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GENERAL DESCRIPTION

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(STI)-9, 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 (Bank 1)	<Ref. to GD(STI)-11, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank 2)	<Ref. to GD(STI)-11, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to GD(STI)-11, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(STI)-12, 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(STI)-14, 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(STI)-16, 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(STI)-18, 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(STI)-20, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	MAP/MAF - Throttle Position Correlation	<Ref. to GD(STI)-22, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to GD(STI)-24, 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(STI)-27, 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(STI)-29, 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(STI)-31, 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(STI)-33, 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(STI)-35, 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(STI)-37, 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(STI)-39, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low	<Ref. to GD(STI)-41, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High	<Ref. to GD(STI)-43, 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(STI)-45, 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(STI)-47, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to GD(STI)-49, 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(STI)-52, 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(STI)-54, 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(STI)-56, 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(STI)-58, 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(STI)-60, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(STI)-63, 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(STI)-65, 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(STI)-67, 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(STI)-68, 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(STI)-74, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(STI)-76, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(STI)-79, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	<Ref. to GD(STI)-82, 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(STI)-85, 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(STI)-87, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	<Ref. to GD(STI)-89, 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(STI)-91, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0230	Fuel Pump Primary Circuit	<Ref. to GD(STI)-93, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0244	Turbo/Super Charger Wastegate Solenoid "A" Range/Performance	<Ref. to GD(STI)-95, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0245	Turbo/Super Charger Wastegate Solenoid "A" Low	<Ref. to GD(STI)-97, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0246	Turbo/Super Charger Wastegate Solenoid "A" High	<Ref. to GD(STI)-99, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(STI)-101, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(STI)-106, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0303	Cylinder 3 Misfire Detected	<Ref. to GD(STI)-106, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(STI)-106, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	<Ref. to GD(STI)-107, 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(STI)-109, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor "A" Circuit	<Ref. to GD(STI)-111, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor "A" Circuit Range/Performance	<Ref. to GD(STI)-113, 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(STI)-115, 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(STI)-116, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0410	Secondary Air Injection System	<Ref. to GD(STI)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0411	Secondary Air Injection System Incorrect Flow Detected	<Ref. to GD(STI)-121, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0413	Secondary Air Injection System Switching Valve "A" Circuit Open	<Ref. to GD(STI)-122, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0414	Secondary Air Injection System Switching Valve "A" Circuit Shorted	<Ref. to GD(STI)-123, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0418	Secondary Air Injection System Control "A" Circuit	<Ref. to GD(STI)-124, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(STI)-125, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0441	Evaporative Emission System Incorrect Purge Flow	<Ref. to GD(STI)-127, DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to GD(STI)-128, 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(STI)-144, 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(STI)-146, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission Control System Pressure Sensor	<Ref. to GD(STI)-148, 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(STI)-150, 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(STI)-152, 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(STI)-153, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	<Ref. to GD(STI)-153, 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(STI)-154, 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(STI)-156, 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(STI)-158, 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(STI)-160, DTC P0462 FUEL LEVEL SENSOR "A" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor "A" Circuit High	<Ref. to GD(STI)-162, DTC P0463 FUEL LEVEL SENSOR "A" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(STI)-164, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Fan Rationality Check	<Ref. to GD(STI)-167, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor "A" Circuit Low Input	<Ref. to GD(STI)-169, DTC P0502 VEHICLE SPEED SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0503	Vehicle Speed Sensor "A" Intermittent/ Erratic/High	<Ref. to GD(STI)-171, DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to GD(STI)-173, 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(STI)-175, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(STI)-177, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0513	Incorrect Immobilizer Key	<Ref. to GD(STI)-178, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Air Control System Performance	<Ref. to GD(STI)-179, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(STI)-180, 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(STI)-181, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Control Module Performance	<Ref. to GD(STI)-182, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(STI)-185, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Fan 1 Control Circuit Low	<Ref. to GD(STI)-188, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Fan 1 Control Circuit High	<Ref. to GD(STI)-189, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low (MT Model)	<Ref. to GD(STI)-190, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High (MT Model)	<Ref. to GD(STI)-191, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to GD(STI)-192, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to GD(STI)-194, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(STI)-196, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(STI)-198, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1410	Secondary Air Injection System Switching Valve Stuck Open	<Ref. to GD(STI)-200, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1418	Secondary Air Injection System Control "A" Circuit Shorted	<Ref. to GD(STI)-202, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(STI)-203, 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(STI)-205, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to GD(STI)-207, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(STI)-209, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to GD(STI)-210, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1570	Antenna	<Ref. to GD(STI)-211, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1571	Reference Code Incompatibility	<Ref. to GD(STI)-211, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to GD(STI)-211, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1574	Key Communication Failure	<Ref. to GD(STI)-211, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1576	EGI Control Module EEPROM	<Ref. to GD(STI)-211, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1577	IMM Control Module EEPROM	<Ref. to GD(STI)-211, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1602	Control Module Programming Error	<Ref. to GD(STI)-212, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to GD(STI)-214, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	<Ref. to GD(STI)-215, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	<Ref. to GD(STI)-216, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	<Ref. to GD(STI)-217, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2008	Intake Manifold Runner Control Circuit / Open (Bank 1)	<Ref. to GD(STI)-218, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	<Ref. to GD(STI)-220, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2011	Intake Manifold Runner Control Circuit / Open (Bank 2)	<Ref. to GD(STI)-222, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	<Ref. to GD(STI)-224, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P2016	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)	<Ref. to GD(STI)-226, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2017	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1)	<Ref. to GD(STI)-228, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2021	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)	<Ref. to GD(STI)-230, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2022	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)	<Ref. to GD(STI)-232, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to GD(STI)-234, 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(STI)-236, 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(STI)-238, 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(STI)-240, 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(STI)-242, 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(STI)-244, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to GD(STI)-246, 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(STI)-248, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to GD(STI)-250, 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(STI)-252, 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(STI)-254, 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(STI)-256, 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(STI)-258, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/ SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2128	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input	<Ref. to GD(STI)-260, 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(STI)-262, 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(STI)-264, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/ SWITCH "D"/"E" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P2419	Evaporative Emission System Switching Valve Control Circuit Low	<Ref. to GD(STI)-266, DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2420	Evaporative Emission System Switching Valve Control Circuit High	<Ref. to GD(STI)-267, DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2431	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Range/Performance	<Ref. to GD(STI)-268, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2432	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Low	<Ref. to GD(STI)-269, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2433	Secondary Air Injection System Air Flow /Pressure Sensor Circuit High	<Ref. to GD(STI)-270, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank1)	<Ref. to GD(STI)-270, DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2444	Secondary Air Injection System Pump Stuck On	<Ref. to GD(STI)-271, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. Diagnostic Trouble Code (DTC) Detecting Criteria

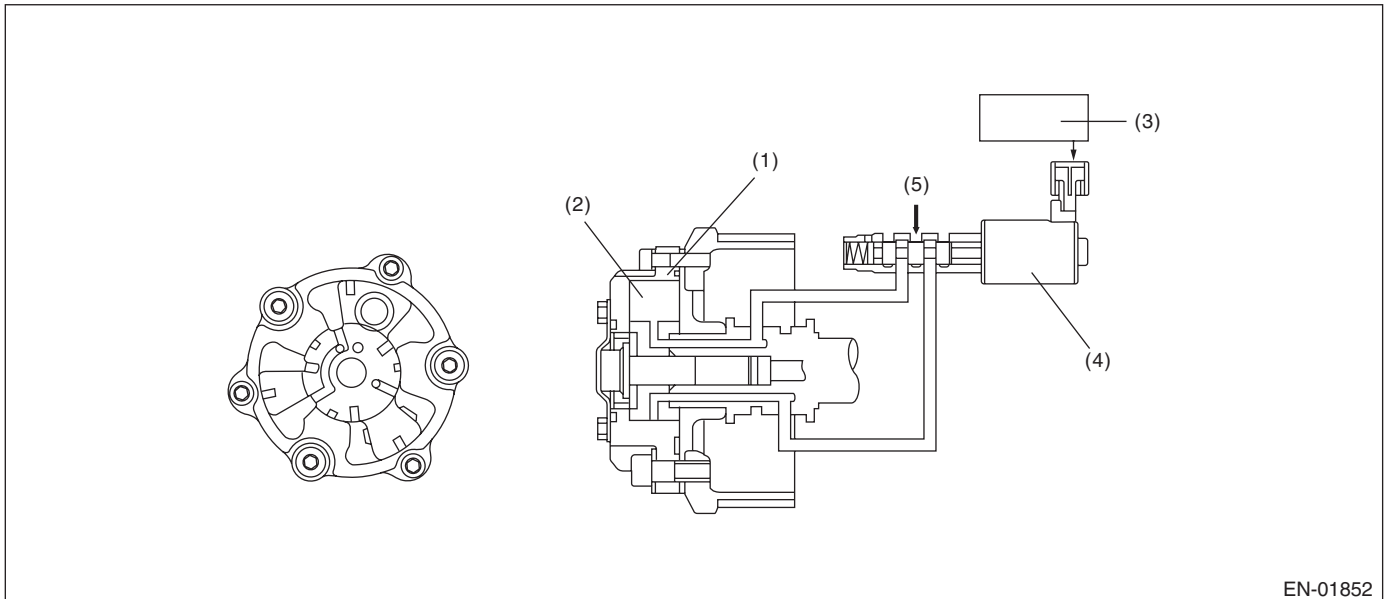
A: DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.

There are two types of diagnosis: Crankshaft cam timing diagnosis and slow response diagnosis. Either of these is performed according to the status of the engine while running.

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

1. Crankshaft cam timing diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$> 60^\circ\text{C}$ (140°F)
Engine speed	$\geq 500 \text{ rpm}$
AVCS	Uncontrolled

2. Slow response diagnosis

Secondary Parameters	Enable Conditions
All secondary parameters are executable.	3 seconds or more
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$> 60^\circ\text{C}$ (140°F)
Engine speed	$\geq 1500 \text{ rpm}$
AVCS	Controlled
Target timing advance change amount	$< 1.07^\circ\text{CA}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

1. Crankshaft cam timing diagnosis

Always perform the diagnosis while AVCS is not operating after starting the engine.

2. Slow response diagnosis

Always perform the diagnosis while AVCS is operating after starting the engine.

5. DIAGNOSTIC METHOD

1. Crankshaft cam timing diagnosis

Judge as NG when the standard timing advance is out of the specification. Judge as OK when it is within the specification.

Judge as NG when the continuous time of meeting the following conditions is 20 seconds or more. Judge as OK and clear the NG when the continuous time of not meeting the following conditions is 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Standard timing advance	< -13°CA or > 25°CA

Time Needed for Diagnosis: 20 seconds

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

2. Slow response diagnosis

Calculates the positive and negative AVCS deviation amount separately. Judge as NG when the total value is large after the predetermined time (30 seconds) has passed.

Abnormality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
AVCS target position	$\geq 0^{\circ}\text{CA}$
AVCS positive deviation integrated value	> 8000°CA (R bank) > 8000°CA (L bank)
or	
AVCS negative deviation integrated value	< -8000°CA (R bank) < -8000°CA (L bank)

Time Needed for Diagnosis: 30 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
AVCS target position	$\geq 0^{\circ}\text{CA}$
AVCS positive deviation integrated value	$\leq 8000^{\circ}\text{CA}$ (R bank) $\leq 8000^{\circ}\text{CA}$ (L bank)
or	
AVCS negative deviation integrated value	$\geq -8000^{\circ}\text{CA}$ (R bank) $\geq -8000^{\circ}\text{CA}$ (L bank)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

B: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(STI)-9, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

C: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2)

NOTE:

For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(STI)-9, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(STI)-9, 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

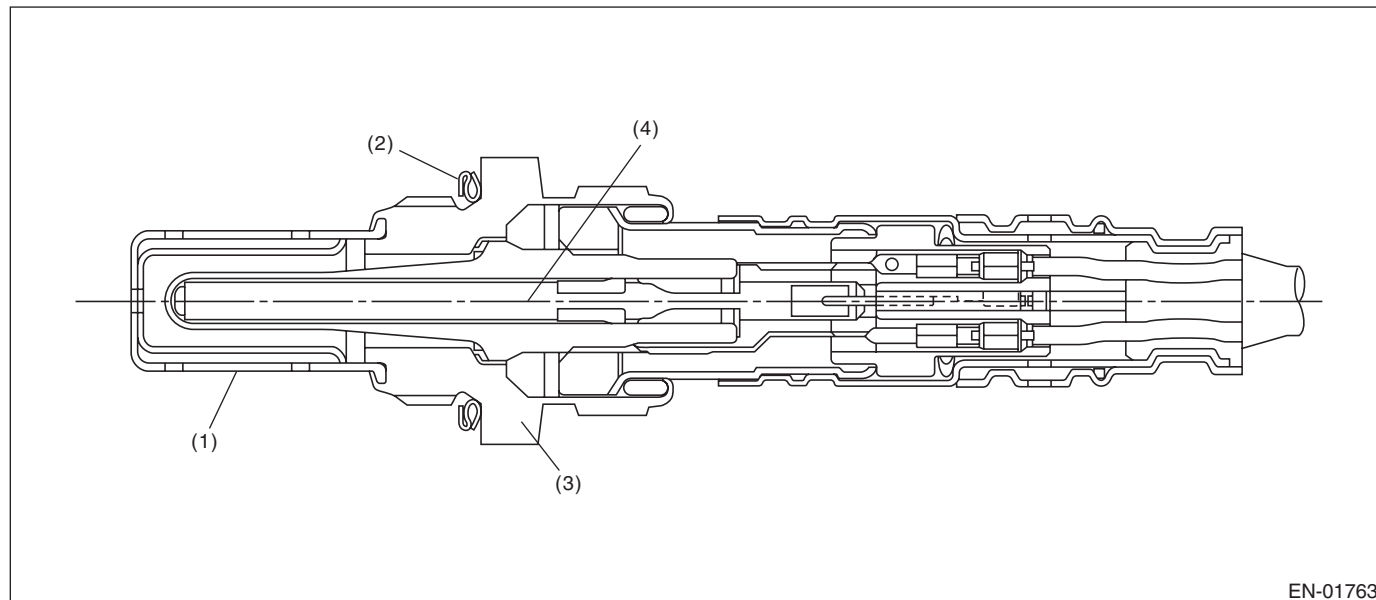
E: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

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



- (1) Protection tube
- (2) Gasket

- (3) Sensor housing

- (4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	42 seconds or more
Battery voltage	> 10.9 V
After fuel cut	20 seconds or more
Front oxygen (A/F) sensor heater control duty \geq 35%	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 60 seconds or more have passed since the engine started.

5. DIAGNOSTIC METHOD

Judge as NG if the duration of time while the following criteria are met is the time needed for diagnosis (10 seconds) or more. Judge as OK and clear NG when the continuous time of not completing the malfunction criteria below becomes the time needed for diagnosis (10 seconds) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Front oxygen (A/F) sensor impedance	> 50 Ω

Time Needed for Diagnosis: 10 seconds

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

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

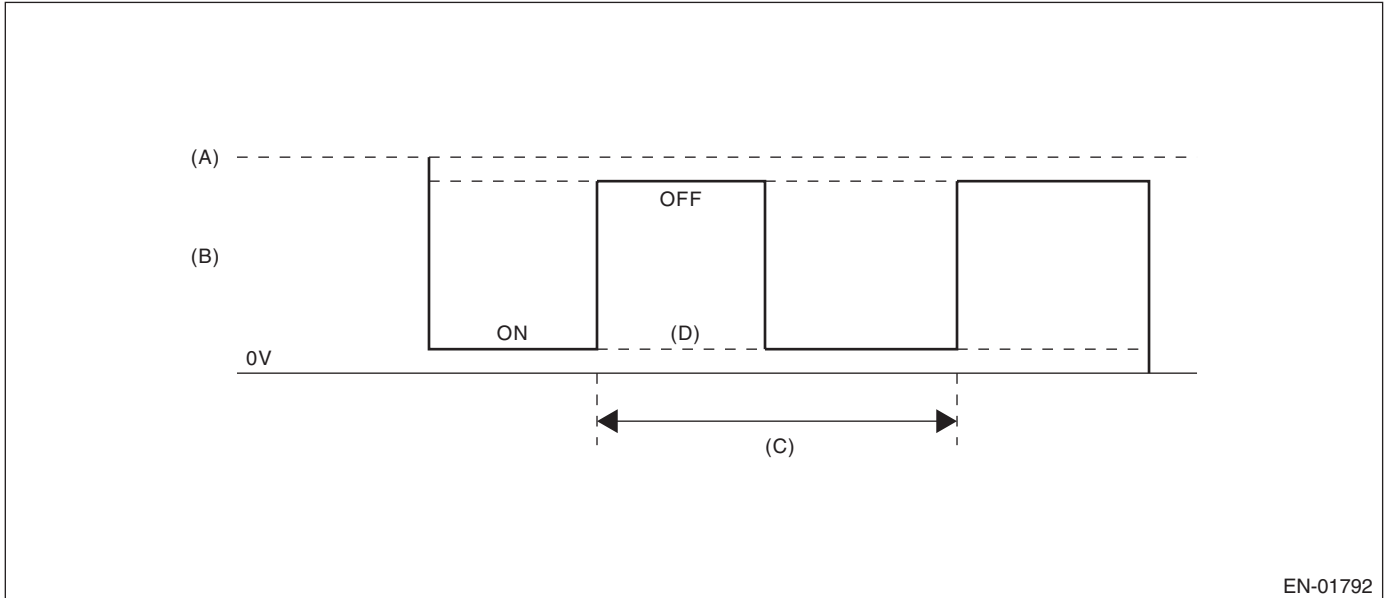
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.

The 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) 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 Judgment

Judge as NG if the duration of time while the following criteria are met is 1 second (8 cycles) or more.

Judgment Value

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

Time Needed for Diagnosis: 1 second

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: 0.3 → 0 at the MIN valve as normal.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

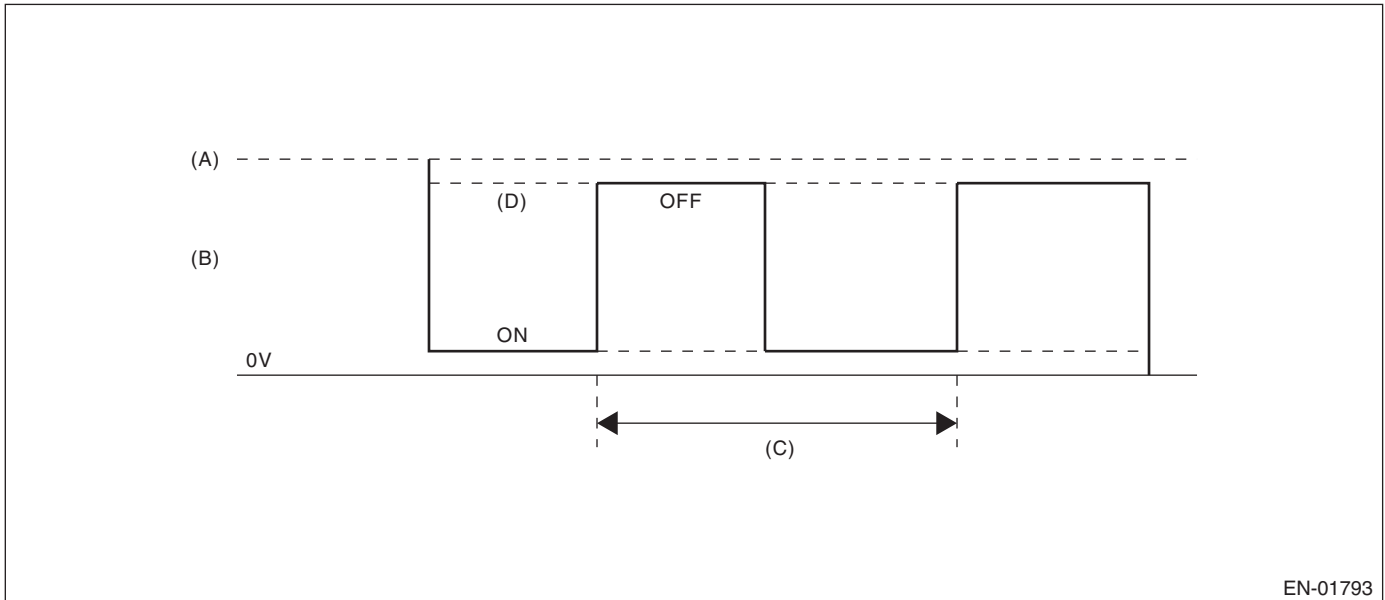
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.

The 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 Judgment

Judge as NG if the duration of time while the following criteria are met is 1 second (8 cycles) or more.

Judgment Value

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

Time Needed for Diagnosis: 1 second

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: 0.3 → 0 at the MIN valve as normal.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

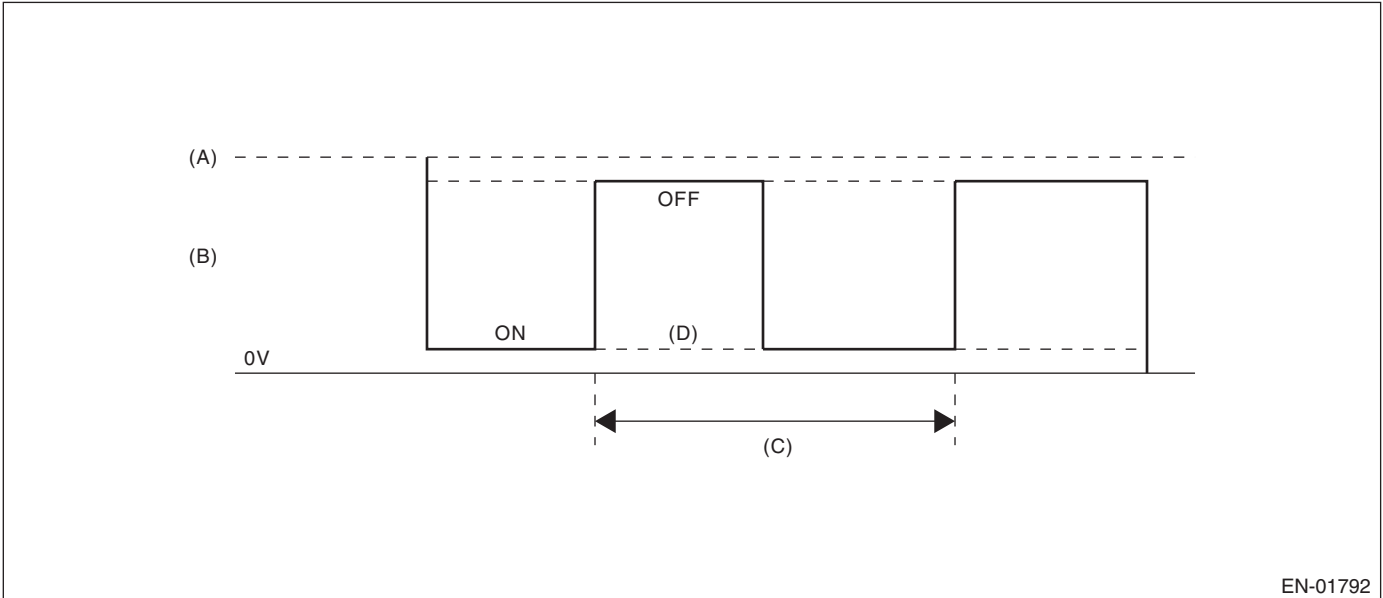
1. OUTLINE OF DIAGNOSIS

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



(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	> 10.9 V
Elapsed time after the engine start	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously from 1 second after the engine start.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting all the malfunction criteria below becomes 2,560 milliseconds (10 cycles) or more.

Judgment Value

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

Time Needed for Diagnosis: 2.56 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

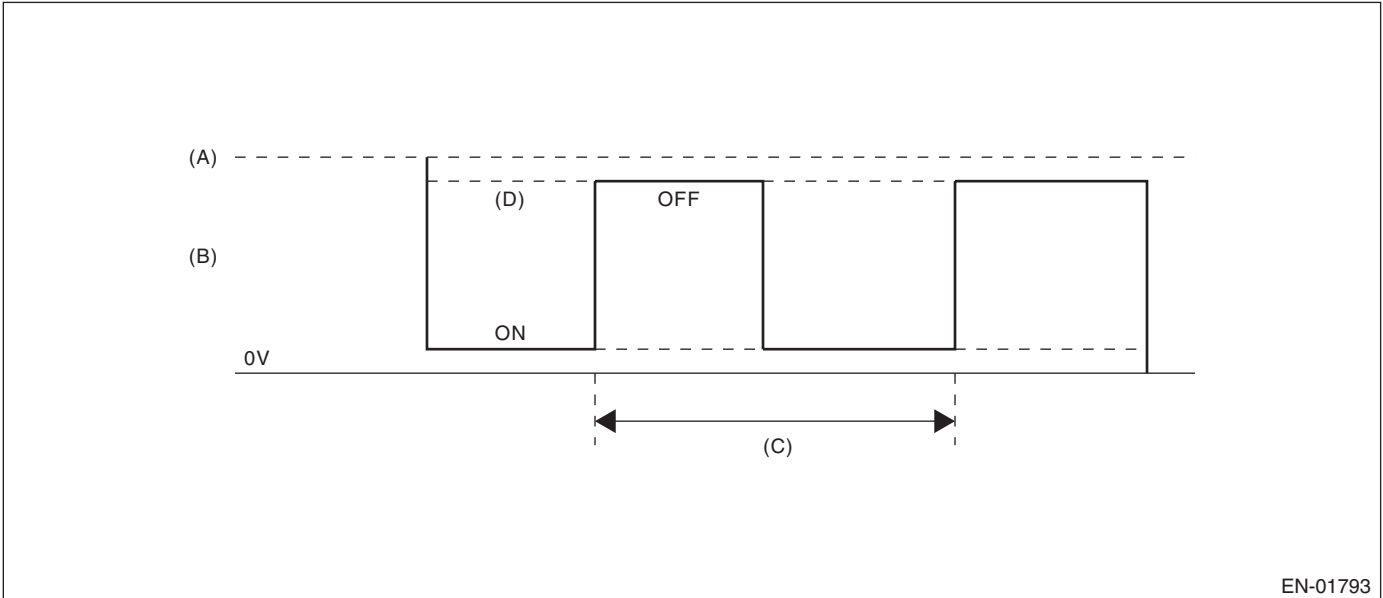
1. OUTLINE OF DIAGNOSIS

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	> 10.9 V
Elapsed time after the engine start	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously from 1 second after the engine start.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting all the malfunction criteria below becomes 2,560 milliseconds (10 cycles) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Rear oxygen sensor heater control duty	≥ 25%

Time Needed for Diagnosis: 2.56 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

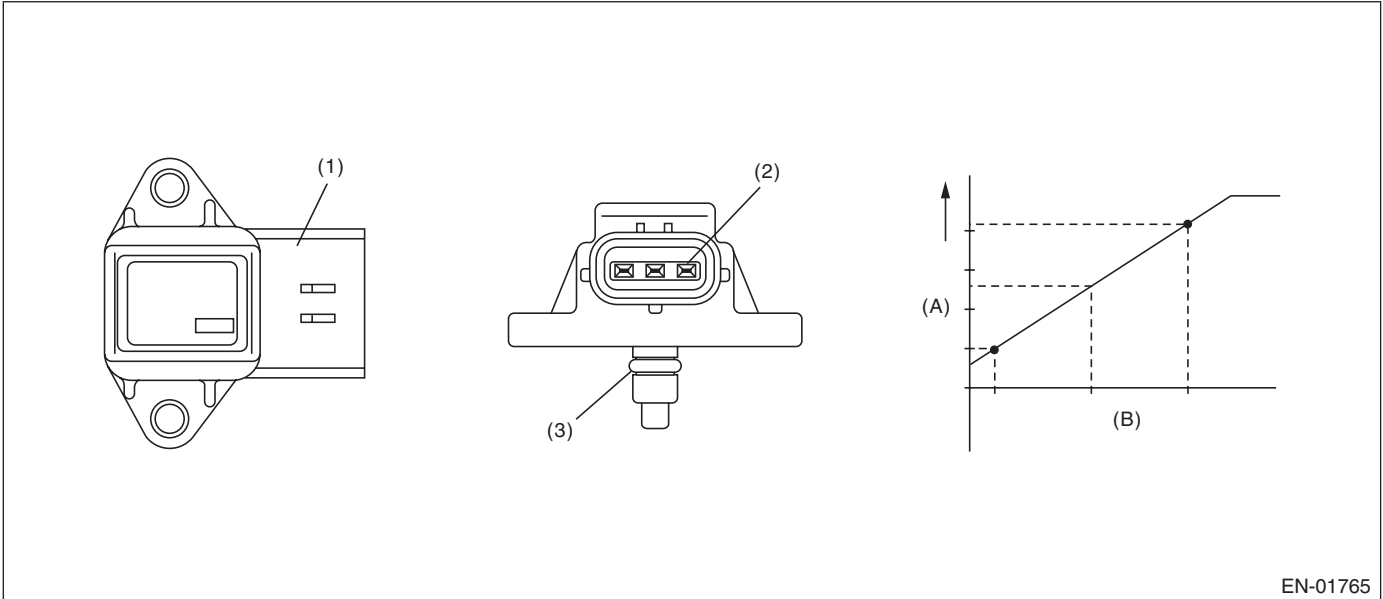
GENERAL DESCRIPTION

J: 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



EN-01765

- (1) Connector
- (2) Terminals

- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

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

Judge as NG when the continuous time of meeting the malfunction criteria below becomes three seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2,500 rpm
Throttle position	≥ 10°
Intake air amount every 0.5 engine revs.	> 1.356g (0.04782 oz) /rev
Output voltage	< 1.0 V
High side	
Engine speed	600 ←→ 900 rpm
Throttle position	< 2.75°
Intake air amount every 0.5 engine revs.	≤ 0.4g (0.014 oz)/rev
Output voltage	≥ 2.36 V

Time Needed for Diagnosis: 3 seconds

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

Normality Judgment

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

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2,500 rpm
Throttle position	≥ 10°
Output voltage	≥ 1.0 V
High side	
Engine speed	600 ←→ 900 rpm
Throttle position	< 2.75°
Output voltage	< 2.36 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

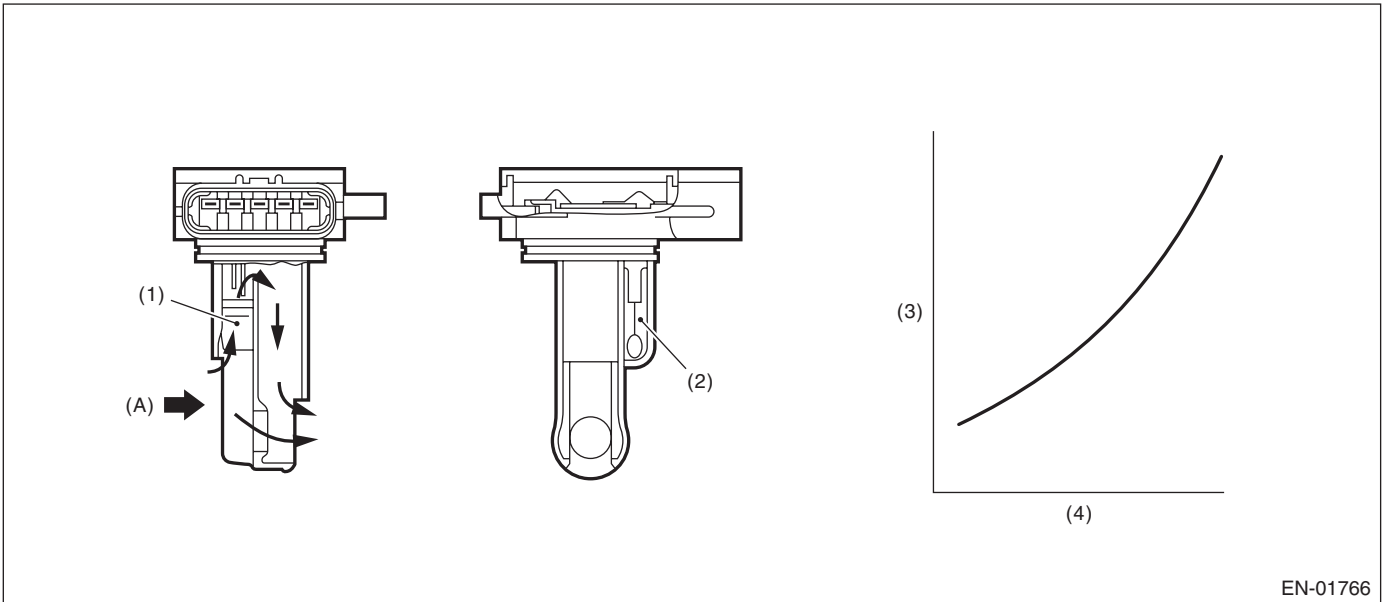
K: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

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

- (1) Air flow sensor
- (2) Intake air temperature sensor
- (3) Voltage (V)
- (4) Amount of intake air (kg/s)
- (A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time while the following criteria are met exceeds the determined time.

Judgment Value

Malfunction Criteria	Threshold Value
(Low side error) Output voltage Engine speed Throttle opening angle Intake manifold pressure	< 1.5 V ≥ 2,500 rpm ≥ 15° ≥ 53.3 kPa (400 mmHg, 15.7 inHg)
(High side error 1) Output voltage Engine speed Throttle opening angle Intake manifold pressure	≥ 1.95 V 600 ←→ 900 rpm < 4.1° < 52.66 kPa (395.05 mmHg, 15.553 inHg)
(High side error 2) Output voltage Engine speed Throttle opening angle Intake manifold pressure Fuel system diagnosis	≥ 1.7 V 600 ←→ 900 rpm < 4.1° < 52.66 kPa (395.05 mmHg, 15.553 inHg) Rich side malfunction

Time Needed for Diagnosis:

Low side	3 seconds
High side	10 seconds

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

Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
(Low side error) Output voltage Engine speed Throttle opening angle Intake manifold pressure	≥ 1.5 V ≥ 2,500 rpm ≥ 15° ≥ 53.3 kPa (400 mmHg, 15.7 inHg)
(High side error) Output voltage Engine speed Throttle opening angle Intake manifold pressure	< 2.5 V 550 ←→ 900 rpm < 1.92° < 46.7 kPa (350 mmHg, 13.8 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - Knock compensation final advance/retard angle value = knock compensation value + whole learning compensation value + portional learning compensation value
 - When normal: Knock compensation value = Fixed at 0°CA
 - Failure: Knock compensation value ≠ Fixed at 0° CA (When knock: Max. 12°CA retard)
 - Whole learning compensation coefficient update not allowed
 - Portional learning zone compensation value calculation not allowed.
- ISC control: Open loop compensation is set to the specified value (1 g/s). Stop calculation of throttle sensor temperature compensation (hold previous value)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

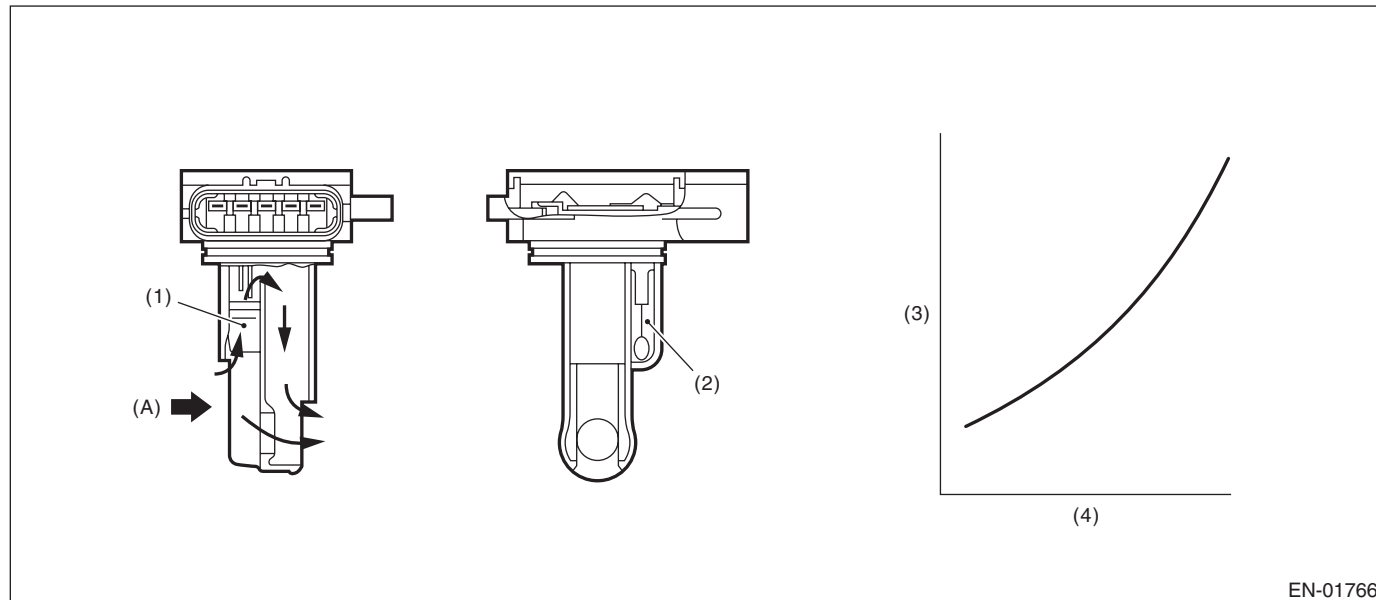
L: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

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

(1) Air flow sensor

(2) Intake air temperature sensor

(3) Voltage (V)

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

(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.2 V

Time Needed for Diagnosis: 0.5 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - Knock compensation final advance/retard angle value = knock compensation value + whole learning compensation value + portional learning compensation value
 - When normal: Knock compensation value = Fixed at 0°CA
 - Failure: Knock compensation value ≠ Fixed at 0° CA (When knock: Max. 12°CA retard)
 - Whole learning compensation coefficient update not allowed
 - Portional learning zone compensation value calculation not allowed.
- ISC control: Open loop compensation is set to the specified value (1 g/s). Stop calculation of throttle sensor temperature compensation (hold previous value)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

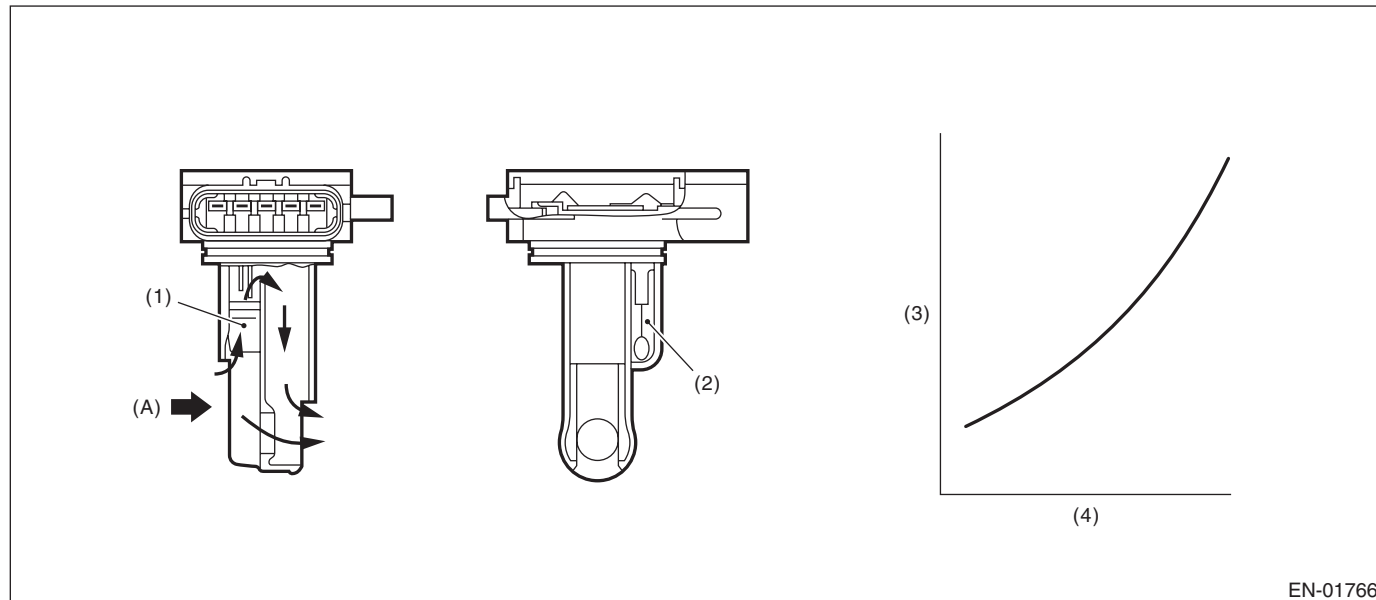
M: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-01766

(1) Air flow sensor

(2) Intake air temperature sensor

(3) Voltage (V)

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

(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.985 V

Time Needed for Diagnosis: 0.5 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - Knock compensation final advance/retard angle value = knock compensation value + whole learning compensation value + portional learning compensation value
 - When normal: Knock compensation value = Fixed at 0°CA
 - Failure: Knock compensation value ≠ Fixed at 0° CA (When knock: Max. 12°CA retard)
 - Whole learning compensation coefficient update not allowed
 - Portional learning zone compensation value calculation not allowed.
- ISC control: Open loop compensation is set to the specified value (1 g/s). Stop calculation of throttle sensor temperature compensation (hold previous value)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

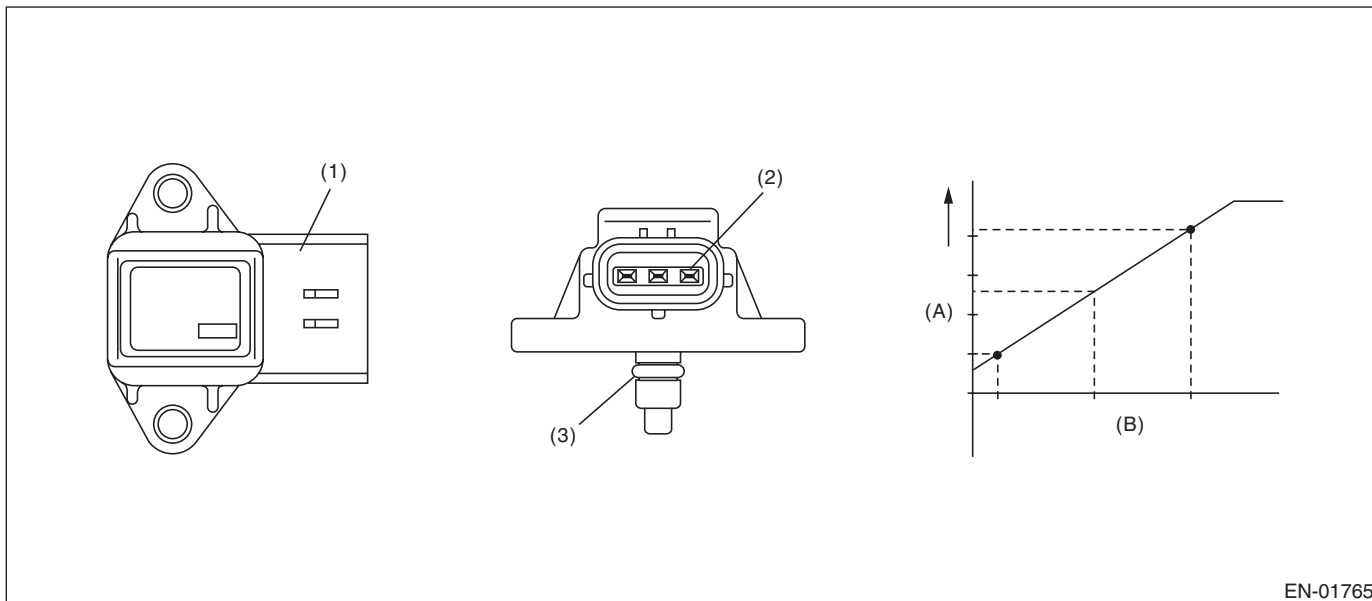
GENERAL DESCRIPTION

N: 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

(1) Connector
(2) Terminals

(3) O-ring

(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.568 V

Time Needed for Diagnosis: 0.5 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

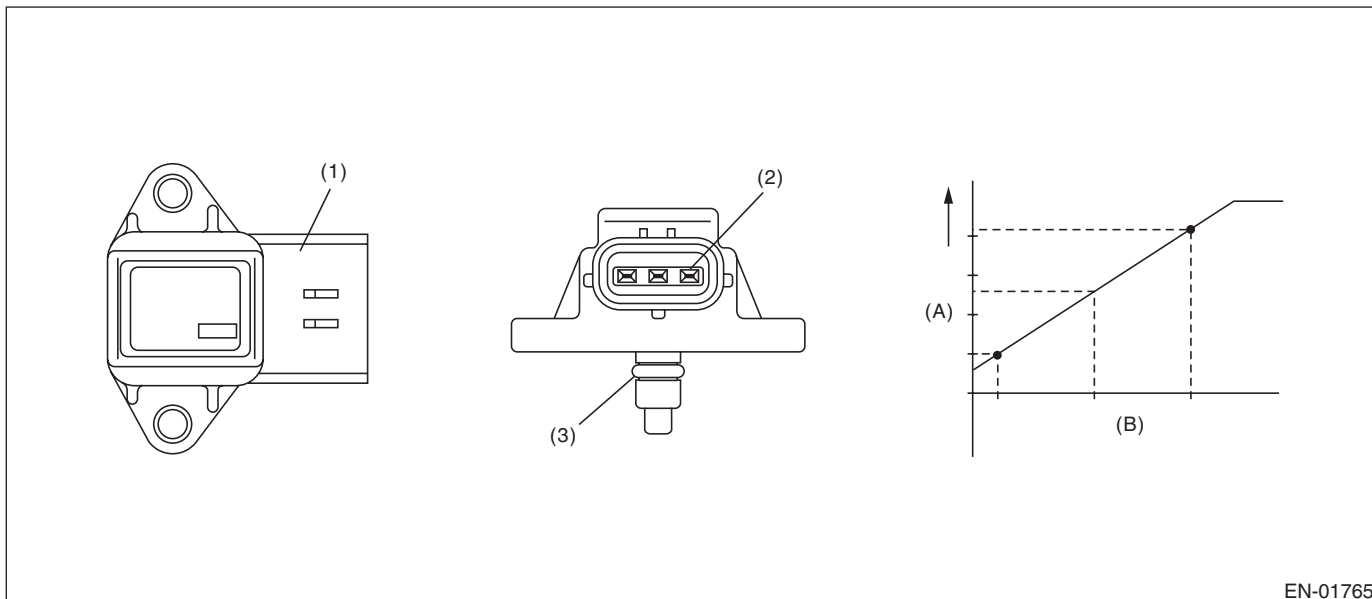
GENERAL DESCRIPTION

O: 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

(1) Connector
(2) Terminals

(3) O-ring

(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.921 V

Time Needed for Diagnosis: 0.5 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

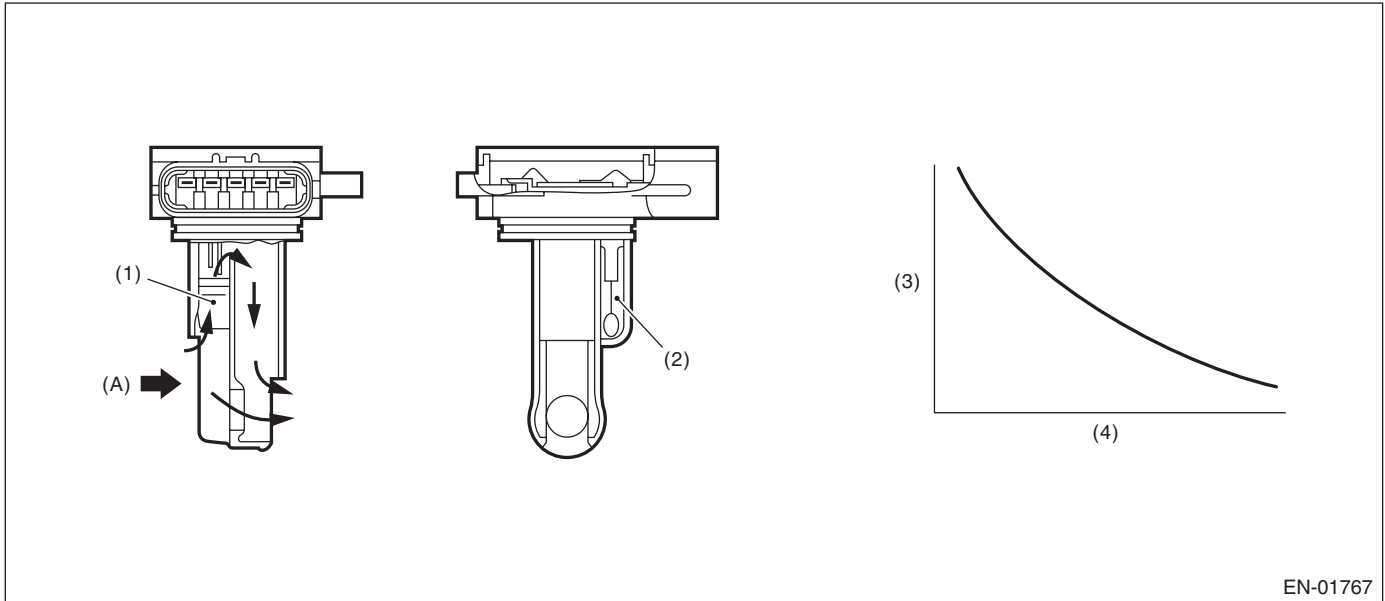
P: DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE

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

(1) Air flow sensor

(3) Resistance value (Ω)

(A) Air

(2) Intake air temperature sensor

(4) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temp. before engine start	< 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 50 km/h (31 MPH)	600 seconds or more

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 Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 20 mV (Equivalent to approximately 0.5°C (33°F) near 25°C)

Time Needed for Diagnosis: 1 second

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 20 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

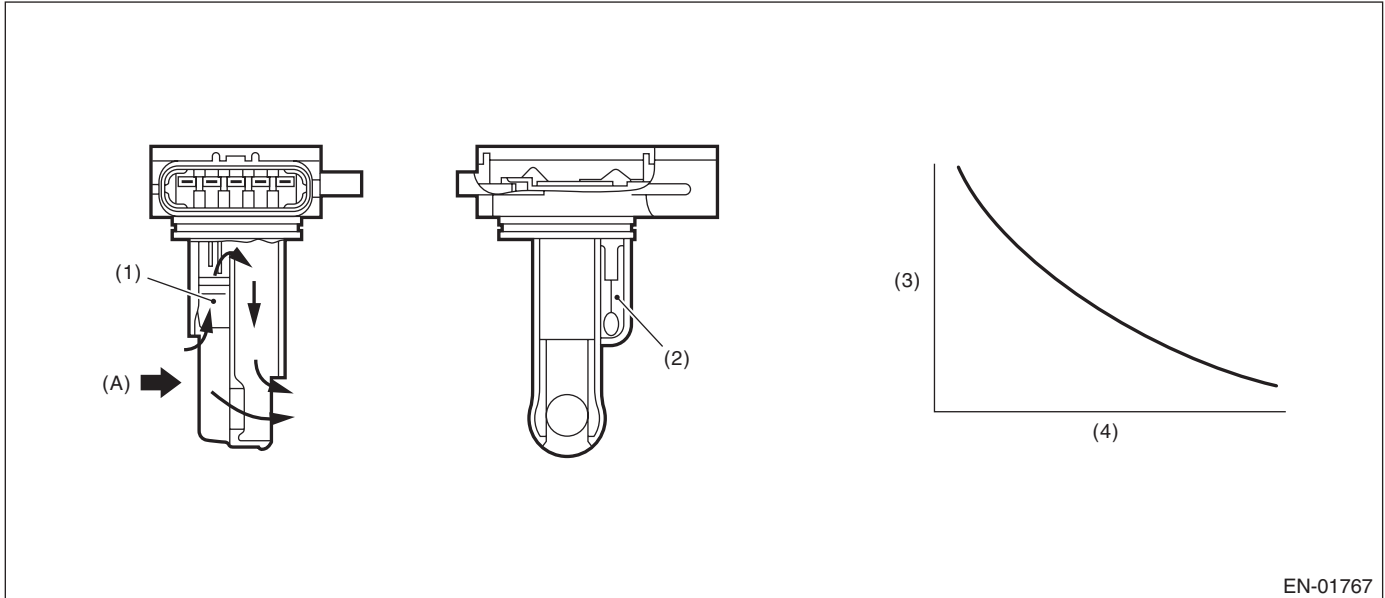
GENERAL DESCRIPTION

Q: 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

- (1) Air flow sensor
- (2) Intake air temperature sensor
- (3) Resistance value (Ω)
- (4) Intake air temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)
- (A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 0.165 \text{ V}$
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 0.165 \text{ V}$
Ignition switch	ON

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

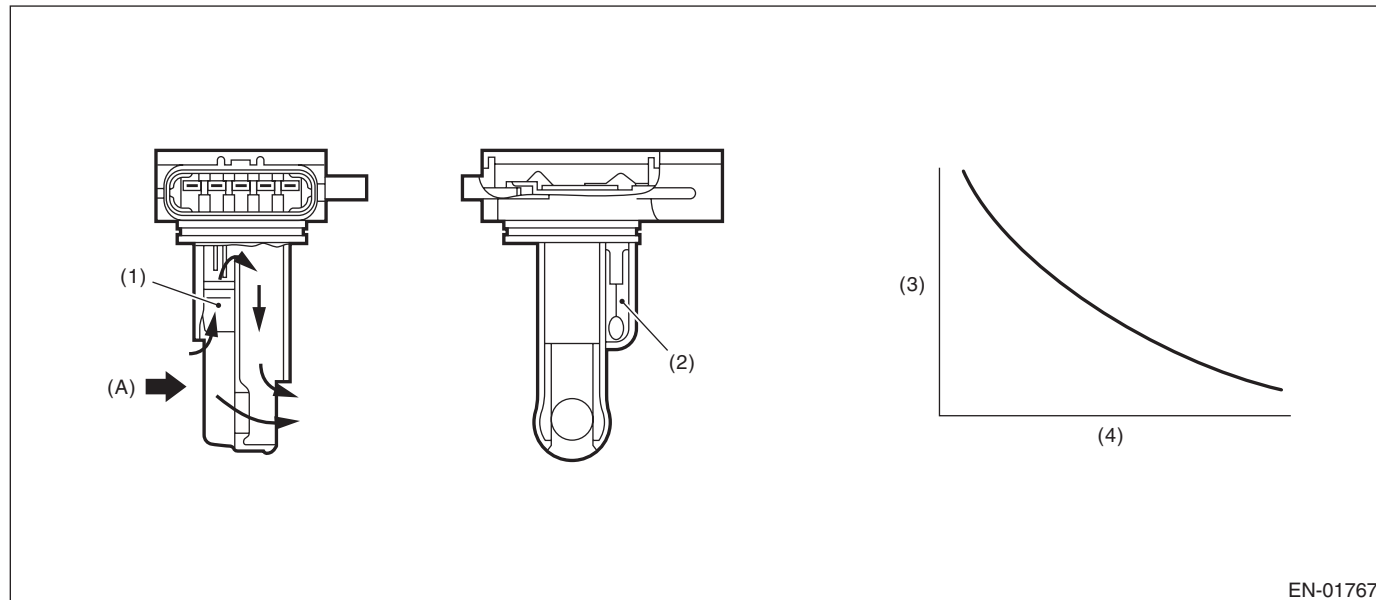
R: DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

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

(1) Air flow sensor

(2) Intake air temperature sensor

(3) Resistance value (Ω)

(4) Intake air temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.72 \text{ V}$
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 0.23 \text{ V}$
Ignition switch	ON

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

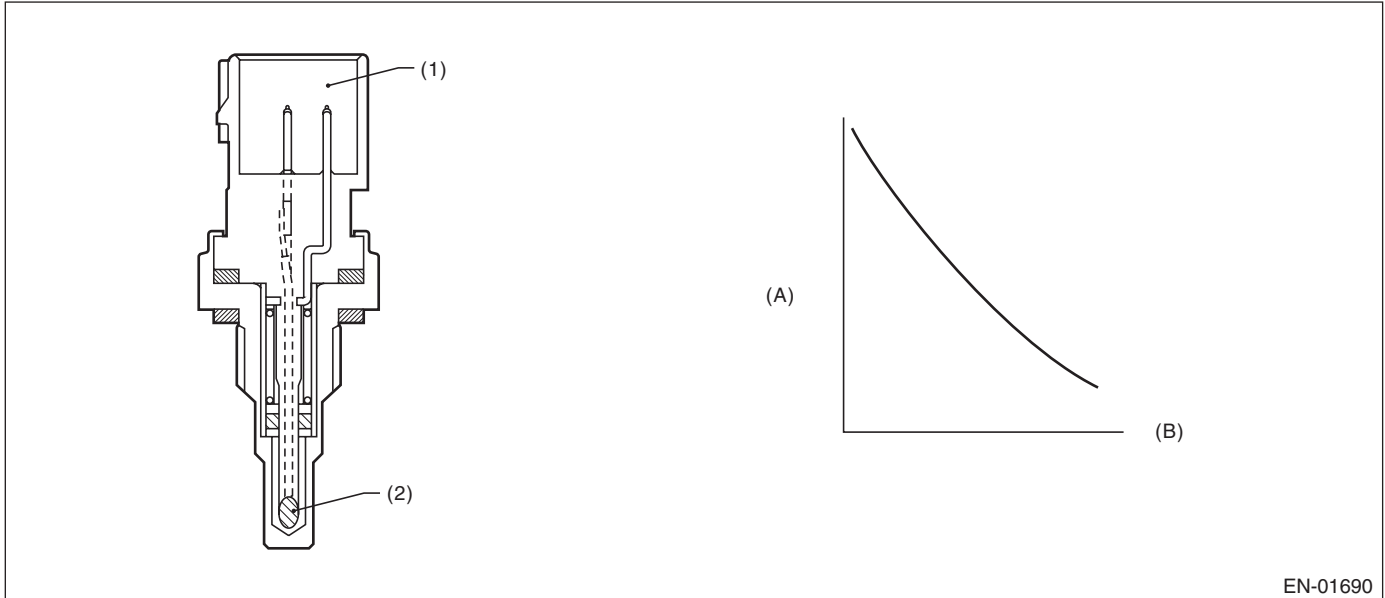
GENERAL DESCRIPTION

S: 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-01690

- (1) Connector
- (2) Thermistor element

- (A) Resistance value (k Ω)
- (B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.166 V

Time Needed for Diagnosis: 0.5 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in high driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores engine coolant temperature conditions and expands when other conditions are established.
- AVCS Control: Oil flow control solenoid valve drive output duty = 0 %.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

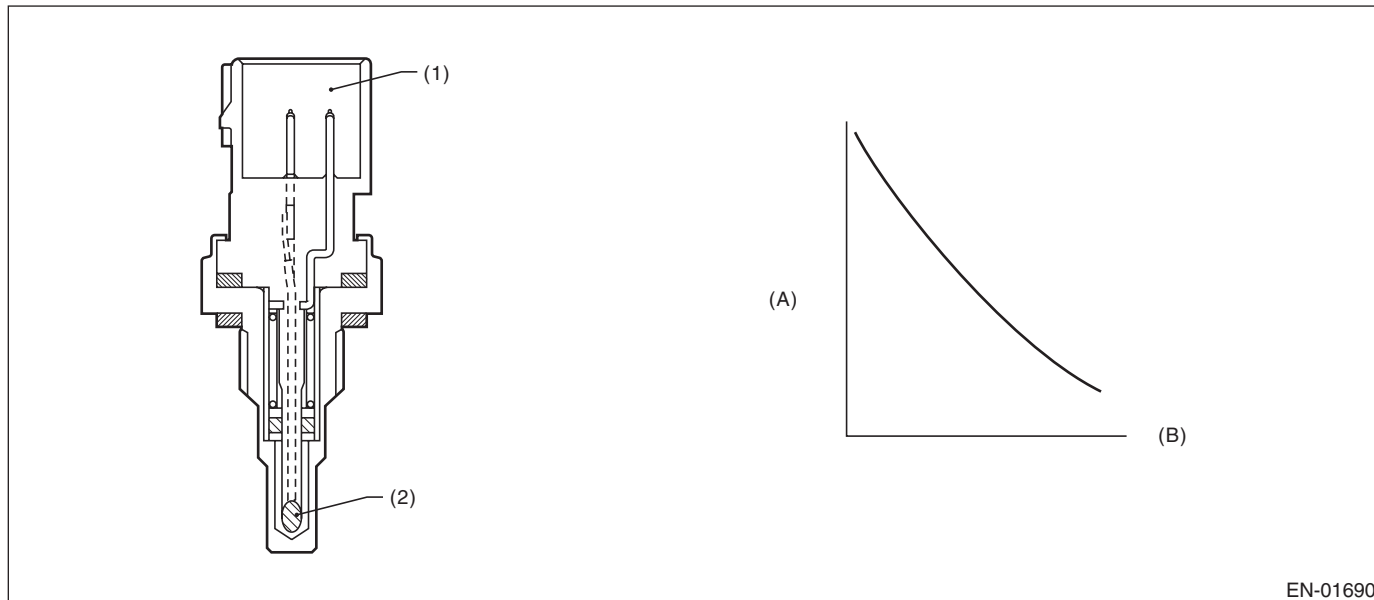
T: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

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



- (1) Connector
- (2) Thermistor element

- (A) Resistance value (k Ω)
- (B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V

Time Needed for Diagnosis: 0.5 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in high driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores engine coolant temperature conditions and expands when other conditions are established.
- AVCS Control: Oil flow control solenoid valve drive output duty = 0 %.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

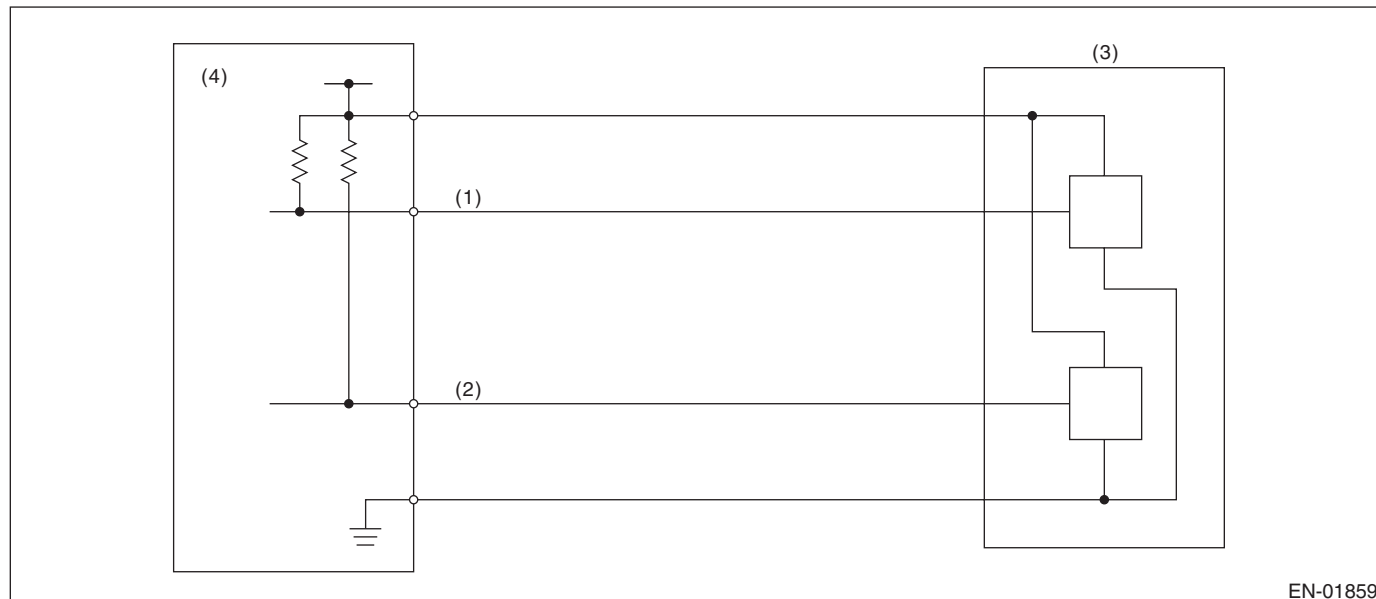
GENERAL DESCRIPTION

U: 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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	> 0.224 V

Time Needed for Diagnosis: 24 milliseconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

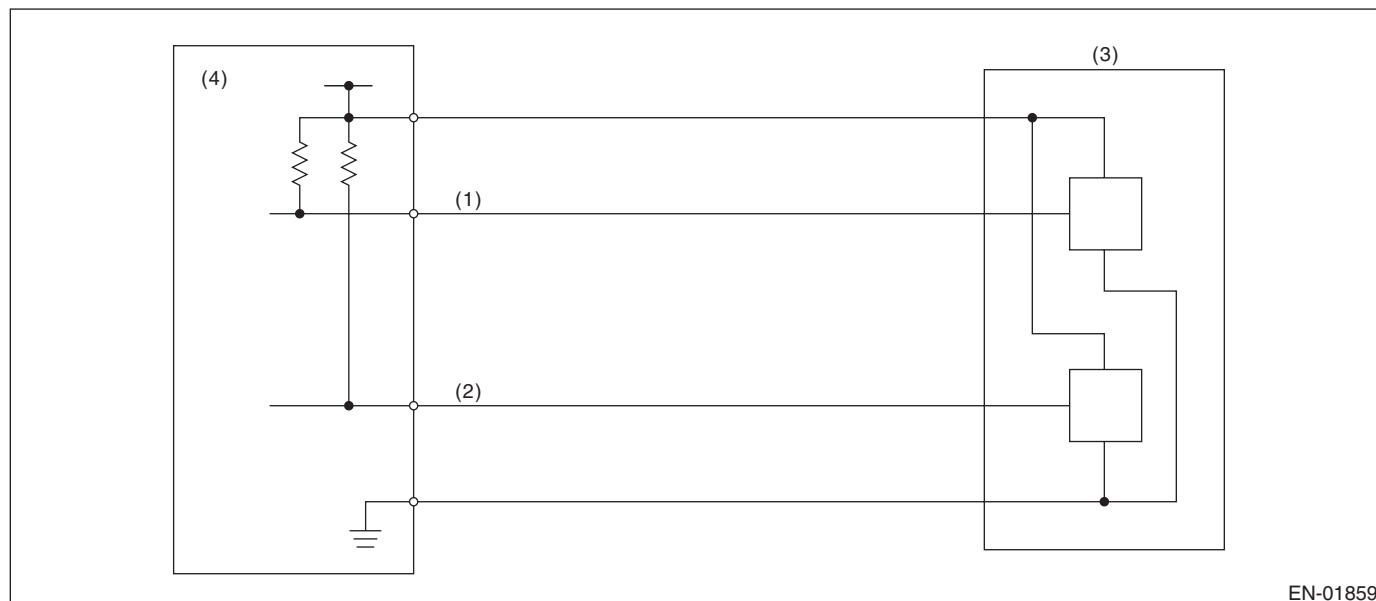
GENERAL DESCRIPTION

V: 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



EN-01859

- (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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.851 V

Time Needed for Diagnosis: 24 milliseconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

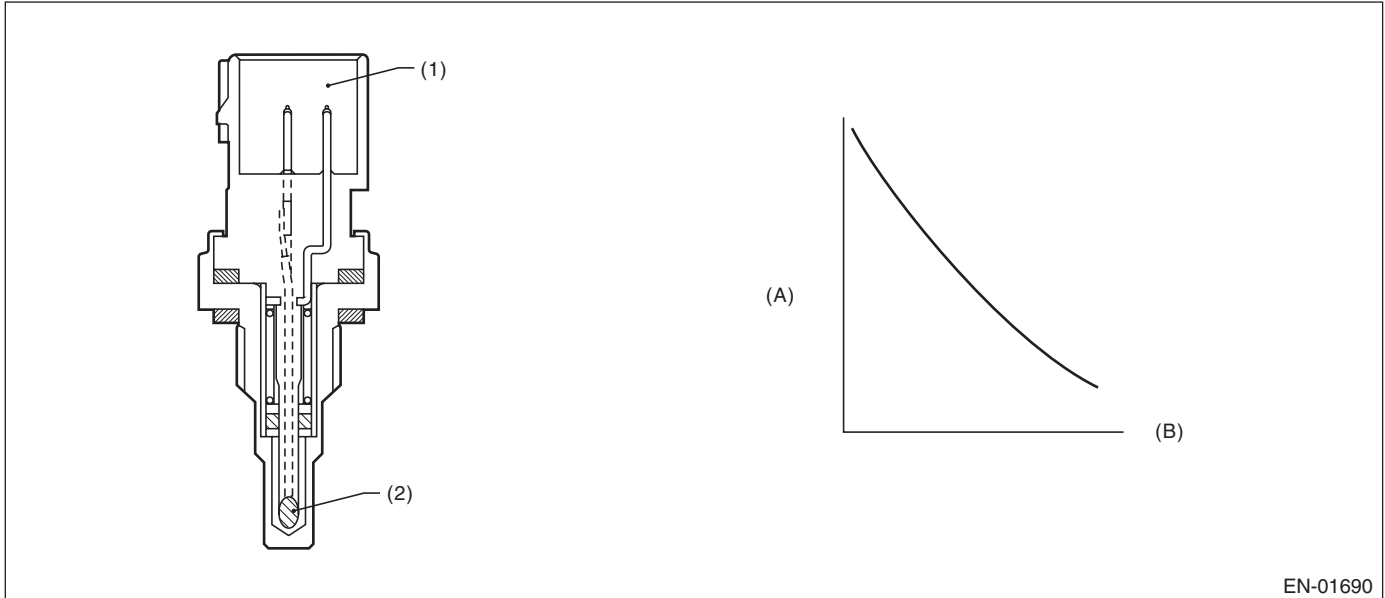
W: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

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-01690

- (1) Connector
- (2) Thermistor element

- (A) Resistance value (k Ω)
- (B) Temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine start.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20°C (68°F)
Timer for diagnosis after engine start	≥ Judgment 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.

Temperature °C (°F)	Vehicle speed km/h (MPH)							
	0 (0)	8 (4.97)	16 (9.94)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
-20 (-4)	0 ms	37.14 ms	74.27 ms	111.41 ms	126.66 ms	141.91 ms	163.59 ms	185.26 ms
-10 (14)	0 ms	27.39 ms	54.78 ms	82.17 ms	99.65 ms	117.13 ms	135.96 ms	154.80 ms
0 (32)	0 ms	17.65 ms	35.29 ms	52.94 ms	72.64 ms	92.34 ms	108.34 ms	124.33 ms
10 (50)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms
20 (68)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms

Judgment value of timer after engine starting

$$t = 451.1 - 25.9 \times T_i$$

T_i : The lowest coolant temperature after engine start

Time Needed for Diagnosis: To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)

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

Normality Judgment

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

Judgment Value

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in high driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores engine coolant temperature conditions and expands when other conditions are established.
- AVCS Control: Oil flow control solenoid valve drive output duty = 0 %.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

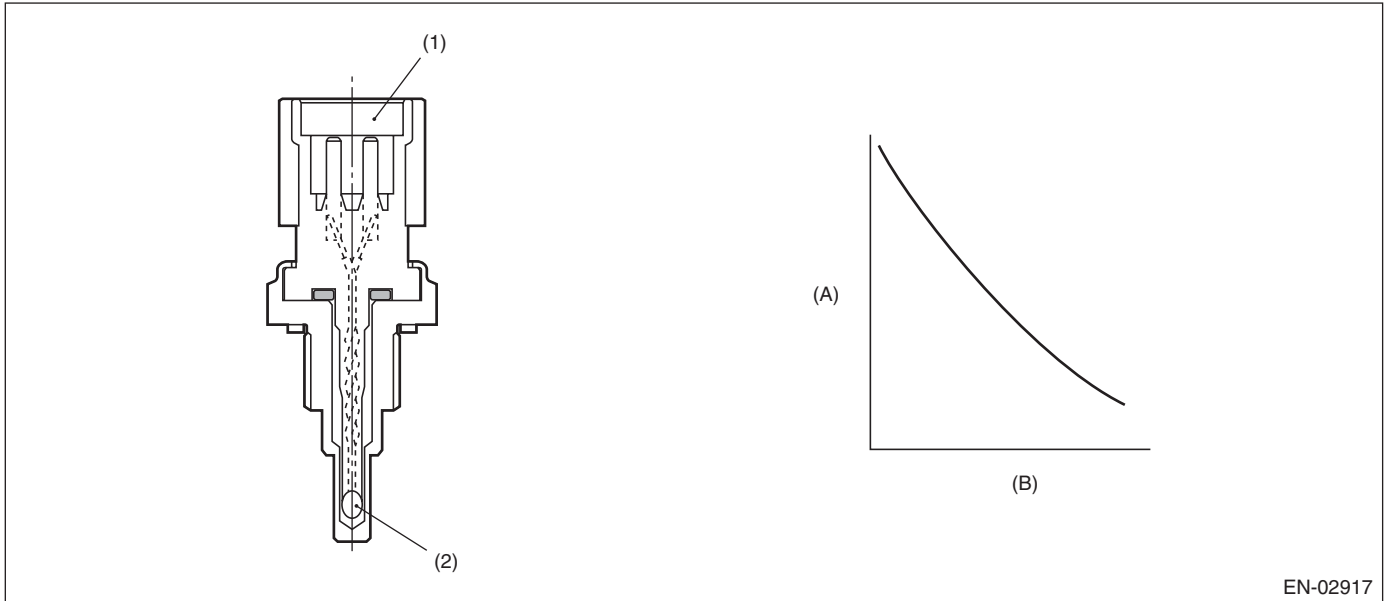
X: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

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

- (1) Connector
- (2) Thermistor element

- (A) Resistance value (k Ω)
- (B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Refueling from the last engine stop till the current engine start	None
Fuel level	≥ 15 \varnothing
Engine coolant temperature at the last engine stop	$\geq 70^{\circ}\text{C}$ (158°F) and $< 95^{\circ}\text{C}$ (203°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 Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature at the last engine stop — Minimum engine coolant temperature after the engine start	< 2.5°C (4.5°F)
Fuel temperature at the last engine stop — fuel temperature	≥ 5°C (9°F)
Intake air temperature — fuel temperature	< 2.5°C (4.5°F)
Fuel temperature	< 35°C (95°F)

Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature at the last engine stop — Minimum engine coolant temperature after the engine start	≥ 2.5°C (4.5°F)

Time Needed for Diagnosis: 2.5 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

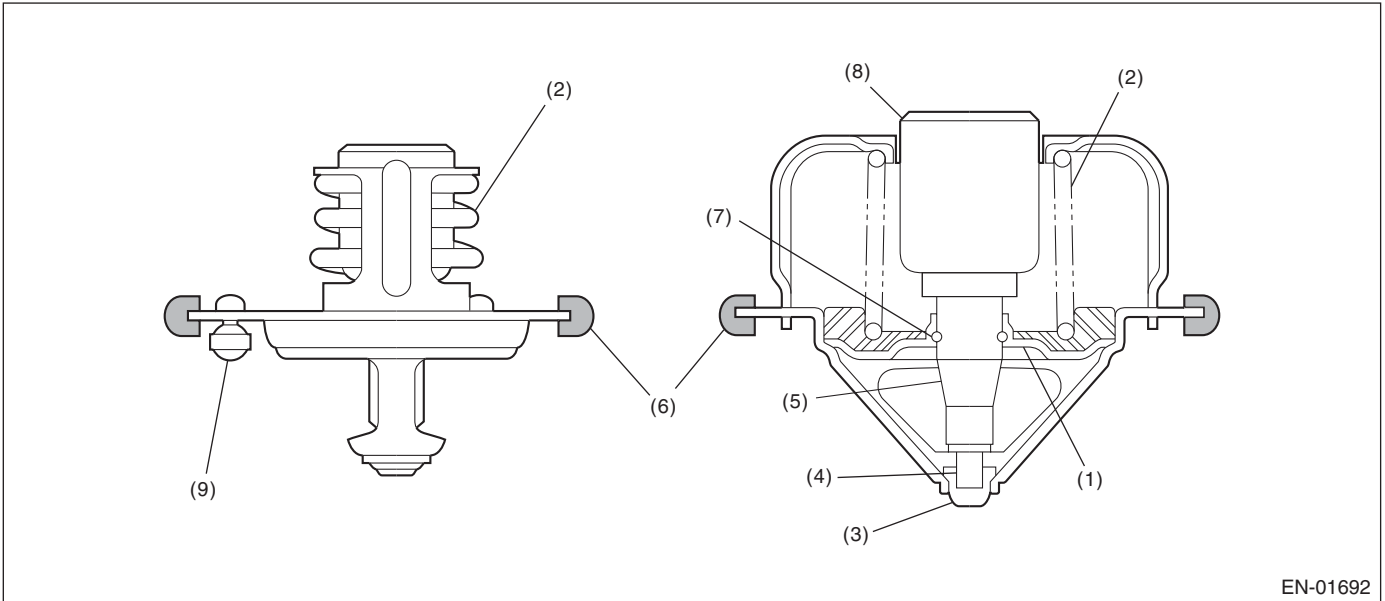
Y: DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

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



EN-01692

- | | | |
|-------------|-----------------|------------------|
| (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 Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 30 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimate ambient temperature	$\geq -7^{\circ}\text{C}$ (19.4°F)
Vehicle speed	≥ 30 km/h (18.6 MPH)
Engine coolant temperature at engine starting	$< 55^{\circ}\text{C}$ (131°F)
Estimated coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Engine coolant temperature	$< 70^{\circ}\text{C}$ (158°F)
(Estimated – measured) Engine coolant temperature	$> 30^{\circ}\text{C}$ (86°F)

Time Needed for Diagnosis: 30 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimate ambient temperature	$\geq -7^{\circ}\text{C}$ (19.4°F)
Engine coolant temperature at engine starting	$< 55^{\circ}\text{C}$ (131°F)
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
(Estimated – measured) Engine coolant temperature	$\leq 30^{\circ}\text{C}$ (86°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

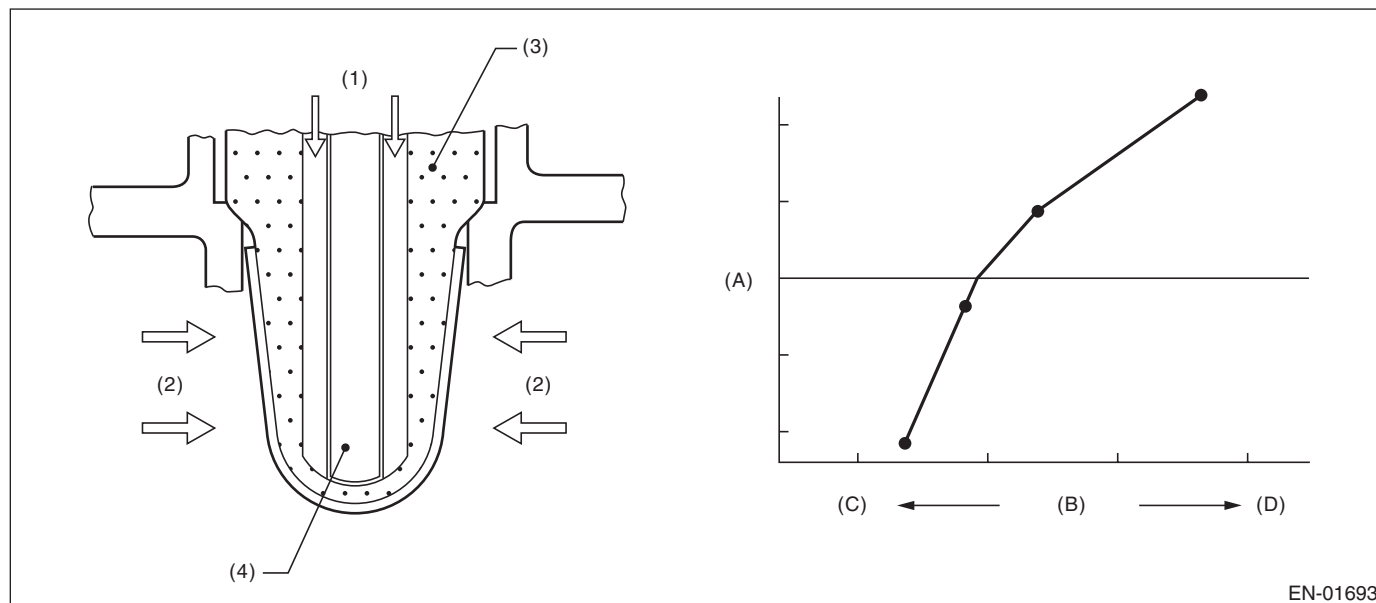
Z: DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

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



- | | |
|----------------------|-------------------------|
| (1) Atmosphere | (A) Electromotive force |
| (2) Exhaust gas | (B) Air fuel ratio |
| (3) ZrO ₂ | (C) Lean |
| (4) Ceramic heater | (D) Rich |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting any malfunction criteria below is 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	< 1.8 V
Input current	< -0.01 A

Time Needed for Diagnosis: 1 second

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: 0.3 → 0 at the MIN valve as normal.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

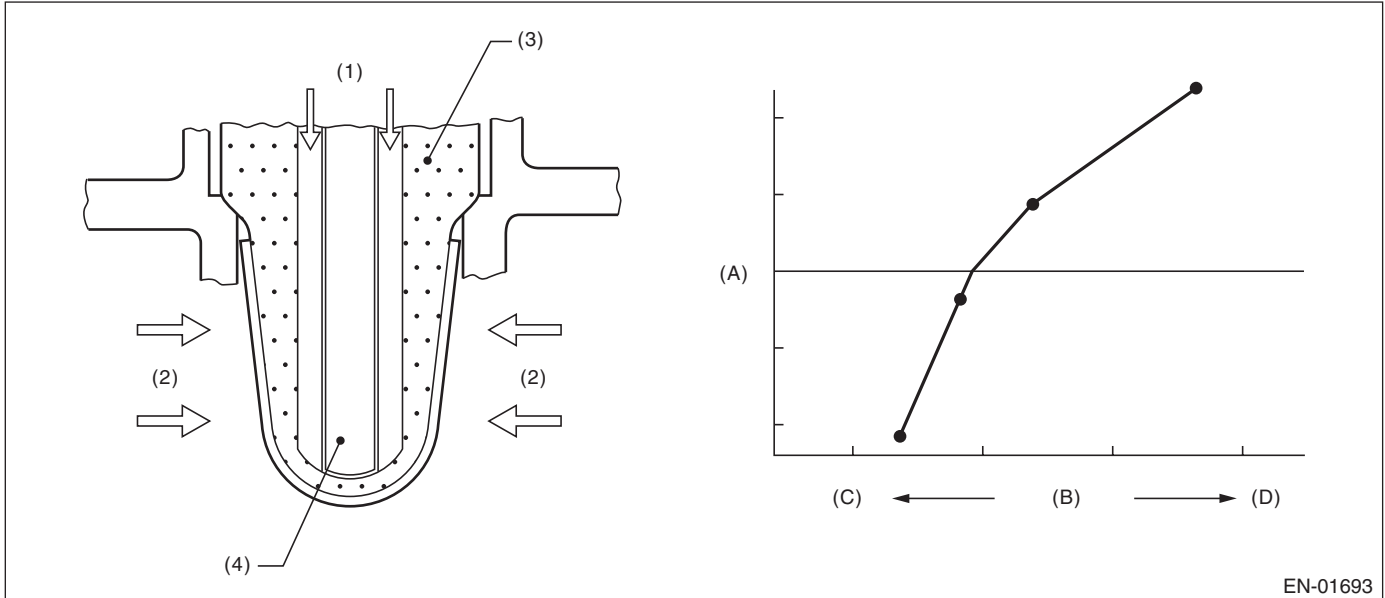
AA:DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

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



EN-01693

- | | |
|----------------------|-------------------------|
| (1) Atmosphere | (A) Electromotive force |
| (2) Exhaust gas | (B) Air fuel ratio |
| (3) ZrO ₂ | (C) Lean |
| (4) Ceramic heater | (D) Rich |

3. ENABLE CONDITION

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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting any malfunction criteria below is 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	$\geq 3.8 \text{ V}$
Input current	$\geq 0.01 \text{ A}$

Time Needed for Diagnosis: 1 second

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: 0.3 → 0 at the MIN valve as normal.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

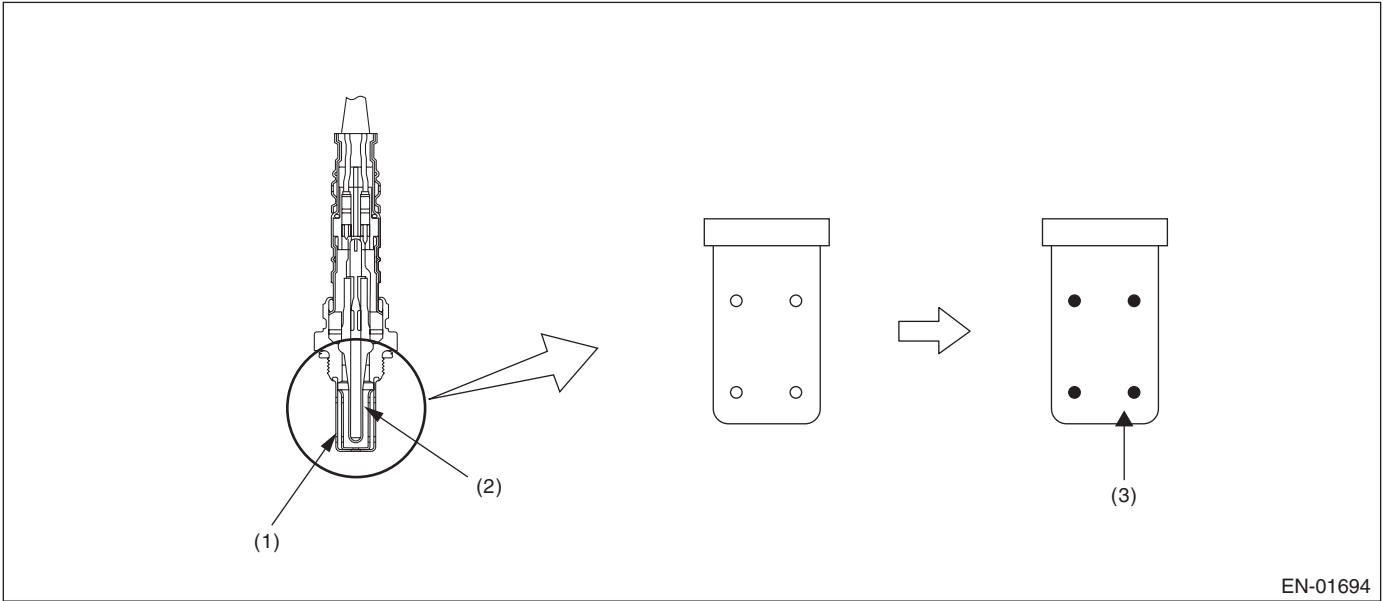
AB:DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

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.



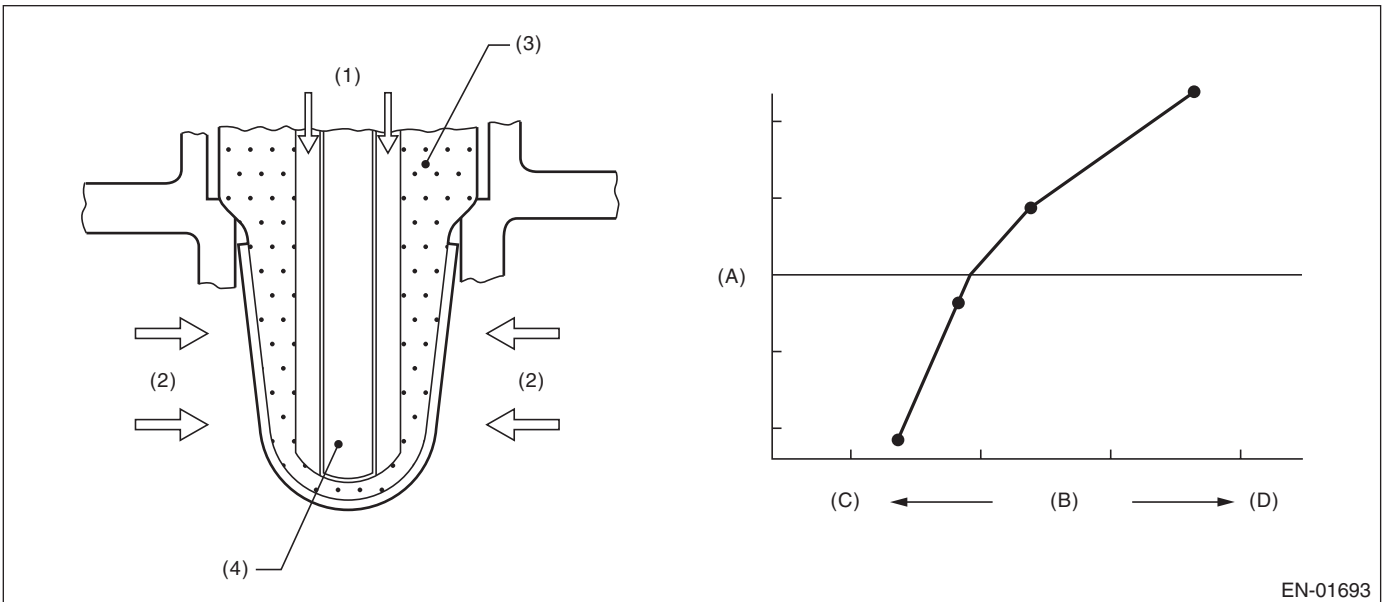
EN-01694

(1) Cover

(2) Zirconia

(3) Clogging

2. COMPONENT DESCRIPTION



EN-01693

(1) Atmosphere

(2) Exhaust gas

(3) ZrO_2

(4) Ceramic heater

(A) Electromotive force

(B) Air fuel ratio

(C) Lean

(D) Rich

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	1 second or more
A/F response diagnosis	Incomplete
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	Operation
Front oxygen (A/F) sensor impedance	0 \longleftrightarrow 50 Ω
After engine starting	120 seconds or more
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158 $^{\circ}\text{F}$)
Engine speed	1,000 \longleftrightarrow 3,200 rpm
Vehicle speed	10 \longleftrightarrow 120 km/h (6.21 \longleftrightarrow 74.6 MPH)
Amount of intake air	10 \longleftrightarrow 31 g/s
Engine load change during 0.5 engine revs.	≤ 0.02 g (0.0007 oz)/rev
All EVAP canister purge conditions	Execution
Learning value of EVAP conc. during purge	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6.21 to 74.6 MPH) 120 seconds or more after starting the engine.

5. DIAGNOSTIC METHOD

Calculate faf difference every 128 milliseconds, and the λ value difference. Calculate the diagnosis value after calculating 1,640 times (210 seconds).

Judge as NG if the criteria below are met. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
$\text{parafca} = \text{td2faf}/\text{td2lmd}$ where, $\text{td2faf} (N) = \text{td2faf} (n-1) + \text{d2faf} (n) $ $\text{td2lmd} (N) = \text{td2lmd} (n-1) + \text{d2lmd} (n) $ add up to a total of 210 seconds $\text{d2faf} (n) = (\text{faf} (n) - \text{faf} (n-1)) - (\text{faf} (n-1) - \text{faf} (n-2))$ $\text{d2lmd} (n) = (\text{lmd} (n) - \text{lmd} (n-1)) - (\text{lmd} (n-1) - \text{lmd} (n-2))$ faf = main feedback compensation coefficient every 128 milliseconds lmd = output lambda every 128 milliseconds	≥ 0.392

Time Needed for Diagnosis: 210 seconds

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

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

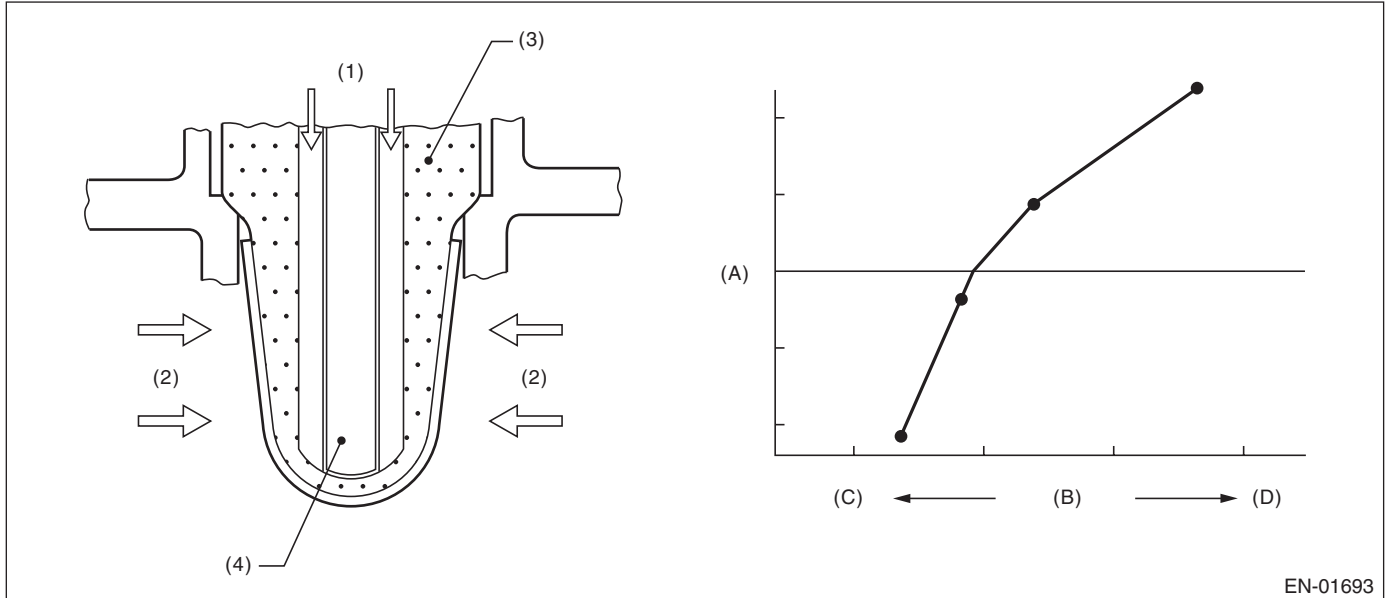
AC:DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect open circuits of the sensor.

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

2. COMPONENT DESCRIPTION



EN-01693

- | | |
|----------------------|-------------------------|
| (1) Atmosphere | (A) Electromotive force |
| (2) Exhaust gas | (B) Air fuel ratio |
| (3) ZrO ₂ | (C) Lean |
| (4) Ceramic heater | (D) Rich |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing the malfunction criteria below becomes two seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage	≥ 10.9 V
Time while heater control duty is 70% or more	≥ 30 seconds
Front oxygen (A/F) sensor impedance.	≥ 500 Ω

Time Needed for Diagnosis: 2 seconds

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

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: 0.3 → 0 at the MIN valve as normal.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

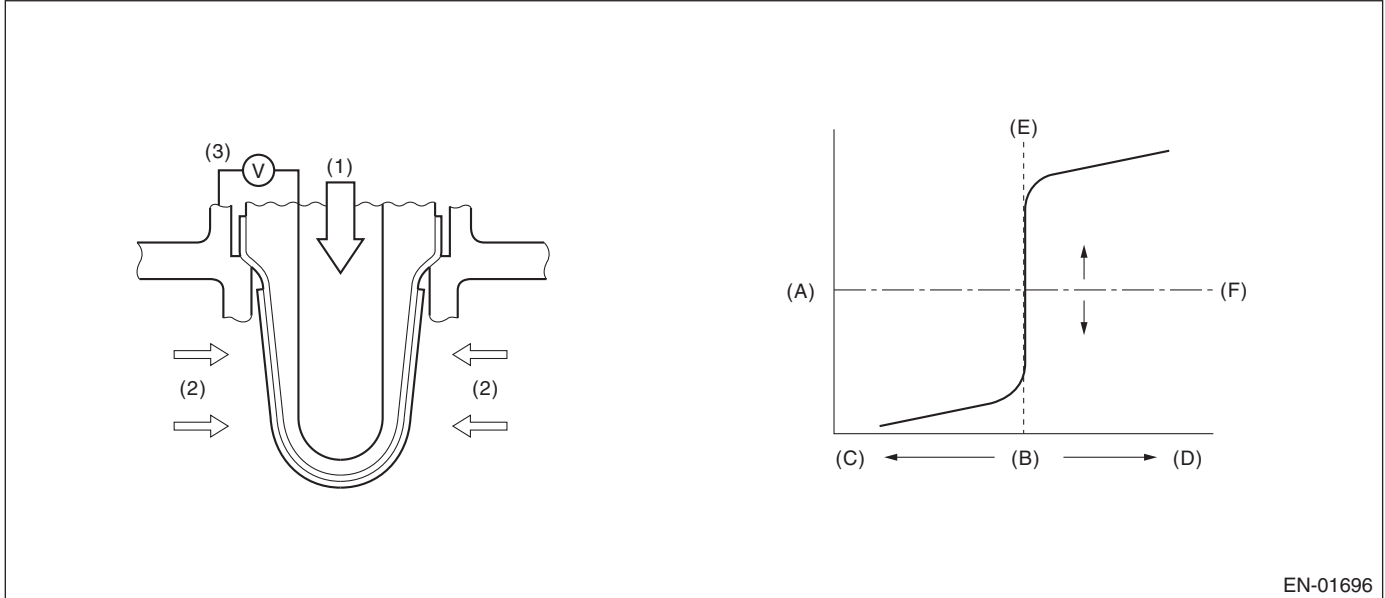
GENERAL DESCRIPTION

AD: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

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Used for abnormality judgment

Secondary Parameters	Enable Conditions
High side	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Low side 1	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	≥ 10 g (0.35 oz)/second
Low side 2	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	< 10 g (0.35 oz)/second
Current continuation time of the rear oxygen sensor heater	25 seconds or more
Low side 3	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	< 10 g (0.35 oz)/second
Current continuation time of the rear oxygen sensor heater	25 seconds or more
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	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V

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 Judgment

Judge as NG when the continuous time of meeting the following conditions is the predetermined time or more. Judge as OK when the following conditions are not established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
High side Maximum output voltage without continuity	≥ 1200 mV	P0138
Low side Minimum output voltage without continuity	< 30 mV	P0137

Time Needed for Diagnosis

High side: 2.5 seconds

Low side 1: 20 seconds

Low side 2: 40 seconds

Low side 3: See the Map.

Map

Fuel Cut Time (Second)	Time needed for diagnosis (second)
0	40
2	40
10	60

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AE: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(STI)-65, 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

AF: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]

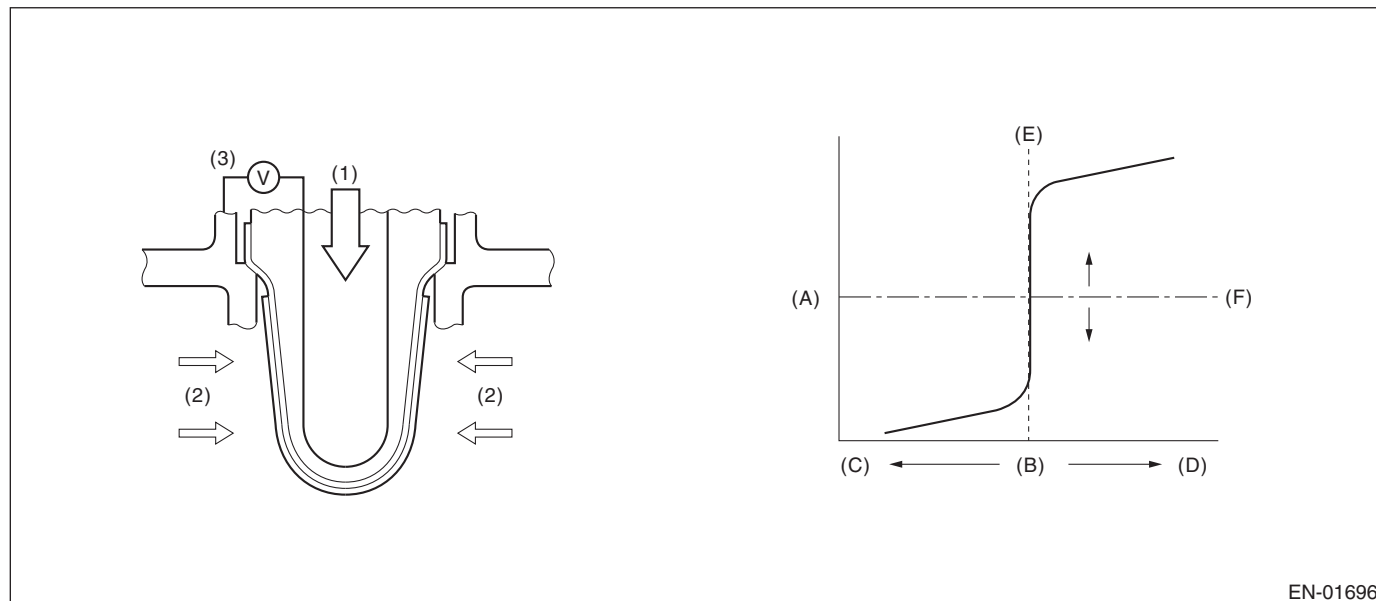
1. Measure the response time for oxygen sensor output changes when the A/F ratio changes to lean to rich. If the measured response time is larger than the threshold value, it is NG.

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

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

- Rich → lean diagnosis response

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F sub feedback control condition	Completed
Deceleration fuel cut time is 6 seconds or more.	Experienced
After fuel cut	≥ 2 seconds
Current calculation time of the rear oxygen sensor heater	≥ 60 seconds
Current continuation time of the rear oxygen sensor heater	≥ 30 seconds
Estimated catalyst layer inner temperature	≥ 400°C (752°F)

4. GENERAL DRIVING CYCLE

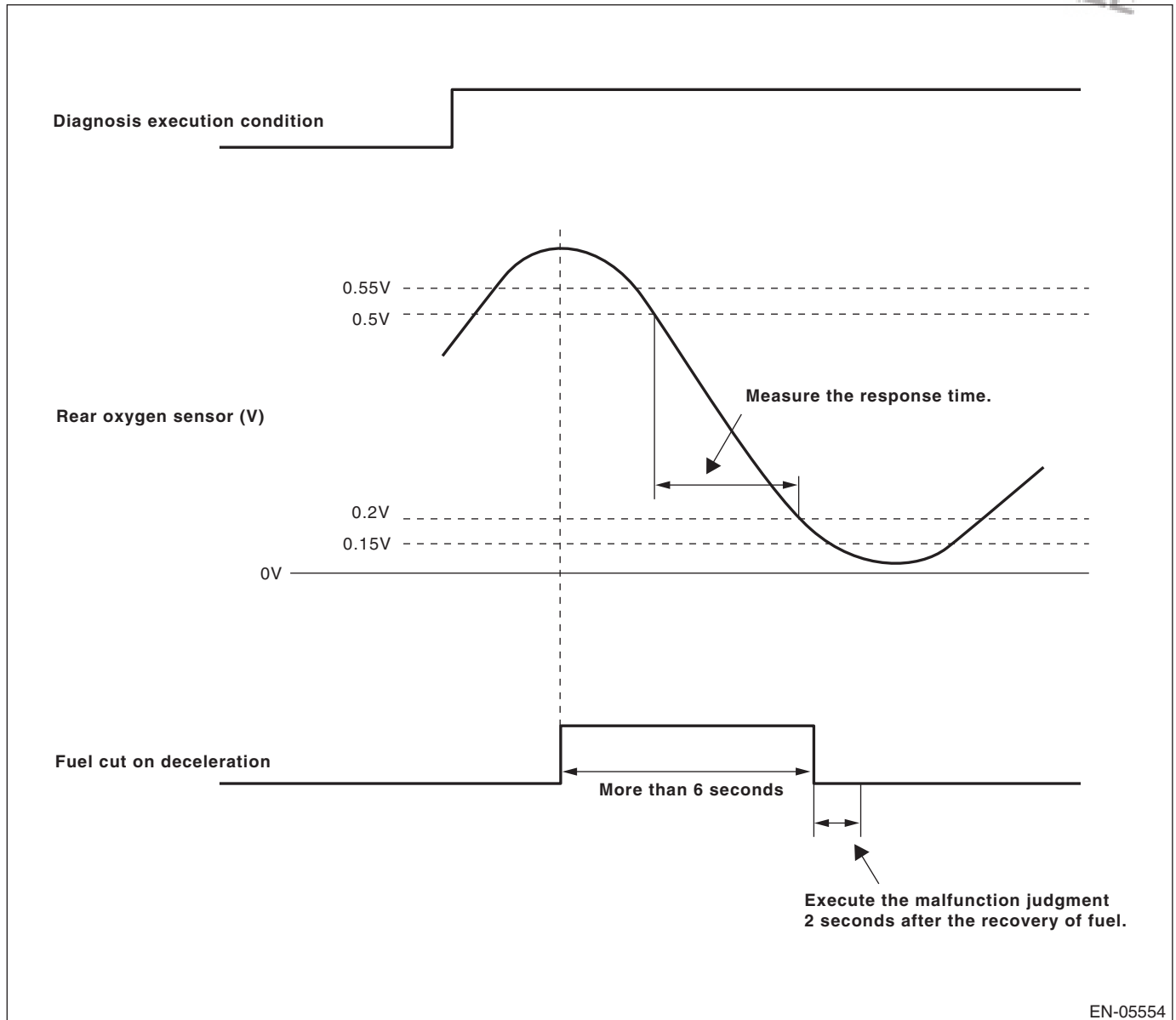
Perform the diagnosis only once when deceleration fuel cut occurs after rapid acceleration. (Pay attention to the oxygen sensor voltage for the timing of the deceleration.)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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.



Abnormality Judgment

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 6 seconds or more, judge as NG if the following criteria are met 2 seconds after recovering from the deceleration fuel cut.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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 (6 s 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.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (500 mV O ₂ output) to lean (200 mV) when voltage reduces from 550 mV to 150 mV or Longest time over 550 mV	> 0.837 seconds > 2 seconds

Time Needed for Diagnosis: 1 time

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

Normality Judgment

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) \leq threshold value \rightarrow normal

2) Do not judge as a normal condition.

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (500 mV O ₂ output) to lean (200 mV) when voltage reduces from 550 mV to 150 mV	\leq 0.698 seconds

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

10.ENABLE CONDITION

- Lean \rightarrow rich response diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
6 seconds or more deceleration fuel cut. After fuel cut	Experienced \geq 2 seconds
Current calculation time of the rear oxygen sensor heater	\geq 60 seconds
Current continuation time of the rear oxygen sensor heater	\geq 30 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

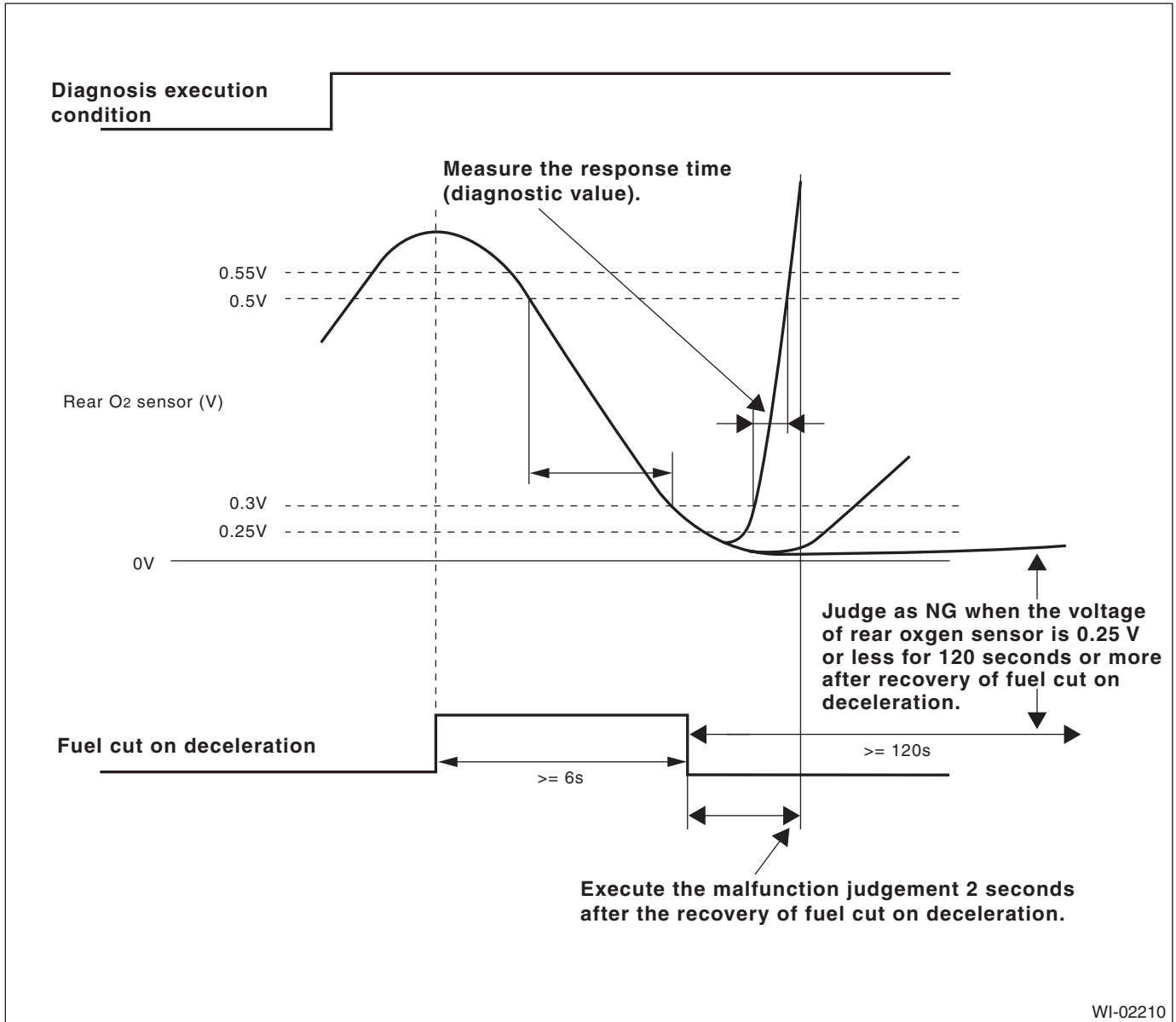
GENERAL DESCRIPTION

11.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.)

12.DIAGNOSTIC METHOD

Calculate the minimum value of 0.3 V to 0.5 V output change response time as judgment value, when the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich).



Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (300 mV O ₂ output) to rich (500 mV) when voltage increases from 250 mV to 550 mV or Longest time to change to 250 mV	> 2 seconds > 120 seconds

Time Needed for Diagnosis: 1 time

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

Normality Judgment

- 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 when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (300 mV O ₂ output) to rich (500 mV) when voltage increases from 250 mV to 550 mV	≤ 2 seconds

13.DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

14.MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

15.FAIL SAFE

Sub feedback control: Not allowed

16.ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AG:DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect abnormalities in the rear oxygen sensor output characteristics.

By referring to the intake air amount, engine coolant temperature, main feedback control, deceleration fuel cut and other operating conditions, if the rear oxygen sensor voltage should be moving under these conditions but is showing a low voltage, this is judged as a Low side NG. If the voltage is showing a high voltage, it is judged as a High side NG.

When either Low side or High side is NG, judged as rear oxygen sensor property NG.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Target output voltage of rear oxygen sensor	$\geq 0.6\text{ V}$
Air intake amount	10 g (0.35 oz)/seconds or more
Battery voltage	$> 10.9\text{ V}$
Closed loop at the oxygen sensor	In operation
Misfire detection every 200 rotations	5 times or less
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Deceleration fuel cut of 5 seconds or more.	Experienced

3. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine warm-up.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum output voltage Low side	$< 550\text{ mV}$
Minimum output voltage High side	$> 150\text{ mV}$

Time Needed for Diagnosis: 200 seconds

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

Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum output voltage Low side	$\geq 550\text{ mV}$
Minimum output voltage High side	$\leq 250\text{ mV}$

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

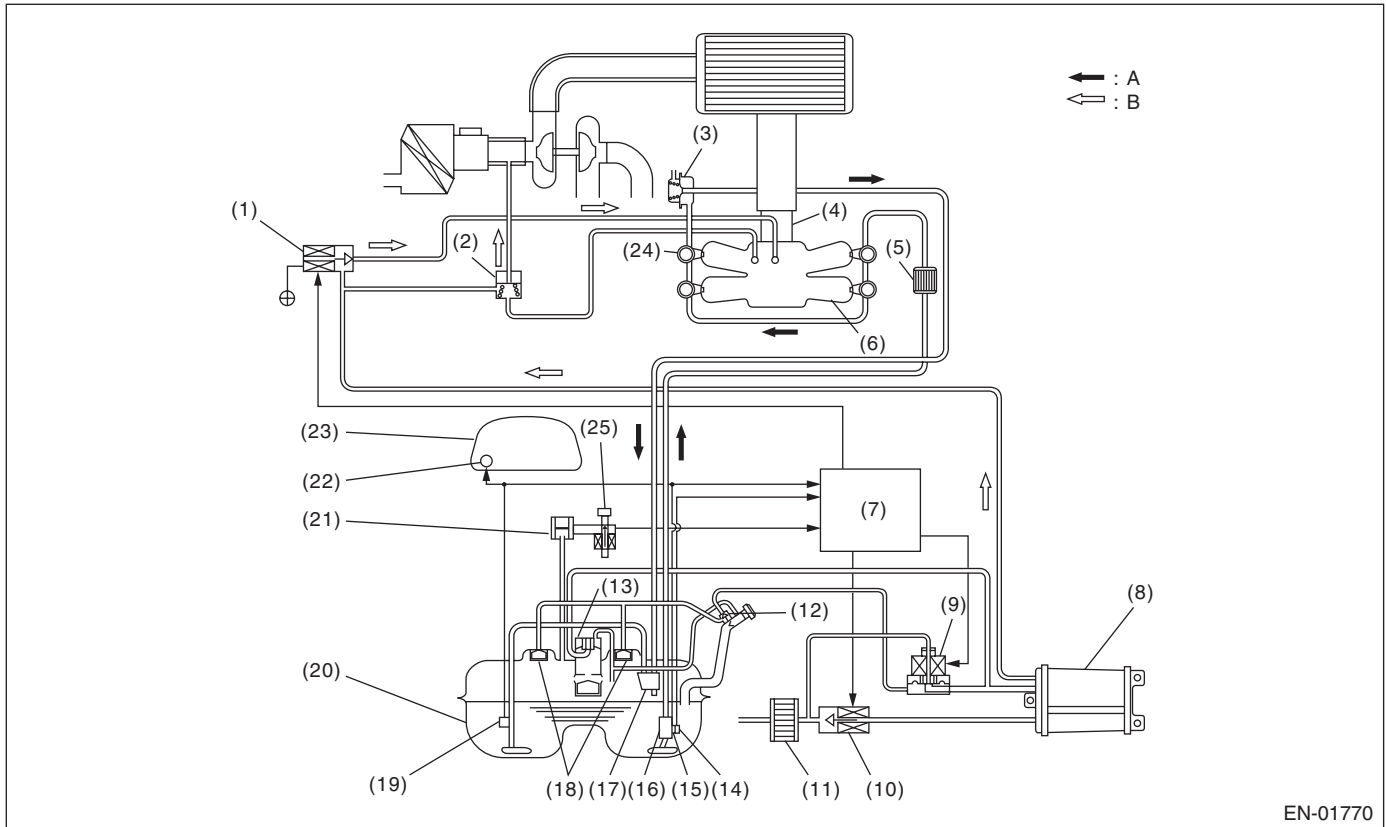
GENERAL DESCRIPTION

AH:DTC P0171 SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

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

Fuel system diagnosis



EN-01770

- | | | |
|-------------------------------------|------------------------------|-------------------------------------|
| (1) Purge control solenoid valve | (10) Drain valve | (18) Fuel cut valve |
| (2) Purge solenoid valve | (11) Drain filter | (19) Fuel sub level sensor |
| (3) Pressure regulator | (12) Shut-off valve | (20) Fuel tank |
| (4) Throttle body | (13) Vent valve | (21) Fuel tank pressure sensor |
| (5) Fuel filter | (14) Fuel temperature sensor | (22) Fuel gauge |
| (6) Intake manifold | (15) Fuel level sensor | (23) Combination meter |
| (7) Engine control module (ECM) | (16) Fuel pump | (24) Fuel injector |
| (8) Canister | (17) Jet pump | (25) Tank pressure control solenoid |
| (9) Pressure control solenoid valve | | |

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.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	≥ 70°C (158°F)
Engine load	≥ Value from Map 5
Intake air change during 0.5 engine revs.	≤ 0.02 g/rev

Map 5

Engine speed (rpm)	Idling	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400
Measured value (g(oz)/rev)	Non-turbo	0.228 (0.008)	0.220 (0.0078)	0.220 (0.0078)	0.220 (0.0078)	0.228 (0.008)	0.230 (0.0081)	0.234 (0.0083)	0.242 (0.0085)	0.250 (0.0088)	0.250 (0.0088)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of 60 km/h (37.3 MPH) or more.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Compare the diagnosed value (fsobd) with the threshold value, and if a condition meeting the malfunction criteria below continues for 30 seconds or more, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + faf + flaf$ where, sglmd = measured lambda tglmda = target lambda faf = main feedback compensation coefficient every 64 milliseconds flaf = main feedback learning compensation coefficient	≥ fsobdL1 See Map 4 fsobdL1 = lean side threshold value of fsobd

Map 4 Threshold value of fuel system malfunction criteria

Amount of air (g/s)	0	2.4	4.7	7	9.4	11.7
fsobdL1 (%)	40	40	36.9	32.0	27.0	26.5

Time Needed for Diagnosis: 10 seconds × 3 times

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

Normality Judgment

Judge as OK when the malfunction criteria below are met for 10 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + faf + flaf$	< 19%

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When similar driving conditions are repeated 3 times and the result is OK.
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

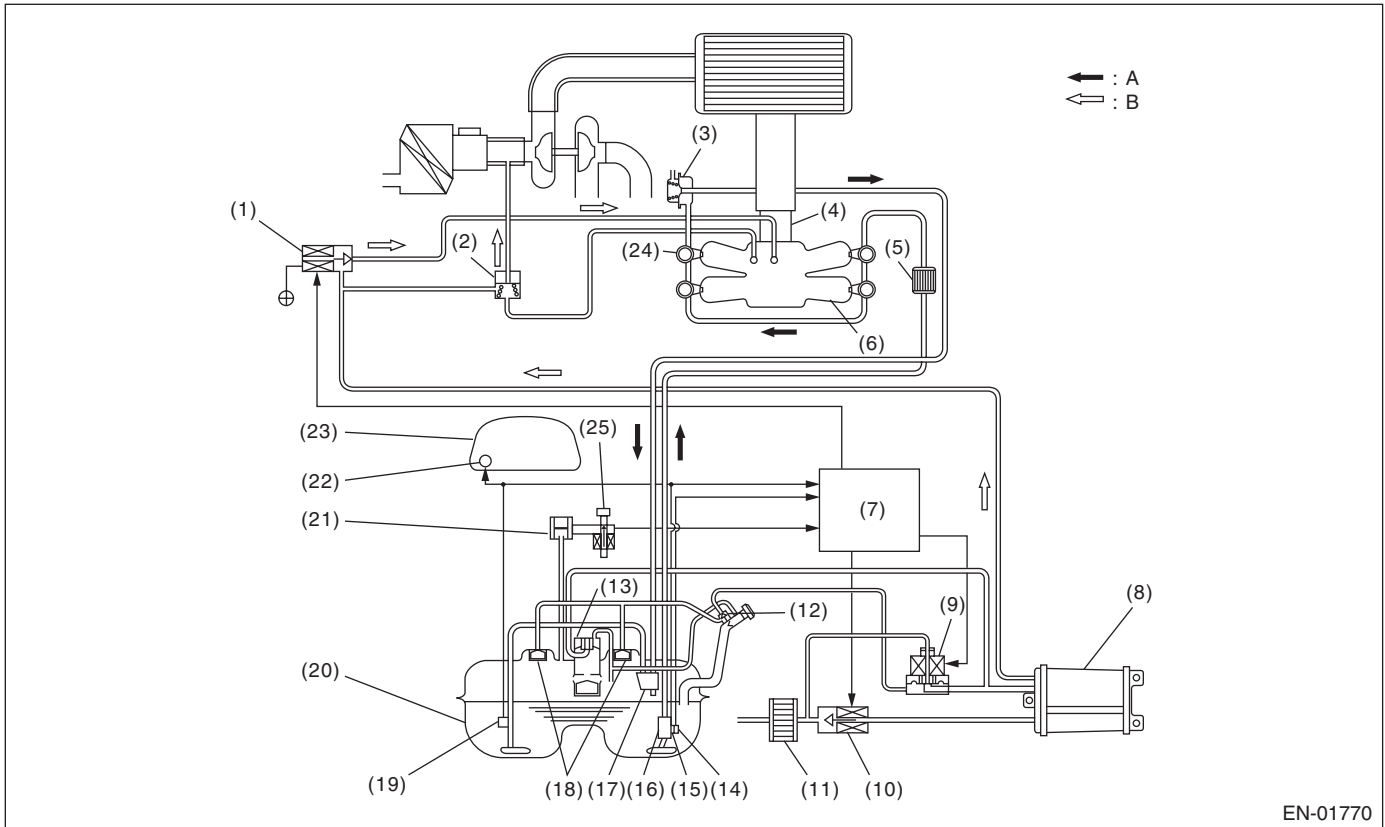
GENERAL DESCRIPTION

AI: DTC P0172 SYSTEM TOO RICH (BANK 1)

1. OUTLINE OF DIAGNOSIS

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

Fuel system diagnosis



- | | | |
|-------------------------------------|------------------------------|-------------------------------------|
| (1) Purge control solenoid valve | (10) Drain valve | (18) Fuel cut valve |
| (2) Purge solenoid valve | (11) Drain filter | (19) Fuel sub level sensor |
| (3) Pressure regulator | (12) Shut-off valve | (20) Fuel tank |
| (4) Throttle body | (13) Vent valve | (21) Fuel tank pressure sensor |
| (5) Fuel filter | (14) Fuel temperature sensor | (22) Fuel gauge |
| (6) Intake manifold | (15) Fuel level sensor | (23) Combination meter |
| (7) Engine control module (ECM) | (16) Fuel pump | (24) Fuel injector |
| (8) Canister | (17) Jet pump | (25) Tank pressure control solenoid |
| (9) Pressure control solenoid valve | | |

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.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Engine load	\geq Value from Map 5
Intake air change during 0.5 engine revs.	≤ 0.02 g/rev
Learning value of EVAP conc. during purge	≤ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	Idling	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400
Measured value (g/rev)	Non-turbo	0.228 (0.008)	0.220 (0.0078)	0.220 (0.0078)	0.220 (0.0078)	0.228 (0.008)	0.230 (0.0081)	0.234 (0.0083)	0.242 (0.0085)	0.250 (0.0088)	0.250 (0.0088)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of 60 km/h (37.3 MPH) or more.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Compare the diagnosed value (fsobd) with the threshold value, and if a condition where the malfunction criteria are met continues for 30 seconds or more, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
$\text{fsobd} = (\text{sglmd} - \text{tglm da}) + \text{faf} + \text{flaf}$ where, sglmd = measured lambda tglm da = target lambda faf = main feedback compensation coefficient every 64 milliseconds flaf = main feedback learning compensation coefficient	$\leq \text{fsobdR1}$ See Map 4 fsobdR1 = rich side threshold value of fsobd

Map 4 Standard threshold value of fuel system malfunction diagnosis for system E

Amount of air (g/s)	0	2.4	4.7	7	9.4	11.7
fsobdR1 (%)	-40	-40	-36.9	-32.0	-27.0	-27.0

Time Needed for Diagnosis: 10 seconds \times 3 times

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
$\text{fsobd} = (\text{sglmd} - \text{tglm da}) + \text{faf} + \text{flaf}$	$\geq -20\%$

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When similar driving conditions are repeated 3 times and the result is OK.
- When "Clear Memory" is performed

7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AJ:DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

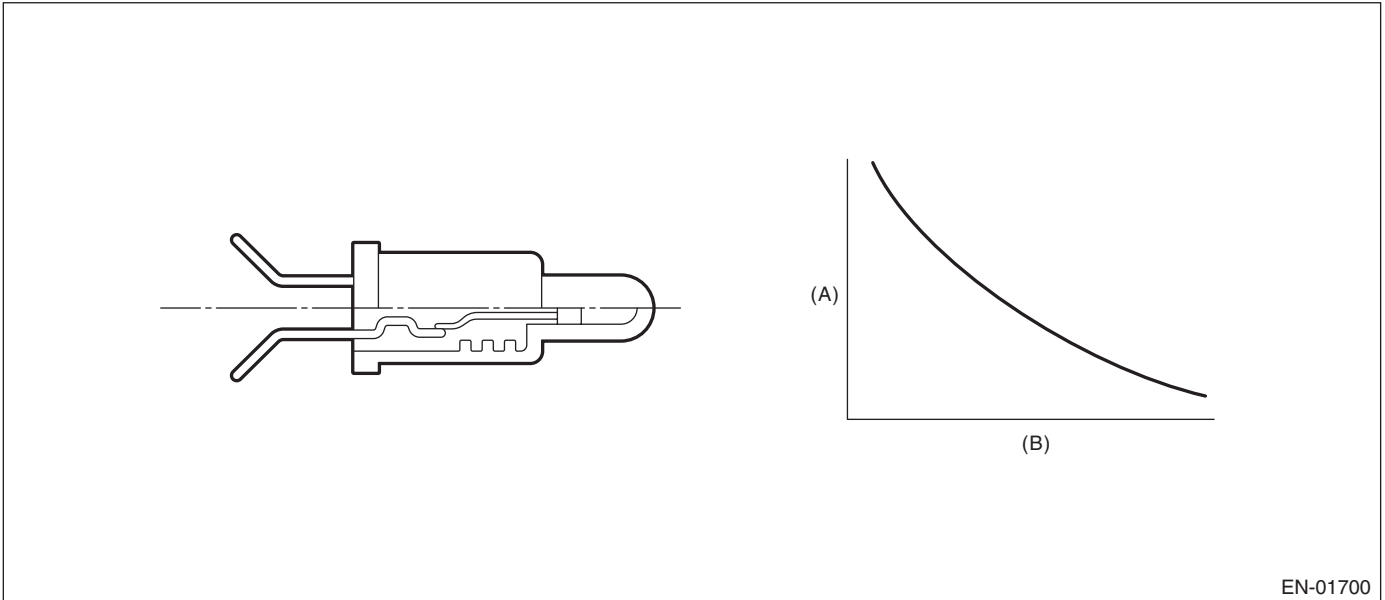
Detect faults in the fuel temperature sensor output properties.

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.

2. COMPONENT DESCRIPTION



EN-01700

(A) Resistance value (Ω)

(B) Fuel temperature °C (°F)

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 Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 120 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	$\geq 9 \text{ l}$ (2.38 US gal, 1.98 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature - engine coolant temperature at engine starting	$> 10^{\circ}\text{C}$ (50°F)
Fuel temperature – Engine coolant temperature	$\geq 10^{\circ}\text{C}$ (50°F)
Battery voltage	$> 10.9 \text{ V}$

Time Needed for Diagnosis: 120 seconds

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

Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	$\geq 9 \text{ l}$ (2.38 US gal, 1.98 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature - engine coolant temperature at engine starting	$> 10^{\circ}\text{C}$ (50°F)
Fuel temperature – Engine coolant temperature	$< 10^{\circ}\text{C}$ (50°F)
Battery voltage	$> 10.9 \text{ V}$

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.

6. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	20 seconds or more
Battery voltage	$> 10.9 \text{ V}$

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 Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1,212.5 lb)
Fuel temperature difference between Max. and Min.	< 2°C (36°F)

Time Needed for Diagnosis: Undetermined

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

Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1,212.5 lb)
Fuel temperature difference between Max. and Min.	≥ 3°C (37.4°F)

9. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

11.FAIL SAFE

None

12.ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

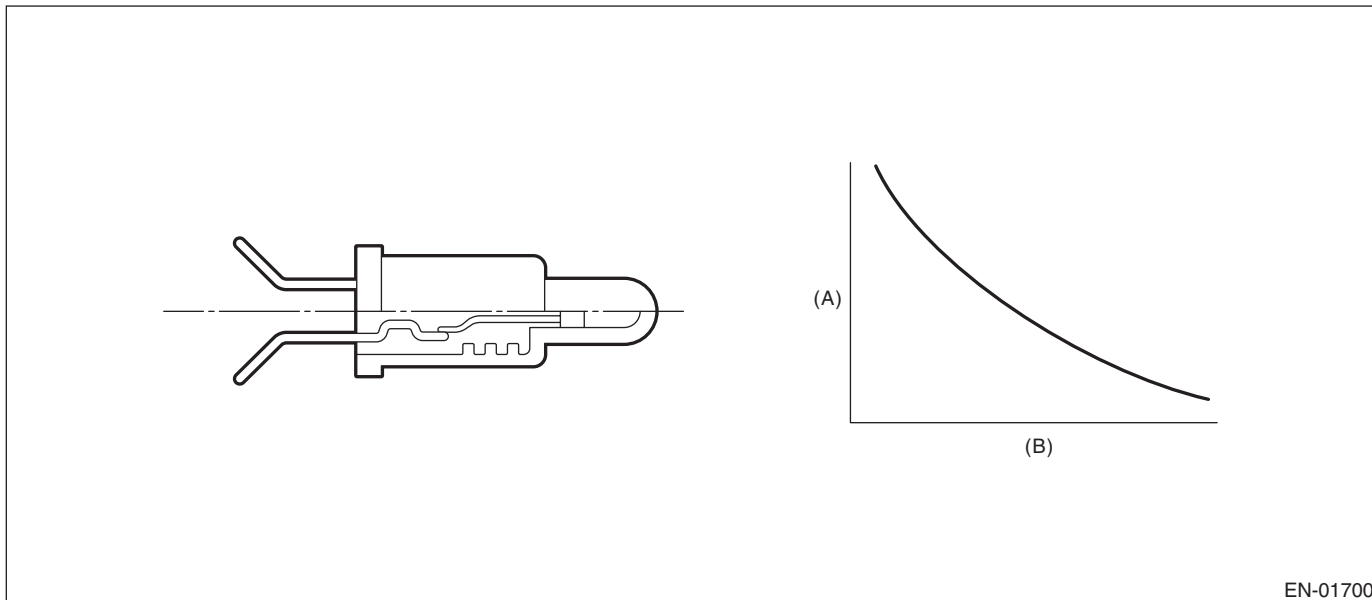
AK:DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-01700

(A) Resistance value (Ω)

(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.166 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.166 V
Battery voltage	≥ 10.9 V

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

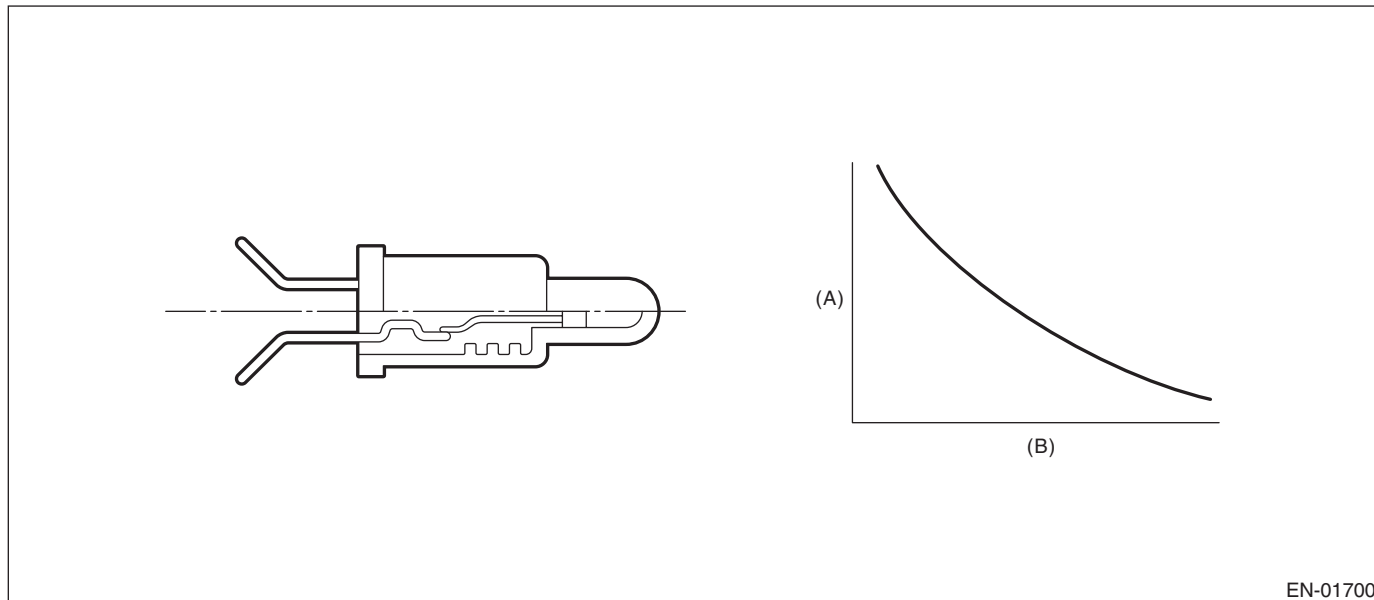
AL:DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT

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 °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.716 V
Battery voltage	≥ 10.9 V

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

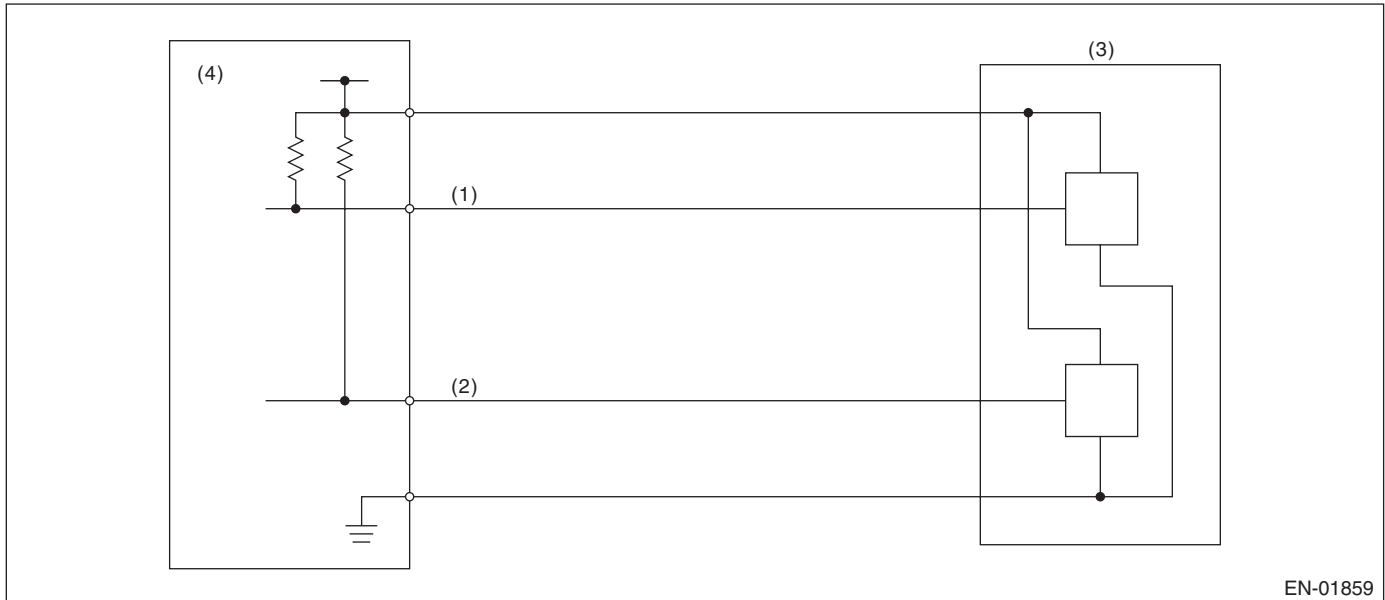
AM:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW

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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	> 0.224 V

Time Needed for Diagnosis: 24 milliseconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

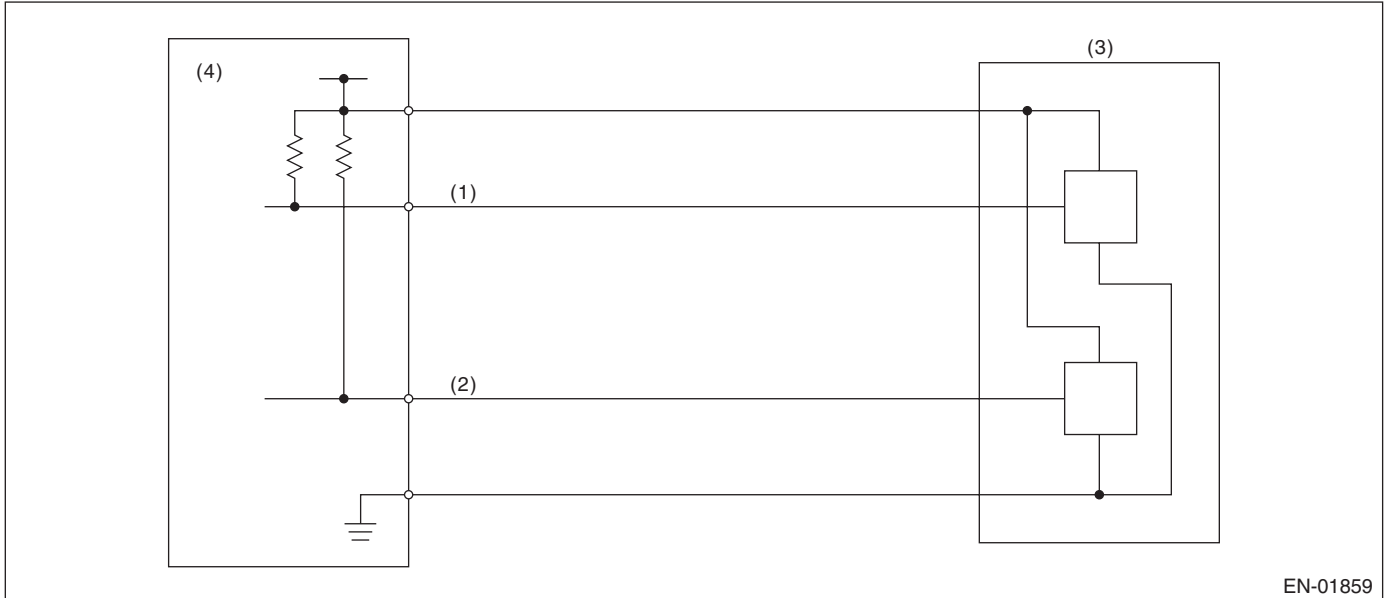
AN:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH

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



EN-01859

- (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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.851 V

Time Needed for Diagnosis: 24 milliseconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AO:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

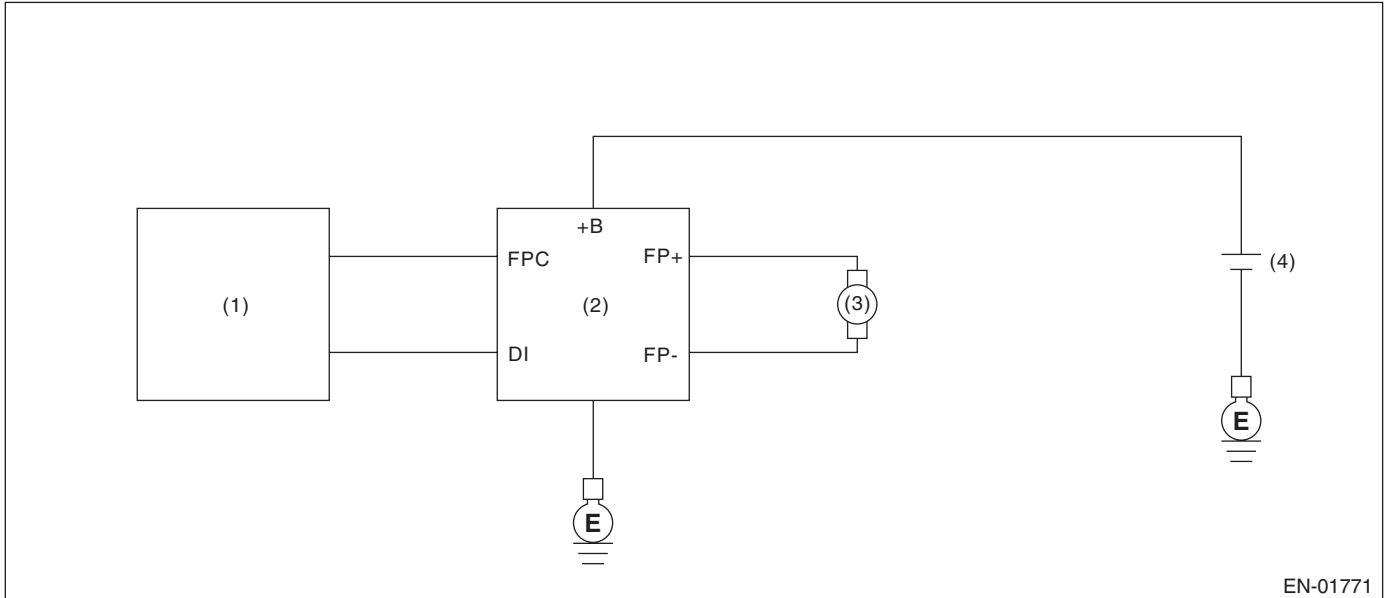
1. OUTLINE OF DIAGNOSIS

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 Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	180 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	Low
Fuel level	≥ 10 ℓ (2.6 US gal, 2.2 Imp gal)

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

OFF setting may be needed depending on the NG portion.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

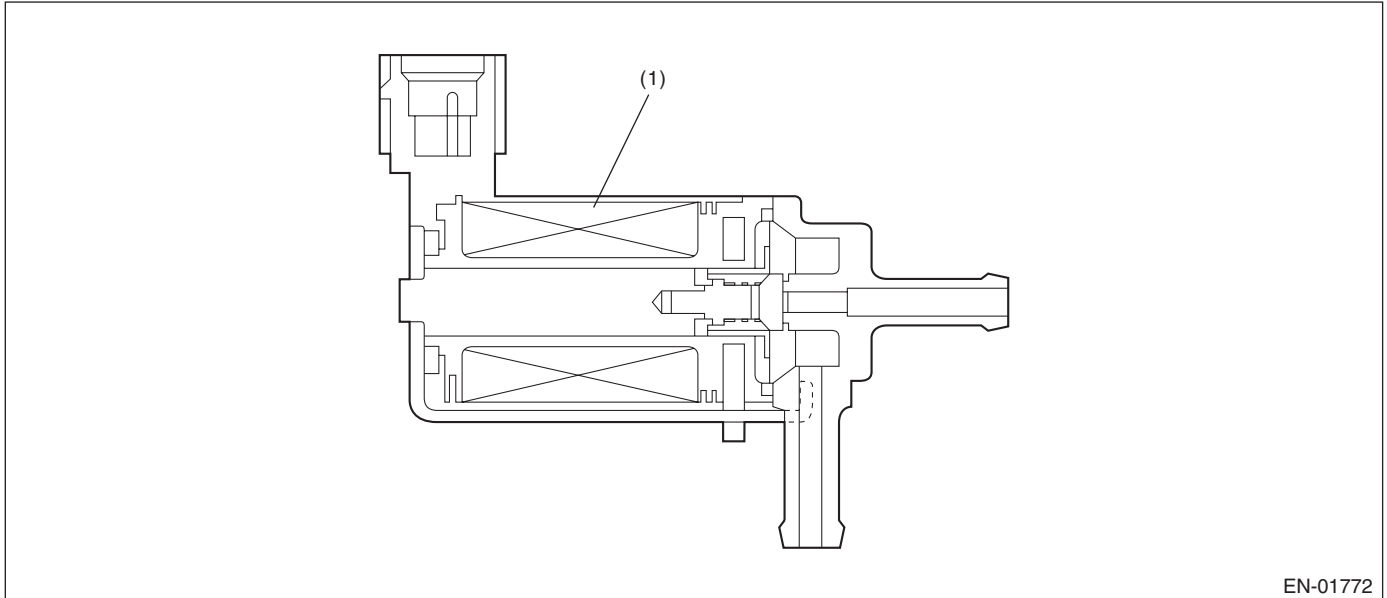
GENERAL DESCRIPTION

AP:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of wastegate control solenoid valve function.
Judge as NG when becoming high wastegate pressure.

2. COMPONENT DESCRIPTION



(1) Coil

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 Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes two seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	≥ Map 10

Map 10

Pa (kPa (mmHg, inHg))	56.7 (440, 17.3)	67.2 (504, 19.8)	75.7 (568, 22.4)	84.3 (632, 24.9)	92.8 (696, 27.4)	101.3 (760, 29.9)
Abnormal threshold (kPa (mmHg, inHg))	152.1 (1,141, 44.9)	168 (1,260, 49.6)	170.6 (1,280, 50.4)	188 (1,410, 55.5)	213.9 (1,605, 63.2)	231.3 (1,735, 68.3)
Normal threshold (kPa (mmHg, inHg))	129.7 (973, 38.3)	145.6 (1,092, 43.0)	148.2 (1,112, 43.8)	165.6 (1,242, 48.9)	191.6 (1,437, 56.6)	208.5 (1,564, 61.6)

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Intake manifold pressure	< Map 10

Time Needed for Diagnosis: 1 second

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

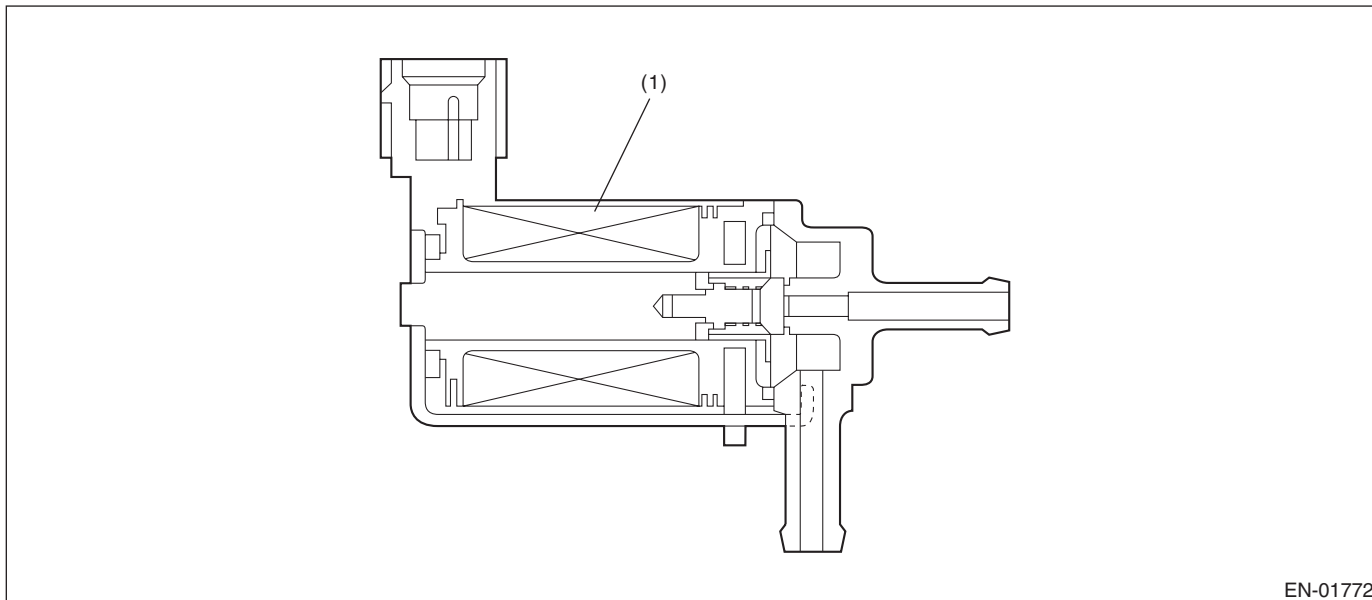
AQ:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW

1. OUTLINE OF DIAGNOSIS

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

Judge as NG when the terminal output voltage remains Low during outputting the duty signal.

2. COMPONENT DESCRIPTION



EN-01772

(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 655 milliseconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Turbocharger wastegate duty ratio when the terminal output voltage is Low	< 75%

Time Needed for Diagnosis: 655 milliseconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

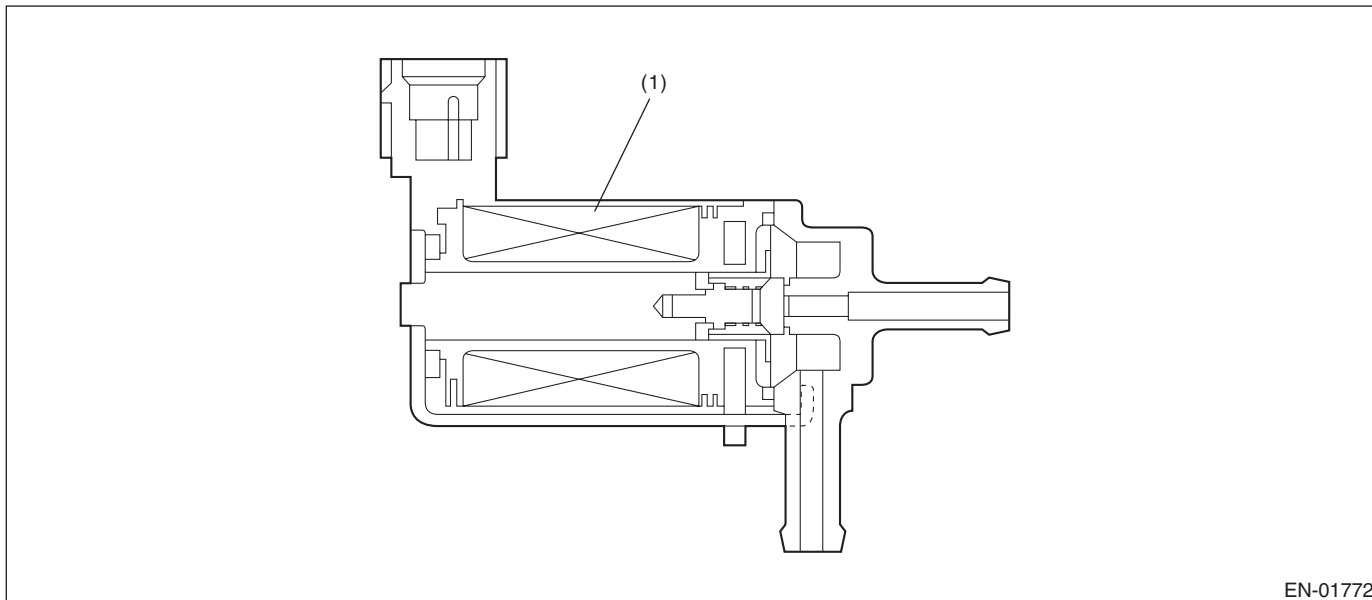
AR:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH

1. OUTLINE OF DIAGNOSIS

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

Judge as NG when the terminal output voltage remains Low or High during outputting the duty signal.

2. COMPONENT DESCRIPTION



EN-01772

(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 655 milliseconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Turbocharger wastegate duty ratio when the terminal output voltage is High	> 25%

Time Needed for Diagnosis: 655 milliseconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AS: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 three 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

- 180° Interval Difference Method (MT: 1,800 rpm or less; AT: None)
- 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
Intake manifold pressure change during 0.5 engine revs.	< 13.3 kPa (99.8 mmHg, 3.93 inHg)
Engine speed change	< 500 rpm/32 milliseconds
Throttle position change during 16 milliseconds	< 14°
Fuel shut-off function	Not in operation
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
Evaporative system leak check	Not in operation
Engine speed	550 — 6,900 rpm
Intake manifold pressure	>Value from Map 3
Battery voltage	≥ 8 V
Continuous time of establishing all secondary parameter conditions	≥ 1 second

Map 3

Vehicle speed < 64.4 km/h (40 MPH)

rpm	700	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	6,700
kPa	25.1	24.8	23.3	24.7	24.0	25.6	28.8	30.0	31.6	32.5	37.1	41.9	46.9	51.1
(mmHg, inHg)	(188, 7.40)	(186, 7.32)	(175, 6.88)	(185, 7.30)	(180, 7.09)	(192, 7.56)	(216, 8.51)	(225, 8.86)	(237, 9.33)	(244, 9.60)	(278, 11.0)	(314, 12.4)	(352, 13.9)	(383, 15.1)

Vehicle speed ≥ 64.4 km/h (40 MPH)

rpm	700	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	6,700
kPa	25.1	24.8	25.6	38.3	39.3	38.9	38.5	37.6	39.7	44.3	44.3	44.3	47.0	51.1
(mmHg, inHg)	(188, 7.40)	(186, 7.32)	(192, 7.56)	(287, 11.3)	(295, 11.6)	(292, 11.5)	(289, 11.4)	(282, 11.1)	(298, 11.7)	(332, 13.1)	(332, 13.1)	(332, 13.1)	(352.5, 13.9)	(383, 15.1)

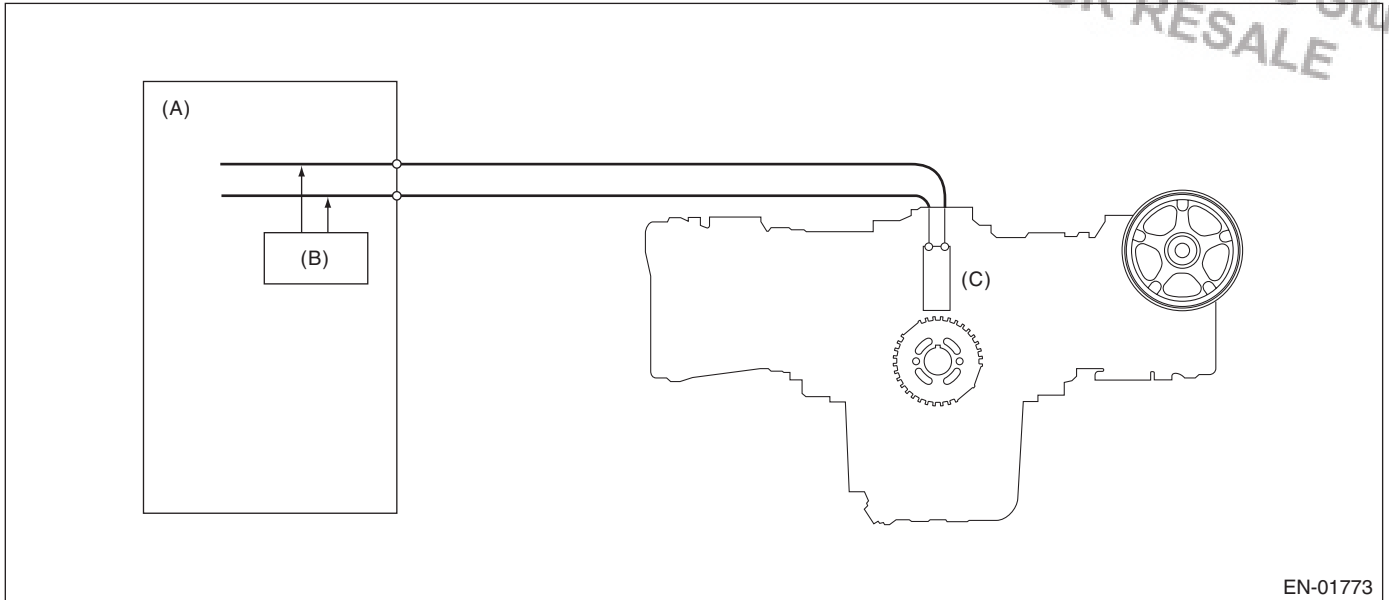
3. GENERAL DRIVING CYCLE

- If conditions are met, it is possible to detect the misfires from idling to high engine speed. However, in case any engine load or breakage occurs, perform with the engine at idle.
- Perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD



(A) Engine control module (ECM)

(B) Diagnosis circuit

(C) Crankshaft position sensor

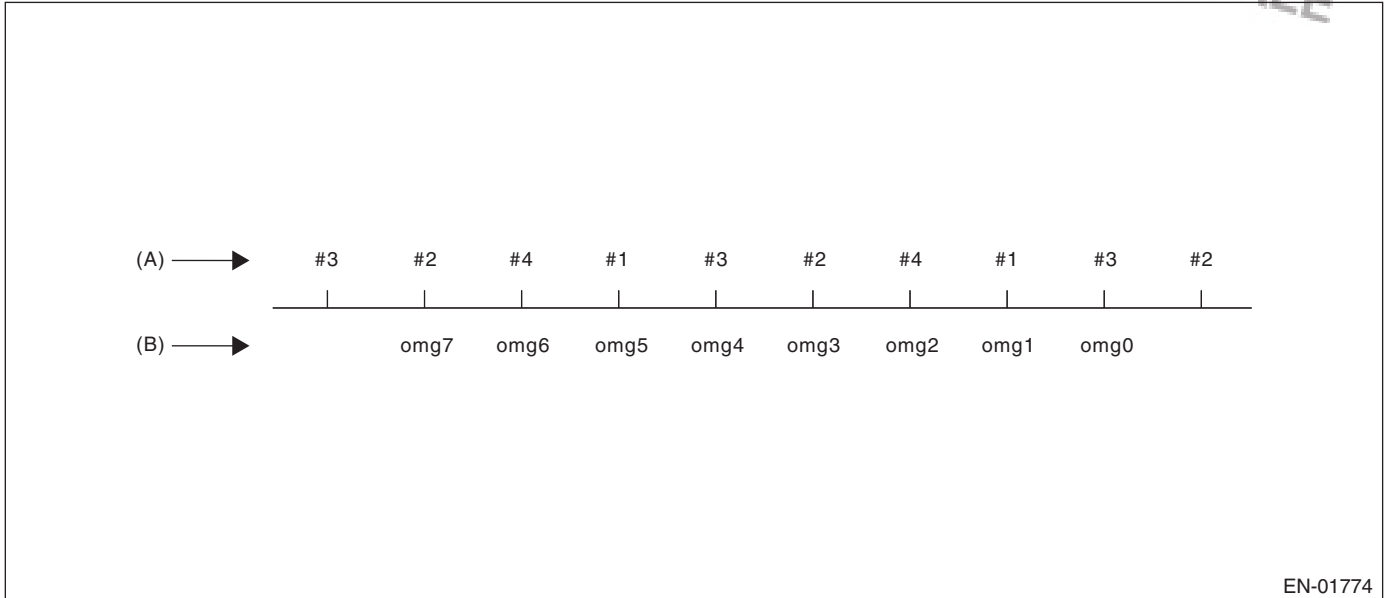
When a misfire occurs, the engine speed will decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether a misfire is occurring or not comparing the calculated result with judgment value. Counting the number of misfires. If the misfire ratio is higher during 1,000 revs. or 200 revs., Judge corresponding cylinders as NG.

Diagnosis value calculation (Calculated from angle speed)	→	Misfire detection at every ignition (Comparing the diagnosis value with the judgement value) <ul style="list-style-type: none"> • 180° Interval Difference Method • 360° Interval Difference Method • 720° Interval Difference Method 	→	NG judgment (Misfire occurrence judgment required by the law) (Compare number of misfire with judgment) <ul style="list-style-type: none"> • FTP 1.5 times misfire NG judgment • Catalyst damage misfire NG judgment
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Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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.



EN-01774

(A) Ignition order

(B) Crankshaft position speed

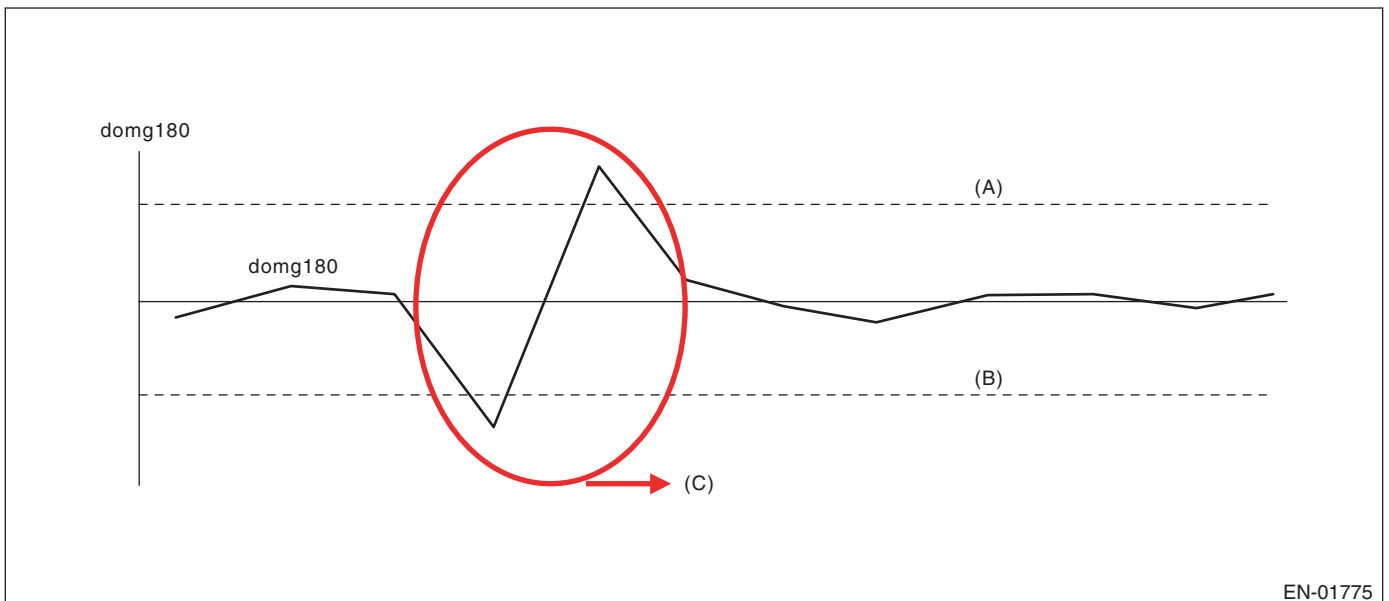
180° Interval Difference Method

Diagnostic value	$\text{domg } 180 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 7 - \text{omg } 1) / 6$
------------------	--

Judge as a misfire in the following cases.

- $\text{domg } 180 > \text{judgment value of positive side}$
- $\text{domg } 180 \leq \text{judgment value of negative side}$

(Judgment value before 180° CA)



EN-01775

(A) Threshold value (judgment value of the positive side)

(B) Threshold value (judgment value of the negative side)

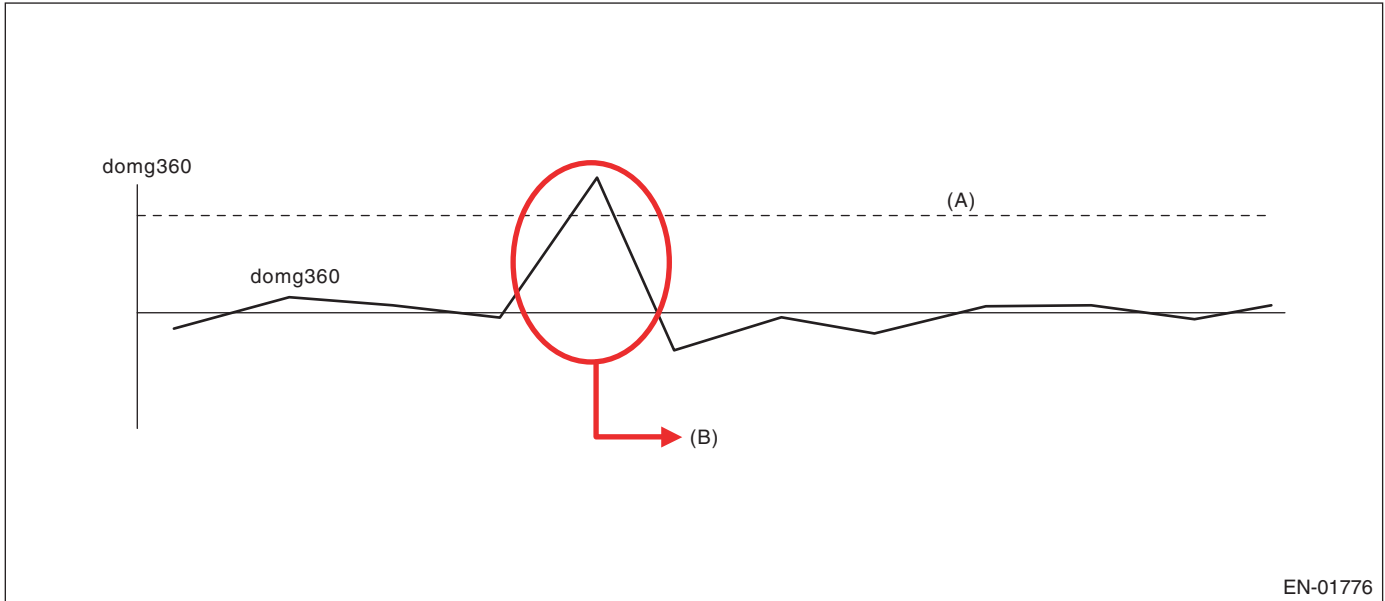
(C) Judged as a misfire

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

360° Interval Difference Method

Diagnostic value	$\text{domg 360} = (\text{omg 1} - \text{omg 0}) - (\text{omg 4} - \text{omg 3})$
Misfire judgment	$\text{domg 360} > \text{Judgment value} \rightarrow \text{Judge as misfire}$



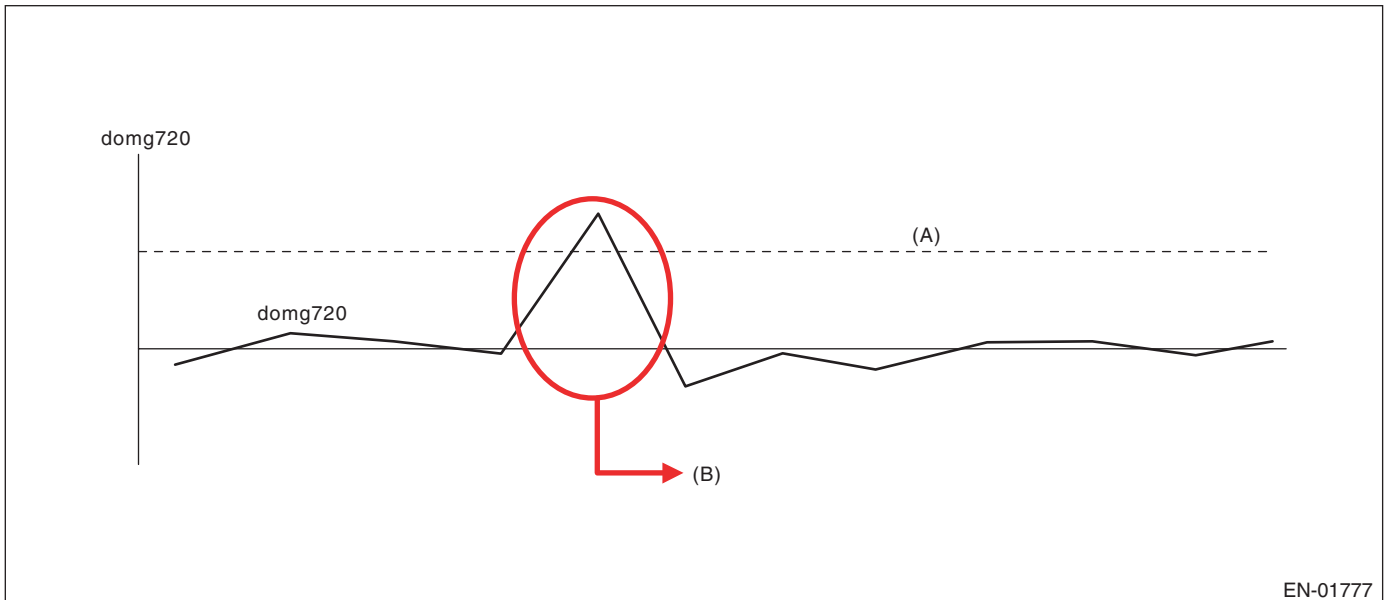
EN-01776

(A) Threshold Value

(B) Judged as a misfire

720° Interval Difference Method

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



EN-01777

(A) Threshold Value

(B) Judged as a misfire

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1,000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission judgment value	> 1.0 % in 1,000 revs.

Time Needed for Diagnosis: 1,000 engine revs.

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

Catalyst damage misfire (Misfire occurrence level damaging catalyst)

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	See Map 1

Map 1 Fault criteria threshold for misfire which would result in catalyst damage

%	INTAKE AIR g(oz)/rev.										
	0.2 (0.007)	0.4 (0.014)	0.6 (0.021)	0.8 (0.028)	1.0 (0.035)	1.2 (0.042)	1.4 (0.049)	1.6 (0.056)	1.8 (0.063)	2.0 (0.071)	
ENGINE SPEED (rpm)	700	37.0	32.0	29.0	26.5	25.0	22.5	22.5	22.5	22.5	22.5
	1000	37.0	32.0	28.5	26.0	23.0	21.3	21.3	21.3	21.3	21.3
	1500	35.0	29.5	25.5	22.5	21.3	21.3	21.3	18.0	18.0	18.0
	2000	32.0	22.5	22.5	18.3	14.5	10.8	10.0	9.0	8.0	5.0
	2500	29.0	21.8	14.3	11.3	9.8	9.0	8.5	8.0	7.5	5.0
	3000	27.0	21.8	14.5	9.8	9.0	9.0	8.0	7.5	7.0	5.0
	3500	24.5	18.5	10.8	6.8	5.8	5.5	5.0	5.0	5.0	5.0
	4000	17.3	15.3	10.0	6.8	5.5	5.0	5.0	5.0	5.0	5.0
	4500	15.0	13.8	8.5	6.3	5.0	5.0	5.0	5.0	5.0	5.0
	5000	13.8	13.8	8.5	5.8	5.0	5.0	5.0	5.0	5.0	5.0
	5500	13.5	13.5	8.3	5.5	5.0	5.0	5.0	5.0	5.0	5.0
	6000	13.0	13.0	8.0	5.3	5.0	5.0	5.0	5.0	5.0	5.0
	6500	12.5	12.5	7.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6700	12.5	12.3	7.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	

EN-05543

These figures are the rate of misfire (%) out of 400 ignitions. 22.5 (%) means that there is a judgement as misfire when 400 (ignitions) × 22.5 (%) = 90 (ignitions) or more.

Time Needed for Diagnosis: 200 engine revs.

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

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AT:DTC P0302 CYLINDER 2 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STI)-101, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AU:DTC P0303 CYLINDER 3 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STI)-101, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AV:DTC P0304 CYLINDER 4 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STI)-101, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

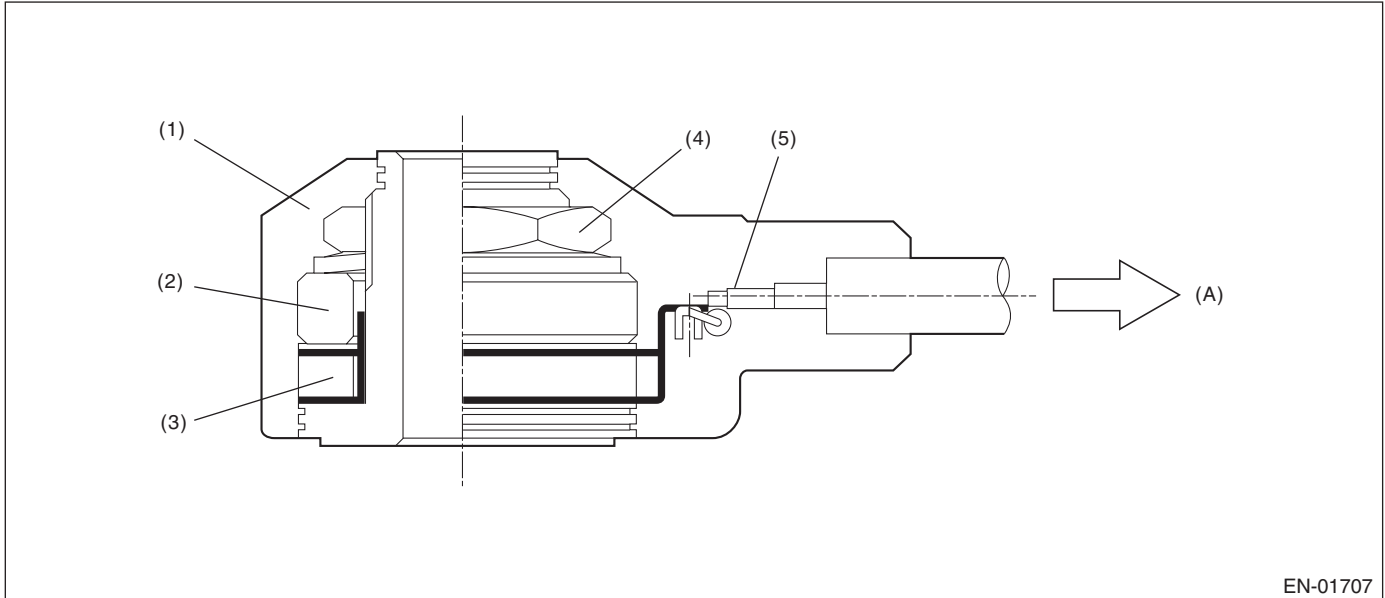
GENERAL DESCRIPTION

AW: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



EN-01707

- (1) Case
- (2) Weight
- (3) Piezoelectric element

- (4) Nut
- (5) Resistance

- (A) To knock sensor harness

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 Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.238 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.238 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Knock compensation:

- Knock compensation final advance/retard angle value = knock compensation value + whole learning compensation value + portional learning compensation value
- When normal: Knock compensation value = Fixed at 0°C A
- Failure: Knock compensation value = -5°C A (5°C A retard)
- Whole learning compensation coefficient update not allowed
- Portional learning zone compensation value calculation not allowed.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

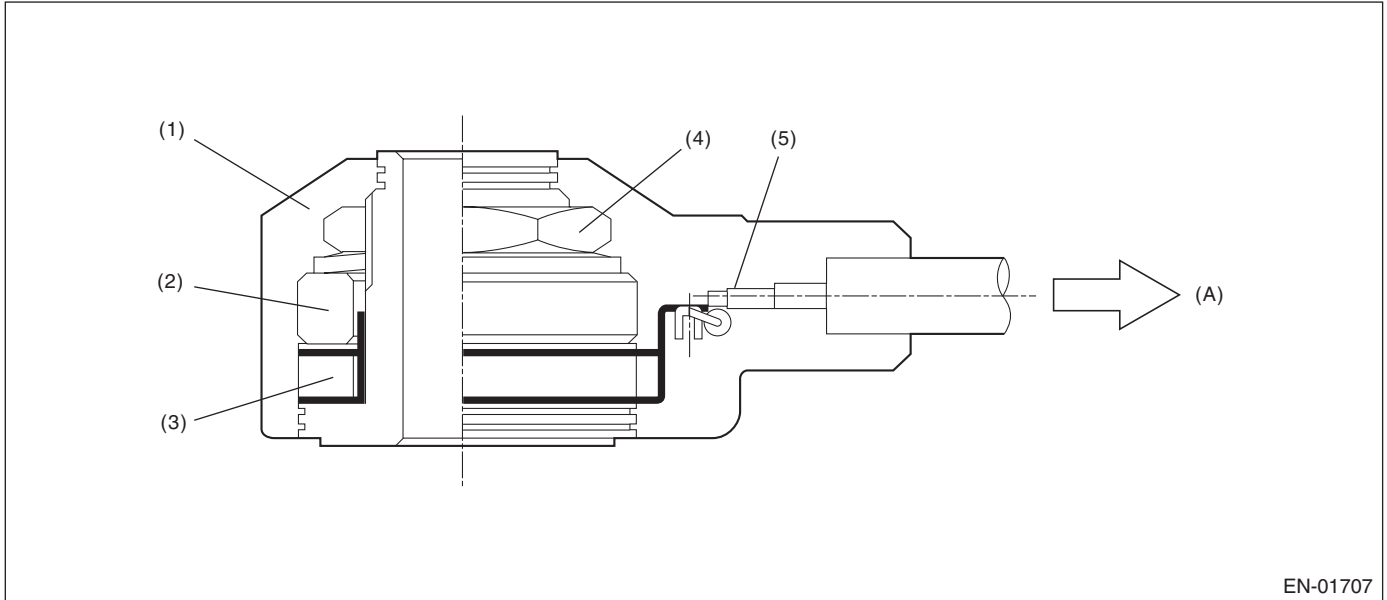
GENERAL DESCRIPTION

AX: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



- (1) Case
- (2) Weight
- (3) Piezoelectric element

- (4) Nut
- (5) Resistance

- (A) To knock sensor harness

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 Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.714 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.714 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Knock compensation:

- Knock compensation final advance/retard angle value = knock compensation value + whole learning compensation value + portional learning compensation value
- When normal: Knock compensation value = Fixed at 0°C A
- Failure: Knock compensation value = -5°C A (5°C A retard)
- Whole learning compensation coefficient update not allowed
- Portional learning zone compensation value calculation not allowed.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

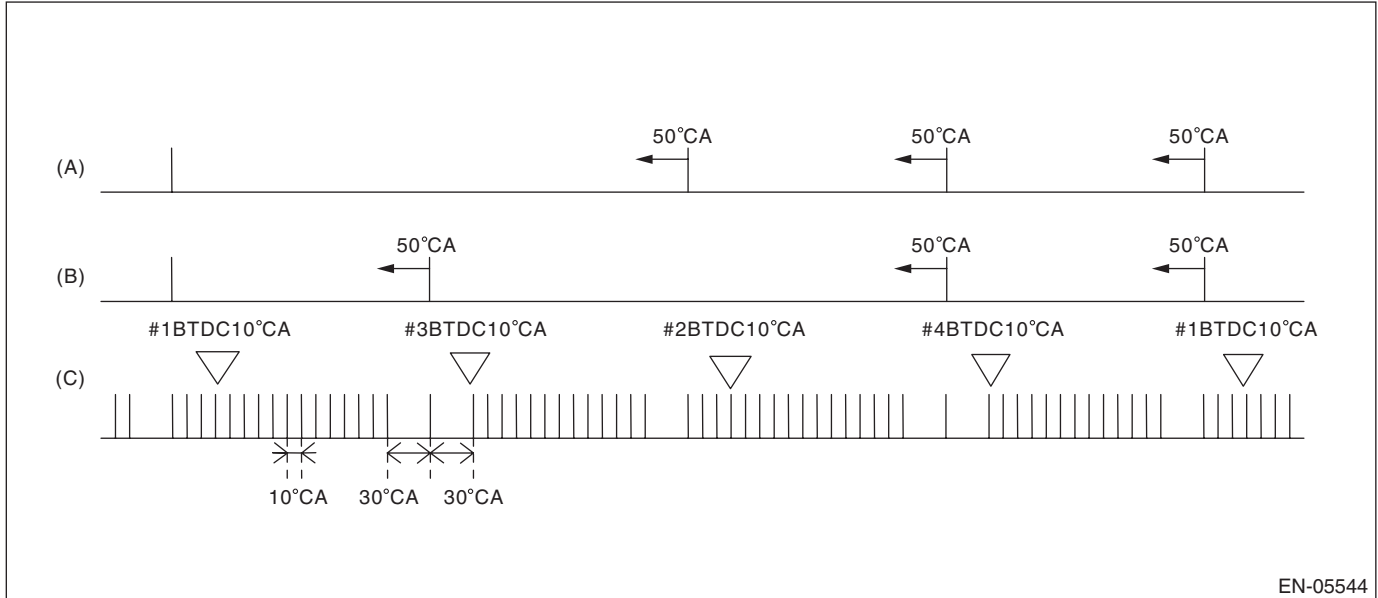
AY:DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT

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

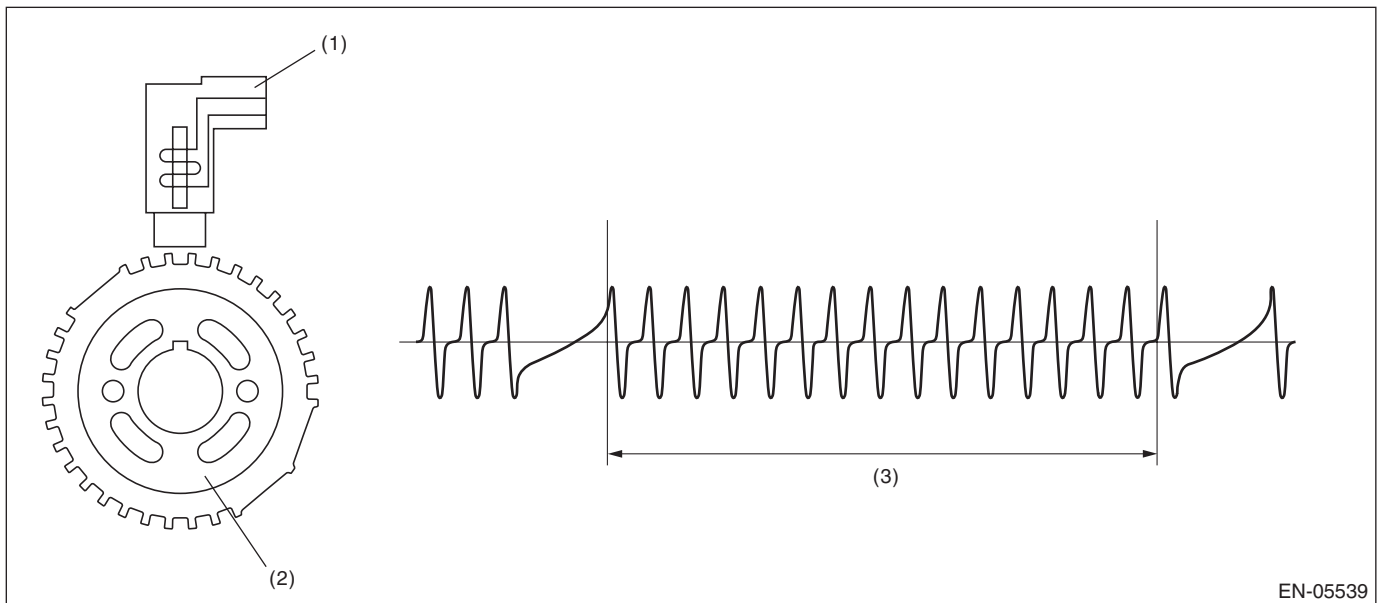


EN-05544

(A) Camshaft signal (RH)

(B) Camshaft signal (LH)

(C) Crankshaft signal



EN-05539

(1) Crankshaft position sensor

(2) Crank sprocket

(3) Crankshaft half-turn

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 Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes three seconds or more.

Judgment Value

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

Time Needed for Diagnosis: 3 seconds

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

Normality Judgment

Judge as OK when the continuous time of meeting the malfunction criteria below is 3 seconds or more.

Judgment Value

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

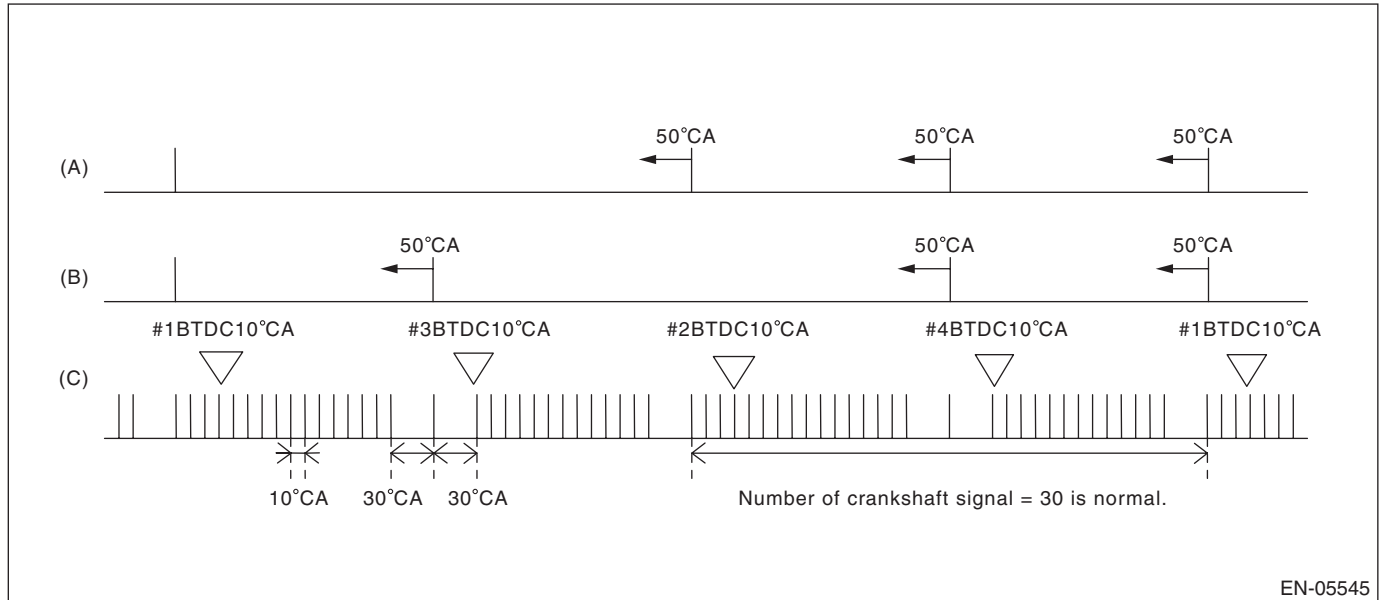
AZ:DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE

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.

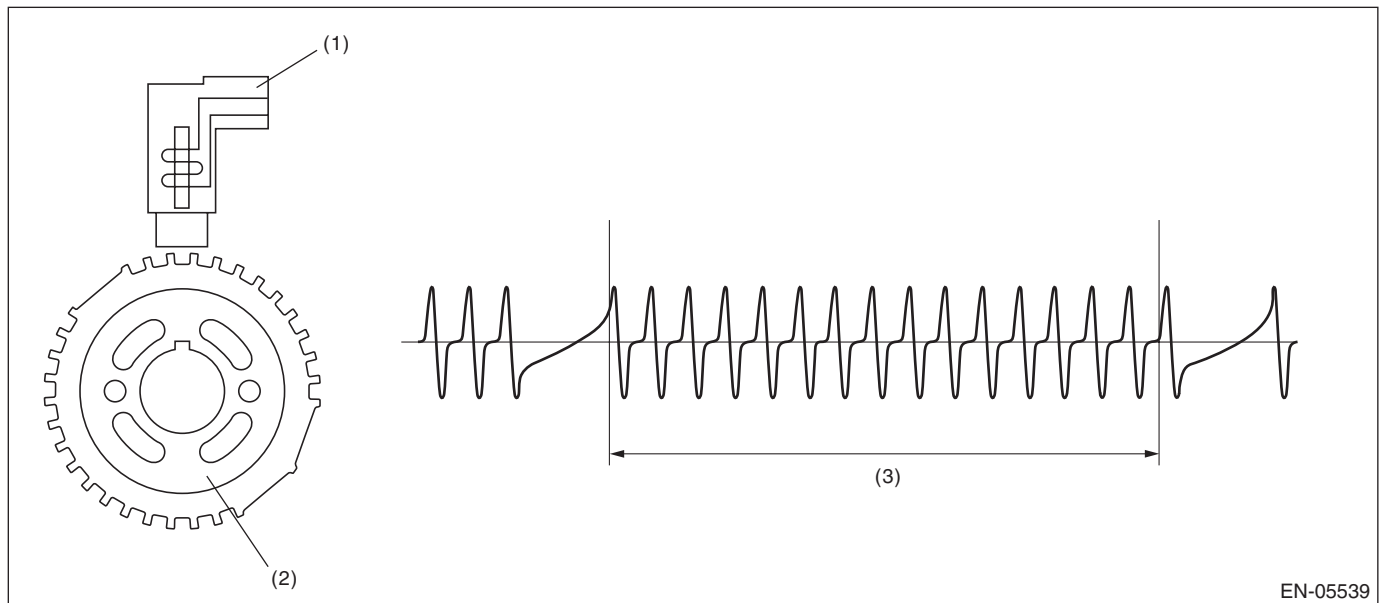
2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH)

(B) Camshaft signal (LH)

(C) Crankshaft signal



(1) Crankshaft position sensor

(2) Crank sprocket

(3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 8 \text{ V}$
Engine speed	$< 3,000 \text{ rpm}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3,000 rpm engine speed.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the following criteria are met continuously 10 times or more in a row.

Judgment 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 two continuous driving cycles.

Normality Judgment

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

Judgment Value

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

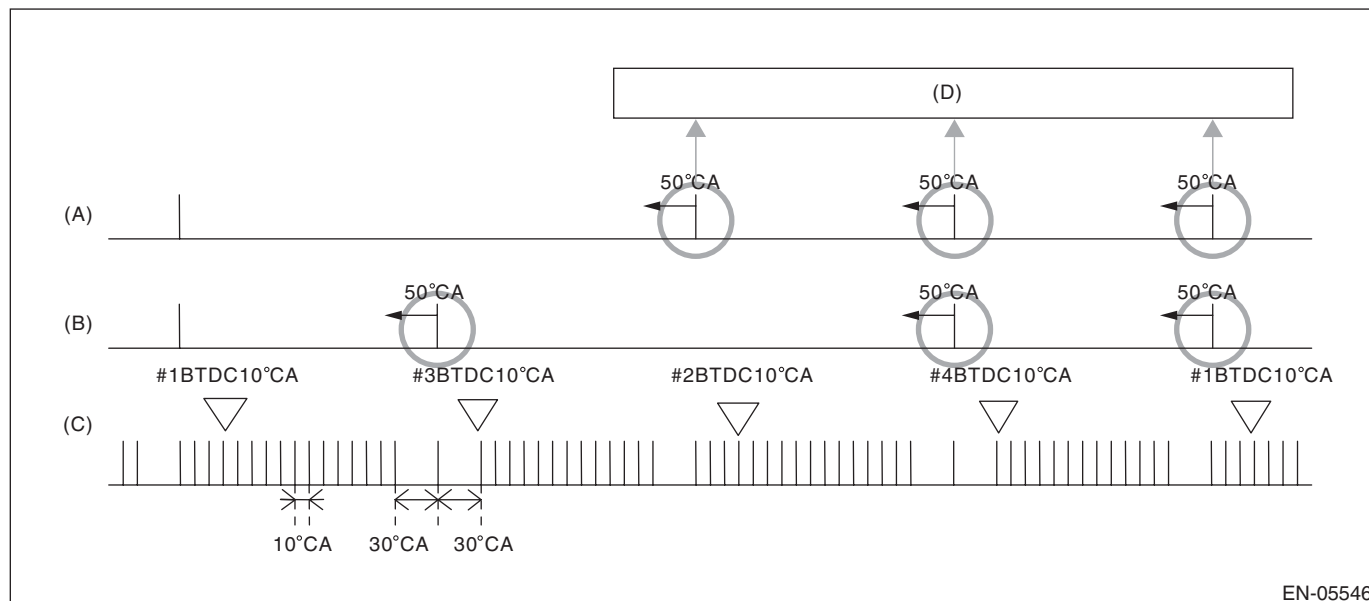
BA:DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

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



EN-05546

(A) Camshaft signal (RH)

(C) Crankshaft signal

(D) Number of camshaft position signals = When normal, there will be three cam signals for every two engine revolutions.

(B) Camshaft signal (LH)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 8 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment 1

When normal, there should be three cam signals per two engine revolutions. If a condition where it is not three signals continues, it is judged as NG.

When the engine speed is 100 rpm or faster, if the following conditions are established it is judged as NG. Judge as OK and clear the NG when the following criteria are not established.

Judgment Value

Malfunction Criteria	Threshold Value
Number of camshaft sensor signals during 2 revs.	< 3

Time Needed for Diagnosis: 100 engine revs.

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

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment 2

Judge as NG when the continuous time of meeting the malfunction criteria below becomes three seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Camshaft angle signal	None

Time Needed for Diagnosis: 3 seconds

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

Normality Judgment

Judge as OK and clear the NG when the following criteria are established.

Judgment Value

Malfunction Criteria	Threshold Value
Camshaft angle signal	Input exists

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone with IG OFF.
 - Enter the initial value (0°CA) to the compensation value of the partial learning zone when making an abnormality → normality judgment.
- AVCS control:
 - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
 - → ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the OCV driving Duty to be the given value (9.36%).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BB:DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2)

1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0340. <Ref. to GD(STI)-115, 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

BC:DTC P0410 SECONDARY AIR INJECTION SYSTEM

1. OUTLINE OF DIAGNOSIS

Detect NG judging from the secondary air delivery pipe pressure and pulses of the secondary air delivery pipe pressure.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Estimate ambient temperature	4.4°C (39.92°F)
Battery voltage	7 V
Atmospheric pressure	563 mmHg
Engine	In operation
Pump supply pressure diagnosis	
Amount of intake air	≥ 2 g (0.07 oz)/second
Secondary air pump	Operating
Combination valve	Open
Combination valve closed pulse diagnosis	
Feasible area for diagnosis	≥ 1 (See Map 4)
After fuel cut	≥ 500 milliseconds
Combination valve change over pressure diagnosis	
Amount of intake air	≥ 2 g (0.07 oz)/second and
	≤ 20 g (0.7 oz)/second
Engine speed	< 4000 rpm
After fuel cut	≥ 1,000 milliseconds

3. GENERAL DRIVING CYCLE

Perform diagnosis during secondary air pump operation

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD

Measure the secondary air delivery pipe pressure and pulses of the secondary air delivery pipe pressure.

Pump supply pressure diagnosis

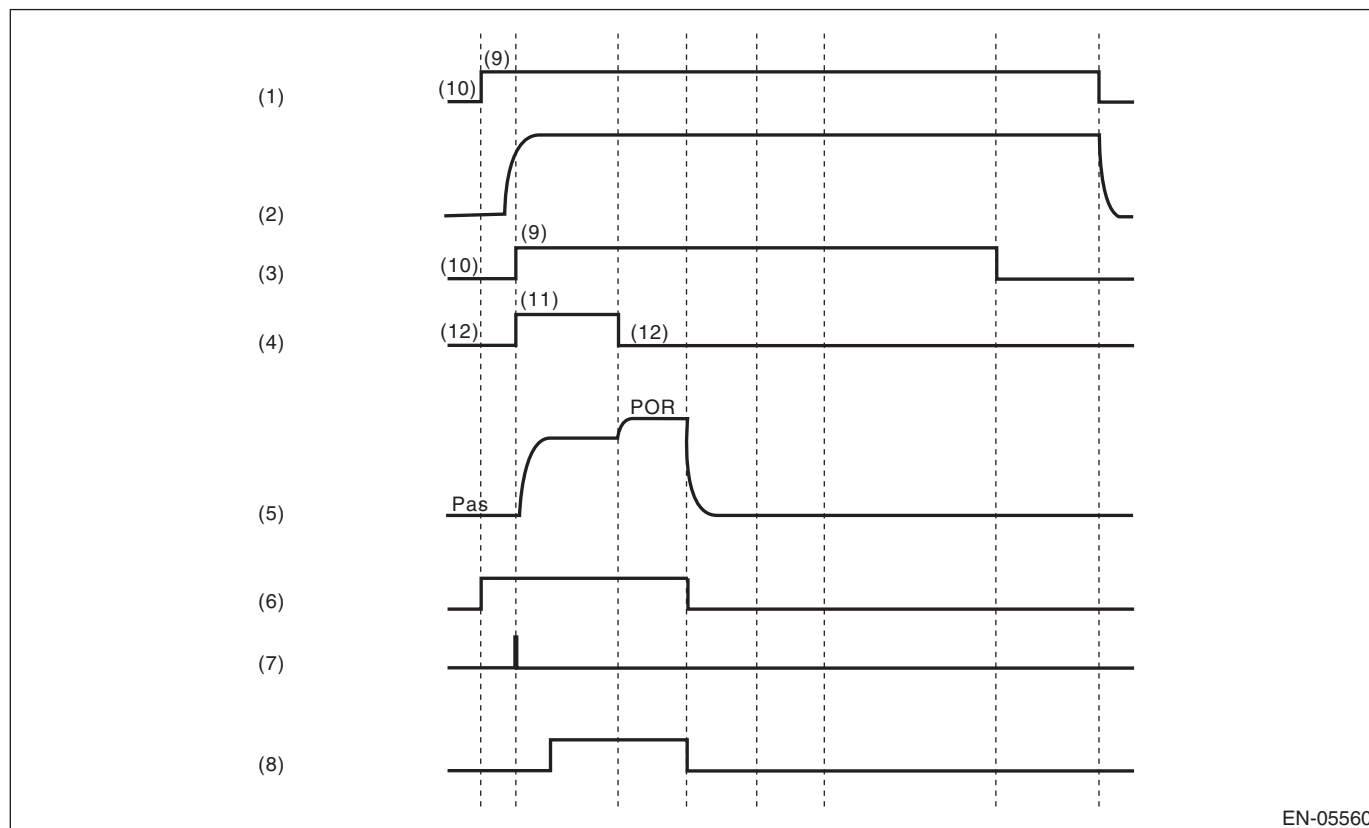
Perform system function diagnosis by comparing the pressure when the secondary air pump is OFF and the pressure increase when it is ON.

Combination valve closed pulse diagnosis

Perform close stuck diagnosis of the combination valve using delivery pipe pressure pulse when the combination valve is open.

Combination valve change over pressure diagnosis

Perform close stuck diagnosis of the combination valve using variation of delivery pipe pressure when the combination valve turns open → closed.



- | | | |
|--|--|------------|
| (1) IG | (6) Diagnosis enable condition | (9) ON |
| (2) Ne | (7) Barometric pressure (Pas) measurement before secondary air control | (10) OFF |
| (3) Secondary air pump operating status | (8) Pump supply pressure check (judgement) | (11) Open |
| (4) E-COMB valve status | | (12) Close |
| (5) Secondary air delivery pipe pressure (psi) | | |

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Judgment Value

Pump supply pressure diagnosis

Judge as NG if Delivery pipe pressure does not rise though it should when the secondary air pump turns OFF → ON.

Judge as NG when the following conditions are established. Judge as OK and clear the NG when the following conditions are not established.

Malfunction Criteria	Threshold Value	DTC
Secondary air delivery pipe pressure (after barometric pressure compensation)	< 1 kPa (7 mmHg, 0.3 inHg)	P0410

Time Needed for Diagnosis: 3 seconds

Combination valve closed pulse diagnosis

Calculate voltage pulse of the pump supply pipe pressure when the combination valve is closed. The calculation of delivery pipe pressure should be large when the combination valve is open. Judge that the combination valve is close stuck if the calculation is small.

Judge as NG when the following conditions are established. Judge as OK and clear the NG when the following conditions are not established.

Malfunction Criteria	Threshold Value	DTC
Pulse calculation value when the combination valve is open	< Value from Map 1	P2441 P0411

Time Needed for Diagnosis: 1 second

Combination valve change over pressure diagnosis

Delivery pipe pressure should vary when the combination valve turns open → closed. When the variation is small, determine that the combination valve is stuck closed.

Judge as NG when the following conditions are established. Judge as OK and clear the NG when the following conditions are not established.

Malfunction Criteria	Threshold Value	DTC
Pressure change value at the combination valve changeover	< Value from Map 2	P2441
Pressure change value at the combination valve changeover	> Value from Map 3	P0411

Time Needed for Diagnosis: 0.5 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 1

		Engine speed (rpm)	
		1,000	4,000
Amount of intake air flow (g (oz)/s)	0 (0)	2	2
	40.0 (1.411)	2	2

Map 2

Unit: (V)		Amount of intake air flow (g (oz)/s)				
		10.0 (0.353)	12.5 (0.441)	15.0 (0.529)	17.5 (0.617)	20.0 (0.705)
Battery voltage (V)	11	0.025	0.025	0.025	0.015	0.015
	12	0.035	0.035	0.035	0.025	0.015
	13	0.05	0.05	0.05	0.035	0.025
	14	0.05	0.05	0.05	0.035	0.025

Map 3

Unit: (V)		Amount of intake air flow (g (oz)/s)	
		2.0 (0.071)	20.0 (0.705)
Battery voltage (V)	12	0.42	0.42
	13	0.42	0.42
	14	0.46	0.46
	15	0.54	0.54

Map 4

		Amount of intake air flow (g (oz)/s)									
		0 (0)	5.0 (0.176)	10 (0.353)	15 (0.529)	20.0 (0.705)	25.0 (0.882)	30.0 (1.058)	35.0 (1.234)	40.0 (1.411)	50.0 (1.764)
Engine speed (rpm)	0	0	0	0	0	0	0	0	0	0	0
	700	0	0	0	1	1	1	1	1	1	0
	1,000	0	0	0	1	1	1	1	1	1	0
	1,500	0	0	0	1	1	1	1	1	1	0
	2,000	0	0	0	0	1	1	1	0	0	0
	2,500	0	0	0	0	1	1	1	1	0	0
	3,000	0	0	0	0	1	1	1	1	1	0
	3,500	0	0	0	0	1	1	1	1	1	0
	4,000	0	0	0	0	0	1	1	1	1	0
4,500	0	0	0	0	0	0	0	0	0	0	

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

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

BD:DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED

NOTE:

For diagnostic procedures, refer to DTC P0410. <Ref. to GD(STI)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BE:DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

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

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time of meeting the following conditions exceeds 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs OFF signal	High

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BF:DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

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

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time of meeting the following conditions exceeds 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs ON signal	Low

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BG:DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT

1. OUTLINE OF DIAGNOSIS

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

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time of meeting the following conditions exceeds 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs OFF signal	High

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

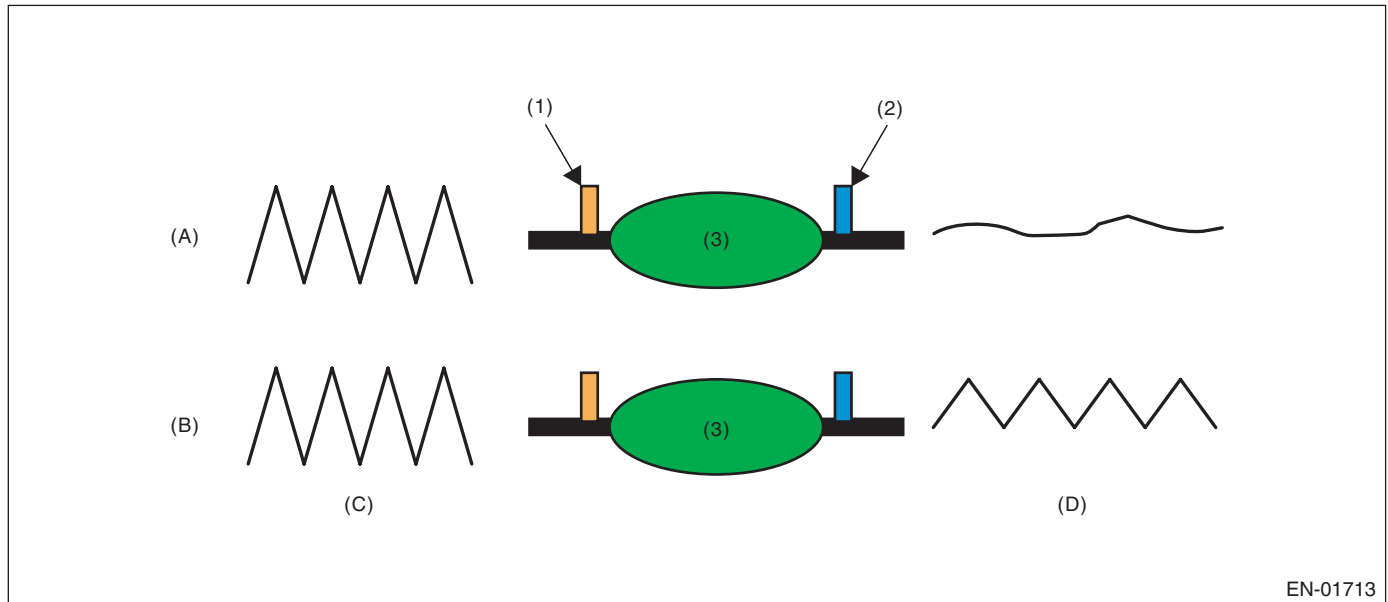
1. OUTLINE OF DIAGNOSIS

Detect the deterioration of the catalyst function.

Though the rear 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 rear oxygen sensor output and comparing it with the front oxygen (A/F) sensor output.

2. COMPONENT DESCRIPTION



EN-01713

- (1) Front oxygen (A/F) sensor
- (2) Rear oxygen sensor
- (3) Catalytic converter

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

- (D) Output waveform from the rear oxygen sensor

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Catalyst deterioration diagnosis	Incomplete
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 70°C (158°F)
Estimated catalyst layer inner temperature	≥ 520°C (968°F)
Misfire detection every 200 rotations	< 5 times
Learning value of evaporation gas density	< 0.20
Sub feedback	In operation
Evaporative system diagnosis	Not in operation
Time of difference (< 0.10) between actual and target lambda	1,000 milliseconds or more
Vehicle speed	≥ 80 km/h (49.7 MPH)
Amount of intake air	15 ←→ 40 g (0.529 ←→ 1.411 oz)/s
Engine load change every 0.5 engine revs.	< 0.02 g (0.001 oz)/rev
Rear oxygen output change from 600 mV or lower to 600 mV or higher	Experienced after fuel cut
After engine starting	≥ 230 seconds
Purge execution calculated time	≥ 5 seconds

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once at a constant speed of 80 — 100 km/h (49.7 — 62.1 MPH).

5. DIAGNOSTIC METHOD

After the execution criteria are established, calculate the output fluctuation value of front oxygen (A/F) sensor and output fluctuation value of rear oxygen sensor. Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value become the specified value or more. A/F response properties and diagnosis values are parameters for the judgment value.

Judge as NG if the criteria below are met. Judge as OK if the criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated variation of output voltage of rear oxygen sensor per 32 milliseconds × 4 divided by accumulated variation of lambda of front oxygen (A/F) sensor per 32 milliseconds × 4	≥ 10

Time Needed for Diagnosis: 55 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

BI: DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW

NOTE:

For diagnostic procedures, refer to DTC P0442. <Ref. to GD(STI)-128, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

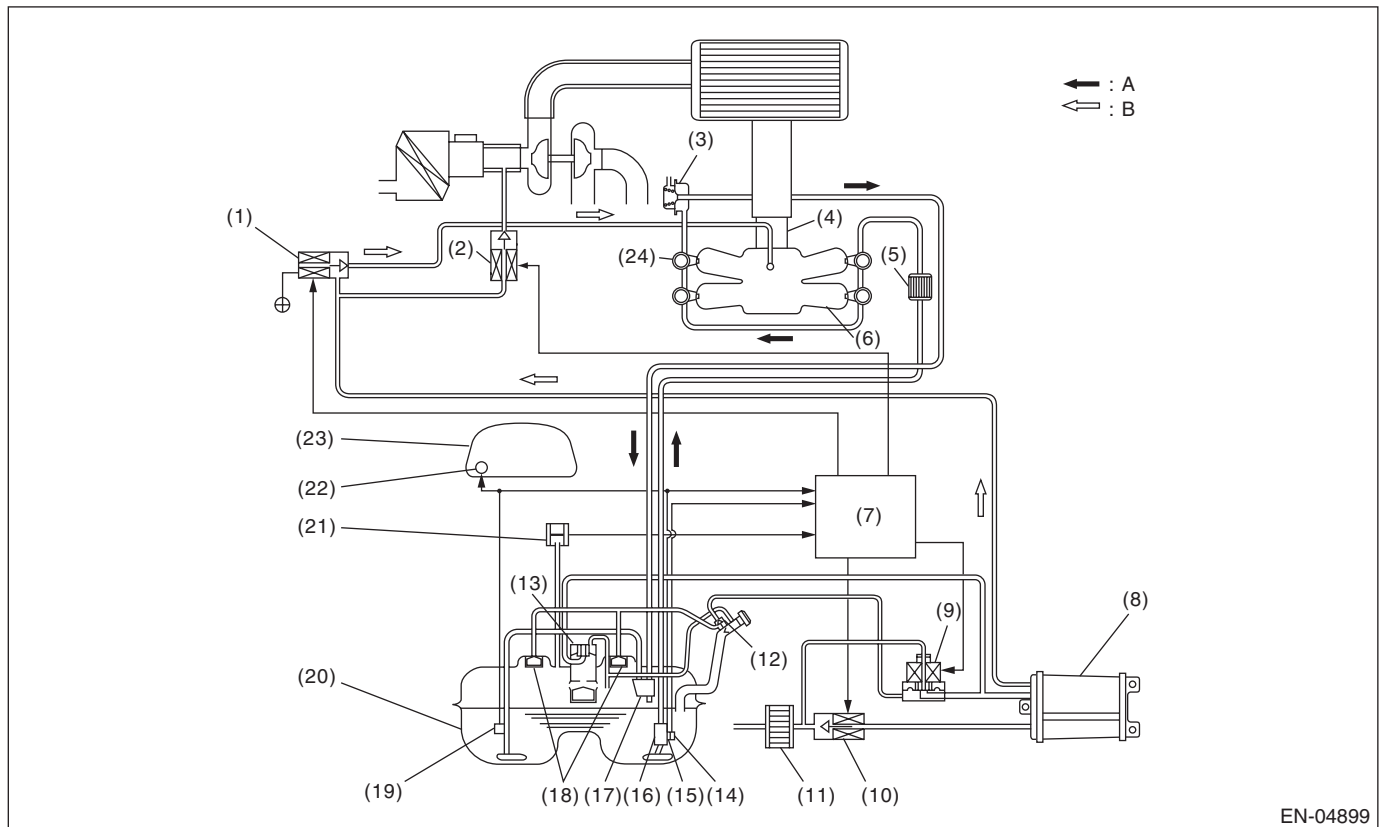
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BJ: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-04899

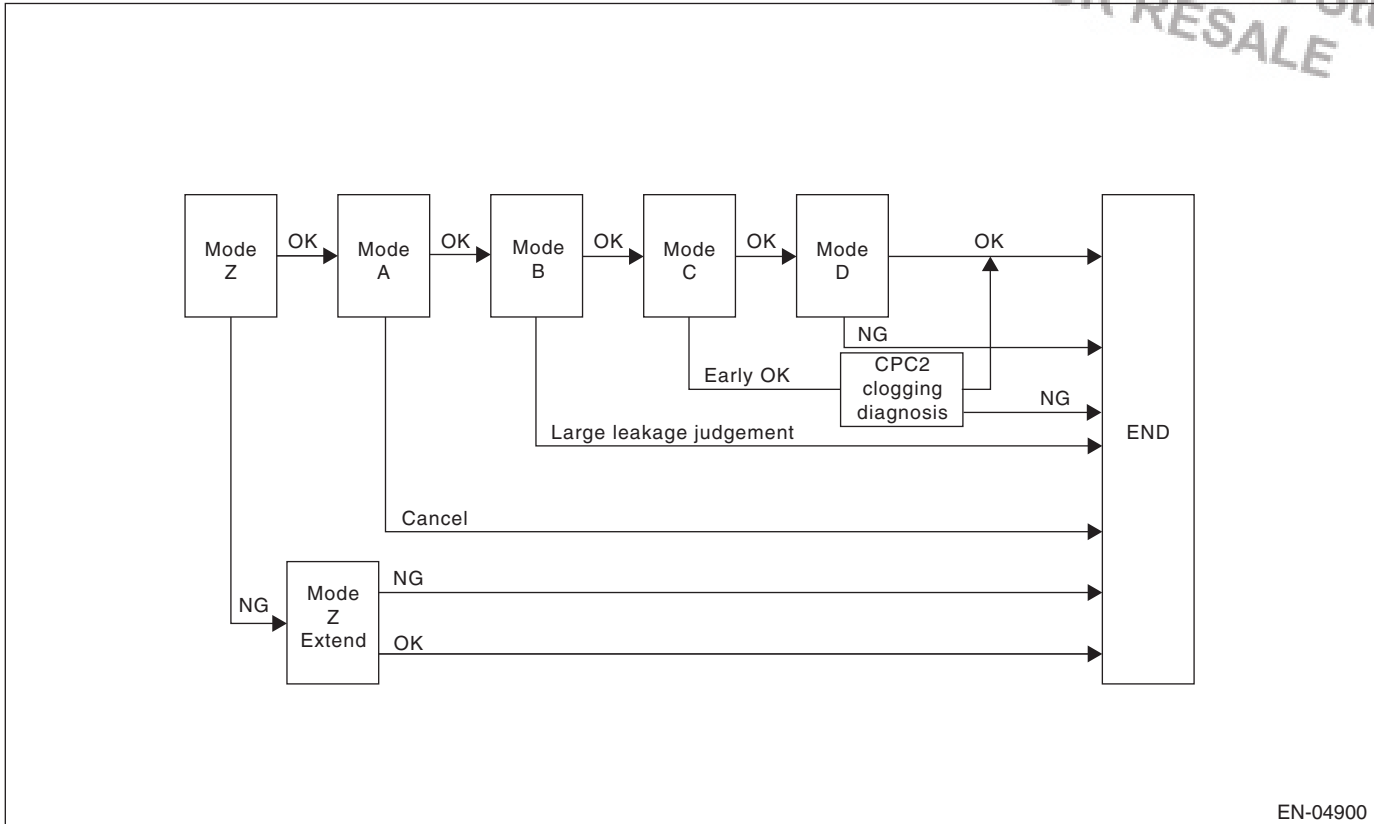
- | | | |
|-------------------------------------|------------------------------|--------------------------------|
| (1) Purge control solenoid valve 1 | (10) Drain valve | (19) Fuel sub level sensor |
| (2) Purge control solenoid valve 2 | (11) Drain filter | (20) Fuel tank |
| (3) Pressure regulator | (12) Shut-off valve | (21) Fuel tank pressure sensor |
| (4) Throttle body | (13) Vent valve | (22) Fuel gauge |
| (5) Fuel filter | (14) Fuel temperature sensor | (23) Combination meter |
| (6) Intake manifold | (15) Fuel level sensor | (24) Fuel injector |
| (7) Engine control module (ECM) | (16) Fuel pump | |
| (8) Canister | (17) Jet pump | (A) Fuel line |
| (9) Pressure control solenoid valve | (18) Fuel cut valve | (B) Evaporative fuel line |

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 A → mode B → mode C → mode D; When in 0.02 inch diagnosis, perform in the order of mode Y → mode A → mode B → mode C → mode D.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

0.04-inch Diagnosis



EN-04900

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.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	10 seconds
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.	5 — 25 seconds
Mode C (Pressure increase check, advanced OK judgment)	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 judgment.	1 — 15 seconds
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.	10 seconds
Purge control solenoid valve 2 stuck close diagnosis	Perform purge control solenoid valve 2 stuck close diagnosis using the variation gap between the tank pressure at the end of mode C and after mode C.	3 seconds

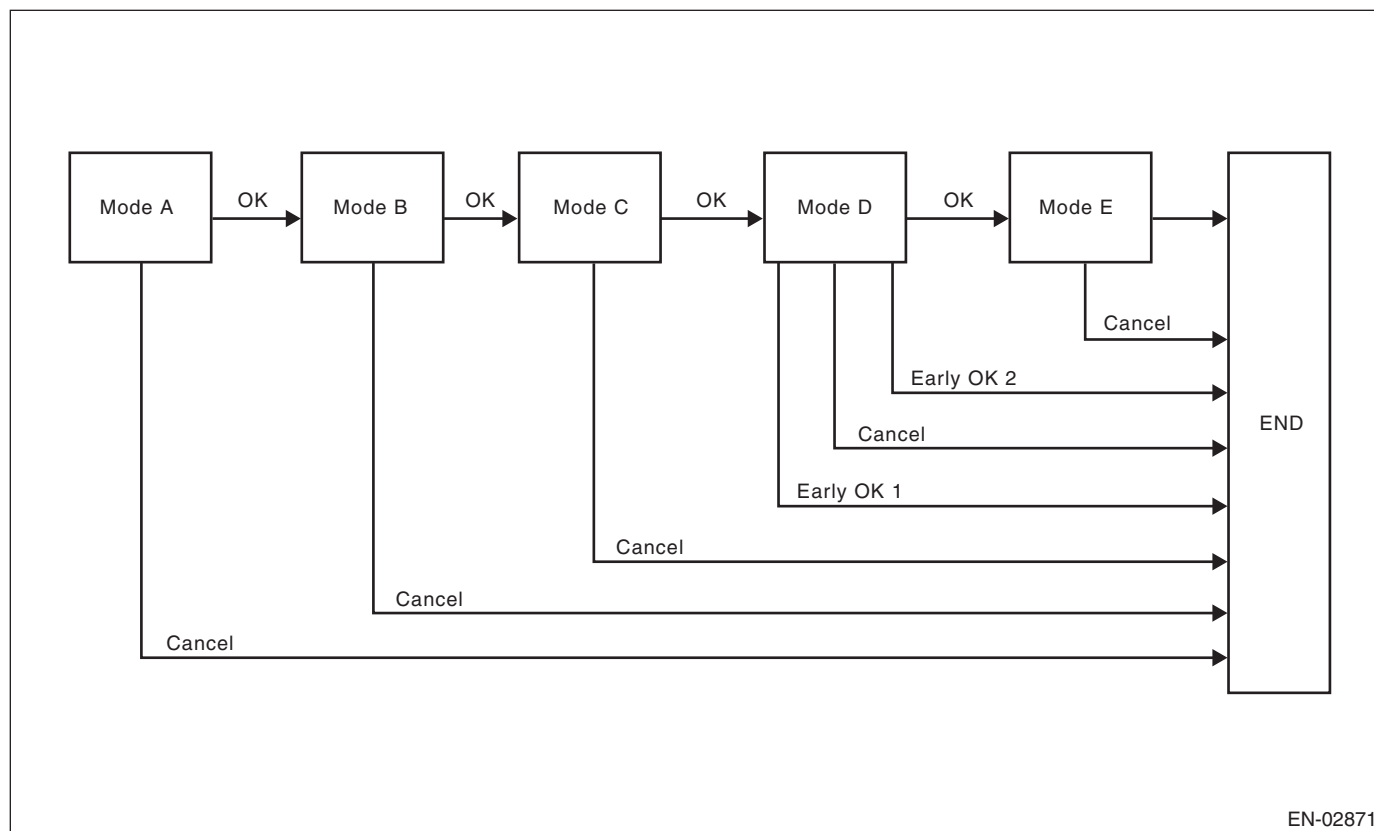
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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.	—	—
Mode B	Negative pressure is formed due to intake manifold negative pressure	Large leak	P0457
Mode C	Reaches target pressure	—	—
Mode D	Pressure change is small.	EVAP system large leak determination [1.0 mm (0.04 in)]	P0442

0.02-inch Diagnosis



EN-02871

Mode	Mode Description	Diagnosis Period
Mode A (0 point compensation)	When the pressure in the tank is high, wait until it returns to 0 point (Near 0 mmHg,).	0 — 12 seconds
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 — 27 seconds
Mode C (Negative pressure maintained)	Wait until the tank pressure returns to the target (start level of P2 calculation).	0 — 20 seconds
Mode D (Negative pressure change calculated)	Calculate the time it takes for the tank pressure to return to the P2 calculation complete pressure. If the tank pressure does not return to the P2 calculation complete pressure, make advanced OK judgment.	0 — 200 seconds
Mode E (Evaporation generated amount calculation)	Calculate the amount of evaporation (P1).	0 — 280 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

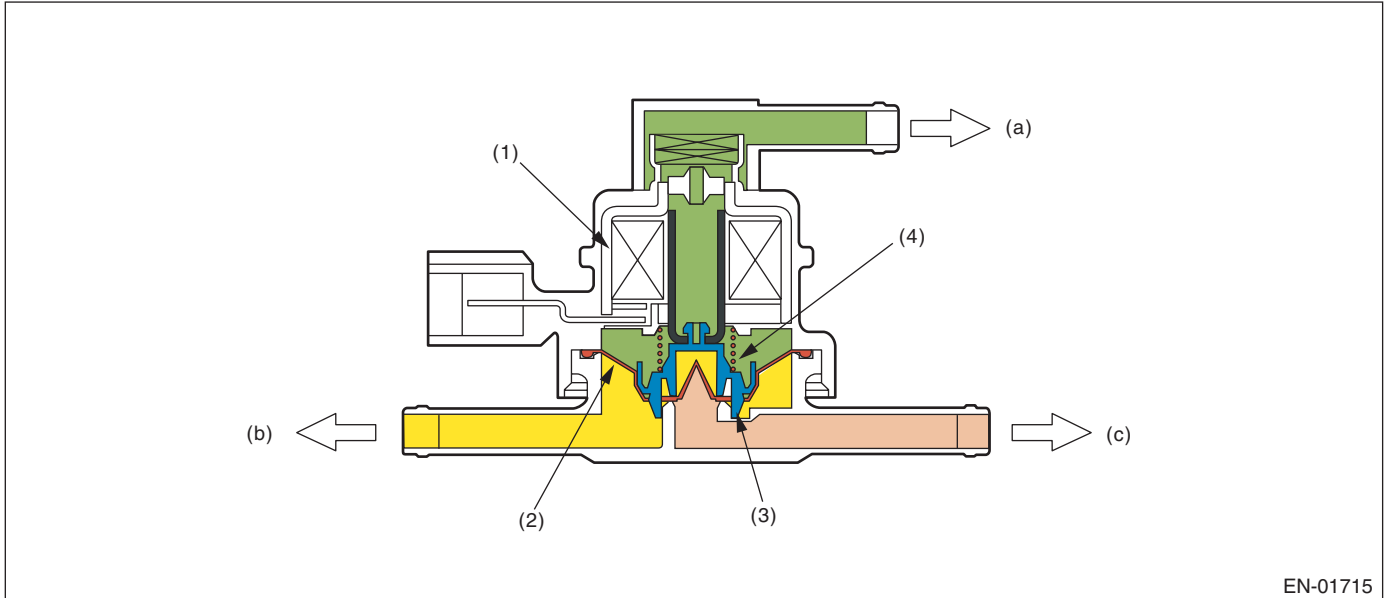
GENERAL DESCRIPTION

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. And 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.



- (1) Solenoid
- (2) Diaphragm

- (3) Valve
- (4) Spring

- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

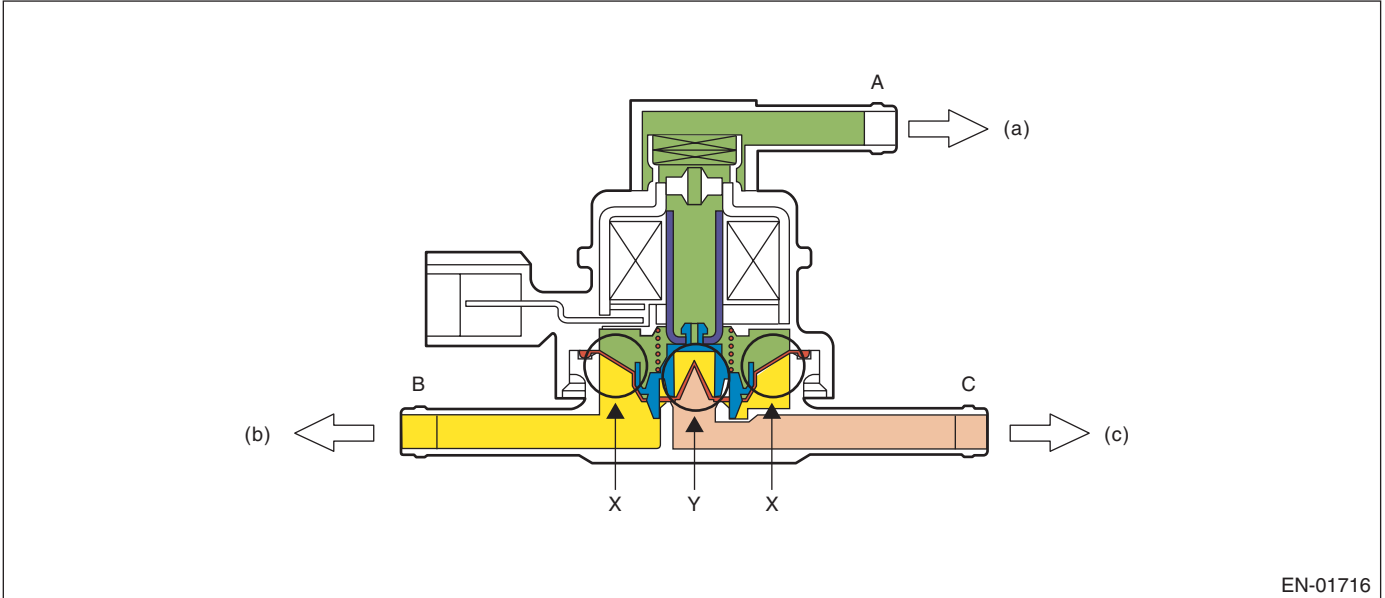
Diagnostic Trouble Code (DTC) Detecting Criteria

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.



EN-01716

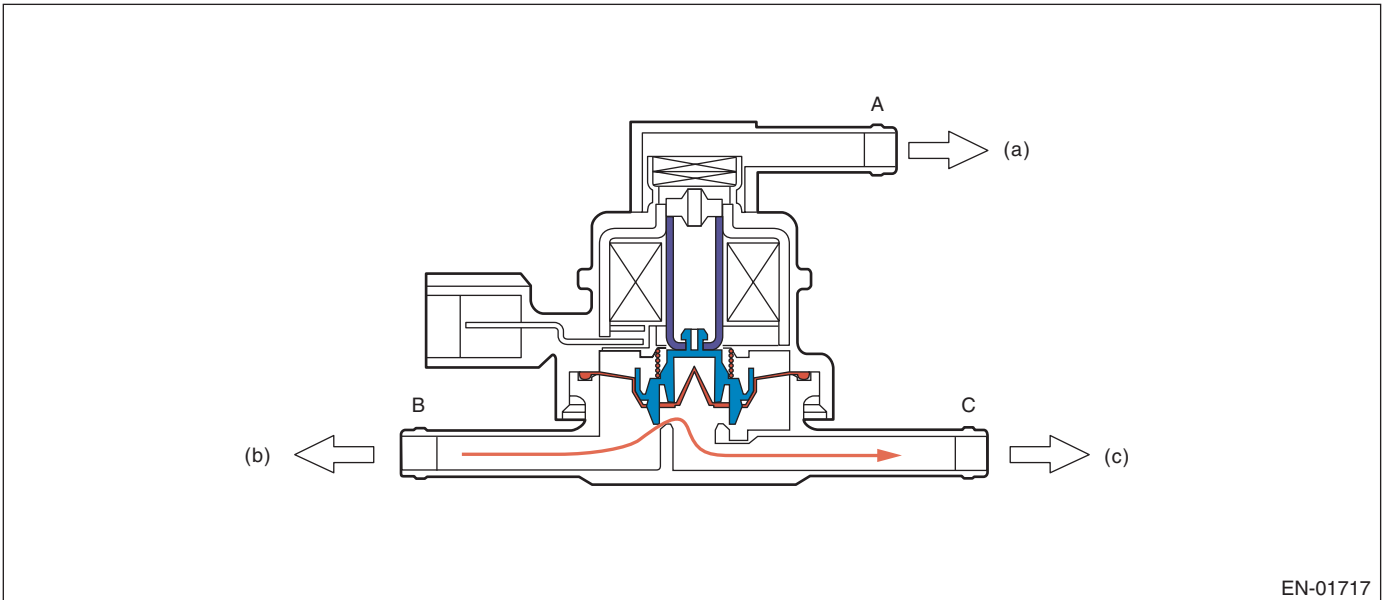
(a) Atmospheric pressure

(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	$B \leftrightarrow C$

When $A < B$ (solenoid OFF)



EN-01717

(a) Atmospheric pressure

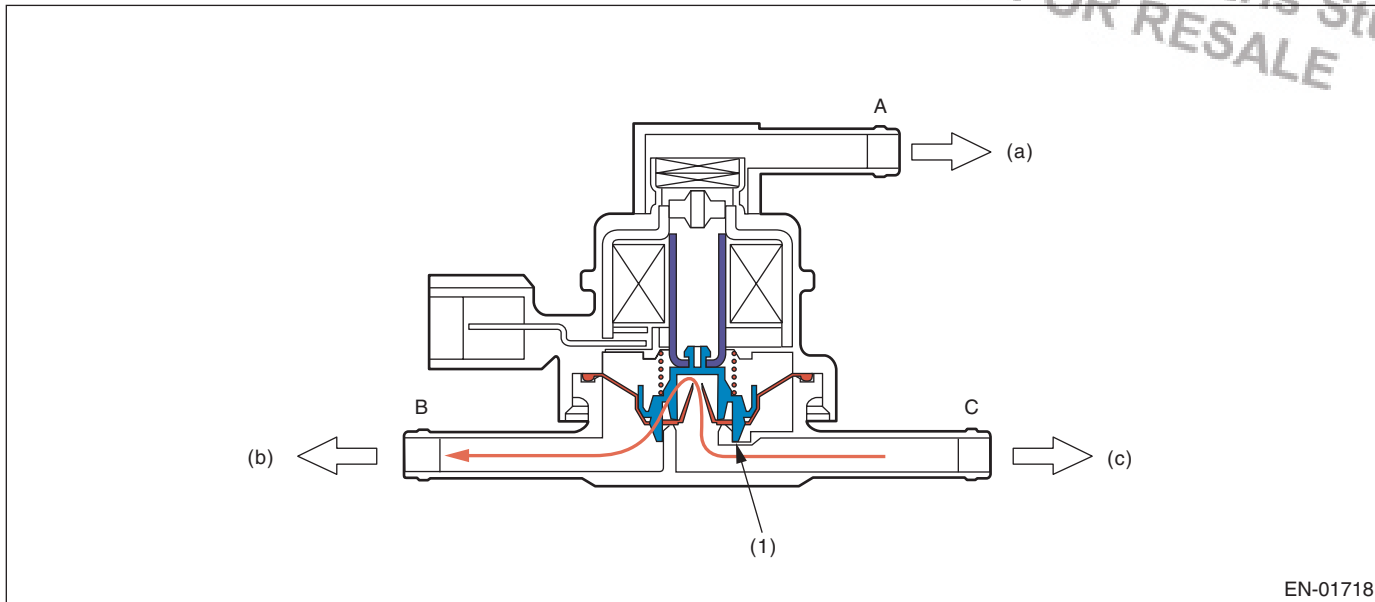
(b) Fuel tank

(c) Canister

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

When $B < C$ (solenoid OFF)



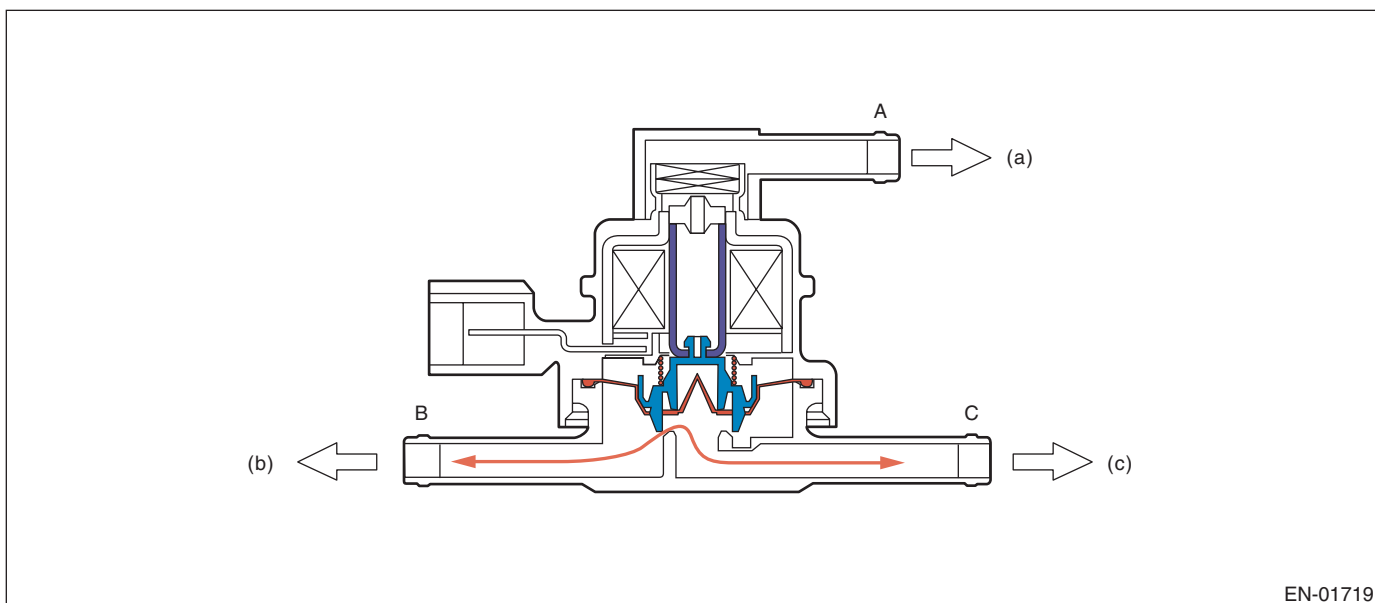
(1) Valve

(a) Atmospheric pressure

(c) Canister

(b) Fuel tank

When Solenoid is ON



(a) Atmospheric pressure

(b) Fuel tank

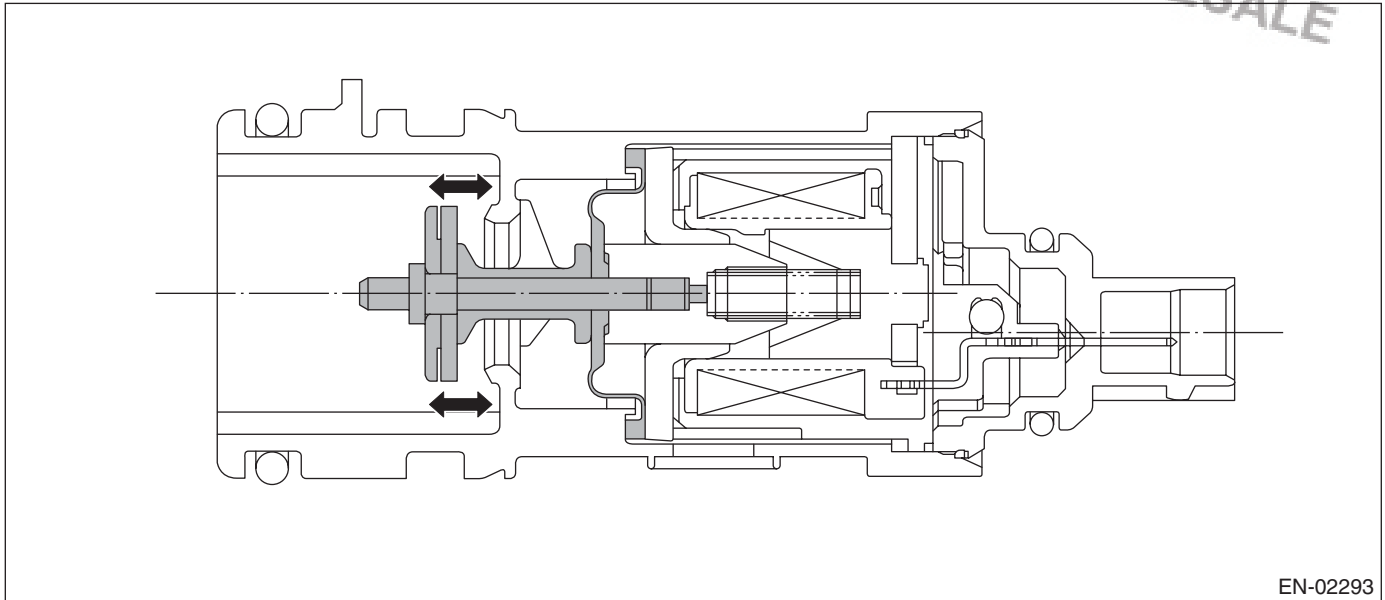
(c) Canister

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	≥ 10.9 V
Barometric pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)
Total time of canister purge operation	120 seconds or more
After engine starting	335 seconds or more
Learning value of evaporation gas density	≤ 0.08
Engine speed	1,050 — 6,500 rpm
Fuel tank pressure	< 1.4 kPa (10.7 mmHg, 0.42 inHg)
Intake manifold relative vacuum (relative pressure)	< -13.3 kPa (-100 mmHg, -3.94 inHg)
Vehicle speed	≥ 32 km/h (19.9 MPH)
Fuel level	9 — 51 ℓ (2.38 — 13.47 US gal, 1.98 — 11.22 Imp gal)
Closed air/fuel ratio control	In operation
Fuel temperature	-10 — 45°C (14 — 113°F)
Intake air temperature	≥ -10 °C (14°F)
Pressure change per second	< 0.23 kPa (1.7 mmHg, 0.07 inHg)
Minimum pressure change value every one second – Maximum pressure change value every one second	< 0.23 kPa (1.7 mmHg, 0.07 inHg)
Change of fuel level	< 2.5 ℓ /128 milliseconds (0.66 US gal/128 milliseconds, 0.55 Imp gal/128 milliseconds)
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	≥ 10.9 V
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)
Time since last incomplete 0.02-inch leakage diagnosis	
When cancelling in mode A	> 120 seconds
When cancelling in mode other than A	> 600 seconds
Total time of canister purge operation	120 seconds or more
After engine starting	120 seconds or more
Fuel temperature	-10 — 55°C (14 — 131°F)
Fuel level	9 — 51 ℓ (2.38 — 13.47 US gal, 1.98 — 11.22 Imp gal)
Intake manifold relative vacuum (relative pressure)	< -13.3 kPa (-100 mmHg, -3.93 inHg)
Fuel tank pressure	-0.67 — 1.43 kPa (-5 — 10.7 mmHg, -0.20 — 0.42 inHg)
Vehicle speed	≥ 30 km/h (18.64 MPH)
Closed air/fuel ratio control	In operation
Engine speed	1,050 — 6,000 rpm
(During diagnosis)	
Change of fuel level	≤ Value from Map 1
Pressure change every one second	< 0.06 kPa (0.44 mmHg, 0.02 inHg)
Minimum pressure change value every one second – Maximum pressure change value every one second	< 0.07 kPa (0.51 mmHg, 0.02 inHg)
Pressure change in tank every second	≤ 0.1 kPa (0.75 mmHg, 0.03 inHg)
Barometric pressure change (Mode D)	-0.47 — 0.32 kPa (-3.5 — 2.4 mmHg, -0.14 — 0.09 inHg)
Barometric pressure change (Mode E)	-0.32 — 0.32 kPa (-2.4 — 2.4 mmHg, -0.09 — 0.09 inHg)

Map 1

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)	4.2, 1.11, 0.92	4.2, 1.11, 0.92	4.1, 1.08, 0.9	4.0, 1.06, 0.88	3.9, 1.03, 0.86	3.8, 1.0, 0.84	3.8, 1.0, 0.84

4. GENERAL DRIVING CYCLE

0.04-inch Diagnosis

- Perform the diagnosis only once in 335 seconds or more after starting the engine, at a constant speed of 32 km/h (19.9 MPH) or more.
- Pay attention to the fuel temperature and fuel level.

0.02-inch Diagnosis

- Perform the diagnosis 120 seconds or more after starting the engine at a constant engine speed of 30 km/h (18.64 MPH) or higher to judge as NG or OK.
- If judgment cannot be made, repeat the diagnosis.
- Be careful of the remaining 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.

Purge Control Solenoid Valve Function Diagnosis [P0457]

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

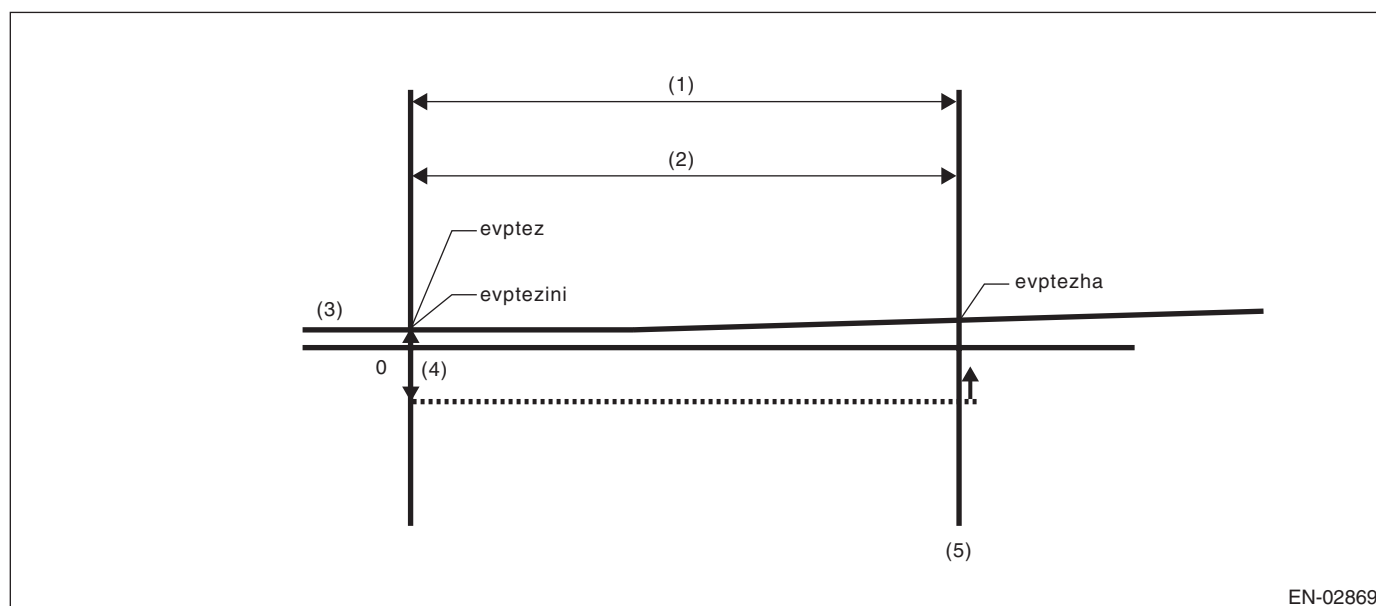
Normality Judgment

Judge as OK and change to Mode A when the criteria below are completed in 3 seconds after Mode Z started.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	≤ 0.4 kPa (3 mmHg, 0.12 inHg)	P0457

Normal



EN-02869

- | | | |
|---------------|-----------------------------------|-----------------|
| (1) Mode Z | (3) Fuel tank pressure | (5) OK judgment |
| (2) 3 seconds | (4) 0.4 kPa (3.0 mmHg, 0.12 inHg) | |

- $evptez - evptezha \leq 0.4$ kPa (3.0 mmHg, 0.12 inHg)
- $evptezini - evptezha \leq 0.4$ kPa (3.0 mmHg, 0.12 inHg)

Normal when both above are established

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	> 0.6 kPa (4.5 mmHg, 0.18 inHg)	P0457
Tank pressure when Mode Z started	≤ 1.43 kPa (10.7 mmHg, 0.42 inHg)	
Time of 2 0 or more fuel no sloshing	≥ 40 seconds	

Time Needed for Diagnosis: 16 seconds

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

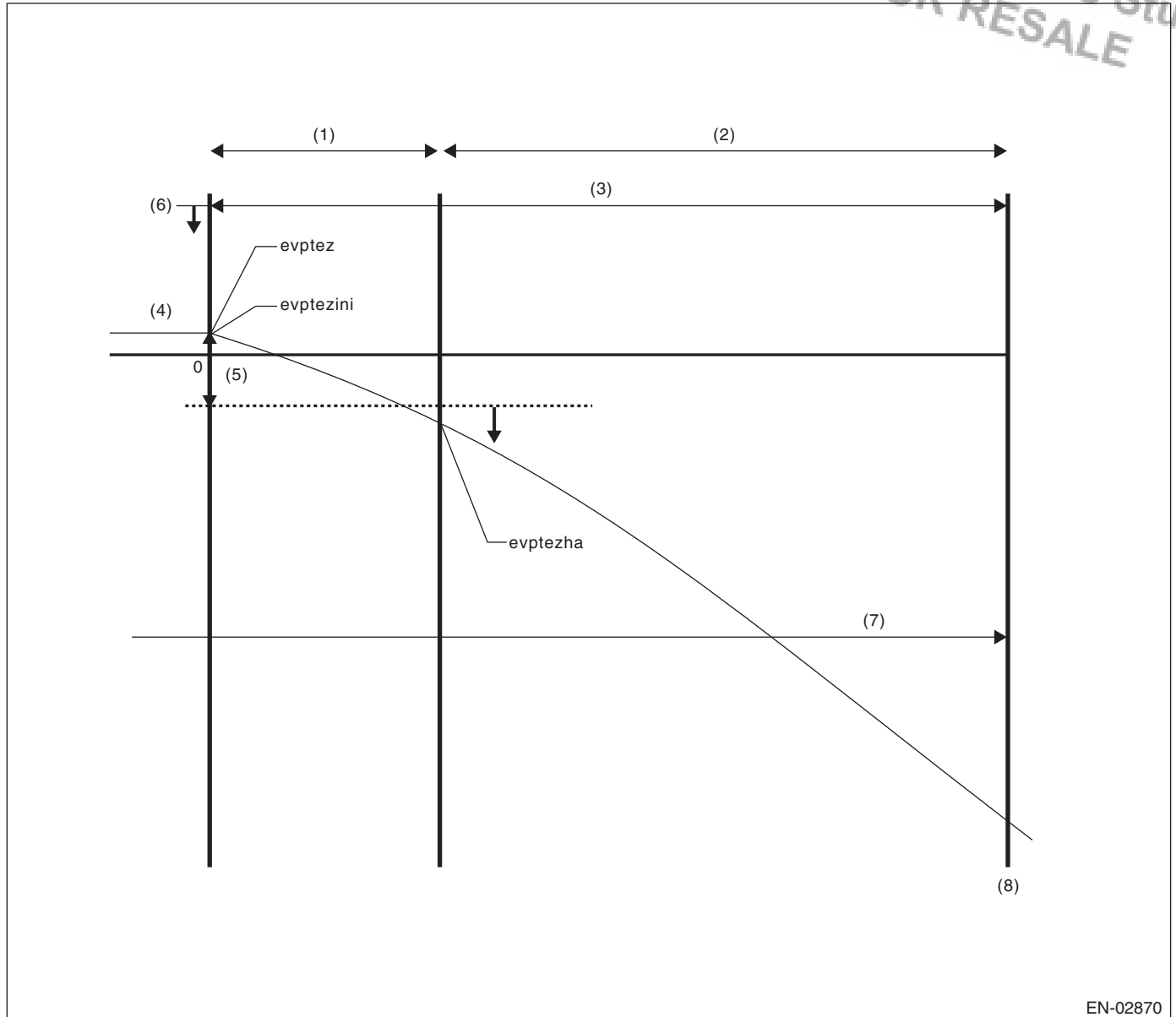
When judgment for purge control solenoid valve stuck open NG is made, end the evaporative diagnosis.

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

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Purge control solenoid valve open fixation



EN-02870

- | | | |
|---------------------|-------------------------------------|-------------------------------------|
| (1) Mode Z | (4) Fuel tank pressure | (7) No fuel sloshing for 40 seconds |
| (2) Extended mode Z | (5) 0.87 kPa (6.5 mmHg, 0.26 inHg) | (8) NG judgment |
| (3) 16 seconds | (6) 1.43 kPa (10.7 mmHg, 0.42 inHg) | |

- $evptezini, evptez \leq 1.43 \text{ kPa (10.7 mmHg, 0.42 inHg)}$
 - $evptez - evptezha \leq 0.87 \text{ kPa (6.5 mmHg, 0.26 inHg)}$
 - $evptezini - evptezha \leq 0.87 \text{ kPa (6.5 mmHg, 0.26 inHg)}$
 - No fuel sloshing of over 2 \varnothing (0.53 US gal, 0.44 Imp gal) lasts for more than 40 seconds.
- Judge as normal when all are established.

Leak Diagnosis

DTC

P0441 CPC2 solenoid property (close)

P0442 Evaporative Emission Control System Leak Detected (Small Leak)

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

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Diagnostic method

- The diagnostic method 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.

Approximately 0 → -1.4 kPa (0 → -10.5 mmHg, 0 → -0.41 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 (10 seconds or 25 seconds) in the system and terminate the evaporative emission control system diagnosis.

Abnormality Judgment

Judge as NG (large leak) when the criteria below are met.

Judgment 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)	≥ 25 seconds ≥ 10 seconds < -0.5 kPa (-4 mmHg, -0.016 inHg)	P0457

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 perform purge control solenoid valve 2 stuck close diagnosis when it does not return after the specified time passed.

Tank pressure when starting calculation of P2	Time for advanced OK judgment
-1.3 kPa (-9.75 mmHg, -0.38 inHg)	15 seconds

Purge control solenoid valve 2 stuck close diagnosis

Perform purge control solenoid valve 2 stuck close diagnosis using the variation gap between the tank pressure at the end of mode C and after mode C.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Tank pressure variation after the end of mode C	3.5 seconds < 0.101 kPa (0.758 mmHg, 0.0298 inHg)	P0441

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 Judgment

Judge as NG when the criteria below are met and judge as OK when not met, and clear NG.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
$P2 - 1.5 \times P1$ P2: Tank pressure that changes every 16 seconds in mode D P1: Tank pressure that changes every 16 seconds in mode A	> Value from Map 2 * Threshold value: Map (Remaining Fuel vs Tank temperature)	P0442

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

Map 2 Malfunction criteria limit for evaporation diagnosis

Fuel temperature vs. Fuel level	5°C (41°F)	15°C (59°F)	25°C (77°F)	35°C (95°F)	45°C (113°F)
0 L (0 US gal, 0 Imp gal)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.53 kPa (3.95 mmHg, 0.16 inHg)	0.54 kPa (4.07 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)
10 L (2.64 US gal, 2.2 Imp gal)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.53 kPa (3.95 mmHg, 0.16 inHg)	0.54 kPa (4.07 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)
20 L (5.28 US gal, 4.4 Imp gal)	0.50 kPa (3.77 mmHg, 0.15 inHg)	0.51 kPa (3.79 mmHg, 0.15 inHg)	0.53 kPa (4.01 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)	0.57 kPa (4.27 mmHg, 0.17 inHg)
30 L (7.93 US gal, 6.6 Imp gal)	0.51 kPa (3.85 mmHg, 0.15 inHg)	0.52 kPa (3.9 mmHg, 0.15 inHg)	0.54 kPa (4.06 mmHg, 0.16 inHg)	0.57 kPa (4.27 mmHg, 0.17 inHg)	0.60 kPa (4.48 mmHg, 0.18 inHg)
40 L (10.57 US gal, 8.8 Imp gal)	0.65 kPa (4.88 mmHg, 0.19 inHg)	0.65 kPa (4.9 mmHg, 0.19 inHg)	0.66 kPa (4.98 mmHg, 0.20 inHg)	0.71 kPa (5.32 mmHg, 0.21 inHg)	0.76 kPa (5.73 mmHg, 0.23 inHg)
50 L (13.21 US gal, 11.0 Imp gal)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.85 kPa (6.38 mmHg, 0.25 inHg)	0.88 kPa (6.6 mmHg, 0.26 inHg)
60 L (15.85 US gal, 13.2 Imp gal)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.85 kPa (6.38 mmHg, 0.25 inHg)	0.88 kPa (6.6 mmHg, 0.26 inHg)

Time Needed for Diagnosis: 30 — 100 seconds

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

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Leak Diagnosis

DTC

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

Diagnostic method

- The diagnostic method 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 high, 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.

Approximately 0 → -2.0 kPa (0 → -15 mmHg, 0 → -0.59 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 return when calculation of P2 is completed. Change to Mode E when the tank pressure returns to the end level of P2 calculation. If it does not return to the P2 calculation end tank internal pressure after the predetermined amount of time has passed, make advanced OK judgment or cancel the diagnosis.

Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Advanced OK judgment 1	
Mode D time	≥ 30 seconds
Tank internal pressure	≤ -1.8 kPa (-13.4 mmHg, -0.53 inHg)
Advanced OK judgment 2	
Mode D time	≥ 200 seconds
P2	≤ 0.9 — 1.3 kPa (7 — 9.6 mmHg, 0.28 — 0.38 inHg)

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 Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
P1	< Value from Map 3 * Threshold value: Map (Remaining fuel level vs. evpdset)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 3 Malfunction criteria limit for evaporation diagnosis

Time (evpdset) vs. Fuel level	0 seconds	30 seconds	80 seconds	100 seconds	150 seconds	200 seconds
0 L (0 US gal, 0 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.21 kPa (1.6 mmHg, 0.06 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)
10 L (2.64 US gal, 2.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.21 kPa (1.6 mmHg, 0.06 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)
30 L (7.93 US gal, 6.6 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.21 kPa (1.6 mmHg, 0.06 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)
50 L (13.21 US gal, 11.0 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.07 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)
60 L (15.85 US gal, 13.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.07 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)
70 L (18.49 US gal, 15.4 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.07 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)
80 L (21.14 US gal, 17.6 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.07 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)

Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
P1	> Value from Map 4 * Threshold value: Map (Remaining fuel level vs. evpdset)

Map 4 Malfunction criteria limit for evaporation diagnosis

Time (evpdset) vs. Fuel level	0 seconds	30 seconds	80 seconds	100 seconds	150 seconds	200 seconds
0 L (0 US gal, 0 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.37 kPa (2.8 mmHg, 0.11 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
10 L (2.64 US gal, 2.2 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.37 kPa (2.8 mmHg, 0.11 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
30 L (7.93 US gal, 6.6 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.37 kPa (2.8 mmHg, 0.11 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
50 L (13.21 US gal, 11.0 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
60 L (15.85 US gal, 13.2 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
70 L (18.49 US gal, 15.4 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
80 L (21.14 US gal, 17.6 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)

Time Needed for Diagnosis: 65 — 516 seconds

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

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

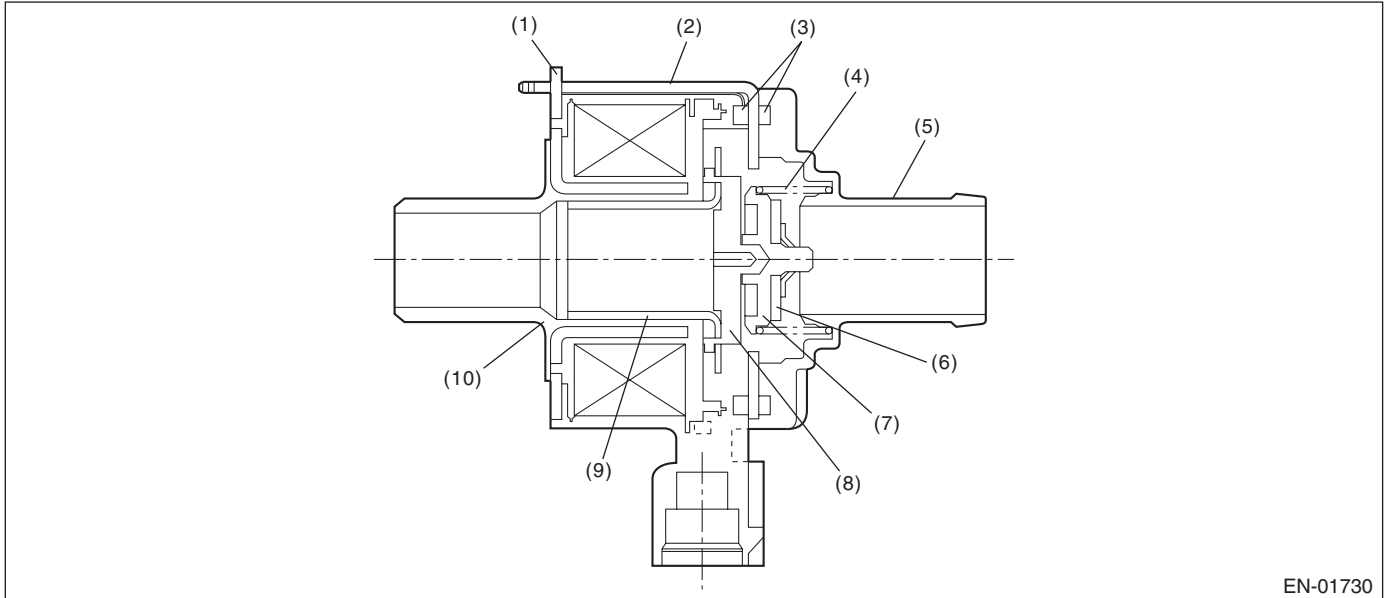
BK:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

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



EN-01730

- | | | |
|--------------------|----------------|------------------|
| (1) Magnetic plate | (5) Valve seat | (8) Retainer |
| (2) Yoke | (6) Valve | (9) Movable core |
| (3) gasket | (7) Plate | (10) Bobbin |
| (4) Spring | | |

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 Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

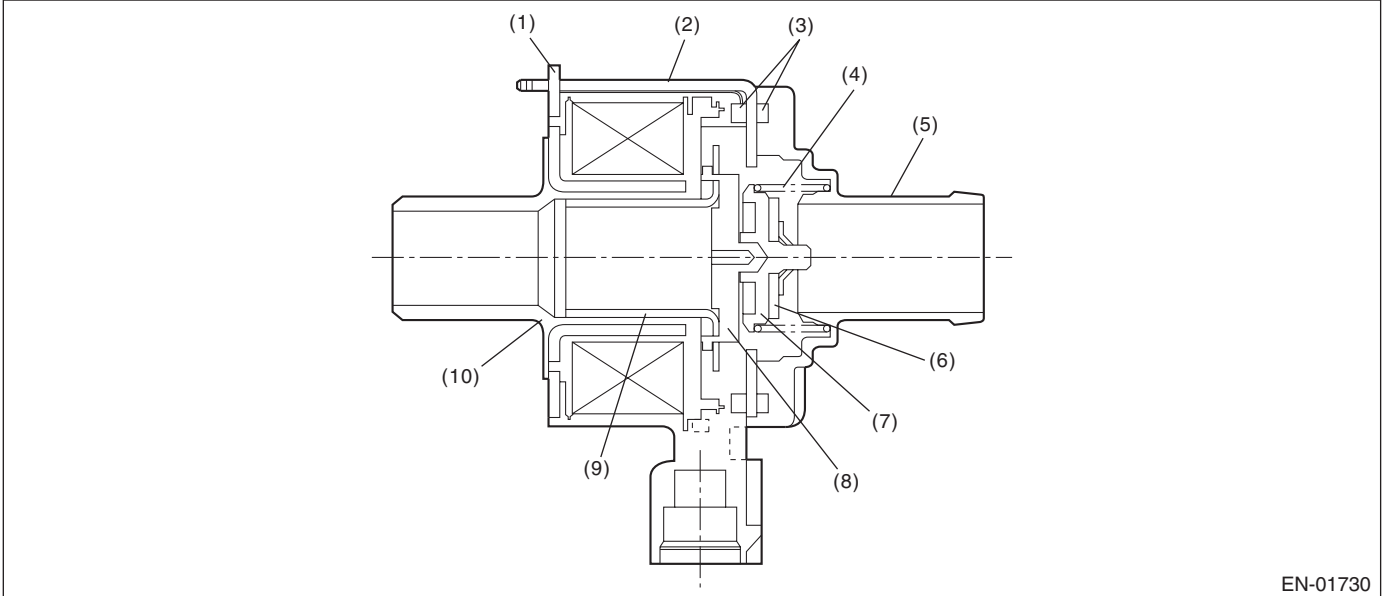
BL:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

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



EN-01730

- | | | |
|--------------------|----------------|------------------|
| (1) Magnetic plate | (5) Valve seat | (8) Retainer |
| (2) Yoke | (6) Valve | (9) Movable core |
| (3) gasket | (7) Plate | (10) Bobbin |
| (4) Spring | | |

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 Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

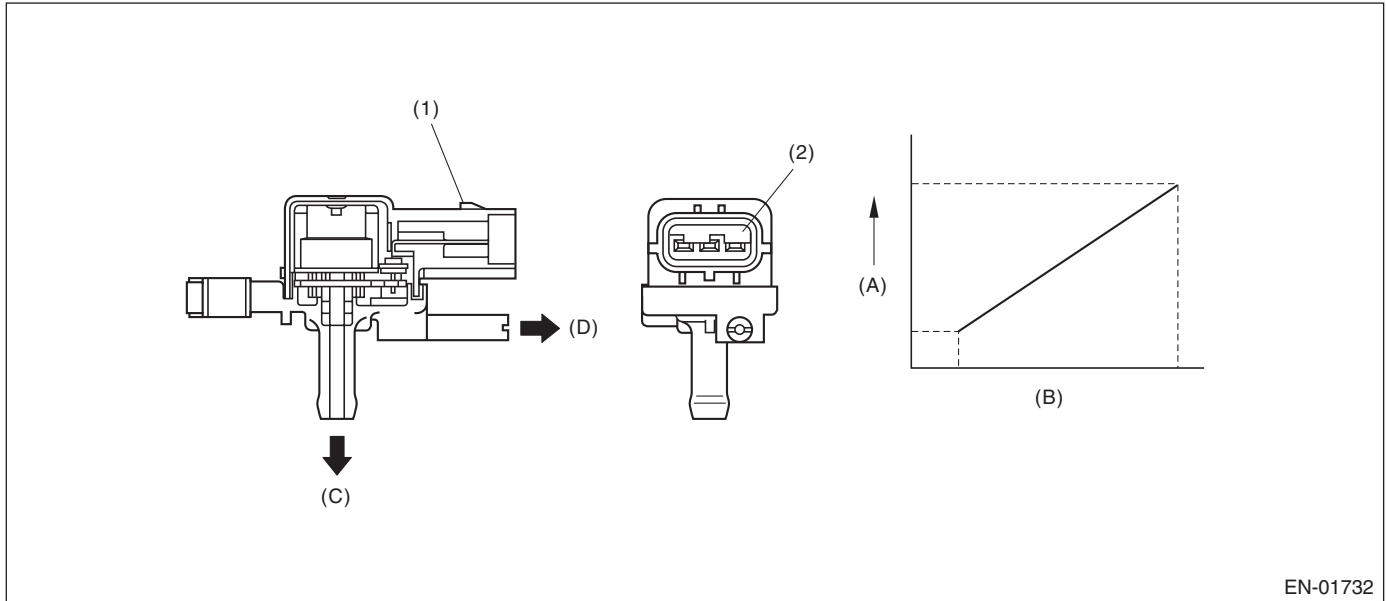
BM:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

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-01732

- (1) Connector
- (2) Terminals

- (A) Output voltage
- (B) Input voltage

- (C) To fuel tank
- (D) To tank pressure control solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	60 seconds or more
Fuel level	$\geq 9 \ell$ (2.38 US gal, 1.98 Imp gal)
Fuel temperature	$< 35^{\circ}\text{C}$ (95°F)
Battery voltage	$\geq 10.9 \text{ V}$
Atmospheric pressure	$> 75.1 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Purge control solenoid valve ON/OFF	Experienced

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously after 60 seconds or more have passed since the engine started.
- Be sure to check the fuel level and fuel temperature.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Number of times the difference between the Max. fuel level and the Min. fuel level every 60 seconds is 2 ℓ (0.53 US gal, 0.44 Imp gal) or more (with enable condition completed)	≥ 16 times
Maximum - Minimum Tank Pressure (with enable condition completed)	< 0.05 kPa (0.375 mmHg, 0.02 inHg)
Maximum - Minimum Fuel Temperature (with enable condition completed)	≥ 7°C (44.6°F)

If the maximum value – minimum value for the fuel level every 60 seconds is less than 2 liters, extend 60 seconds and make judgment with the maximum and minimum values for the fuel level in 120 seconds. If a difference does not appear though the time was extended 60 seconds, extend the time (180, 240, 300 seconds) and continue the judgment. If the maximum value – minimum value for the fuel level is 2 ℓ or more, the diagnosis counter counts up.

Time Needed for Diagnosis: 1 second × 16 times or more

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Maximum - minimum tank pressure	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixed mode is prohibited.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

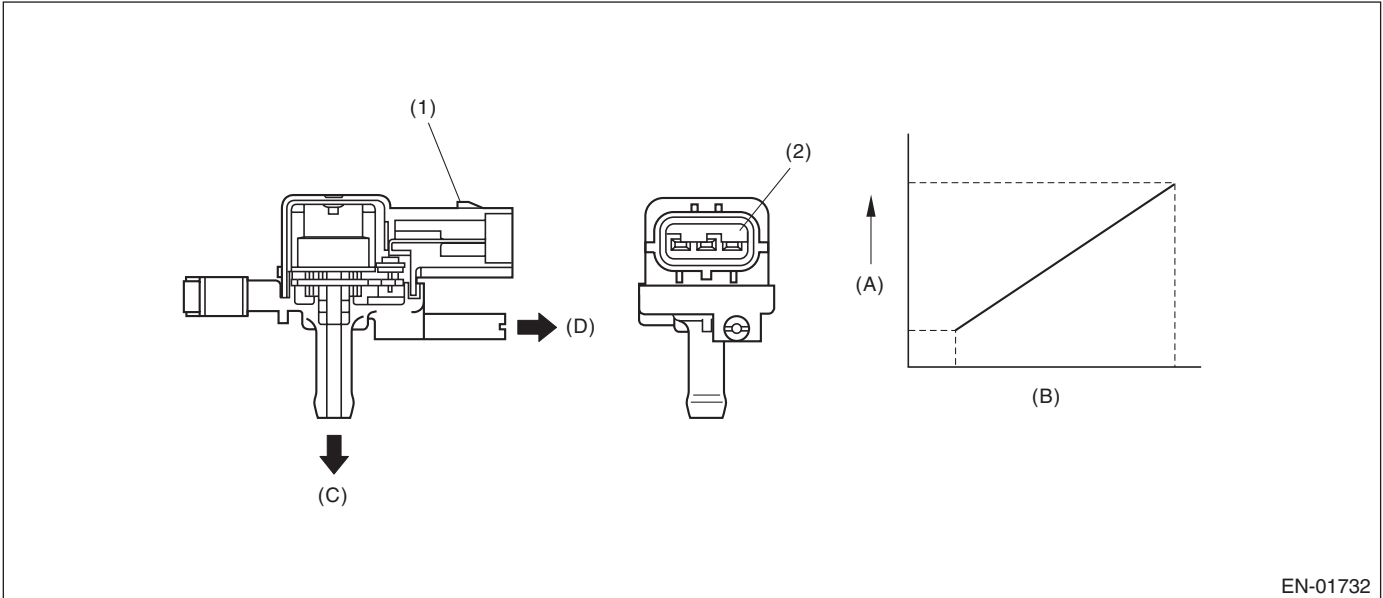
GENERAL DESCRIPTION

BN: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-01732

- (1) Connector
- (2) Terminals

- (A) Output voltage
- (B) Input voltage

- (C) To fuel tank
- (D) To tank pressure control solenoid

3. ENABLE CONDITION (NORMAL ON HIGH SIDE / USED ONLY FOR MALFUNCTION JUDGMENT)

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 Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 15 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< -7.45 kPa (-55.85 mmHg, -2.20 inHg)

Time Needed for Diagnosis: 15 seconds

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

Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ -7.33 kPa (-55 mmHg, -2.17 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixed mode is prohibited.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

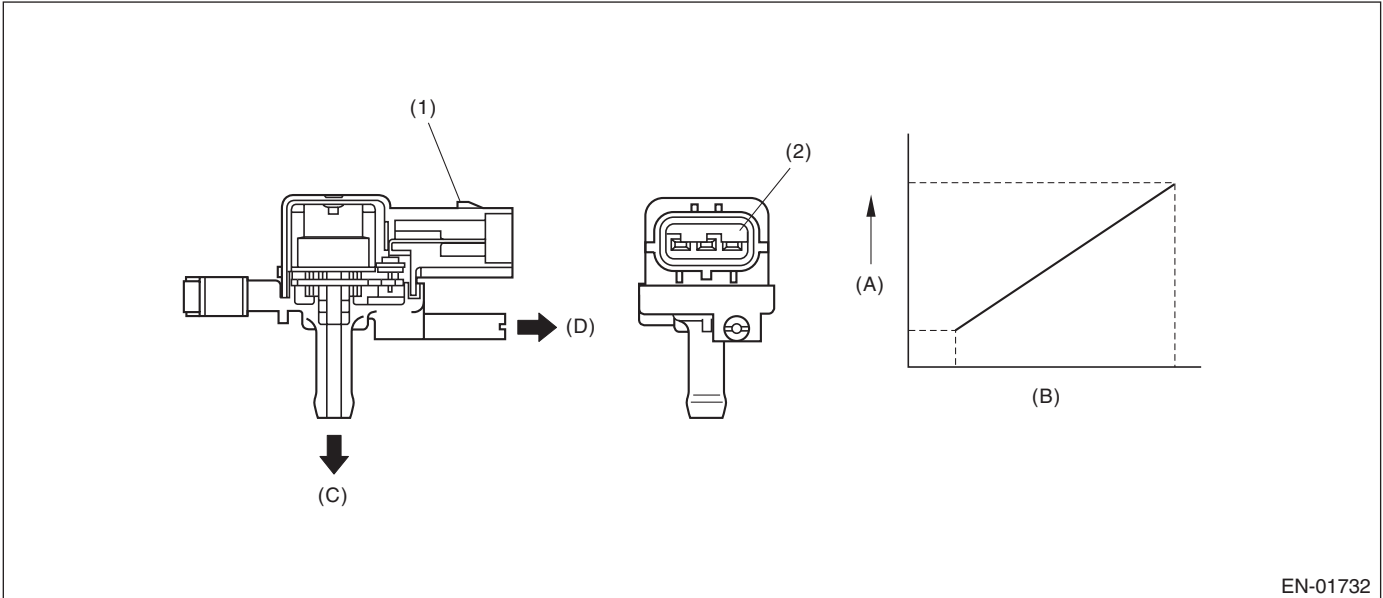
GENERAL DESCRIPTION

BO: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-01732

- (1) Connector
- (2) Terminals

- (A) Output voltage
- (B) Input voltage

- (C) To fuel tank
- (D) To tank pressure control solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≥ 2 km/h (1.24 MPH)
All conditions of EVAP canister purge	Completed
Learning value of evaporation gas density	≤ 0.08
Main feedback compensation coefficient	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis when purging.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 15 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.98 kPa (59.85 mmHg, 2.36 inHg)
Fuel temperature	< 35°C (95°F)
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)

Time Needed for Diagnosis: 15 seconds

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

Normality Judgment

Judge as OK if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< 7.33 kPa (55 mmHg, 2.17 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixed mode is prohibited.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

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

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0442 Evaporative system (Small leak).

<Ref. to GD(STI)-128, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0442 Evaporative system (Small leak).

<Ref. to GD(STI)-128, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

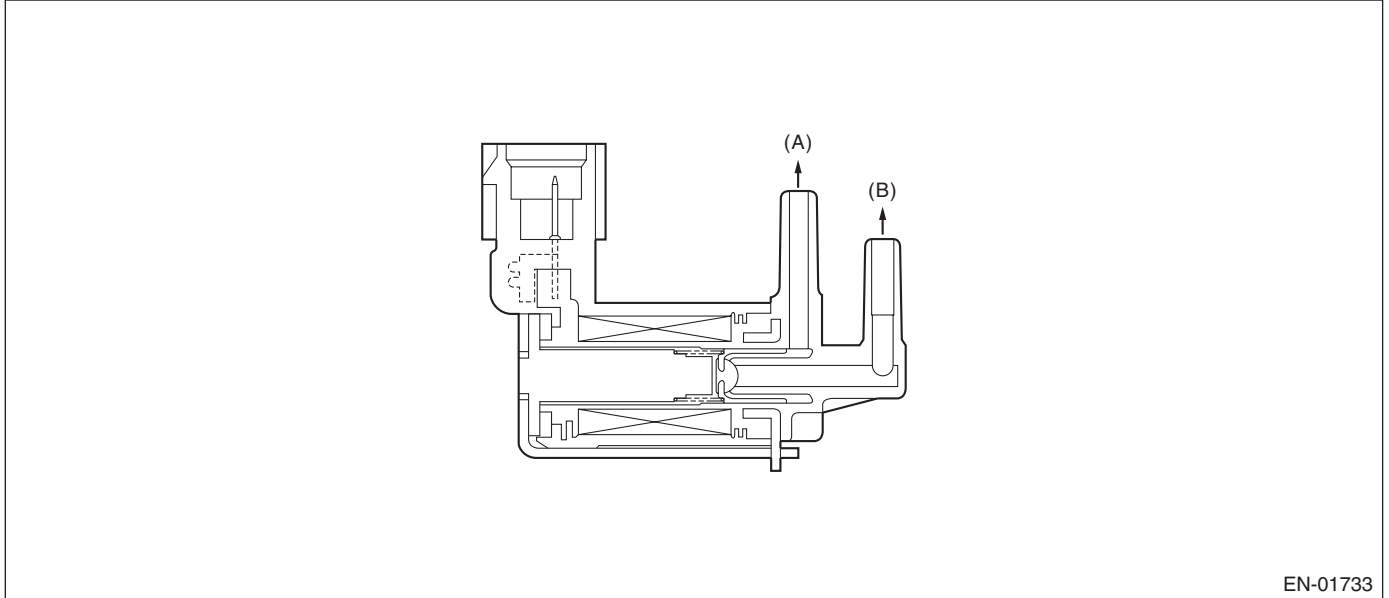
BR:DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

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 intake manifold

(B) To canister

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time with the following conditions established:	≥ 2.5 seconds
Duty ratio of "ON"	< 75%
Terminal output voltage	Low

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

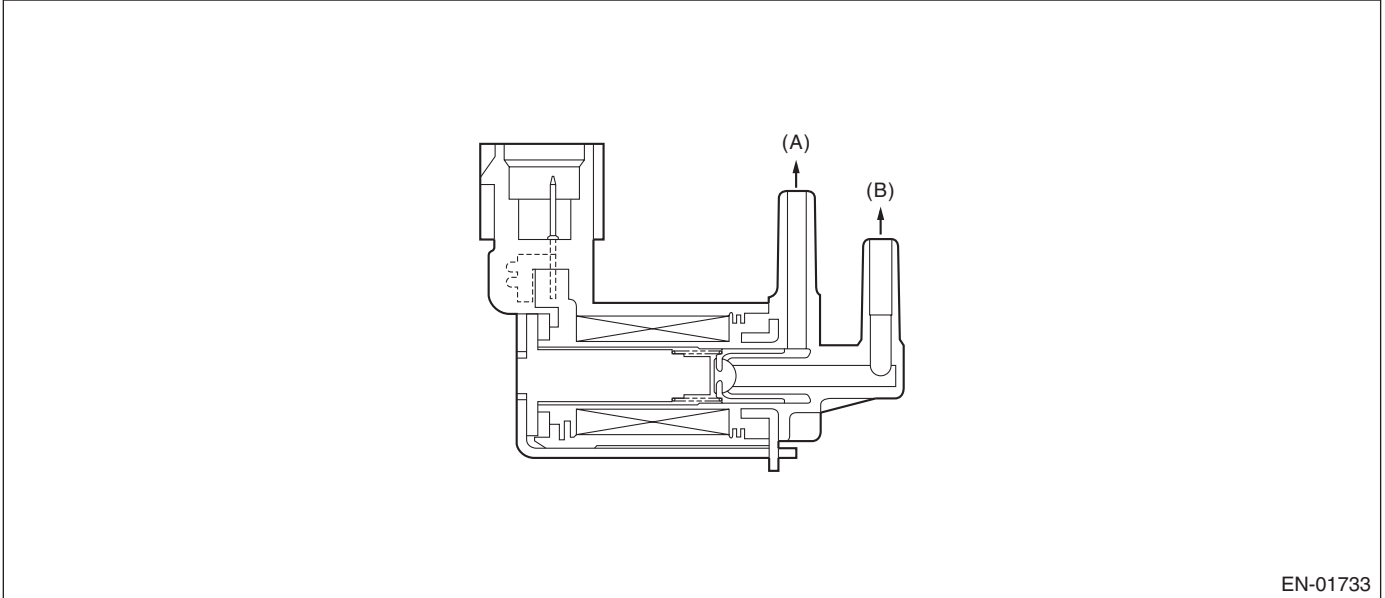
BS:DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

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



EN-01733

(A) To intake manifold

(B) To canister

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time with the following conditions established:	≥ 2.5 seconds
Duty ratio of "ON"	≥ 25%
Terminal output voltage	High

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

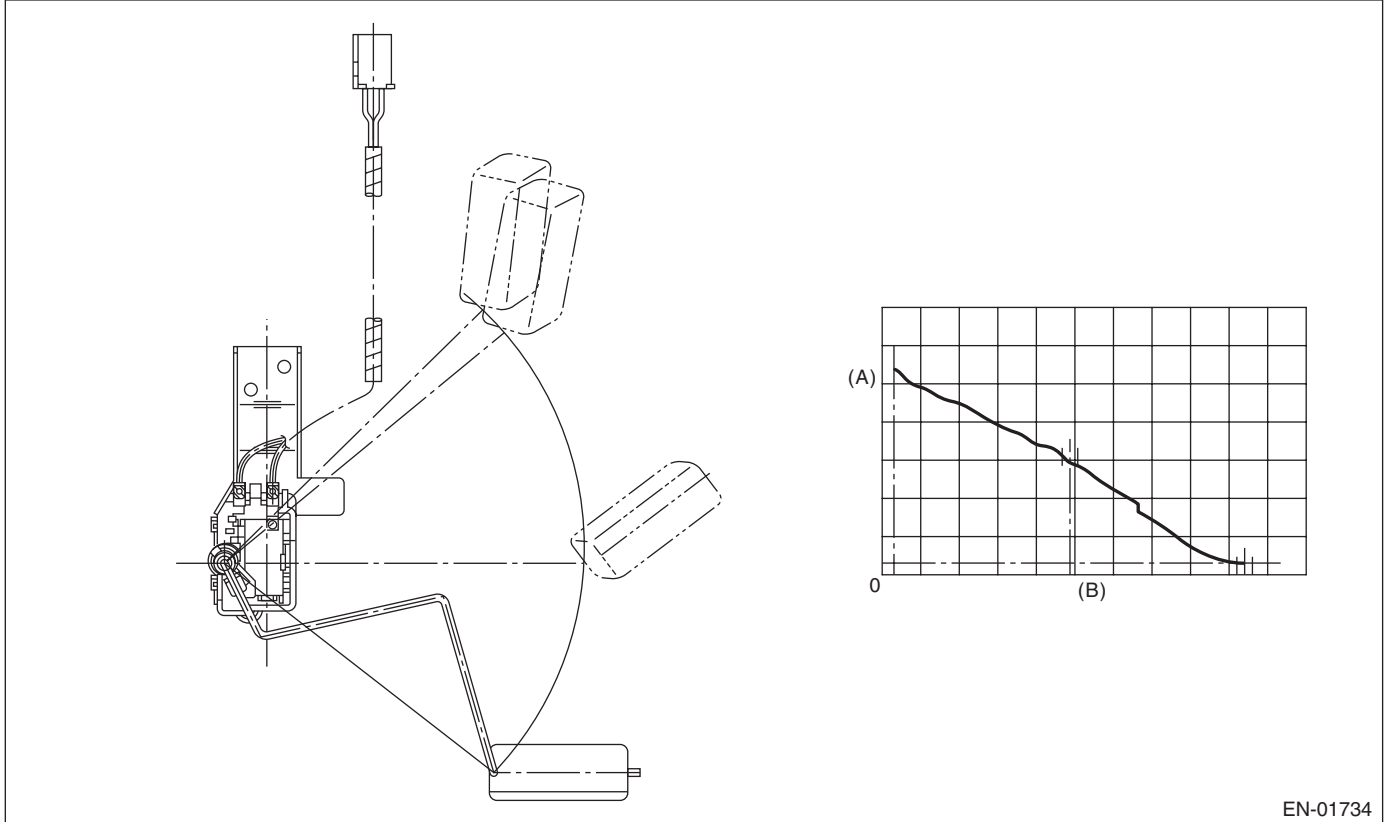
BT:DTC P0461 FUEL LEVEL SENSOR "A" CIRCUIT RANGE/PERFORMANCE

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 Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max. – min. values of fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine starting	5 seconds or more

Time Needed for Diagnosis: Undetermined

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max. – min. values of fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine starting	5 seconds or more

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

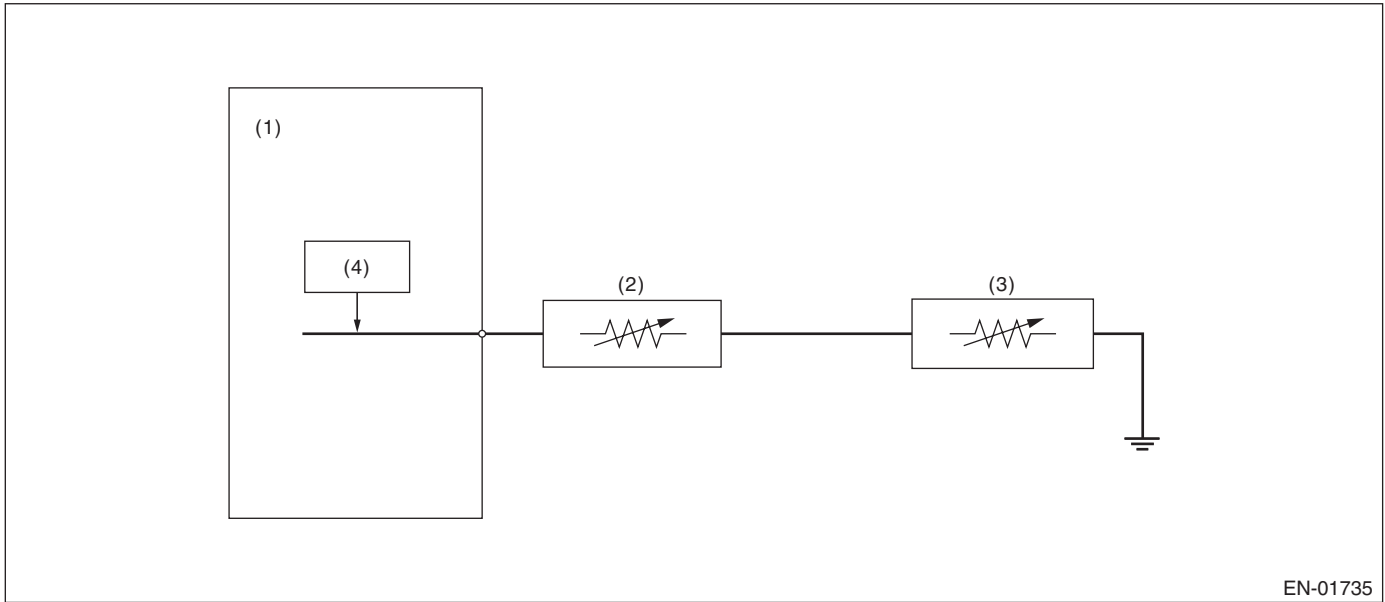
GENERAL DESCRIPTION

BU: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)

(3) Fuel sub level sensor

(4) Detecting circuit

(2) Fuel level sensor

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 Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes time needed for diagnosis (2.5 seconds) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 0.035 V

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 0.035 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

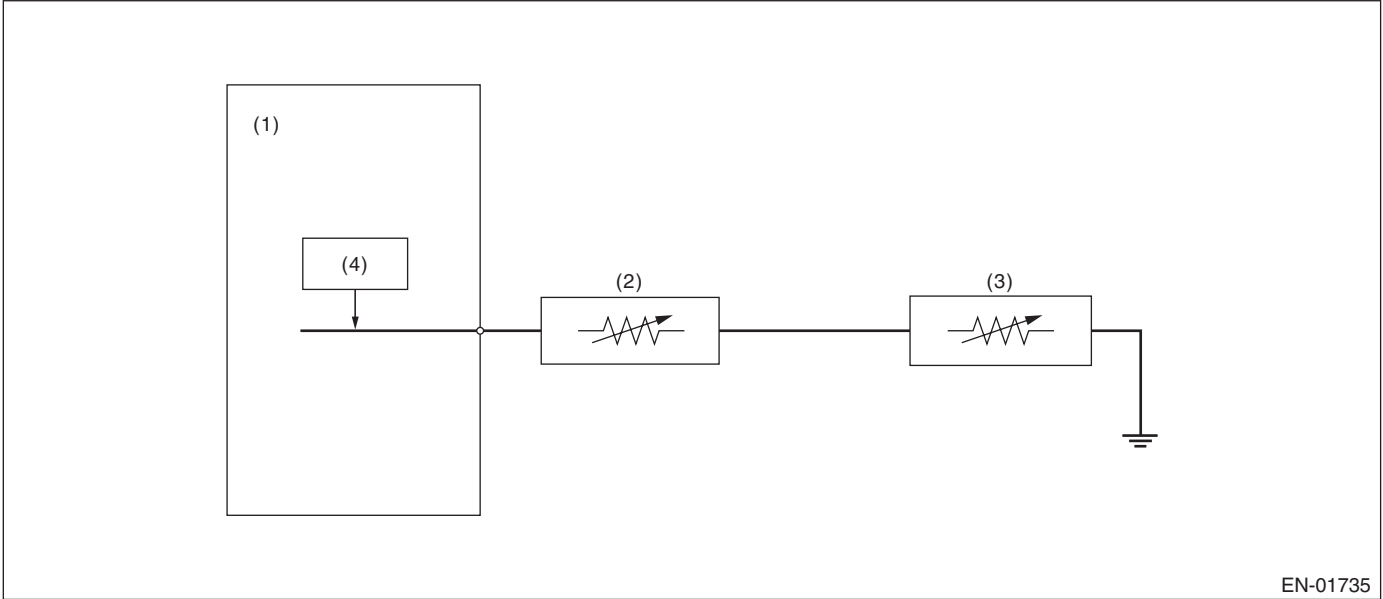
GENERAL DESCRIPTION

BV: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)

(3) Fuel sub level sensor

(4) Detecting circuit

(2) Fuel level sensor

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 Judgment

Judge as NG when the continuous time of completing the malfunction criteria below exceeds the time needed for diagnosis (1 second).

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 4.911 V

Time Needed for Diagnosis: 1 second

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 4.911 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BW: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
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9 ↔ 51 ℓ (2.4 ↔ 13.4 US gal, 1.98 ↔ 11.2 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

3. GENERAL DRIVING CYCLE

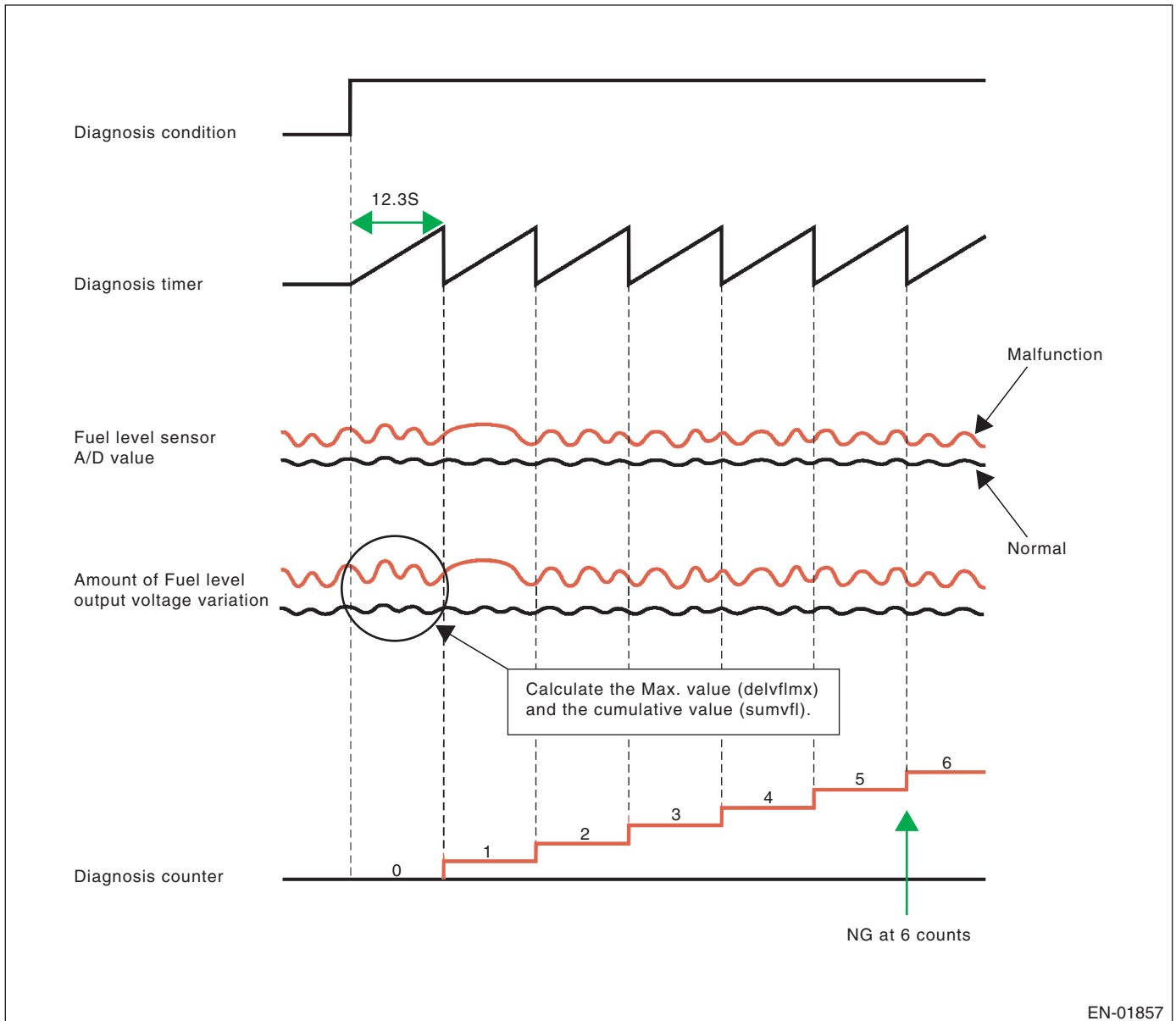
- Always perform the diagnosis continuously at idle speed.
- Pay attention to the fuel level.

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 12.3 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 6 counts.



EN-01857

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, DELFLMAX ≥ 0.228 — 0.748 V or SUMFL ≥ 21.8 V At that time, DELFLMAX: Maximum difference of sensor output for 12.3 seconds; SUMFL: Integrated value of the sensor output deviation for 12.3 seconds	≥ 4 times

The diagnosis counter does not count up when the following conditions are completed within 12.3 seconds.

Maximum value – minimum value of change of tank pressure during 12.3 seconds	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)
Maximum value – minimum value of battery voltage during 12.3 seconds	≥ 0.27 V

Time Needed for Diagnosis: 12.3 seconds \times 4 times

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
DELFLMAX	< 0.228 V
SUMFL	< 21.8 V
At this point, DELFLMAX: maximum deviation of sensor output for 12.3 seconds SUMFL: calculated value of sensor output deviation for 12.3 seconds	

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BX:DTC P0483 FAN RATIONALITY CHECK

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.

Judge as NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

2. ENABLE CONDITION

Diagnostic enable condition is established if the radiator fan changes from OFF → ON when all of the conditions below are met.

When one of the conditions below is not met, the diagnostic enable condition is not established.

Secondary Parameters	Enable Conditions
Engine speed	550 — 950 rpm
Idle switch	ON
Vehicle speed	0
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the radiator fan changes from OFF → ON when idling.

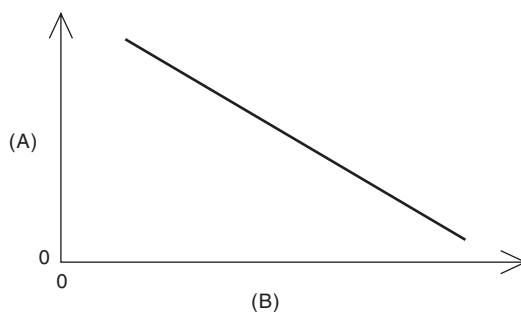
4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 5 minutes or more.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 96°C (204.8°F)
Radiator fan	OFF → ON
Engine coolant temperature	Does not decrease



EN-01737

(A) engine coolant temperature °C (°F) (B) A/D value (V)

Time Needed for Diagnosis: 5 minutes

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

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Radiator fan	OFF → ON
Engine coolant temperature	Decreases

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BY:DTC P0502 VEHICLE SPEED SENSOR “A” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the vehicle speed sensor. Judge as NG when the vehicle speed remains low (0 km/h (0 MPH)) under the condition that the vehicle is running at a certain speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4,000 rpm
Deceleration fuel cut	In operation
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously during deceleration fuel cut.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes four seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1

Time Needed for Diagnosis: 4 seconds

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

Normality Judgment

Judge as OK and clear the NG when all of the following criteria are established.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 1
Starter switch	OFF
Time when the starter switch turns ON → OFF	≥ 3 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Accelerator sensor signal process: Not allowed fully closed point learning. (Hold previous value)
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Open loop compensation is set to the specified value (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Both main and sub fans are in high driving.
- Gear ratio judgment: Control as fixed in sixth gear
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BZ:DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the vehicle speed sensor. Judge as NG when the vehicle speed remains high (240 km/h (149.1 MPH)) under the condition that the vehicle is running at a certain speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4,000 rpm
Deceleration fuel cut	In operation
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously during deceleration fuel cut.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes four seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 300 km/h (186 MPH)

Time Needed for Diagnosis: 4 seconds

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

Normality Judgment

Judge as OK and clear the NG when all of the following criteria are established.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 300 km/h (186 MPH)
Starter switch	OFF
Time when the starter switch turns ON → OFF	≥ 3 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Accelerator sensor signal process: Not allowed fully closed point learning. (Hold previous value)
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Open loop compensation is set to the specified value (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Both main and sub fans are in high driving.
- Gear ratio judgment: Control as fixed in sixth gear
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CA: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	≥ 70°C (158°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback of ISC	In operation
Lambda value	0.90 ↔ 1.1
After switching air conditioner to ON/OFF	5 seconds or more
After intake manifold pressure changes by 4 kPa (30 mmHg, 1.2 inHg) or more.	> 5 seconds
After neutral switch ON/OFF change	> 5 seconds
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 Judgment

Judge as NG when the continuous time of completing the malfunction criteria below is 10 seconds × 3 times.

Judgment Value

Malfunction Criteria	Threshold Value
Actual - target engine speed	< -100 rpm
Feedback value for ISC	Max.

Time Needed for Diagnosis: 10 seconds × 3 times

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

Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes the time needed for diagnosis (10 seconds) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Actual - target engine speed	≥ -100 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel
- Knock compensation:
 - Knock compensation final advance/retard angle value = knock compensation value + whole learning compensation value + portional learning compensation value
 - When normal: Knock compensation value = Fixed at 0°CA
 - Failure: Knock compensation value ≠ Fixed at 0° CA (When knock: Max. 12°CA retard)
 - Whole learning compensation coefficient update not allowed
 - Portional learning zone compensation value calculation not allowed.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CB: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	≥ 70°C (158°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback of ISC	In operation
Lambda value	0.90 ←→ 1.1
After switching air conditioner to ON/OFF	5 seconds or more
After intake manifold pressure changes by 4 kPa (30 mmHg, 1.2 inHg) or more.	> 5 seconds
After neutral switch ON/OFF change	> 5 seconds
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 Judgment

Judge as NG when the continuous time of completing the malfunction criteria below is 10 seconds × 3 times.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	≥ 200 rpm
Feedback value for ISC	Min.

Time Needed for Diagnosis: 10 seconds × 3 times

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

Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes the time needed for diagnosis (10 seconds) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel
- Knock compensation:
 - Knock compensation final advance/retard angle value = knock compensation value + whole learning compensation value + portional learning compensation value
 - When normal: Knock compensation value = Fixed at 0°CA
 - Failure: Knock compensation value ≠ Fixed at 0° CA (When knock: Max. 12°CA retard)
 - Whole learning compensation coefficient update not allowed
 - Portional learning zone compensation value calculation not allowed.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CC: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.

Judge as OFF NG when the engine starts without starter experience.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as ON NG when the continuous time of meeting the malfunction criteria below becomes 3 minutes or more.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	> 500 rpm
Starter switch	ON
Battery voltage	> 8 V

Time Needed for Diagnosis: 180 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	OFF
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CD: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

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 in the table above are established.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CE:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunctions that the engine speed continues to rise during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Feedback of ISC	In operation
Vehicle speed	< 12 km/h (7.46 MPH)
After engine starting	1 second or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously if the vehicle speed is at less than 4 km/h (2.49 MPH).

4. DIAGNOSTIC METHOD

Abnormality Judgment 1

Judge as NG when the continuous time of meeting the all malfunction criteria below becomes the time needed for diagnosis (2 seconds) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed - Targeted engine speed	$\geq 1,500$ rpm
Feedback value for ISC	$\leq 0\%$
Engine speed change every 180 degree engine rev.	≥ -5 rpm

Time Needed for Diagnosis: 2 seconds

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

Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting all the malfunction criteria below becomes the time needed for diagnosis (5 seconds) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed - Targeted engine speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Fuel cut: Cuts off fuel only #1 and #2 cylinders, or for all cylinders according to vehicle speed, engine speed, and throttle position.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of microcomputer (RAM). Judge as NG when the sum of all cleared RAM is not 0000 after zero-clearing all the usual RAM area in the initial routine.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	OFF → ON

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

Judge as NG if the criteria below are met. Judge as OK and clear the NG if the conditions are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Sum of the RAM data after the data clear	Cannot be read out.

Time Needed for Diagnosis: Undetermined

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

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CG: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 Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
SUM value of ROM	Standard

Time Needed for Diagnosis: Undetermined

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

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

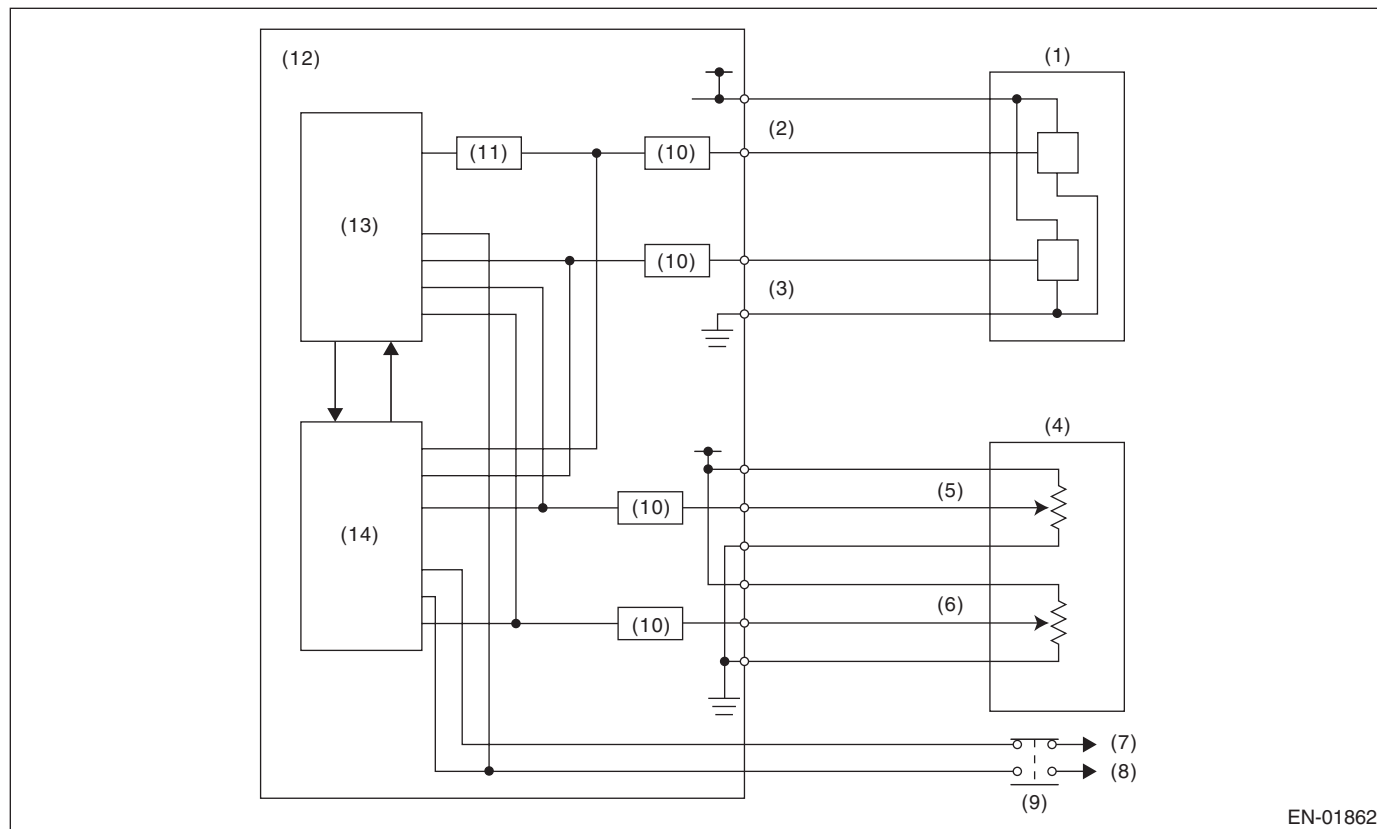
CH:DTC P0607 CONTROL MODULE PERFORMANCE

1. OUTLINE OF DIAGNOSIS

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

- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator pedal position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU \leftrightarrow sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the opening angle sent from the main CPU is abnormal

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
(2) Ignition switch	ON
(3) None	—
(4) None	—
(5) Throttle opening angle	
(6) Brake switch (only with cruise control)	ON
(7) None	—
(8) Cruise control	OFF

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.
- (8): Always perform the diagnosis continuously when the cruise control pedal is not operating.

5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
(1) Difference of CPU reading value of the throttle position sensor signal	Within 0.858 V
(2) Difference of CPU read value of the accelerator pedal position sensor signal	Within 0.038 V
(3) WD pulse from sub CPU	WD pulse occur
(4) Communication between CPU	Possible to communicate
(5) Difference of signal on connection of amplifier	within 4 times $\pm 3^\circ$
(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. 250 milliseconds
- 2. 250 milliseconds
- 3. 200 milliseconds
- 4. 200 milliseconds
- 5. 24 milliseconds
- 6. 250 milliseconds
- 7. 200 milliseconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

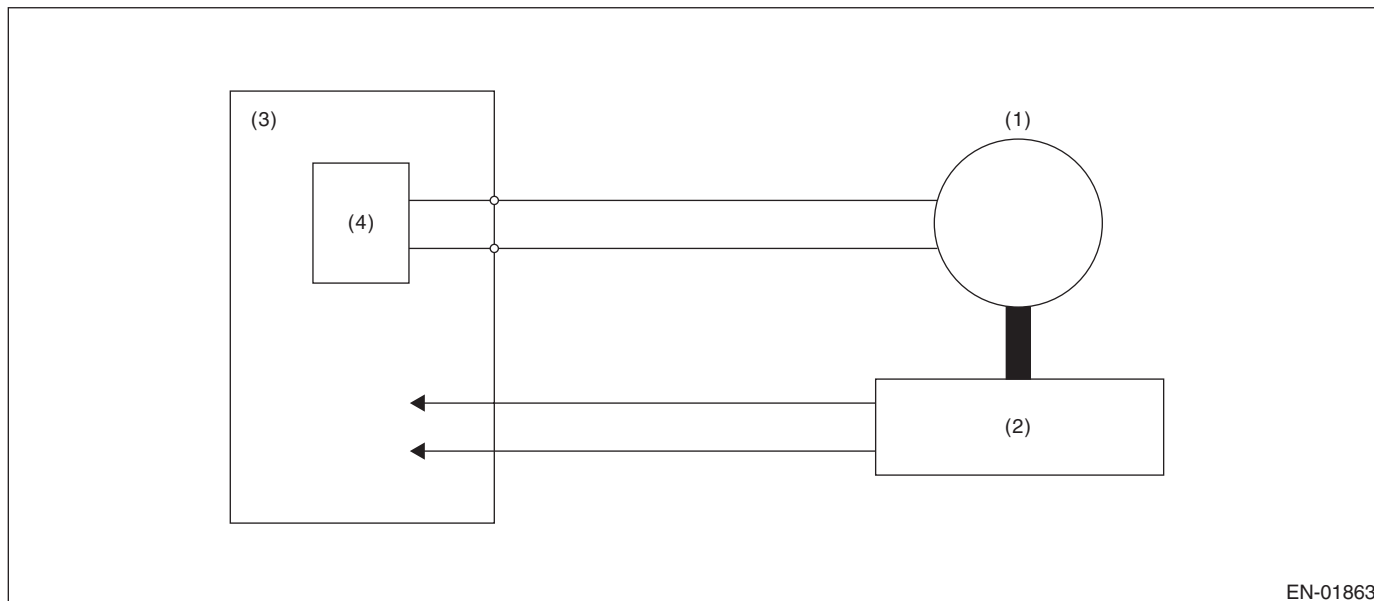
GENERAL DESCRIPTION

CI: 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
(2) Throttle position sensor
(3) Engine control module (ECM)
(4) Drive circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Normal operation of electronic throttle control	ON

4. GENERAL DRIVING CYCLE

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

5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	3.5° or less
Output duty to drive circuit	95% or less

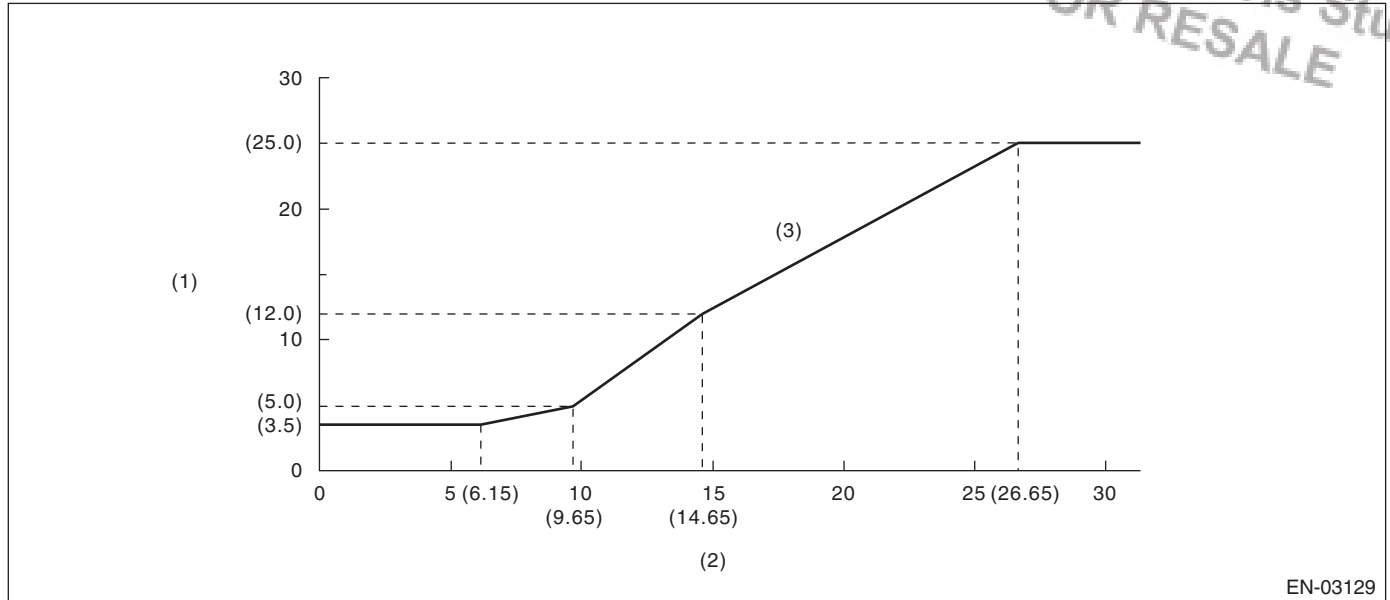
Time Needed for Diagnosis:

- Target opening angle and actual opening angle: 250 milliseconds (For NG) 2,000 milliseconds (For OK)
- Output duty to drive circuit: 2,000 milliseconds

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

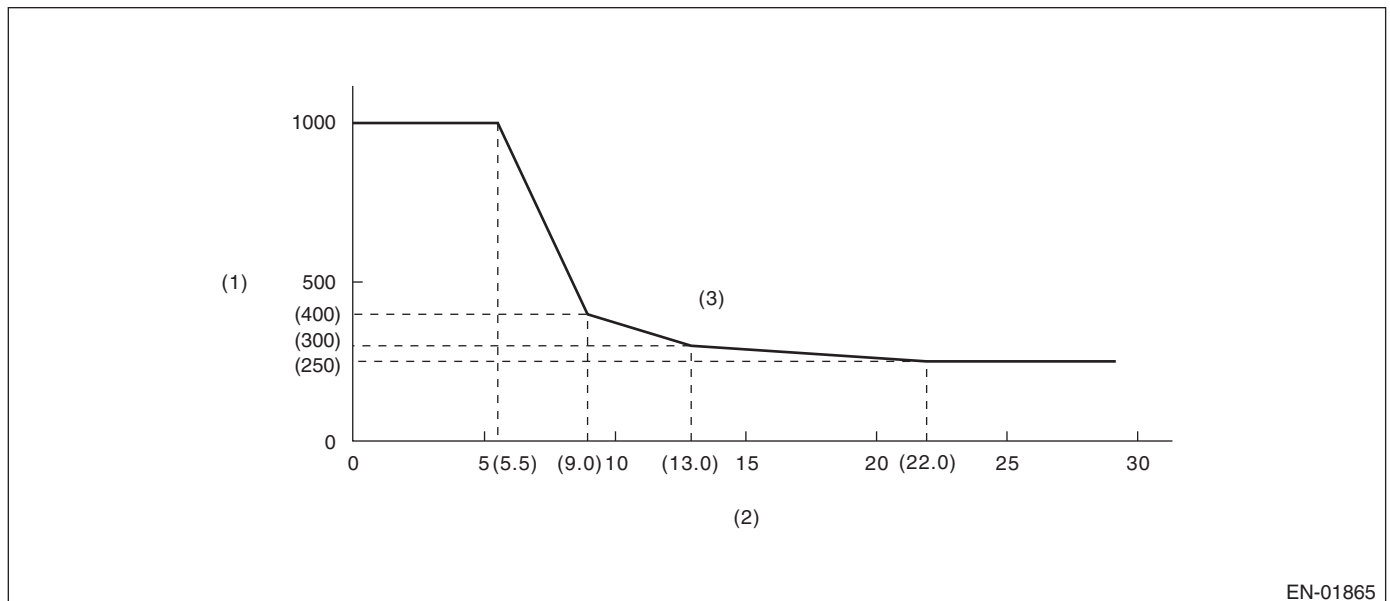
Details of Judgment Value



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- (1) Difference between target opening angle and actual opening angle (°) (2) Target throttle opening angle (°) (3) NG area

Details of Judgment time (The actual opening angle ≤ target opening angle is always 1,000 milliseconds)



EN-01865

- (1) Judgment time (milliseconds) (2) Throttle position sensor 1 opening angle (3) NG area

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CJ:DTC P0691 FAN 1 CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of radiator fan circuit.

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

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs OFF signal	High level

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CK:DTC P0692 FAN 1 CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of radiator fan circuit.

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

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs ON signal	Low level

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CL:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge as NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in two seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge as NG when the malfunction criteria below are completed three times or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	Low continues.
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed = 64 km/h (40 MPH) & engine speed 1,600 — 2,550 rpm	

Time Needed for Diagnosis: 3 monitorings

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

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CM:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge as NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in two seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge as NG when the malfunction criteria below are completed three times or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	High continues.
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed = 64 km/h (40 MPH) & engine speed 1,600 — 2,550 rpm	

Time Needed for Diagnosis: 3 monitorings

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

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CN:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains low.

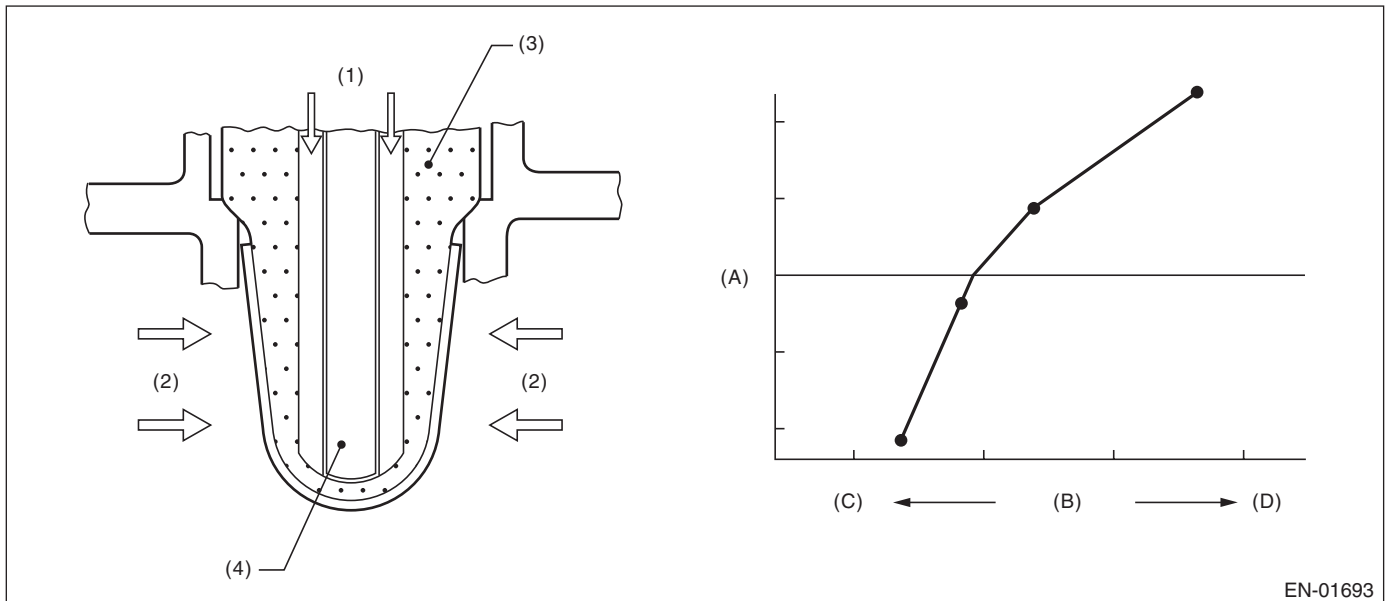
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

λ value = Actual air fuel ratio/Theoretical air fuel ratio

$\lambda > 1$: Lean

$\lambda < 1$: Rich

2. COMPONENT DESCRIPTION



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- (1) Atmosphere
- (2) Exhaust gas
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 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.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g/s
Load change during 0.5 engine revs.	≤ 0.02 g (0.001 oz)/rev
Front oxygen (A/F) sensor impedance	0 ↔ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more after 60 seconds have passed since the engine started.

5. DIAGNOSTIC METHOD

Judge as NG if the duration of time while the following criteria are met is the time needed for diagnosis (10 seconds) or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output λ value when rear oxygen sensor sub feedback compensation coefficient is not at maximum limit	≤ 0.85

Time Needed for Diagnosis: 10 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CO:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains high.

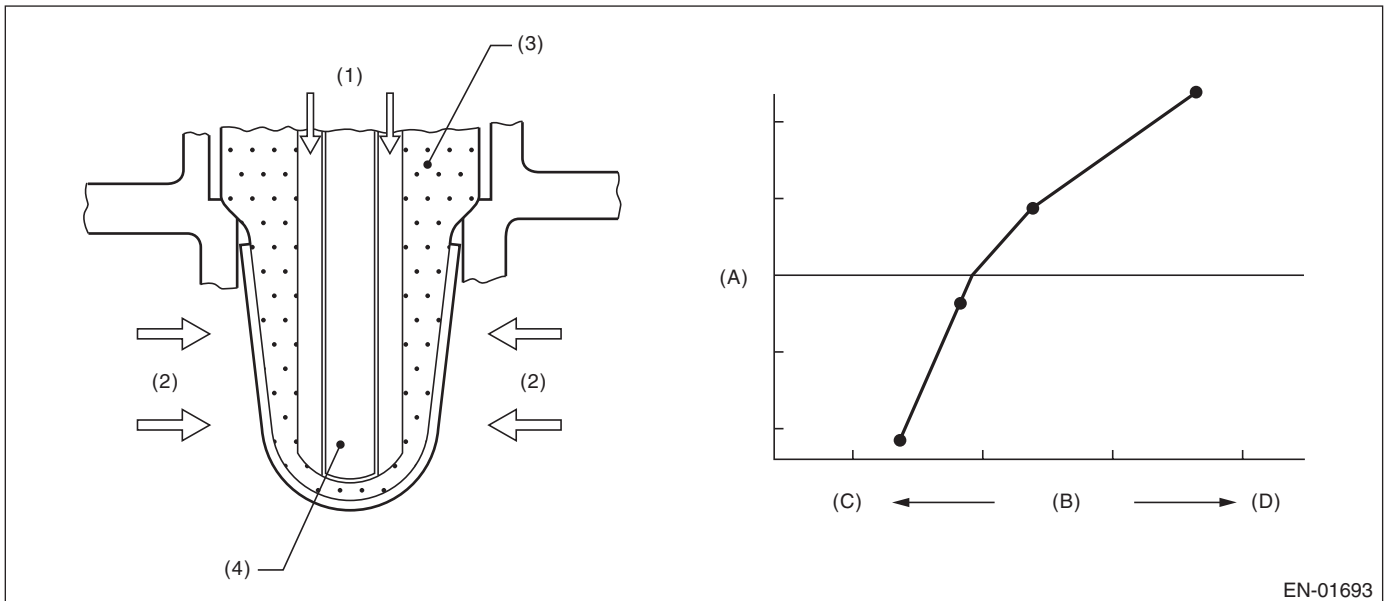
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

λ value = Actual air fuel ratio/Theoretical air fuel ratio

$\lambda > 1$: Lean

$\lambda < 1$: Rich

2. COMPONENT DESCRIPTION



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- (1) Atmosphere
- (2) Exhaust gas
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 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.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g/s
Load change during 0.5 engine revs.	≤ 0.02 g (0.001 oz)/rev
Front oxygen (A/F) sensor impedance	0 ↔ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant vehicle speed of 20 km/h (12 MPH) or more after 60 seconds have passed since the engine started.

5. DIAGNOSTIC METHOD

Judge as NG if the duration of time while the following criteria are met is the time needed for diagnosis (10 seconds) or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output λ value when rear oxygen sensor sub feedback compensation coefficient cannot be at minimum limit	≥ 1.15

Time Needed for Diagnosis: 10 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

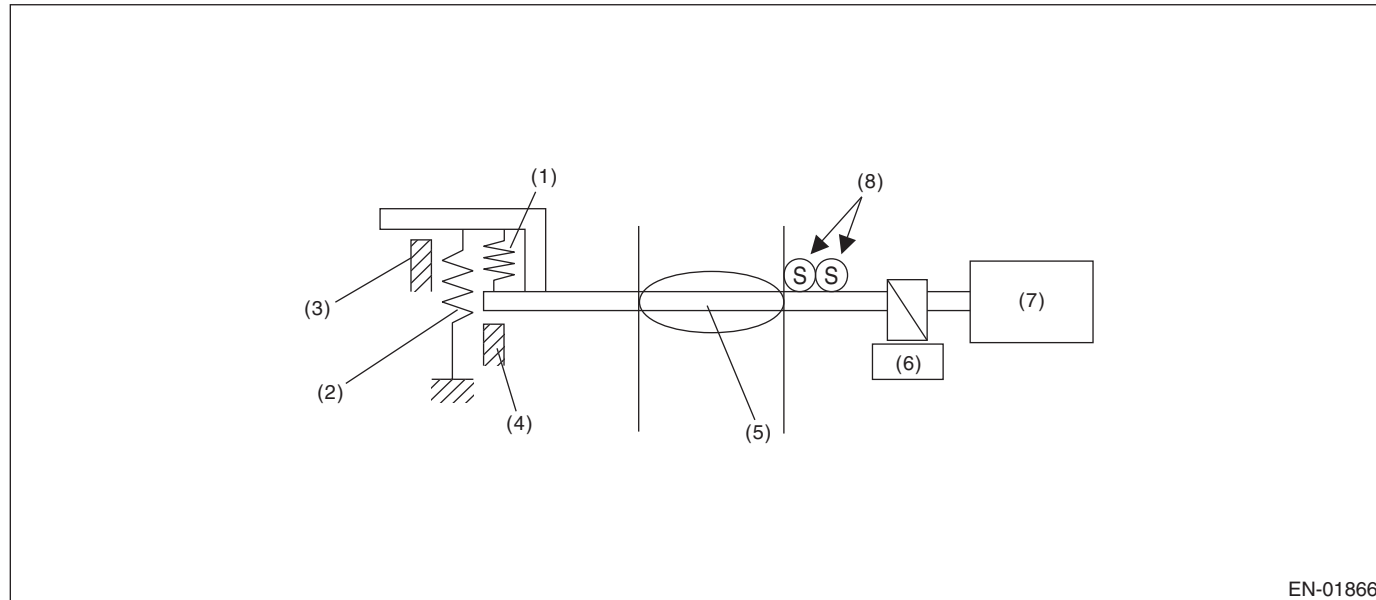
GENERAL DESCRIPTION

CP: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



- | | | |
|--------------------------|-------------------------|----------------------------------|
| (1) Opener spring | (4) Full closed stopper | (7) DC motor |
| (2) Return spring | (5) Throttle valve | (8) Main and sub throttle sensor |
| (3) Intermediate stopper | (6) Gear | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Motor continuity	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	< 2°

Time Needed for Diagnosis: 600 milliseconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

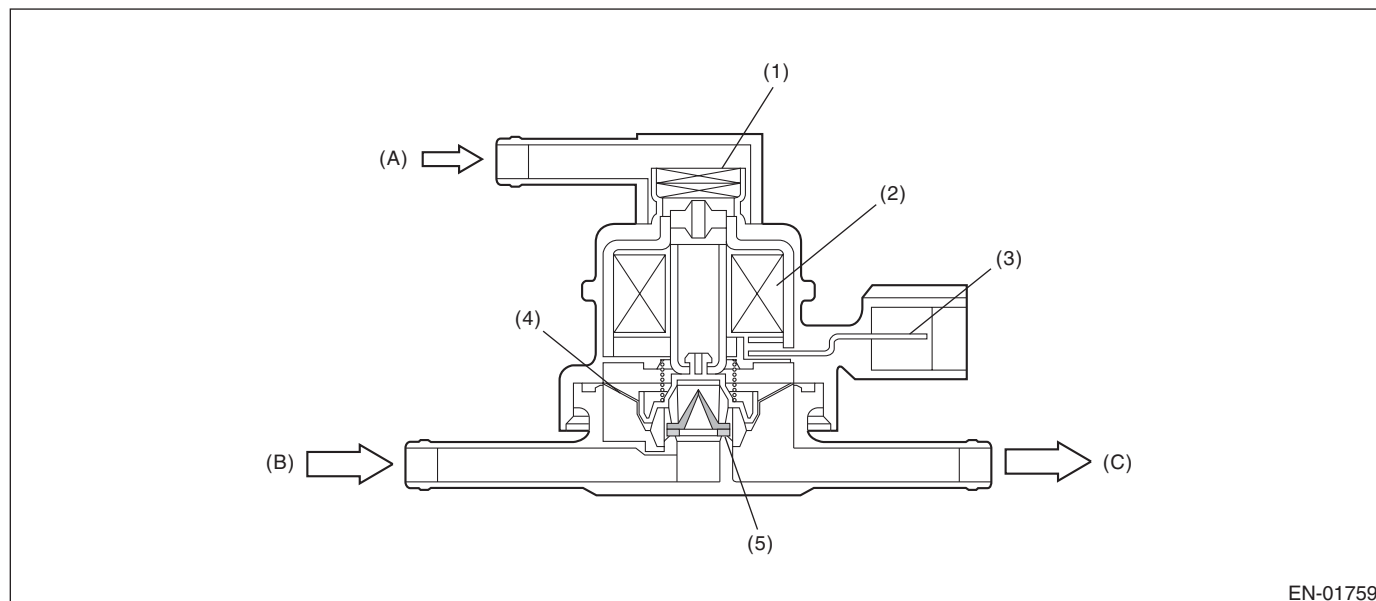
CQ:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

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



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- | | | |
|------------------------|---------------|--------------------------|
| (1) Filter | (4) Diaphragm | (A) Atmospheric pressure |
| (2) Coil | (5) Valve | (B) Shut-off valve |
| (3) Connector terminal | | (C) To fuel tank |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes time needed for diagnosis (2.5 seconds) or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

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

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CR:DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN

1. OUTLINE OF DIAGNOSIS

Always detect abnormality that both combination valve electromagnetic valve and the reed valve are open failure.

Calculate the integrated value of Max./Min. value and output voltage deviation of the secondary air delivery pipe pressure sensor output voltage in a given time after engine start. Judge as NG if the integrated value and the difference between Max. and Min. value are large.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 500 rpm
After engine starting	9 seconds or more
After secondary air system stop	9 seconds or more
Amount of intake air	2 g (0.07 oz)/second or more and Less than 400 g (14.11 oz)/seconds
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform continuous diagnosis when air flow amount is large during the secondary air pump stop after engine start.

4. DIAGNOSTIC METHOD

When both combination valve electromagnetic valve and the reed valve are open failure, the failure appears as pulses in the secondary air delivery pipe pressure sensor output. Detect abnormality by capturing these pulses using the following method.

Calculate Max./Min. value of the secondary air delivery pipe pressure sensor output voltage and the sum of the output voltage deviation for kCOTIM seconds. Compare the value of the difference between Max. and Min. value with threshold value and also compare the sum value with the threshold value. If the values exceed the threshold value, count up NG counter and then judge as NG if the counter reaches kCOCOT times. Judge as OK if neither exceeds the threshold value, or if either of the two exceeds the threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
Pipe inner pressure difference between Max. and Min.	≥ 0.015 V
Sum of the pipe inner pressure variation value every 4 milliseconds	≥ 4 V
Barometric pressure variation value	< 26.7 kPa (200 mmHg, 7.89 inHg)

Time Needed for Diagnosis: 2 seconds × 20 times

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

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CS:DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

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

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time of meeting the following conditions exceeds 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs ON signal	Low

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

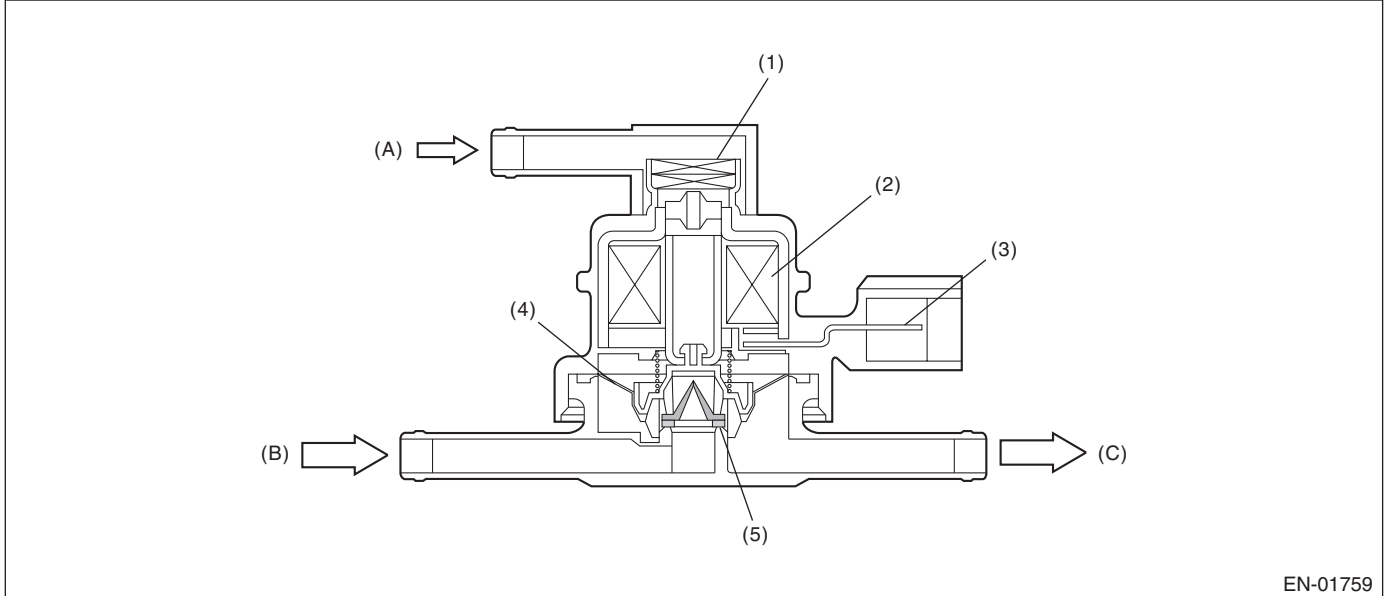
CT:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

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



- | | | |
|------------------------|---------------|--------------------------|
| (1) Filter | (4) Diaphragm | (A) Atmospheric pressure |
| (2) Coil | (5) Valve | (B) Shut-off valve |
| (3) Connector terminal | | (C) To fuel tank |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes time needed for diagnosis (2.5 seconds) or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

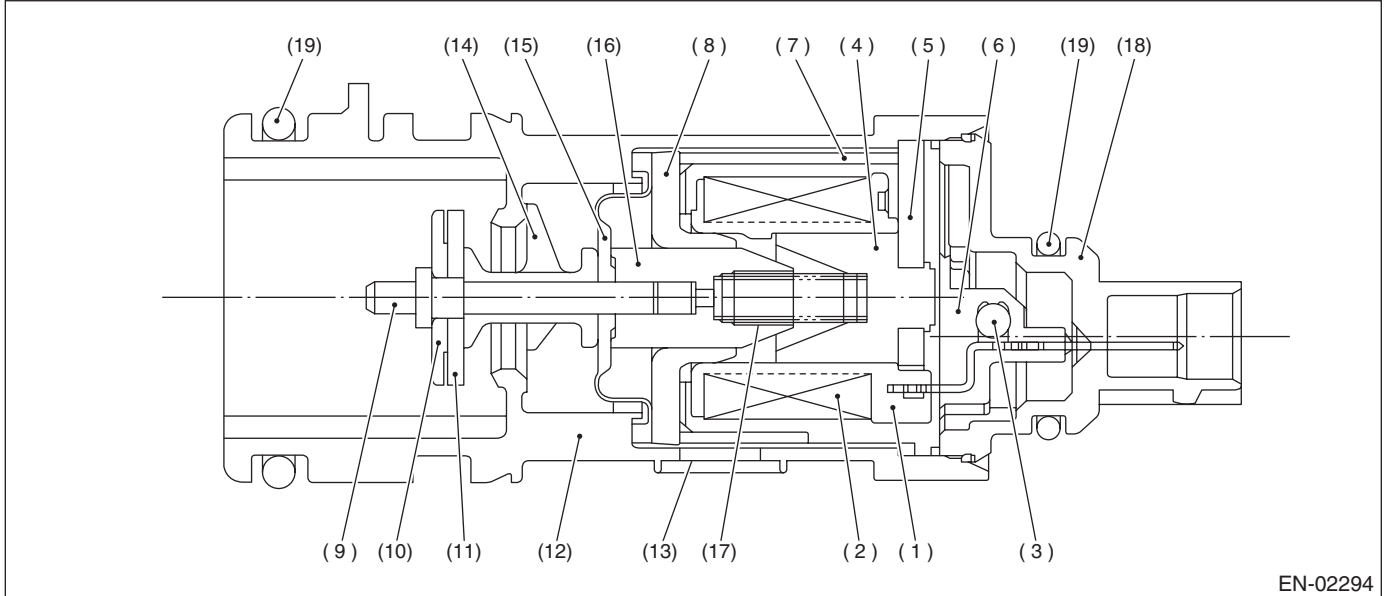
GENERAL DESCRIPTION

CU: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	$\geq 10.9 \text{ V}$
Atmospheric pressure	$\geq 75.0 \text{ kPa (563 mmHg, 22.17 inHg)}$
Tank pressure when starter is OFF → ON	$-0.67 \leftrightarrow 1.43 \text{ kPa (-5} \leftrightarrow 10.7 \text{ mmHg, -0.20} \leftrightarrow 0.42 \text{ inHg)}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes three seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≤ -4.0 kPa (-30 mmHg, -1.18 inHg)

Time Needed for Diagnosis: 3 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	> -4.0 kPa (-30 mmHg, -1.18 inHg)
Cumulative time when all the malfunction criteria below are met.	≥ 30 seconds
Purge control solenoid valve duty ratio	Not = 0
Fuel temperature	$-10 \leftrightarrow 45^\circ\text{C}$ ($14 \leftrightarrow 113^\circ\text{F}$)
Intake manifold relative pressure	≤ -26.7 kPa (-200 mmHg, -7.87 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

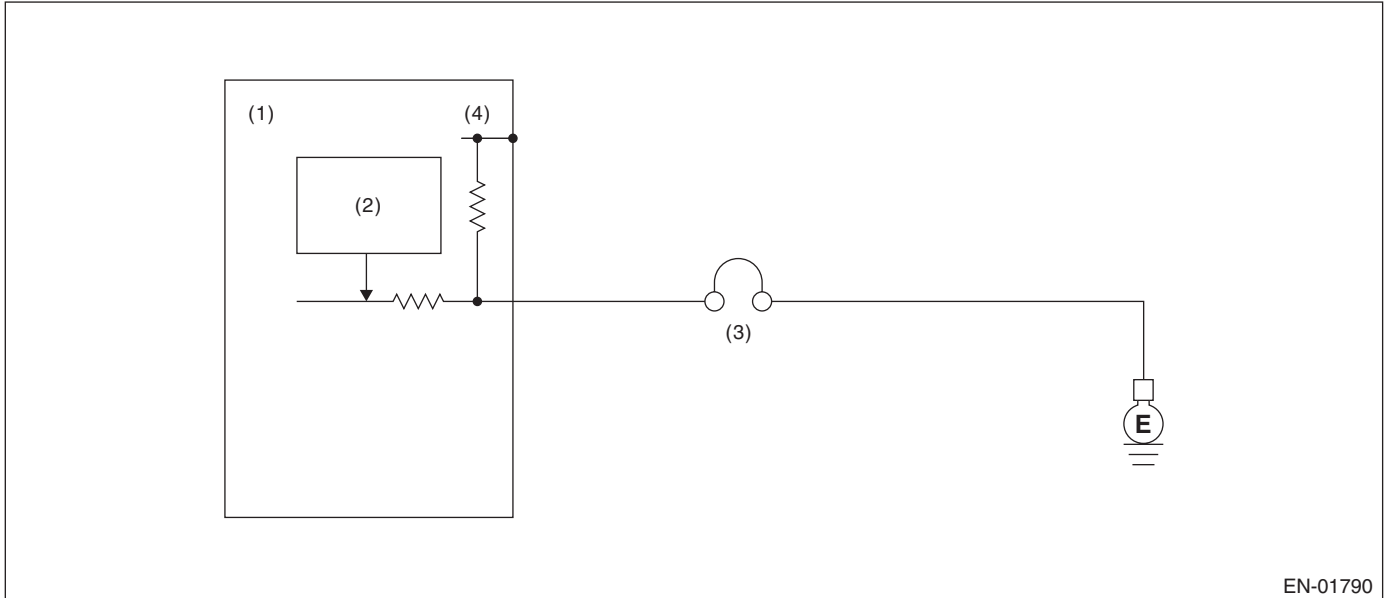
GENERAL DESCRIPTION

CV:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.
Judge as NG when the diagnosis terminal voltage is high.

2. COMPONENT DESCRIPTION



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- (1) Engine control module (ECM) (3) PCV diagnosis connector (4) 5 V
(2) 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 Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Before and after engine start	After engine starting
Positive crankcase ventilation diagnosis voltage	High

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Before and after engine start	After engine starting
Positive crankcase ventilation diagnosis voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CW:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge as OFF NG when the engine starts without starter ON experience.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as OFF NG when the continuous time of meeting the malfunction criteria below becomes three seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed It took 0.8 seconds or more at engine starting, and then it turned after engine starting.	< 1 km/h (0.62 MPH)
Starter ON signal	Not detected
Engine speed in 0.8 seconds or more for which the condition that engine speed is less than 500 rpm continues	≥ 500 rpm

Time Needed for Diagnosis: Undetermined

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Starter ON diagnosis	Not diagnosed
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CX: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 voltage becomes smaller than the battery voltage.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	Low
Battery voltage	≥ 10.9 V
Before and after engine start	After engine starting

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	High
Battery voltage	≥ 10.9 V
Before and after engine start	After engine starting

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CY:DTC P1570 ANTENNA

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(STI)-178, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CZ:DTC P1571 REFERENCE CODE INCOMPATIBILITY

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(STI)-178, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DA:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(STI)-178, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DB:DTC P1574 KEY COMMUNICATION FAILURE

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(STI)-178, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DC:DTC P1576 EGI CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(STI)-178, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DD:DTC P1577 IMM CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(STI)-178, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DE: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 exhaust 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	> 75.1 kPa (563 mmHg, 22.2 inHg)
Battery voltage	> 10.9 V
Cold start diagnosis	Incomplete
Engine	Starting
Vehicle speed	≤ 2 km/h (1 MPH)
Misfire within 200 engine revs.	< 5
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 Judgment

Calculate the estimated exhaust gas temperature when the diagnostic enable condition is established. Judge as NG when the following conditions are established in 14 seconds after starting the engine.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust gas temperature	< Value from Map 1

Map 1

Engine coolant temperature at engine start	-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)	45°C (113°F)
Threshold Value	200°C (392°F)	200°C (392°F)	200°C (392°F)	200°C (392°F)	75°C (167°F)	73°C (163°F)	71°C (160°F)	67°C (153°F)	64°C (147°F)	63°C (145°F)

Time Needed for Diagnosis: 14 seconds

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

Normality Judgment

Judge as OK when the following conditions are established after the specified amount of time has passed.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust gas temperature	≥ Value from Map 1

- Idle speed diagnosis

Judge as NG when all of the following conditions are established, and judge as OK when the following conditions are not met.

Malfunction Criteria	Threshold Value
Continuous time of (Target engine speed – Actual engine speed > 100)	≥ 6000 milliseconds
Continuous time of (actual retard amount > 30°CA)	≥ 0 milliseconds

Time Needed for Diagnosis: 14 seconds

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

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DF:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge as stuck open malfunction when the opening degree is large even after finishing the tumble generator valve opening driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq -30^{\circ}\text{C}$ (-22°F)
Ambient air temperature	$\geq -30^{\circ}\text{C}$ (-22°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes three seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$\geq 64.3^{\circ}$
Tumble generator valve "close" signal output	3.2 seconds or more

Time Needed for Diagnosis: 3 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$< 64.3^{\circ}$
Tumble generator valve "close" signal output	3.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

Tumble generator valve control

- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DG:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq -30^{\circ}\text{C}$ (-22°F)
Ambient air temperature	$\geq -30^{\circ}\text{C}$ (-22°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes three seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$\geq 64.3^{\circ}$
Tumble generator valve "close" signal output	3.2 seconds or more

Time Needed for Diagnosis: 3 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$< 64.3^{\circ}$
Tumble generator valve "close" signal output	3.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

Tumble generator valve control

- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DH:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq -30^{\circ}\text{C}$ (-22°F)
Ambient air temperature	$\geq -30^{\circ}\text{C}$ (-22°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes three seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$< 64.3^{\circ}$
Tumble generator valve "open" signal output	4.6 seconds or more

Time Needed for Diagnosis: 3 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$< 64.3^{\circ}$
Tumble generator valve "open" signal output	4.6 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

Tumble generator valve control

- Output the close signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DI: DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	$\geq -30^{\circ}\text{C}$ (-22°F)
Ambient air temperature	$\geq -30^{\circ}\text{C}$ (-22°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes three seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$< 64.3^{\circ}$
Tumble generator valve "open" signal output	4.6 seconds or more

Time Needed for Diagnosis: 3 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$< 64.3^{\circ}$
Tumble generator valve "open" signal output	4.6 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

Tumble generator valve control

- Output the close signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

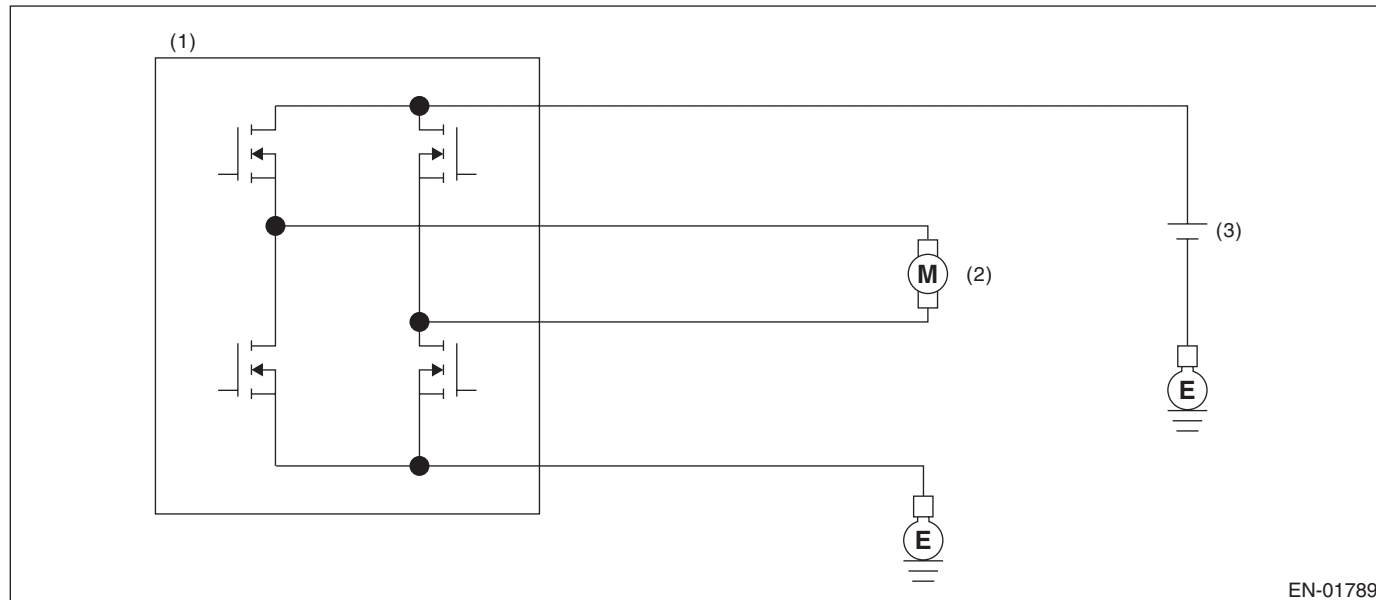
DJ:DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge as NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(2) Tumble generator valve

(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

When the malfunction criteria below are met through the tumble generator valve driving IC, judge as NG and send the NG signal to the main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON → OFF, and judge open NG when the open NG signal is sent 20 times in a row.

Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	Low
Overcurrent NG signal input	High

Time Needed for Diagnosis: 2 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

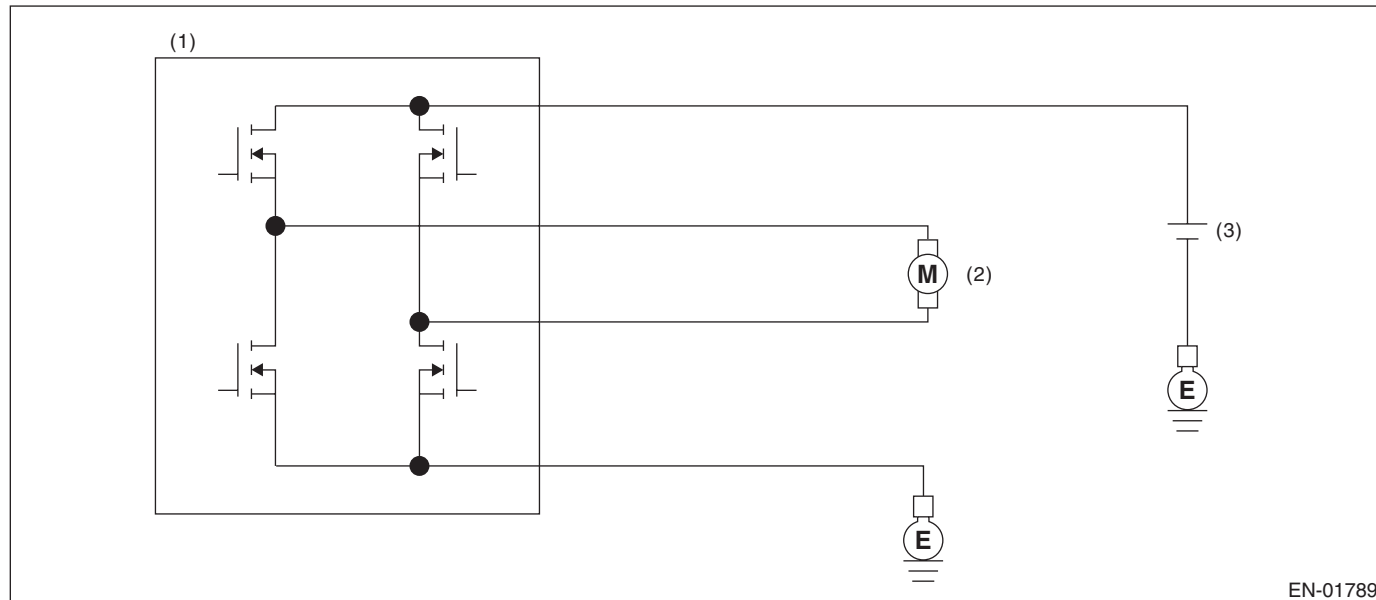
DK:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge as NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(2) Tumble generator valve

(3) Battery

EN-01789

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

When the malfunction criteria below are met through the tumble generator valve driving IC, judge as NG and send the NG signal to the main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON → OFF, and judge overcurrent NG when the overcurrent NG signal is sent 10 times in a row. Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	High
Overcurrent NG signal input	Low

Time Needed for Diagnosis: 1 second

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

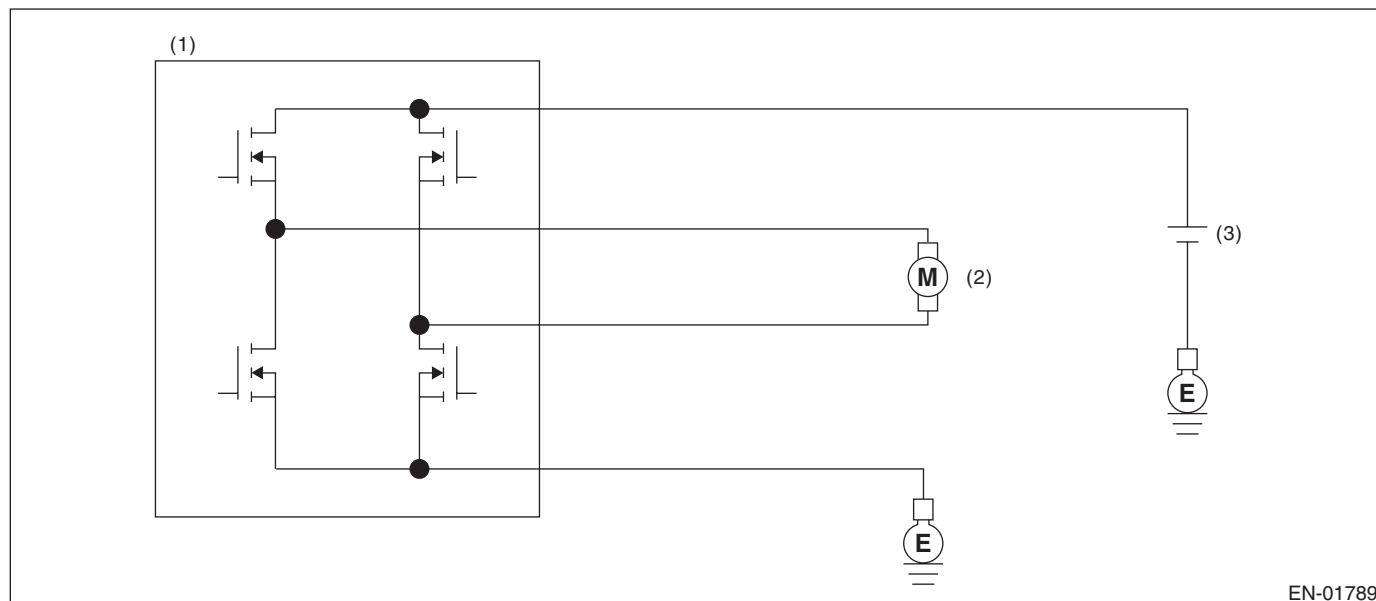
DL:DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge as NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(2) Tumble generator valve

(3) Battery

EN-01789

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

When the malfunction criteria below are met through the tumble generator valve driving IC, judge as NG and send the NG signal to the main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON → OFF, and judge open NG when the open NG signal is sent 20 times in a row. Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	Low
Overcurrent NG signal input	High

Time Needed for Diagnosis: 2 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

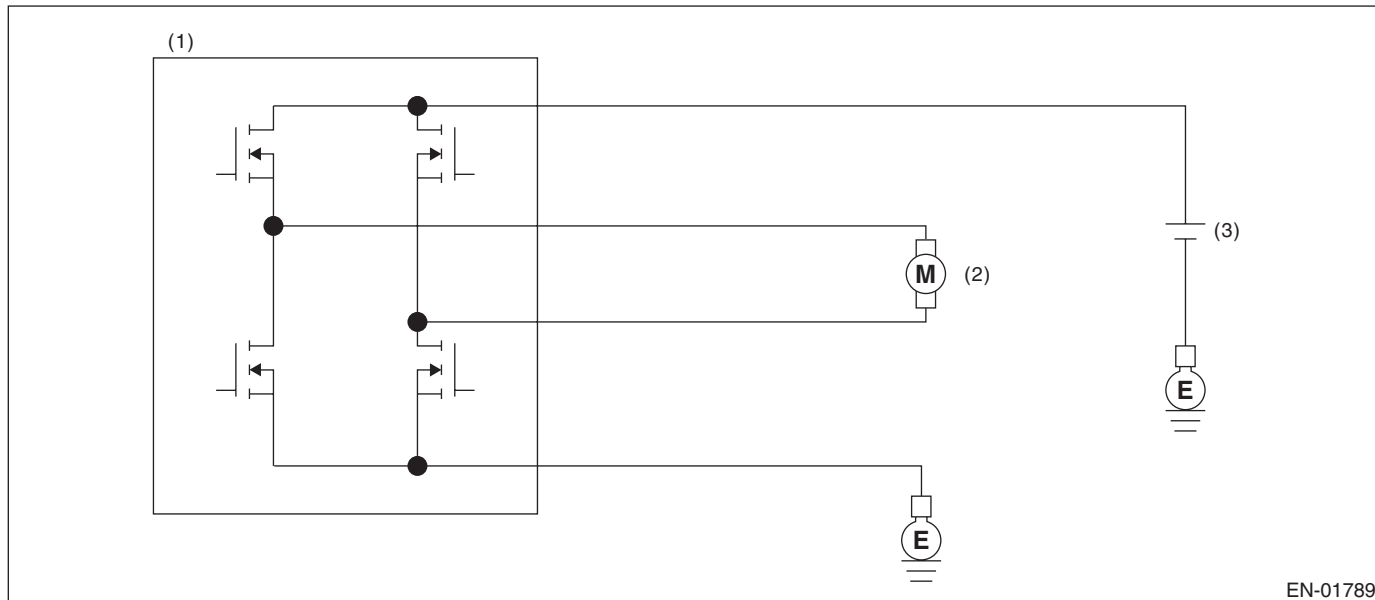
DM:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge as NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(2) Tumble generator valve

(3) Battery

EN-01789

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

When the malfunction criteria below are met through the tumble generator valve driving IC, judge as NG and send the NG signal to the main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON → OFF, and judge overcurrent NG when the overcurrent NG signal is sent 10 times in a row. Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	High
Overcurrent NG signal input	Low

Time Needed for Diagnosis: 1 second

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

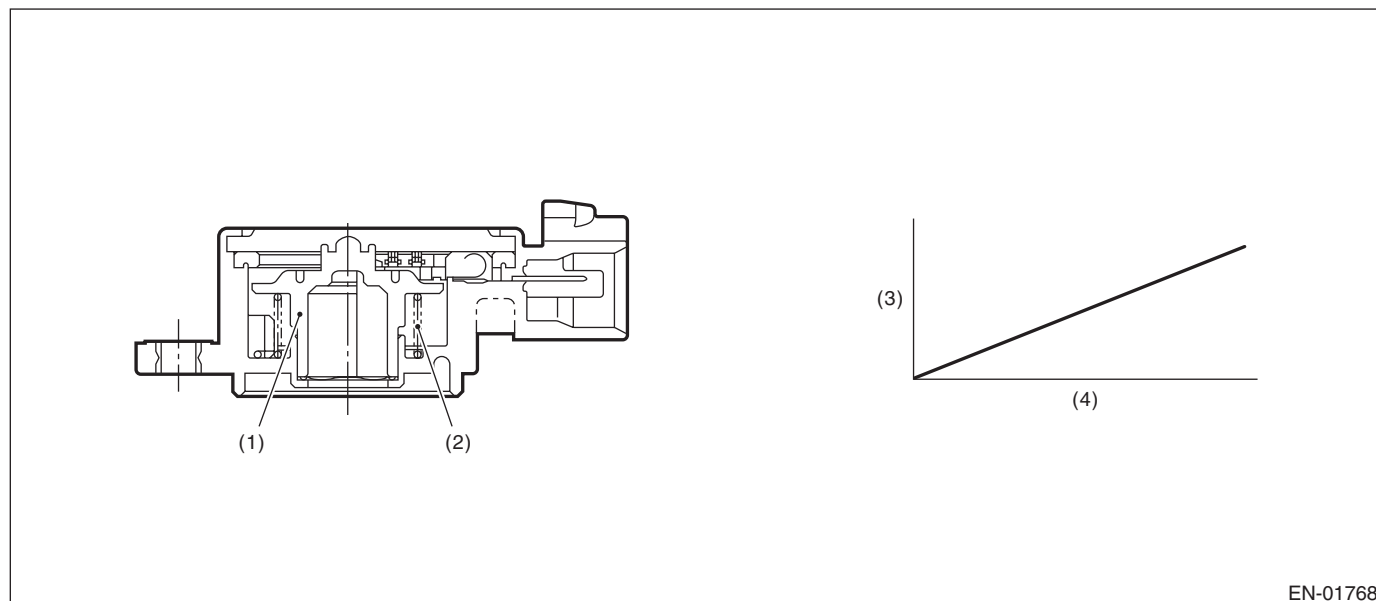
GENERAL DESCRIPTION

DN:DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Rotor

(2) Return spring

(3) Voltage (V)

(4) Tumble generator valve opening (°)

EN-01768

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

Time Needed for Diagnosis: 0.5 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

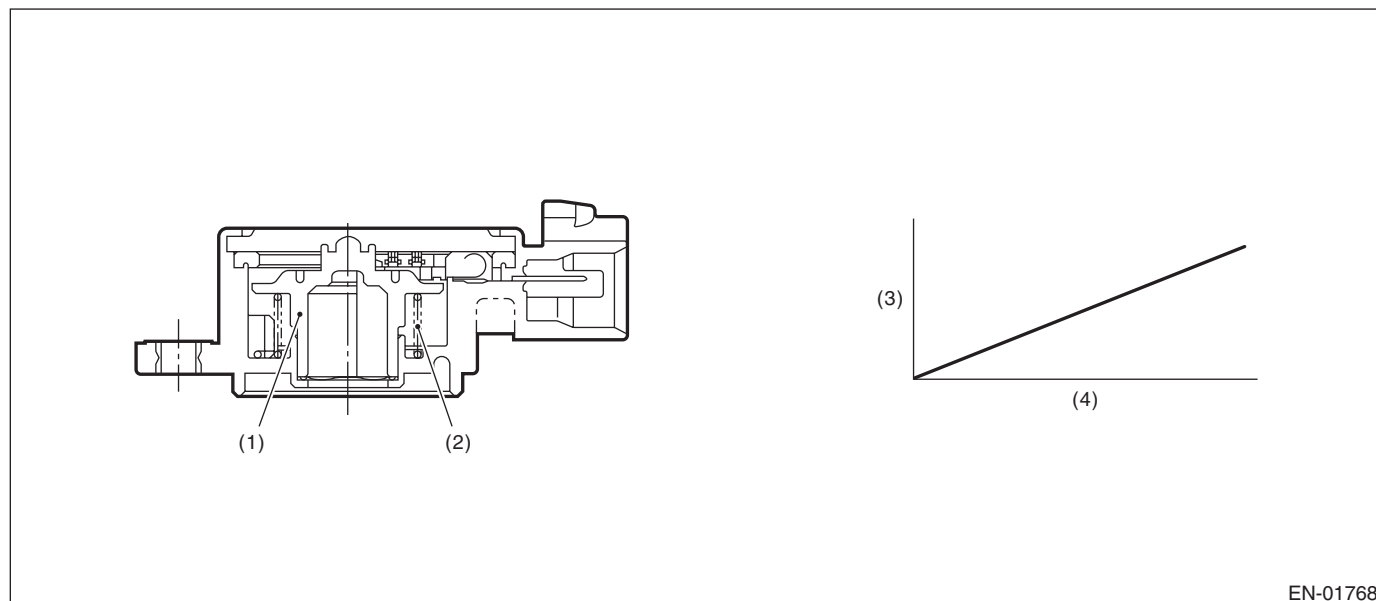
GENERAL DESCRIPTION

DO:DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Rotor

(2) Return spring

(3) Voltage (V)

(4) Throttle valve opening angle (°)

EN-01768

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

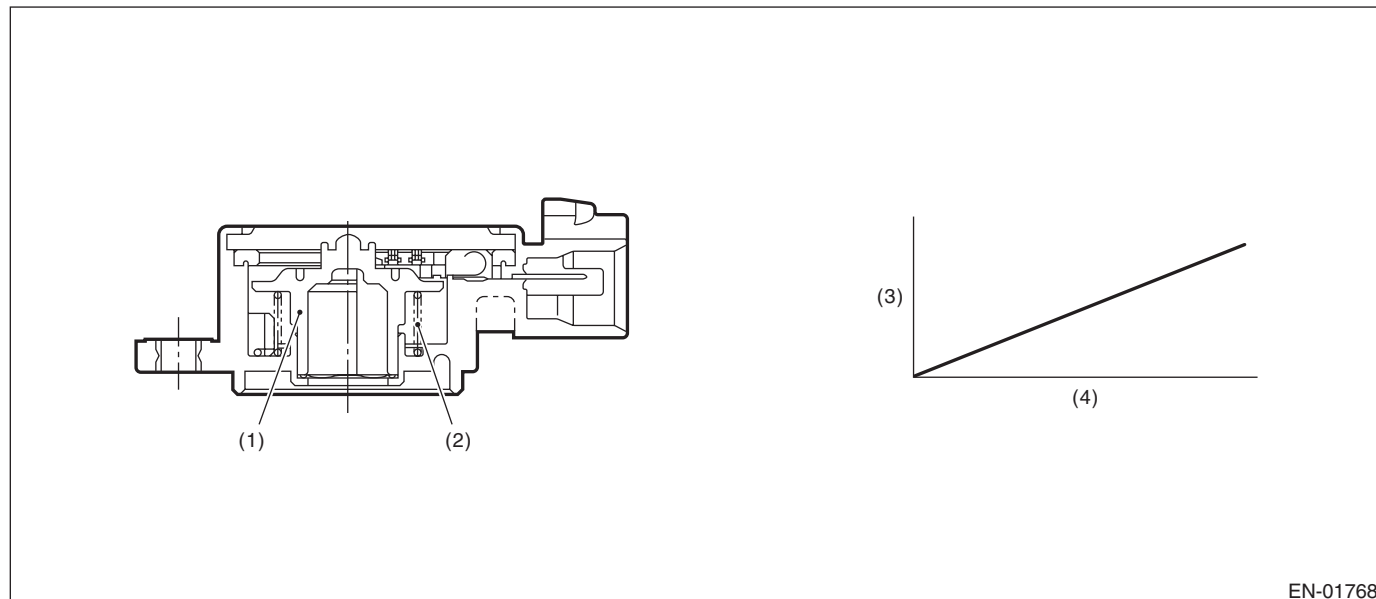
GENERAL DESCRIPTION

DP:DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Rotor

(2) Return spring

(3) Voltage (V)

(4) Tumble generator valve opening (°)

EN-01768

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

Time Needed for Diagnosis: 0.5 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

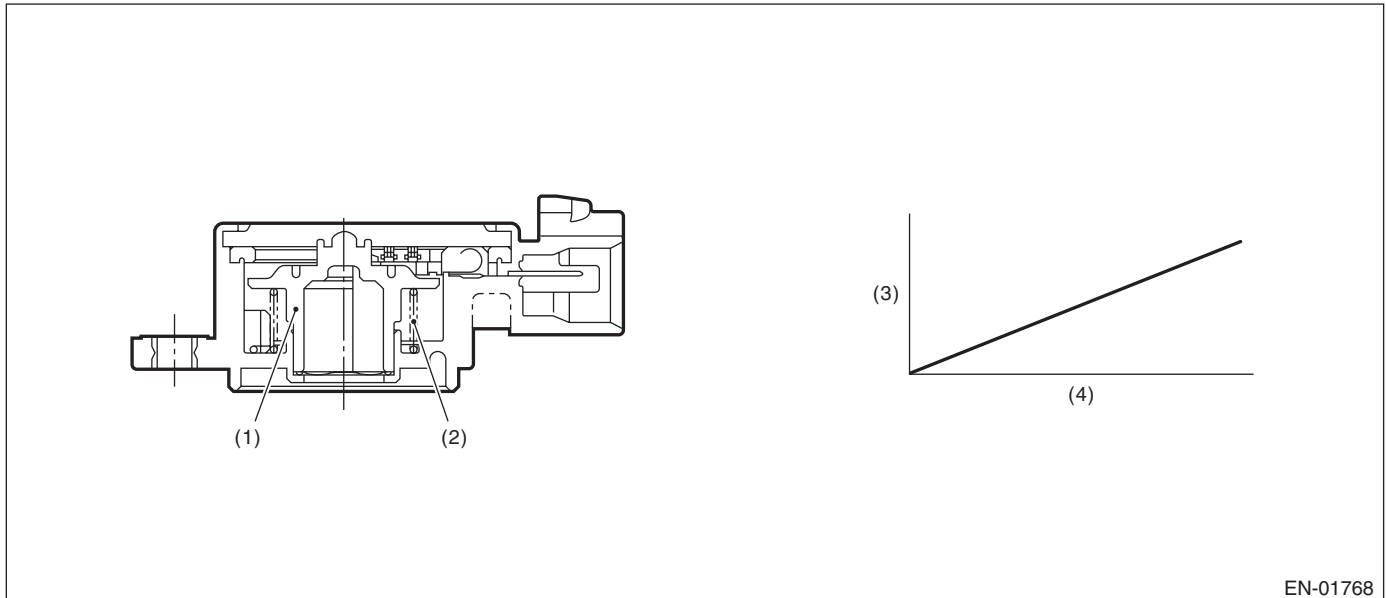
DQ:DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-01768

(1) Rotor

(3) Voltage (V)

(4) Tumble generator valve opening (°)

(2) Return spring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DR: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 valve solenoid.

Judge as open NG when the current flow is small whereas duty signal is large, and judge as short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes two seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Oil flow control solenoid valve control duty	$\geq 99.61\%$
Oil control solenoid valve control present current	< 0.306 A

Time Needed for Diagnosis: 2,000 milliseconds

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

Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes two seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of the oil flow control solenoid valve	$\geq 0.14\%$
[Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value]	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone with IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
 - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
 - → ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the oil flow control solenoid valve driving duty a predetermined value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DS:DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil flow control valve solenoid.

Judge as open NG when the current flow is small whereas duty signal is large, and judge as short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes two seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Oil flow control solenoid valve control duty	$< 0.39\%$
Oil control solenoid valve control present current	≥ 0.306 A

Time Needed for Diagnosis: 2,000 milliseconds

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

Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes two seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value	< 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone with IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
 - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
 - → ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the oil flow control solenoid valve driving duty a predetermined value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DT:DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil flow control valve solenoid.

Judge as open NG when the current flow is small whereas duty signal is large, and judge as short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes two seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Oil flow control solenoid valve control duty	$\geq 99.61\%$
Oil control solenoid valve control present current	< 0.306 A

Time Needed for Diagnosis: 2,000 milliseconds

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

Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes two seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of the oil flow control solenoid valve	$\geq 0.14\%$
[Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value]	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone with IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
 - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
 - → ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the oil flow control solenoid valve driving duty a predetermined value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DU:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil flow control valve solenoid.

Judge as open NG when the current flow is small whereas duty signal is large, and judge as short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes two seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Oil flow control solenoid valve control duty	$< 0.39\%$
Oil control solenoid valve control present current	≥ 0.306 A

Time Needed for Diagnosis: 2,000 milliseconds

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

Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the malfunction criteria below becomes two seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value	< 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone with IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
 - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
 - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the oil flow control solenoid valve driving duty a predetermined value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

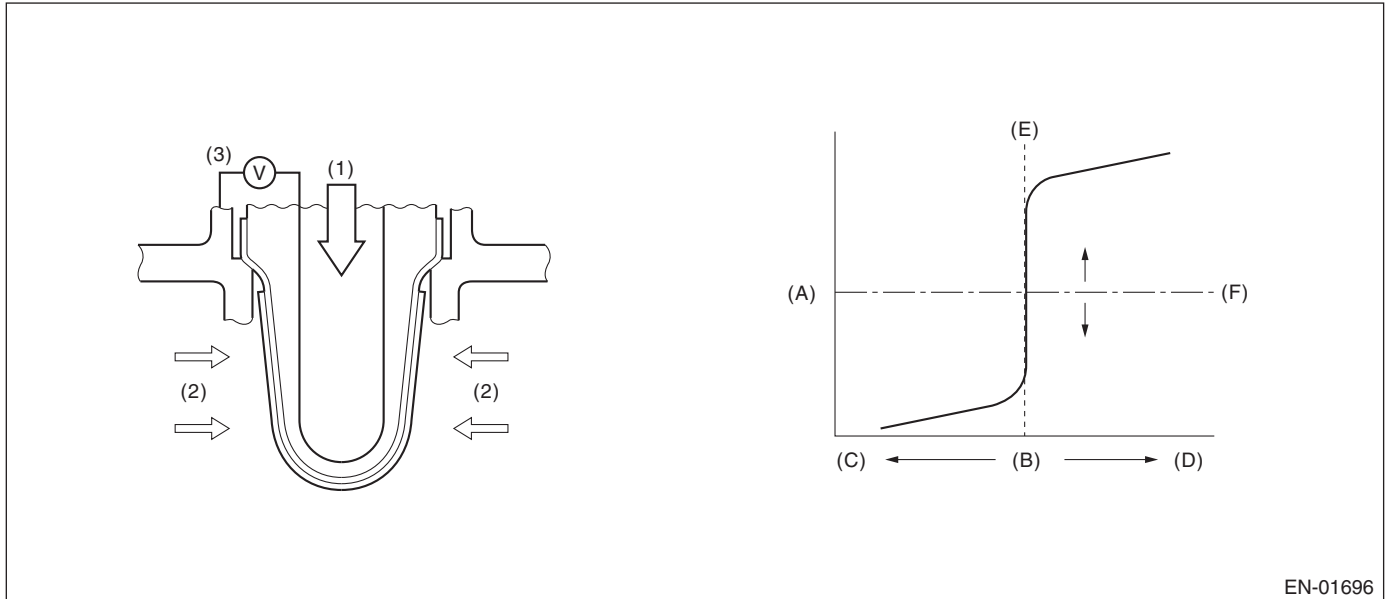
DV:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.

Sub feedback learning control is being performed and when the learning value goes to the lean side, judge as NG.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when the following conditions are established	1 second or more
Conditions for carrying out the sub feedback learning	Completed

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of 50 — 100 km/h (31 — 62 MPH).

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time with the following criteria established is 5 seconds or more. Judge as OK when the continuous time with the following criteria not established is 5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≤ -0.044

Time Needed for Diagnosis: 5 seconds \times 1 time

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When similar driving conditions are repeated 3 times and the result is OK.
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

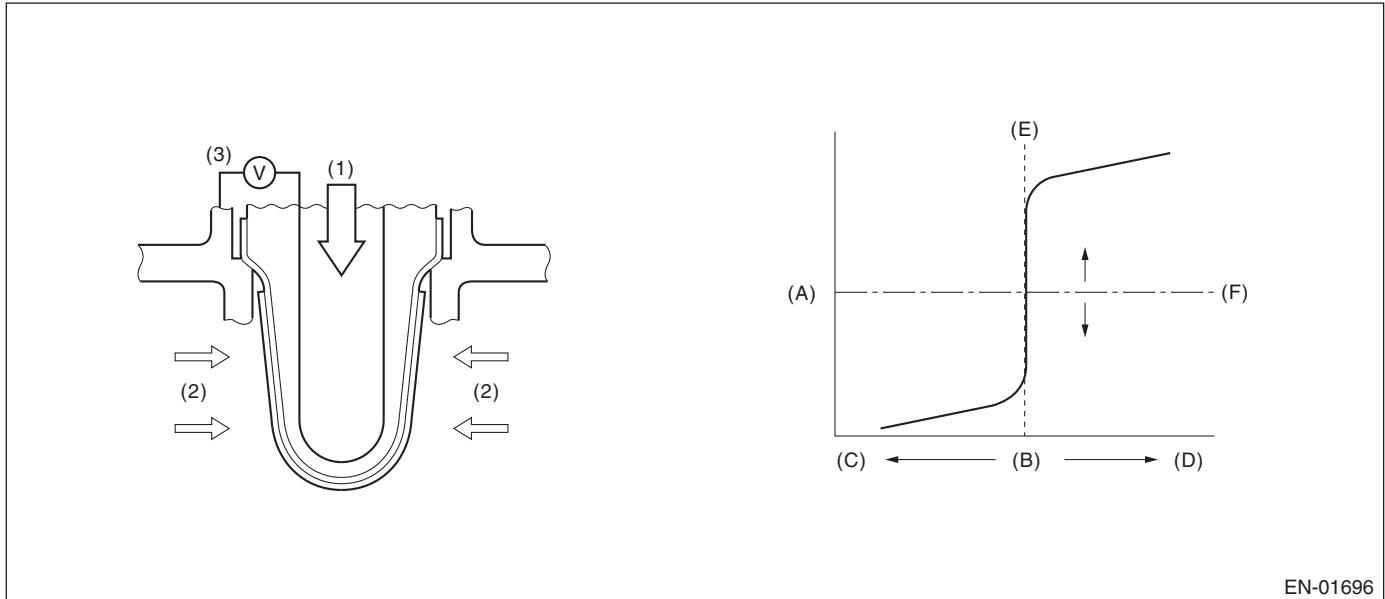
DW:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.

Sub feedback learning control is being performed and when the learning value goes to the rich side, judge as NG.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when the following conditions are established	1 second or more
Conditions for carrying out the sub feedback learning	Completed

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of 50 — 100 km/h (31 — 62 MPH).

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time with the following criteria established is 5 seconds or more. Judge as OK when the continuous time with the following criteria not established is 5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≥ 0.038

Time Needed for Diagnosis: 5 seconds \times 1 time

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When similar driving conditions are repeated 3 times and the result is OK.
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

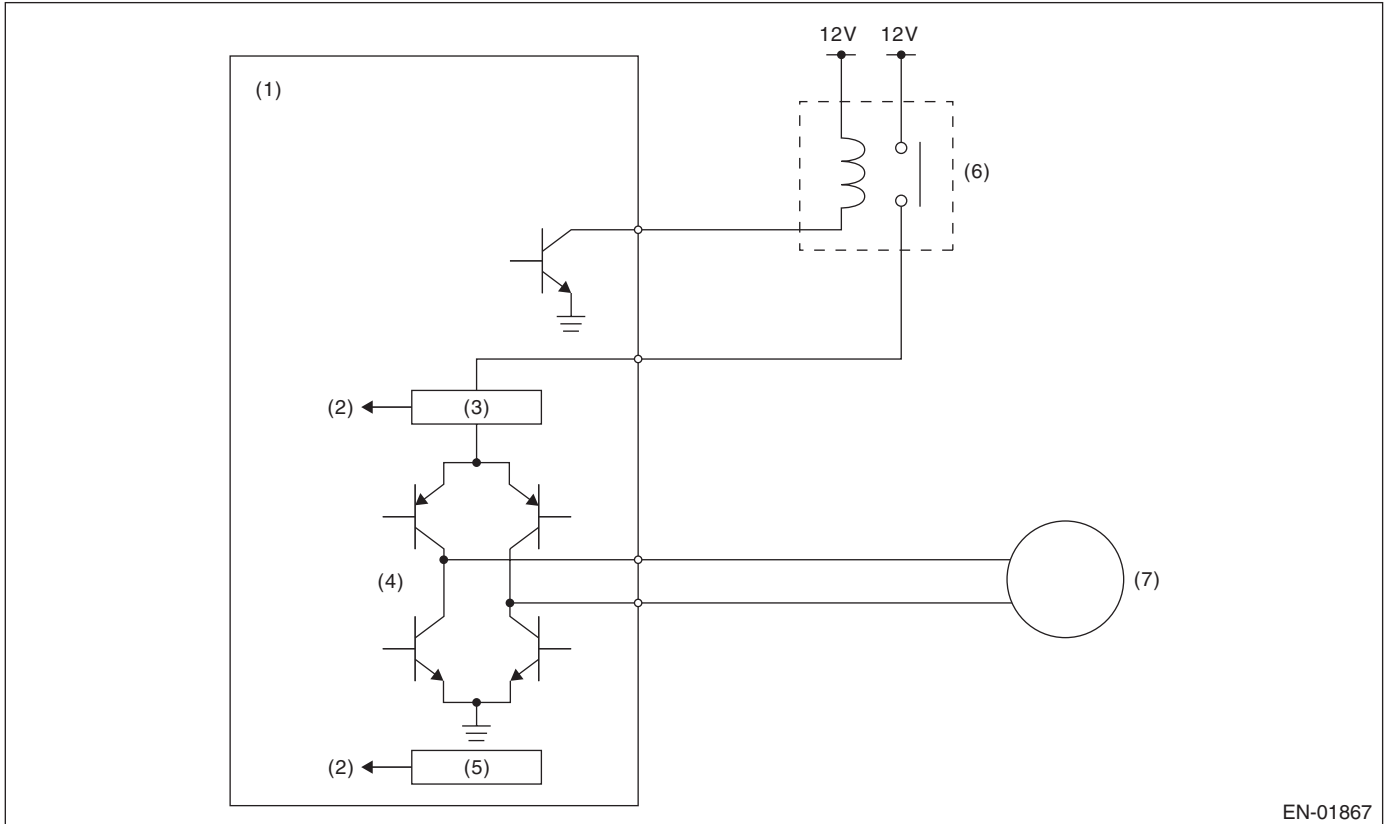
GENERAL DESCRIPTION

DX: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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Motor current	$\leq 8 \text{ A}$
Drive circuit inner temperature	$\leq 175^{\circ}\text{C}$ (347°F)

Time Needed for Diagnosis:

- 500 milliseconds (For NG)
- 2,000 milliseconds (For OK)

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

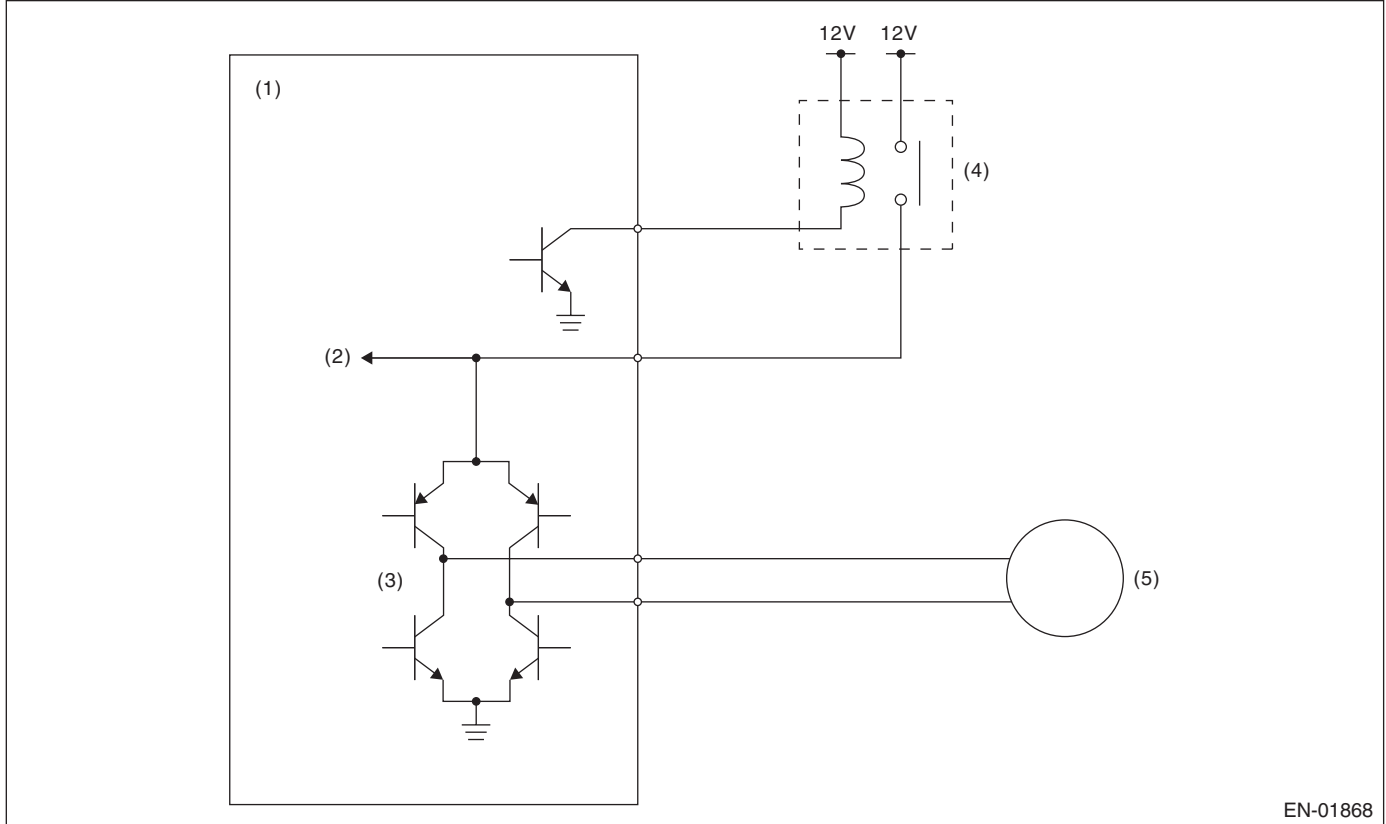
GENERAL DESCRIPTION

DY: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
Electronic throttle control relay output	ON
Battery voltage	≥ 11 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≤ 5 V

Time Needed for Diagnosis:

- 400 milliseconds (For NG)
- 2,000 milliseconds (For OK)

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

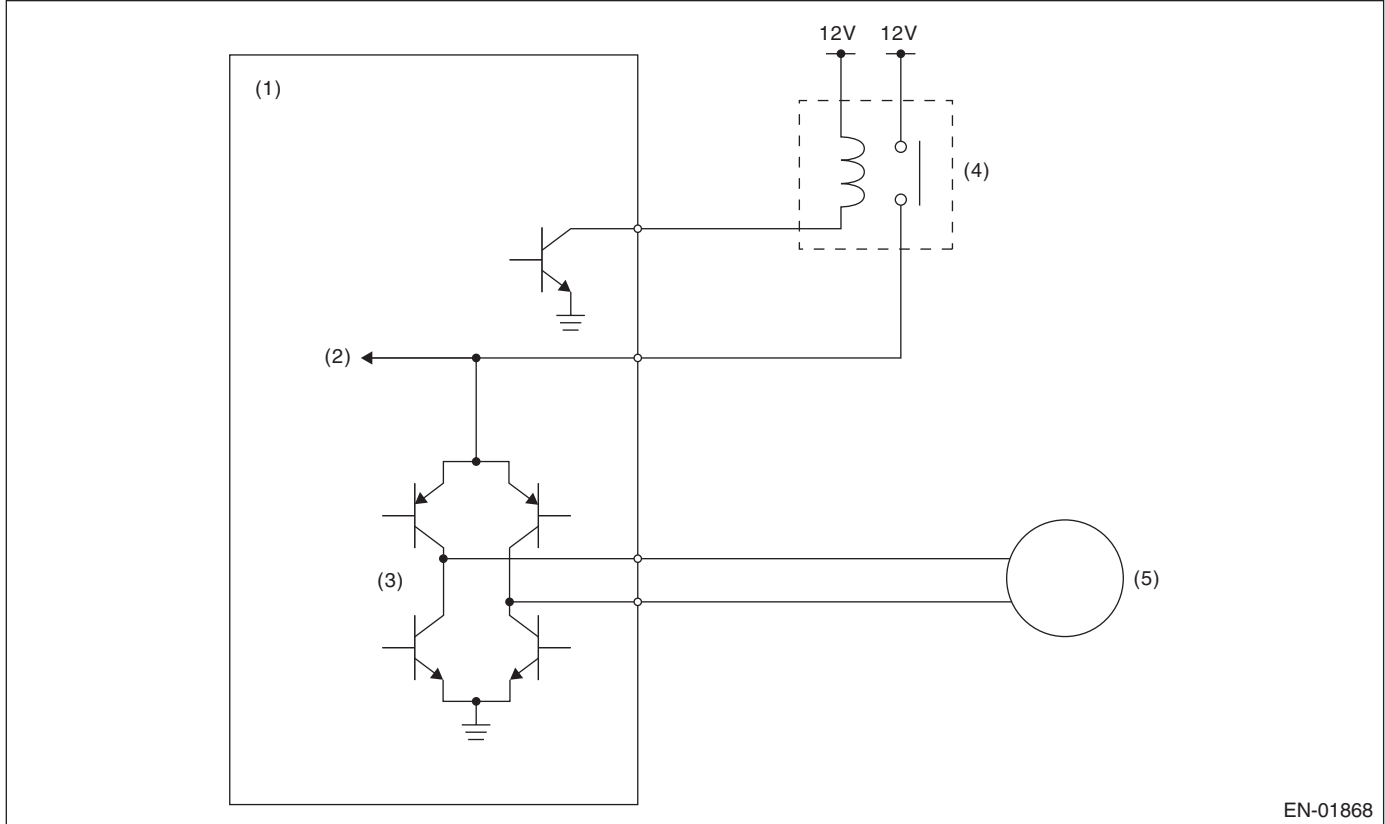
GENERAL DESCRIPTION

DZ: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
Electronic throttle control relay output	OFF
Battery voltage	$\geq 6 \text{ V}$

4. GENERAL DRIVING CYCLE

- When ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	$\leq 5 \text{ V}$

Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

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

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

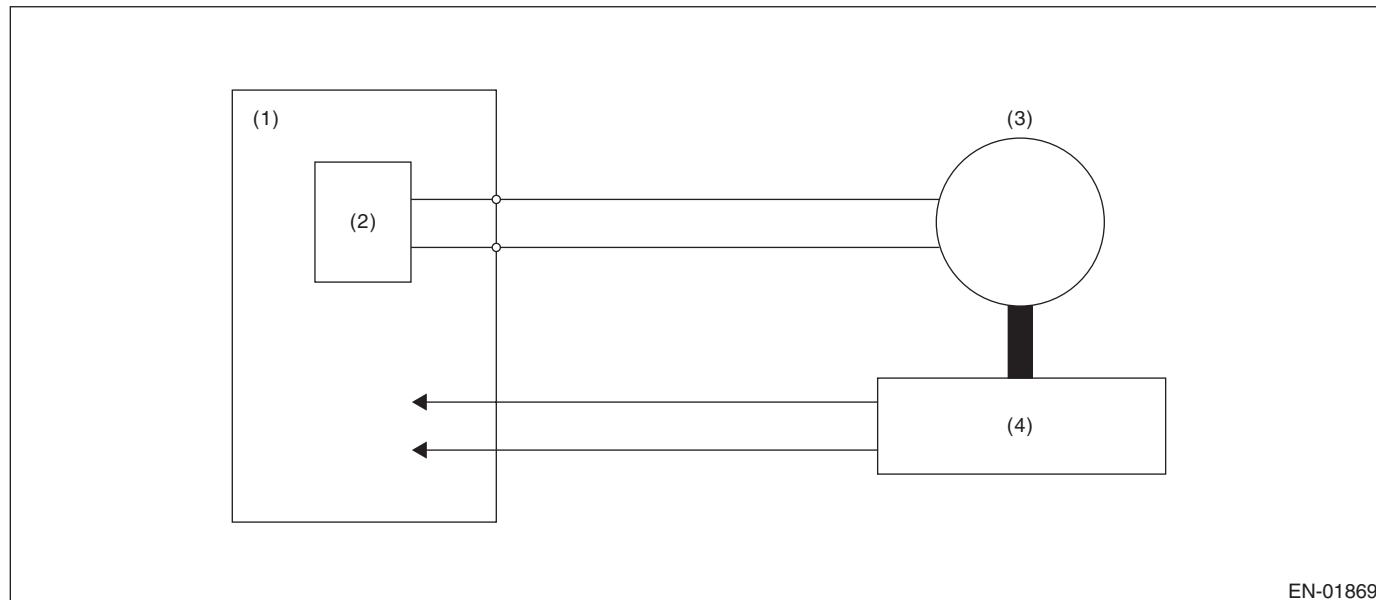
GENERAL DESCRIPTION

EA:DTC P2109 THROTTLE/PEDAL POSITION SENSOR "A" MINIMUM STOP PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when full close point learning cannot be conducted or an abnormal value is detected.

2. COMPONENT DESCRIPTION



EN-01869

(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.

5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
Throttle sensor opening angle at full close point learning	10.127° or more, 19.872° or less
Throttle opening angle when the ignition switch is ON – Throttle minimum stop position	≥ 1.683°

Time Needed for Diagnosis: None

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

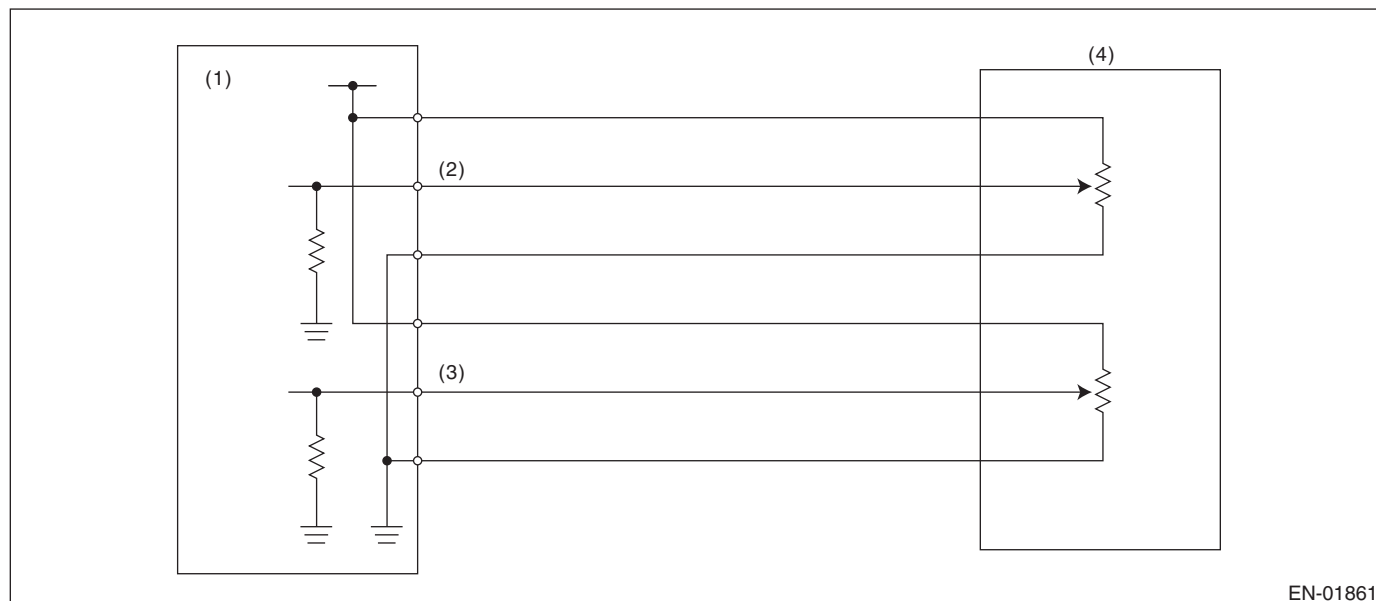
GENERAL DESCRIPTION

EB: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



EN-01861

- (1) Engine control module (ECM) (3) Accelerator pedal position sensor 2 signal (4) Accelerator pedal position sensor
(2) Accelerator pedal position sensor 1 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	> 0.219 V

Time Needed for Diagnosis: 100 milliseconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

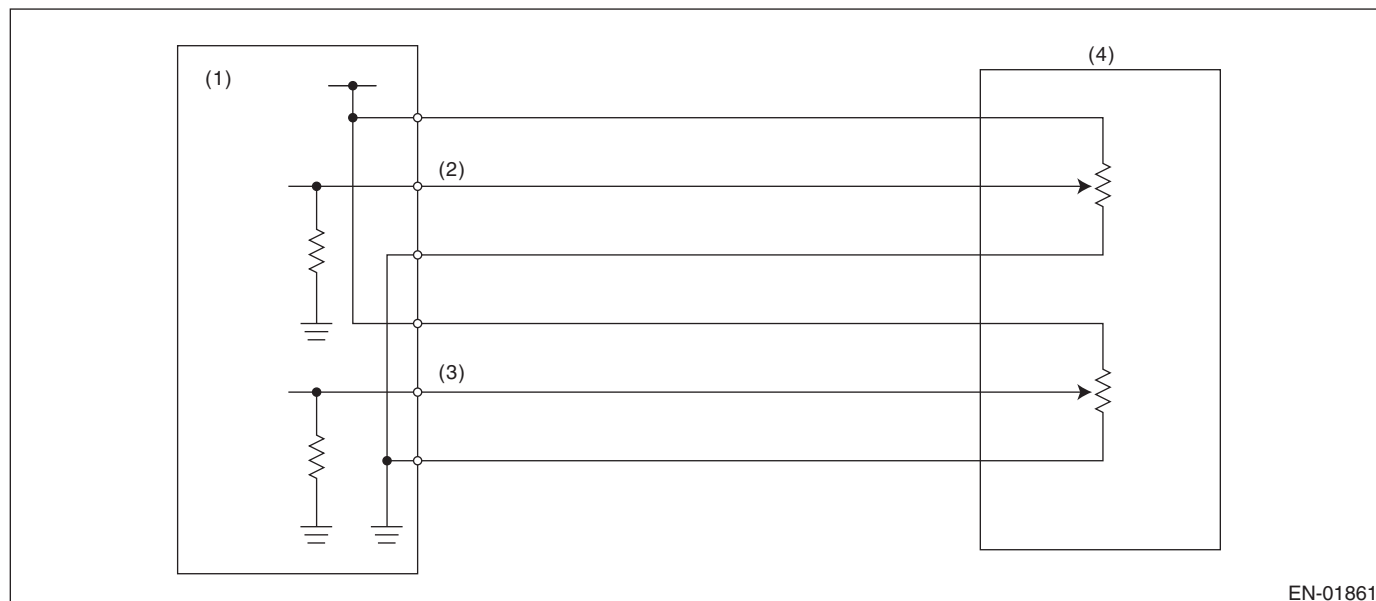
GENERAL DESCRIPTION

EC: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



EN-01861

- (1) Engine control module (ECM) (3) Accelerator pedal position sensor 2 signal (4) Accelerator pedal position sensor
(2) Accelerator pedal position sensor 1 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.781 V

Time Needed for Diagnosis: 32 milliseconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

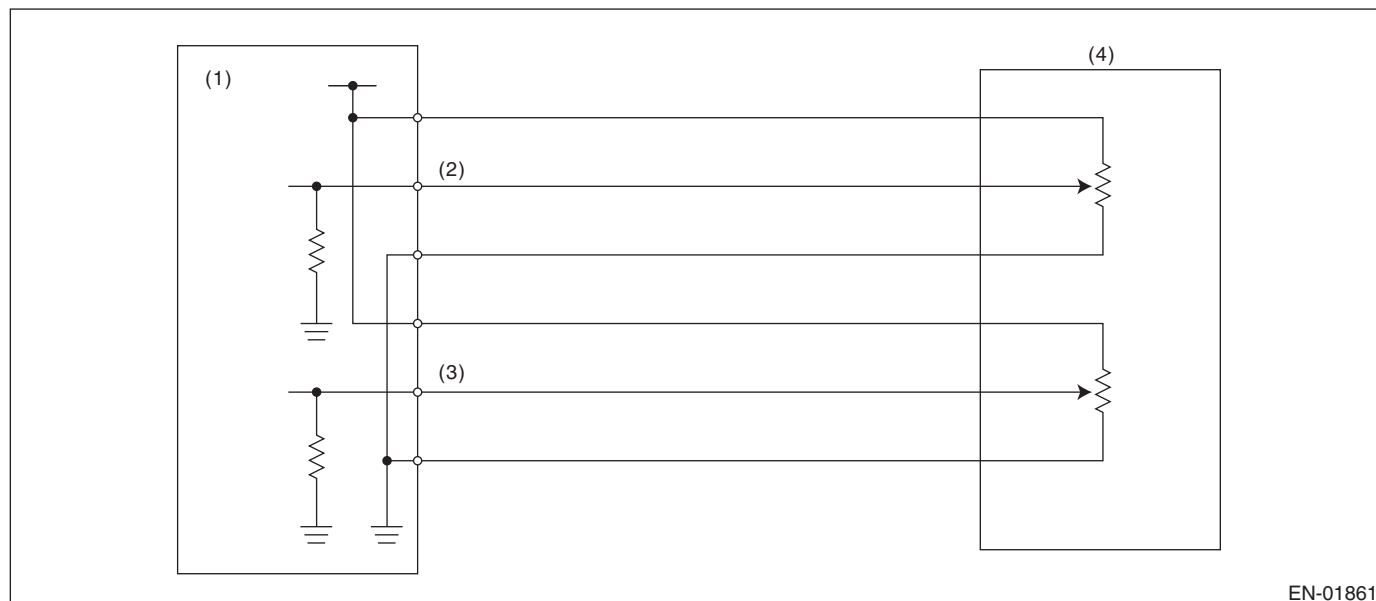
GENERAL DESCRIPTION

ED: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) (3) Accelerator pedal position sensor 2 signal (4) Accelerator pedal position sensor 2 signal
(2) Accelerator pedal position sensor 1 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	> 0.219 V

Time Needed for Diagnosis: 100 milliseconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

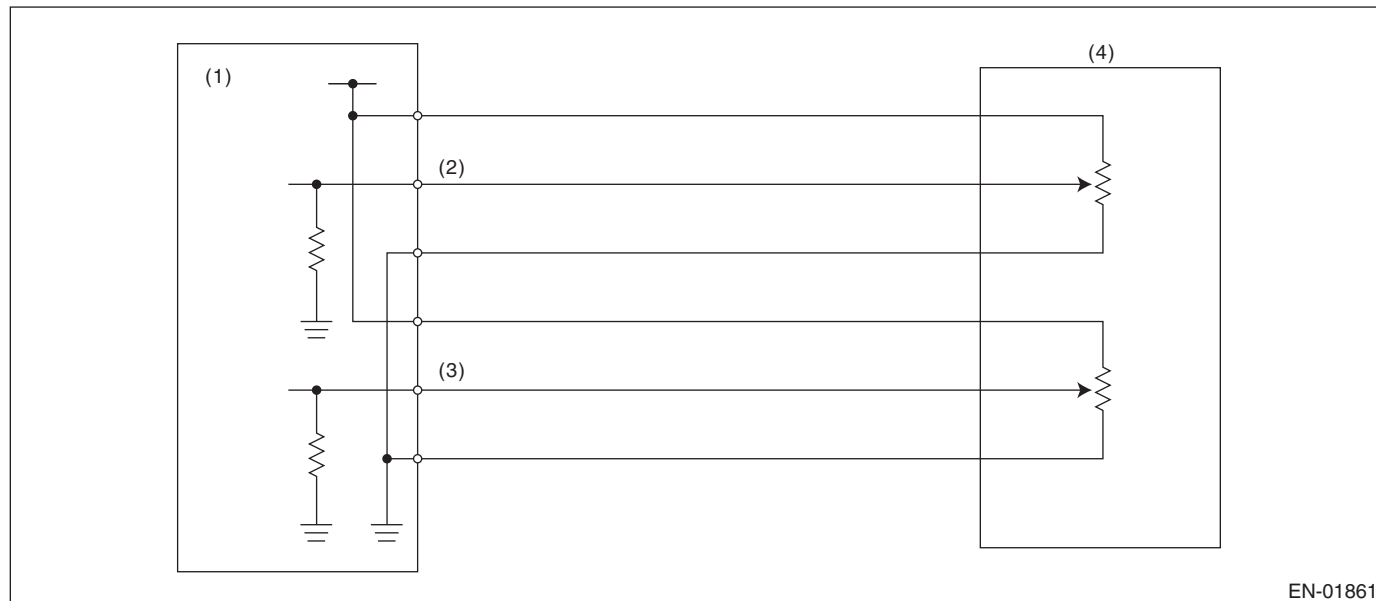
GENERAL DESCRIPTION

EE: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) (3) Accelerator pedal position sensor 2 signal (4) Accelerator pedal position sensor
(2) Accelerator pedal position sensor 1 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.781 V

Time Needed for Diagnosis: 100 milliseconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

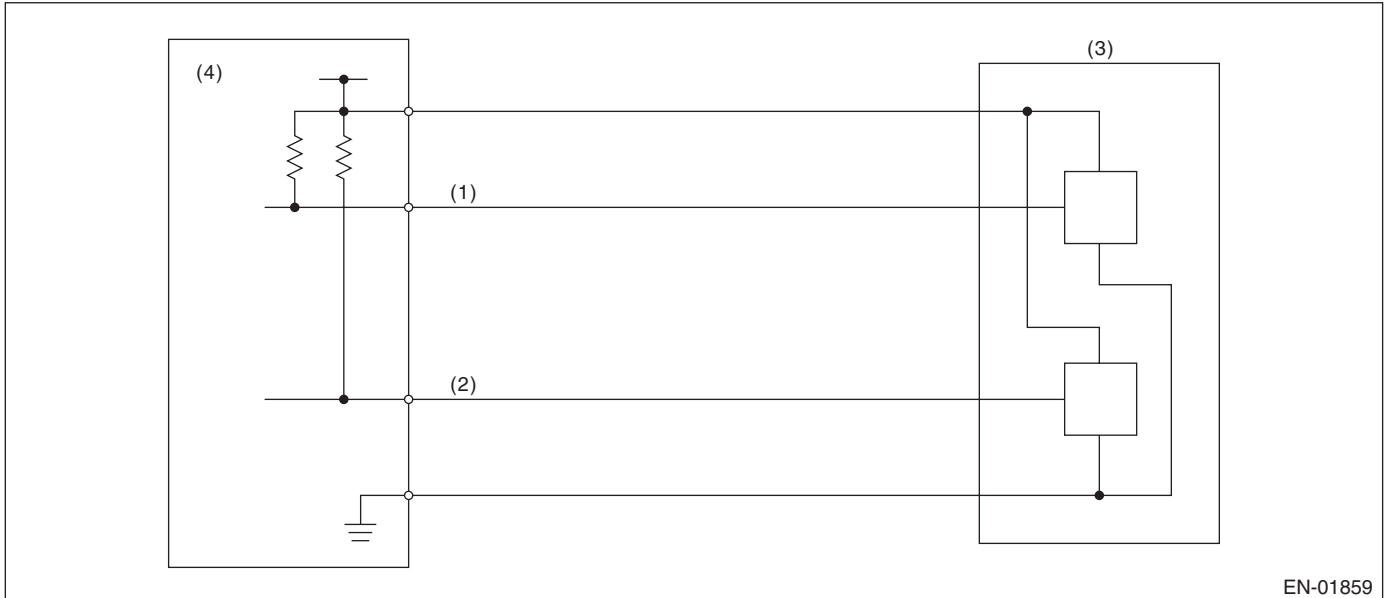
GENERAL DESCRIPTION

EF: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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

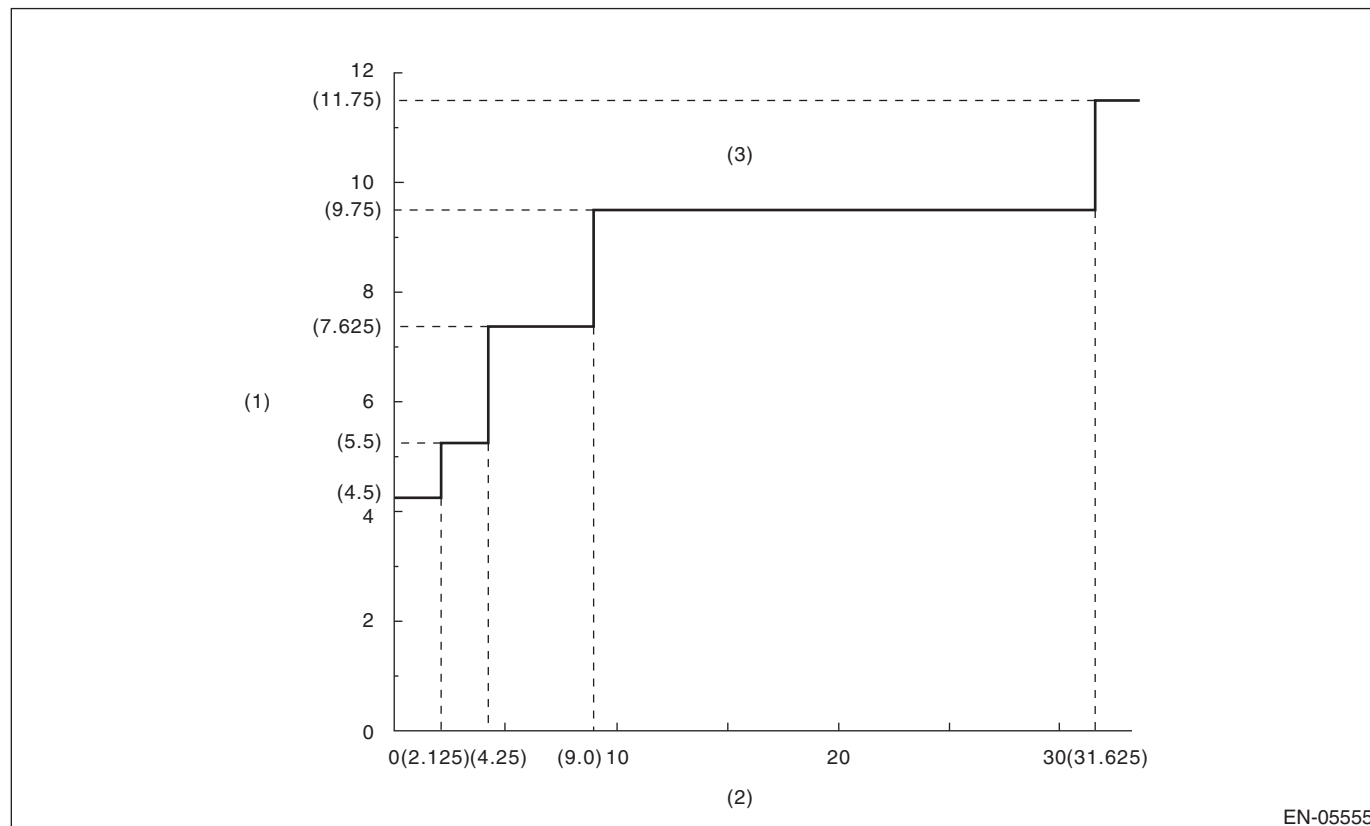
5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≤ 4.5

Details of Judgment Value



EN-05555

(1) Sensor output difference (°)

(2) Throttle position sensor 1 opening angle (°)

(3) NG area

Time Needed for Diagnosis: 212 milliseconds

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to ETC motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

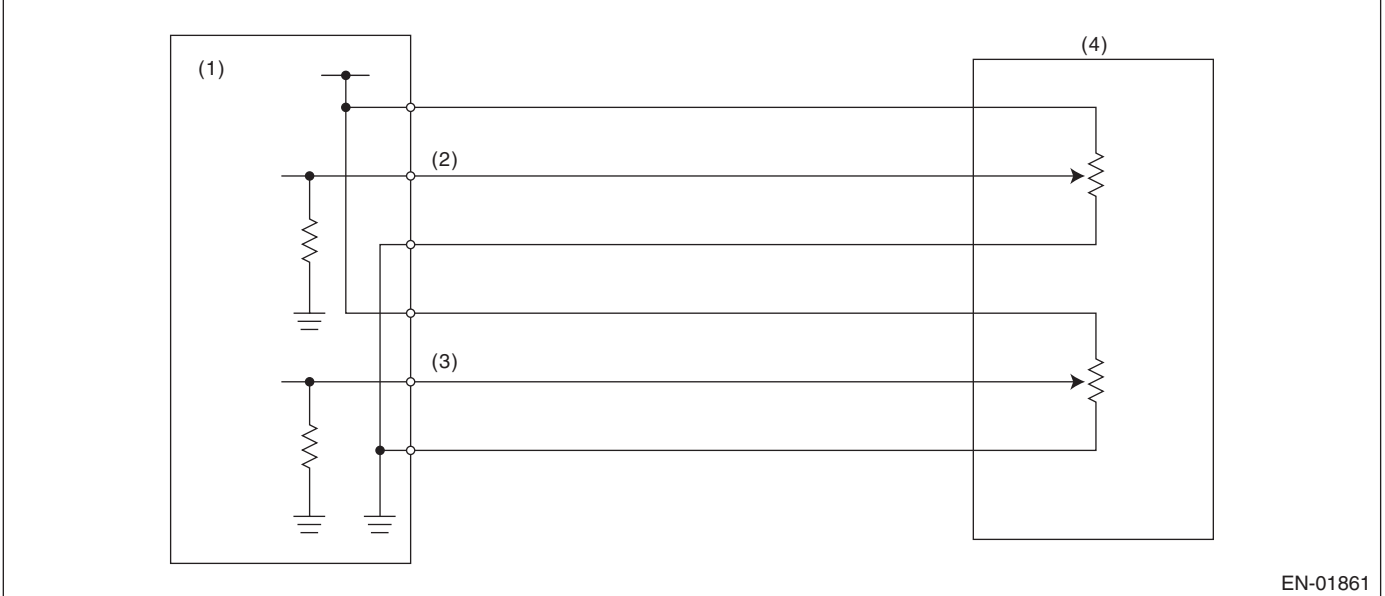
GENERAL DESCRIPTION

EG: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



EN-01861

- (1) Engine control module (ECM) (3) Accelerator pedal position sensor 2 signal (4) Accelerator pedal position sensor 2 signal
(2) Accelerator pedal position sensor 1 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

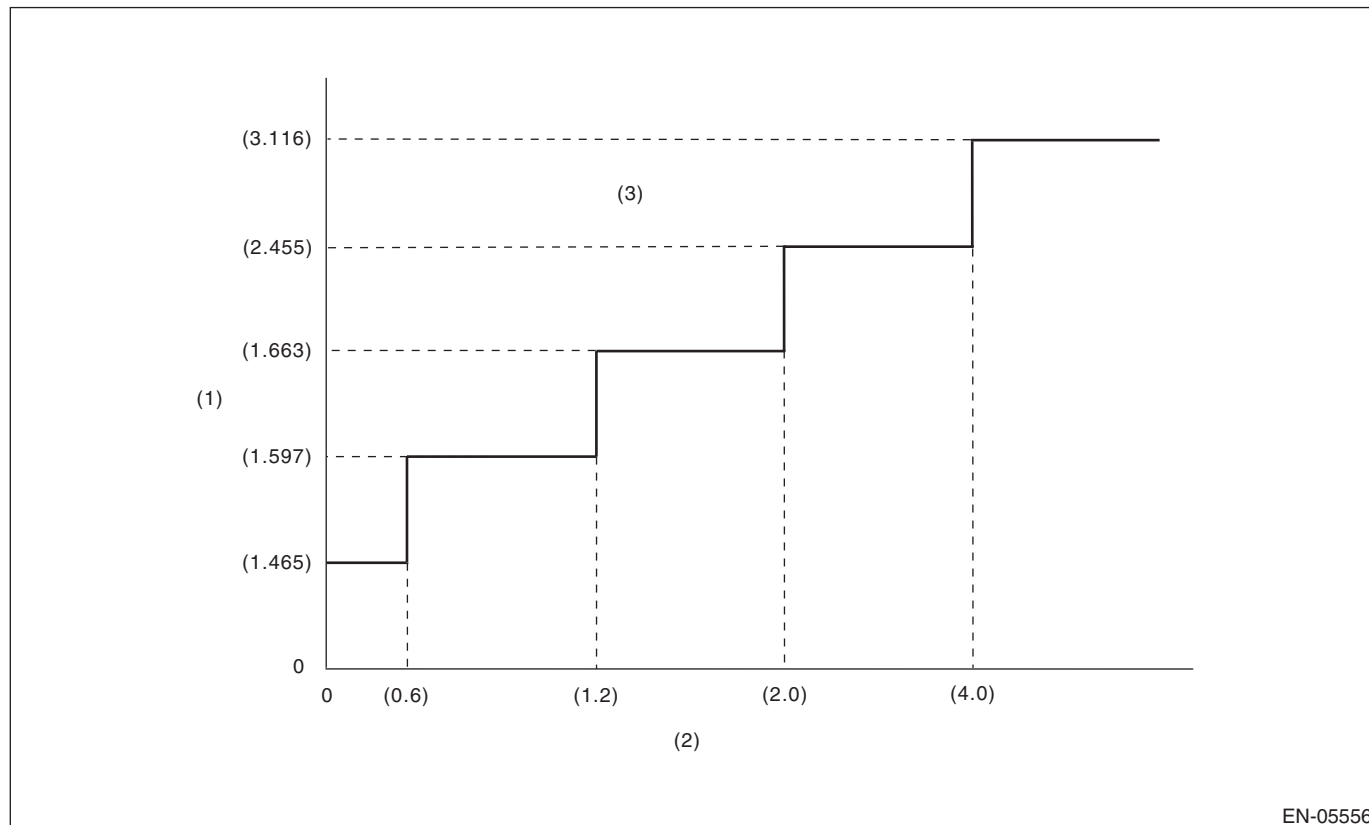
5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	$\leq 0.8^\circ$

Details of Judgment Value



EN-05556

(1) Sensor output difference

(2) Accelerator pedal position sensor
2 opening angle (°)

(3) NG area

Time Needed for Diagnosis:

- 116 milliseconds (For NG)
- 1,000 milliseconds (For OK)

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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EH:DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve 2.
Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	High

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EI: DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve 2.

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

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	Low

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EJ: DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of secondary air pressure sensor output property.

Judge as NG when the secondary air pressure sensor output is largely different from the intake manifold pressure at engine start.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed at engine start	< 300 rpm
Vehicle speed	< 1 km/h
After secondary air system stop	3 seconds or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis with ignition switch ON.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time of meeting the following conditions is 0.3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Secondary air pipe pressure – Intake manifold pressure	≥ 200 mmHg
Intake manifold pressure at engine start – Intake manifold pressure	< 10 mmHg

Time Needed for Diagnosis: 0.3 seconds

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

Normality Judgment

Judge as OK and clear the NG when the continuous time of meeting the following conditions is 0.26 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Secondary air pipe pressure – Intake manifold pressure	< 200 mmHg

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EK:DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge as NG if out of specification.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time of meeting the following conditions is 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 0.568 V

Time Needed for Diagnosis: 0.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 0.568 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EL:DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Judge as NG if out of specification.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time of meeting the following conditions is 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 4.921 V

Time Needed for Diagnosis: 0.5 seconds

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

Normality Judgment

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

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 4.921 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

EM:DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 1)

NOTE:

For diagnostic procedures, refer to DTC P0410. <Ref. to GD(STI)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EN:DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON

1. OUTLINE OF DIAGNOSIS

Detect the secondary air pump malfunction (always ON).

Judge as NG when the secondary air delivery pipe pressure is higher than the barometric pressure.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

The secondary air delivery pipe pressure should be as high as the barometric pressure when the secondary air pump is OFF. Judge as NG when the pressure is higher than the barometric pressure.

Judge as NG when the continuous time of meeting all the following conditions is 5 seconds or more. Judge as OK and clear the NG when the conditions are not established.

Malfunction Criteria	Threshold Value
Battery voltage	≥ 7 V
Time after secondary air system operation	3 — 8 seconds
Secondary air pressure – Secondary air pressure before the secondary air operation	> 6.7 kPa (50 mmHg, 1.98 inHg)
Engine	In operation

Time Needed for Diagnosis: 5 seconds

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

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed three times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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