oxidation catalyst too high
	Exhaust gas temperature sensor before oxidation catalyst too low
P244B	DPF PM over accumulation
P244C	DPF deterioration
P244D	Exhaust gas temperature sensor before DPF too high
	Exhaust gas temperature sensor before DPF too low
P2453	DPF pressure sensor performance
P2454	Exhaust gas pressure reference too low
P2455	Exhaust gas pressure reference too high
P2457	EGR cooler inferiority
P2459	DPF regeneration excessive frequency
P2463	DPF trip over accumulation
P254C	Auxiliary engine RPM sensor circuit low
P254D	Auxiliary engine RPM sensor circuit high
P2564	VGT hole IC sensor circuit low
P2565	VGT hole IC sensor circuit high
P256C	Idle Air Control (IAC) valve control circuit low voltage
P256D	IAC valve control circuit high voltage
P268A	QR code not programmed
U0001	CAN bus 2 reset counter overrun
U0073	CAN bus reset counter overrun
U0101	Lost CAN communication (CAN SOH) with TM control system
U0106	Glow plug module communication failure
U010C	VGT module communication failure
U010E	DeNOx-DS communication time-out
U0121	CAN ABS SOH diagnostic
U0307	GPCM engine ID diagnostic

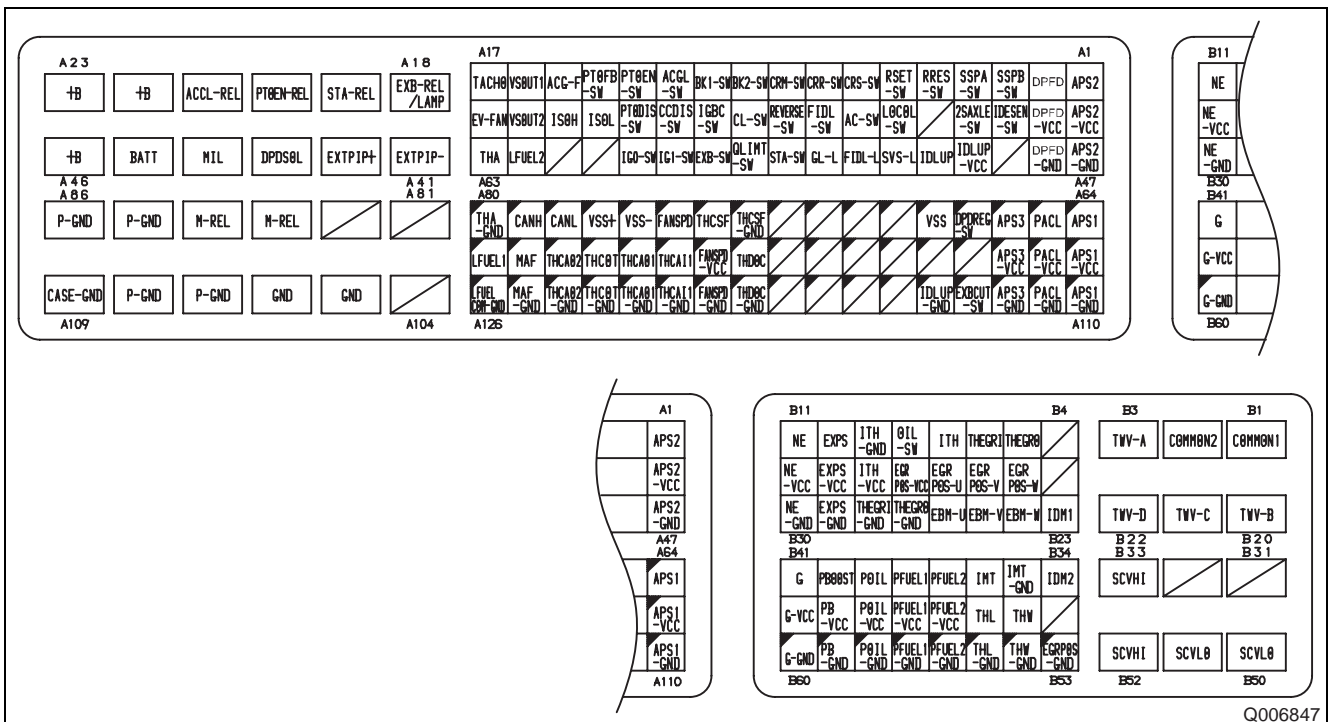
9. Control System Component Information

9.1 Engine ECU Terminal Layout Diagrams





9.2 Connector Diagram



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