

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

1. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0011	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	<Ref. to GD(H6DO)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0016	Crankshaft Position - Camshaft Position Correlation (Bank1)	<Ref. to GD(H6DO)-12, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	<Ref. to GD(H6DO)-13, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to GD(H6DO)-13, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0026	Intake Valve Control Solenoid Circuit Range/Performance (Bank 1)	<Ref. to GD(H6DO)-14, DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0028	Intake Valve Control Solenoid Circuit Range/Performance (Bank 2)	<Ref. to GD(H6DO)-16, DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-17, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-19, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-21, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-23, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-25, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0050	HO2S Heater Control Circuit (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-26, DTC P0050 HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0051	HO2S Heater Control Circuit Low (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-26, DTC P0051 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0052	HO2S Heater Control Circuit High (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-26, DTC P0052 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0057	HO2S Heater Control Circuit Low (Bank 2 Sensor 2)	<Ref. to GD(H6DO)-26, DTC P0057 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0058	HO2S Heater Control Circuit High (Bank 2 Sensor 2)	<Ref. to GD(H6DO)-26, DTC P0058 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	MAP/MAF - Throttle Position Correlation	<Ref. to GD(H6DO)-27, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0076	Intake Valve Control Solenoid Circuit Low (Bank 1)	<Ref. to GD(H6DO)-29, DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0077	Intake Valve Control Solenoid Circuit High (Bank 1)	<Ref. to GD(H6DO)-30, DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0082	Intake Valve Control Solenoid Circuit Low (Bank 2)	<Ref. to GD(H6DO)-30, DTC P0082 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0083	Intake Valve Control Solenoid Circuit High (Bank 2)	<Ref. to GD(H6DO)-30, DTC P0083 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to GD(H6DO)-31, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to GD(H6DO)-33, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to GD(H6DO)-34, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to GD(H6DO)-35, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(H6DO)-36, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	<Ref. to GD(H6DO)-37, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Sensor 1 Circuit Low	<Ref. to GD(H6DO)-39, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0113	Intake Air Temperature Sensor 1 Circuit High	<Ref. to GD(H6DO)-40, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low	<Ref. to GD(H6DO)-41, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High	<Ref. to GD(H6DO)-42, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low	<Ref. to GD(H6DO)-43, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High	<Ref. to GD(H6DO)-44, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to GD(H6DO)-45, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0126	Insufficient Engine Coolant Temperature For Stable Operation	<Ref. to GD(H6DO)-47, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(H6DO)-49, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-51, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-53, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-55, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-58, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-60, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-63, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-64, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0140	O2 Sensor Circuit No Activity Detected (Bank1 Sensor2)	<Ref. to GD(H6DO)-69, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0151	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-71, DTC P0151 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0152	O2 Sensor Circuit High Voltage (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-71, DTC P0152 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0153	O2 Sensor Circuit Slow Response (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-71, DTC P0153 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0154	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-71, DTC P0154 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0157	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 2)	<Ref. to GD(H6DO)-71, DTC P0157 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0158	O2 Sensor Circuit High Voltage (Bank 2 Sensor 2)	<Ref. to GD(H6DO)-71, DTC P0158 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0159	O2 Sensor Circuit Slow Response (Bank 2 Sensor 2)	<Ref. to GD(H6DO)-71, DTC P0159 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0160	O2 Sensor Circuit No Activity Detected (Bank2 Sensor2)	<Ref. to GD(H6DO)-71, DTC P0160 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK2 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(H6DO)-72, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H6DO)-73, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0174	System Too Lean (Bank 2)	<Ref. to GD(H6DO)-74, DTC P0174 SYSTEM TOO LEAN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0175	System Too Rich (Bank 2)	<Ref. to GD(H6DO)-74, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	<Ref. to GD(H6DO)-75, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0182	Fuel Temperature Sensor "A" Circuit Low Input	<Ref. to GD(H6DO)-78, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0183	Fuel Temperature Sensor "A" Circuit High Input	<Ref. to GD(H6DO)-79, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0196	Engine Oil Temperature Sensor Circuit Range/Performance	<Ref. to GD(H6DO)-80, DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0197	Engine Oil Temperature Sensor Low	<Ref. to GD(H6DO)-82, DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0198	Engine Oil Temperature Sensor High	<Ref. to GD(H6DO)-83, DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0222	Throttle/Pedal Position Sensor/ Switch "B" Circuit Low	<Ref. to GD(H6DO)-84, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0223	Throttle/Pedal Position Sensor/ Switch "B" Circuit High	<Ref. to GD(H6DO)-85, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0230	Fuel Pump Primary Circuit	<Ref. to GD(H6DO)-86, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H6DO)-88, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H6DO)-93, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H6DO)-93, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H6DO)-93, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0305	Cylinder 5 Misfire Detected	<Ref. to GD(H6DO)-93, DTC P0305 CYLINDER 5 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0306	Cylinder 6 Misfire Detected	<Ref. to GD(H6DO)-93, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	<Ref. to GD(H6DO)-94, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	<Ref. to GD(H6DO)-95, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0332	Knock Sensor 2 Circuit Low (Bank 2)	<Ref. to GD(H6DO)-96, DTC P0332 KNOCK SENSOR 2 CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0333	Knock Sensor 2 Circuit High (Bank 2)	<Ref. to GD(H6DO)-96, DTC P0333 KNOCK SENSOR 2 CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor "A" Circuit	<Ref. to GD(H6DO)-97, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor "A" Circuit Range/Performance	<Ref. to GD(H6DO)-99, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	<Ref. to GD(H6DO)-101, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0345	Camshaft Position Sensor "A" Circuit (Bank 2)	<Ref. to GD(H6DO)-102, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0400	Exhaust Gas Recirculation Flow	<Ref. to GD(H6DO)-103, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency below Threshold (Bank 1)	<Ref. to GD(H6DO)-106, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to GD(H6DO)-108, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to GD(H6DO)-124, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to GD(H6DO)-126, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0451	Evaporative Emission Control System Pressure Sensor	<Ref. to GD(H6DO)-128, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(H6DO)-130, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to GD(H6DO)-132, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to GD(H6DO)-133, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	<Ref. to GD(H6DO)-133, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission System Purge Control Valve Circuit Low	<Ref. to GD(H6DO)-134, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission System Purge Control Valve Circuit High	<Ref. to GD(H6DO)-136, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0461	Fuel Level Sensor "A" Circuit Range/Performance	<Ref. to GD(H6DO)-138, DTC P0461 FUEL LEVEL SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor "A" Circuit Low	<Ref. to GD(H6DO)-140, DTC P0462 FUEL LEVEL SENSOR "A" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor "A" Circuit High	<Ref. to GD(H6DO)-142, DTC P0463 FUEL LEVEL SENSOR "A" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H6DO)-144, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0500	Vehicle Speed Sensor "A"	<Ref. to GD(H6DO)-147, DTC P0500 VEHICLE SPEED SENSOR "A", Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to GD(H6DO)-148, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Air Control System RPM Higher Than Expected	<Ref. to GD(H6DO)-149, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H6DO)-150, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0513	Incorrect Immobilizer Key	<Ref. to GD(H6DO)-151, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0600	Serial Communication Link	<Ref. to GD(H6DO)-152, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H6DO)-154, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to GD(H6DO)-155, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Throttle Control System Circuit Range/Performance	<Ref. to GD(H6DO)-156, DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(H6DO)-159, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0700	Transmission Control System (MIL Request)	<Ref. to GD(H6DO)-161, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to GD(H6DO)-162, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to GD(H6DO)-164, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1154	O2 Sensor Circuit Range/Performance (Low) (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-166, DTC P1154 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1155	O2 Sensor Circuit Range/Performance (High) (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-166, DTC P1155 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(H6DO)-167, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H6DO)-169, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(H6DO)-171, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(H6DO)-173, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1492	EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to GD(H6DO)-175, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1493	EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to GD(H6DO)-177, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1494	EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to GD(H6DO)-179, DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1495	EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input)	<Ref. to GD(H6DO)-179, DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1496	EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to GD(H6DO)-179, DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1497	EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input)	<Ref. to GD(H6DO)-179, DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1498	EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	<Ref. to GD(H6DO)-179, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1499	EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to GD(H6DO)-179, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(H6DO)-180, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1570	Antenna	<Ref. to GD(H6DO)-181, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1571	Reference Code Incompatibility	<Ref. to GD(H6DO)-181, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to GD(H6DO)-181, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P1574	Key Communication Failure	<Ref. to GD(H6DO)-181, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1576	EGI Control Module EEPROM	<Ref. to GD(H6DO)-181, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1577	IMM Control Module EEPROM	<Ref. to GD(H6DO)-181, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1578	Meter Failure	<Ref. to GD(H6DO)-181, DTC P1578 METER FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1602	Control Module Programming Error	<Ref. to GD(H6DO)-182, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to GD(H6DO)-184, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)	<Ref. to GD(H6DO)-185, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	<Ref. to GD(H6DO)-186, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to GD(H6DO)-186, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean (Bank 1)	<Ref. to GD(H6DO)-187, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2097	Post Catalyst Fuel Trim System Too Rich (Bank 1)	<Ref. to GD(H6DO)-189, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2098	Post Catalyst Fuel Trim System Too Lean Bank 2	<Ref. to GD(H6DO)-190, DTC P2098 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 2, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2099	Post Catalyst Fuel Trim System Too Rich Bank 2	<Ref. to GD(H6DO)-190, DTC P2099 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to GD(H6DO)-191, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to GD(H6DO)-193, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to GD(H6DO)-195, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2109	Throttle/Pedal Position Sensor "A" Minimum Stop Performance	<Ref. to GD(H6DO)-197, DTC P2109 THROTTLE/PEDAL POSITION SENSOR "A" MINIMUM STOP PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	<Ref. to GD(H6DO)-199, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	<Ref. to GD(H6DO)-201, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	<Ref. to GD(H6DO)-203, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P2128	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input	<Ref. to GD(H6DO)-205, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2135	Throttle/Pedal Position Sensor/ Switch "A"/"B" Voltage Correlation	<Ref. to GD(H6DO)-207, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2138	Throttle/Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation	<Ref. to GD(H6DO)-209, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2227	Barometric Pressure Circuit Range/ Performance	<Ref. to GD(H6DO)-211, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2228	Barometric Pressure Circuit Low	<Ref. to GD(H6DO)-212, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2229	Barometric Pressure Circuit High	<Ref. to GD(H6DO)-213, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. Diagnostic Trouble Code (DTC) Detecting Criteria

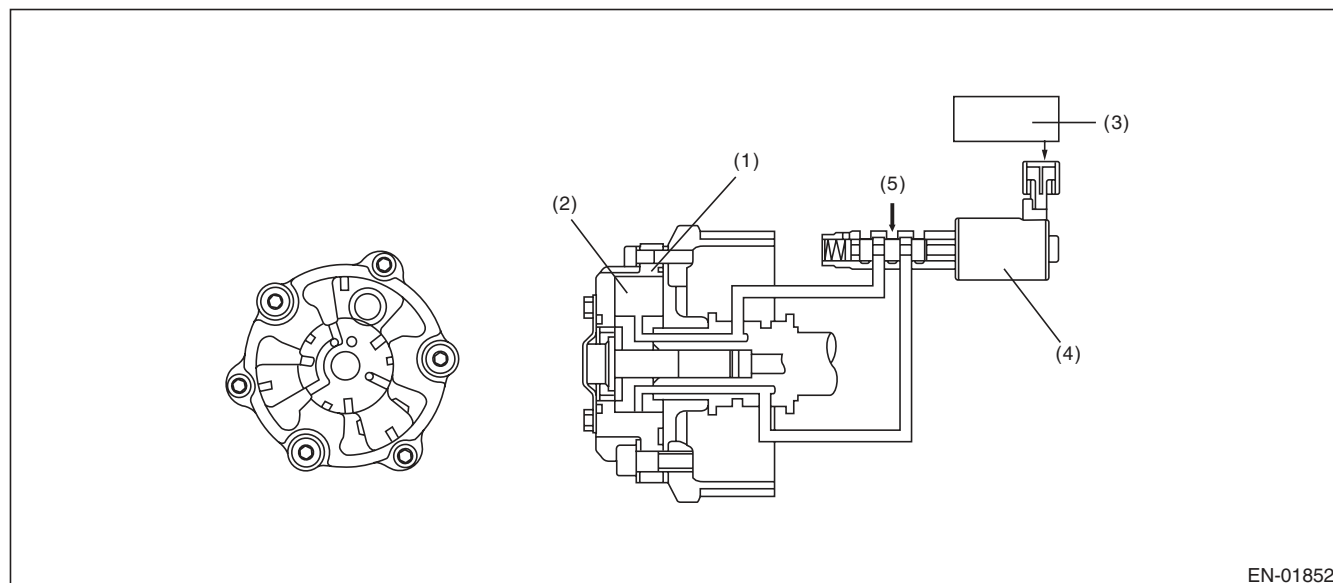
A: DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.

Judge NG when the amount of AVCS actual timing advance does not approach to the amount of AVCS target timing advance.

2. COMPONENT DESCRIPTION



(1) AVCS timing controller

(2) Vane

(3) Engine control module (ECM)

(4) Oil flow control solenoid valve

(5) Oil pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time of establishing all secondary parameter conditions	≥ 3000 ms
Battery voltage	≥ 10.9 V
Engine speed	≥ 1500 rpm
Engine coolant temperature	≥ 50 °C (122 °F)
AVCS control	Operation
Target advance angle	≥ 0 °CA
Target timing advance change amount (per 64 ms)	< 1.07 °CA

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after warming up when the engine speed increases and AVCS operates.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

1) When the conditions during which the differences of AVCS target timing advance amount and AVCS actual timing advance amount is large continues for certain amount of time.

2) When the differences of target timing advance amount and actual timing advance amount is calculated during AVCS control, and the difference per predetermined time is the specified value or larger.

• Abnormality Judgement

Judge as NG when the following conditions are established within the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
$\Sigma(\text{Target position} - \text{Actual position})$	> 8000 °CA (Bank 1) > 8000 °CA (Bank 2)
or	
$\Sigma(\text{Target position} - \text{Actual position})$	< -2500 °CA (Bank 1) < -2500 °CA (Bank 2)

Time Needed for Diagnosis: 30000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the following conditions are established within the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
$\Sigma(\text{Target position} - \text{Actual position})$	≤ 8000 °CA (Bank 1) ≤ 8000 °CA (Bank 2) and ≥ -2500 °CA (Bank 1) ≥ -2500 °CA (Bank 2)

Time Needed for Diagnosis: 30000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

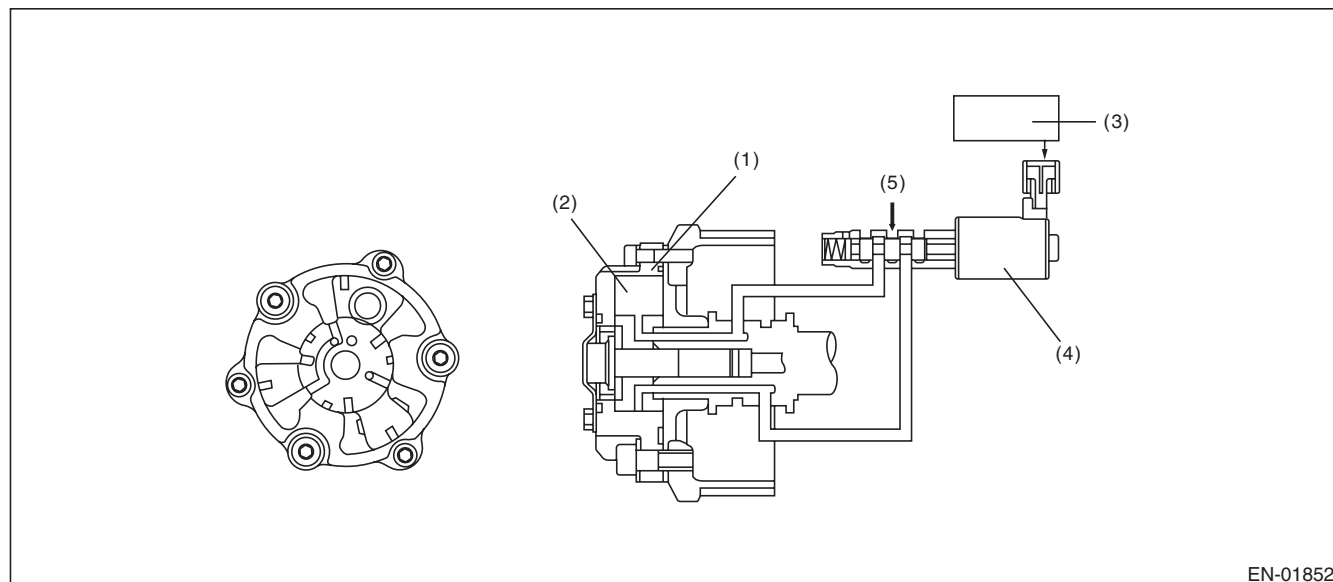
B: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1)

1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.

Judge as NG when the timing advance is outside the normal range.

2. COMPONENT DESCRIPTION



(1) AVCS timing controller

(3) Engine control module (ECM)

(5) Oil pressure

(2) Vane

(4) Oil flow control solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine speed	$\geq 500 \text{ rpm}$
Engine coolant temperature	$\geq 50 \text{ }^{\circ}\text{C}$ (122 $^{\circ}\text{F}$)
AVCS control	Not in operation
Target timing advance	0 $^{\circ}\text{CA}$

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting engine and while AVCS is not operating.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge as NG when the camshaft sensor input position is not within the normal range.

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Crankshaft position when camshaft position sensor signal is input	< BTDC 22 °CA (Bank 1) < BTDC 22 °CA (Bank 2) or > BTDC 58 °CA (Bank 1) > BTDC 58 °CA (Bank 2)

Time Needed for Diagnosis: 20000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Crankshaft position when camshaft position sensor signal is input	≥ BTDC 22 °CA (Bank 1) ≥ BTDC 22 °CA (Bank 2) and ≤ BTDC 58 °CA (Bank 1) ≤ BTDC 58 °CA (Bank 2)

Time Needed for Diagnosis: 1000 ms

C: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0016. <Ref. to GD(H6DO)-12, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

D: DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0011. <Ref. to GD(H6DO)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

E: DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Judge as NG with either Low NG or High NG.

A variable valve lift diagnosis oil pressure switch is installed for diagnosis. It is possible to determine whether the intake valve is in high mode (increase the amount of lift) or in low mode (suppressing the amount of lift) when the variable valve lift diagnosis oil pressure switch is turned ON or OFF.

• Normal

Oil switching solenoid valve duty	Intake valve	Variable valve lift diagnosis oil pressure switch
Large	High mode	ON
Minimum	Low mode	OFF

• Low NG

When the variable valve lift diagnosis oil pressure switch remains OFF even though the intake valve tried to enter high mode (oil switching solenoid valve duty is large), this is judged as a Low NG.

• High NG

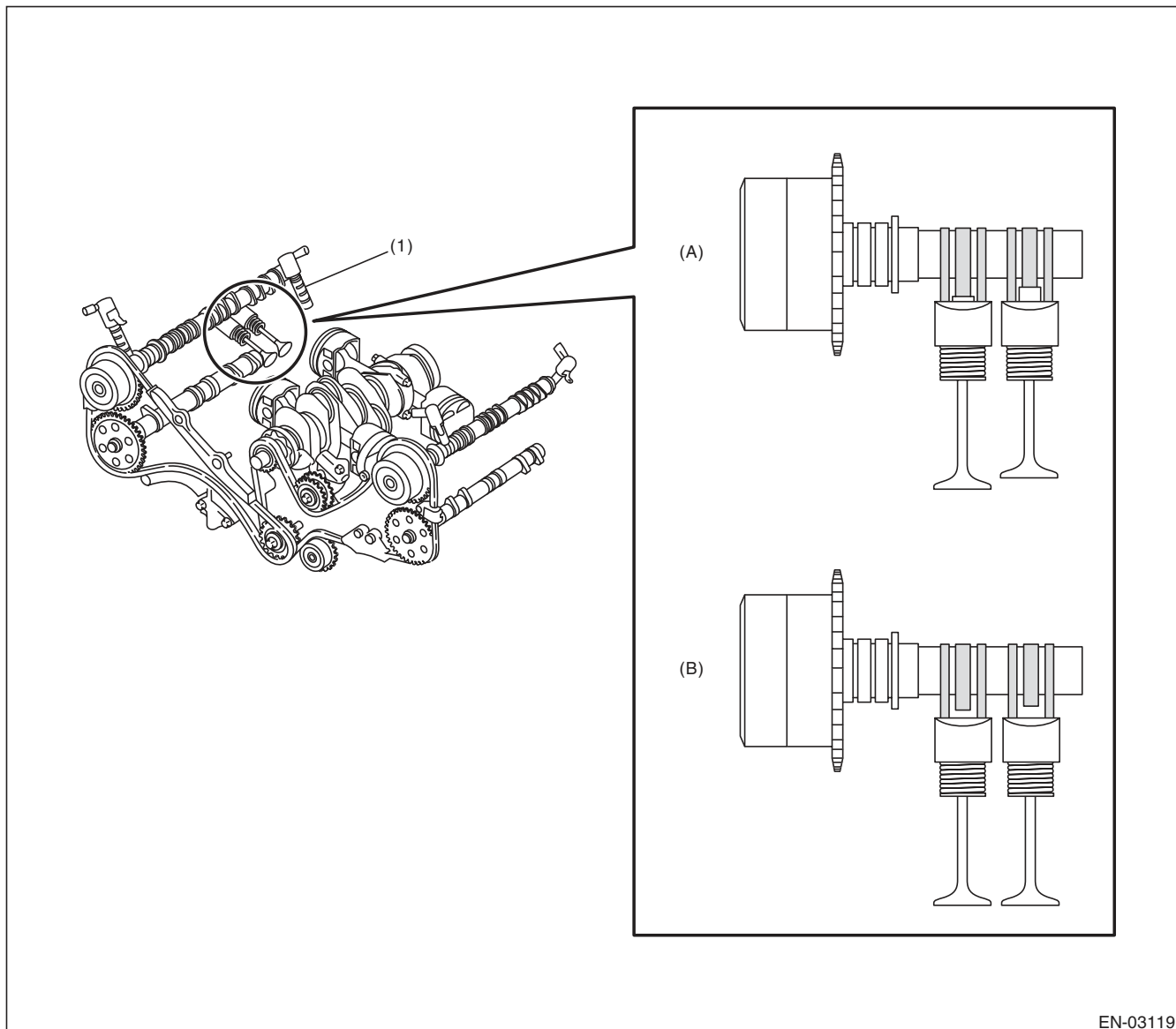
When the variable valve lift diagnosis oil pressure switch remains ON even though the intake valve tried to enter low mode (oil switching solenoid valve duty is small), this is judged as a High NG.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. COMPONENT DESCRIPTION

The variable valve lift system optimizes the intake valve lift by switching between the low lift cam and the high lift cam according to the engine speed. The amount of intake valve lift is varied by controlling the oil switching solenoid valve duty according to signals from the ECM.



EN-03119

(A) When at low speed

(B) When at high speed

(1) Oil switching solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	$\geq 6000 \text{ ms}$
Engine oil temperature	$\geq 0 \text{ }^{\circ}\text{C}$ (32 $^{\circ}\text{F}$)
Variable valve lift control	Operation

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously 6 seconds after engine start while variable valve lift is being controlled

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Low Duty ratio Variable valve lift diagnosis oil pressure switch	$\geq 62\%$ OFF
High Duty ratio Variable valve lift diagnosis oil pressure switch	$< 33\%$ ON

Time Needed for Diagnosis:

Low side: 784 ms

High side: 3000 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Low Duty ratio Variable valve lift diagnosis oil pressure switch	$\geq 62\%$ ON
High Duty ratio Variable valve lift diagnosis oil pressure switch	$< 33\%$ OFF

Time Needed for Diagnosis:

Low side: 208 ms

High side: 3000 ms

F: DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0026. <Ref. to GD(H6DO)-14, DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

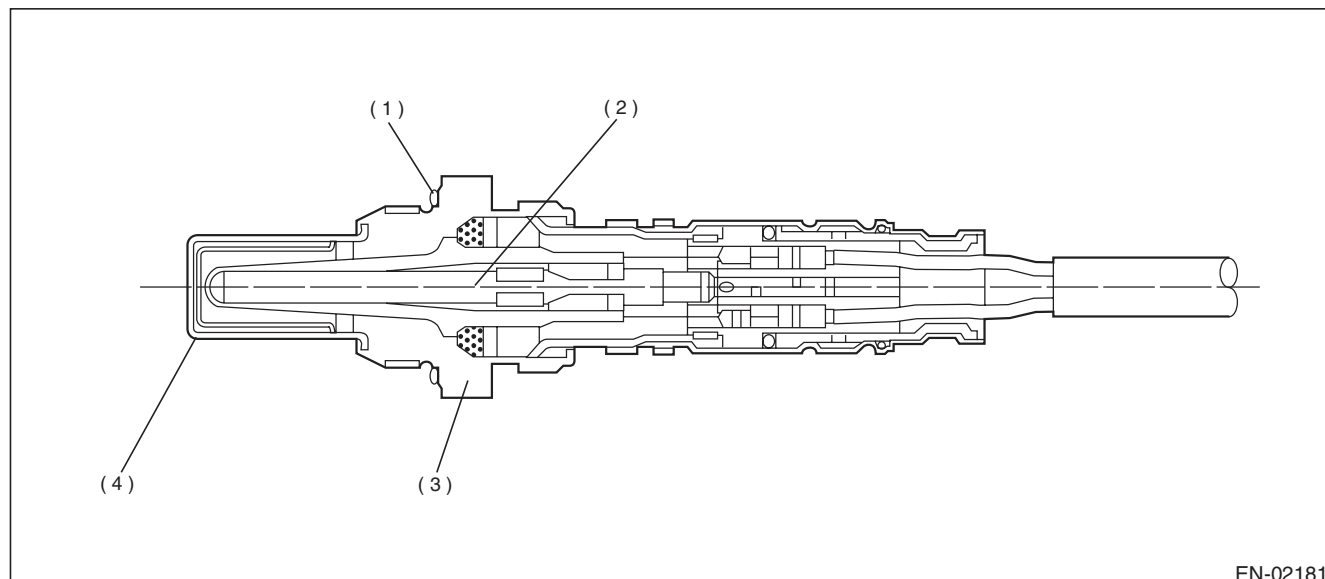
G: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect functional errors of the front oxygen (A/F) sensor heater.

Judge as NG when it is determined that the front oxygen (A/F) sensor impedance is large when looking at engine status such as deceleration fuel cut.

2. COMPONENT DESCRIPTION



EN-02181

(1) Gasket

(3) Sensor housing

(4) Protection tube

(2) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Condition established time	≥ 30000 ms
Battery voltage	≥ 10.9 V
Heater current	Permitted
Control duty ≥ 35 %	Experienced
After fuel cut	≥ 20000 ms

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 30000 ms or more have passed since the engine started.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Front oxygen (A/F) sensor impedance	> 50 Ω

Time Needed for Diagnosis: 10000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Front oxygen (A/F) sensor impedance	$\leq$ 50 Ω

Time Needed for Diagnosis: 10000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

H: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

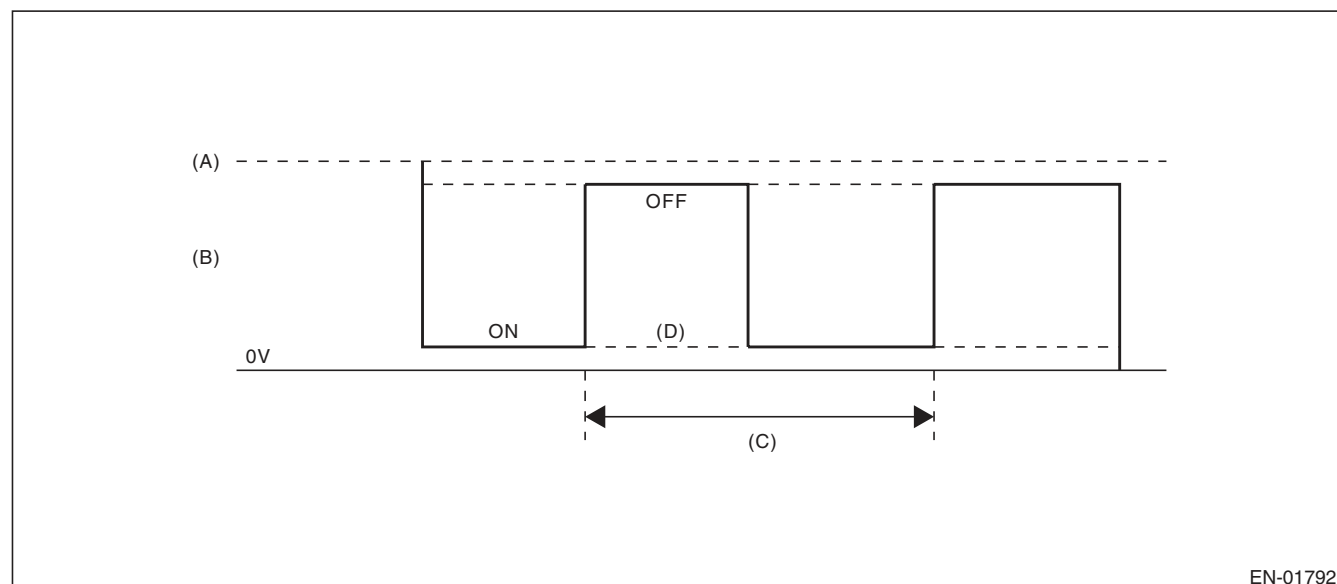
1. OUTLINE OF DIAGNOSIS

Detect front oxygen (A/F) sensor heater open or short circuit.

The front oxygen (A/F) sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.

Judge as NG when the terminal voltage remains Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage

(C) 128 milliseconds

(D) Low error

(B) Front oxygen (A/F) sensor heater
output voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Front oxygen (A/F) sensor heater control duty	< 87.5 %

Time Needed for Diagnosis: 4 ms × 250 time(s)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage level	High

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

I: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

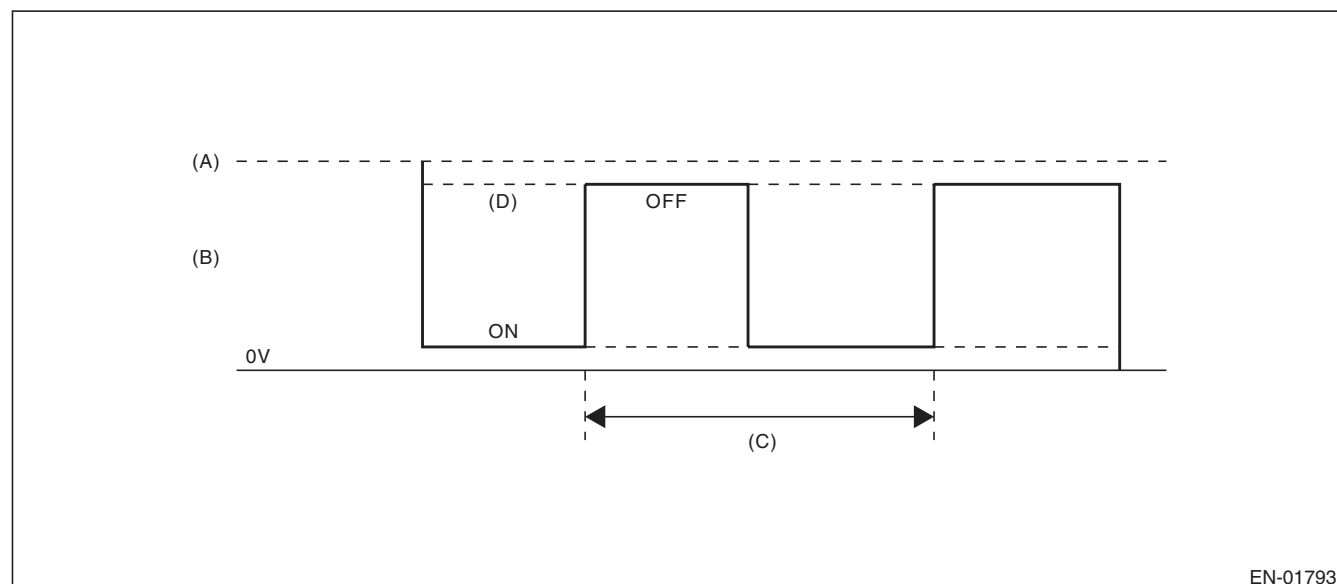
1. OUTLINE OF DIAGNOSIS

Detect front oxygen (A/F) sensor heater open or short circuit.

The front oxygen (A/F) sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.

Judge as NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



(A) Battery voltage

(C) 128 milliseconds

(D) High error

(B) Front oxygen (A/F) sensor heater
output voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Front oxygen (A/F) sensor heater control duty	$\geq 12.5 \%$

Time Needed for Diagnosis: 4 ms $\times$ 250 time(s)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

J: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

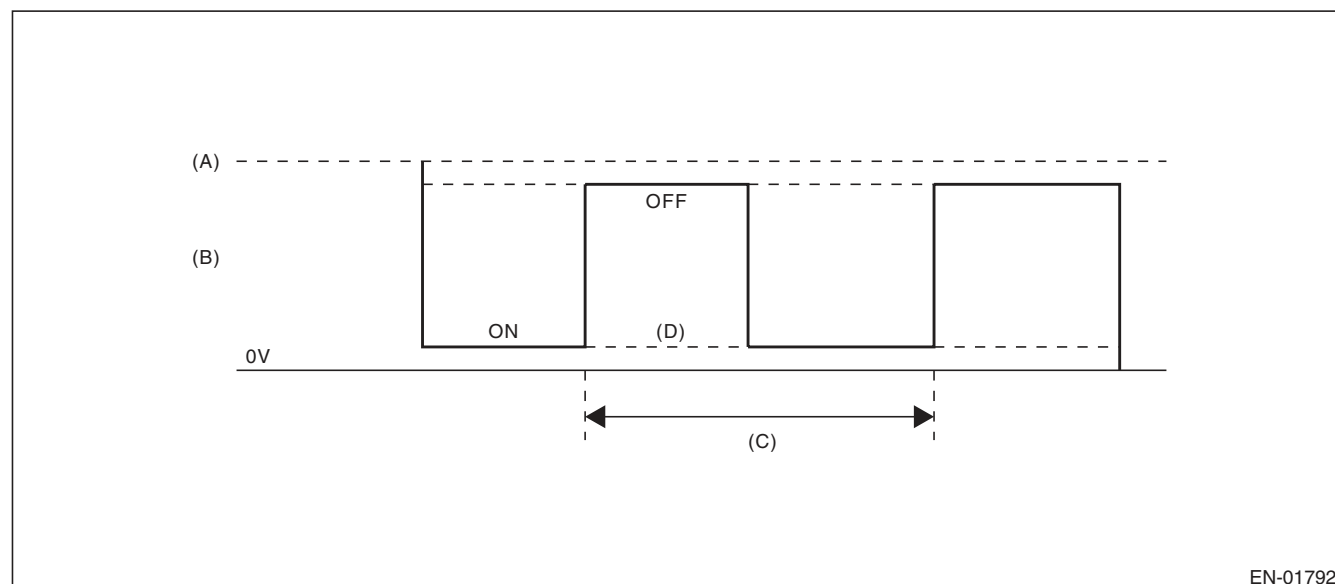
1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor heater open or short circuit.

The rear oxygen sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.

Judge as NG when the terminal voltage remains Low.

2. COMPONENT DESCRIPTION



EN-01792

(A) Battery voltage

(C) 256 milliseconds (cycles)

(D) Low error

(B) Output voltage of the rear oxygen sensor heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after engine starting	$\geq 1 \text{ second}$
Engine speed	$< 4500 \text{ rpm}$

4. GENERAL DRIVING CYCLE

After starting the engine, perform the diagnosis continuously when engine is low speed.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Rear oxygen sensor heater control duty	< 75 %

Time Needed for Diagnosis: 8 ms × 320 time(s)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage level	High

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

K: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

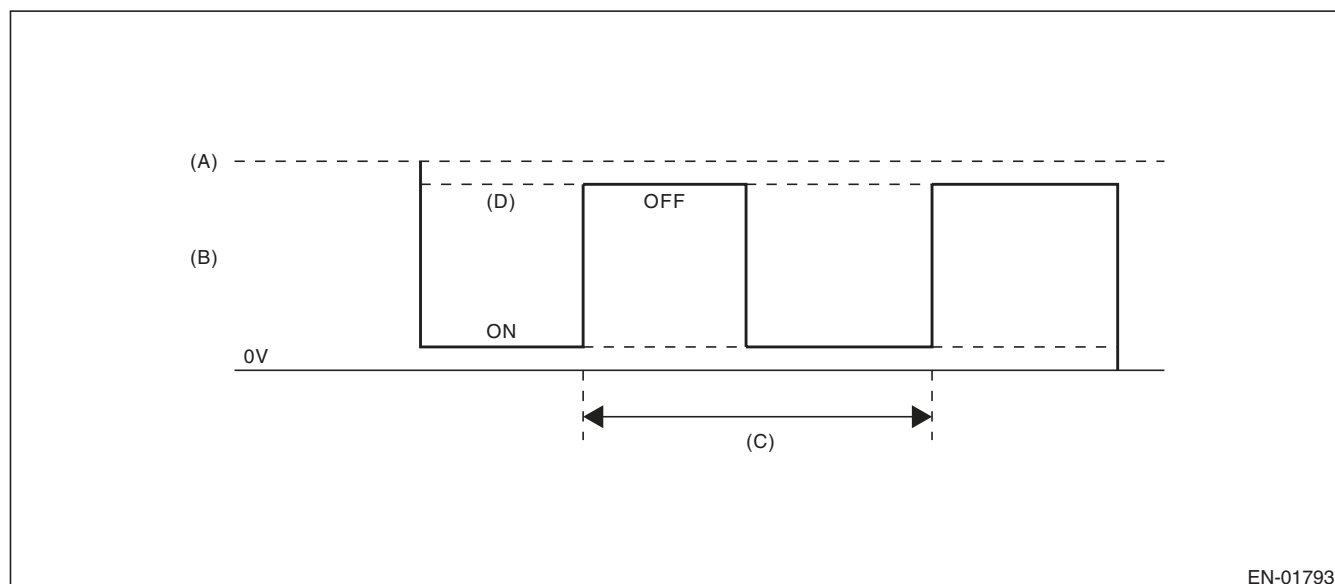
1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor heater open or short circuit.

The rear oxygen sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.

Judge as NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



(A) Battery voltage

(C) 256 milliseconds (cycles)

(D) High error

(B) Output voltage of the rear oxygen sensor heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after engine starting	$\geq 1 \text{ second}$
Engine speed	$< 4500 \text{ rpm}$

4. GENERAL DRIVING CYCLE

After starting the engine, perform the diagnosis continuously when engine is low speed.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Rear oxygen sensor heater control duty	≥ 15 %

Time Needed for Diagnosis: 8 ms × 320 time(s)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

Time Needed for Diagnosis: Less than 1 second

L: DTC P0050 HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0030. <Ref. to GD(H6DO)-17, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

M: DTC P0051 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0031. <Ref. to GD(H6DO)-19, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

N: DTC P0052 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0032. <Ref. to GD(H6DO)-21, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

O: DTC P0057 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0037. <Ref. to GD(H6DO)-23, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

P: DTC P0058 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0038. <Ref. to GD(H6DO)-25, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

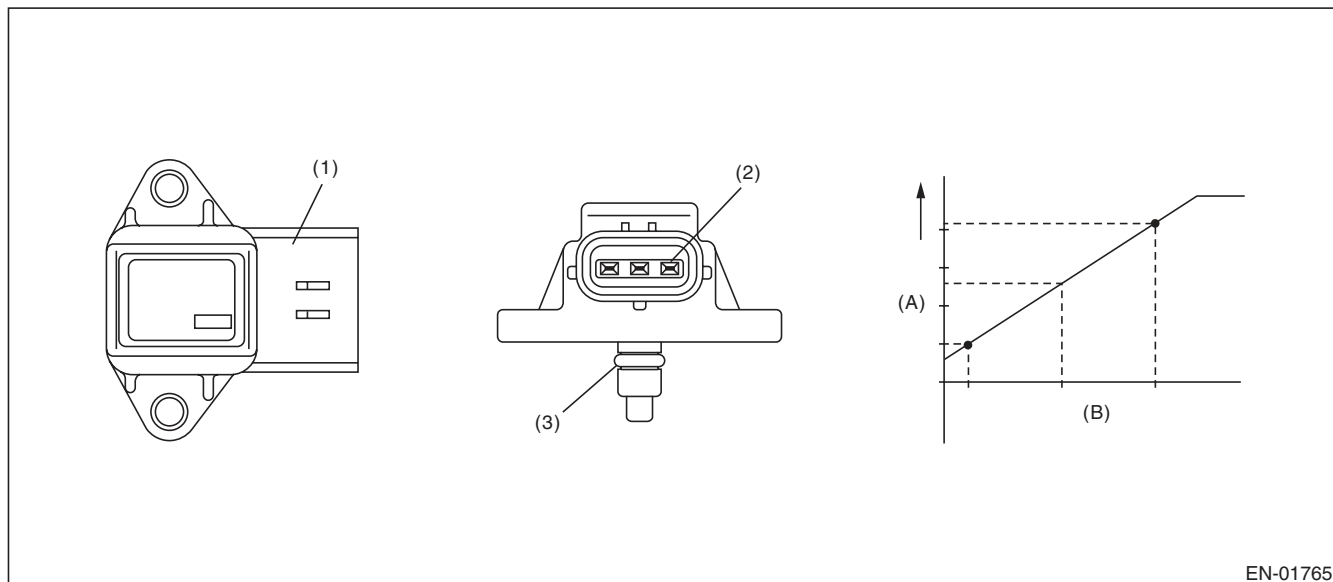
Q: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

1. OUTLINE OF DIAGNOSIS

Detect problems in the intake manifold pressure sensor output properties.

Judge as NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

2. COMPONENT DESCRIPTION



(A) Output voltage

(B) Absolute pressure

(1) Connector

(2) Terminals

(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167 °F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

Judge as NG when Low side or High side becomes NG.

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Low	
Engine speed	< 2500 rpm
Throttle position	≥ 15 °
Output voltage	< 2.12 V
Engine load	> 0.87 g/rev (0.03 oz/rev)
High	
Engine speed	500 rpm — 850 rpm
Throttle position	< 3.5 °
Output voltage	≥ 2.66 V
Engine load	< 0.6 g/rev (0.02 oz/rev)

Time Needed for Diagnosis:

Low side: 3000 ms

High side: 10000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG when both Low side and High side become OK.

If the duration of time while the following conditions are met is longer than the time indicated, judge as OK.

Judgement Value

Malfunction criteria	Threshold value
Low	
Engine speed	< 2500 rpm
Throttle position	≥ 15 °
Output voltage	≥ 2.12 V
Engine load	> 0.87 g/rev (0.03 oz/rev)
High	
Engine speed	500 rpm — 850 rpm
Throttle position	< 3.5 °
Output voltage	< 2.66 V
Engine load	< 0.6 g/rev (0.02 oz/rev)

Time Needed for Diagnosis:

Low side: Less than 1 second

High side: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

R: DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the open circuit of the oil switching solenoid valve.

Judge as NG when the current is small even though the output duty is large.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Duty ratio	$\geq 30 \%$
Control current	$< 0.026 \text{ A}$

Time Needed for Diagnosis: 2000 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Oil switching solenoid valve target current value – Oil switching solenoid valve current value	$< 0.08 \text{ A}$
Target current	$\geq 0.11 \text{ A}$

Time Needed for Diagnosis: 2000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

S: DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect short circuits of the oil switching solenoid valve.

Judge as a short NG when the current is large even though the output duty is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Duty ratio	$< 7 \%$
Control current	$\geq 0.465 \text{ A}$

Time Needed for Diagnosis: 2000 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
$ \text{Oil switching solenoid valve target current value} - \text{Oil switching solenoid valve current value} $	$< 0.08 \text{ A}$

Time Needed for Diagnosis: 2000 ms

T: DTC P0082 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0076. <Ref. to GD(H6DO)-29, DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

U: DTC P0083 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0077. <Ref. to GD(H6DO)-30, DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

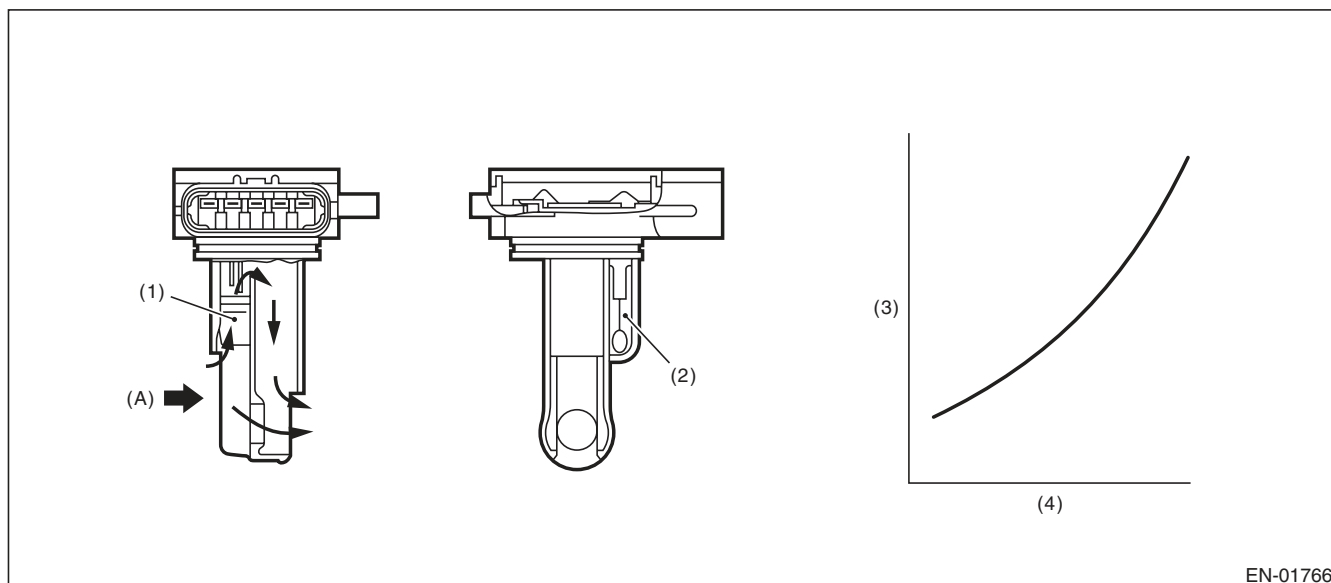
V: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output properties.

Judge as a low side NG when the air flow voltage indicates a small value regardless of running in a state where the air flow voltage increases. Judge as a high side NG when the air flow voltage indicates a large value regardless of running in a state where the air flow voltage decreases. Judge air flow sensor property NG when the Low side or High side becomes NG.

2. COMPONENT DESCRIPTION



EN-01766

(A) Air

(1) Air flow sensor

(2) Intake air temperature sensor

(3) Voltage (V)

(4) Amount of intake air (kg (lb)/s)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

Judge as NG when Low side or High side becomes NG.

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Low	
Output voltage	< 1.79 V
Engine speed	≥ 2000 rpm
Throttle opening angle	≥ 15 °
Intake manifold pressure	≥ 73.3 kPa (550 mmHg, 21.7 inHg)
High (1)	
Output voltage	≥ 1.83 V
Engine speed	500 rpm — 850 rpm
Throttle opening angle	< 3.5 °
Intake manifold pressure	≥ 46.7 kPa (350 mmHg, 13.8 inHg)
High (2)	
Output voltage	≥ 1.73 V
Engine speed	500 rpm — 850 rpm
Throttle opening angle	< 3.5 °
Intake manifold pressure	≥ 46.7 kPa (350 mmHg, 13.8 inHg)
Fuel system diagnosis	Rich side malfunction

Time Needed for Diagnosis:

Low: 5000 ms

High: 10000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG when both Low side and High side become OK.

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Low	
Output voltage	≥ 1.79 V
Engine speed	≥ 2000 rpm
Throttle opening angle	≥ 15 °
Intake manifold pressure	≥ 73.3 kPa (550 mmHg, 21.7 inHg)
High	
Output voltage	< 1.83 V
Engine speed	500 rpm — 850 rpm
Throttle opening angle	< 3.5 °
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)
Fuel system diagnosis	Rich side normal

Time Needed for Diagnosis:

Low: Less than 1 second

High: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

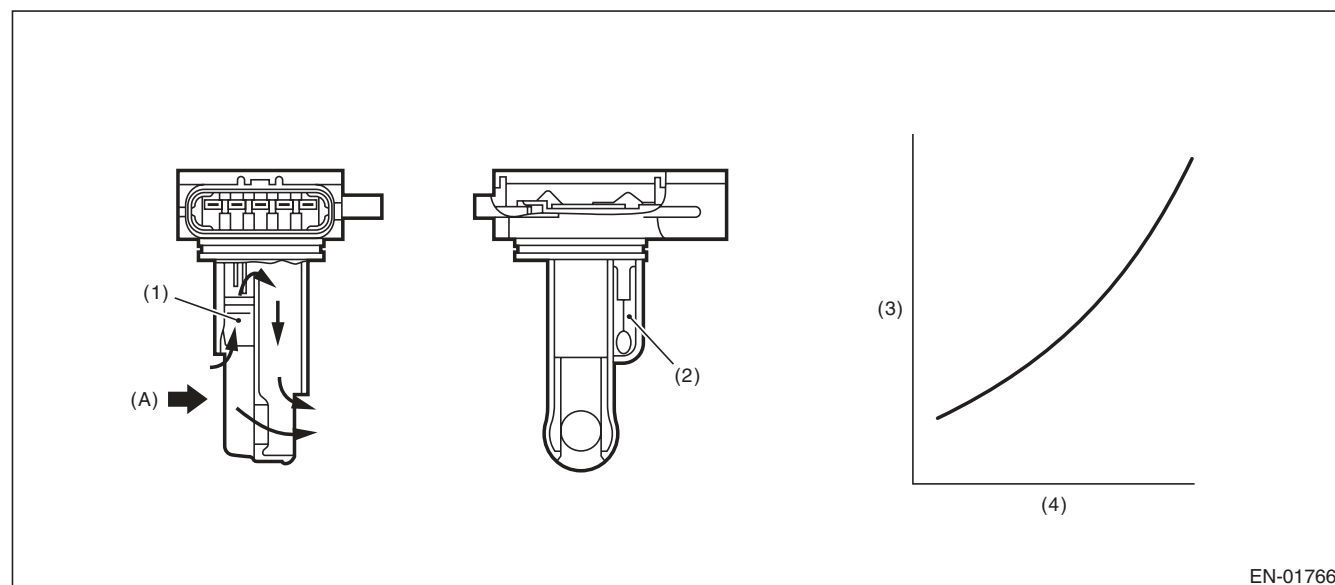
W: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-01766

(A) Air

(1) Air flow sensor

(3) Voltage (V)

(4) Amount of intake air (kg (lb)/s)

(2) Intake air temperature sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	≤ 0.200 V

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	> 0.200 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

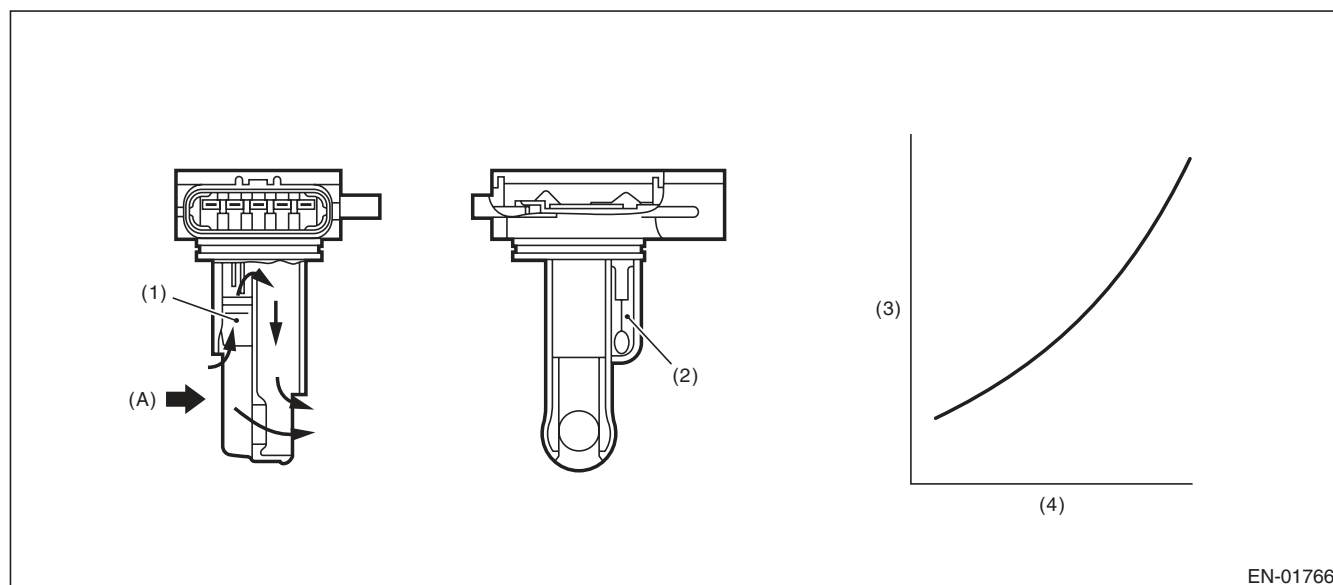
X: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor

(3) Voltage (V)

(4) Amount of intake air (kg (lb)/s)

(2) Intake air temperature sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	≥ 4.791 V

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	< 4.791 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

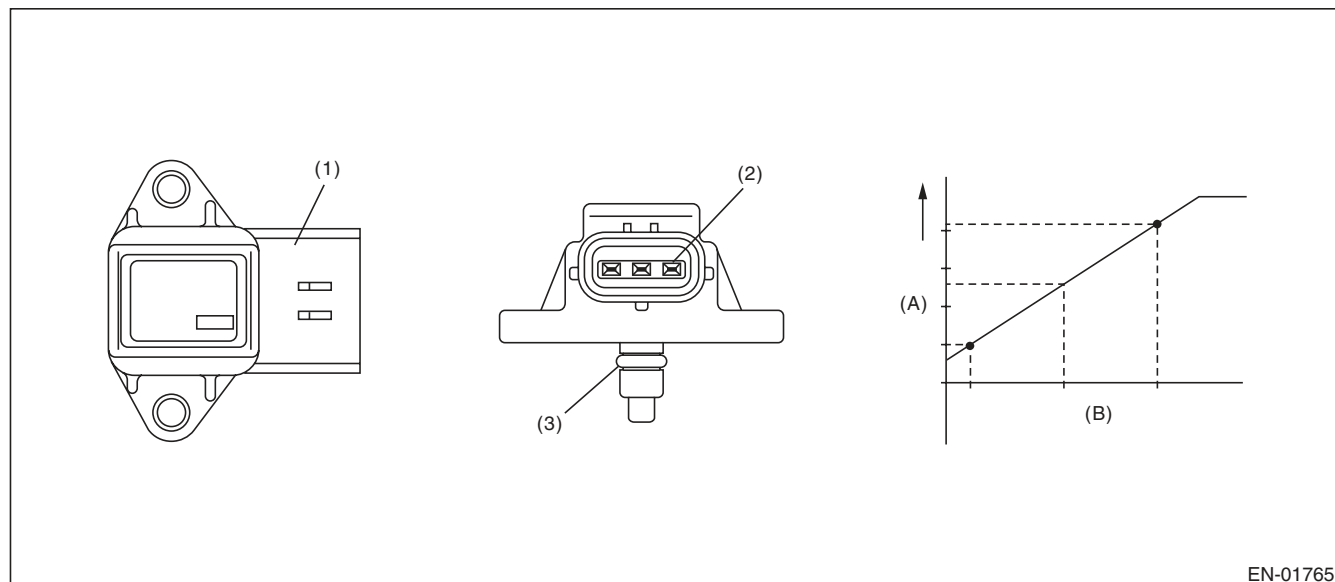
Y: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-01765

(A) Output voltage

(B) Absolute pressure

(1) Connector

(2) Terminals

(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	$\leq 0.568 \text{ V}$

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	$> 0.568 \text{ V}$

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

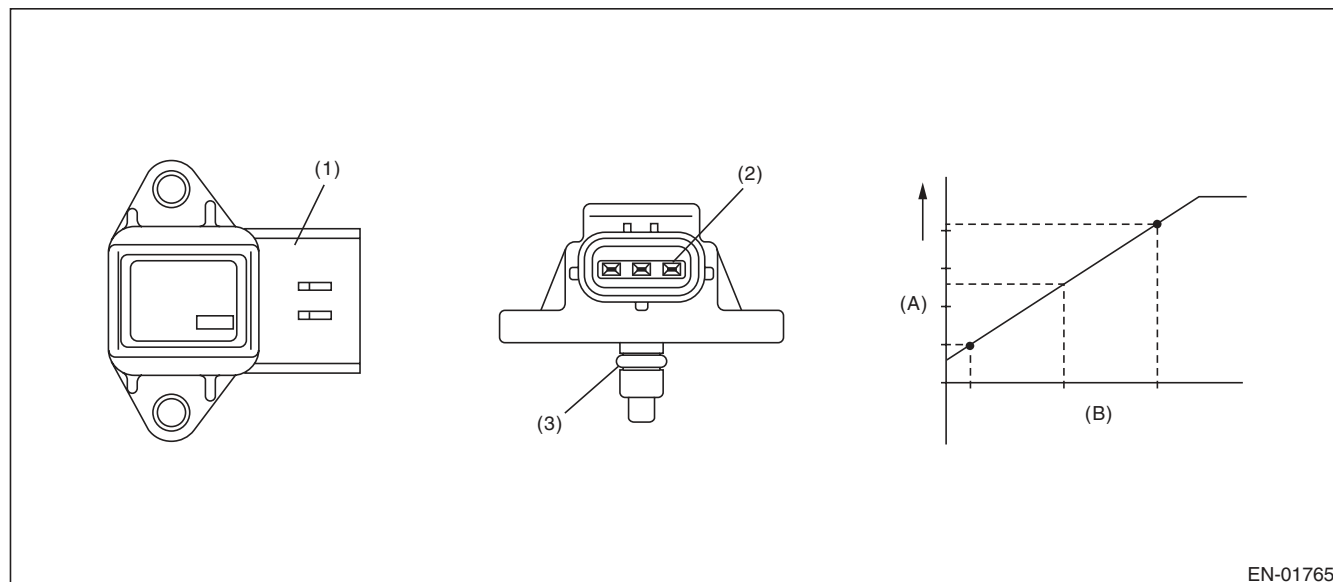
Z: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-01765

(A) Output voltage

(B) Absolute pressure

(1) Connector

(2) Terminals

(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	$\geq 4.382 \text{ V}$

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	$< 4.382 \text{ V}$

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

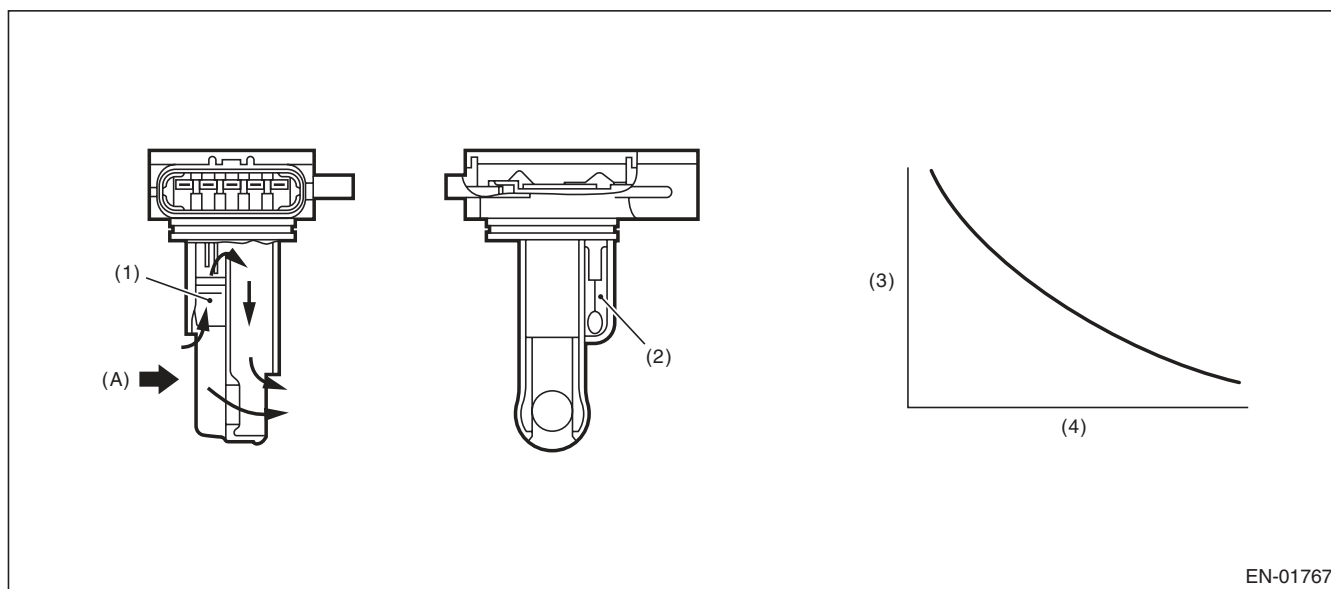
AA:DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property.

Judge as NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

2. COMPONENT DESCRIPTION



EN-01767

(A) Air

(1) Air flow sensor

(3) Resistance value (Ω)

(4) Intake air temperature °C (°F)

(2) Intake air temperature sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature at engine starting	< 30 °C (86 °F)
Engine coolant temperature	≥ 95 °C (203 °F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 60 km/h (37.3 MPH)	≥ 600 s

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is met after warming up from a cold condition.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

Judge as NG when the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
Output voltage difference between Max. and Min.	< 0.02 V(Equivalent to approximately 0.5°C (0.9°F) near 25°C)

Time Needed for Diagnosis: Less than 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
Output voltage difference between Max. and Min.	≥ 0.02 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

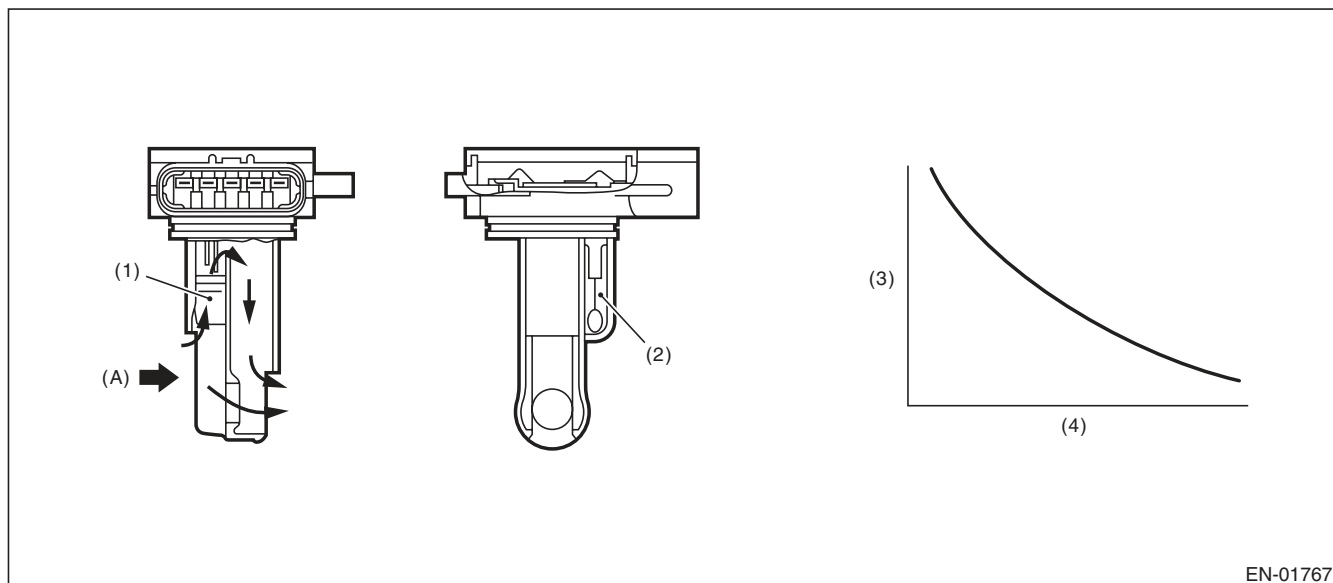
GENERAL DESCRIPTION

AB:DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the intake air temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-01767

(A) Air

(1) Air flow sensor

(3) Resistance value (Ω)

(4) Intake air temperature °C (°F)

(2) Intake air temperature sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	< 0.231 V

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	≥ 0.231 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

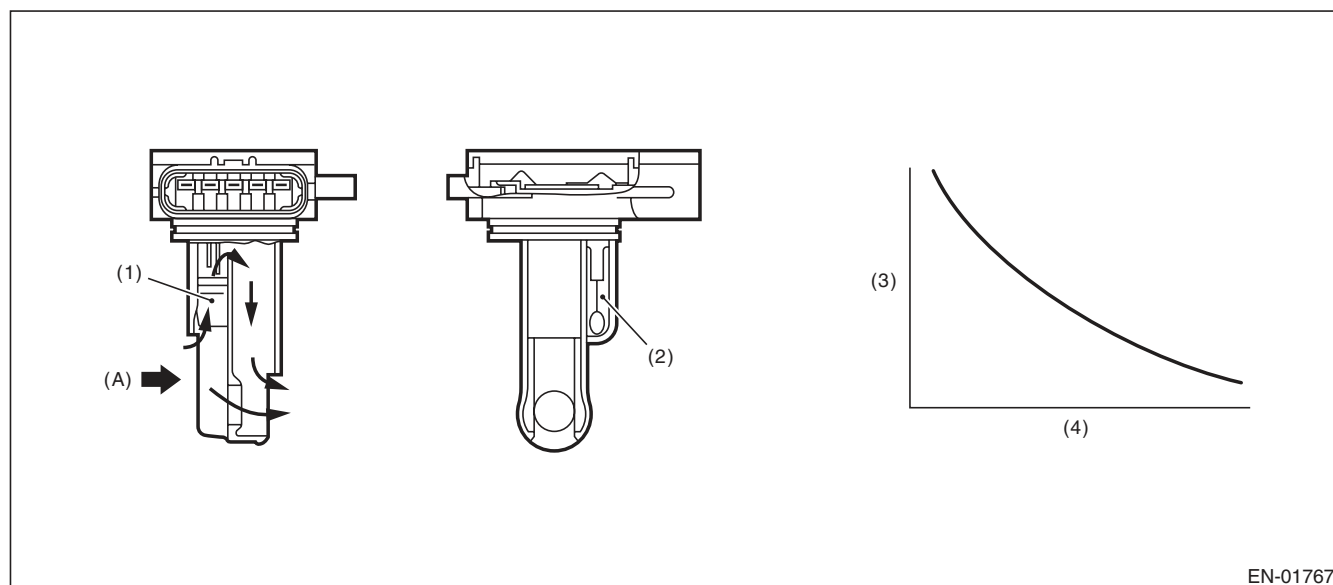
GENERAL DESCRIPTION

AC:DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the intake air temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-01767

(A) Air

(1) Air flow sensor

(3) Resistance value (Ω)

(4) Intake air temperature °C (°F)

(2) Intake air temperature sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	≥ 4.716 V

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	< 4.716 V

Time Needed for Diagnosis: Less than 1 second

GD(H6DO)-40

Diagnostic Trouble Code (DTC) Detecting Criteria

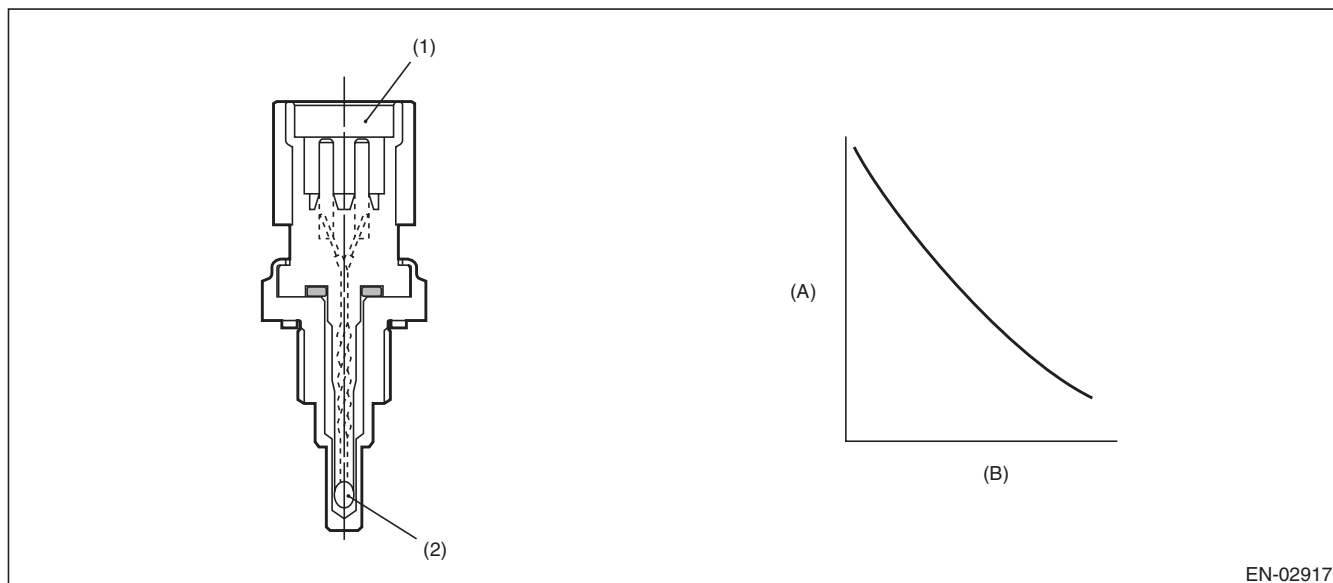
GENERAL DESCRIPTION

AD:DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the engine coolant temperature sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-02917

(A) Resistance value (k Ω)

(B) Temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

(1) Connector

(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	< 0.265 V

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	≥ 0.265 V

Time Needed for Diagnosis: Less than 1 second

GD(H6DO)-41

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

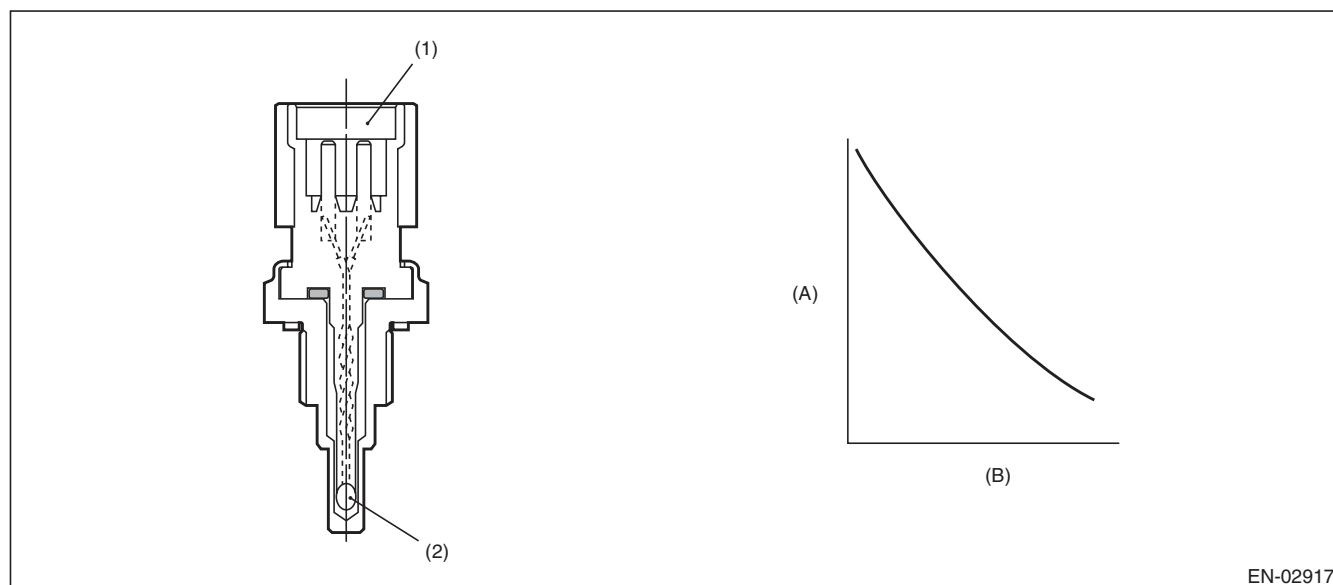
AE:DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the engine coolant temperature sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-02917

(A) Resistance value (k Ω)

(B) Temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

(1) Connector

(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	$\geq 4.716 \text{ V}$

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	$< 4.716 \text{ V}$

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

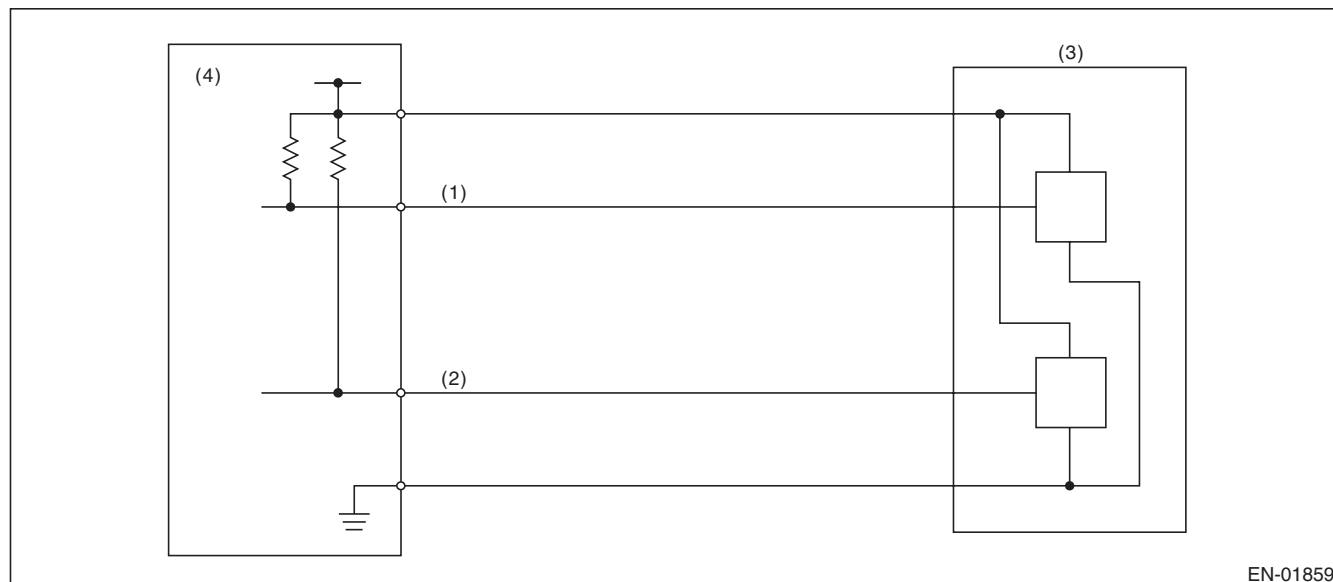
AF:DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal

(3) Throttle position sensor

(4) Engine control module (ECM)

(2) Throttle position sensor 2 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 6\text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Sensor 1 input voltage	$\leq 0.224\text{ V}$

Time Needed for Diagnosis: 24 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Sensor 1 input voltage	$> 0.224\text{ V}$

Time Needed for Diagnosis: 24 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

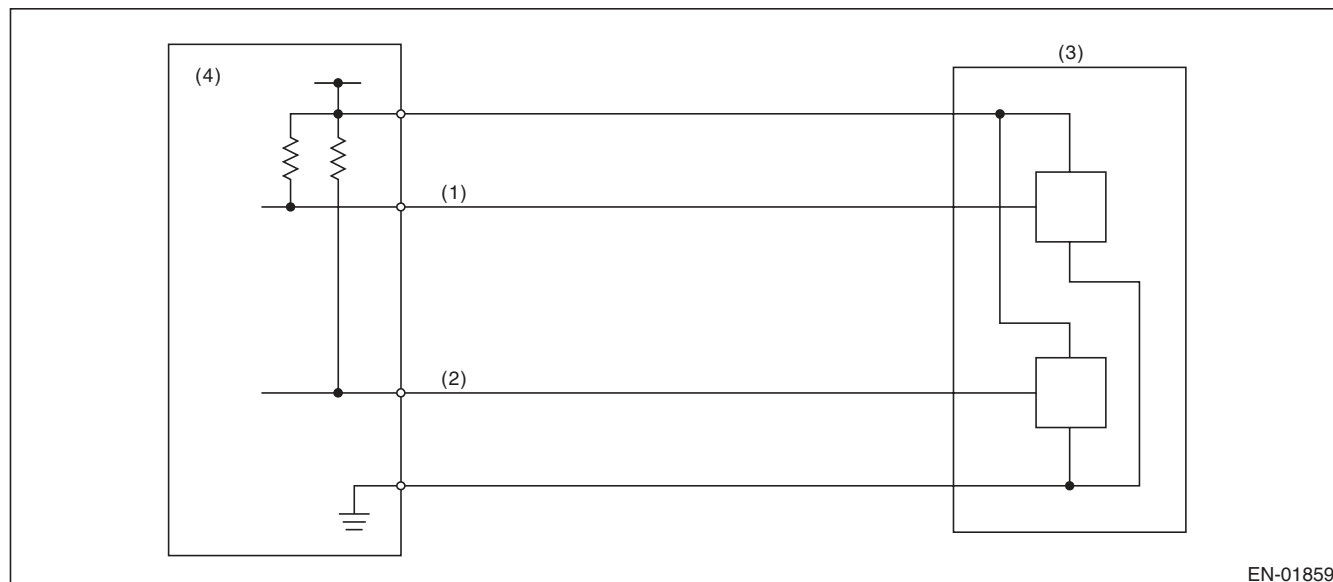
AG:DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal

(3) Throttle position sensor

(4) Engine control module (ECM)

(2) Throttle position sensor 2 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 6\text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Sensor 1 input voltage	$\geq 4.851\text{ V}$

Time Needed for Diagnosis: 24 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Sensor 1 input voltage	$< 4.851\text{ V}$

Time Needed for Diagnosis: 24 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

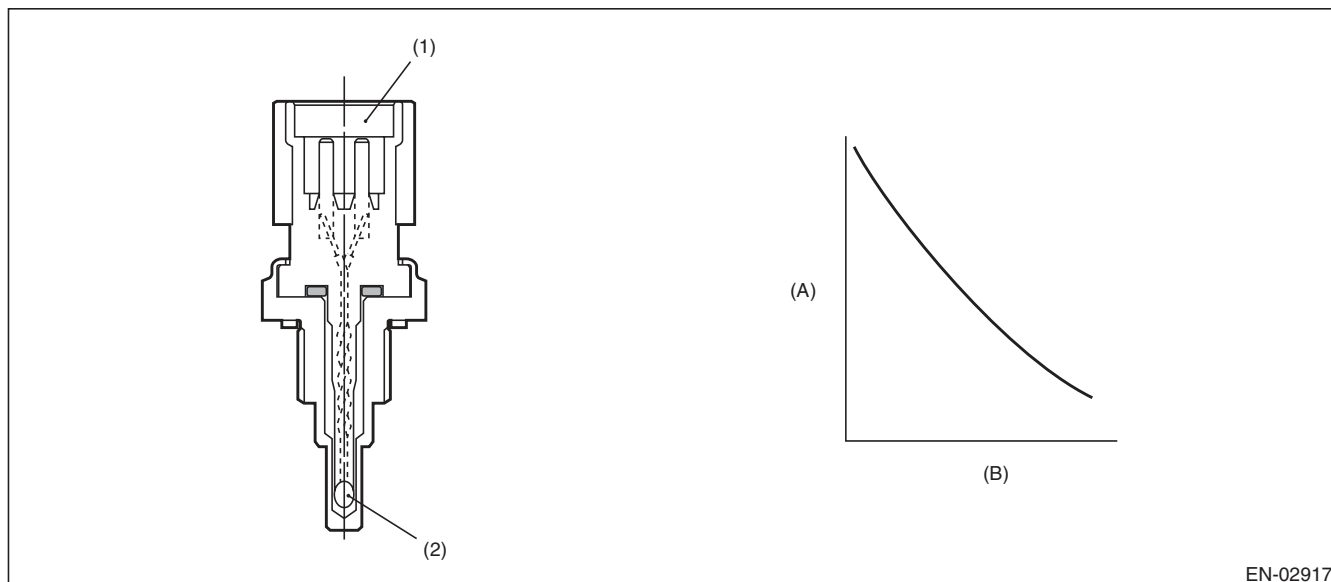
AH:DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property.

Judge as NG when the engine coolant temperature does not rise in driving conditions where it should.

2. COMPONENT DESCRIPTION



EN-02917

(A) Resistance value (k Ω)

(B) Temperature °C (°F)

(1) Connector

(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	$\geq$ Value from Map
Battery voltage	≥ 10.9 V

Map

Engine coolant temperature °C (°F)	-40 (-40)	110 (230)
Engine speed rpm	500	500

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine start.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

Judge as NG if the criteria below are met.

Judgement Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20 °C (68 °F)
Timer for diagnosis after engine start	≥ Judgement value of timer after engine start

Timer for diagnosis after engine start

a. Timer stop at fuel cut

b. During the driving conditions except a) above, timer counts up as follows.

64 milliseconds + TWCNT milliseconds (the time of at 64 milliseconds)

TWCNT is defined as follows,

TWCNT = 0 at idle switch ON,

TWCNT show on the following table at idle switch OFF.

		Vehicle speed km/h (MPH)							
		0 (0)	8 (5)	16 (9.9)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
Temperature °C (°F)	-20 (-4)	0 ms	37.136 ms	74.272 ms	111.41 ms	126.66 ms	141.91 ms	163.59 ms	185.26 ms
	-10 (14)	0 ms	27.391 ms	54.782 ms	82.173 ms	99.65 ms	117.13 ms	135.96 ms	154.8 ms
	0 (32)	0 ms	17.646 ms	35.292 ms	52.938 ms	72.64 ms	92.341 ms	108.34 ms	124.33 ms
	10 (50)	0 ms	7.9012 ms	15.802 ms	23.704 ms	45.63 ms	67.556 ms	80.711 ms	93.867 ms
	20 (68)	0 ms	7.9012 ms	15.802 ms	23.704 ms	45.63 ms	67.556 ms	80.711 ms	93.867 ms

Judgement value of timer after engine starting

$$t = 429523 \text{ ms} - 28605 \text{ ms} \times T_i$$

T_i : The lowest coolant temperature after engine start

Time Needed for Diagnosis: Less than 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgement Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 20 °C (68 °F)

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

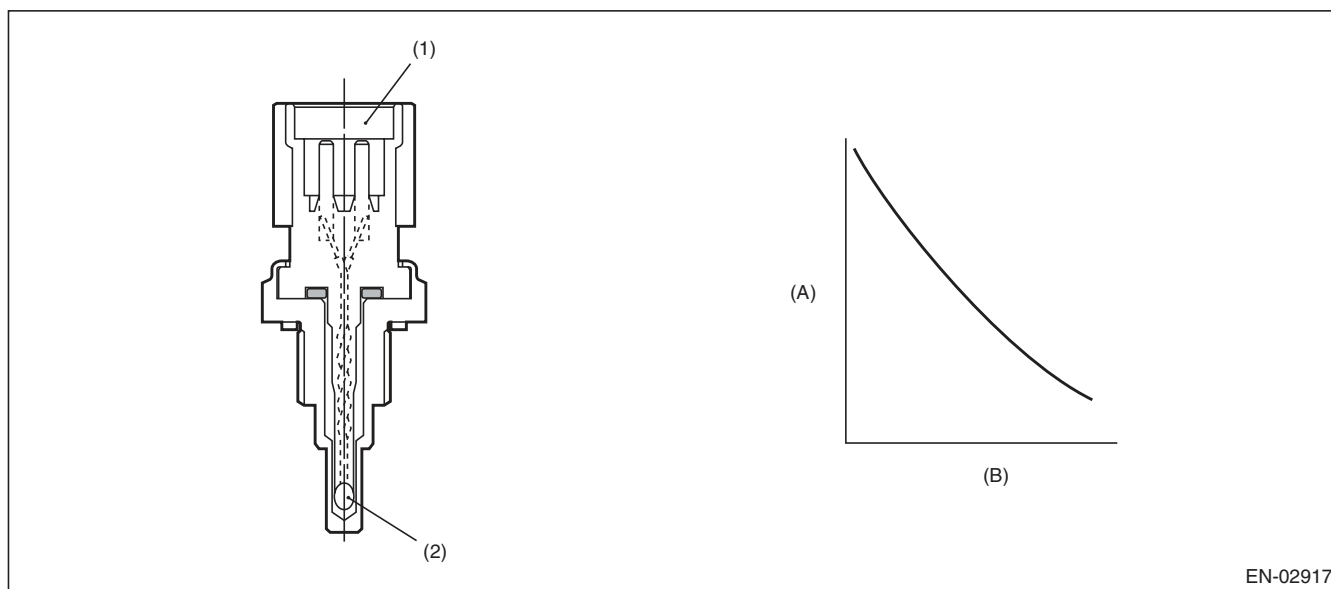
AI: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of the engine coolant temperature sensor characteristics.

Memorize the engine coolant temperature and fuel temperature at the last engine stop, and use them to judge as NG when the engine coolant temperature does not decrease when it should.

2. COMPONENT DESCRIPTION



EN-02917

(A) Resistance value (k Ω)

(B) Temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

(1) Connector

(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Refueling from the last engine stop till the current engine start	None
Fuel level	$\geq 15 \text{ L}$ (3.96 US gal, 3.3 Imp gal)
Engine coolant temperature at the last engine stop	$\geq 75 \text{ }^{\circ}\text{C}$ (167 $^{\circ}\text{F}$)

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Engine coolant temperature at the last engine stop — Minimum engine coolant temperature after the engine start	< 2.5 °C (36.5 °F)
Fuel temperature at the last engine stop — fuel temperature	≥ 5 °C (41 °F)
Intake air temperature — fuel temperature	< 2.5 °C (36.5 °F)
Fuel temperature	< 35 °C (95 °F)

Time Needed for Diagnosis: 2500 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Engine coolant temperature at the last engine stop — Minimum engine coolant temperature after the engine start	≥ 2.5 °C (36.5 °F)

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

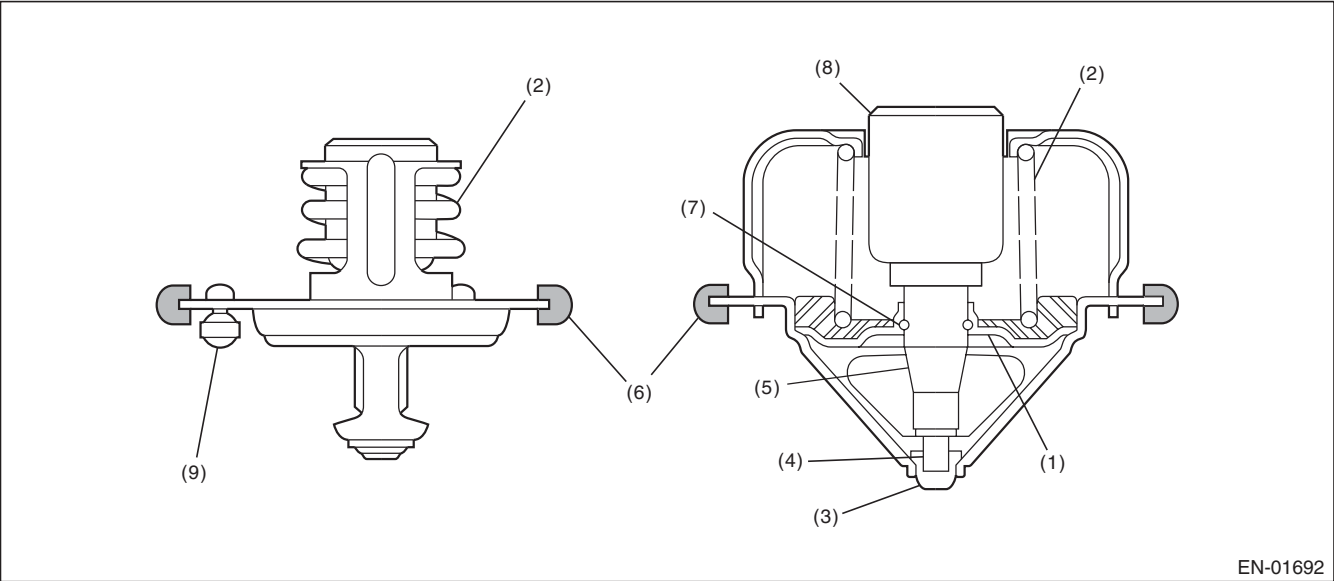
GENERAL DESCRIPTION

AJ:DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the thermostat function.
Judge as NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge as OK when the engine coolant temperature becomes to 75°C (167°F), and the difference is small, before judging NG.

2. COMPONENT DESCRIPTION



- | | | |
|-------------|-----------------|------------------|
| (1) Valve | (4) Piston | (7) Stop ring |
| (2) Spring | (5) Guide | (8) Wax element |
| (3) Stopper | (6) Rubber seal | (9) Jiggle valve |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9 \text{ V}$
Estimate ambient temperature	$\geq -7 \text{ }^{\circ}\text{C}$ (19.4 $^{\circ}\text{F}$)
Thermostat malfunction diagnosis	Incomplete
Engine coolant temperature at engine starting	$< 55 \text{ }^{\circ}\text{C}$ (131 $^{\circ}\text{F}$)
Estimated coolant temperature	$\geq 75 \text{ }^{\circ}\text{C}$ (167 $^{\circ}\text{F}$)
Engine coolant temperature	$\leq 75 \text{ }^{\circ}\text{C}$ (167 $^{\circ}\text{F}$)
(Estimated – Measured) Engine coolant temperature	$> 20 \text{ }^{\circ}\text{C}$ (68 $^{\circ}\text{F}$)
Vehicle speed	$\geq 20 \text{ km/h}$ (12.4 MPH)

Time Needed for Diagnosis: 64 ms $\times$ 3 time(s) $\times$ 120 time(s)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9 \text{ V}$
Estimate ambient temperature	$\geq -7 \text{ }^{\circ}\text{C}$ (19.4 $^{\circ}\text{F}$)
Thermostat malfunction diagnosis	Incomplete
Engine coolant temperature at engine starting	$< 55 \text{ }^{\circ}\text{C}$ (131 $^{\circ}\text{F}$)
Engine coolant temperature	$\geq 75 \text{ }^{\circ}\text{C}$ (167 $^{\circ}\text{F}$)
(Estimated – Measured) Engine coolant temperature	$\leq 20 \text{ }^{\circ}\text{C}$ (68 $^{\circ}\text{F}$)

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

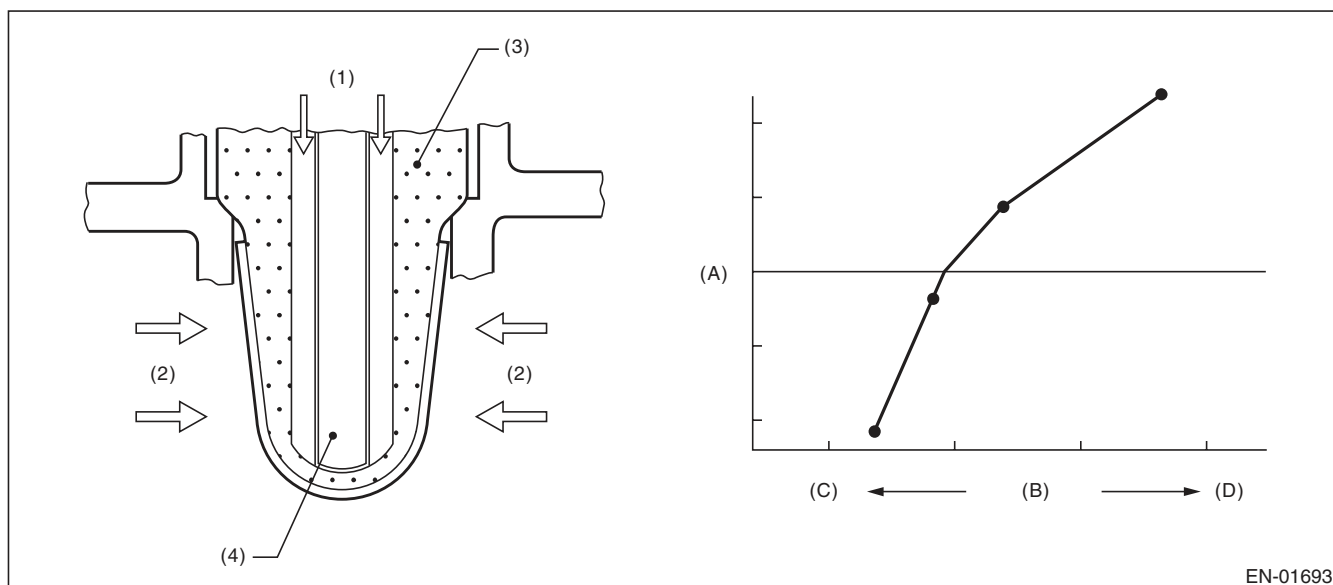
AK:DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge as NG when the element applied voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



(A) Electromotive force

(B) Air fuel ratio

(C) Lean

(D) Rich

(1) Atmosphere

(2) Exhaust gas

(3) ZrO_2

(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Input voltage or Input current	< 1.800 V < -0.005 A

Time Needed for Diagnosis: 1000 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Input voltage Input current	≥ 1.800 V ≥ -0.005 A

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

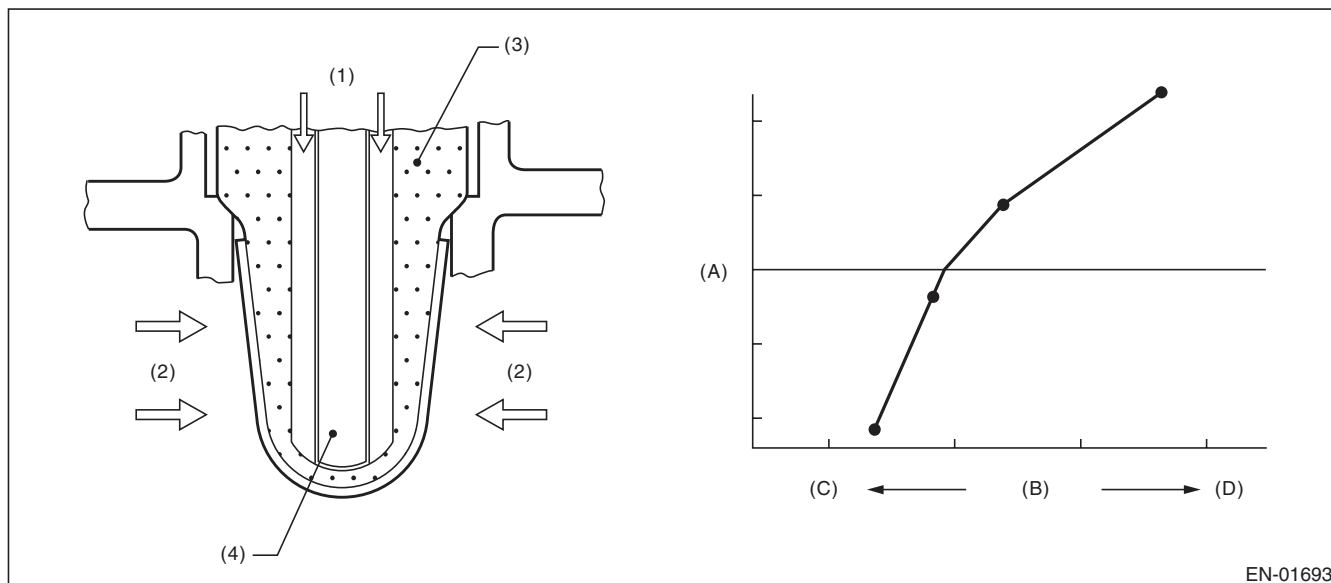
AL:DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge as NG when the element applied voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



(A) Electromotive force

(B) Air fuel ratio

(C) Lean

(D) Rich

(1) Atmosphere

(2) Exhaust gas

(3) ZrO_2

(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Input voltage or Input current	> 3.800 V > 0.005 A

Time Needed for Diagnosis: 1000 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Input voltage Input current	≤ 3.800 V ≤ 0.005 A

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

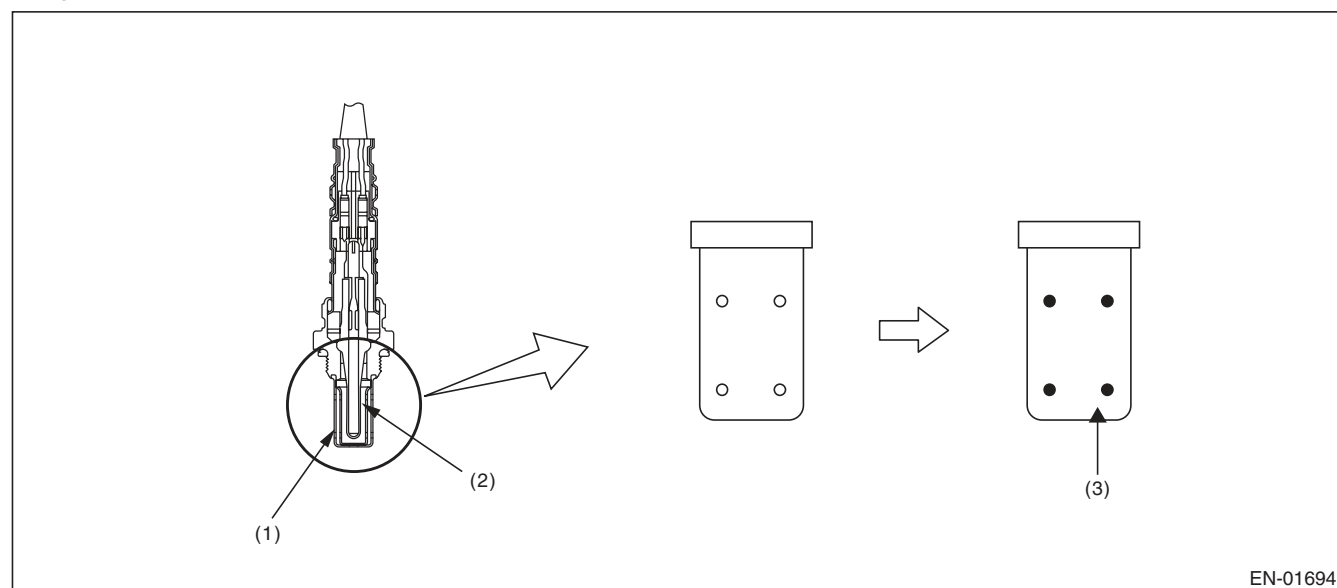
AM:DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the slow response of front oxygen (A/F) sensor.

Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed.

When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the sensor cover holes are clogged, the rich to lean judgment in the ECM is delayed when the actual change from rich to lean occurs. Judge as NG when the actual movement in comparison to the ECM control amount is slow.



(1) Cover

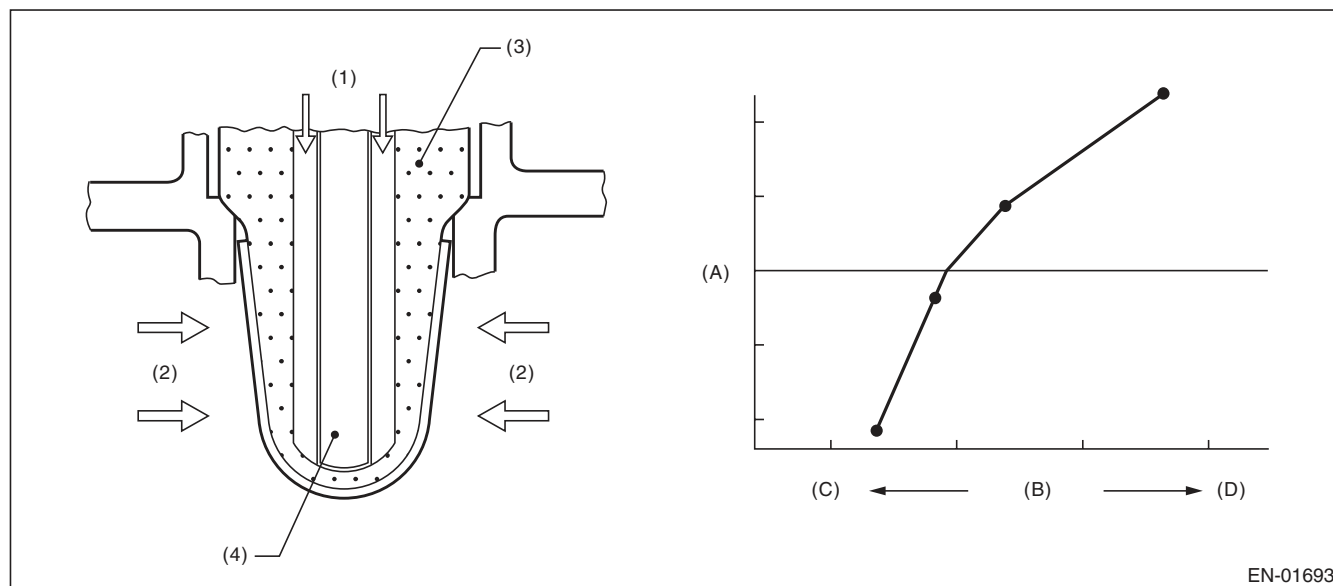
(2) Zirconia

(3) Clogging

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. COMPONENT DESCRIPTION



(A) Electromotive force

(B) Air fuel ratio

(C) Lean

(D) Rich

(1) Atmosphere

(2) Exhaust gas

(3) ZrO_2

(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 1024 ms
Battery voltage	≥ 10.9 V
Barometric pressure	> 75 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	Operation
Front oxygen (A/F) sensor impedance	$0 \Omega - 50 \Omega$
Elapsed time after starting the engine	≥ 120000 ms
Engine coolant temperature	≥ 75 °C (167 °F)
Engine speed	1000 rpm — 2500 rpm
Vehicle speed	10 km/h — 120 km/h (6.2 MPH — 74.6 MPH)
Amount of intake air	10 g/s — 40 g/s (0.35 oz/s — 1.41 oz/s)
Engine load	< 0.02 g/rev (0 oz/rev)
Learning value of EVAP conc. during purge	< 0.2
Total time of operating canister purge	≥ 19.9 s

4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 km/h — 120 km/h (6.2 MPH — 74.6 MPH) 120000 ms or more after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Calculate faf difference every $32\text{ms} \times 4$, and the λ value difference. Calculate the diagnosis value after calculating 820 time(s).

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
$\text{para}fca = \text{td}2\text{faf}/\text{td}2\text{lmd}$ where, $\text{td}2\text{faf} (N) = \text{td}2\text{faf} (n-1) + \text{d}2\text{faf} (n) $ $\text{td}2\text{lmd} (N) = \text{td}2\text{lmd} (n-1) + \text{d}2\text{lmd} (n) $ add up to $32\text{ ms} \times 4 \times 820\text{ time(s)}$. $\text{d}2\text{faf} (n) = (\text{faf} (n) - \text{faf} (n-1)) - (\text{faf} (n-1) - \text{faf} (n-2))$ $\text{d}2\text{lmd} (n) = (\text{lmd} (n) - \text{lmd} (n-1)) - (\text{lmd} (n-1) - \text{lmd} (n-2))$ faf = main feedback compensation coefficient every 128 milliseconds lmd = output lambda every 128 milliseconds	> 0.2

Time Needed for Diagnosis: $32\text{ ms} \times 4 \times 820\text{ time(s)}$

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
$\text{para}fca = \text{td}2\text{faf}/\text{td}2\text{lmd}$ where, $\text{td}2\text{faf} (N) = \text{td}2\text{faf} (n-1) + \text{d}2\text{faf} (n) $ $\text{td}2\text{lmd} (N) = \text{td}2\text{lmd} (n-1) + \text{d}2\text{lmd} (n) $ add up to $32\text{ ms} \times 4 \times 820\text{ time(s)}$. $\text{d}2\text{faf} (n) = (\text{faf} (n) - \text{faf} (n-1)) - (\text{faf} (n-1) - \text{faf} (n-2))$ $\text{d}2\text{lmd} (n) = (\text{lmd} (n) - \text{lmd} (n-1)) - (\text{lmd} (n-1) - \text{lmd} (n-2))$ faf = main feedback compensation coefficient every 128 milliseconds lmd = output lambda every 128 milliseconds	≤ 0.2

Time Needed for Diagnosis: $32\text{ ms} \times 4 \times 820\text{ time(s)}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

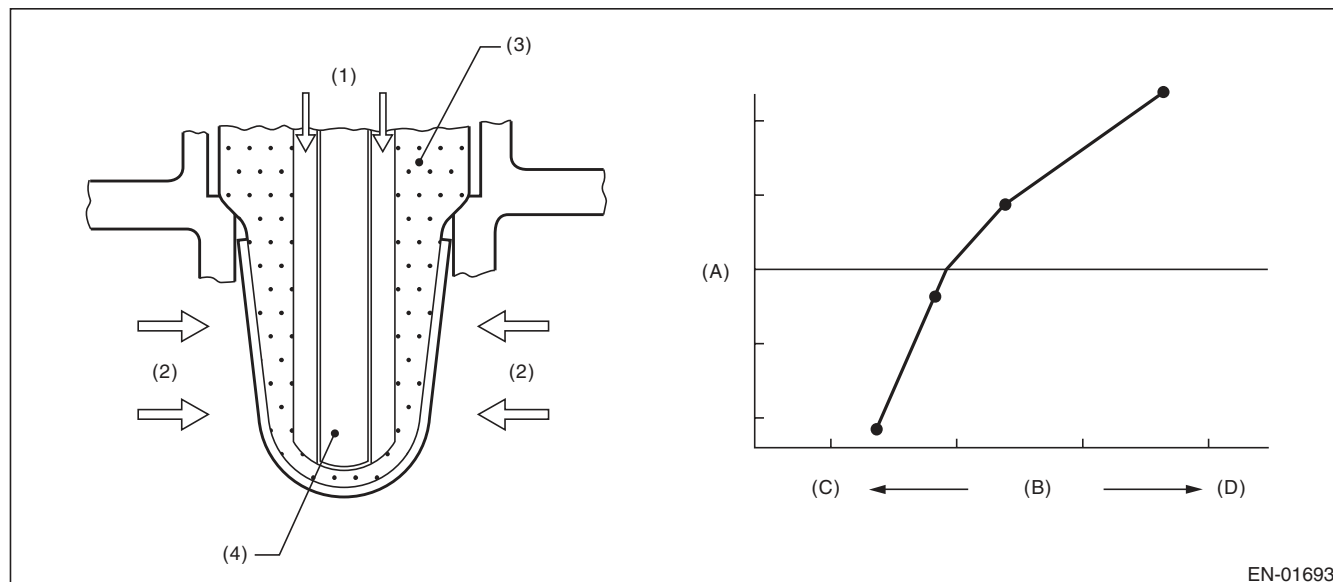
AN:DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect open circuits of the sensor.

Judge as NG when the impedance of the element is large.

2. COMPONENT DESCRIPTION



(A) Electromotive force

(C) Lean

(D) Rich

(B) Air fuel ratio

(1) Atmosphere

(3) ZrO_2

(4) Ceramic heater

(2) Exhaust gas

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9 \text{ V}$
Time of heater control duty at 70 % or more	$\geq 30000 \text{ ms}$
Front oxygen (A/F) sensor impedance.	$> 500 \Omega$

Time Needed for Diagnosis: 5000 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9 \text{ V}$
Front oxygen (A/F) sensor impedance.	$\leq 500 \Omega$

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

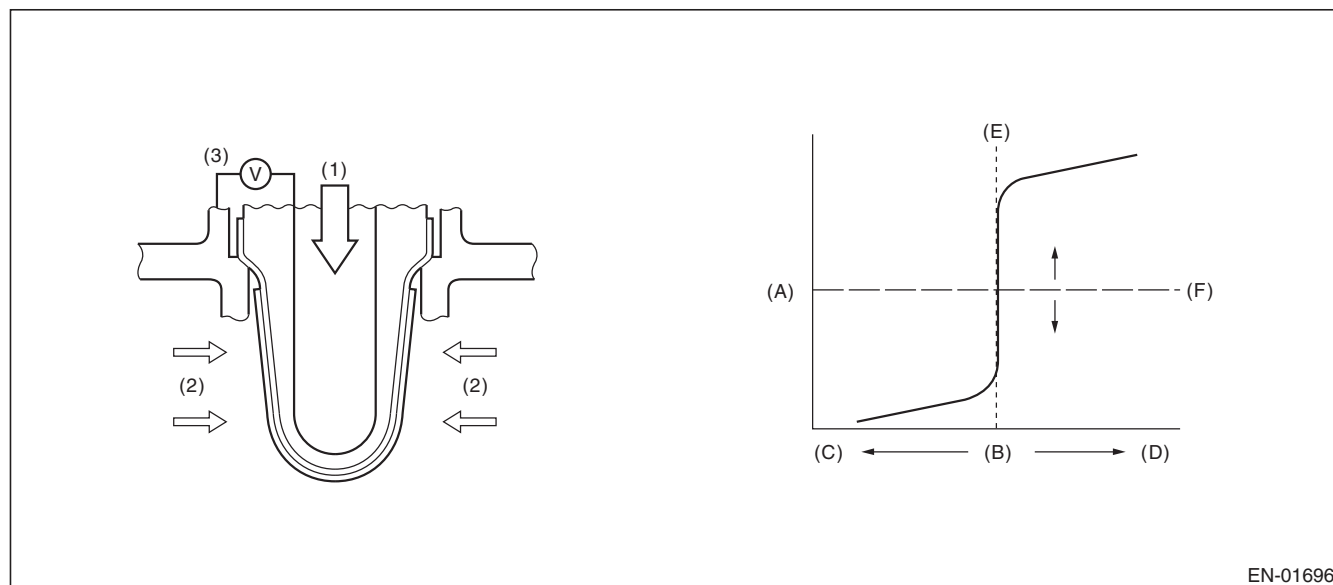
GENERAL DESCRIPTION

AO:DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect continuity NG of the oxygen sensor. If the oxygen sensor voltage reading is not within the probable range considering the operating conditions, judge as NG.

2. COMPONENT DESCRIPTION



EN-01696

(A) Electromotive force

(B) Air fuel ratio

(1) Atmosphere

(C) Rich

(D) Lean

(2) Exhaust gas

(E) Theoretical air fuel ratio

(F) Comparative voltage

(3) Electromotive force

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Used for abnormality judgment

Secondary Parameters	Enable Conditions
High	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 7 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 75 °C (167 °F)
Low (1)	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 7 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 75 °C (167 °F)
Amount of intake air	≥ 10 g/s (0.35 oz/s)
Low (2)	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 7 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 75 °C (167 °F)
Amount of intake air	< 10 g/s (0.35 oz/s)
Current continuation time of the rear oxygen sensor heater	≥ 25000 ms
Low (3)	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 7 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 75 °C (167 °F)
Amount of intake air	< 10 g/s (0.35 oz/s)
Current continuation time of the rear oxygen sensor heater	≥ 25000 ms
Fuel cut	Experienced

Used for normality judgment

Secondary Parameters	Enable Conditions
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 7 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 75 °C (167 °F)

GD(H6DO)-61

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

After starting the engine, continuously perform the diagnosis with the same engine condition.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value	DTC
High		
Sensor output voltage	> 1.200 V	P0138 P0158
Low		
Sensor output voltage	< 0.030 V	P0137 P0157

Time Needed for Diagnosis:

High: 2500 ms

Low (1): 20000 ms

Low (2): 40000 ms

Low (3): Value from Map

Map

Fuel Cut Time (second)	0	2000	10000
Time needed for diagnosis (second)	40000	40000	60000

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value	DTC
High		
Sensor output voltage	≤ 1.200 V	P0138 P0158
Low		
Sensor output voltage	≥ 0.030 V	P0137 P0157

Time Needed for Diagnosis:

High: Less than 1 second

Low (1): Less than 1 second

Low (2): Less than 1 second

Low (3): Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AP:DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0137. <Ref. to GD(H6DO)-60, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AQ:DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the slow response of the oxygen sensor.

Judge as NG if either the rich to lean response diagnosis or lean to rich response diagnosis is NG, and Judge as OK if both are OK.

[Rich → lean diagnosis response]

1. Measure the response time for oxygen sensor output changes when the A/F ratio changes to rich to lean. If the measured response time is larger than the threshold value, it is NG. If it is smaller, it is OK.

2. Judge as NG when the oxygen sensor voltage is large (rich) when recovering from a deceleration fuel cut.

[Lean → rich diagnosis response]

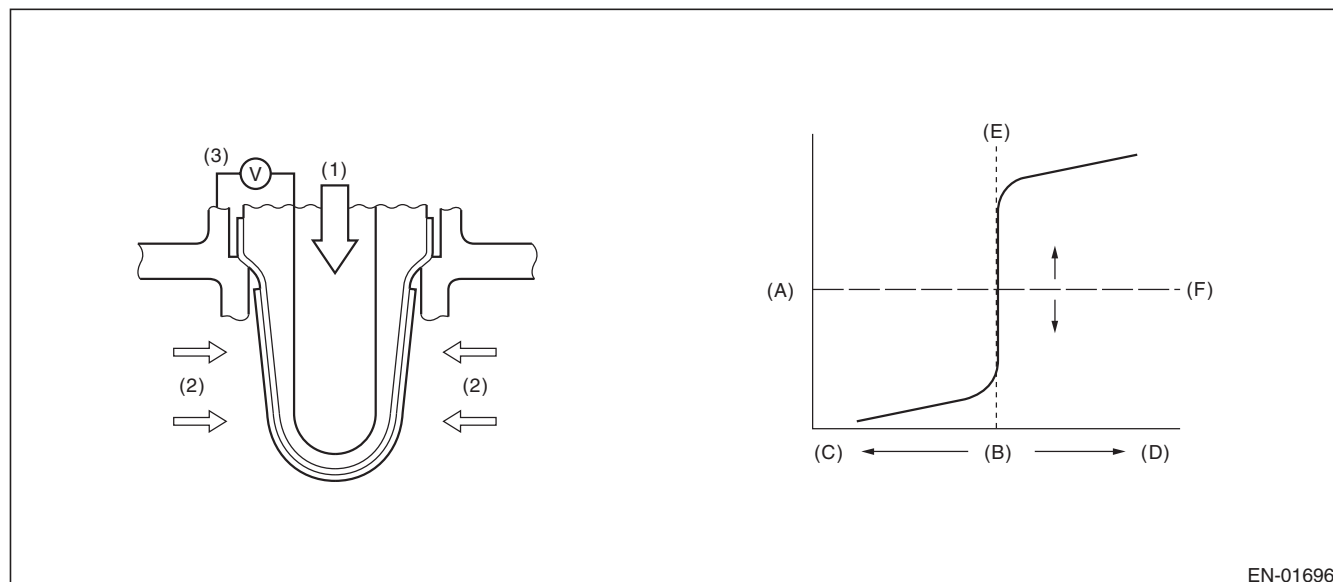
1. Measure the response time for oxygen sensor output changes when the A/F ratio changes to lean to rich. If the measured response time is larger than the threshold value, it is NG.

2. Judge as NG when the oxygen sensor voltage remains small when recovering from a deceleration fuel cut.

Diagnostic method

Measure the response time of the output change of the oxygen sensor when the A/F ratio changes to rich to lean. And Judge as NG when the measured response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



EN-01696

(A) Electromotive force

(B) Air fuel ratio

(C) Rich

(D) Lean

(E) Theoretical air fuel ratio

(F) Comparative voltage

(1) Atmosphere

(2) Exhaust gas

(3) Electromotive force

3. ENABLE CONDITION

Rich → lean diagnosis response

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
A/F main feedback control condition	Completed
Deceleration fuel cut time is 5000 ms or more.	Experienced
After fuel cut	$\geq 2000 \text{ ms}$
Current calculation time of the rear oxygen sensor heater	$\geq 40000 \text{ ms}$
Current continuation time of the rear oxygen sensor heater	$\geq 20000 \text{ ms}$
Estimated catalyst temperature	$\geq 400 \text{ }^{\circ}\text{C}$ (752 $^{\circ}\text{F}$)
Number of deceleration fuel cut	$\geq 1 \text{ time(s)}$

Diagnostic Trouble Code (DTC) Detecting Criteria

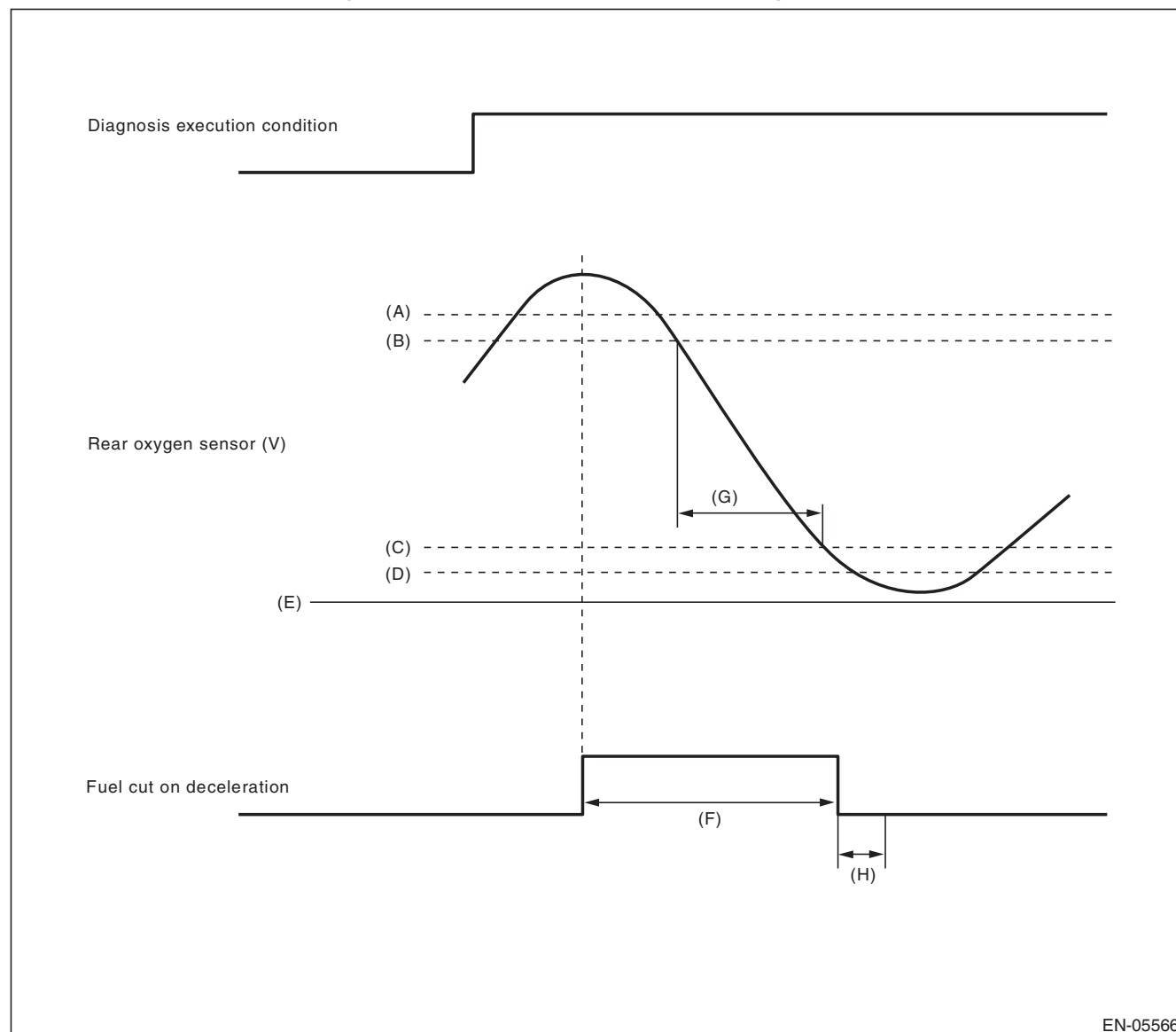
GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when deceleration fuel cut occurs after rapid acceleration. (Pay attention to the oxygen sensor voltage for the timing of the deceleration.)

5. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.55 V (rich) to 0.15 V (lean), calculate the minimum response time for output change between 0.5 V and 0.2 V for the judgment criteria.



- (A) 0.55 V
- (B) 0.5 V
- (C) 0.2 V
- (D) 0.15 V

- (E) 0 V
- (F) More than 5000 ms
- (G) Measure the response time.

- (H) Execute the malfunction judgment in 2000 ms from the recovery of fuel cut on deceleration.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Abnormality Judgement

1) Judge as NG when the judgment value is larger than the threshold value after deceleration fuel cut.
Response time (diagnosis value) > threshold value → abnormal

NOTE:

Variation time of rear oxygen sensor output voltage is short during fuel cut in deceleration. NG judgment should be performed after deceleration fuel cut. Even without deceleration fuel cut, judge as OK if the value is below the threshold.

When the deceleration fuel cut time is 5000 ms or more, judge as NG if the following criteria are met 2000 ms after recovering from the deceleration fuel cut.

2) Judge as NG when the oxygen sensor voltage at recovery from a deceleration fuel cut, is large.

If the fuel cut time in a deceleration fuel cut is long (5000 ms or more), and even after recovering from a deceleration fuel cut, the oxygen sensor voltage is high (0.55 V or more), judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Shortest time change from rich (0.5 V O ₂ output) to lean (0.2 V) when voltage reduces from 0.55 V to 0.15 V or Longest time over 0.55 V	> 491 ms ≥ 2000 ms

Time Needed for Diagnosis: 1 time(s)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

1) Regardless of a deceleration fuel cut, if the response time (diagnosis value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as a normal condition.

Response time (diagnosis value) ≤ threshold value → normal

2) Do not judge as a normal condition.

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
Shortest time change from rich (0.5 V O ₂ output) to lean (0.2 V) when voltage reduces from 0.55 V to 0.15 V	≤ 491 ms

Time Needed for Diagnosis: 1 time(s)

6. ENABLE CONDITION

Lean → rich response diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
A/F main feedback control condition	Completed
Deceleration fuel cut time is 5000 ms or more.	Experienced
After fuel cut	≥ 2000 ms
Current calculation time of the rear oxygen sensor heater	≥ 0 ms
Current continuation time of the rear oxygen sensor heater	≥ 0 ms
Estimated catalyst temperature	≥ 0 °C (32 °F)
Number of deceleration fuel cut	≥ 1 time(s)

Diagnostic Trouble Code (DTC) Detecting Criteria

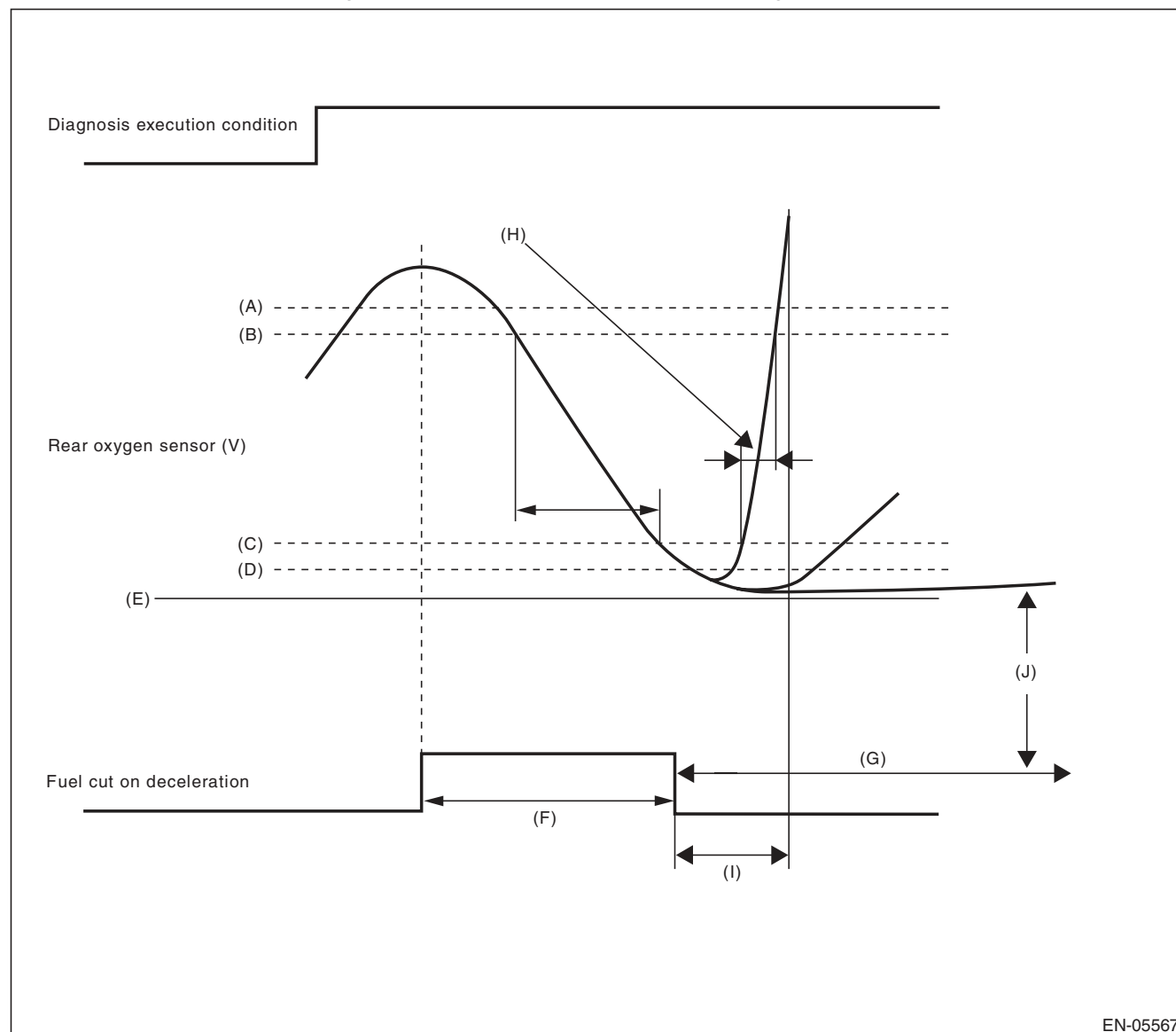
GENERAL DESCRIPTION

7. GENERAL DRIVING CYCLE

Perform the diagnosis only once when deceleration fuel cut occurs after rapid acceleration. (Pay attention to the oxygen sensor voltage for the timing of the deceleration.)

8. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich), calculate the minimum response time for output change between 0.3 V and 0.5 V for the judgment criteria.



EN-05567

- (A) 0.55 V
- (B) 0.5 V
- (C) 0.3 V
- (D) 0.25 V
- (E) 0 V
- (F) More than 5 seconds

- (G) More than 120000 ms
- (H) Measure the response time (diagnostic value).
- (I) Execute the malfunction judgment in 2000 ms from the recovery of fuel cut on deceleration.

- (J) Judge NG when the voltage of rear oxygen sensor is 0.25 V or less for 120000 ms or more after recovery of fuel cut on deceleration.

GENERAL DESCRIPTION

2) If the oxygen sensor voltage is small after recovering from a deceleration fuel cut, and remains small, judge as NG.

Malfunction Criteria	Threshold Value
Shortest time change from lean (0.3 V O ₂ output) to rich (0.5 V) when voltage changes from 0.25 V to 0.55 V or Longest time under 0.25 V	> 2000 ms ≥ 120000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Judge as OK and clear the NG if the following conditions are established.

Malfunction criteria	Threshold value
Shortest time change from lean (0.3 V O ₂ output) to rich (0.5 V) when voltage changes from 0.25 V to 0.55 V	≤ 2000 ms

GD(H6DO)-68

Diagnostic Trouble Code (DTC) Detecting Criteria

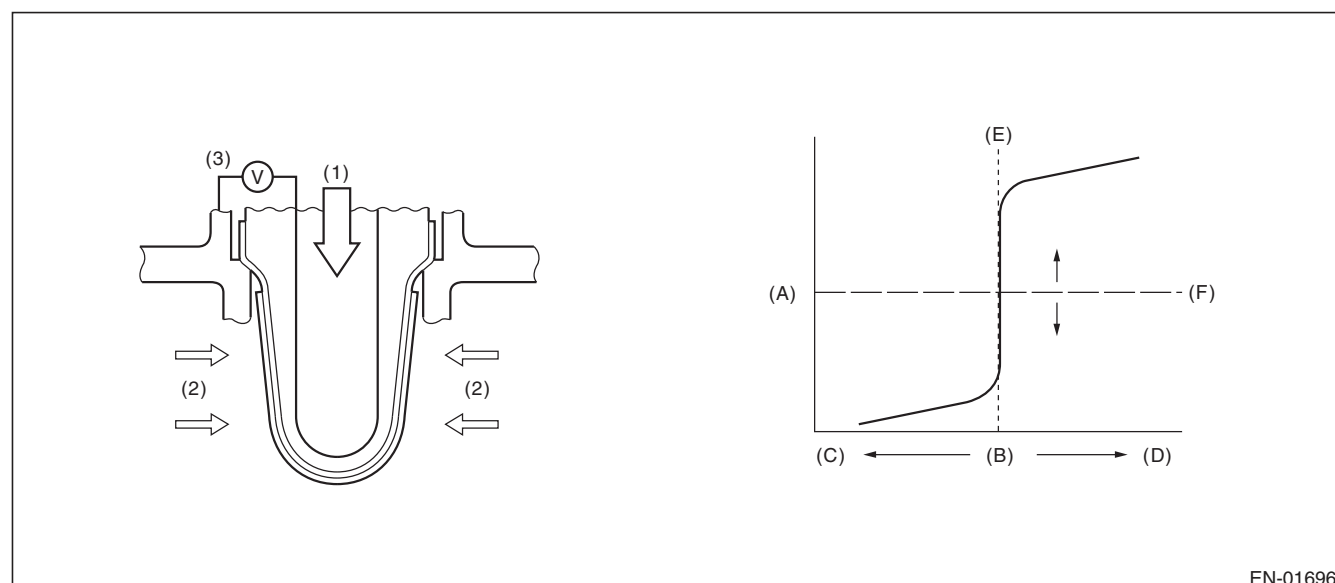
GENERAL DESCRIPTION

AR:DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2)

1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor open or short circuit. Judge as NG when the rear oxygen sensor voltage can be determined to be abnormal considering conditions such as intake air amount, engine coolant temperature, main feedback control and deceleration fuel cut.

2. COMPONENT DESCRIPTION



EN-01696

(A) Electromotive force

(B) Air fuel ratio

(C) Rich

(D) Lean

(E) Theoretical air fuel ratio

(F) Comparative voltage

(1) Atmosphere

(2) Exhaust gas

(3) Electromotive force

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control at the rear oxygen sensor	In operation
Target output voltage of rear oxygen sensor	$\geq 0.55 \text{ V} + 0.05 \text{ V}$
Amount of intake air	$\geq 10 \text{ g/s}$ (0.35 oz/s)
Engine coolant temperature	$\geq 75 \text{ }^{\circ}\text{C}$ (167 $^{\circ}\text{F}$)
Misfire detection every 200 rotations	$< 7 \text{ time(s)}$
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	$\geq 10.9 \text{ V}$
Deceleration fuel cut of 5000 ms or more.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Minimum output voltage or Maximum output voltage	> 0.15 V < 0.55 V

Time Needed for Diagnosis: 200000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
Diagnosis of the rear oxygen sensor voltage low side	Incomplete
Minimum output voltage	≤ 0.15 V
Maximum output voltage	≥ 0.55 V

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AS:DTC P0151 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0131. <Ref. to GD(H6DO)-51, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AT:DTC P0152 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0132. <Ref. to GD(H6DO)-53, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AU:DTC P0153 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0133. <Ref. to GD(H6DO)-55, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AV:DTC P0154 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0134. <Ref. to GD(H6DO)-58, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AW:DTC P0157 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0137. <Ref. to GD(H6DO)-60, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AX:DTC P0158 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0137. <Ref. to GD(H6DO)-60, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AY:DTC P0159 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0139. <Ref. to GD(H6DO)-64, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AZ:DTC P0160 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK2 SENSOR2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0140. <Ref. to GD(H6DO)-69, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BA:DTC P0171 SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect fuel system malfunction by the amount of main feedback control.

Diagnostic method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)
Engine load change	< 0.02 g/rev (0 oz/rev)
Engine load	$\geq$ Value of Map 1

Map1

Engine speed (rpm)	Idling	700	1000	1500	2000	2500	3000	3500	4000	4500	5000
Measured value (g(oz)/rev)	Non-turbo	0.357 (0.01)	0.25 (0.01)	0.25 (0.01)	0.317 (0.01)	0.326 (0.01)	0.337 (0.01)	0.397 (0.01)	0.439 (0.02)	0.454 (0.02)	0.454 (0.02)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant speed after warming up the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

Compare the diagnosed value (fsobd) with the threshold value, and if a condition meeting the malfunction criteria below continues for $10\text{ s} \times 5$ time(s) or more, judge that there is a fault in the fuel system.

Judgement Value

Malfunction criteria	Threshold value
$\text{fsobd} = (\text{sglmd} - \text{tglmda}) + \text{faf} + \text{flaf}$ In this case: sglmd = measured lambda tglmda = target lambda faf = main feedback compensation coefficient every 64 milliseconds flaf = main feedback learning compensation coefficient	$\geq$ Value of Map 2

Map2

Amount of air (g (oz)/s)	0 (0)	3.2 (0.11)	6.4 (0.23)	9.6 (0.34)	12.8 (0.45)	16 (0.56)	19.2 (0.68)
fsobdL1 (%)	1.4	1.4	1.332	1.265	1.265	1.265	1.265

Time Needed for Diagnosis: $10\text{ s} \times 5$ time(s)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
$\text{fsobd} = (\text{sglmd} - \text{tglmda}) + \text{faf} + \text{flaf}$	< 1.2

Time Needed for Diagnosis: 10 s

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BB:DTC P0172 SYSTEM TOO RICH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect fuel system malfunction by the amount of main feedback control.

Diagnostic method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167 °F)
Engine load change	≤ 0.02 g/rev (0 oz/rev)
Learning value of EVAP conc.	< 0.1
Cumulative time of canister purge after engine start	≥ 20 s
Continuous period after canister purge starting	≥ 29884 ms
Engine load	$\geq$ Value of Map 1

Map1

Engine speed (rpm)	Idling	700	1000	1500	2000	2500	3000	3500	4000	4500	5000
Measured value (g(oz)/rev)	Non-turbo	0.357 (0.01)	0.25 (0.01)	0.25 (0.01)	0.317 (0.01)	0.326 (0.01)	0.337 (0.01)	0.397 (0.01)	0.439 (0.02)	0.454 (0.02)	0.454 (0.02)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant speed after warming up the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

Compare the diagnosed value (fsobd) with the threshold value, and if a condition meeting the malfunction criteria below continues for 10 s $\times$ 5 time(s) or more, judge that there is a fault in the fuel system.

Judgement Value

Malfunction criteria	Threshold value
$\text{fsobd} = (\text{sglmd} - \text{tglmda}) + \text{faf} + \text{flaf}$ In this case: sglmd = measured lambda tglmda = target lambda faf = main feedback compensation coefficient every 64 milliseconds flaf = main feedback learning compensation coefficient	$<$ Value of Map 2

Map2

Amount of air (g (oz)/s)	0 (0)	3.2 (0.11)	6.4 (0.23)	9.6 (0.34)	12.8 (0.45)	16 (0.56)	19.2 (0.68)
fsobdL1 (%)	0.6	0.6	0.688	0.735	0.735	0.735	0.735

Time Needed for Diagnosis: 10 s $\times$ 5 time(s)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK when the malfunction criteria below continues for 10 seconds.

Judgement Value

Malfunction Criteria	Threshold Value
$\text{fsobd} = (\text{sglmd} - \text{tglmda}) + \text{faf} + \text{flaf}$	≥ 0.8

Time Needed for Diagnosis: 10 s

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BC:DTC P0174 SYSTEM TOO LEAN (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0171. <Ref. to GD(H6DO)-72, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BD:DTC P0175 SYSTEM TOO RICH (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0172. <Ref. to GD(H6DO)-73, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BE:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect faults in the fuel temperature sensor output properties.

Diagnosis is performed in two methods (drift diagnosis and stuck diagnosis). If either is NG, judge as NG. If both are OK, Judge as OK and clear the NG.

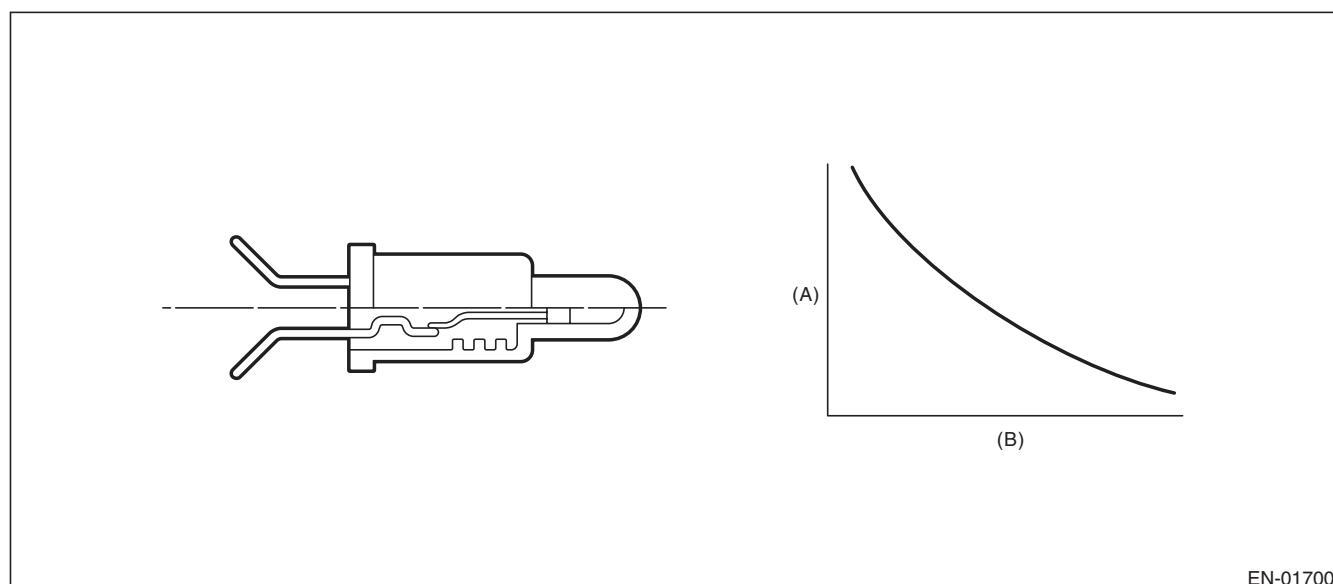
Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and judged as NG.

Stuck Diagnosis

As the engine warms up (cumulative amount of intake air after starting is large), if the fuel temperature which should rise does not, determine as being stuck and NG.

2. COMPONENT DESCRIPTION



EN-01700

(A) Resistance value (Ω)

(B) Fuel temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

3. ENABLE CONDITION

DRIFT DIAGNOSIS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Fuel level	$\geq 9.6 \ell$ (2.54 US gal, 2.11 Imp gal)
Elapsed time after starting the engine	$\geq 20 \text{ s}$
Engine coolant temperature – Engine coolant temperature at engine start	$> 10 \text{ }^{\circ}\text{C}$ (50 $^{\circ}\text{F}$)
Fuel temperature – Engine coolant temperature	$\geq 10 \text{ }^{\circ}\text{C}$ (50 $^{\circ}\text{F}$)
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: 120 s

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Fuel level	$\geq 9.6 \ell$ (2.54 US gal, 2.11 Imp gal)
Elapsed time after starting the engine	$\geq 20 \text{ s}$
Engine coolant temperature – Engine coolant temperature at engine start	$> 10 \text{ }^{\circ}\text{C}$ (50 $^{\circ}\text{F}$)
Fuel temperature – Engine coolant temperature	$< 10 \text{ }^{\circ}\text{C}$ (50 $^{\circ}\text{F}$)
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$< 75 \text{ }^{\circ}\text{C}$ (167 $^{\circ}\text{F}$)

Time Needed for Diagnosis: Less than 1 second

6. ENABLE CONDITION

Stuck Diagnosis

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	$\geq 20000 \text{ ms}$
Battery voltage	$\geq 10.9 \text{ V}$

7. GENERAL DRIVING CYCLE

Always perform diagnosis after 20 seconds have passed since the engine started.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. DIAGNOSTIC METHOD

• Abnormality Judgement

Judge as NG when the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
Accumulated amount of intake air	≥ 551043 g (19435.29 oz)
Fuel temperature difference between Max. and Min.	< 2 °C (35.6 °F)

Time Needed for Diagnosis: Less than 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
Fuel temperature difference between Max. and Min.	≥ 2 °C (35.6 °F)

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

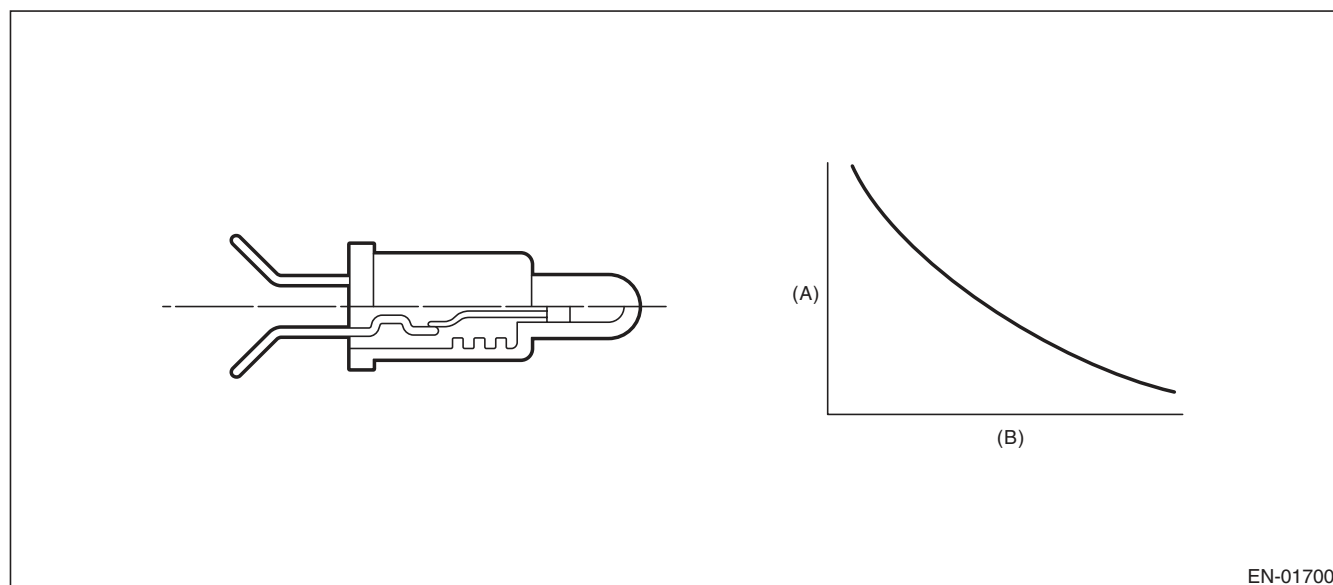
BF:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω)

(B) Fuel temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	$< 0.344 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: 2500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	$\geq 0.344 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

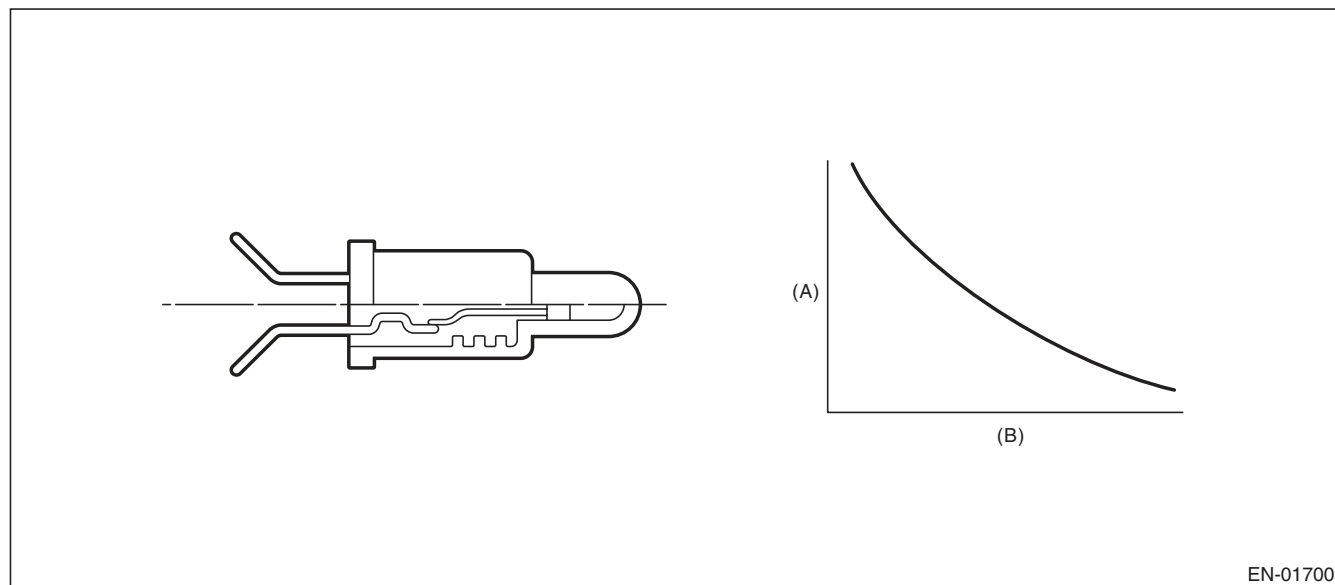
BG:DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-01700

(A) Resistance value (Ω)

(B) Fuel temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	$\geq 4.716 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: 2500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	$< 4.716 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: Within 1 second

GD(H6DO)-79

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BH:DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect for abnormal values in the oil temperature sensor output properties.

Judge as NG when the oil temperature does not rise even though the engine is running under a condition where it should rise.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine speed	$\geq$ Value from Map

Map

Engine coolant temperature °C (°F)	-40 (-40)	110 (230)
Engine speed rpm	500	500

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD

• Abnormality Judgement

Judge as NG when the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
Engine oil temperature	< 15 °C (59 °F)
After engine start oil temperature sensor characteristic diagnosis timer.	≥ Judgement value for after engine start oil temperature sensor characteristic diagnosis timer

After engine start oil temperature sensor characteristic diagnosis timer (timer for diagnosis).

a. Timer stop at fuel cut

b. During the driving conditions except a) above, timer counts up as follows.

64 milliseconds + TOILCNT milliseconds (at the time of 64 milliseconds).

Where, TOILCNT is determined as follows,

TOILCNT = 0 at idle switch ON

For TOILCNT at Idle switch off, refer to the following table.

		Vehicle speed km/h (MPH)							
		0 (0)	8 (5)	16 (9.9)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
Temperature °C (°F)	-40 (-40)	0 ms	32 ms	76 ms	130 ms	149 ms	171 ms	176 ms	181 ms
	-30 (-22)	67 ms	93 ms	121 ms	157 ms	170 ms	184 ms	193 ms	203 ms
	-20 (-4)	98 ms	123 ms	148 ms	184 ms	193 ms	204 ms	214 ms	226 ms
	-10 (14)	145 ms	166 ms	187 ms	208 ms	223 ms	239 ms	242 ms	245 ms
	0 (32)	161 ms	187 ms	212 ms	243 ms	252 ms	262 ms	266 ms	270 ms

After engine start oil temperature characteristic diagnosis timer judgment value (t).

$t = 2400000 \text{ ms} - 60000 \text{ ms} \times T_i$ ($t \geq 2400000$)

T_i = The lowest coolant temperature after starting the engine.

Time Needed for Diagnosis: Less than 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
Engine oil temperature	≥ 15 °C (59 °F)

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BI: DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the oil temperature sensor.
Judge as NG when outside of the judgment value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	< 0.166 V

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	≥ 0.166 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BJ:DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the oil temperature sensor.
Judge as NG when outside of the judgment value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	$\geq 4.716 \text{ V}$

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	$< 4.716 \text{ V}$

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

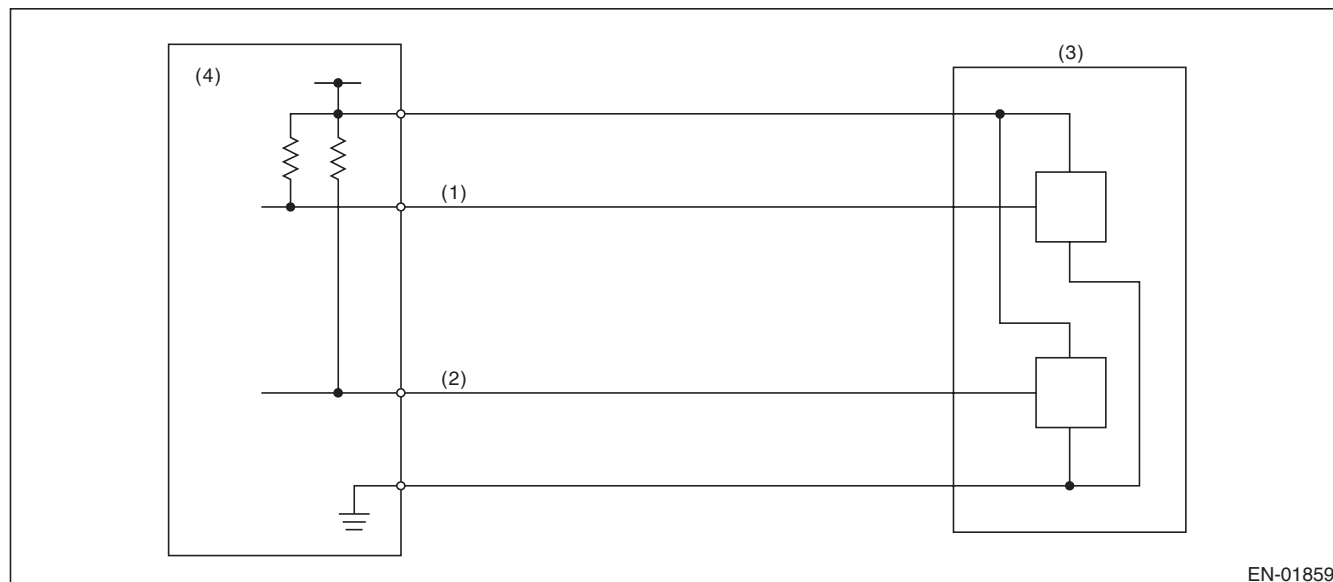
BK:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal

(3) Throttle position sensor

(4) Engine control module (ECM)

(2) Throttle position sensor 2 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 6 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Sensor 2 input voltage	$\leq 0.926 \text{ V}$

Time Needed for Diagnosis: 24 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Sensor 2 input voltage	$> 0.926 \text{ V}$

Time Needed for Diagnosis: 24 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

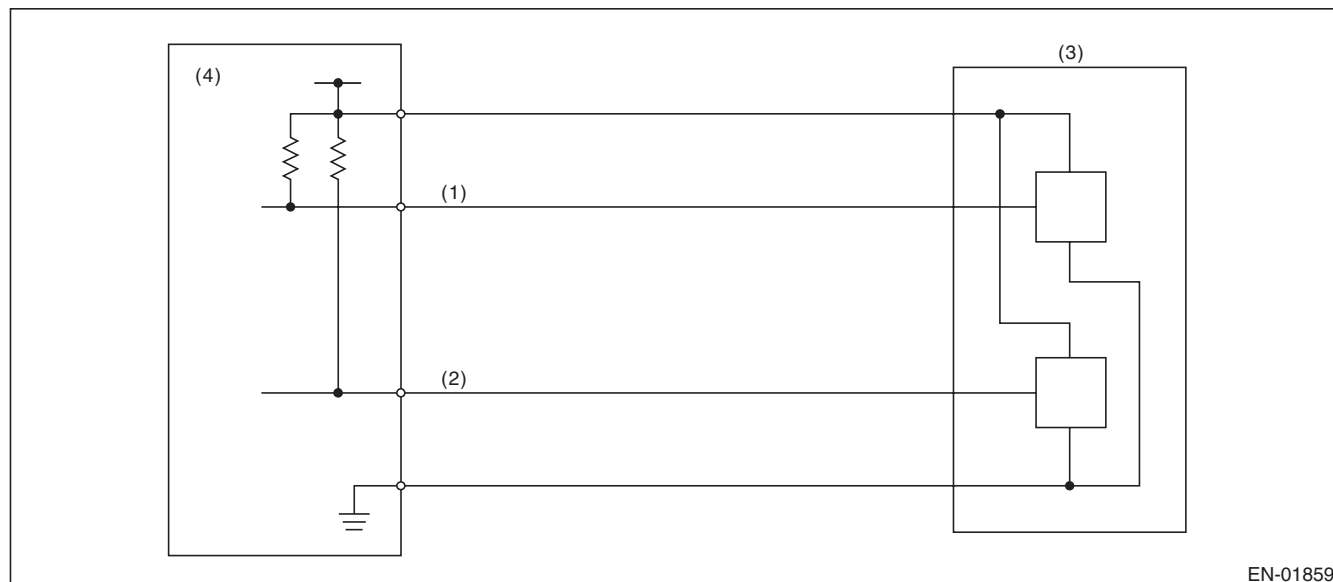
BL:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal

(3) Throttle position sensor

(4) Engine control module (ECM)

(2) Throttle position sensor 2 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 6\text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Sensor 2 input voltage	$\geq 4.851\text{ V}$

Time Needed for Diagnosis: 24 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Sensor 2 input voltage	$< 4.851\text{ V}$

Time Needed for Diagnosis: 24 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BM:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

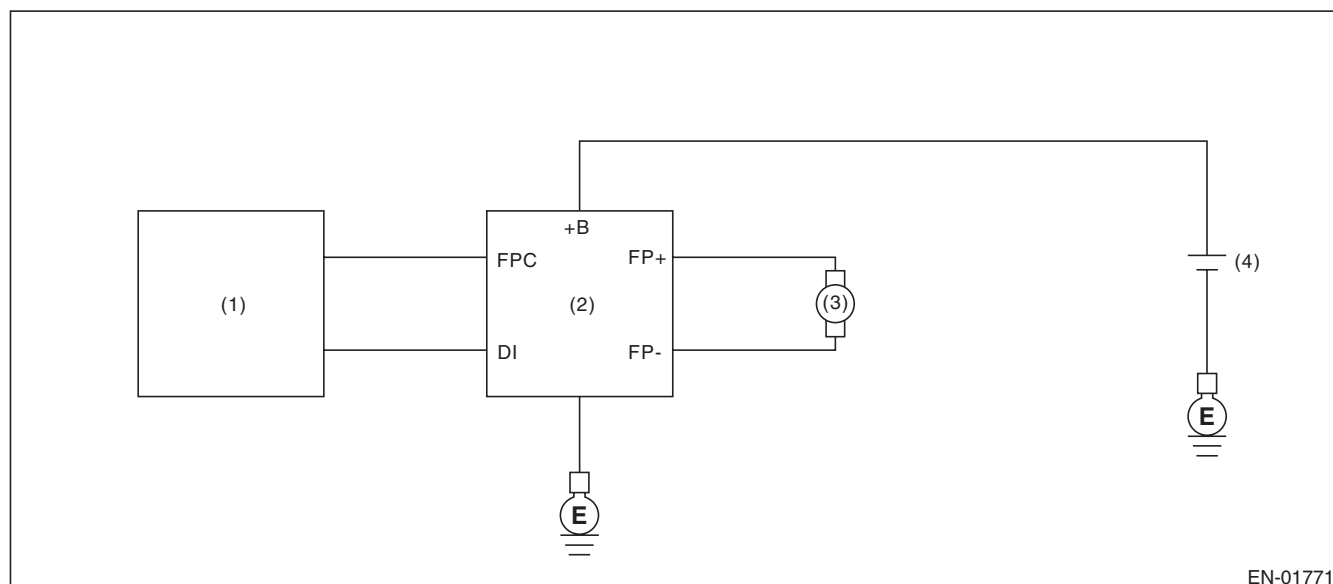
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit.

Judge as NG when the NG signal is sent through a diagnostic line coming from the fuel pump control unit.

Fuel pump control unit detects the open or short circuit malfunction for each line, and then sends NG signals if one of them is found NG.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(3) Fuel pump

(4) Battery

(2) Fuel pump control unit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 8 \text{ V}$
Elapsed time after starting the engine	$\geq 180000 \text{ ms}$
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	Low
Fuel level	$\geq 9.6 \text{ ℓ}$ (2.54 US gal, 2.11 Imp gal)

Time Needed for Diagnosis: 2500 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 8 \text{ V}$
Elapsed time after starting the engine	$\geq 180000 \text{ ms}$
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	High
Fuel level	$\geq 9.6 \text{ ℓ}$ (2.54 US gal, 2.11 Imp gal)

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BN:DTC P0301 CYLINDER 1 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

Detect the presence of misfire occurrence. (Revolution fluctuation method)

Monitoring Misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has two patterns below. :

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.

1) Intermittent misfire: FTP 1.5 times misfire

- 120° Interval Difference Method
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or more)

2) Misfire every time: FTP 1.5 times misfire, Catalyst damage misfire

- 360° Interval Difference Method

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	≥ 1024 ms
Intake manifold pressure change at 120°CA	< Value of Map 1
Throttle position change during 16 milliseconds	< 20 °
Fuel shut-off function	Not in operation
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Vehicle dynamic control or AT torque control	Not in operation
Evaporative system leak check	Not in operation
Engine speed	400 rpm — 8000 rpm
Intake manifold pressure	≥ Value of Map 2
Battery voltage	≥ 8 V
Fuel parameter determination	Not extremely low volatility
Elapsed time after starting the engine	≥ 0 ms
Engine speed change during 32 milliseconds	< 500 rpm

Map1

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000
kPa	20	20	20	20	20	20	20	20	20	20	20	20	20	20
(mmHg, inHg)	(150, 5.9)	(150, 5.9)	(150, 5.9)	(150, 5.9)	(150, 5.9)	(150, 5.9)	(150, 5.9)	(150, 5.9)	(150, 5.9)	(150, 5.9)	(150, 5.9)	(150, 5.9)	(150, 5.9)	(150, 5.9)

Map2

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000
kPa	26.7	23.3	23.3	23.3	23.6	24.4	28.3	32.3	36.3	36.3	37.2	38.1	41.9	48.9
(mmHg, inHg)	(200.0, 7.9)	(175.0, 6.9)	(175.0, 6.9)	(175.0, 6.9)	(177.0, 7)	(183.0, 7.2)	(212.5, 8.4)	(242.2, 9.5)	(272.0, 10.7)	(272.0, 10.7)	(279.0, 11)	(286.0, 11.3)	(314.0, 12.4)	(367.0, 14.4)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. GENERAL DRIVING CYCLE

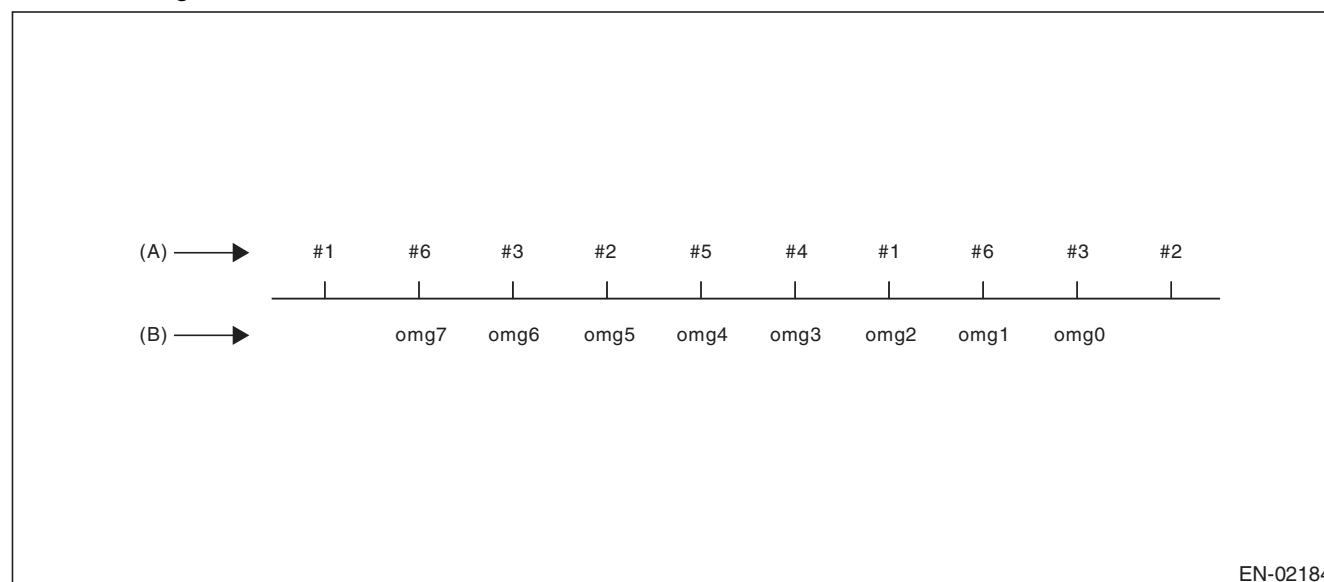
- If conditions are met, it is possible to detect the misfires from idling to high engine speed. However, to avoid excessive load or harm to the engine, perform diagnosis at idle.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

When a misfire occurs, the engine speed will decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether a misfire is occurring or not comparing the calculated result with judgment value. Counting the number of misfires. If the misfire ratio is higher during 1000 revs. or 200 revs., Judge corresponding cylinders as NG.

Diagnostic value calculation (Calculate from angle speed) →	Misfire detection every single ignition (Compare diagnostic value with judgment value) →	NG judgment (Misfire occurrence judgment required by the law) (Compare number of misfire with judgment)
	• 120° Interval Difference Method • 360° Interval Difference Method • 720° Interval Difference Method	• FTP 1.5 times misfire NG judgment • Catalyst damage misfire NG judgment

As shown in the following figure, pick a cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, etc.



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(A) Ignition order

(B) Crankshaft position speed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

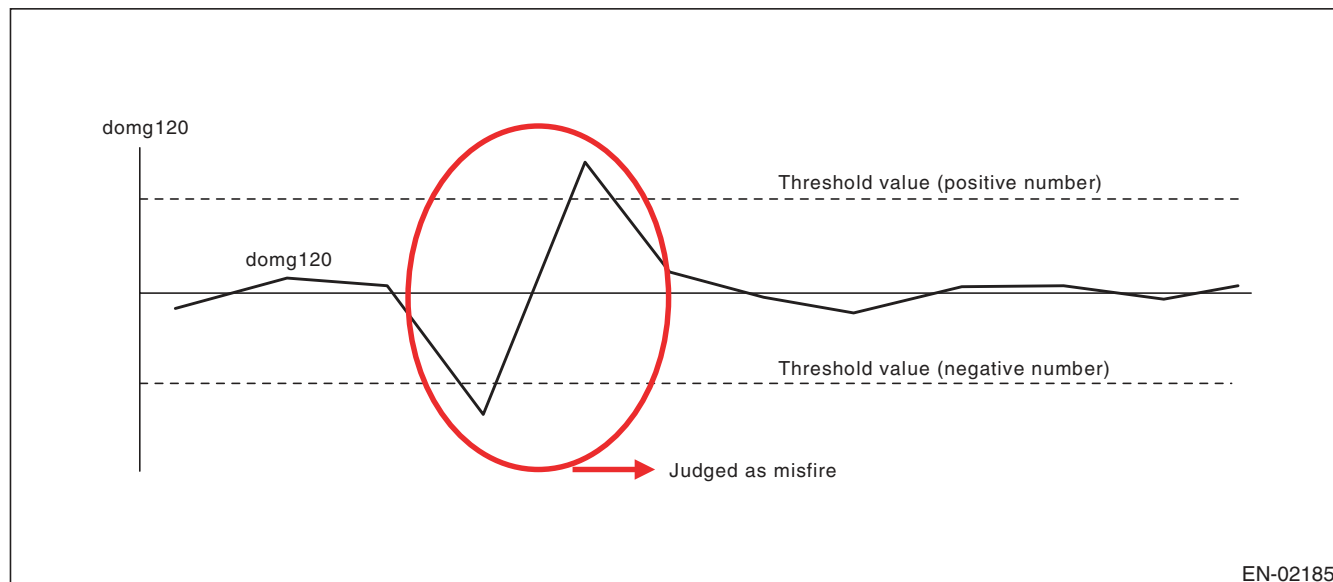
120° Interval Difference Method

Diagnostic value $\text{domg } 120 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 7 - \text{omg } 1)/6$

Judge as a misfire in the following cases.

- $\text{domg } 120 > \text{judgment value of positive side}$
- $\text{domg } 121 \leq \text{judgment value of negative side}$

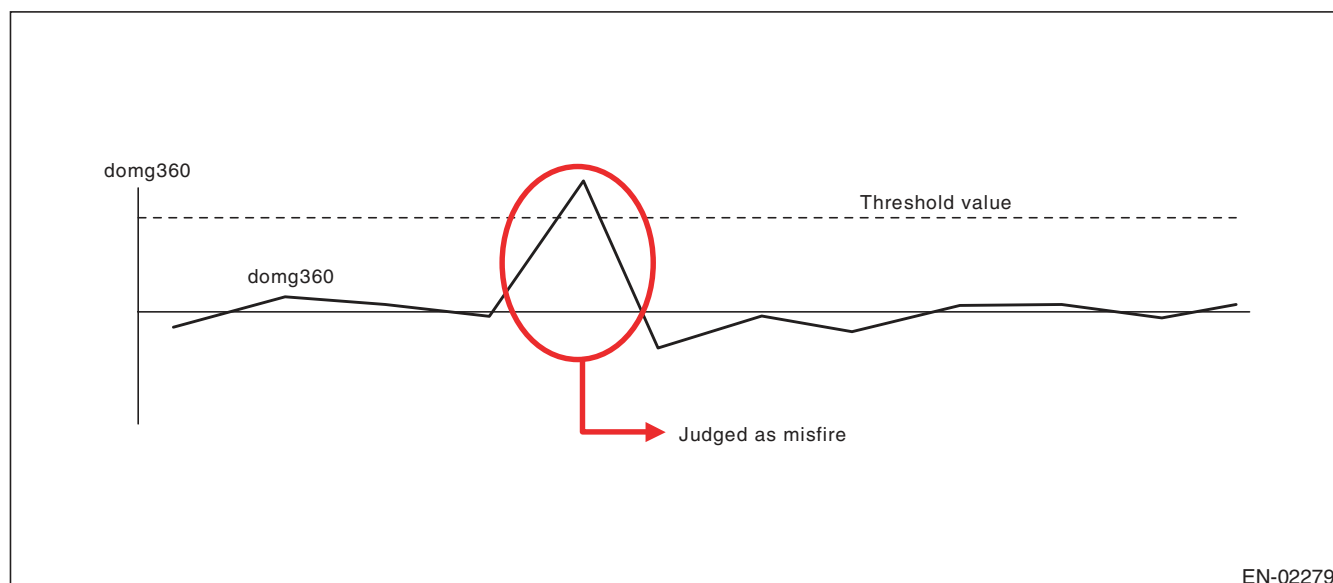
(Judgement value before 120° CA)



360° Interval Difference Method

Diagnostic value $\text{domg } 360 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 4 - \text{omg } 3)$

Misfire judgment $\text{domg } 360 > \text{Judgement value} \rightarrow \text{Judge as misfire}$

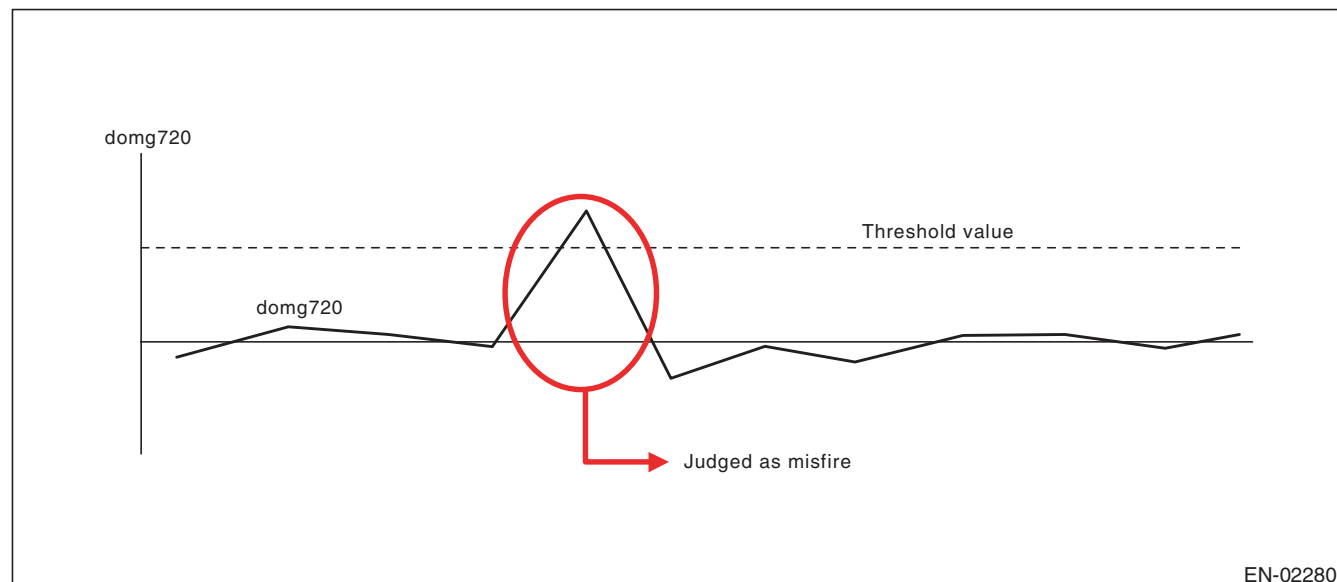


Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

720° Interval Difference Method

Diagnostic value	$\text{domg } 720 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 7 - \text{omg } 6)$
Misfire judgment	$\text{domg } 720 > \text{Judgement value} \rightarrow \text{Judge as misfire}$



- FTP 1.5 times misfire (Misfire occurrence level which influences exhaust gas)

- Abnormality Judgement

Judgement Value (Judge that malfunction occurs when the misfire ratio is high in 1000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission judgment value	$\geq 27 \times 100/3000\%$ in 1000 revs.

Time Needed for Diagnosis: 1000 engine revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- Normality Judgement

Judgement Value

Malfunction criteria	Threshold value
FTP emission judgment value	$< 27 \times 100/3000\%$ in 1000 revs.

Time Needed for Diagnosis: 1000 engine revs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

- Catalyst damage misfire (Misfire occurrence level damaging catalyst)
- Abnormality Judgement

Judgement Value

Malfunction criteria	Threshold value
Catalyst damage misfire judgment value	≥ Value of Map 3

Map 3

		Intake air (g(oz)/rev)									
		0.2 (0.01)	0.4 (0.01)	0.6 (0.02)	0.8 (0.03)	1 (0.04)	1.2 (0.04)	1.4 (0.05)	1.6 (0.06)	1.8 (0.06)	2 (0.07)
Engine speed (rpm)	700	90	90	88	76	68	68	68	68	68	68
	1000	90	90	88	76	68	68	68	68	68	68
	1500	89	88	80	64	56	56	56	56	56	56
	2000	88	84	64	40	36	35	35	35	35	35
	2500	88	80	56	36	30	30	30	30	30	30
	3000	64	56	30	30	30	30	30	30	30	30
	3500	50	40	30	30	30	30	30	30	30	30
	4000	40	38	30	30	30	30	30	30	30	30
	4500	50	30	30	30	30	30	30	30	30	30
	5000	40	30	30	30	30	30	30	30	30	30
	5500	40	30	30	30	30	30	30	30	30	30
	6000	36	36	30	30	30	30	30	30	30	30
	6500	32	32	30	30	30	30	30	30	30	30
	7000	32	32	30	30	30	30	30	30	30	30

Time Needed for Diagnosis: 200 engine revs.

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- Normality Judgement

Judgement Value

Malfunction criteria	Threshold value
Catalyst damage misfire judgment value	< Value of Map 2

Time Needed for Diagnosis: 200 engine revs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BO:DTC P0302 CYLINDER 2 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-88, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BP:DTC P0303 CYLINDER 3 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-88, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BQ:DTC P0304 CYLINDER 4 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-88, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BR:DTC P0305 CYLINDER 5 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-88, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BS:DTC P0306 CYLINDER 6 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0301. <Ref. to GD(H6DO)-88, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

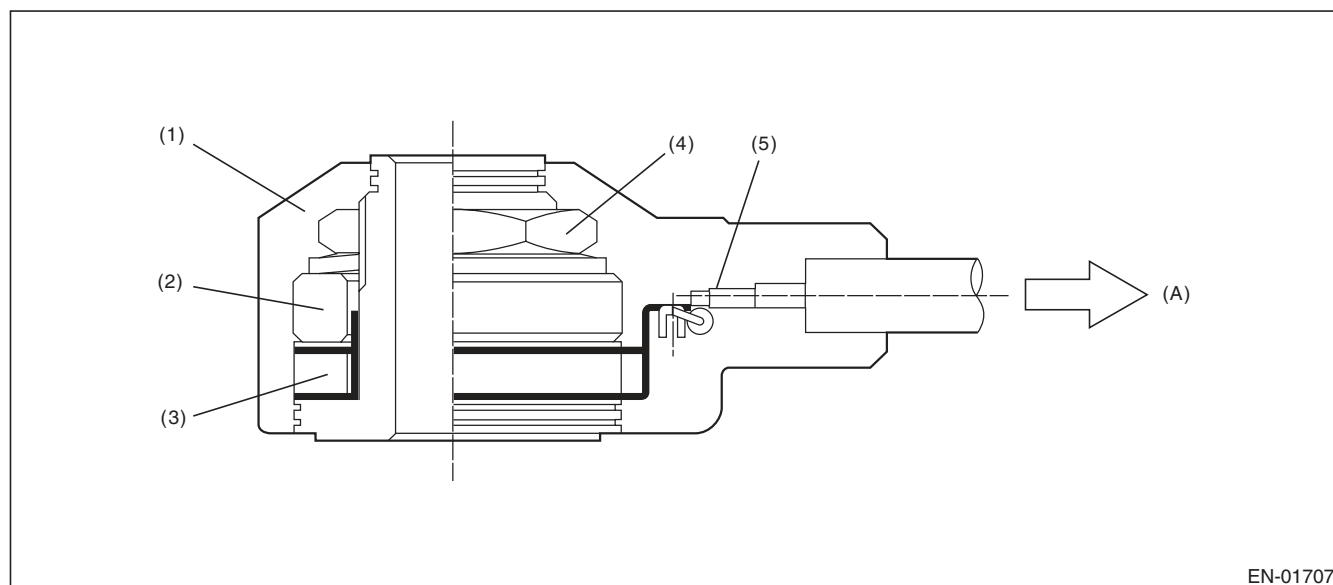
BT:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) To knock sensor harness

(1) Case

(2) Weight

(3) Piezoelectric element

(4) Nut

(5) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	< 0.238 V

Time Needed for Diagnosis: 1000 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	≥ 0.238 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

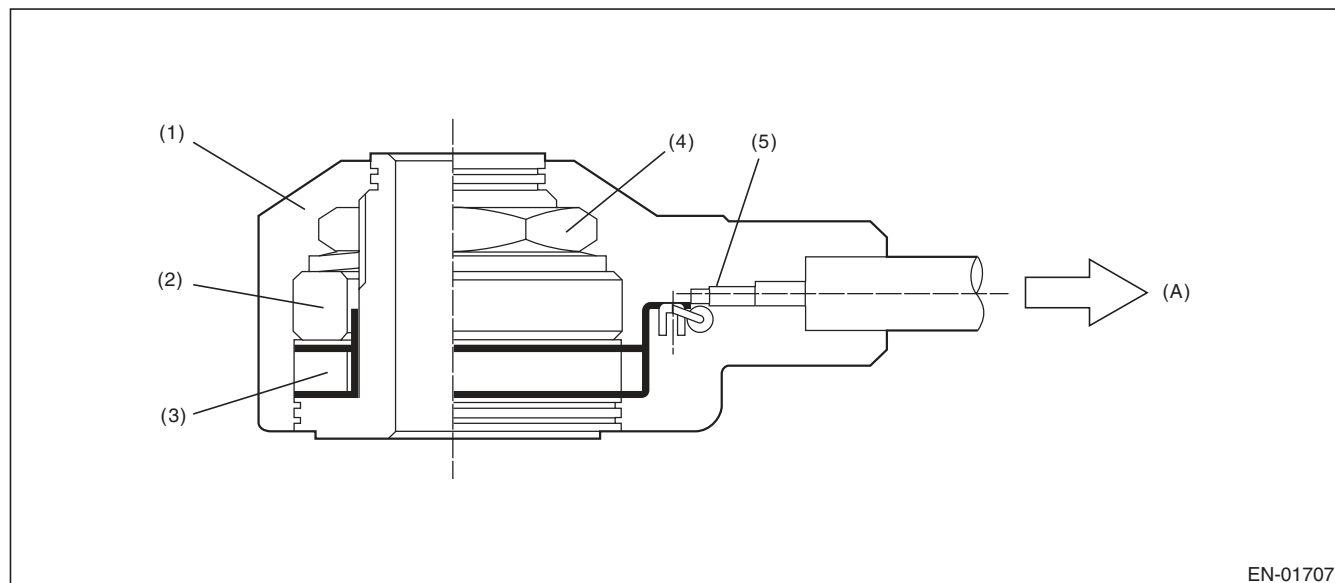
BU:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(A) To knock sensor harness

(1) Case

(2) Weight

(3) Piezoelectric element

(4) Nut

(5) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	≥ 4.714 V

Time Needed for Diagnosis: 1000 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	< 4.714 V

Time Needed for Diagnosis: Less than 1 second

GD(H6DO)-95

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BV:DTC P0332 KNOCK SENSOR 2 CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0327. <Ref. to GD(H6DO)-94, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BW:DTC P0333 KNOCK SENSOR 2 CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0328. <Ref. to GD(H6DO)-95, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

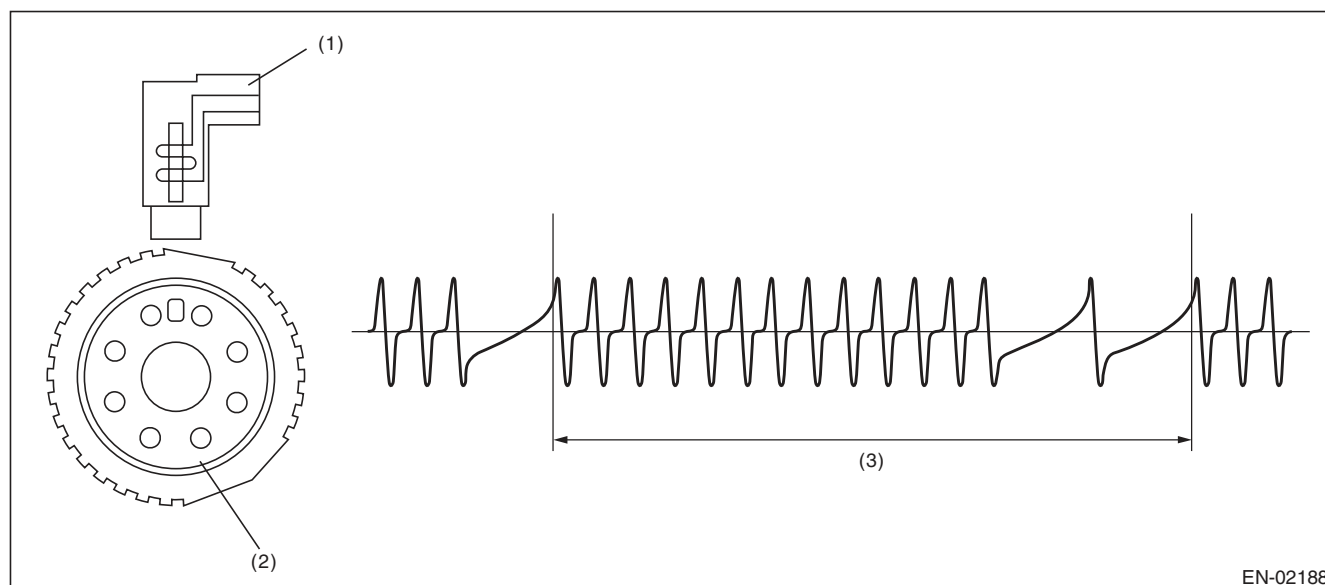
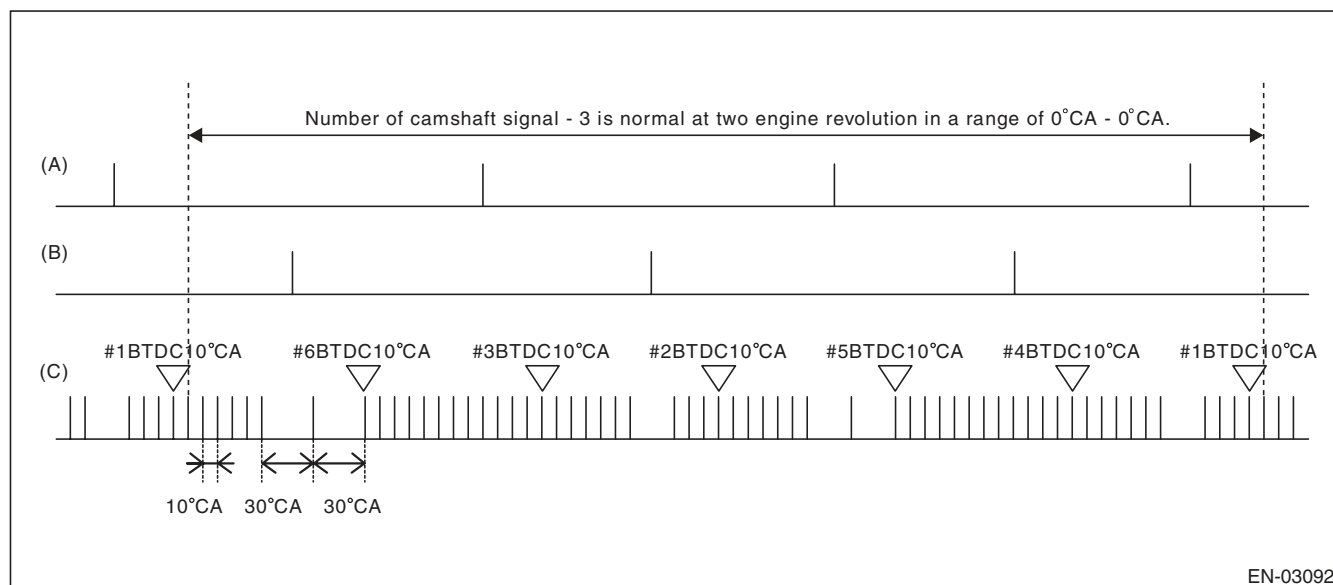
BX:DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the crankshaft position sensor.

Judge as NG when the crank signal is not input even though the starter was rotated.

2. COMPONENT DESCRIPTION



3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	$\geq 8 \text{ V}$

Time Needed for Diagnosis: 3000 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	$\geq 8 \text{ V}$

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

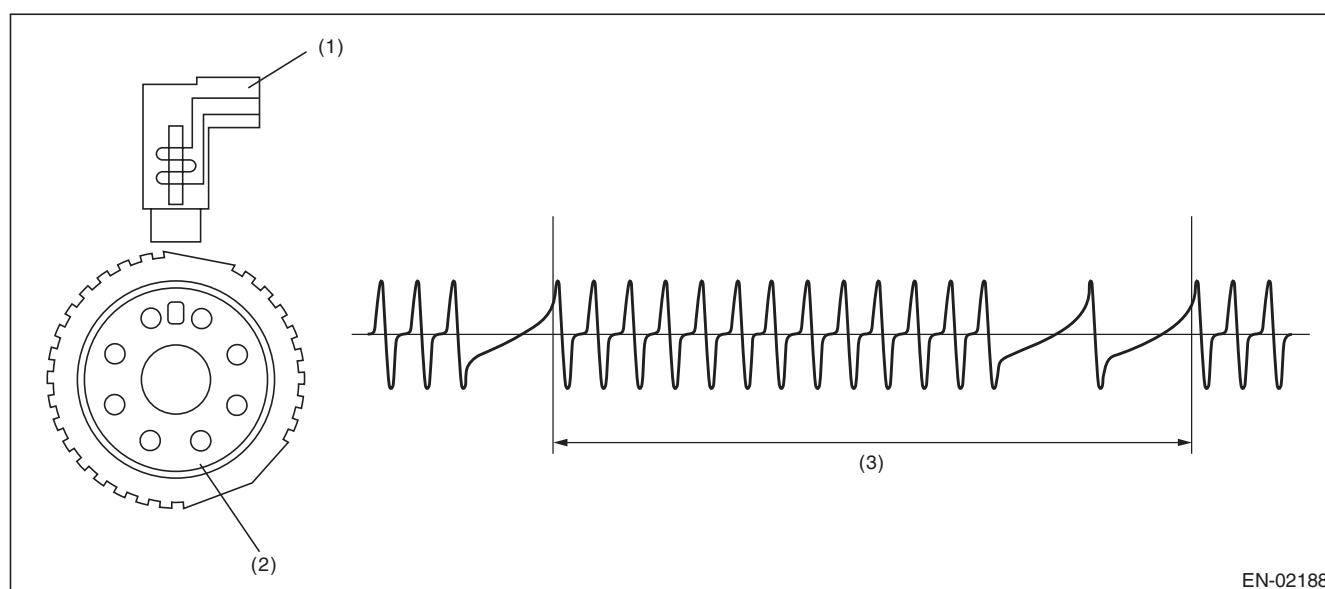
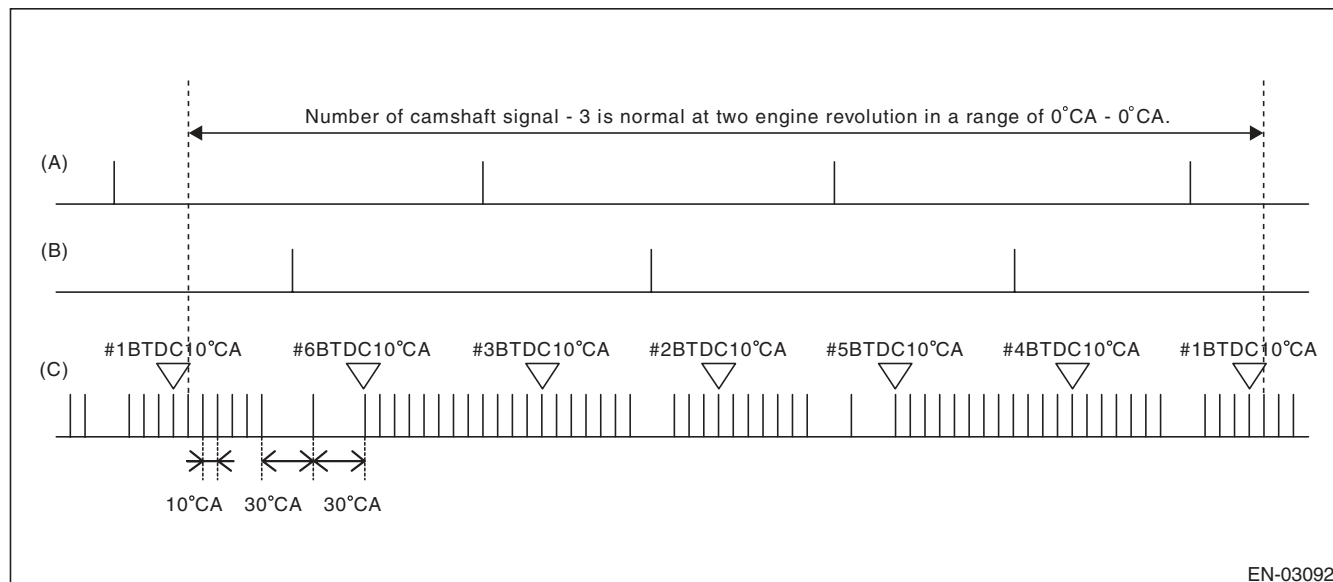
BY:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect for faults in crankshaft position sensor output properties.

Judge as NG when there is a problem in the number of crankshaft signals for every revolution.

2. COMPONENT DESCRIPTION



3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 8 \text{ V}$
Engine speed	$< 3000 \text{ rpm}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3000 rpm engine speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

Judge as NG when the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
Cylinder number identification	Completed
Amount of crank sensor signal during 1 rev.	Not = 30

Time Needed for Diagnosis: 10 engine revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Cylinder number identification	Completed
Amount of crank sensor signal during 1 rev.	= 30

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

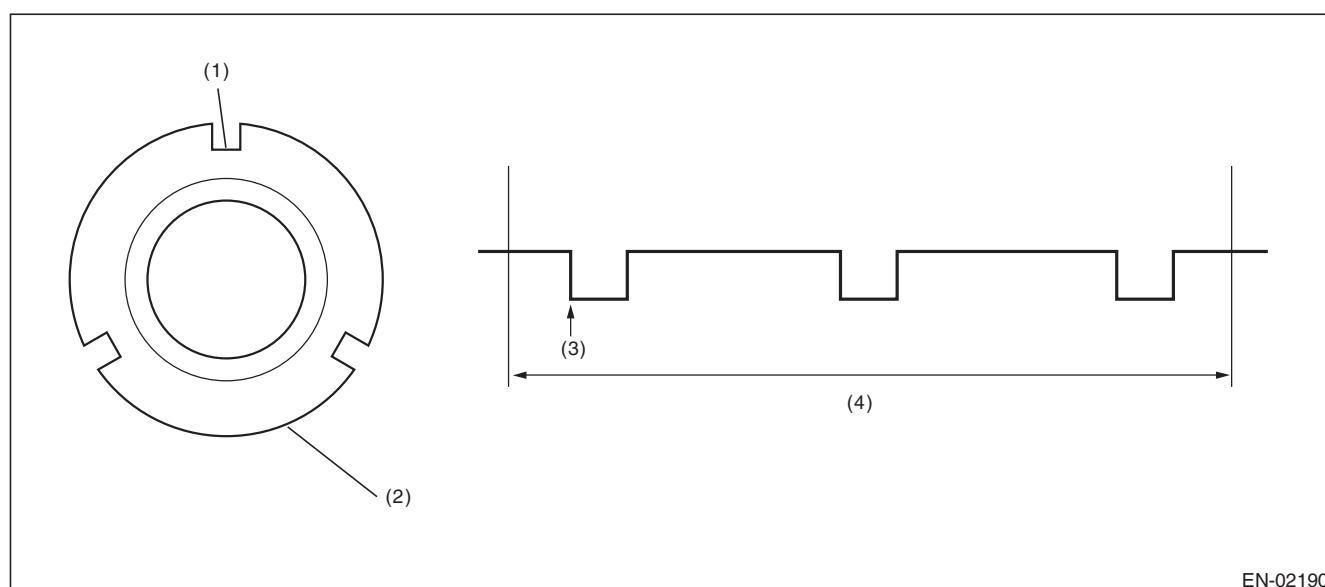
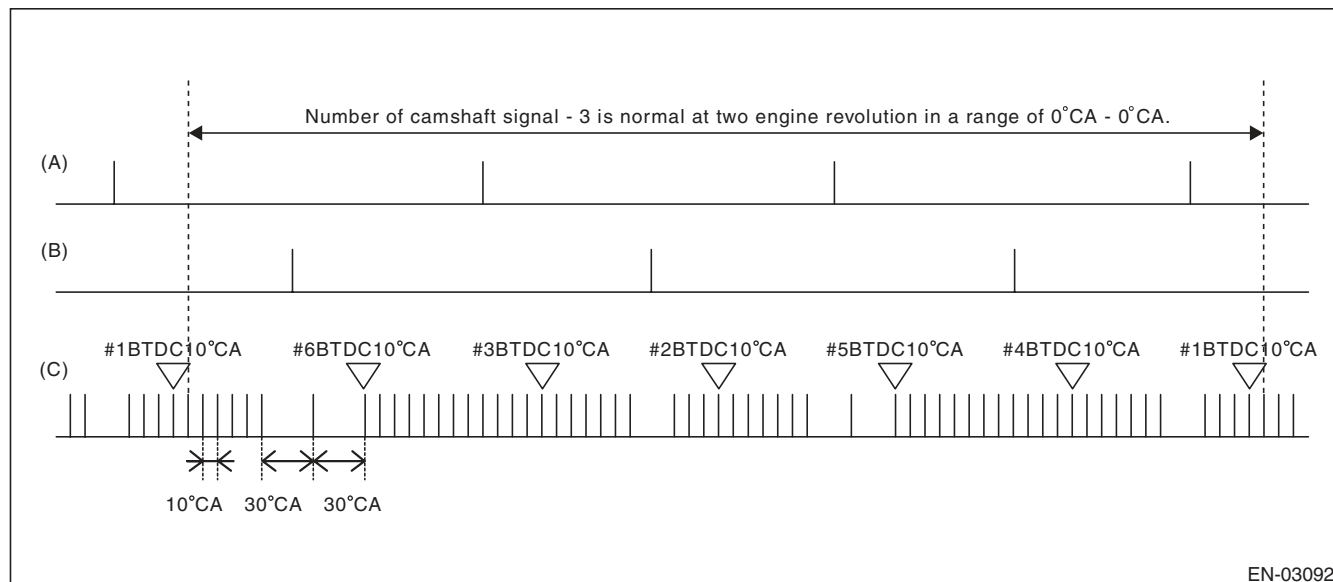
BZ:DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the camshaft position sensor.

Judge as NG when the number of camshaft signals remains abnormal.

2. COMPONENT DESCRIPTION



3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement 1

Judge as NG when the condition where the number of camshaft position sensor signals are less than 3 times during 2 engine speed. continues.

Judgement Value

Malfunction Criteria	Threshold Value
Amount of camshaft sensor signal during 2 revs.	< 3.000 time(s)

Time Needed for Diagnosis: Two engine revolutions × 4 time(s)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement 1

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgement Value

Malfunction Criteria	Threshold Value
Camshaft position sensor signal	≥ 3.000 time(s)

Time Needed for Diagnosis: Two engine revolutions

• Abnormality Judgement 2

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Starter	ON
Camshaft position sensor signal	No input

Time Needed for Diagnosis: 3000 ms

• Normality Judgement 2

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Camshaft position sensor signal	Input exists

Time Needed for Diagnosis: Less than 1 second

CA:DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0340. <Ref. to GD(H6DO)-101, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

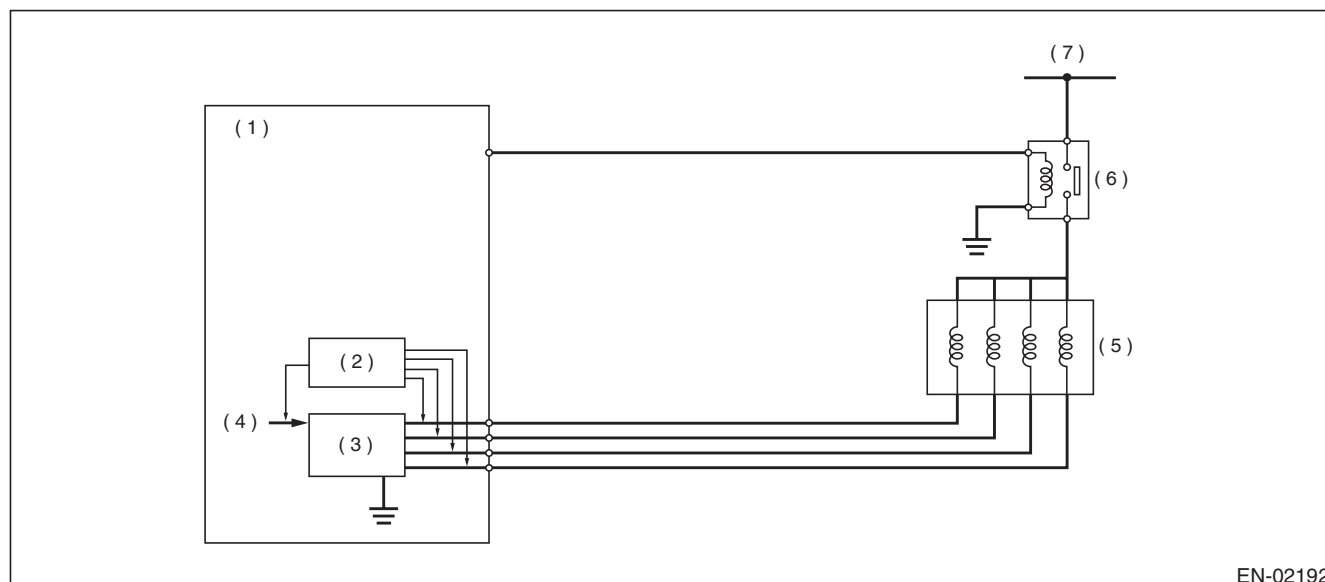
CB:DTC P0400 EXHAUST GAS RECIRCULATION FLOW

1. OUTLINE OF DIAGNOSIS

Detect EGR system malfunction.

Intake manifold pressure (negative pressure) is constant because the throttle valve is fully closed during deceleration fuel cut. At this time, when the EGR valve is opened/closed, the intake manifold pressure will change. EGR System OK/NG is judged by the range of this change.

2. COMPONENT DESCRIPTION



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- | | | |
|-----------------------|---------------|--------------------------|
| (1) ECM | (4) CPU | (6) Main relay |
| (2) Detecting circuit | (5) EGR valve | (7) Battery power supply |
| (3) Switching circuit | | |

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 40 s
Engine coolant temperature	≥ 75 °C(167 °F)
Engine speed	1200 rpm — 3250 rpm
Intake manifold pressure (absolute pressure)	< 36.7 kPa (275 mmHg, 10.8 inHg)
Ambient air temperature	≥ 5 °C(41 °F)
Throttle position	< 0.25 °
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Vehicle speed	≥ 53 km/h (32.9 MPH)
Fuel shut-off function	In operation
Neutral switch	OFF
After neutral switch ON/OFF change	≥ Value from Map
No load change (A/C, power steering, lighting, rear defogger, heater fan and radiator fan)	≥ 5000 ms

Map

Engine coolant temperature °C (°F)	-40 (-40)	-30 (-22)	-20 (-4)	-10 (14)	0 (32)	10 (50)	20 (68)	30 (86)
After neutral switch change msec	0	0	0	0	0	0	0	0

Engine coolant temperature °C (°F)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)	110 (230)
After neutral switch change msec	0	0	0	0	0	0	0	0

4. GENERAL DRIVING CYCLE

During deceleration fuel cut from 53 km/h (approx. 33 MPH) or more, perform diagnosis once. Be careful of vehicle speed and engine speed. (Diagnosis will not be completed if the vehicle speed and engine speed conditions become out of specification due to deceleration.)

5. DIAGNOSTIC METHOD

Measure the pressure values when the enable conditions are established, and perform diagnosis by calculating those results.

1. Label the intake manifold pressure value as PMOF1, which is observed when enable conditions are established, and set the EGR target step to 50 steps (nearly full open).
2. Label the intake manifold pressure value as PMON, which is observed after one second has passed since EGR target step was set to 50 steps (when the enable conditions were established), and set the EGR target step to 0.
3. Label the intake manifold pressure as PMOF2, which is observed after one second has passed since EGR target step was set to 0 (after two seconds have passed since the enable conditions were established).

• Abnormality Judgement

Judge as NG when the following conditions are established.

Judgement Value

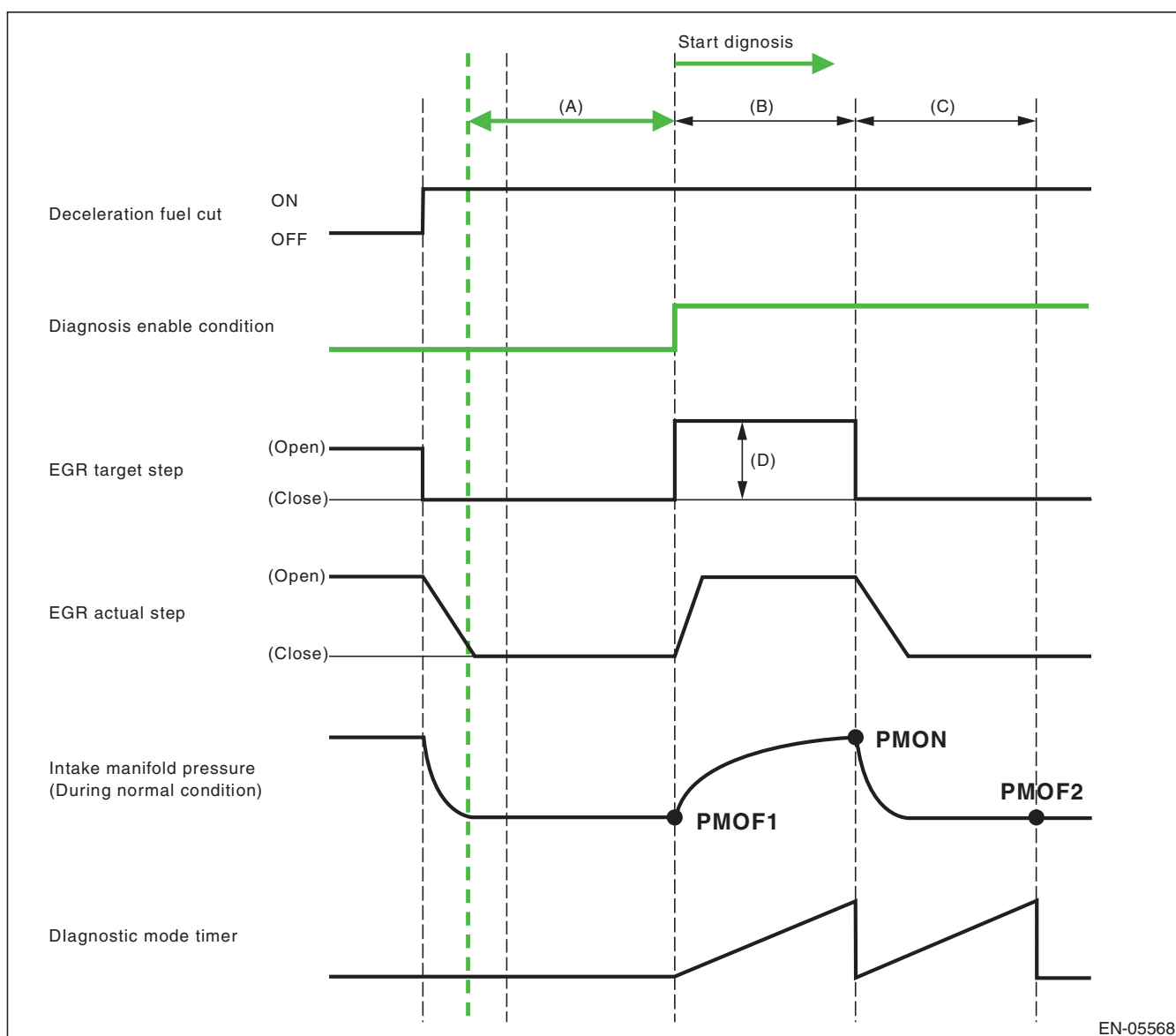
Malfunction Criteria	Threshold Value
PMON – (PMOF1 + PMOF2)/2	< 1.6 kPa (11.8 mmHg, 0.5 inHg)

Time Needed for Diagnosis: 1 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION



(A) 2000 ms

(C) 1500 ms

(D) 50 step(s)

(B) 1500 ms

• Normality Judgement

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
$PMON - (PMOF1 + PMOF2)/2$	$\geq 1.6 \text{ kPa (11.8 mmHg, 0.5 inHg)}$

Time Needed for Diagnosis: 1 time

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CC:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

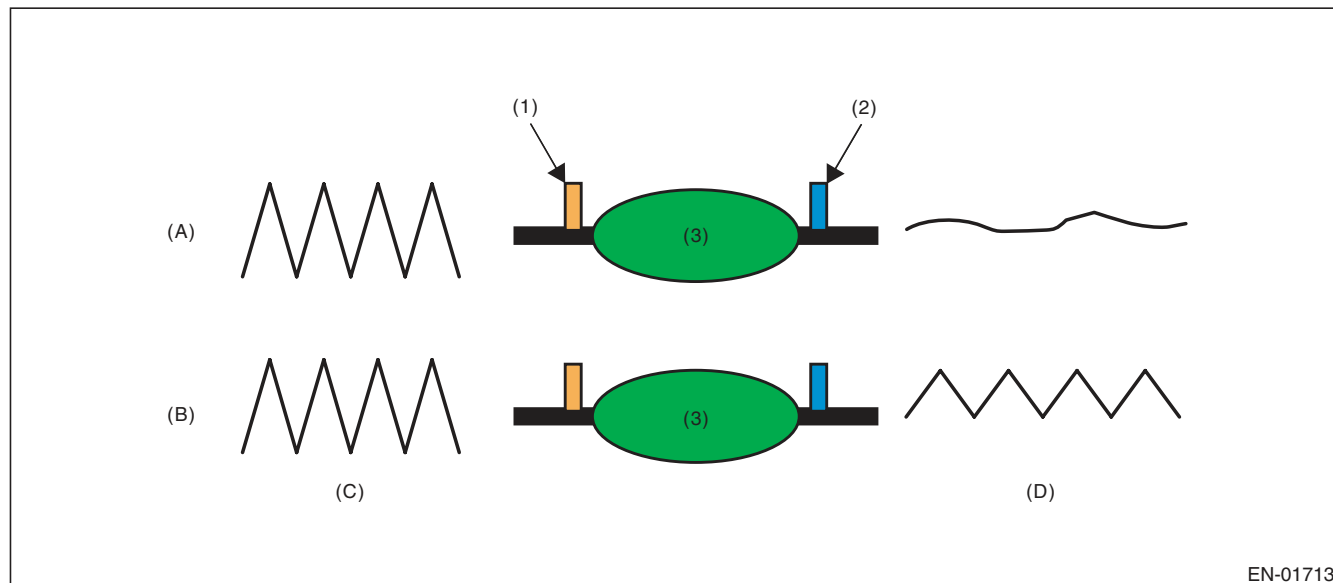
1. OUTLINE OF DIAGNOSIS

Detect the deterioration of the catalyst function.

Though the front oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened.

For this reason, the catalyst diagnosis is carried out by monitoring the front oxygen sensor output and comparing it with the front oxygen (A/F) sensor output.

2. COMPONENT DESCRIPTION



- (A) Normal
(B) Deterioration

- (C) Output waveform from the front oxygen (A/F) sensor

- (D) Output waveform from the front oxygen sensor

- (1) Front oxygen (A/F) sensor

- (2) Front oxygen sensor

- (3) Catalytic converter

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Atmospheric pressure	$\geq 75 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Engine coolant temperature	$\geq 75 \text{ }^{\circ}\text{C}$ (167 $^{\circ}\text{F}$)
Estimated catalyst temperature	$\geq 560 \text{ }^{\circ}\text{C}$ (1040 $^{\circ}\text{F}$)
Misfire detection every 200 rotations	$< 7 \text{ time(s)}$
Learning value of evaporation gas density	< 0.2
Sub feedback	In operation
Evaporative system diagnosis	Not in operation
Time of difference (< 0.10) between actual lambda and target lambda	$\geq 1000 \text{ ms}$
Vehicle speed	$> 60 \text{ km/h}$ (37.3 MPH)
Amount of intake air	$\geq 10 \text{ g/s}$ (0.35 oz/s) and $< 40 \text{ g/s}$ (1.41 oz/s)
Engine load change every 0.5 engine speed.	$< 0.02 \text{ g/rev}$ (0 oz/rev)
Rear oxygen output change from 660 mV or less to 660 mV or more	Experienced after fuel cut
Elapsed time after starting the engine	$\geq 205 \text{ s}$
Purge execution calculated time	$\geq 5 \text{ s}$

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once at a constant 60 km/h (37.3 MPH) or higher.

5. DIAGNOSTIC METHOD

After establishing the execution conditions, calculate the front oxygen (A/F) sensor lambda deviation cumulative value ($\sum |(sglmd_n - sglmd_{n-1})|$) and rear oxygen sensor output voltage deviation cumulative value ($\sum |(ro2sad_n - ro2sad_{n-1})|$) per 32 milliseconds $\times 4$, and when the front oxygen (A/F) sensor lambda deviation cumulative value ($\sum |(sglmd_n - sglmd_{n-1})|$) becomes the predetermined value or more, calculate the diagnostic value.

• Abnormality Judgement

If the duration of time while the following conditions are met is within the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
$\sum (ro2sad_n - ro2sad_{n-1}) / \sum (sglmd_n - sglmd_{n-1}) $	> 25

Time Needed for Diagnosis: 30 — 55 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is within the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
$\sum (ro2sad_n - ro2sad_{n-1}) / \sum (sglmd_n - sglmd_{n-1}) $	≤ 25

Time Needed for Diagnosis: 30 — 55 seconds

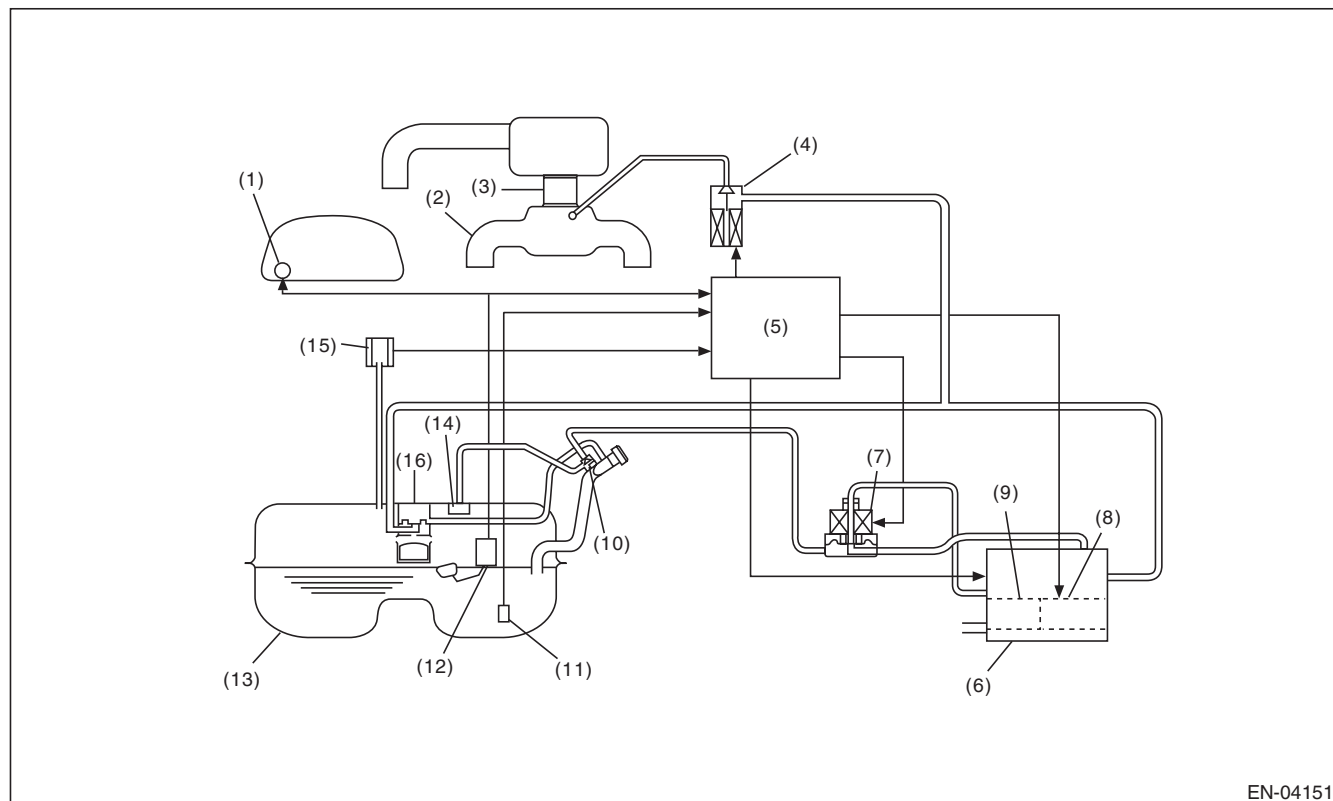
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CD:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

Check if there is a leakage in fuel system or not, and perform the function diagnosis of valve.



EN-04151

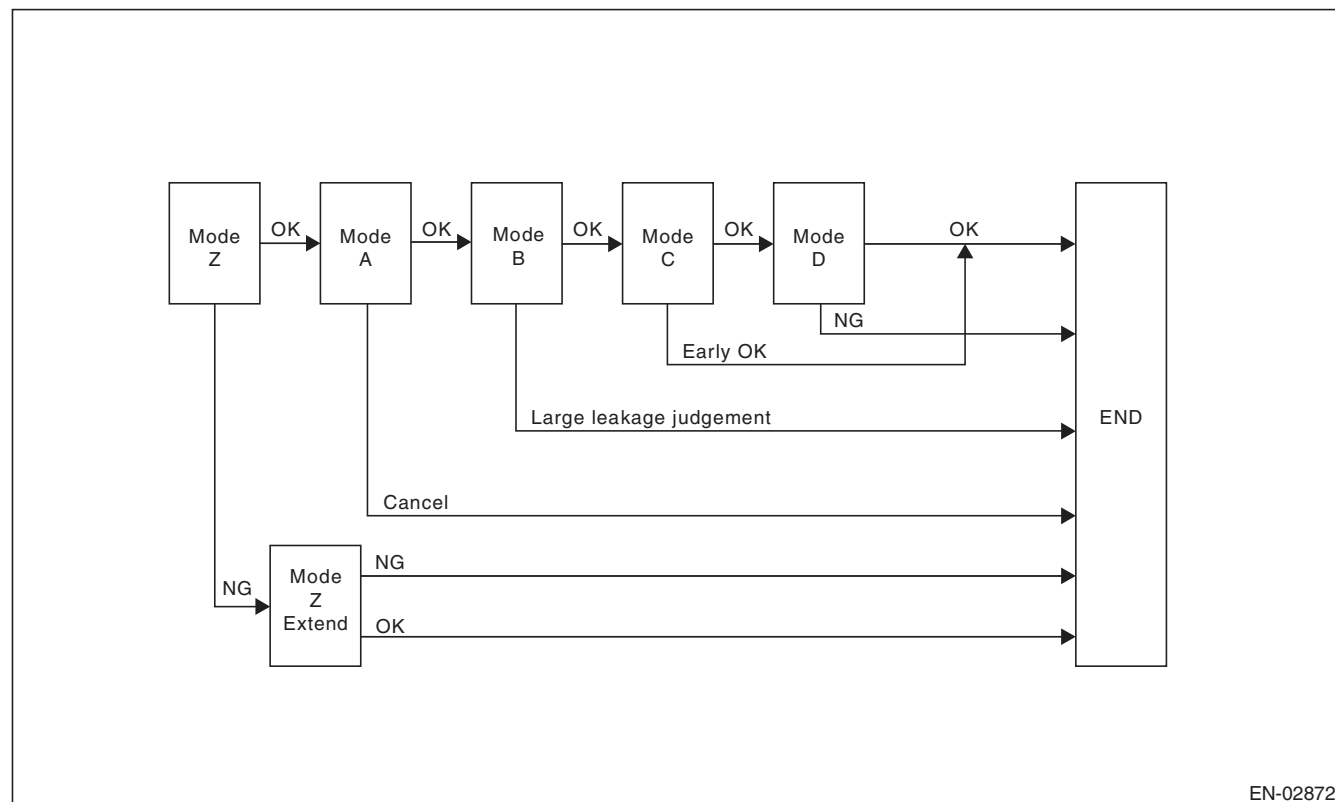
- | | | |
|----------------------------------|------------------------------|--------------------------------|
| (1) Fuel gauge | (7) Pressure control valve | (12) Fuel level sensor |
| (2) Intake manifold | (8) Drain valve | (13) Fuel tank |
| (3) Throttle body | (9) Drain filter | (14) Fuel cut valve |
| (4) Purge control solenoid valve | (10) Shut-off valve | (15) Fuel tank pressure sensor |
| (5) Engine control module (ECM) | (11) Fuel temperature sensor | (16) Vent valve |
| (6) Canister | | |

In this system diagnosis, check for leakage and valve function is conducted by changing the fuel tank pressure and monitoring the pressure change using the fuel tank pressure sensor. When in 0.04 inch diagnosis, perform in the order of mode Z → mode A → mode B → mode C and mode D; When in 0.02 inch diagnosis, perform in the order of mode A → mode B → mode C → mode D and mode E.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

0.04-inch Diagnosis



EN-02872

Mode	Mode Description	Diagnosis Period
Mode Z (Purge control solenoid valve opening failure diagnosis)	Perform purge control solenoid valve opening failure diagnosis from the size of tank pressure variation from diagnosis start.	0 ms + 3000 ms — 0 ms + 3000 ms + 13000 ms
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	10000 ms
Mode B (Sealed negative pressure, large leakage judgement)	Decrease the pressure in the tank to the target value by introducing the intake manifold pressure to the fuel tank. If the tank pressure cannot be reduced, it is diagnosed as large leak.	0 — 10000 ms + 25000 ms
Mode C (Pressure increase check, advanced OK judgement)	Wait until the tank pressure returns to the target (start level of P2 calculation). If the tank pressure does not become the value, make advanced OK judgement.	0 — 17000 ms
Mode D (Negative pressure variation measurement, evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 found in Mode A. Perform the evaporation diagnosis using the diagnostic value.	0 ms + 10000 ms

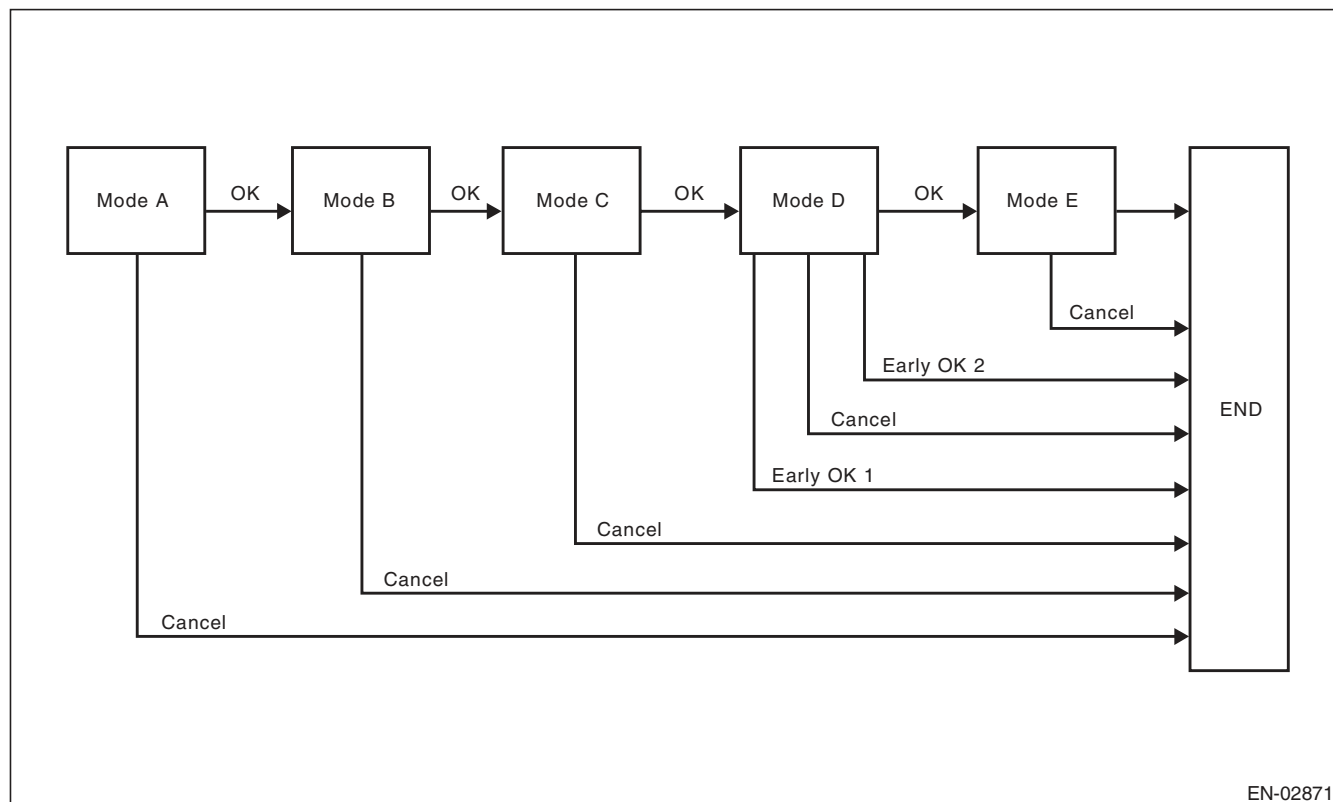
Mode Table for Evaporative Emission Control System Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Z	Roughly the same as barometric pressure (Same as 0 kPa (0 mmHg, 0 inHg))	Purge control solenoid valve is judged to be open.	P0457
Mode A	Pressure is in proportion to amount of evaporative emission.	—	None
Mode B	Negative pressure is formed due to intake manifold negative pressure	Large leak	P0457
Mode C	Reaches target pressure	—	None
Mode D	Pressure change is small.	EVAP system large leak determination. [1.0 mm (0.04 in)]	P0442

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

0.02-inch Diagnosis



Mode	Mode Description	Diagnosis Period
Mode A (0 point compensation)	When the pressure in the tank is not near 0 mmHg, wait until it returns to 0 point (near 0 mmHg).	0 — Value of Map 1
Mode B (Negative pressure introduced)	Decrease the pressure in the tank to the target value by introducing the intake manifold pressure to the fuel tank.	0 — Value of Map 2
Mode C (Negative pressure maintained)	Wait until the tank pressure returns to the target (start level of P2 calculation).	0 — 20000 ms + 0 + Value from Map 2
Mode D (Negative pressure change calculated)	Calculate the time it takes for the tank pressure to change to the Mode E shifting pressure. If the tank pressure does not change to the Mode E shifting pressure, make advanced OK judgement.	0 — 0 ms + 200000 ms
Mode E (Evaporation generated amount calculation)	Calculate the amount of evaporation (P1).	0 — 0 ms + 200000 ms + Value from Map 3

Map1

Fuel level (ℓ, US gal, Imp gal)	0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Time Needed for Diagnosis (ms)	12000	12000	11000	10000	7500	5000	5000

Map2

Fuel level (ℓ, US gal, Imp gal)	0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Time Needed for Diagnosis (ms)	18500	18500	18500	18500	18500	18500	18500

Map 3

Fuel level (ℓ, US gal, Imp gal)	0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Time Needed for Diagnosis (ms)	60000	60000	60000	60000	60000	60000	60000

Diagnostic Trouble Code (DTC) Detecting Criteria

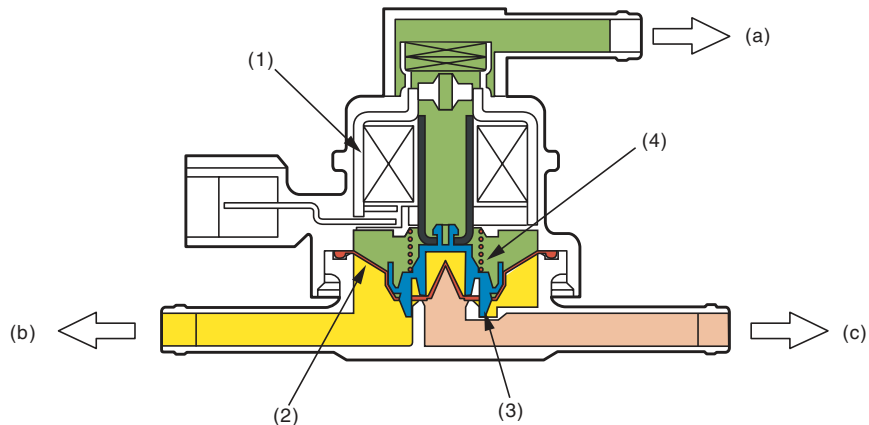
GENERAL DESCRIPTION

2. COMPONENT DESCRIPTION

Pressure control solenoid valve

PCV controls the fuel tank pressure to be equal to the atmospheric air pressure. Normally, the solenoid is set to OFF. The valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.

The valve is forcibly opened by setting the solenoid to ON at the time of diagnosis.



EN-01715

(a) Barometric pressure

(b) Fuel tank

(c) Canister

(1) Solenoid

(3) Valve

(4) Spring

(2) Diaphragm

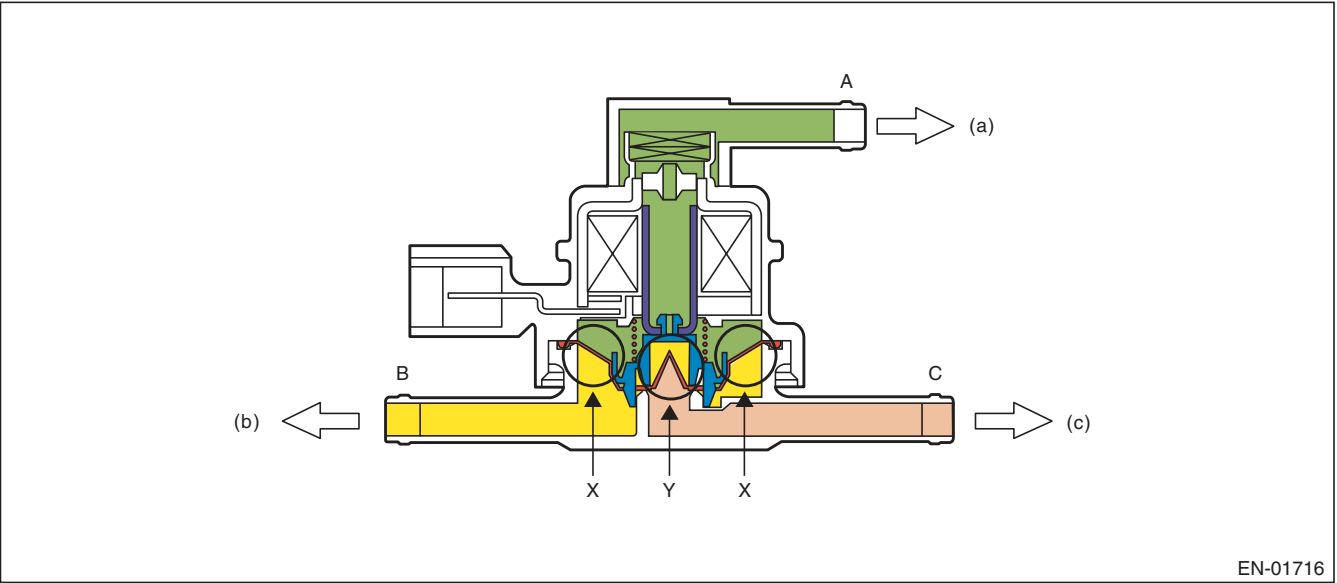
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Valve Operation and Air Flow

In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.

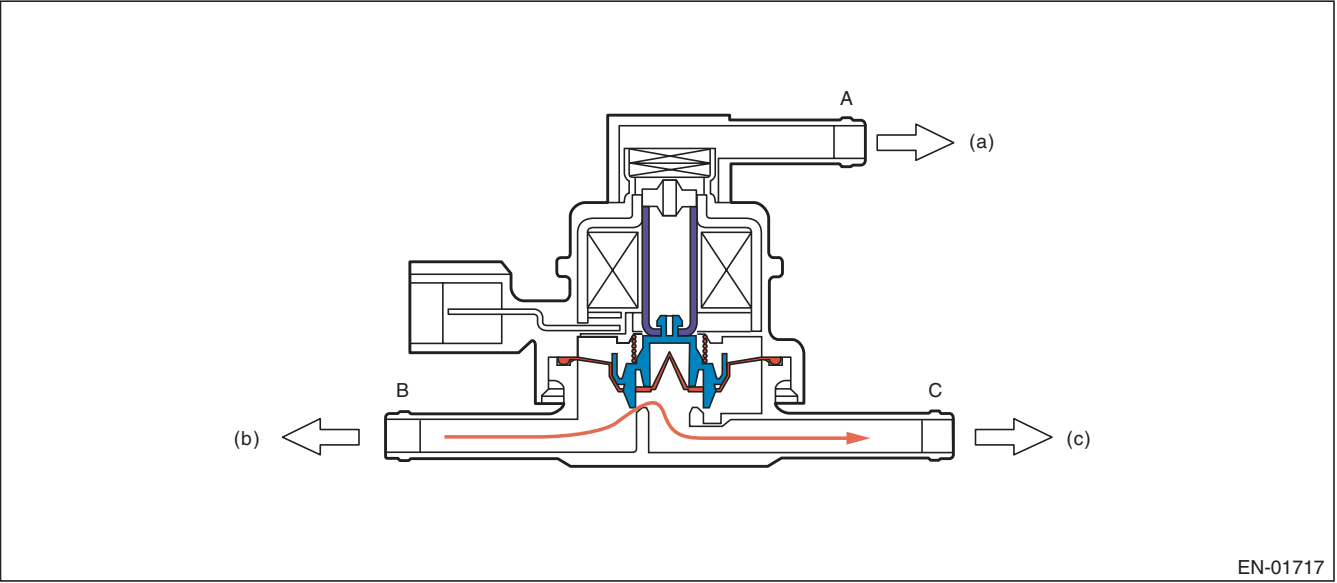
If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



(a) Barometric pressure (b) Fuel tank (c) Canister

Condition of pressure	Flow
$A < B$ (solenoid OFF)	$B \rightarrow C$
$B < C$ (solenoid OFF)	$C \rightarrow B$
Solenoid ON	$B \leftarrow \rightarrow C$

When $A < B$ (solenoid OFF)

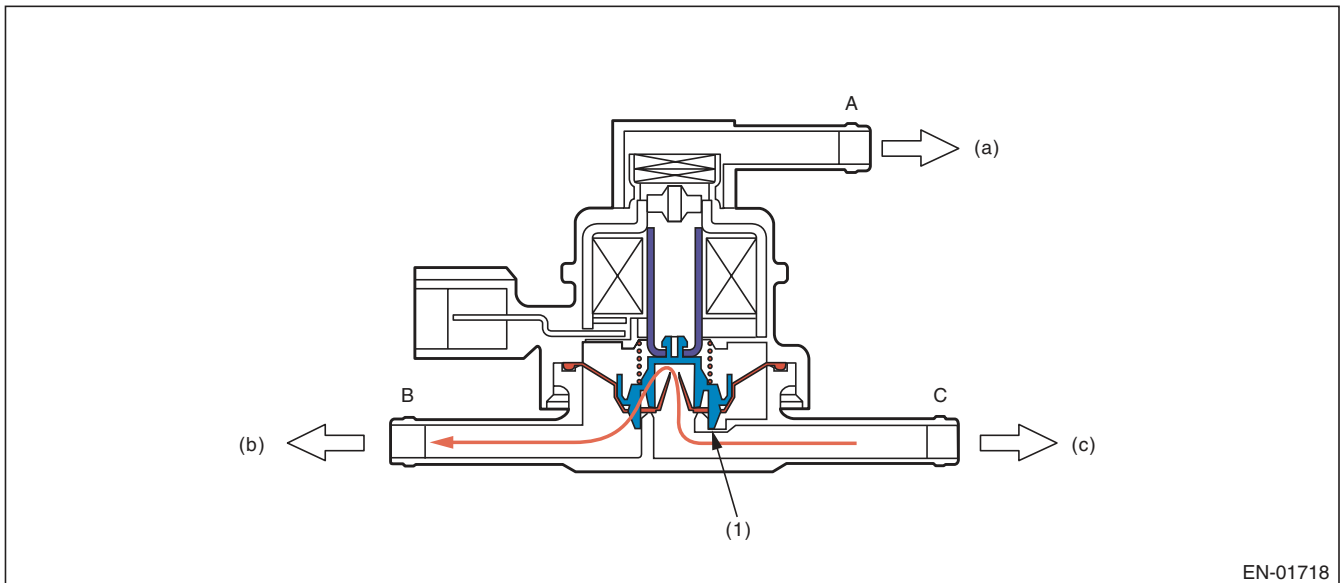


(a) Barometric pressure (b) Fuel tank (c) Canister

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

When $B < C$ (solenoid OFF)



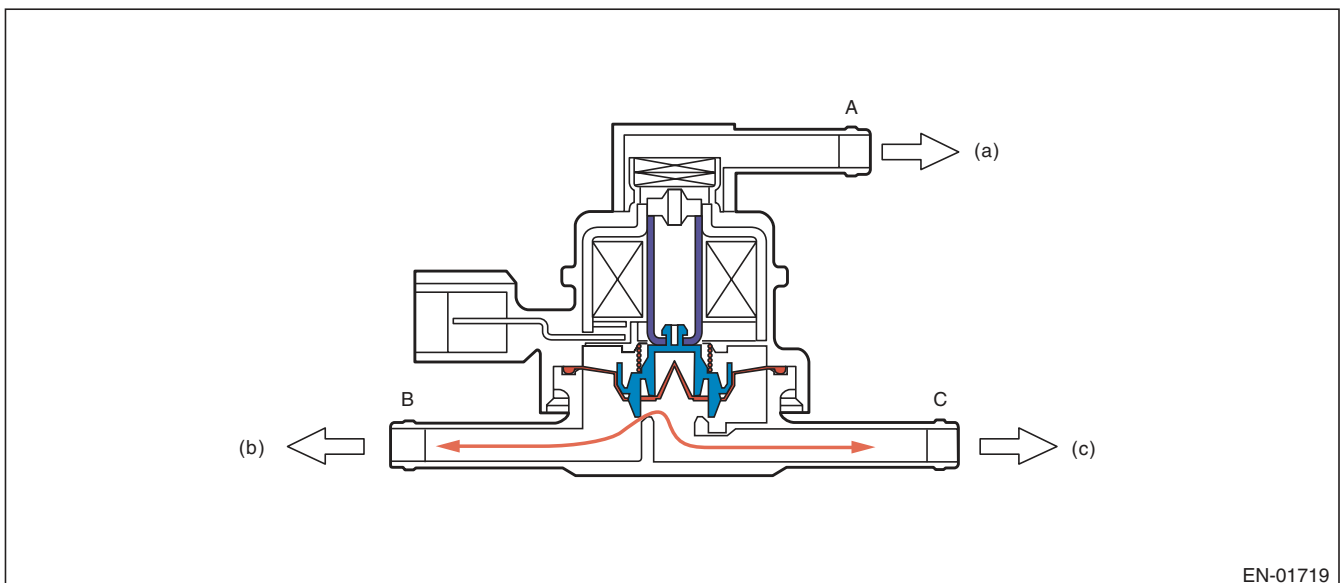
(a) Barometric pressure

(b) Fuel tank

(c) Canister

(1) Valve

When Solenoid is ON



(a) Barometric pressure

(b) Fuel tank

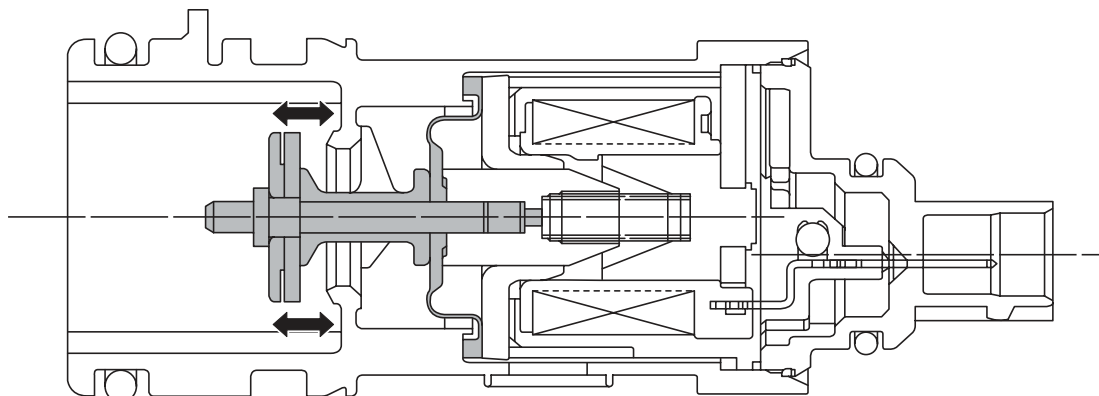
(c) Canister

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Drain valve

Drain valve controls the ambient air to be introduced to the canister.



EN-02293

3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Barometric pressure	$\geq 75 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Total time of canister purge operation	$\geq 120000 \text{ ms}$
Elapsed time after starting the engine	$\geq 856 \text{ s}$
Learning value of evaporation gas density	< 0.08
Engine speed	1050 rpm — 6500 rpm
Fuel tank pressure	$\geq -4 \text{ kPa}$ (-30 mmHg, -1.2 inHg)
Intake manifold relative vacuum (relative pressure)	$\geq -26.7 \text{ kPa}$ (-200 mmHg, -7.9 inHg)
Vehicle speed	$\geq 32 \text{ km/h}$ (19.9 MPH)
Fuel level	9.6 ℓ (2.54 US gal, 2.11 Imp gal) — 54.4 ℓ (14.37 US gal, 11.97 Imp gal)
Closed air/fuel ratio control	In operation
Fuel temperature	$-10 \text{ }^{\circ}\text{C}$ (14 $^{\circ}\text{F}$) — $45 \text{ }^{\circ}\text{C}$ (113 $^{\circ}\text{F}$)
Intake air temperature	$\geq -10 \text{ }^{\circ}\text{C}$ (14 $^{\circ}\text{F}$)
Pressure change every one second	$< 1.7 \text{ mmHg}$ (Mode A) $< 1.7 \text{ mmHg}$ (Mode D)
Minimum pressure change value every one second — Maximum pressure change value every one second	$< 1.7 \text{ mmHg}$ (Mode A) $< 1.7 \text{ mmHg}$ (Mode D)
Change of fuel level per 128 milliseconds	$< 2 \text{ } \ell$ (0.53 US gal, 0.44 Imp gal)
Air fuel ratio	0.76 — 1.25

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
At starting a diagnosis	
Evap. diagnosis	Incomplete
Battery voltage	$\geq 10.9 \text{ V}$
Barometric pressure	$\geq 75 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Time since last incomplete 0.02-inch leakage diagnosis	
When cancelling in mode A	$> 120000 \text{ ms}$
When cancelling in other than mode A	$> 600000 \text{ ms}$
Total time of canister purge operation	$\geq 120000 \text{ ms}$
Elapsed time after starting the engine	$\geq 120 \text{ s}$
Fuel temperature	$-10 \text{ }^{\circ}\text{C}$ (14 $^{\circ}\text{F}$) — $55 \text{ }^{\circ}\text{C}$ (131 $^{\circ}\text{F}$)
Fuel level	9.6 ℓ (2.54 US gal, 2.11 Imp gal) — 54.4 ℓ (14.37 US gal, 11.97 Imp gal)
Intake manifold relative vacuum (relative pressure)	$\geq -8 \text{ kPa}$ (-60 mmHg , -2.4 inHg)
Fuel tank pressure	-0.7 kPa (-5 mmHg , -0.2 inHg) — 1.4 kPa (10.7 mmHg, 0.4 inHg)
Vehicle speed	50 km/h (31.1 MPH) — 510 km/h (316.9 MPH) continues for 125000 ms
Closed air/fuel ratio control	In operation
Engine speed	1050 rpm — 7000 rpm
During diagnosis	
Change of fuel level	$\leq \text{Value of Map 4}$
Pressure change every one second	$< 0.1 \text{ kPa}$ (0.44 mmHg, 0 inHg)
Minimum pressure change value every one second – Maximum pressure change value every one second	$< 0.1 \text{ kPa}$ (0.51 mmHg, 0 inHg) (Mode D)
Pressure change in tank every second	$\leq 0.1 \text{ kPa}$ (0.75 mmHg, 0 inHg)
Barometric pressure change	-0.5 kPa (-3.6 mmHg , -0.1 inHg) — 0.3 kPa (2.4 mmHg, 0.1 inHg) (Mode D) -0.3 kPa (-2.4 mmHg , -0.1 inHg) — 0.3 kPa (2.4 mmHg, 0.1 inHg) (Mode E)

Map4

Fuel level (ℓ , US gal, Imp gal)	0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Change (ℓ , US gal, Imp gal)	5, 1.32, 1.1	5, 1.32, 1.1	5, 1.32, 1.1	5, 1.32, 1.1	5, 1.32, 1.1	5, 1.32, 1.1	5, 1.32, 1.1

4. GENERAL DRIVING CYCLE

0.04-inch Diagnosis

- Perform the diagnosis only once in 856 seconds or more after starting the engine, at a constant speed of 32 km/h (20 MPH) or more.
- Pay attention to the fuel temperature and fuel level.

0.02-inch Diagnosis

- Perform the diagnosis 125 seconds or more at a constant engine speed of 50 km/h (31 MPH) or higher to judge as NG or OK.
- If judgement cannot be made, repeat the diagnosis.
- Pay attention to the fuel level.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Purge control solenoid valve stuck open fault diagnosis

DTC

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, the purge control solenoid valve must operate normally. Therefore, mode Z is used to diagnose the purge control solenoid valve stuck open condition. Note that if a purge control solenoid valve stuck open fault is detected, the EVAP system leakage diagnosis is cancelled.

DIAGNOSTIC METHOD

Purge control solenoid valve functional diagnosis is performed by monitoring the tank pressure in mode Z.

• Abnormality Judgement

If OK judgment cannot be made, extend Mode Z, and Judge as NG when the following conditions are established after predetermined amount of time.

Judgement Value

Malfunction criteria	Threshold value	DTC
evptez – evptezha	> 0.6 kPa (4.5 mmHg, 0.2 inHg)	P0457
evptezini	≤ 1.4 kPa (10.7 mmHg, 0.4 inHg)	
Time of 2 ℓ (0.53 US gal, 0.44 Imp gal) or more fuel no sloshing	≥ 40000 ms	

Time Needed for Diagnosis: 0 ms + 3000 ms + 13000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

When judgment for purge control solenoid valve stuck open NG is made, end the evaporative diagnosis.

Cancel the evaporative diagnosis when the OK/NG judgment for purge control solenoid valve stuck open cannot be made in Mode Z.

• Normality Judgement

Judge as OK and change to Mode A when the following conditions are established after predetermined time has passed since Mode Z started.

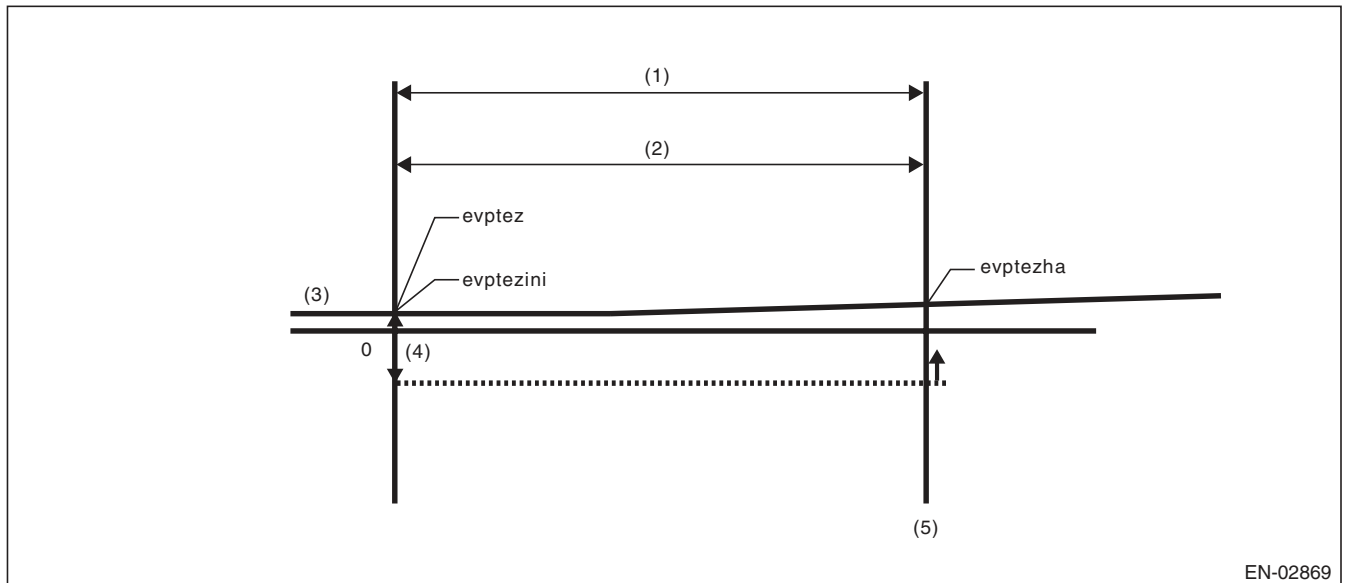
Judgement Value

Malfunction criteria	Threshold value	DTC
evptez – evptezha	≤ 0.4 kPa (3 mmHg, 0.1 inHg)	P0457

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Normal



(1) Mode Z
(2) 3000 ms

(3) Fuel tank pressure
(4) 0.4 kPa (3 mmHg, 0.1 inHg)

(5) OK judgment

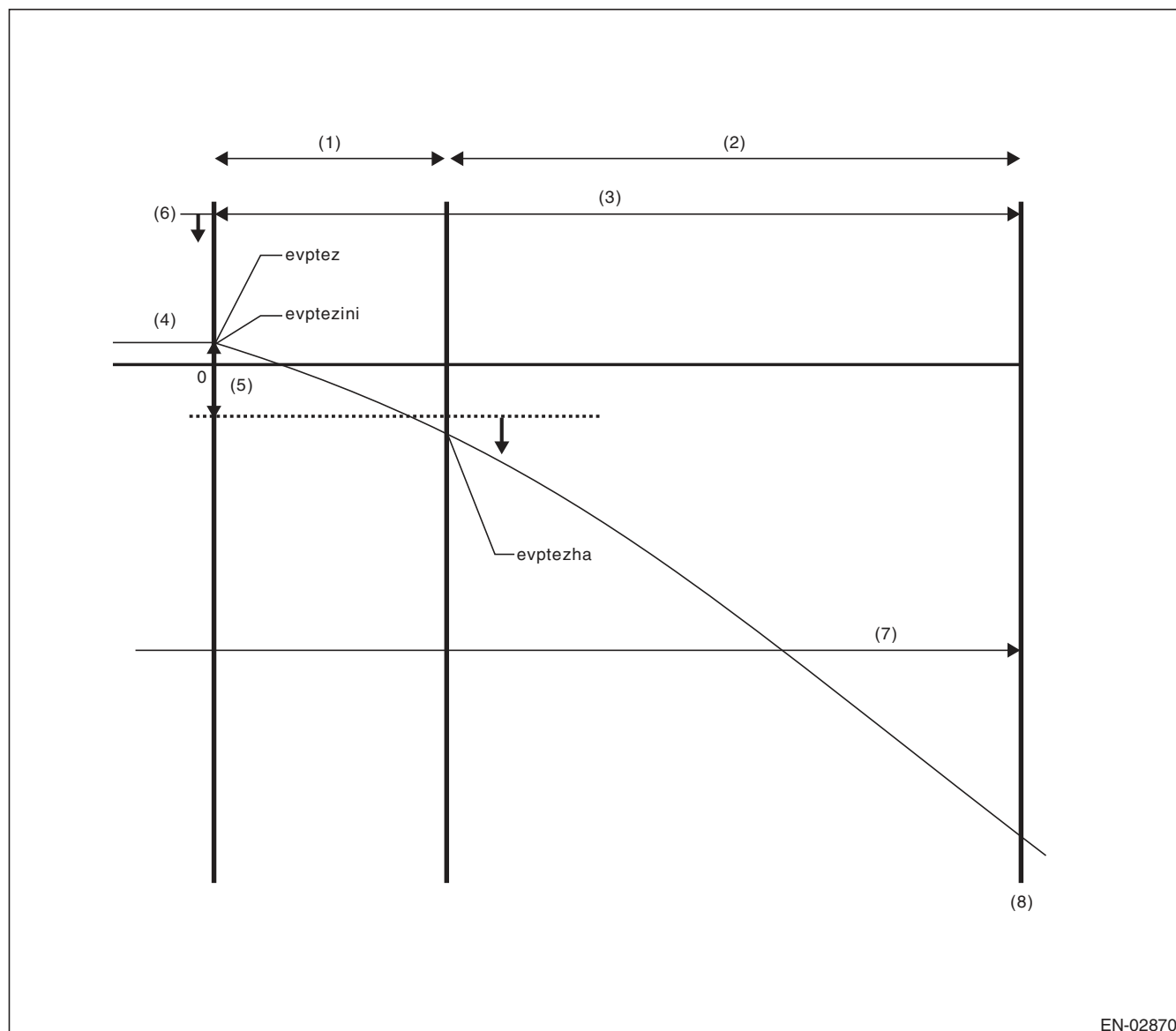
$evptez - evptezha \leq 0.4 \text{ kPa (3 mmHg, 0.1 inHg)}$ Normal when above is established

Time Needed for Diagnosis: 0 ms + 3000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Purge control solenoid valve Open Fixation



EN-02870

- | | | |
|------------------------|-----------------------------------|-------------------------------|
| (1) Mode Z | (4) Fuel tank pressure | (7) 40000 ms no fuel sloshing |
| (2) Extended mode Z | (5) 0.6 kPa (4.5 mmHg, 0.2 inHg) | (8) NG judgment |
| (3) 3000 ms + 13000 ms | (6) 1.4 kPa (10.7 mmHg, 0.4 inHg) | |

- $evptezini \leq 1.4 \text{ kPa}$ (10.7 mmHg, 0.4 inHg)
 - $evptez - evptezha > 0.6 \text{ kPa}$ (4.5 mmHg, 0.2 inHg)
 - No fuel sloshing of over 2 $\varnothing$ (0.53 US gal, 0.44 Imp gal) lasts for more than 40000 ms.
- Judge as abnormal when all are established.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Leak Diagnosis

DTC

P0442 Evaporative Emission Control System Leak Detected (Small Leak)

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

- The diagnostic consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to barometric pressure.
- The diagnosis is divided into the following five phases.

Mode A: (Estimated evaporation gas amount)

Calculate the tank pressure change amount (P1) when using mode A. After calculating P1, switch to mode B.

Mode B: (Negative pressure sealed)

Introduce negative pressure in the intake manifold to the tank.

Approx. 0 → -1.4 kPa (0 → -10.5 mmHg, 0 → -0.4 inHg)

When the pressure above (desired negative pressure) is reached, enters Mode C.

In this case, if the tank pressure does not reach the target negative pressure, judge that there is a large leakage in the system and terminate the evaporative emission control system diagnosis.

Abnormality Judgement

Judge as NG (large leakage) when the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value	DTC
Time to reach target negative pressure or Mode B time (Min. pressure value in tank when in mode B) – (Tank pressure when mode B started)	$\geq 10000 \text{ ms} + 25000 \text{ ms}$ $\geq 10000 \text{ ms}$ $> -0.3 \text{ kPa } (-2.5 \text{ mmHg, } -0.1 \text{ inHg})$	P0457

Time Needed for Diagnosis: 0 ms + 3000 ms + 10000 ms + 10000 ms + 25000 ms

Mode C: (Check pressure rise)

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)

Change to Mode D when the tank pressure returns to the start level of P2 calculation.

Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

Tank pressure when starting calculation of P2	Time for advanced OK judgment
-1.3 kPa (-9.75 mmHg, -0.4 inHg)	17000 ms

Time Needed for Diagnosis: 0 ms + 3000 ms + 10000 ms + 10000 ms + 25000 ms + 17000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Mode D: (Measure amount of negative pressure change)

Monitor the tank pressure change amount when using mode D. In this case, the tank pressure increases, (nears barometric pressure) because evaporation occurs. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.

After calculating P2, perform a small leak diagnosis according to the items below.

When Mode D is ended

Assign tank variations measured in Mode A and Mode D, P1 and P2, to the formula below, judge small leaks in the system. If the measured judgment value exceeds the threshold value, it is judged to be a malfunction.

Abnormality Judgement

Judge as NG when the following conditions are established within the predetermined time. Judge as OK and clear the NG if the following conditions are not established within the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value	DTC
$P2 - 1.5 - \times P1$ P2: Tank pressure that changes every 10000 ms in mode D P1: Tank pressure that changes every 10000 ms in mode A	> Value of Map 5	P0442

*1.5 –: Evaporation amount compensation value when below negative pressure (Amount of evaporation occurrence increases as a vacuum condition increases.)

Map 5 Malfunction criteria limit for evaporation diagnosis

Fuel temperature vs. Fuel level	25 °C (77 °F)	30 °C (86 °F)	35 °C (95 °F)	40 °C (104 °F)	45 °C (113 °F)
0 ℓ (0 US gal, 0 Imp gal)	0.3 kPa (2.1 mmHg, 0.1 inHg)	0.3 kPa (2.2 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0.3 kPa (2.35 mmHg, 0.1 inHg)	0.3 kPa (2.4 mmHg, 0.1 inHg)
10 ℓ (2.64 US gal, 2.2 Imp gal)	0.3 kPa (2.1 mmHg, 0.1 inHg)	0.3 kPa (2.2 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0.3 kPa (2.35 mmHg, 0.1 inHg)	0.3 kPa (2.4 mmHg, 0.1 inHg)
20 ℓ (5.28 US gal, 4.4 Imp gal)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0.3 kPa (2.4 mmHg, 0.1 inHg)	0.3 kPa (2.5 mmHg, 0.1 inHg)	0.3 kPa (2.6 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)
30 ℓ (7.93 US gal, 6.6 Imp gal)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (3.05 mmHg, 0.1 inHg)	0.4 kPa (3.15 mmHg, 0.1 inHg)	0.4 kPa (3.25 mmHg, 0.1 inHg)	0.4 kPa (3.35 mmHg, 0.1 inHg)
40 ℓ (10.57 US gal, 8.8 Imp gal)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (3.15 mmHg, 0.1 inHg)	0.4 kPa (3.3 mmHg, 0.1 inHg)	0.5 kPa (3.4 mmHg, 0.1 inHg)	0.5 kPa (3.5 mmHg, 0.1 inHg)
50 ℓ (13.21 US gal, 11 Imp gal)	0.4 kPa (3.2 mmHg, 0.1 inHg)	0.4 kPa (3.3 mmHg, 0.1 inHg)	0.5 kPa (3.5 mmHg, 0.1 inHg)	0.5 kPa (3.6 mmHg, 0.1 inHg)	0.5 kPa (3.7 mmHg, 0.1 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0.4 kPa (3.2 mmHg, 0.1 inHg)	0.4 kPa (3.3 mmHg, 0.1 inHg)	0.5 kPa (3.5 mmHg, 0.1 inHg)	0.5 kPa (3.6 mmHg, 0.1 inHg)	0.5 kPa (3.7 mmHg, 0.1 inHg)

Time Needed for Diagnosis: 0 ms + 3000 ms + 10000 ms + 10000 ms + 25000 ms + 17000 ms + 10000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Leak Diagnosis

DTC

P0456 Evaporative Emission Control System Leak Detected (very small leak)

- The diagnostic consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to barometric pressure.
- The diagnosis is divided into the following five phases.

Mode A: (0 point compensation)

When the pressure in the tank is not near 0 mmHg, wait until it returns to 0 point (near 0 mmHg). Shift to mode B when returned to the 0 point. Cancel the diagnosis when 0 point does not return in the specified time.

Mode B: (Negative pressure introduced)

Introduce negative pressure in the intake manifold to the tank.

Approx. 0 → -2 kPa (0 → -15 mmHg, 0 → -0.6 inHg)

When the pressure above (desired negative pressure) is reached, enters Mode C.

When the tank internal pressure does not reach the target negative pressure, the diagnosis is cancelled.

Mode C: (Negative pressure maintained)

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)

Change to Mode D either when the tank pressure returns to the start level of P2 calculation, or when the predetermined amount of time has passed.

Mode D: (Calculate the amount of negative pressure change)

Monitor the tank pressure in mode D, calculate (P2) the pressure change in the tank, and measure the time (evpdset) for the tank pressure to change to the Mode E shifting pressure. When the Mode E shifting pressure is reached, Mode E is entered. If it does not change to the Mode E shifting pressure after the predetermined amount of time has passed, make advanced OK judgment or cancel the diagnosis.

Normality Judgement

Judge as OK when the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
Advanced OK judgment 1	
Mode D time	≥ 0 ms + 20000 ms
Tank internal pressure	≤ Value of Map 6
Advanced OK judgment 2	
Mode D time	≥ 0 ms + 200000 ms
P2	≤ Value of Map 7

Map6

Fuel level (ℓ, US gal, Imp gal)	0, 0, 0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Tank pressure (kPa, mmHg, inHg)	-1.9, -13.9, -0.5	-1.9, -13.9, -0.5	-1.8, -13.8, -0.5	-1.8, -13.7, -0.5	-1.8, -13.6, -0.5	-1.8, -13.5, -0.5	-1.8, -13.5, -0.5

Map7

Fuel level (ℓ, US gal, Imp gal)	0, 0, 0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Tank pressure (kPa, mmHg, inHg)	0.9, 7, 0.3	0.9, 7, 0.3	0.9, 7.05, 0.3	0.9, 7.1, 0.3	1.1, 8.2, 0.3	1.3, 9.6, 0.4	1.3, 9.6, 0.4

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Mode E: (Evaporation occurrence amount calculation)

Calculate the change of tank pressure with the time evpdset to judge as NG/OK according to the value of P1. (ambiguous determination acceptable).

• Abnormality Judgement

Judge as NG when the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
P1	< Value of Map 8

Map 8 Malfunction criteria limit for evaporation diagnosis

Time (evpdset) vs. Fuel level	0 ms	30000 ms	50000 ms	100000 ms	160000 ms	200000 ms
0 ℓ (0 US gal, 0 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.2 kPa (1.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)
10 ℓ (2.64 US gal, 2.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.2 kPa (1.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)
20 ℓ (5.28 US gal, 4.4 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.2 kPa (1.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)
30 ℓ (7.93 US gal, 6.6 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.2 kPa (1.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)
40 ℓ (10.57 US gal, 8.8 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.2 kPa (1.85 mmHg, 0.1 inHg)	0.3 kPa (2.5 mmHg, 0.1 inHg)	0.3 kPa (2.5 mmHg, 0.1 inHg)	0.3 kPa (2.5 mmHg, 0.1 inHg)
50 ℓ (13.21 US gal, 11 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.3 kPa (2 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0 kPa (0 mmHg, 0 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.3 kPa (2 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0 kPa (0 mmHg, 0 inHg)

Time Needed for Diagnosis: Value of Map1+ Value of Map2 + 20000 ms + 0 + Value of Map2 + 0 ms + 200000 ms + Value of Map3 + 0 ms + 200000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgement

Judge as OK when the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
P1	> Value of Map 9

Map 9 Malfunction criteria limit for evaporation diagnosis

Time (evpdset) vs. Fuel level	0 ms	30000 ms	50000 ms	100000 ms	160000 ms	200000 ms
0 ℓ (0 US gal, 0 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.5 kPa (3.5 mmHg, 0.1 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)
10 ℓ (2.64 US gal, 2.2 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.5 kPa (3.5 mmHg, 0.1 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)
20 ℓ (5.28 US gal, 4.4 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.4 kPa (3.25 mmHg, 0.1 inHg)	0.5 kPa (4.1 mmHg, 0.2 inHg)	0.5 kPa (4.1 mmHg, 0.2 inHg)	0.5 kPa (4.1 mmHg, 0.2 inHg)	0.5 kPa (4.1 mmHg, 0.2 inHg)
30 ℓ (7.93 US gal, 6.6 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.4 kPa (3 mmHg, 0.1 inHg)	0.5 kPa (3.9 mmHg, 0.2 inHg)	0.5 kPa (3.9 mmHg, 0.2 inHg)	0.5 kPa (3.9 mmHg, 0.2 inHg)	0.5 kPa (3.9 mmHg, 0.2 inHg)
40 ℓ (10.57 US gal, 8.8 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.3 kPa (2.25 mmHg, 0.1 inHg)	0.5 kPa (3.4 mmHg, 0.1 inHg)	0.5 kPa (3.4 mmHg, 0.1 inHg)	0.5 kPa (3.4 mmHg, 0.1 inHg)	0.5 kPa (3.4 mmHg, 0.1 inHg)
50 ℓ (13.21 US gal, 11 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.2 kPa (1.5 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.2 kPa (1.5 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)

Time Needed for Diagnosis: Value of Map1+ Value of Map2 + 20000 ms + 0 + Value of Map2 + 0 ms + 200000 ms + Value of Map3 + 0 ms + 200000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

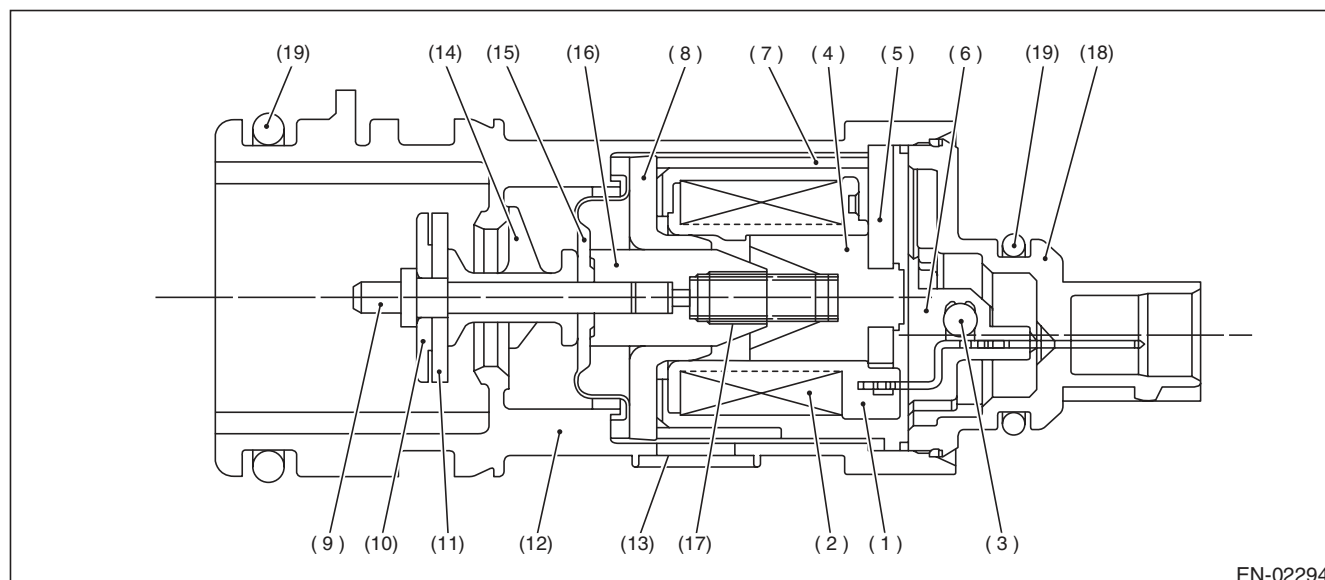
CE:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.

Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



- | | | |
|-----------------|--------------------|-------------------|
| (1) Bobbin | (8) Magnetic plate | (14) Retainer |
| (2) Coil | (9) Shaft | (15) Diaphragm |
| (3) Diode | (10) Plate | (16) Movable core |
| (4) Stator core | (11) Valve | (17) Spring |
| (5) End plate | (12) Housing | (18) Cover |
| (6) Body | (13) Filter | (19) O-ring |
| (7) Yoke | | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after starting the engine	$\geq 1 \text{ second}$
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after starting the engine	$\geq 1 \text{ second}$
Terminal output voltage when ECM outputs OFF signal	High

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

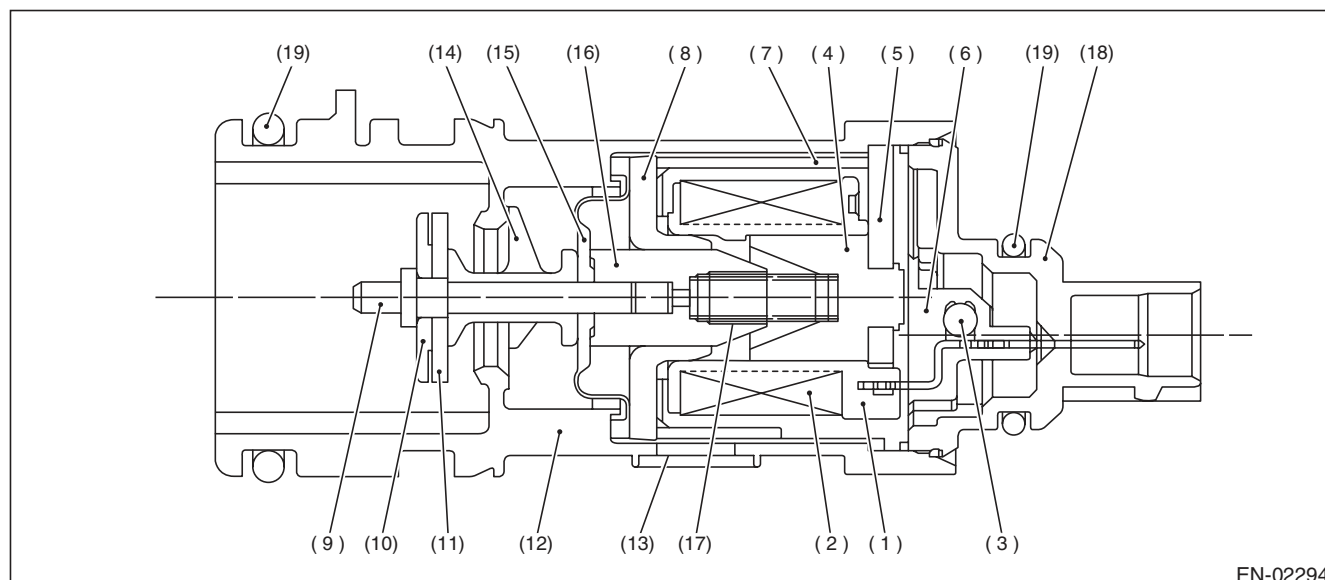
CF:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.

Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



- | | | |
|-----------------|--------------------|-------------------|
| (1) Bobbin | (8) Magnetic plate | (14) Retainer |
| (2) Coil | (9) Shaft | (15) Diaphragm |
| (3) Diode | (10) Plate | (16) Movable core |
| (4) Stator core | (11) Valve | (17) Spring |
| (5) End plate | (12) Housing | (18) Cover |
| (6) Body | (13) Filter | (19) O-ring |
| (7) Yoke | | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after starting the engine	$\geq 1 \text{ second}$
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after starting the engine	$\geq 1 \text{ second}$
Terminal output voltage when ECM outputs ON signal	Low

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

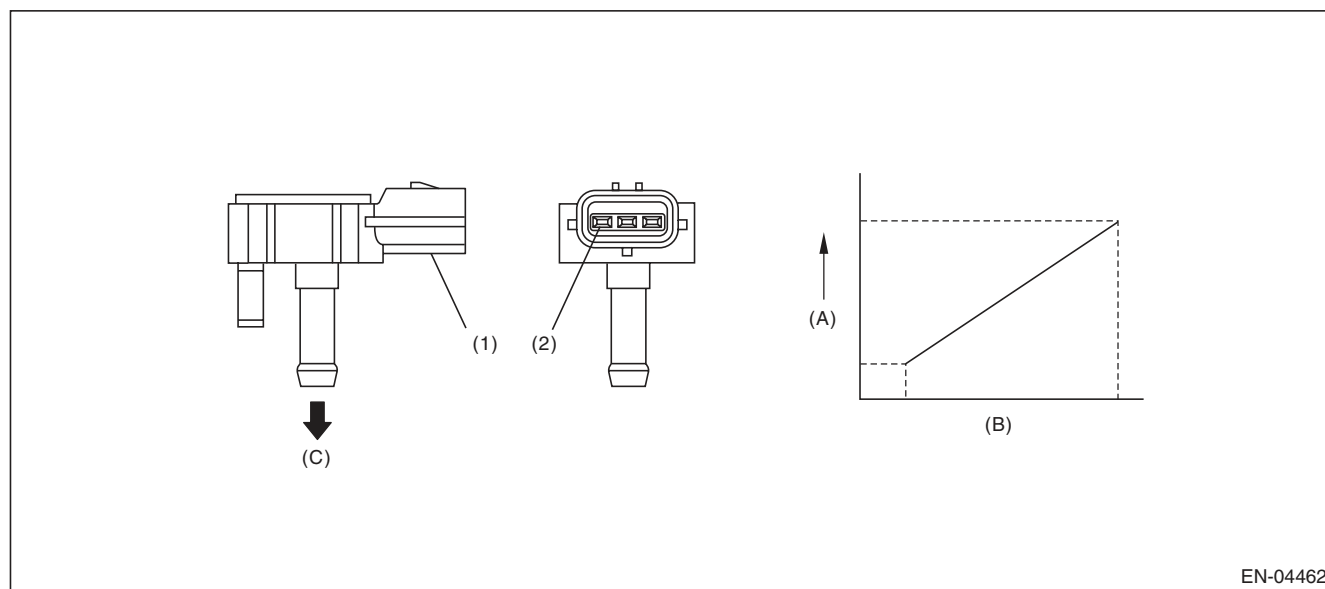
CG:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.

Judge as NG when there is no pressure variation, which should exist in the tank, considering the engine status.

2. COMPONENT DESCRIPTION



EN-04462

(A) Output voltage

(B) Input voltage

(C) To fuel tank

(1) Connector

(2) Terminals

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 60 s
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Fuel temperature	< 35 $^{\circ}\text{C}$ (95 $^{\circ}\text{F}$)
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously after 60 s have passed since the engine started.
- Pay attention to the fuel level and temperature.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Number of times that the difference between the Max. fuel level every 60 s and Min. fuel level every 60 s is 2 $\varnothing$ (0.53 US gal, 0.44 Imp gal) or more (with enable condition established)	≥ 16 time(s)
Maximum – Minimum tank pressure (with enable condition completed)	< 0 kPa (0.375 mmHg, 0 inHg)
Maximum – Minimum fuel temperature (with enable condition completed)	≥ 7 °C (44.6 °F)

If the difference between the Max. fuel level every 60 s and Min. fuel level every 60 s is less than 2 $\varnothing$ (0.53 US gal, 0.44 Imp gal), extend 60 s and make judgement with the Max. and Min. values for the fuel level in 60 s $\times$ 2. If a difference does not appear, extend the time (60 s $\times$ 3, 60 s $\times$ 4, 60 s $\times$ 5) and continue the judgement. If the difference between the Max. fuel level every 60 s and Min. fuel level every 60 s is 2 $\varnothing$ (0.53 US gal, 0.44 Imp gal) or more, the diagnosis counter counts up.

Time Needed for Diagnosis: 60 s $\times$ 16 time(s) or more

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Maximum — Minimum tank pressure	≥ 0 kPa (0.375 mmHg, 0 inHg)

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

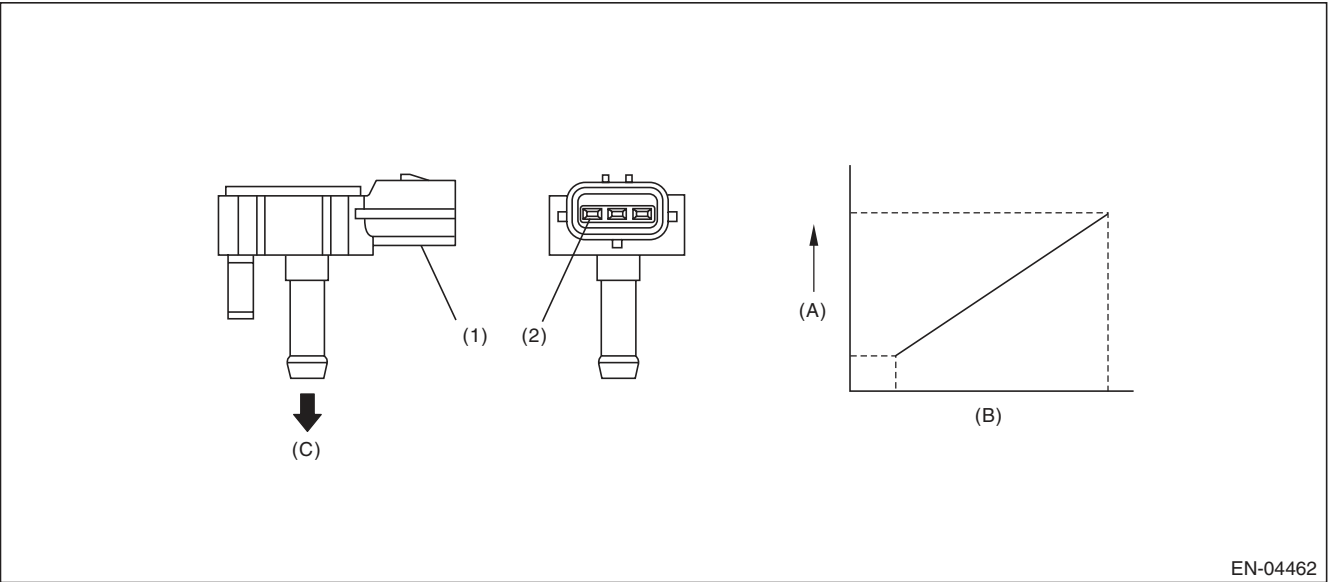
GENERAL DESCRIPTION

CH:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-04462

(A) Output voltage

(B) Input voltage

(C) To fuel tank

(1) Connector

(2) Terminals

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Fuel tank pressure	< -7.4 kPa (-55.85 mmHg, -2.2 inHg)
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 15000 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Fuel tank pressure	≥ -7.4 kPa (-55.85 mmHg, -2.2 inHg)
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

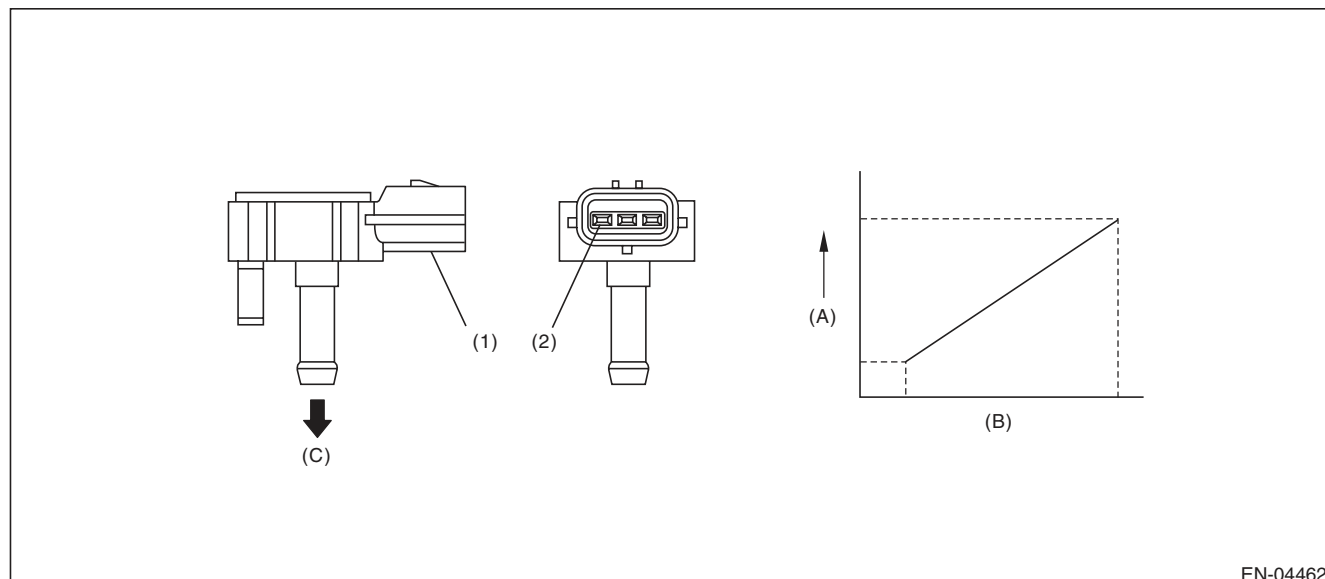
CI: DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-04462

(A) Output voltage

(B) Input voltage

(C) To fuel tank

(1) Connector

(2) Terminals

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 5000 ms
Vehicle speed	≥ 2 km/h (1.2 MPH)
All conditions of EVAP canister purge	Completed
Learning value of evaporation gas concentration (left and right)	< 0.08
Main feedback compensation coefficient (left and right)	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis when purging enable conditions are met without idling.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Fuel tank pressure	≥ 8 kPa (59.85 mmHg, 2.4 inHg)
Fuel temperature	< 35 °C (95 °F)
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)

Time Needed for Diagnosis: 15000 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< 8 kPa (59.85 mmHg, 2.4 inHg)

Time Needed for Diagnosis: Less than 1 second

CJ:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0442. <Ref. to GD(H6DO)-108, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CK:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0442. <Ref. to GD(H6DO)-108, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

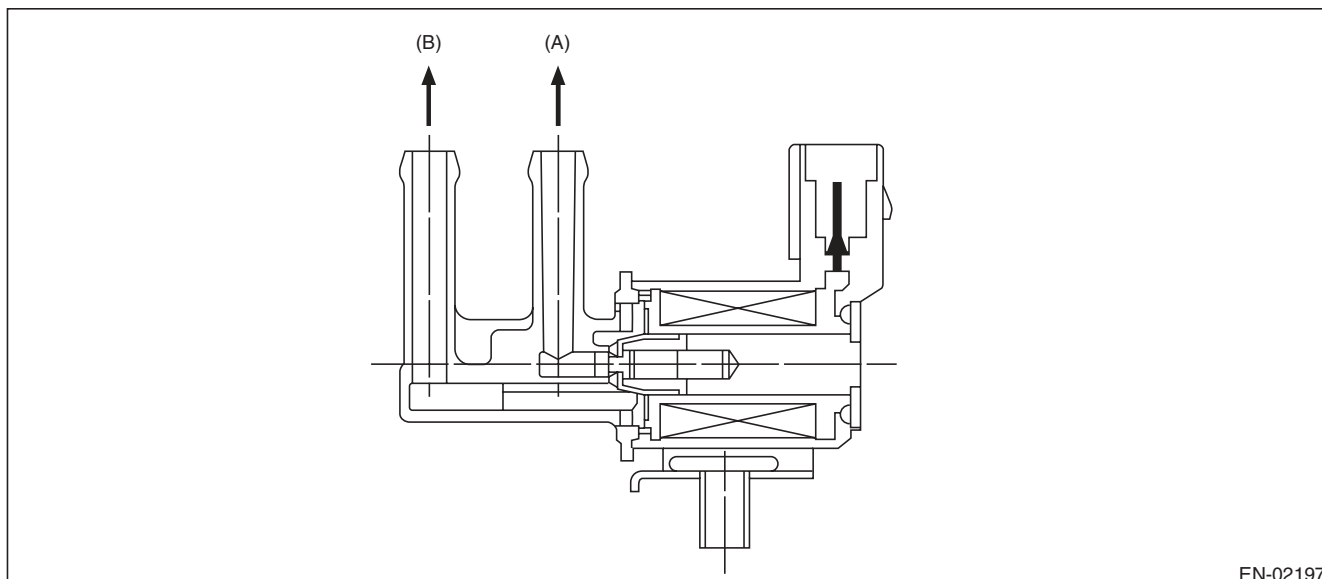
CL:DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve.

Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



(A) To canister

(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after starting the engine	$\geq 1 \text{ second}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Duty ratio of "ON"	< 0.75
Terminal output voltage	Low

Time Needed for Diagnosis: 2500 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

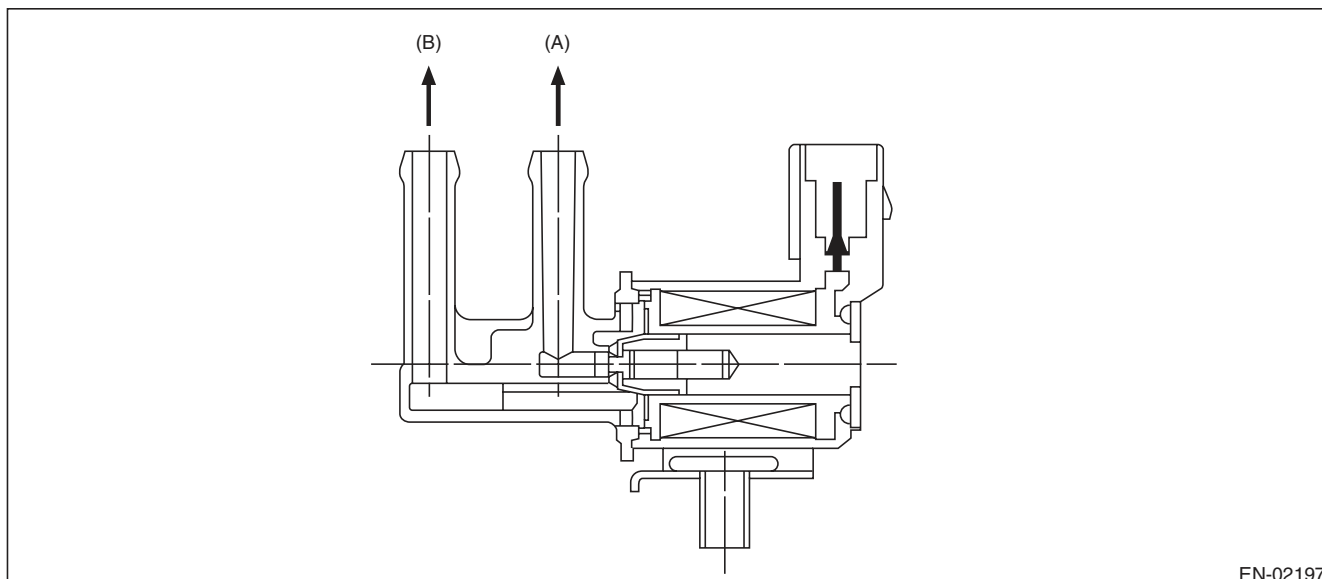
CM:DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve.

Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



(A) To canister

(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after starting the engine	$\geq 1 \text{ second}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Duty ratio of "ON"	≥ 0.25
Terminal output voltage	High

Time Needed for Diagnosis: 2500 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

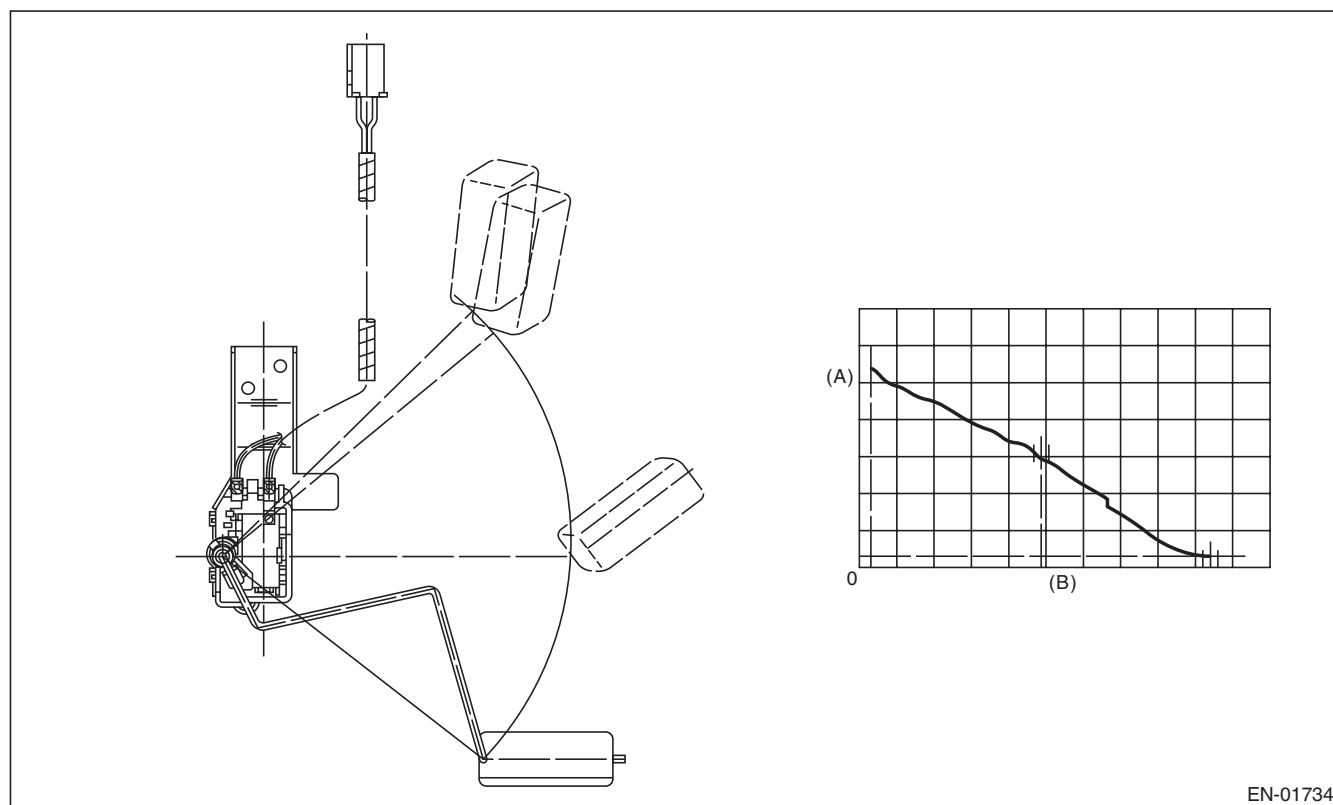
CN:DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the fuel level sensor output property.

If the fuel level does not vary in a particular driving condition / engine condition where it should, judge as NG.

2. COMPONENT DESCRIPTION



EN-01734

(A) Fuel level

(B) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

Judge as NG when the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
Accumulated amount of intake air	≥ 330957 g (11672.85 oz)
Max. – min. values of fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 6500 rpm
Elapsed time after starting the engine	≥ 5000 ms

Time Needed for Diagnosis: Less than 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
Accumulated amount of intake air	≥ 330957 g (11672.85 oz)
Max. – min. values of fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 6500 rpm
Elapsed time after starting the engine	≥ 5000 ms

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

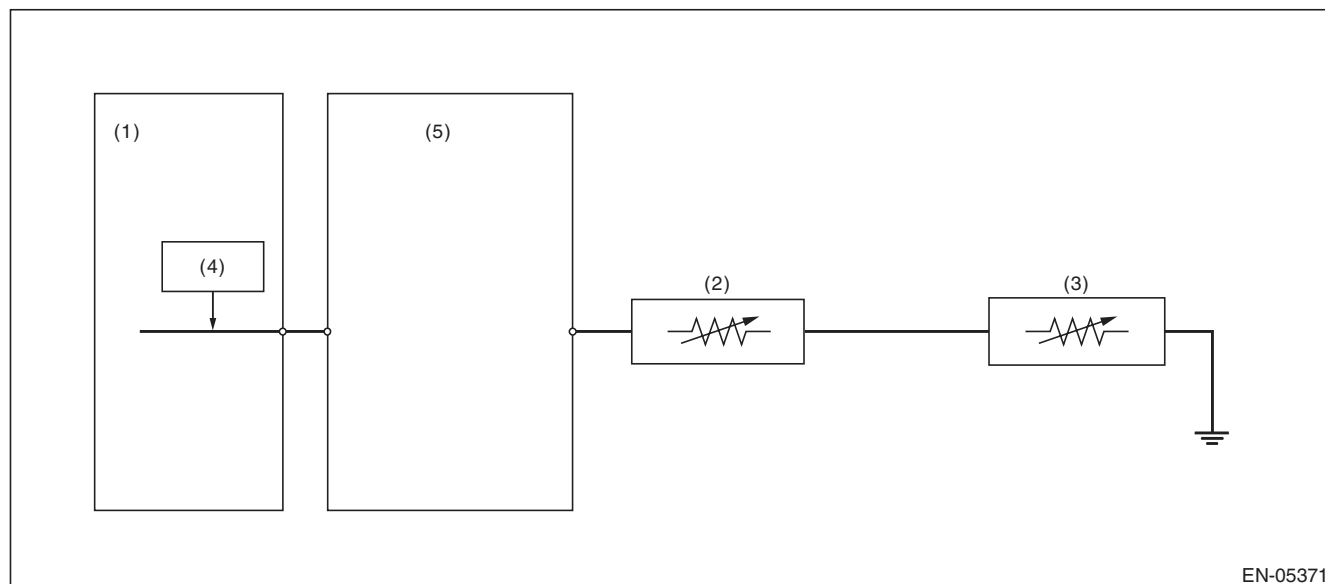
GENERAL DESCRIPTION

CO:DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(2) Fuel level sensor

(3) Fuel sub level sensor

(5) Body integrated unit

(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after starting the engine	$\geq 3000 \text{ ms}$
Output voltage	$< 0.173 \text{ V}$

Time Needed for Diagnosis: 2500 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after starting the engine	$\geq 3000 \text{ ms}$
Output voltage	$\geq 0.173 \text{ V}$

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

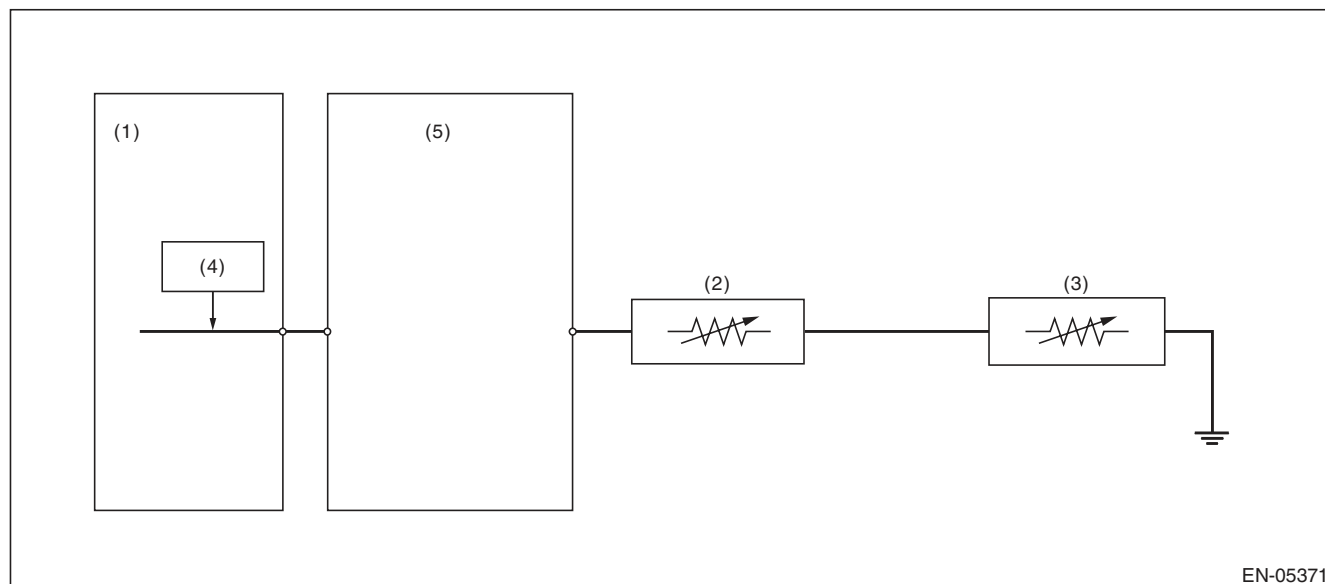
GENERAL DESCRIPTION

CP:DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(2) Fuel level sensor

(3) Fuel sub level sensor

(5) Body integrated unit

(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after starting the engine	$\geq 3000 \text{ ms}$
Output voltage	$\geq 7.212 \text{ V}$

Time Needed for Diagnosis: 1000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after starting the engine	$\geq 3000 \text{ ms}$
Output voltage	$< 7.212 \text{ V}$

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CQ:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

1. OUTLINE OF DIAGNOSIS

Detect the unstable output faults from the fuel level sensor caused by noise. Judge as NG when the max. value and cumulative value of output voltage variation of the fuel level sensor is larger than the threshold value.

2. ENABLE CONDITION

Malfunction Criteria	Threshold Value
Engine speed	≥ 500 rpm
Elapsed time after starting the engine	≥ 1 second
Battery voltage	≥ 10.9 V
Idle switch	ON
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal) and < 54.4 ℓ (14.37 US gal, 11.97 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	≥ 10000 ms

3. GENERAL DRIVING CYCLE

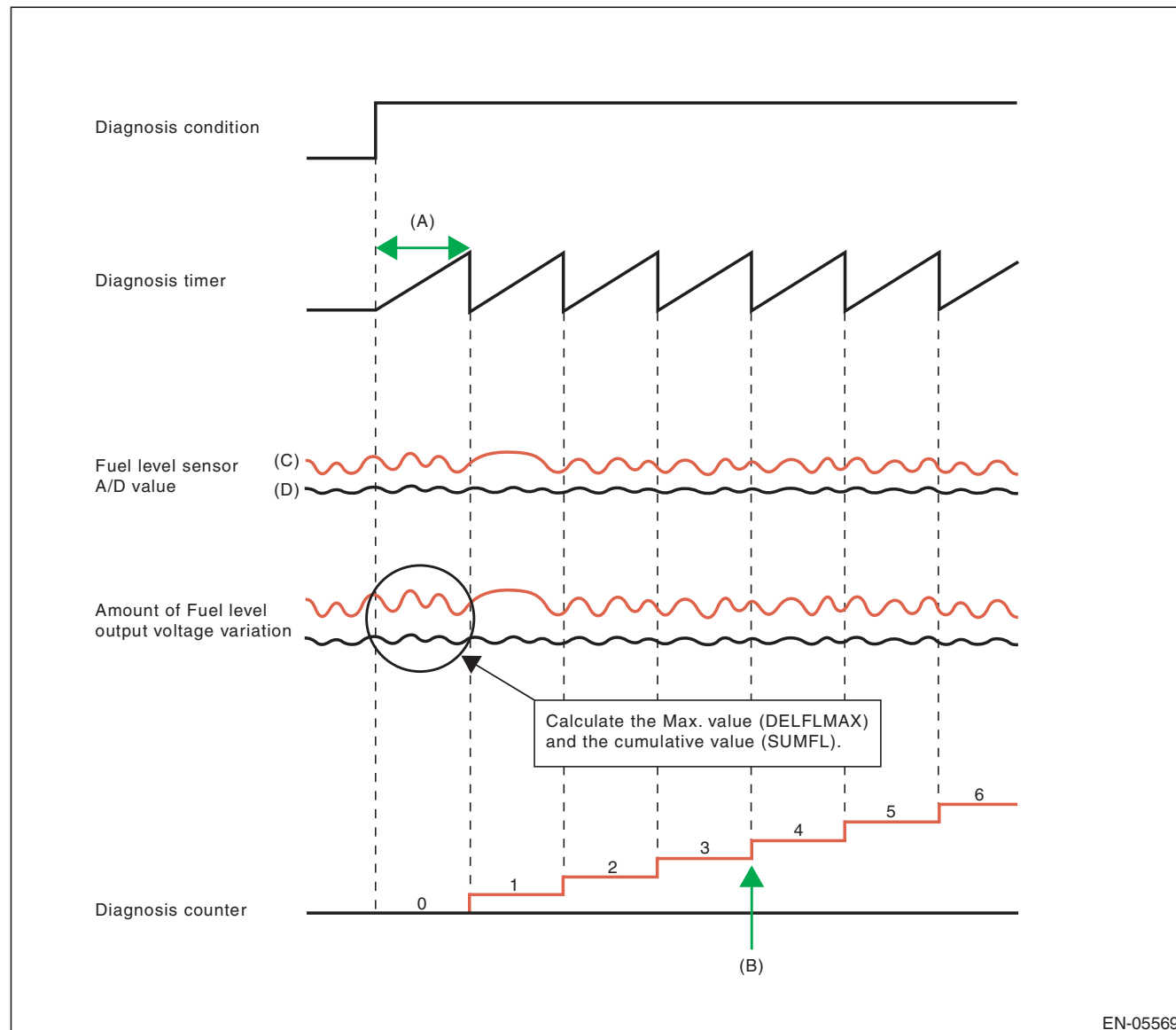
- Always perform the diagnosis continuously at idle speed.
- Pay attention to the fuel level.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD

Calculate the Max. value (DELFLMAX) and cumulative value (SUMFL) of output voltage variation of fuel level sensor during 12.2 seconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, the diagnosis counter counts up. Judge as NG if the counter indicated 4 time(s).



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(A) 12288 ms
(B) NG at 4 time(s)

(C) Malfunction

(D) Normal

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, DELFLMAX or SUMFL At this time, DELFLMAX: Maximum difference of sensor output for 12288 ms SUMFL: Integrated value of the sensor output deviation for 12288 ms	≥ 4 time(s) $\geq$ Value from Map ≥ 25.92 V

Map

Fuel level (ℓ, US gal, Imp gal)	0, 0, 0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Measured voltage (V)	0.27	0.27	0.426	0.582	0.738	0.894	0.894

The diagnosis counter does not count up when the following conditions are completed within 12288 ms.

Maximum value – Minimum value of change of tank pressure for 12288 ms	≥ 0 kPa (0.375031 mmHg, 0 inHg)
Maximum value – Minimum value of battery voltage for 12288 ms	≥ 0.609 V

Time Needed for Diagnosis: 12288 ms × 4 time(s)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
DELFLMAX SUMFL At this time, DELFLMAX: Maximum difference of sensor output for 12288 ms SUMFL: Integrated value of the sensor output deviation for 12288 ms	$<$ Value from Map < 25.92 V

Time Needed for Diagnosis: 12288 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CR:DTC P0500 VEHICLE SPEED SENSOR "A"

1. OUTLINE OF DIAGNOSIS

Judge as NG when outside of the judgment value.

Judge NG when the received data from ABSCM&H/U is abnormal vehicle speed, and the vehicle speed data is impossible.

2. COMPONENT DESCRIPTION

Vehicle speed signals are taken in to the ABS control module and hydraulic control unit, and normal/erroneous data of the ABS wheel speed sensor is received by CAN communication from the ABS control module and hydraulic control unit.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after engine starting	≥ 2000 ms

4. GENERAL DRIVING CYCLE

Always perform diagnosis more than 2000 ms after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Front ABS wheel speed sensor status	Malfunction
Either of the following is established	
Front left wheel speed	≥ 300 km/h (186.4 MPH)
Front right wheel speed	≥ 300 km/h (186.4 MPH)

Time Needed for Diagnosis: 2500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Front left wheel speed	> 0 km/h (0 MPH) and < 300 km/h (186.4 MPH)
Front right wheel speed	> 0 km/h (0 MPH) and < 300 km/h (186.4 MPH)

Time Needed for Diagnosis: 2500 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CS:DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling. Judge as NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)
Battery voltage	$\geq 10.9\text{ V}$
Atmospheric pressure	$\geq 75\text{ kPa}$ (563 mmHg , 22.2 inHg)
Fuel level	$\geq 9.6\text{ 0}$ (2.54 US gal , 2.11 Imp gal)
Elapsed time after starting the engine	$\geq 10.49\text{ s}$
Feedback of ISC	In operation
Lambda value (left and right)	≥ 0.9 and < 1.1
After switching air conditioner to ON/OFF	$\geq 5.1\text{ s}$
After intake manifold pressure changes by 4 kPa (30 mmHg , 1.2 inHg) or more.	$> 5.1\text{ s}$
Elapsed time after switching neutral position switch to ON/OFF	$> 5.1\text{ s}$
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling after warming up engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Actual engine speed — Targeted engine speed	$< -100\text{ rpm}$
Feedback compensation for ISC	Max.

Time Needed for Diagnosis: $10\text{ s} \times 3\text{ time(s)}$

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Actual engine speed — Targeted engine speed	$\geq -100\text{ rpm}$

Time Needed for Diagnosis: 10 s

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CT:DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling. Judge as NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)
Battery voltage	$\geq 10.9\text{ V}$
Atmospheric pressure	$\geq 75\text{ kPa}$ (563 mmHg , 22.2 inHg)
Fuel level	$\geq 9.6\text{ L}$ (2.54 US gal , 2.11 Imp gal)
Elapsed time after starting the engine	$\geq 10.49\text{ s}$
Feedback of ISC	In operation
Lambda value (left and right)	≥ 0.9 and < 1.1
After switching air conditioner to ON/OFF	$\geq 5.1\text{ s}$
After intake manifold pressure changes by 4 kPa (30 mmHg , 1.2 inHg) or more.	$> 5.1\text{ s}$
Elapsed time after switching neutral position switch to ON/OFF	$> 5.1\text{ s}$
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling after warming up engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	$\geq 200\text{ rpm}$
Feedback value for ISC	Min.

Time Needed for Diagnosis: $10\text{ s} \times 3\text{ time(s)}$

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	$< 200\text{ rpm}$

Time Needed for Diagnosis: 10 s

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CU:DTC P0512 STARTER REQUEST CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge as ON NG when the starter SW signal remains ON.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Engine condition	After engine starting
Starter OFF signal	Not detected
Battery voltage	$\geq 8 \text{ V}$

Time Needed for Diagnosis: 180000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Starter OFF signal	Detected
Battery voltage	$\geq 8 \text{ V}$

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CV:DTC P0513 INCORRECT IMMOBILIZER KEY

1. OUTLINE OF DIAGNOSIS

DTC	Item	Outline of diagnosis
P0513	Incorrect Immobilizer Key	Incorrect immobilizer key (Use of unregistered key in body integrated unit)
P1570	Antenna	Faulty antenna
P1571	Reference Code Incompatibility	Reference code incompatibility between body integrated unit and ECM
P1572	IMM Circuit Failure (Except Antenna Circuit)	Communication failure between body integrated unit and ECM
P1574	Key Communication Failure	Failure of body integrated unit to verify key (transponder) ID code or transponder failure
P1576	EGI Control Module EEPROM	ECM malfunctioning
P1577	IMM Control Module EEPROM	Body integrated unit malfunctioning
P1578	Meter Failure	Reference code incompatibility between body integrated unit and combination meter

2. ENABLE CONDITION

When starting the engine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis only after starting the engine.

4. DIAGNOSTIC METHOD

Judge as NG when the conditions for the outline of the diagnosis of the top are established.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CW:DTC P0600 SERIAL COMMUNICATION LINK

1. OUTLINE OF DIAGNOSIS

Detect malfunction of CAN communication.

When CAN communications is not possible, and CAN communications with TCM is not possible, judge as NG if data from the TCM is not normal.

2. COMPONENT DESCRIPTION

ECM and TCM are connected by high speed CAN.

(Common Specifications)

CAN Protocol 2.0 B (Active)

Frame Format: 11 Bit ID Frame (Standard Frame)

(High speed CAN)

Conforms to ISO11898

Communication Speed: 500 kbps

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

Judge as NG when the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Starter switch	OFF
Engine	run
bus off flag or error warning flag	set (error)
or	
ID received from control module connected to driving system CAN	None during 500 milliseconds
or	
Data updated from control module connected to driving system CAN	None during 500 milliseconds

Time Needed for Diagnosis: Less than 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Starter switch	OFF
Engine	run
bus off flag or error warning flag	clear (No error)
ID received from control module connected to driving system CAN	Yes
Data updated from control module connected to driving system CAN	Yes

Time Needed for Diagnosis: 1000 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CX:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of microcomputer (RAM).

When there is a problem in the main CPU normal RAM, or the sub CPU normal RAM, judge as NG. Judge as OK when both are operating properly.

If it is possible to write data to the whole area of RAM in the initial routine, and is possible to read the same data, it is judged as OK, and if not, NG.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

Diagnosis with the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis as soon as the ignition switch is turned to ON.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

Judge as NG when the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
Write the specified value to RAM and then read.	The written value cannot be read.

Time Needed for Diagnosis: Less than 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
Write the specified value to RAM and then read.	The written value can be read.

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CY:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

1. OUTLINE OF DIAGNOSIS

Judge as NG when SUM value of ROM is outside the standard value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

Judge as NG when the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
SUM value of ROM	Standard

Time Needed for Diagnosis:

- Main CPU: 16 milliseconds × 32 time(s)
- Sub CPU: 16 milliseconds × 2 time(s)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
SUM value of ROM	Standard

Time Needed for Diagnosis:

- Main CPU: 16 milliseconds × 125 time(s)
- Sub CPU: 16 milliseconds × 2 time(s)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

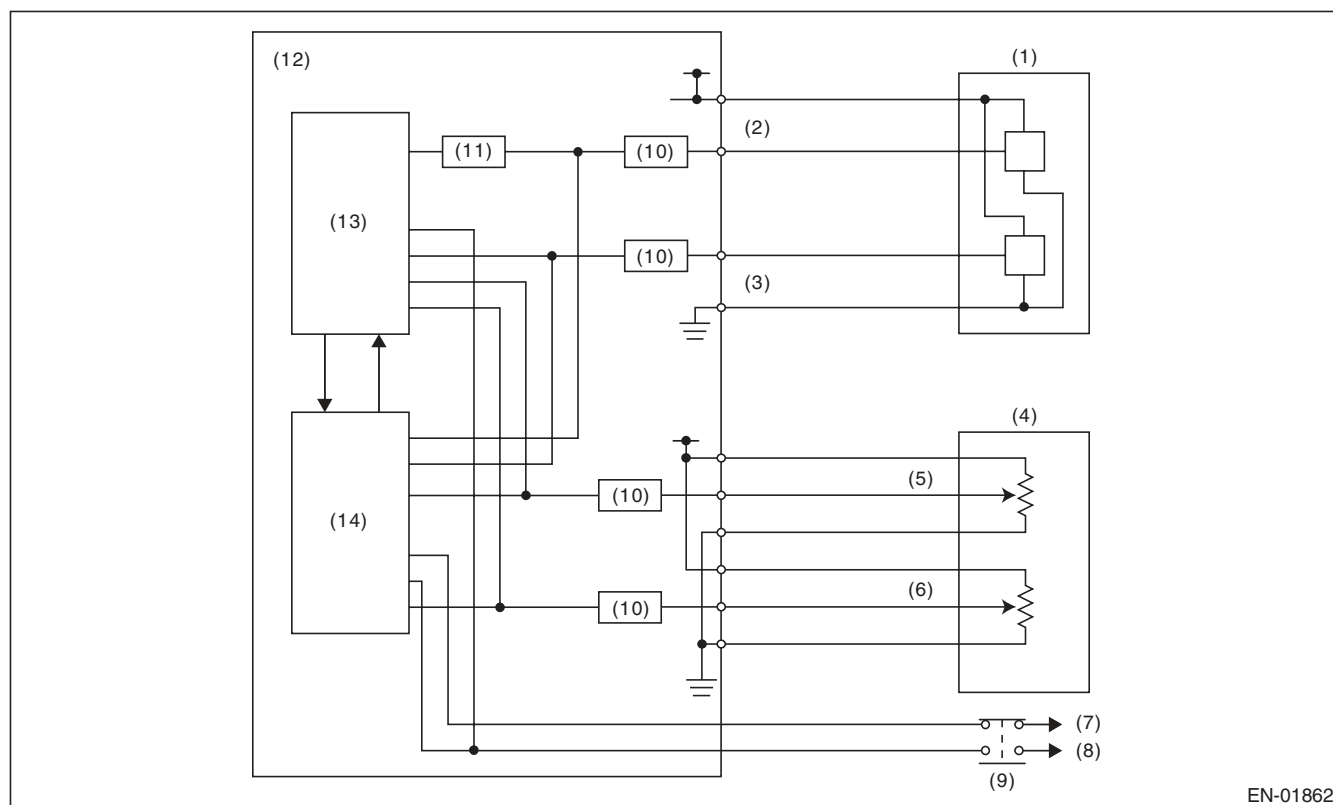
CZ:DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when any one of the followings is established.

- (1) When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- (2) When the read value of accelerator pedal position sensor 1 signal is mismatched between main CPU and sub CPU.
- (3) When the sub CPU operates abnormally.
- (4) When the communication between main CPU $\leftrightarrow$ sub CPU is abnormal.
- (5) When the input amplifier circuit of throttle position sensor 1 is abnormal.
- (6) When the cruise control cannot be canceled correctly.
- (7) When the signal of brake SW1 and 2 is mismatched.

2. COMPONENT DESCRIPTION



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- | | | |
|---|---|----------------------------------|
| (1) Throttle position sensor | (6) Accelerator pedal position sensor 2 | (11) Amplifier circuit |
| (2) Throttle position sensor 1 | (7) Battery | (12) Engine control module (ECM) |
| (3) Throttle position sensor 2 | (8) Stop light | (13) Sub CPU |
| (4) Accelerator pedal position sensor | (9) Brake switch | (14) Main CPU |
| (5) Accelerator pedal position sensor 1 | (10) I/F circuit | |

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
(1) Ignition switch	ON
(1) Battery voltage	$\geq 6\text{ V}$
(2) Ignition switch	ON
(2) Battery voltage	$\geq 6\text{ V}$
(3) Ignition switch	ON
(3) Battery voltage	$\geq 6\text{ V}$
(4) Ignition switch	ON
(4) Battery voltage	$\geq 6\text{ V}$
(5) Throttle opening angle	
(5) Ignition switch	ON
(5) Battery voltage	$\geq 6\text{ V}$
(6) Brake switch (only with cruise control)	ON
(6) Ignition switch	ON
(6) Battery voltage	$\geq 6\text{ V}$
(7) Ignition switch	ON
(7) Battery voltage	$\geq 6\text{ V}$

4. GENERAL DRIVING CYCLE

- (1) — (4): Always perform the diagnosis continuously.
- (5): Always perform the diagnosis continuously when idling.
- (6): Perform the diagnosis when the brake pedal is depressed.
- (7): Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

Judge as NG when the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
(1) Difference of CPU reading value of the throttle position sensor signal	$\geq 0.4058 \text{ V}$
(2) Difference of CPU read value of the accelerator pedal position sensor signal	$\geq 0.127542424 \text{ V}$
(3) WD pulse from sub CPU	No WD pulse occur
(4) Communication between CPU	Not possible to communicate
(5) Throttle position sensor 1 opening angle — (Throttle position sensor 1 opening angle after passing amplifier) 1/4	$\geq 3^\circ$
(6) Cruise control cancel signal at brake ON	Cruise control cancel signal OFF
(7) Brake switch 1, 2 signal	SW 1 and 2 are not matched

Time Needed for Diagnosis:

- (1): 600 ms
- (2): 830 ms
- (3): 200 ms
- (4): 200 ms
- (5): 24 ms
- (6): 250 ms
- (7): 200 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction Criteria	Threshold Value
(1) Difference of CPU reading value of the throttle position sensor signal	$< 0.4058 \text{ V}$
(2) Difference of CPU read value of the accelerator pedal position sensor signal	$< 0.127542424 \text{ V}$
(3) WD pulse from sub CPU	WD pulse occur
(4) Communication between CPU	Possible to communicate
(5) Throttle position sensor 1 opening angle — (Throttle position sensor 1 opening angle after passing amplifier) 1/4	$< 3^\circ$
(6) Cruise control cancel signal at brake ON	Cruise control cancel signal ON
(7) Brake switch 1, 2 signal	SW 1 and 2 are matched

Time Needed for Diagnosis:

- (1): 2000 ms
- (2): 2000 ms
- (3): 2000 ms
- (4): 2000 ms
- (5): 24 ms
- (6): 2000 ms
- (7): 2000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

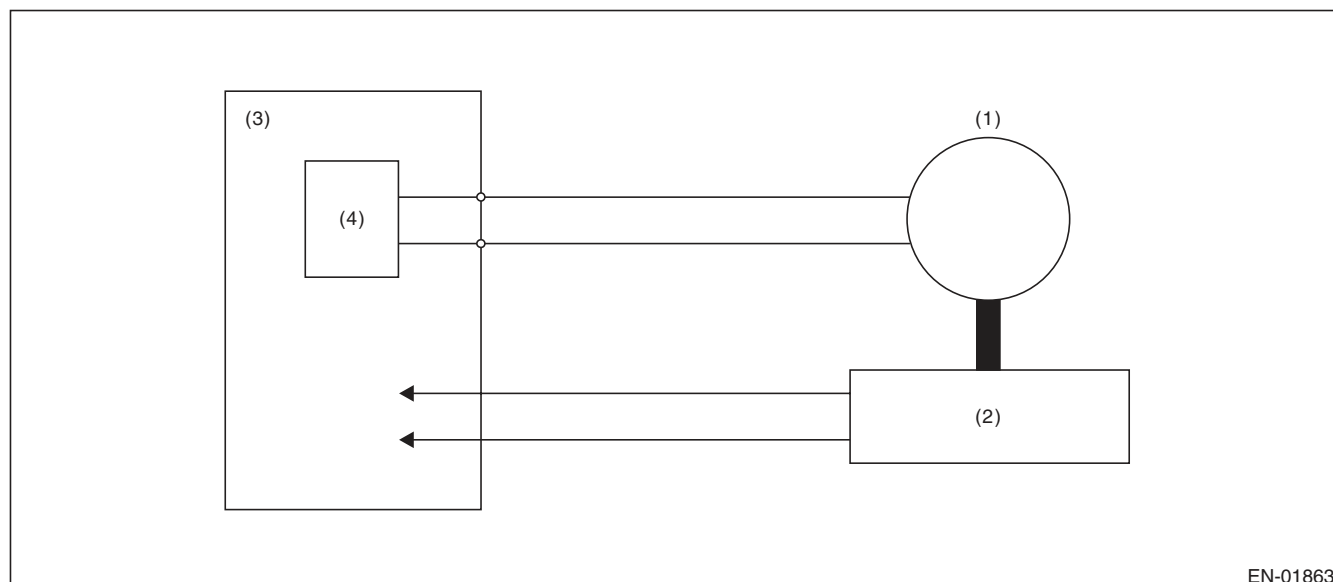
GENERAL DESCRIPTION

DA:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Judge as NG when the target opening angle and actual opening angle is mismatched or the current to motor is the specified duty or more for specified time continuously.

2. COMPONENT DESCRIPTION



(1) Motor

(3) Engine control module (ECM)

(4) Drive circuit

(2) Throttle position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Normal operation of electronic throttle control	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electronic throttle control is operating.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

Judge as NG when the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
Difference between target opening angle and actual opening angle	$\geq$ Value of Map 1
Output duty to drive circuit	$\geq 95\%$

Map1

Target throttle opening angle ($^{\circ}$) = d	$0 \leq d < 6.15$	$6.15 \leq d < 9.65$	$9.65 \leq d < 14.65$	$14.65 \leq d < 26.65$	$26.65 \leq d$
Difference between target opening angle and actual opening angle ($^{\circ}$)	3.5	5	12	25	25

Time Needed for Diagnosis:

- Difference between target opening angle and actual opening angle: 1000 milliseconds (when target opening angle > actual opening angle) or value of Map 2 (when target opening angle $\leq$ actual opening angle)
- Output duty to drive circuit: value of Map 3

Map2

Throttle position sensor 1 opening angle ($^{\circ}$) = d	$0 \leq d < 5.5$	$5.5 \leq d < 9$	$9 \leq d < 13$	$13 \leq d < 22$	$22 \leq d$
Judgement time (milliseconds)	1000	400	300	250	250

Map 3

Voltage to drive circuit (V)	6	8	10	12	14	16
Judgement time (milliseconds)	2000	2000	2000	2000	2000	2000

• Normality Judgement

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
Difference between target opening angle and actual opening angle	$<$ Value of Map 1
Output duty to drive circuit	$< 95\%$

Time Needed for Diagnosis:

- Difference between target opening angle and actual opening angle: 2000 ms
- Output duty to drive circuit: 2000 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DB:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

1. OUTLINE OF DIAGNOSIS

Judge as NG when there is CAN communication with the TCM and there is a MIL lighting request.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	≥ 10.9 V
MIL lighting request from TCM	Yes

Time Needed for Diagnosis: 2500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	≥ 10.9 V
MIL lighting request from TCM	None

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DC:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

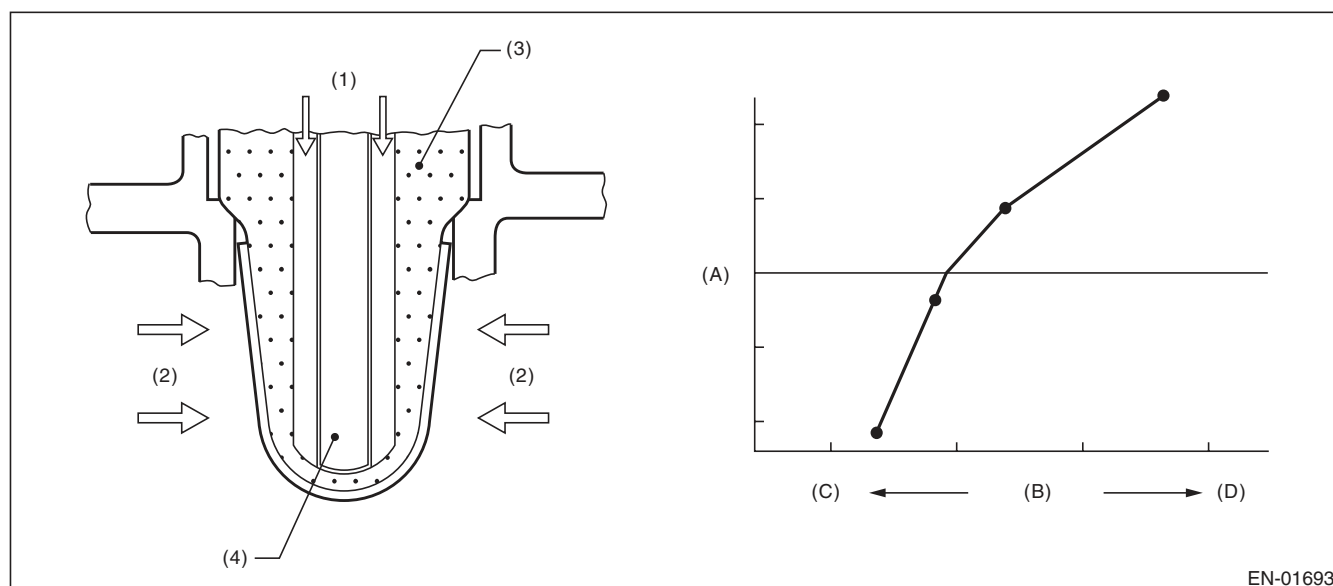
1. OUTLINE OF DIAGNOSIS

Detect that λ value remains low.

Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

λ value = Actual air fuel ratio/Theoretical air fuel ratio
 $\lambda > 1$: Lean
 $\lambda < 1$: Rich

2. COMPONENT DESCRIPTION



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(A) Electromotive force

(B) Air fuel ratio

(C) Lean

(D) Rich

(1) Atmosphere

(3) ZrO_2

(4) Ceramic heater

(2) Exhaust gas

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 4096 ms
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Execution
Rear oxygen sensor output voltage – Feedback target voltage	-0.2 V — 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
Elapsed time after starting the engine	≥ 60000 ms
Engine coolant temperature	≥ 75 °C (167 °F)
Vehicle speed	≥ 20 km/h (12.4 MPH)
Amount of intake air	≥ 8 g/s (0.28 oz/s)
Load change at 120°C	< 0.02 g/rev (0 oz/rev)
Front oxygen (A/F) sensor impedance	$0\ \Omega$ — $50\ \Omega$
Learning value of evaporation gas density	< 0.2
Total time of operating canister purge	≥ 19.9 s
Targeted lambda value load compensation coefficient	-0.05 — 0.050

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12.4 MPH) or more after 60000 ms have passed since the engine started.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
λ value	< 0.85

Time Needed for Diagnosis: 10000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
λ value	≥ 0.85

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DD:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

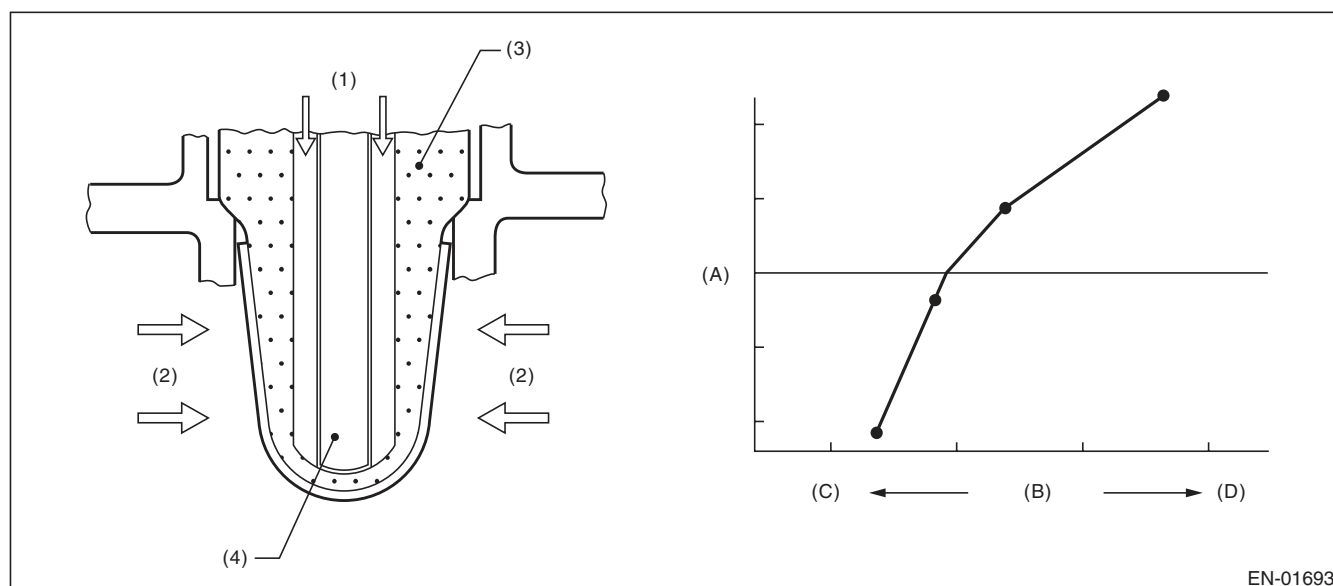
1. OUTLINE OF DIAGNOSIS

Detect that λ value remains high.

Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

λ value = Actual air fuel ratio/Theoretical air fuel ratio
 $\lambda > 1$: Lean
 $\lambda < 1$: Rich

2. COMPONENT DESCRIPTION



(A) Electromotive force

(B) Air fuel ratio

(C) Lean

(D) Rich

(1) Atmosphere

(3) ZrO_2

(4) Ceramic heater

(2) Exhaust gas

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 4096 ms
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Execution
Rear oxygen sensor output voltage – Feedback target voltage	-0.2 V — 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
Elapsed time after starting the engine	≥ 60000 ms
Engine coolant temperature	≥ 75 °C (167 °F)
Vehicle speed	≥ 20 km/h (12.4 MPH)
Amount of intake air	≥ 8 g/s (0.28 oz/s)
Load change at 120°CA	< 0.02 g/rev (0 oz/rev)
Front oxygen (A/F) sensor impedance	$0\ \Omega$ — $50\ \Omega$
Learning value of evaporation gas density	< 0.2
Total time of operating canister purge	≥ 19.9 s
Targeted lambda value load compensation coefficient	-0.05 — 0.050

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12.4 MPH) or more after 60000 ms have passed since the engine started.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
λ value	> 1.15

Time Needed for Diagnosis: 10000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
λ value	≤ 1.15

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DE:DTC P1154 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P1152. <Ref. to GD(H6DO)-162, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DF:DTC P1155 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P1153. <Ref. to GD(H6DO)-164, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

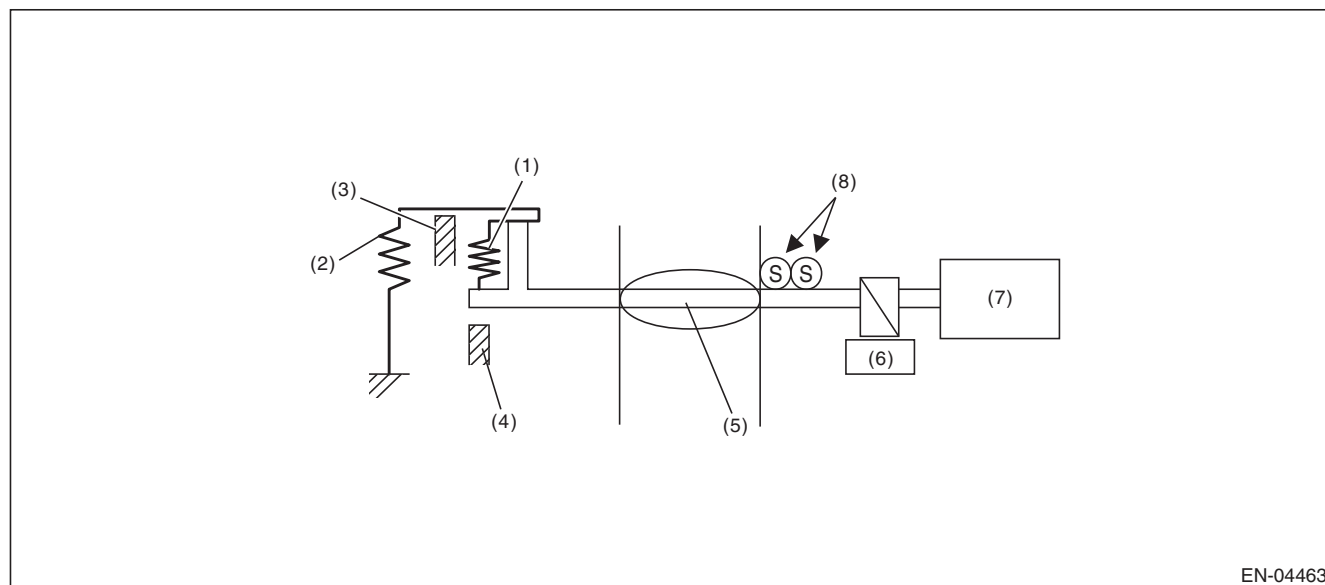
GENERAL DESCRIPTION

DG:DTC P1160 RETURN SPRING FAILURE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the valve is opened more than the default opening angle, but does not move to the close direction with the motor power stopped.

2. COMPONENT DESCRIPTION



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- | | | |
|--------------------------|-------------------------|---|
| (1) Opener spring | (4) Full closed stopper | (7) DC motor |
| (2) Return spring | (5) Throttle valve | (8) Main and sub throttle position sensor |
| (3) Intermediate stopper | (6) Gear | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 6\text{ V}$
Throttle position sensor	Normal

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

- **Abnormality Judgement**

Judge as NG when the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
Opening variation after continuity is set to OFF	$< 2^{\circ}$

Time Needed for Diagnosis: 24 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgement**

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
Opening variation after continuity is set to OFF	$\geq 2^{\circ}$

Time Needed for Diagnosis: 3400 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

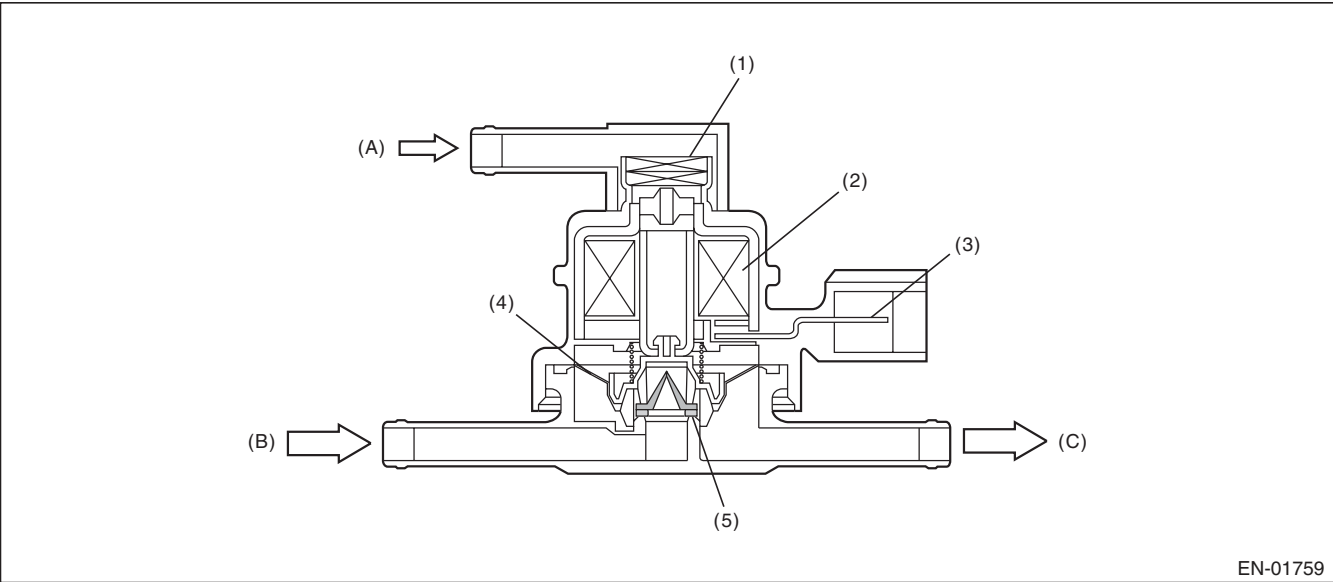
GENERAL DESCRIPTION

DH:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of pressure control solenoid valve.
Judge as NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



- (A) Barometric pressure
- (B) Shut-off valve
- (C) To fuel tank
- (1) Filter
- (3) Connector terminal
- (5) Valve
- (2) Coil
- (4) Diaphragm

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2500 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs OFF signal	High

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

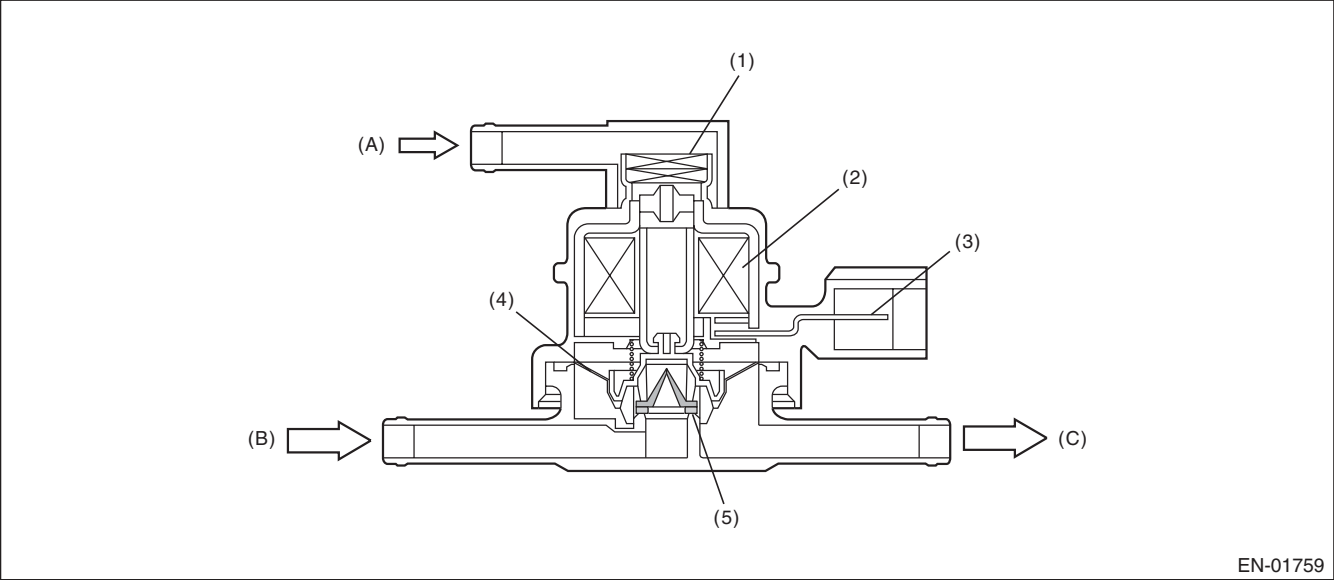
GENERAL DESCRIPTION

DI: DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of pressure control solenoid valve.
Judge as NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



- | | | |
|-------------------------|------------------------|------------------|
| (A) Barometric pressure | (B) Shut-off valve | (C) To fuel tank |
| (1) Filter | (3) Connector terminal | (5) Valve |
| (2) Coil | (4) Diaphragm | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after starting the engine	$\geq 1 \text{ second}$
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2500 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 10.9 \text{ V}$
Elapsed time after starting the engine	$\geq 1 \text{ second}$
Terminal output voltage when ECM outputs ON signal	Low

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

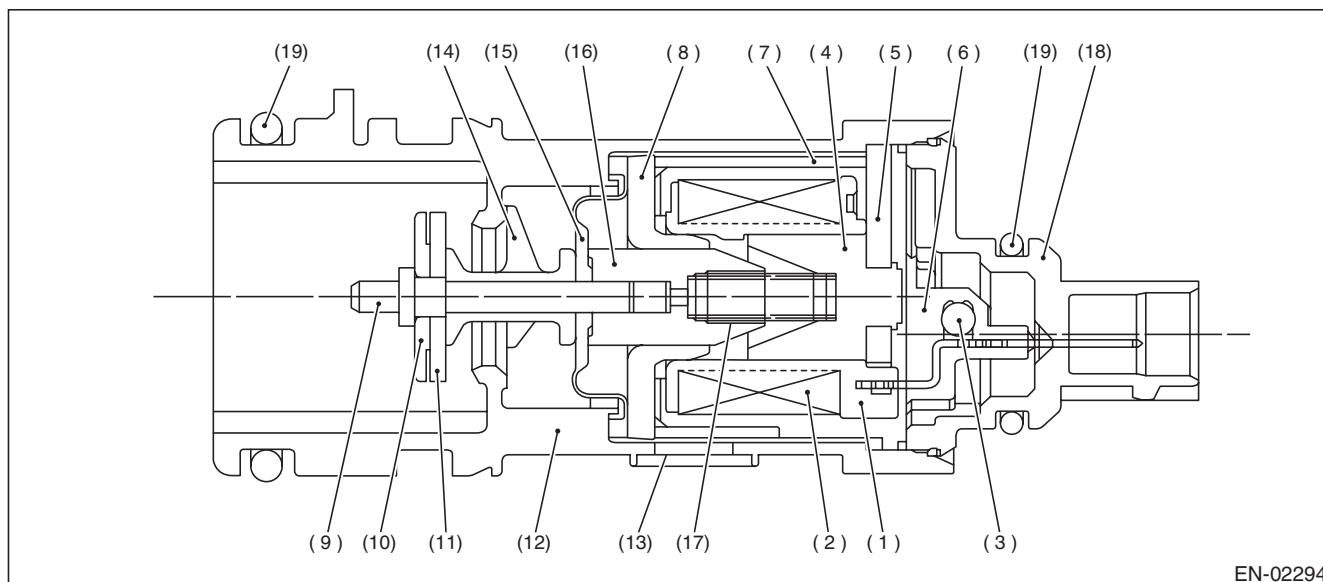
DJ:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the abnormal function (stuck closed) of the drain valve.

Judge as NG when fuel tank pressure is low.

2. COMPONENT DESCRIPTION



- | | | |
|-----------------|--------------------|-------------------|
| (1) Bobbin | (8) Magnetic plate | (14) Retainer |
| (2) Coil | (9) Shaft | (15) Diaphragm |
| (3) Diode | (10) Plate | (16) Movable core |
| (4) Stator core | (11) Valve | (17) Spring |
| (5) End plate | (12) Housing | (18) Cover |
| (6) Body | (13) Filter | (19) O-ring |
| (7) Yoke | | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Drain valve	Open
Battery voltage	$\geq 10.9 \text{ V}$
Barometric pressure	$\geq 75 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Tank pressure when starter is OFF → ON	-0.4 kPa (-3.2 mmHg , -0.1 inHg) and 1.4 kPa (10.7 mmHg, 0.4 inHg)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≤ -4 kPa (-30 mmHg, -1.2 inHg)

Time Needed for Diagnosis: 3000 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	> -4 kPa (-30 mmHg, -1.2 inHg)
Cumulative time when all the malfunction criteria below are met.	≥ 30000 ms
Purge control solenoid valve duty	Not = 0
Fuel temperature	-10 °C (14 °F) — 55 °C (131 °F)
Intake manifold relative pressure	≥ -26.7 kPa (-200 mmHg, -7.9 inHg)

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

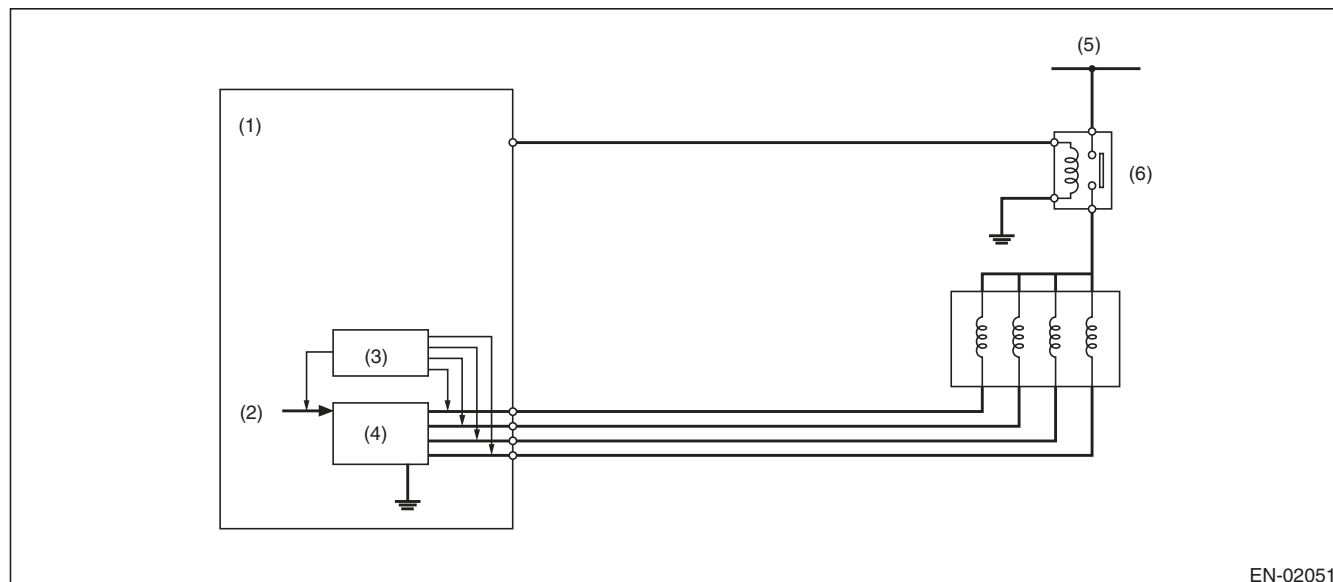
GENERAL DESCRIPTION

DK:DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

- Detects open or short circuit of EGR.
- Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(3) Detecting circuit

(5) Battery voltage

(2) Computer unit (CPU)

(4) Switch circuit

(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 1 second
EGR valve target position	> 0 step
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously during EGR operation.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 4 ms × 625 time(s)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	High level

Time Needed for Diagnosis: 4 ms × 2 time(s)

Diagnostic Trouble Code (DTC) Detecting Criteria

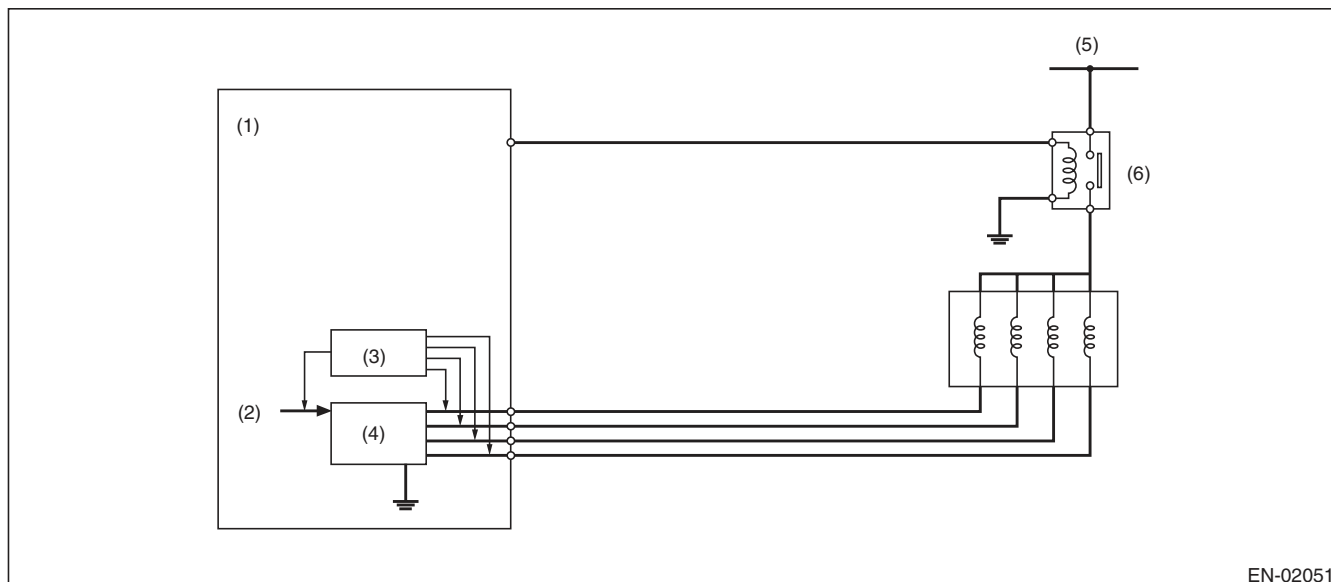
GENERAL DESCRIPTION

DL:DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

- Detects open or short circuit of EGR.
- Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



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(1) Engine control module (ECM)

(3) Detecting circuit

(5) Battery voltage

(2) Computer unit (CPU)

(4) Switch circuit

(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 1 second
EGR valve target position	> 0 step
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 4 ms × 625 time(s)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	Low level

Time Needed for Diagnosis: 4 ms × 2 time(s)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DM:DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P1492. <Ref. to GD(H6DO)-175, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DN:DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P1493. <Ref. to GD(H6DO)-177, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DO:DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P1492. <Ref. to GD(H6DO)-175, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DP:DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P1493. <Ref. to GD(H6DO)-177, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DQ:DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P1492. <Ref. to GD(H6DO)-175, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DR:DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P1493. <Ref. to GD(H6DO)-177, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DS:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of back-up power supply circuit.
Judge as NG when the backup power voltage is low.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	Low
Battery voltage	≥ 10.9 V
Engine condition	After engine starting

Time Needed for Diagnosis: 2500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	High
Battery voltage	≥ 10.9 V
Engine condition	After engine starting

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DT:DTC P1570 ANTENNA

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-151, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DU:DTC P1571 REFERENCE CODE INCOMPATIBILITY

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-151, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DV:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-151, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DW:DTC P1574 KEY COMMUNICATION FAILURE

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-151, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DX:DTC P1576 EGI CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-151, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DY:DTC P1577 IMM CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-151, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DZ:DTC P1578 METER FAILURE

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0513. <Ref. to GD(H6DO)-151, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EA:DTC P1602 CONTROL MODULE PROGRAMMING ERROR

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the catalyst advanced idling retard angle control.

Judge as NG when ECM is not controlling the angle properly during catalyst advanced idling retard angle control.

Judge as NG if there is exhaust gas temperature diagnosis and idle speed diagnosis and if either of them is NG.

- Exhaust gas temperature diagnosis

Judge as NG when the estimated exhausted gas temperature in 14 seconds after the cold start is below the specified value.

- Idle speed diagnosis

Judge as NG when actual engine speed is not close to target engine speed after terminating the retard angle control.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Battery voltage	≥ 10.9 V
Cold start diagnosis	Incomplete
Vehicle speed	< 2 km/h (1.2 MPH)
Misfire in 200 engine revs.	< 7
Time after starting	$= 14$ seconds

3. GENERAL DRIVING CYCLE

Perform the diagnosis at cold start.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD

• Exhaust gas temperature diagnosis

Abnormality Judgement

Calculate the estimated exhaust gas temperature when the diagnostic enable condition is established. Judge as NG when the following conditions are established after engine starting within the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Estimated exhaust gas temperature	< Value from Map

Map

Coolant temperature after starting the engine	-40 °C (-40 °F)	-30 °C (-22 °F)	-20 °C (-4 °F)	-10 °C (14 °F)	0 °C (32 °F)	10 °C (50 °F)	20 °C (68 °F)	30 °C (86 °F)	40 °C (104 °F)	50 °C (122 °F)
Threshold Value	0 °C (32 °F)	0 °C (32 °F)	0 °C (32 °F)	0 °C (32 °F)	155 °C (311 °F)	150 °C (302 °F)	155 °C (311 °F)	140 °C (284 °F)	133 °C (271.4 °F)	130 °C (266 °F)

Time Needed for Diagnosis: 14 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgement

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
Estimated exhaust gas temperature	≥ Value from Map

Time Needed for Diagnosis: Less than 1 second

• Idle speed diagnosis

Abnormality Judgement

Judge as NG when the following conditions are established after the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Continuous time of (Target engine speed – Actual engine speed > –200 rpm)	≥ 6000 ms
Continuous time of (actual retard amount > 20 °CA)	≥ 0 ms

Time Needed for Diagnosis: 14 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgement

Judge as OK and clear the NG if the following conditions are established.

Judgement Value

Malfunction criteria	Threshold value
Continuous time of (Target engine speed – Actual engine speed > –200 rpm)	< 6000 ms
Continuous time of (actual retard amount > 20 °CA)	< 0 ms

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EB:DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil flow control solenoid valve.

Judge as NG when the current is small even though the duty signal is large.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 10.9 \text{ V}$
Oil flow control solenoid valve control duty	$\geq 99.61 \%$
Oil control solenoid valve control present current	$< 0.306 \text{ A}$

Time Needed for Diagnosis: 2000 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 10.9 \text{ V}$
Target current value of the oil flow control solenoid valve	$\geq 0.14 \text{ A}$
[Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value]	$< 0.08 \text{ A}$

Time Needed for Diagnosis: 2000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EC:DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control solenoid valve.

Judge as NG when the current is large even though the duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 10.9 \text{ V}$
Oil flow control solenoid valve control duty	$< 0.39 \%$
Oil control solenoid valve control present current	$\geq 0.306 \text{ A}$

Time Needed for Diagnosis: 2000 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Battery voltage	$\geq 10.9 \text{ V}$
[Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value]	$< 0.08 \text{ A}$

Time Needed for Diagnosis: 2000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

ED:DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P2088. <Ref. to GD(H6DO)-184, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

EE:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P2089. <Ref. to GD(H6DO)-185, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

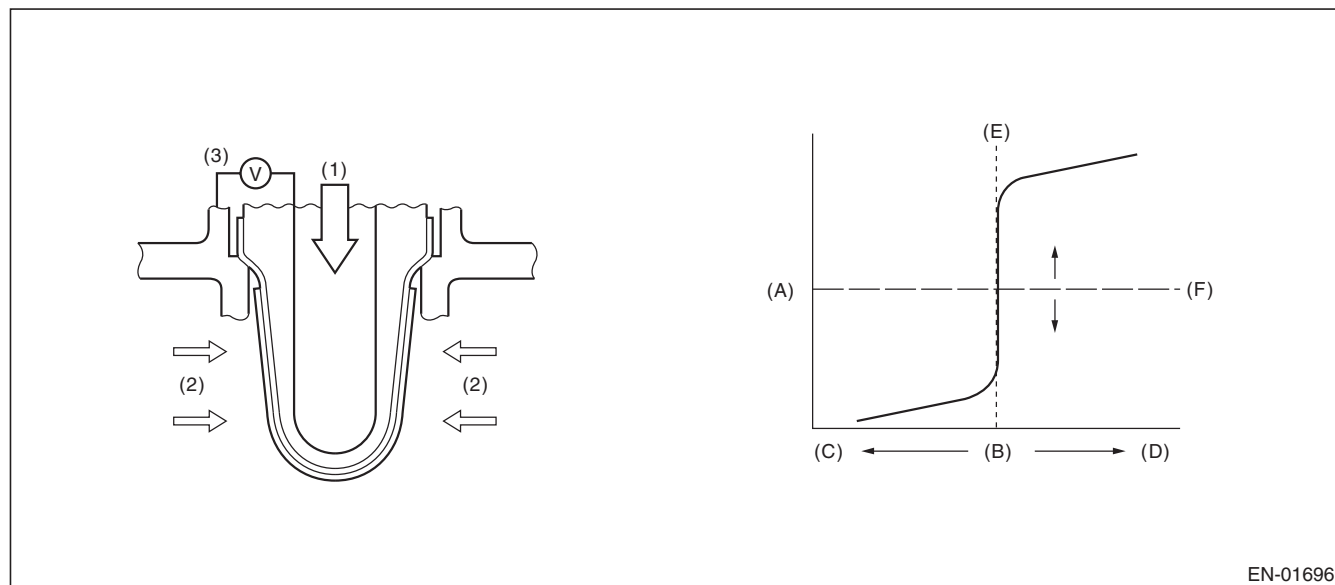
GENERAL DESCRIPTION

EF:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the size of the sub feedback learning value.
Control the sub feedback learning and judge as NG when the learning value is in the lean zone.

2. COMPONENT DESCRIPTION



EN-01696

(A) Electromotive force

(B) Air fuel ratio

(C) Rich

(D) Lean

(E) Theoretical air fuel ratio

(F) Comparative voltage

(1) Atmosphere

(2) Exhaust gas

(3) Electromotive force

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Conditions for carrying out the sub feedback learning	Completed
Continuous time when all conditions are established.	≥ 1 s

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the vehicle is idling or running at a constant speed of 80 km/h (50 MPH) or more.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Sub feedback learning value	< -0.03

Time Needed for Diagnosis: $5 \text{ s} \times 1 \text{ time(s)}$

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Sub feedback learning value	$\geq -0.03 + 0$

Time Needed for Diagnosis: 5 s

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

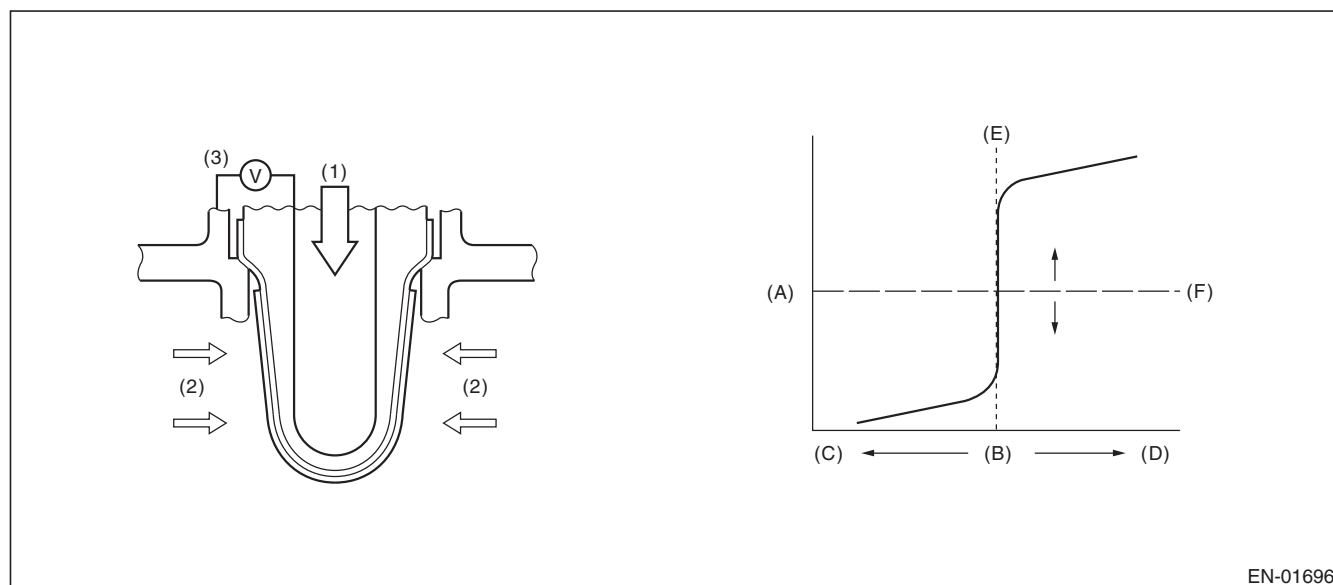
EG:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the size of the sub feedback learning value.

Sub feedback learning is being performed. When the learning value goes to the rich side, judge as NG.

2. COMPONENT DESCRIPTION



EN-01696

(A) Electromotive force

(B) Air fuel ratio

(C) Rich

(D) Lean

(E) Theoretical air fuel ratio

(F) Comparative voltage

(1) Atmosphere

(2) Exhaust gas

(3) Electromotive force

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Conditions for carrying out the sub feedback learning	Completed
Continuous time when all conditions are established.	≥ 1 s

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the vehicle is idling or running at a constant speed of 80 km/h (50 MPH) or more.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Sub feedback learning value	≥ 0.04

Time Needed for Diagnosis: 5 s $\times$ 1 time(s)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Sub feedback learning value	$< 0.04 + 0$

Time Needed for Diagnosis: 5 s

EH:DTC P2098 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 2

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P2096. <Ref. to GD(H6DO)-187, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

EI: DTC P2099 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P2097. <Ref. to GD(H6DO)-189, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

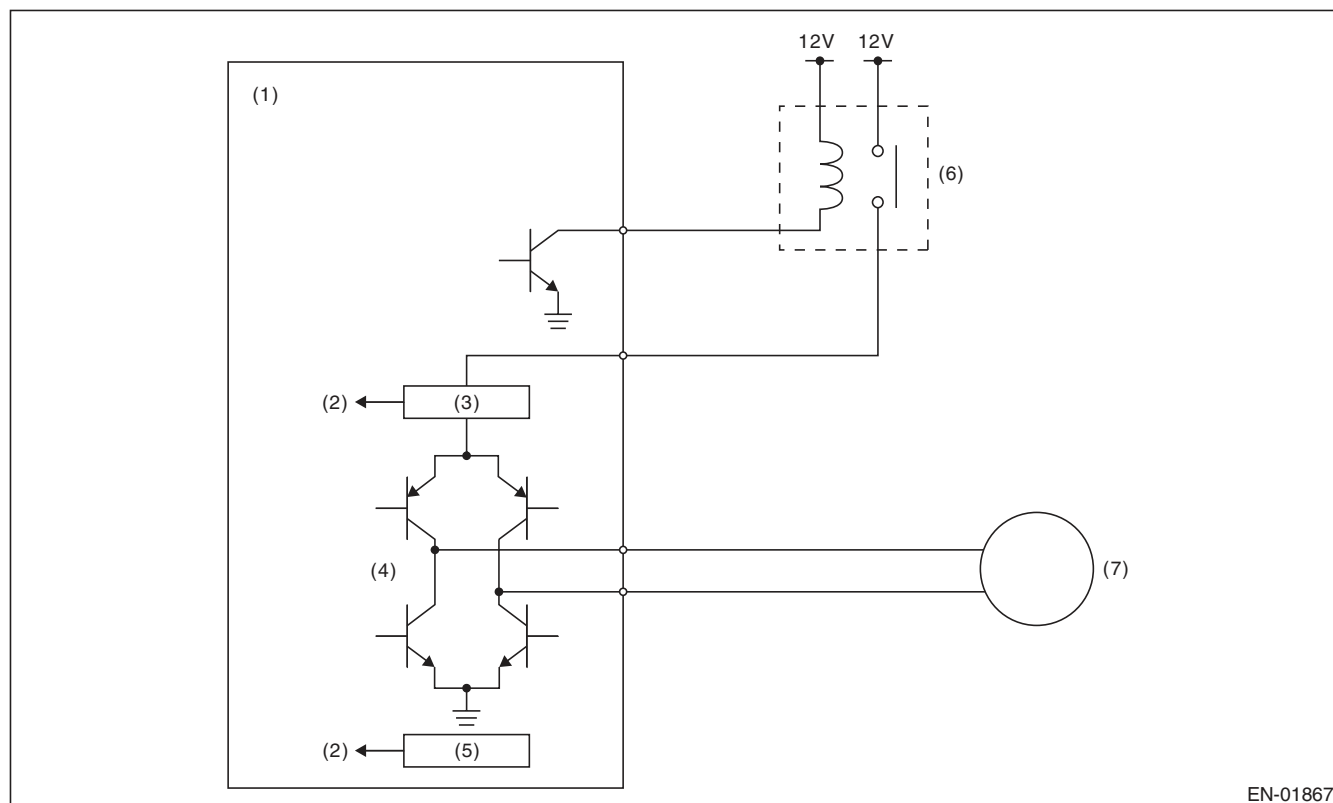
GENERAL DESCRIPTION

EJ:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the motor current becomes large or drive circuit is heated.

2. COMPONENT DESCRIPTION



EN-01867

- | | | |
|-----------------------------------|-----------------------------------|---------------------------------------|
| (1) Engine control module (ECM) | (4) Drive circuit | (6) Electronic throttle control relay |
| (2) Detecting circuit | (5) Temperature detection circuit | (7) Motor |
| (3) Overcurrent detection circuit | | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Under control of electronic throttle control	ON
CPU communication line sub → main normal judgment	Normal

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Motor current or Drive circuit inner temperature	> 8 A > 175°C (347°F)

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Motor current Drive circuit inner temperature	≤ 8 A ≤ 175°C (347°F)

Time Needed for Diagnosis: 2000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

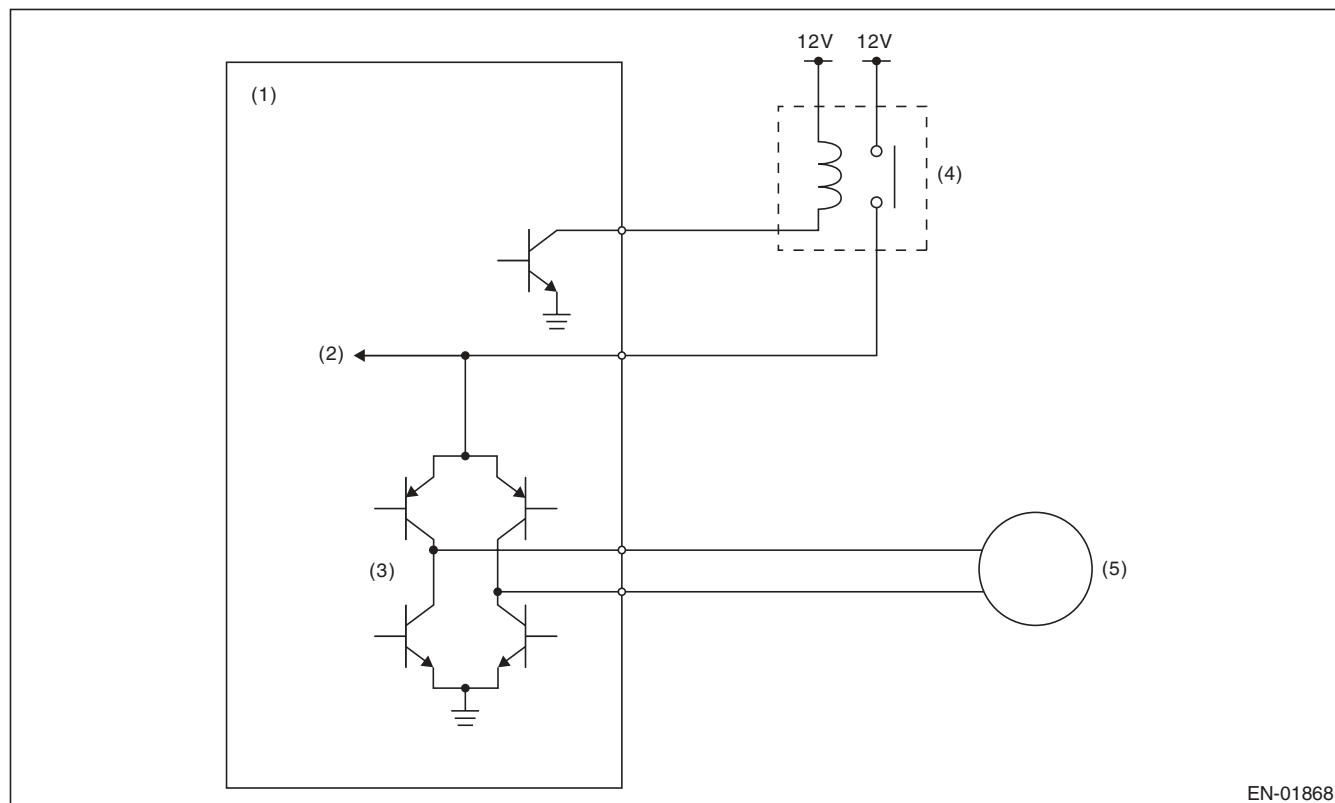
GENERAL DESCRIPTION

EK:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge as NG when the electronic throttle control power is not supplied even when ECM sets the electronic throttle control relay to ON.

2. COMPONENT DESCRIPTION



EN-01868

- | | | |
|---------------------------------|---------------------------------------|-----------|
| (1) Engine control module (ECM) | (3) Drive circuit | (5) Motor |
| (2) Voltage detection circuit | (4) Electronic throttle control relay | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 11 \text{ V}$
Electronic throttle control relay output	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Motor power voltage	$\leq 5 \text{ V}$

Time Needed for Diagnosis: 400 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Motor power voltage	$> 5 \text{ V}$

Time Needed for Diagnosis: 2000 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

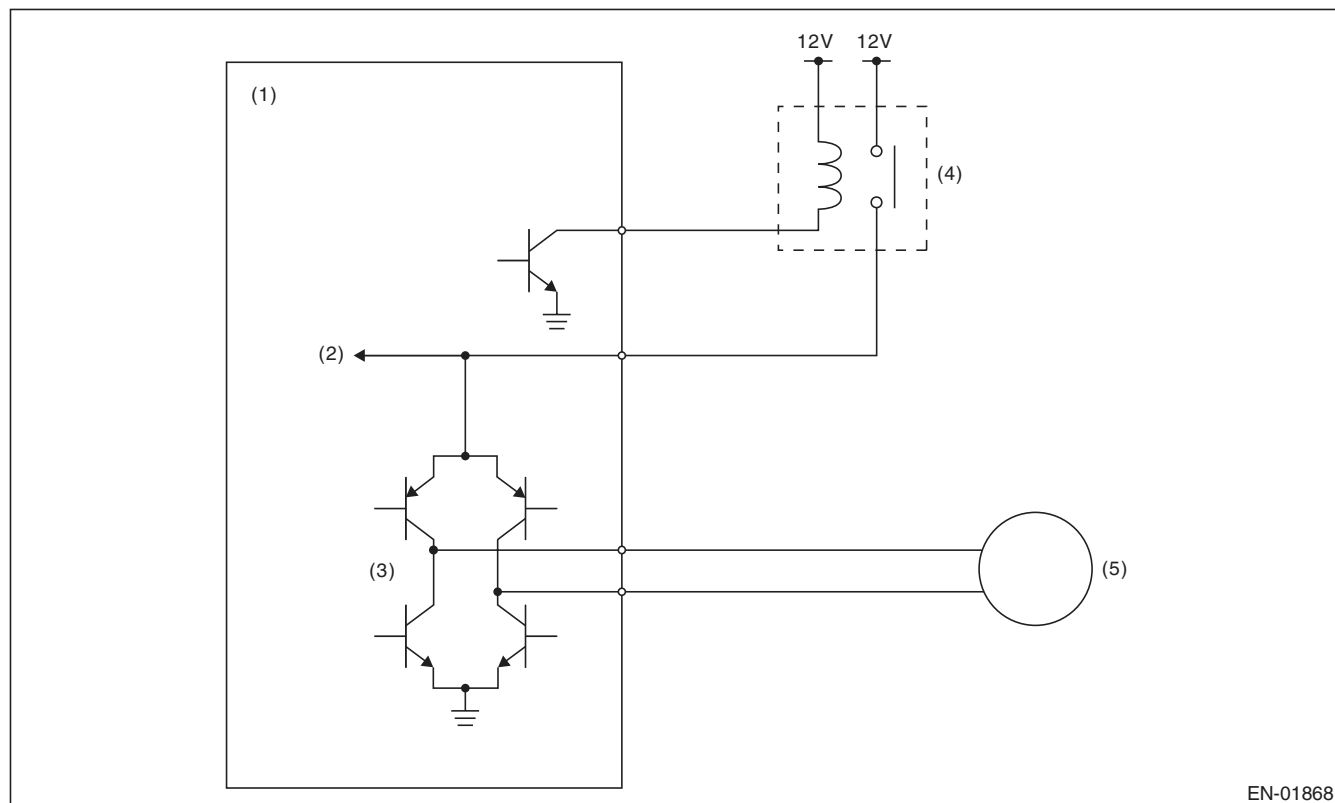
GENERAL DESCRIPTION

EL:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Judge as NG when the electronic throttle control power is supplied even when ECM sets the electronic throttle control relay to OFF.

2. COMPONENT DESCRIPTION



EN-01868

- | | | |
|---------------------------------|---------------------------------------|-----------|
| (1) Engine control module (ECM) | (3) Drive circuit | (5) Motor |
| (2) Voltage detection circuit | (4) Electronic throttle control relay | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 6\text{ V}$
Electronic throttle control relay output	OFF

4. GENERAL DRIVING CYCLE

- When ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Motor power voltage	$\geq 5 \text{ V}$

Time Needed for Diagnosis: 600 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Motor power voltage	$< 5 \text{ V}$

Time Needed for Diagnosis: 400 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

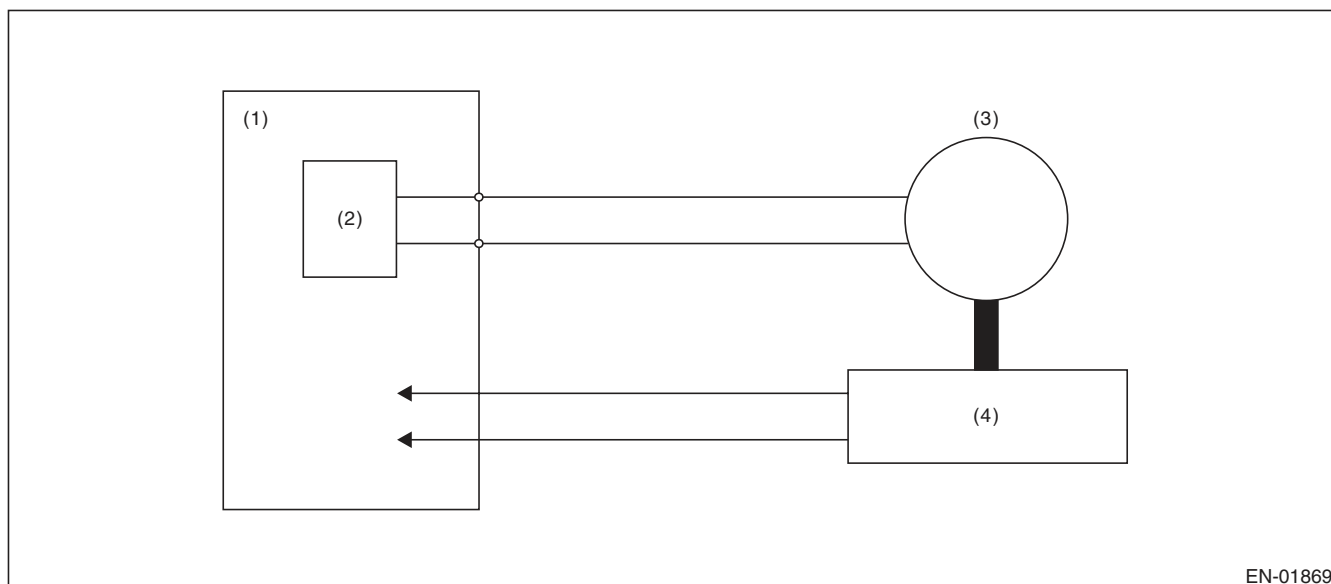
GENERAL DESCRIPTION

EM:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when full close point learning cannot conducted or abnormal value is detected.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(3) Motor

(4) Throttle position sensor

(2) Drive circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON → OFF
Ignition switch (only after clear memory)	OFF → ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis at full closed point learning.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Throttle sensor opening angle at full close point learning	$< 10.127^{\circ}$
	or
	$> 19.872^{\circ}$
or	
Throttle opening angle when the ignition switch is ON – Throttle minimum stop position	$< 1.683^{\circ}$

Time Needed for Diagnosis: 8 ms — 80 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Throttle sensor opening angle at full close point learning	$\geq 10.127^{\circ}$
	and
	$\leq 19.872^{\circ}$
Throttle opening angle when the ignition switch is ON – Throttle minimum stop position	$\geq 1.683^{\circ}$

Time Needed for Diagnosis: 8 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

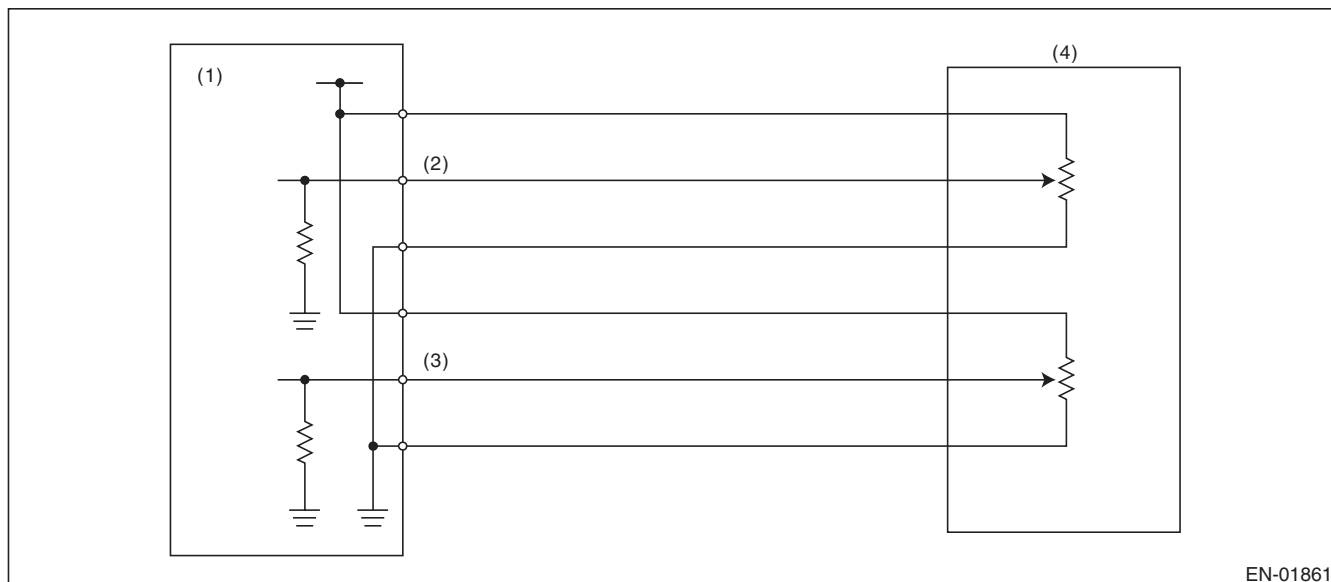
EN:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(2) Accelerator pedal position sensor 1 signal

(3) Accelerator pedal position sensor 2 signal

(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 6\text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Sensor 1 input voltage	< 0.219 V

Time Needed for Diagnosis: 100 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Sensor 1 input voltage	≥ 0.219 V

Time Needed for Diagnosis: 100 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

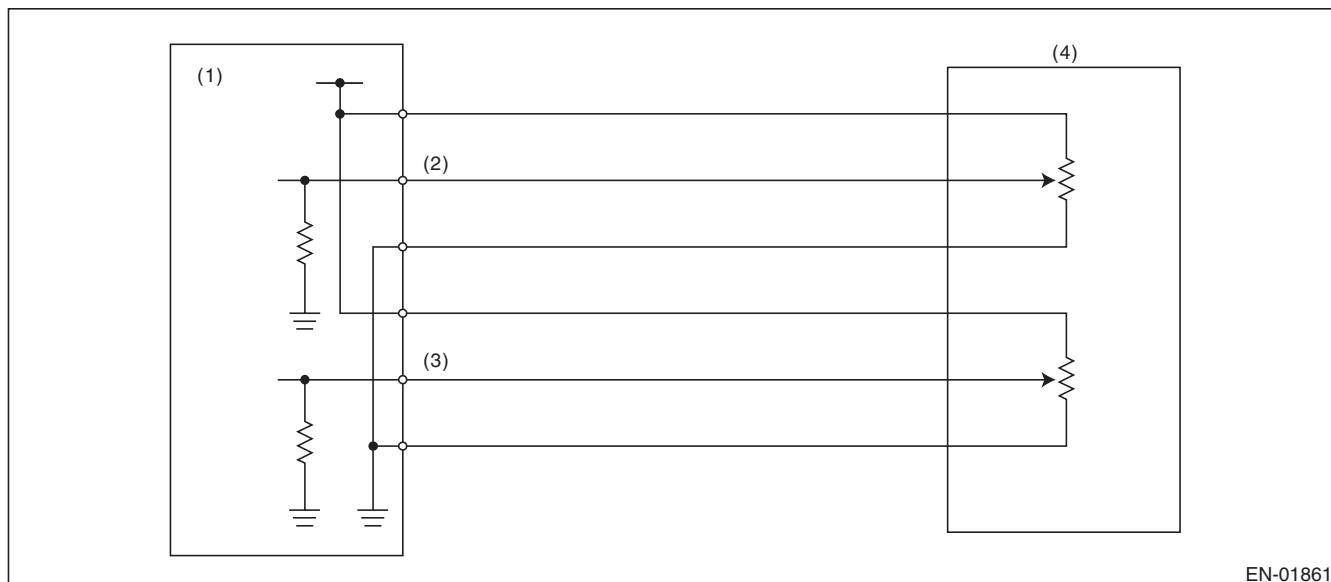
EO:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(2) Accelerator pedal position sensor 1 signal

(3) Accelerator pedal position sensor 2 signal

(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 6\text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Sensor 1 input voltage	≥ 4.781 V

Time Needed for Diagnosis: 32 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Sensor 1 input voltage	< 4.781 V

Time Needed for Diagnosis: 32 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

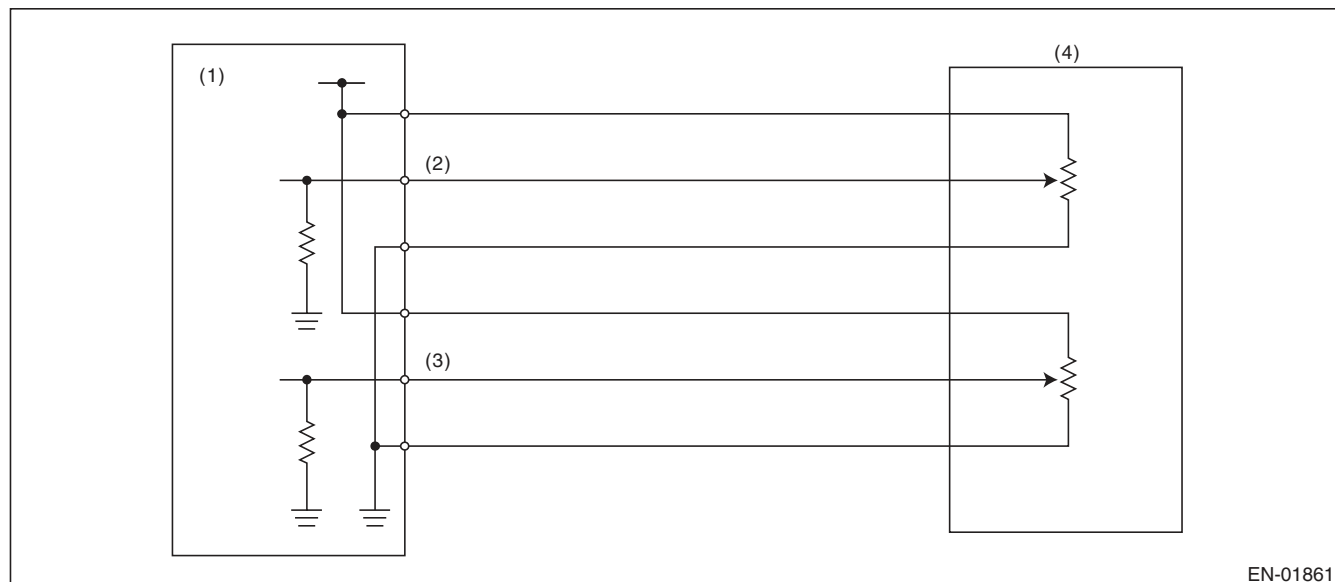
EP:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(2) Accelerator pedal position sensor
1 signal

(3) Accelerator pedal position sensor
2 signal

(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 6\text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

- **Abnormality Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Sensor 2 input voltage	< 0.219 V

Time Needed for Diagnosis: 100 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Sensor 2 input voltage	≥ 0.219 V

Time Needed for Diagnosis: 100 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

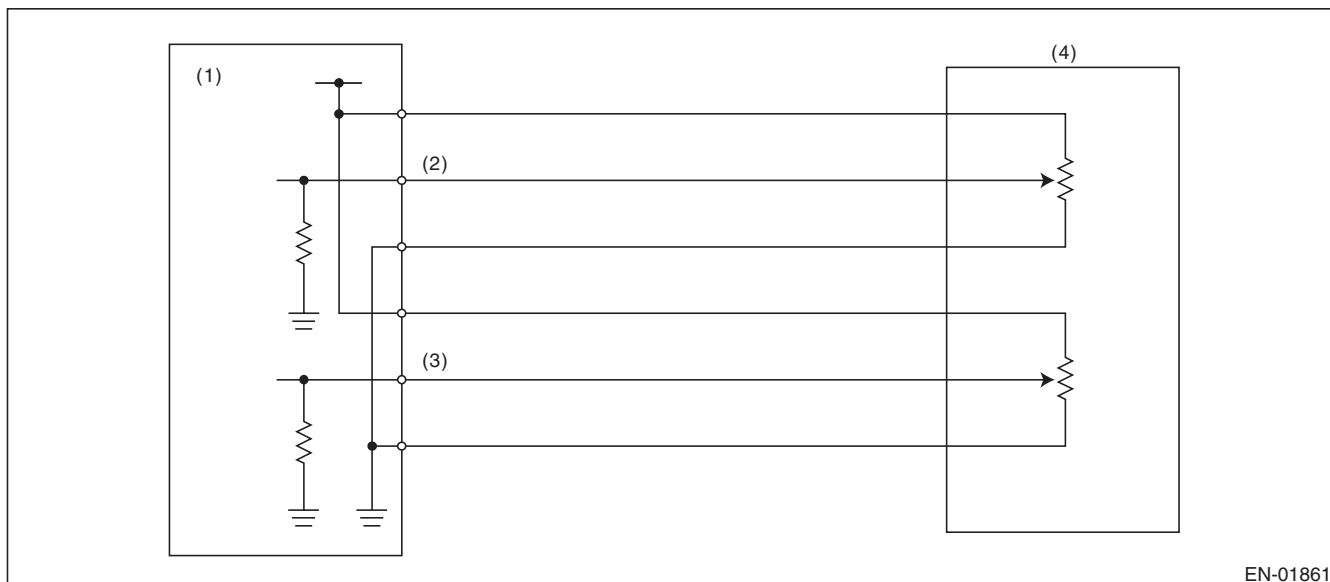
EQ:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(2) Accelerator pedal position sensor 1 signal

(3) Accelerator pedal position sensor 2 signal

(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 6\text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

- **Abnormality Judgement**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Sensor 2 input voltage	$\geq 4.781 \text{ V}$

Time Needed for Diagnosis: 100 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgement**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Sensor 2 input voltage	$< 4.781 \text{ V}$

Time Needed for Diagnosis: 100 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

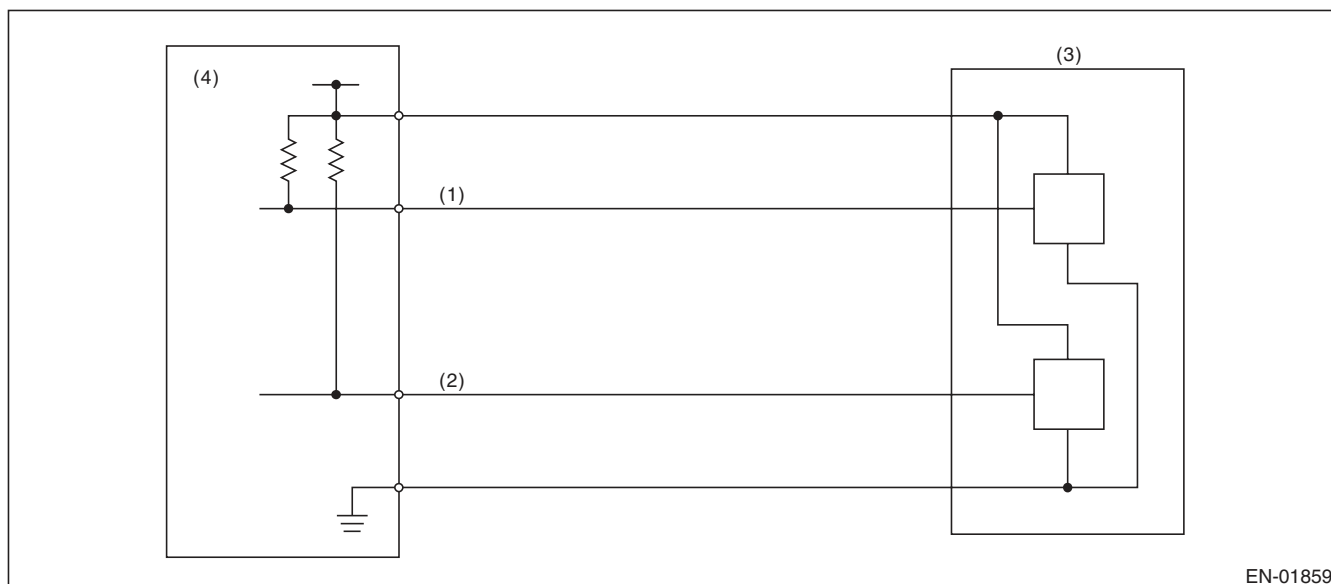
GENERAL DESCRIPTION

ER:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION

1. OUTLINE OF DIAGNOSIS

Judge as NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal

- (3) Throttle position sensor

- (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 6 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	> Value from Map

Map

Throttle position sensor 1 opening angle (°) = d	$0^{\circ} \leq d < 2.125^{\circ}$	$2.125^{\circ} \leq d < 4.25^{\circ}$	$4.25^{\circ} \leq d < 9^{\circ}$	$9^{\circ} \leq d < 31.625^{\circ}$	$31.625^{\circ} \leq d$
Sensor output difference (°)	4.5 °	5.5 °	7.625 °	9.75 °	11.75 °

Time Needed for Diagnosis: 212 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	$\leq$ Value from Map

Time Needed for Diagnosis: 24 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

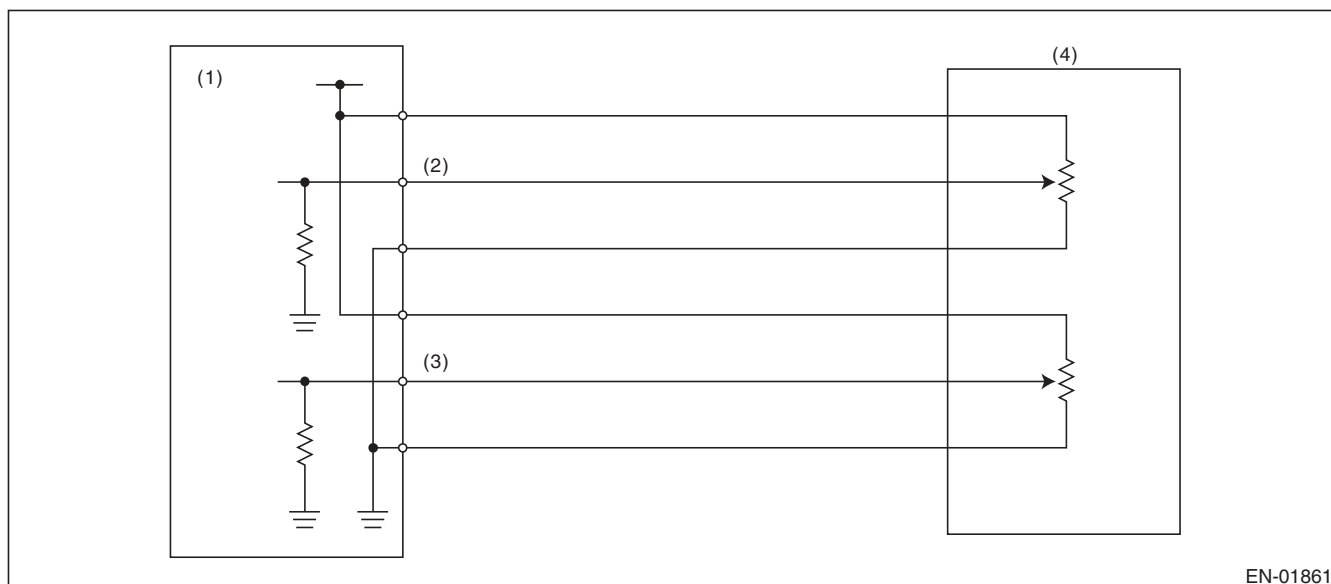
GENERAL DESCRIPTION

ES:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION

1. OUTLINE OF DIAGNOSIS

Judge as NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM) (3) Accelerator pedal position sensor 2 signal (4) Accelerator pedal position sensor 1 signal
- (2) Accelerator pedal position sensor 1 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 6\text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	> Value from Map

Map

Throttle position sensor 1 opening angle (°) = d	$0^{\circ} \leq d < 0.6^{\circ}$	$0.6^{\circ} \leq d < 1.2^{\circ}$	$1.2^{\circ} \leq d < 2^{\circ}$	$2^{\circ} \leq d < 4^{\circ}$	$4^{\circ} \leq d$
Sensor output difference (°)	1.465 °	1.597 °	1.663 °	2.455 °	3.116 °

Time Needed for Diagnosis: 116 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	$\leq$ Value from Map

Time Needed for Diagnosis: 116 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

ET:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of barometric pressure sensor output property.

Judge as NG when the barometric pressure sensor output is largely different from the intake manifold pressure at engine start.

2. COMPONENT DESCRIPTION

The barometric pressure sensor is built into the ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 300 rpm
Vehicle speed	< 1 km/h (0.6 MPH)

4. GENERAL DRIVING CYCLE

Perform the diagnosis once at ignition switch ON.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Barometric pressure – Intake manifold pressure	≥ 26.7 kPa (200 mmHg, 7.9 inHg)
Intake manifold pressure at engine start – Intake manifold pressure	< 1.3 kPa (9.99 mmHg, 0.4 inHg)

Time Needed for Diagnosis: 328 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Barometric pressure – Intake manifold pressure	< 26.7 kPa (200 mmHg, 7.9 inHg)

Time Needed for Diagnosis: 262 ms

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EU:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of the barometric pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION

The barometric pressure sensor is built into the ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	< 1.707 V

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	≥ 1.707 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EV:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of the barometric pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION

The barometric pressure sensor is built into the ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgement

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	≥ 4.234 V

Time Needed for Diagnosis: 500 ms

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgement

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgement Value

Malfunction criteria	Threshold value
Output voltage	< 4.234 V

Time Needed for Diagnosis: Less than 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION
