GENERAL DESCRIPTION

GD(H4DOTC)

1. List of DiagnosticTrouble Code (DTC)

A: LIST

DTC	Item	Index
P0011	A Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)	<Ref. to GD(H4DOTC)-9, DTC P0011 — “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	A Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)	<Ref. to GD(H4DOTC)-11, DTC P0021 — “A” 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(H4DOTC)-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(H4DOTC)-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(H4DOTC)-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(H4DOTC)-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(H4DOTC)-20, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	<Ref. to GD(H4DOTC)-22, DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to GD(H4DOTC)-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(H4DOTC)-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(H4DOTC)-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(H4DOTC)-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(H4DOTC)-33, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to GD(H4DOTC)-35, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to GD(H4DOTC)-37, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0113	Intake Air Temperature Circuit High Input	<Ref. to GD(H4DOTC)-39, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to GD(H4DOTC)-41, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to GD(H4DOTC)-43, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to GD(H4DOTC)-45, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High Input	<Ref. to GD(H4DOTC)-47, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to GD(H4DOTC)-49, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0126	Insufficient Coolant Temperature for Stable Operation	<Ref. to GD(H4DOTC)-52, DTC P0126 — INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(H4DOTC)-54, DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-56, DTC P0131 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-58, DTC P0132 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-60, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-63, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-65, DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-67, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-69, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System too Lean (Bank 1)	<Ref. to GD(H4DOTC)-74, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System too Rich (Bank 1)	<Ref. to GD(H4DOTC)-77, DTC P0172 — SYSTEM TOO RICH (BANK 1) — , Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to GD(H4DOTC)-80, 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(H4DOTC)-83, 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(H4DOTC)-85, DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0222	Throttle/Pedal Position Sensor/ Switch “B” Circuit Low Input	<Ref. to GD(H4DOTC)-87, DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0223	Throttle/Pedal Position Sensor/ Switch “B” Circuit High Input	<Ref. to GD(H4DOTC)-89, DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0230	Fuel Pump Primary Circuit	<Ref. to GD(H4DOTC)-91, DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	<Ref. to GD(H4DOTC)-93, 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(H4DOTC)-95, 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(H4DOTC)-97, DTC P0246 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 misfire detected	<Ref. to GD(H4DOTC)-99, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 misfire detected	<Ref. to GD(H4DOTC)-105, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 misfire detected	<Ref. to GD(H4DOTC)-106, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 misfire detected	<Ref. to GD(H4DOTC)-107, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-108, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-110, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to GD(H4DOTC)-112, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to GD(H4DOTC)-114, 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(H4DOTC)-116, 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(H4DOTC)-118, DTC P0345 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H4DOTC)-119, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (small leak)	<Ref. to GD(H4DOTC)-122, 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(H4DOTC)-145, 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(H4DOTC)-147, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to GD(H4DOTC)-149, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(H4DOTC)-151, 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(H4DOTC)-153, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0456	Evaporative Emission Control System Leak Detected (very small leak)	<Ref. to GD(H4DOTC)-155, DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	<Ref. to GD(H4DOTC)-156, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to GD(H4DOTC)-157, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to GD(H4DOTC)-159, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to GD(H4DOTC)-161, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to GD(H4DOTC)-163, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to GD(H4DOTC)-165, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H4DOTC)-167, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Cooling Fan Rationality Check	<Ref. to GD(H4DOTC)-170, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to GD(H4DOTC)-171, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	<Ref. to GD(H4DOTC)-172, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to GD(H4DOTC)-173, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to GD(H4DOTC)-175, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H4DOTC)-177, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to GD(H4DOTC)-178, DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0545	Exhaust Gas Temperature Sensor Circuit Low — Bank 1 —	<Ref. to GD(H4DOTC)-179, DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0546	Exhaust Gas Temperature Sensor Circuit High — Bank 1 —	<Ref. to GD(H4DOTC)-181, DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0600	CAN Communication Circuit	<Ref. to GD(H4DOTC)-183, DTC P0600 — CAN COMMUNICATION CIRCUIT—, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H4DOTC)-184, 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(H4DOTC)-185, DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Control Module Performance	<Ref. to GD(H4DOTC)-186, DTC P0607 — CONTROL MODULE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(H4DOTC)-189, DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to GD(H4DOTC)-192, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to GD(H4DOTC)-193, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0700	AT MIL Light up Request	<Ref. to GD(H4DOTC)-194, DTC P0700 — AT MIL LIGHT UP REQUEST —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low (AT model)	<Ref. to GD(H4DOTC)-195, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low (MT model)	<Ref. to GD(H4DOTC)-196, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High (AT model)	<Ref. to GD(H4DOTC)-197, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High (MT model)	<Ref. to GD(H4DOTC)-198, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to GD(H4DOTC)-199, DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to GD(H4DOTC)-202, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(H4DOTC)-205, DTC P1160 — RETURN SPRING FAILURE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1301	Misfire Defected (High Temperature Exhaust Gas)	<Ref. to GD(H4DOTC)-207, DTC P1301 — MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1312	Exhaust Gas Temperature Sensor Malfunction	<Ref. to GD(H4DOTC)-209, DTC P1312 — EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H4DOTC)-210, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(H4DOTC)-212, 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(H4DOTC)-214, DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to GD(H4DOTC)-215, DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to GD(H4DOTC)-217, DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1448	Fuel Tank Sensor Control Valve Range/Performance	<Ref. to GD(H4DOTC)-219, DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to GD(H4DOTC)-223, DTC P1491 — POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P1518	Starter Switch Circuit Low Input	<Ref. to GD(H4DOTC)-225, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1544	Exhaust Gas Temperature Tool High	<Ref. to GD(H4DOTC)-226, DTC P1544 — EXHAUST GAS TEMPERATURE TOO HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(H4DOTC)-227, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2004	Tumble Generated Valve System 1 (Valve Open)	<Ref. to GD(H4DOTC)-228, DTC P2004 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2005	Tumble Generated Valve System 2 (Valve Open)	<Ref. to GD(H4DOTC)-229, DTC P2005 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2006	Tumble Generated Valve System 1 (Valve Close)	<Ref. to GD(H4DOTC)-230, DTC P2006 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2007	Tumble Generated Valve System 2 (Valve Close)	<Ref. to GD(H4DOTC)-231, DTC P2007 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2008	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	<Ref. to GD(H4DOTC)-232, DTC P2008 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2009	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	<Ref. to GD(H4DOTC)-234, DTC P2009 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2011	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	<Ref. to GD(H4DOTC)-236, DTC P2011 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2012	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	<Ref. to GD(H4DOTC)-238, DTC P2012 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2016	Tumble Generated Valve Position Sensor 1 Circuit Low	<Ref. to GD(H4DOTC)-240, DTC P2016 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2017	Tumble Generated Valve Position Sensor 1 Circuit High	<Ref. to GD(H4DOTC)-242, DTC P2017 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2021	Tumble Generated Valve Position Sensor 2 Circuit Low	<Ref. to GD(H4DOTC)-244, DTC P2021 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2022	Tumble Generated Valve Position Sensor 2 Circuit High	<Ref. to GD(H4DOTC)-246, DTC P2022 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	<Ref. to GD(H4DOTC)-248, DTC P2088 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	<Ref. to GD(H4DOTC)-249, DTC P2089 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	<Ref. to GD(H4DOTC)-250, DTC P2092 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2093	OCV Solenoid Valve Signal A Circuit Short (Bank 2)	<Ref. to GD(H4DOTC)-251, DTC P2093 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to GD(H4DOTC)-252, DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to GD(H4DOTC)-254, 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(H4DOTC)-256, 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(H4DOTC)-258, DTC P2102 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to GD(H4DOTC)-260, 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(H4DOTC)-262, 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(H4DOTC)-264, 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(H4DOTC)-266, 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(H4DOTC)-268, 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(H4DOTC)-270, 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 Rationality	<Ref. to GD(H4DOTC)-272, DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2138	Throttle/Pedal Position Sensor/ Switch “D”/“E” Voltage Rationality	<Ref. to GD(H4DOTC)-274, DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2227	Atmospheric Pressure Sensor Circuit Range/Performance	<Ref. to GD(H4DOTC)-276, DTC P2227 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2228	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to GD(H4DOTC)-277, DTC P2228 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2229	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to GD(H4DOTC)-278, DTC P2229 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

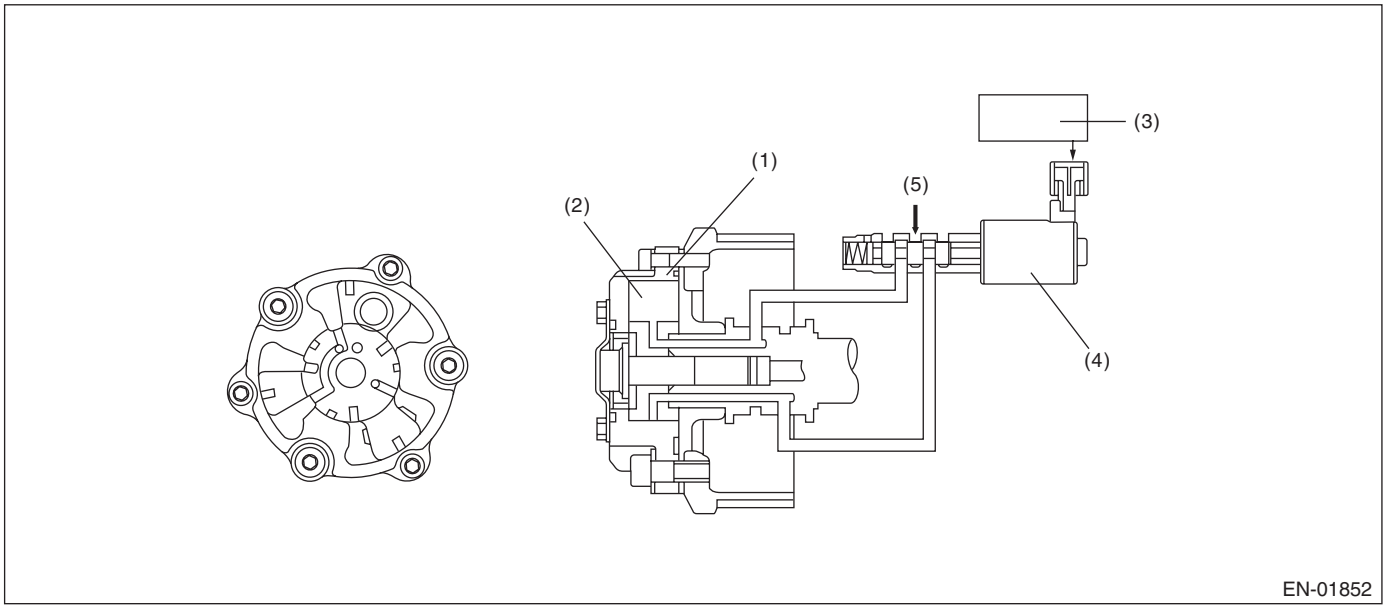
2. Diagnostic Trouble Code (DTC) Detecting Criteria

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of AVCS system.
1) Judge NG when the amount of AVCS actual timing advance does not approach to the amount of AVCS target timing advance.
2) Judge NG when the most retarded learning value is outside of the normal range.

2. COMPONENT DESCRIPTION



(1) AVCS timing controller
(2) Vane
(3) Engine control module (ECM)
(4) Oil flow control valve
(5) Oil pressure

3. ENABLE CONDITION (For abnormality judgment only)

Secondary Parameters	Enable Conditions
Abnormality judgement (1)	
Battery voltage	≥ 10.9 V
Engine speed	≥ 1500 rpm
Coolant temperature	≥ 60°C (140 °F)
Abnormality judgement (2)	
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm
Coolant temperature	≥ 60°C (140 °F)

4. GENERAL DRIVING CYCLE

1) Always perform the diagnosis after idling when the engine speed is more than 1500 rpm.
2) Always perform the diagnosis after warming up the engine when the engine speed is more than 500 rpm.

5. DIAGNOSTIC METHOD

1) Judge NG when the difference of the amount of AVCS target timing advance and the amount of AVCS actual timing advance becomes large.
2) Judge NG when the most retarded learning value is outside of the normal range.

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 20 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
(1) Judgemet value	
|AVCS target position – AVCS actual position|	≥ 7.5°
(2) Judgemet value	
AVCS control	During most timing retard learning
Most timing retard learning value	< –29.5°CA or > 29.5°CA

Time Needed for Diagnosis: 20 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
AVCS control	During feedback
Amount of AVCS target timing advance	5 — 30°CA
AVCS target position – AVCS actual position	< 10°
Most timing retard learning value	–29.5 — 29.5°CA

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

AVCS control: Make the OCV driving Duty to be the given value (9.36%).

9. ECM OPERATING AT DTC SETTING

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

B: DTC P0021 — “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2) —

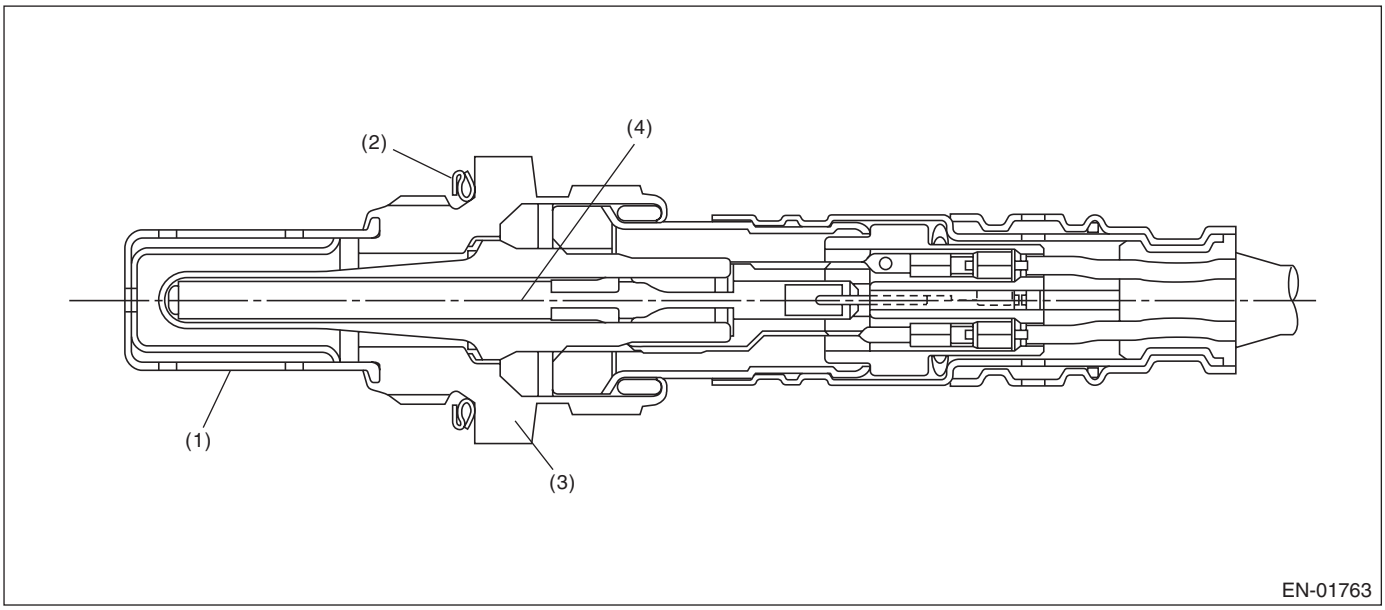
NOTE:
For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H4DOTC)-9, DTC P0011 — “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1) —.>

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor heater.
Judge NG when impedance of front oxygen (A/F) sensor is larger than the standard value by referring to the engine condition such as fuel shut-off in deceleration, etc.

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	60 seconds or more
Battery voltage	> 10.9 V
After fuel shut-off	10 seconds or more
Front oxygen (A/F) sensor heater control duty ≥ 30%	Experienced

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously in 60 seconds after starting engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Impedance of front oxygen (A/F) sensor	> 50 Ω

Time Needed for Diagnosis: 10 seconds

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

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Purge control: Not allowed to purge

9. ECM OPERATING AT DTC SETTING

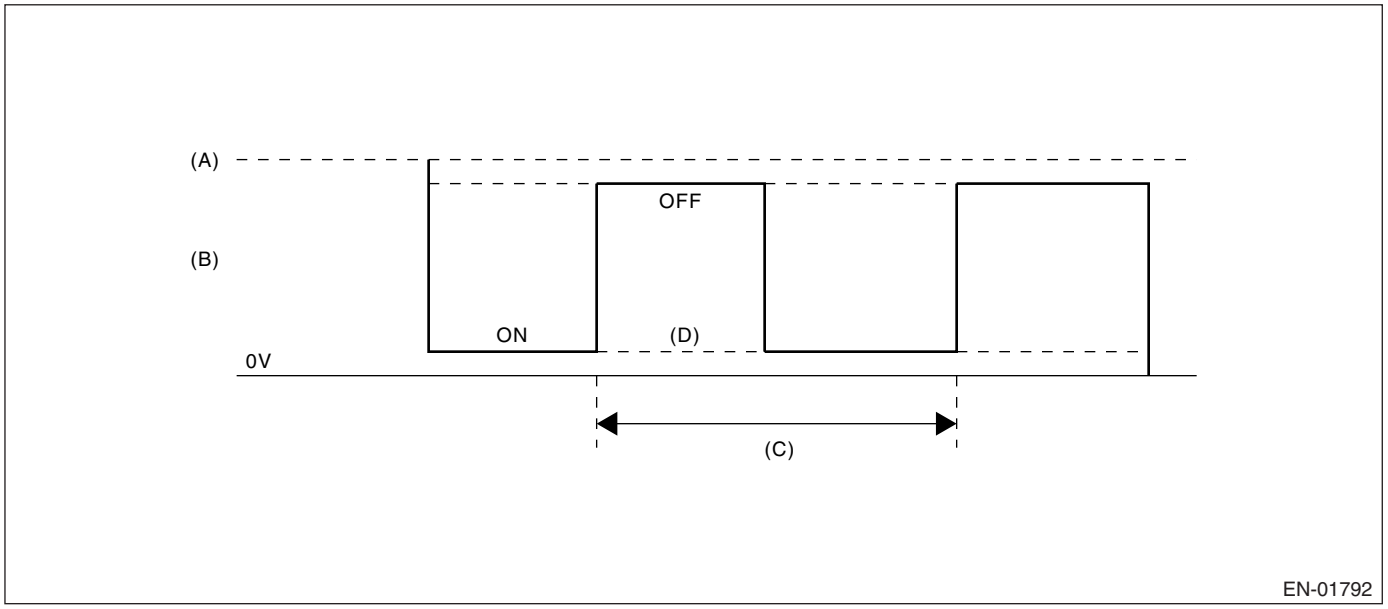
Memorize the freeze frame data. (For test mode $02)

D: 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 conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.
Judge NG when the terminal voltage remains to be Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Front oxygen (A/F) sensor heater output voltage
(C) 128 milliseconds
(D) Low abnormality

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second (8 cycles).

• Judgment Value

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

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

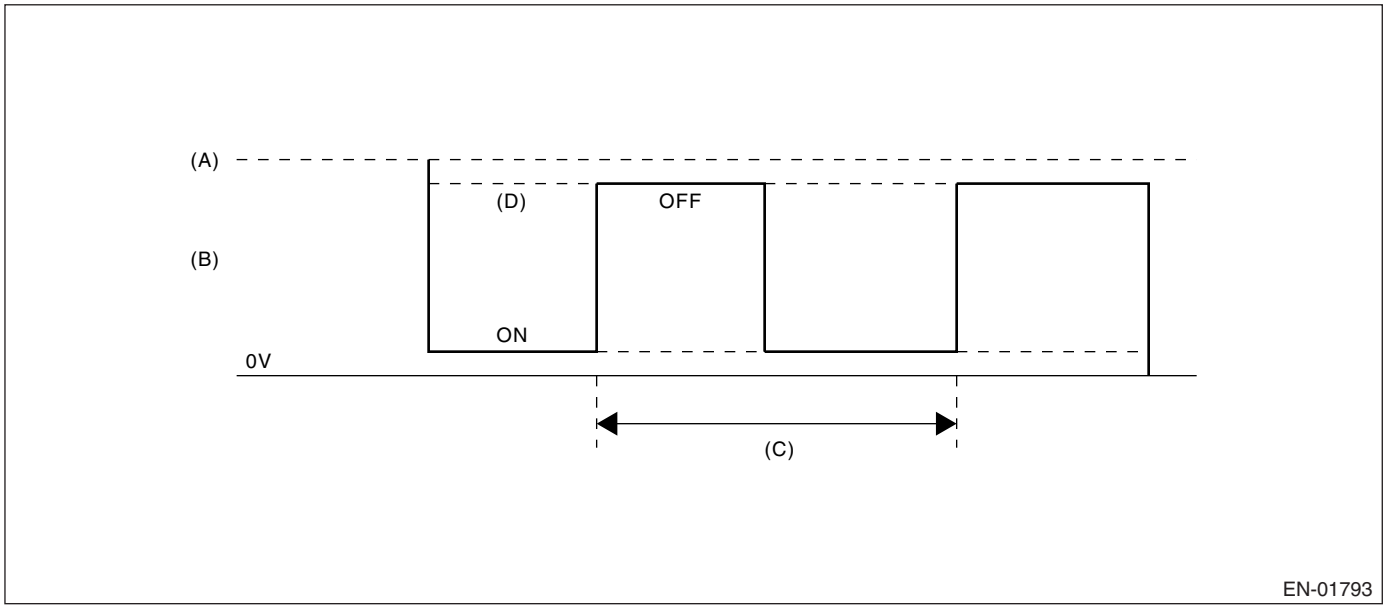
Memorize the freeze frame data. (For test mode $02)

E: 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 conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.
Judge NG when the terminal voltage remains to be High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Front oxygen (A/F) sensor heater output voltage
(C) 128 milliseconds
(D) High abnormality

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes 1 second (8 cycles).

• 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 malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

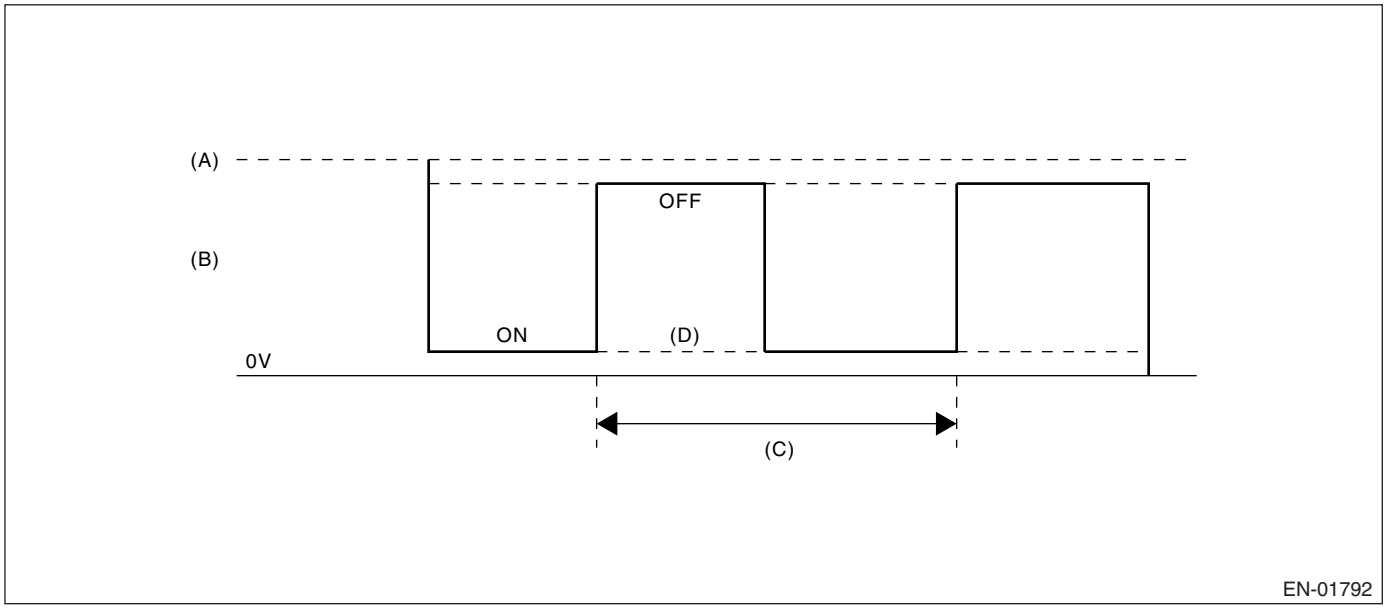
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen sensor heater.
Rear oxygen sensor heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.
Judge NG when the terminal voltage remains to be Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Rear oxygen sensor heater output voltage
(C) 256 milliseconds (cycles)
(D) Low malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Elapsed time after engine starting	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2560 millisecond (10 cycles).

• 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 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

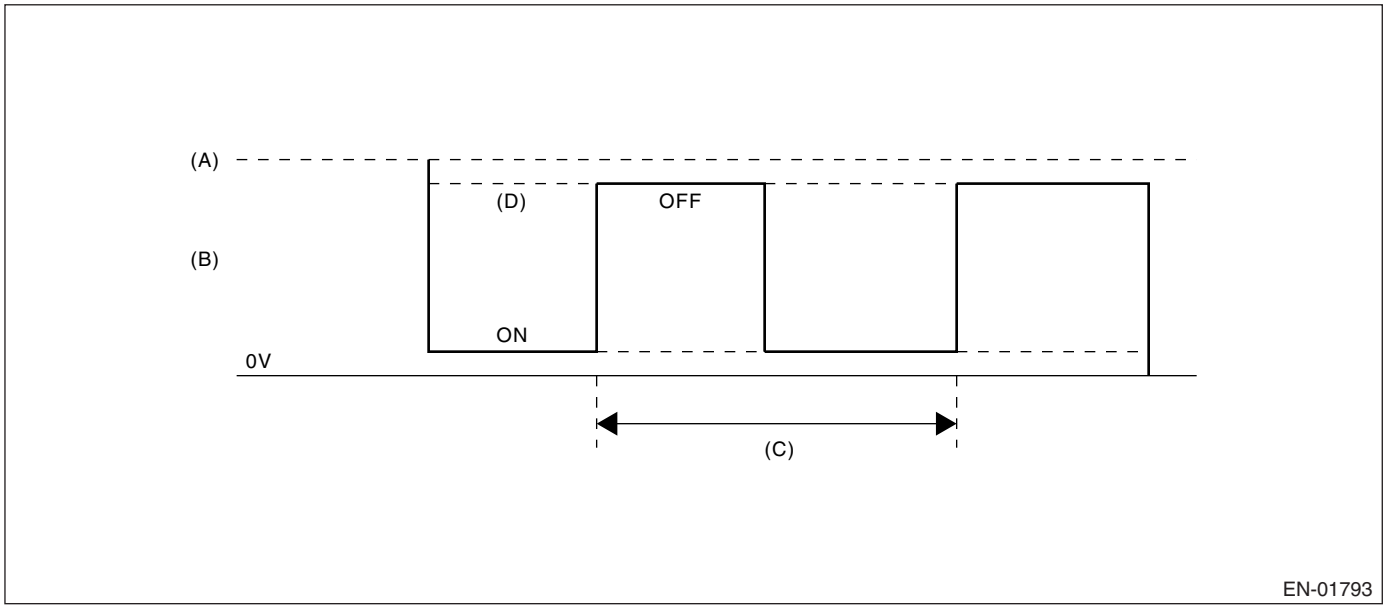
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen heater.
Rear oxygen heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.
Judge NG when the terminal voltage remains to be High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Rear oxygen sensor heater output voltage
(C) 256 milliseconds (cycle)
(D) High malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Elapsed time after engine starting	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2560 milliseconds (10 cycles).

• 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 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

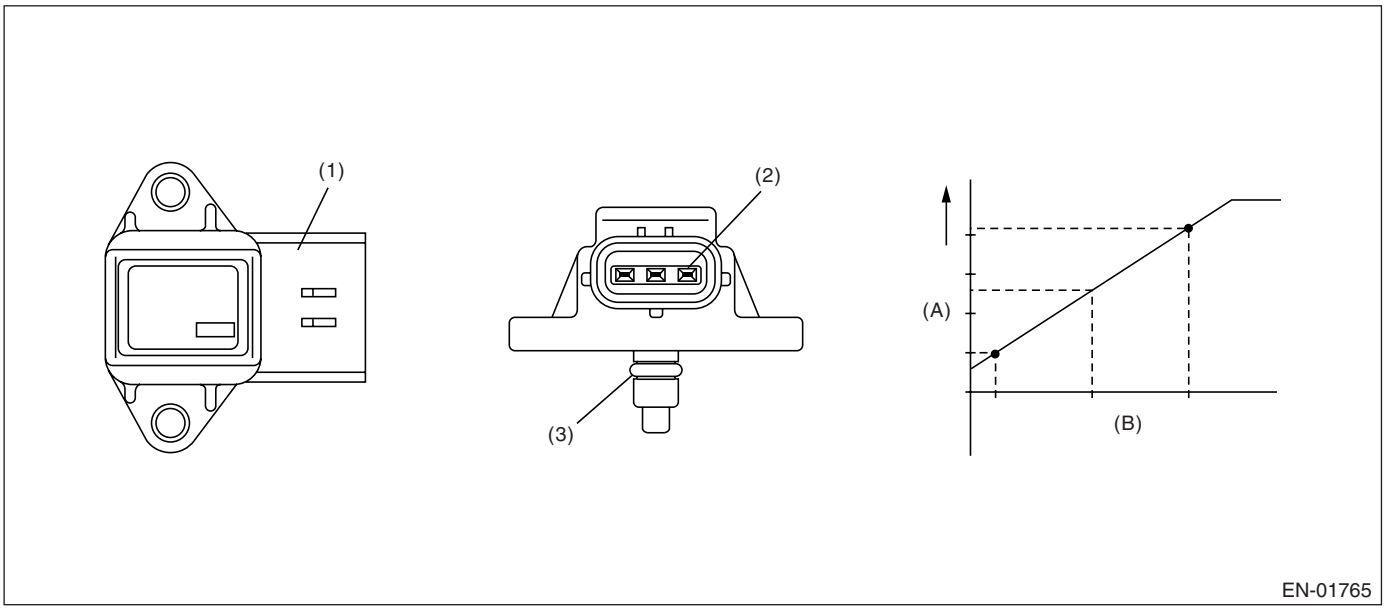
Memorize the freeze frame data. (For test mode $02)

H: DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property. Judge 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



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when either Low side or High side becomes NG. Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2500 rpm
Throttle position	≥ 10°
Intake air flow of every 0.5 engine rev.	> 1.356
Output voltage	< 1.0 V
High side	
Engine speed	600 ←→ 900 rpm
Throttle position	< 1.3°
Intake air flow of every 0.5 engine rev.	≤ 0.4
Output voltage	≥ 2.36 V

Time Needed for Diagnosis: 3 seconds

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

• Normality Judgment

Judge OK and clear the NG when both Low side and High side become OK. Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2500 rpm
Throttle position	≥ 10°
Output voltage	≥ 1.0 V
High side	
Engine speed	600 ←→ 900 rpm
Throttle position	< 1.3°
Output voltage	< 2.36 V

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was 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.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATING AT DTC SETTING

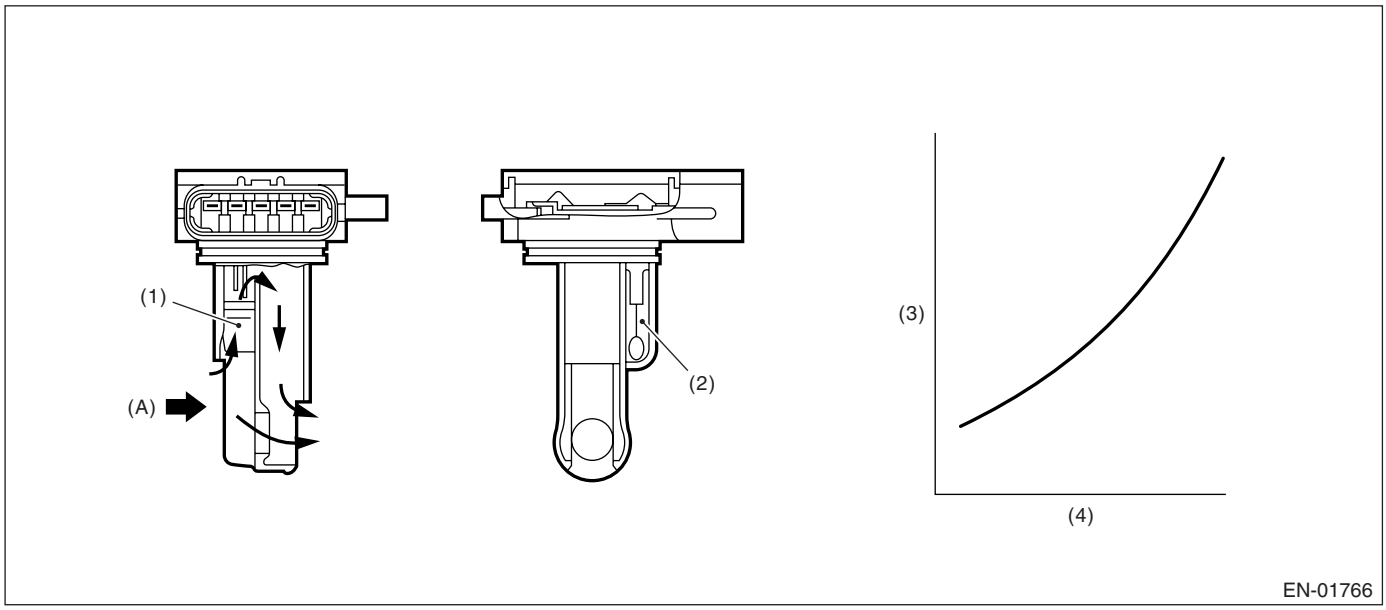
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property. Judge Low side NG when the air flow voltage indicates low value in spite of the driving condition that the air flow voltage might be high; otherwise, judge High side NG when the air flow voltage indicates high value in spite of the driving condition that the air flow voltage might be low. Judge air flow sensor property NG when the Low side or High side becomes NG.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg (lb)/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70°C (158°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more then the time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side NG	
Output voltage	< 1.5 V
Engine speed	≥ 2500 rpm
Throttle angle	≥ 15°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG	
Output voltage	≥ 1.95 V
(Voltage when rich condition of fuel system is NG)	(≥ 1.7 V)
Engine speed	600 ←→ 900 rpm
Throttle angle	< 4.1°
Intake manifold pressure	< 52.7 kPa (395 mmHg, 15.6 inHg)

Time Needed for Diagnosis:

Low side	3 seconds
High side	10 seconds

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

• Normality Judgment

Judge OK the when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side NG	
Output voltage	≥ 1.5 V
Engine speed	≥ 2500 rpm
Throttle angle	≥ 15°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG	
Output voltage	< 1.95 V
Engine speed	600 ←→ 900 rpm
Throttle angle	< 4.1°
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

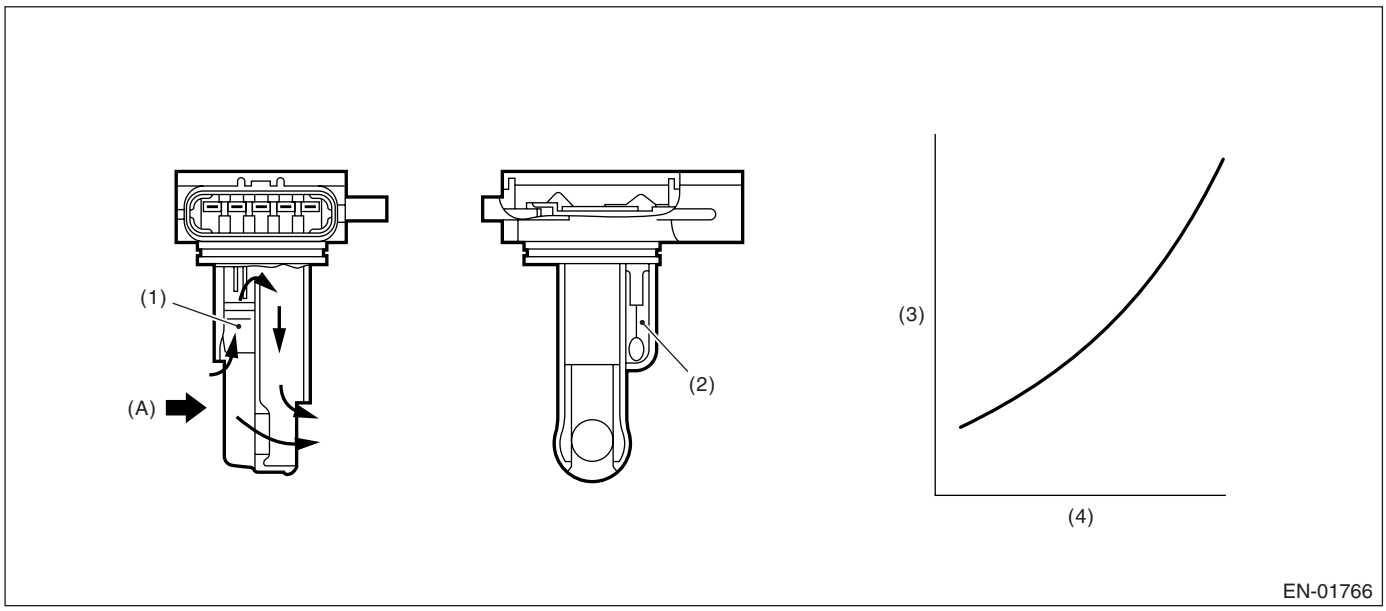
Memorize the freeze frame data. (For test mode $02)

J: DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg (lb)/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

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

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 the malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

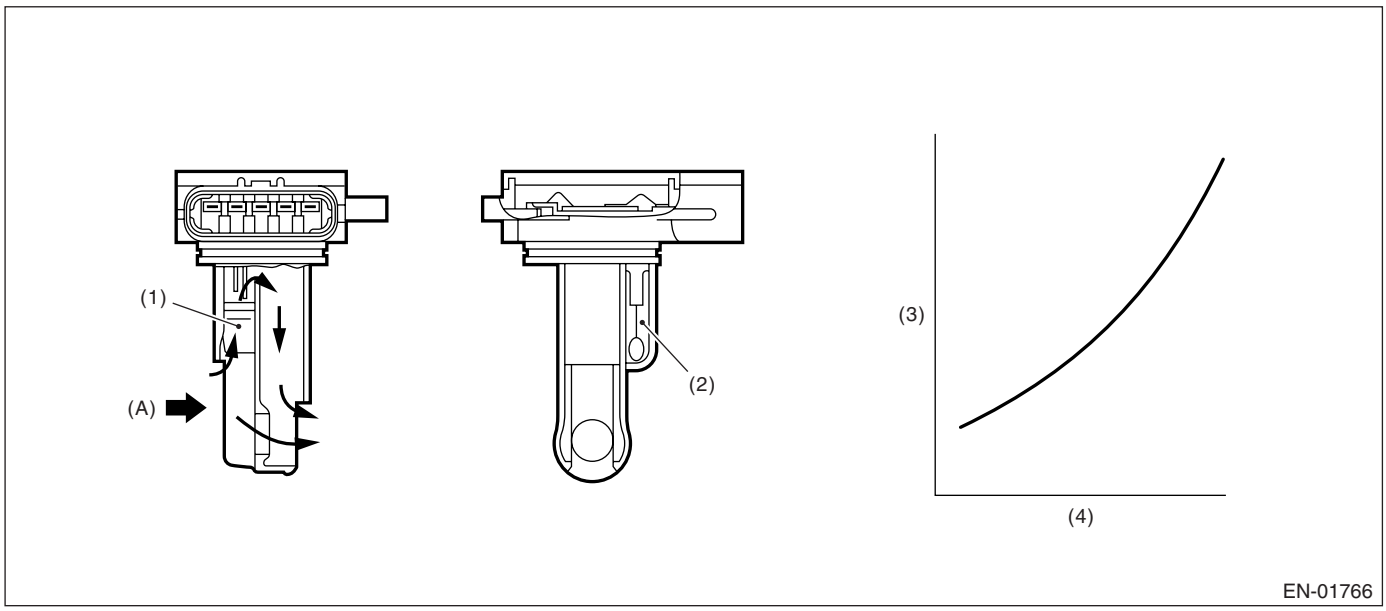
Memorize the freeze frame data. (For test mode $02)

K: DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg (lb)/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

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

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 the malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

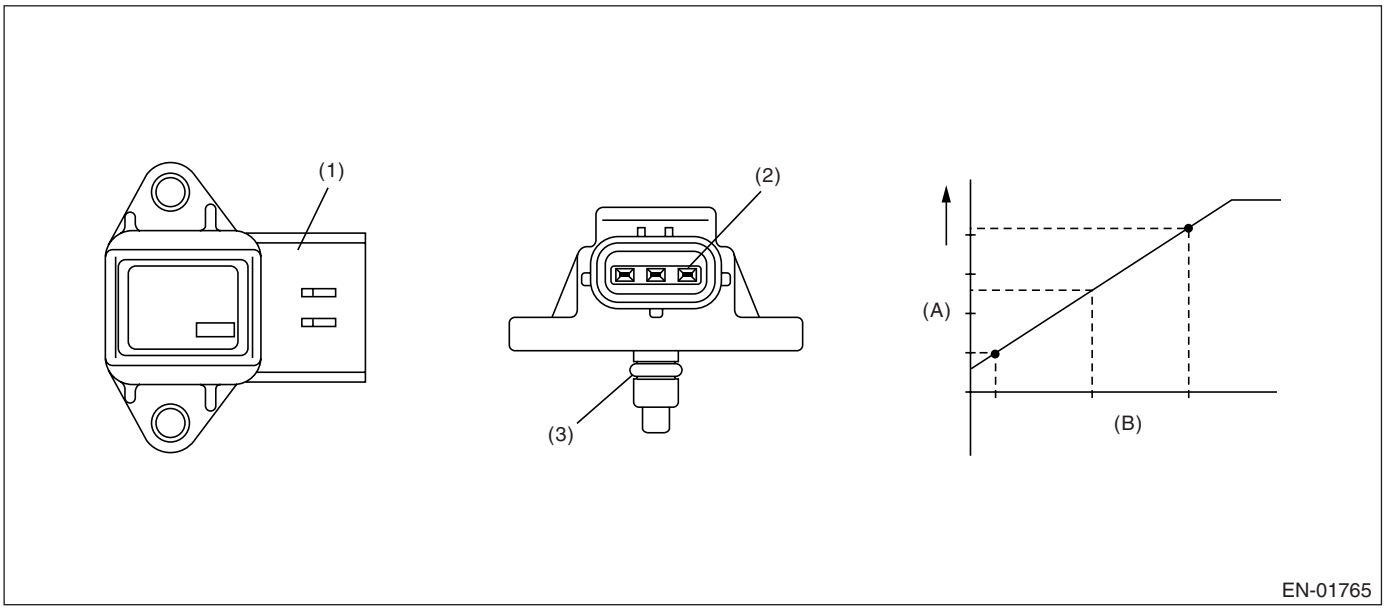
Memorize the freeze frame data. (For test mode $02)

L: 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 NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

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

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 the malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was 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.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATING AT DTC SETTING

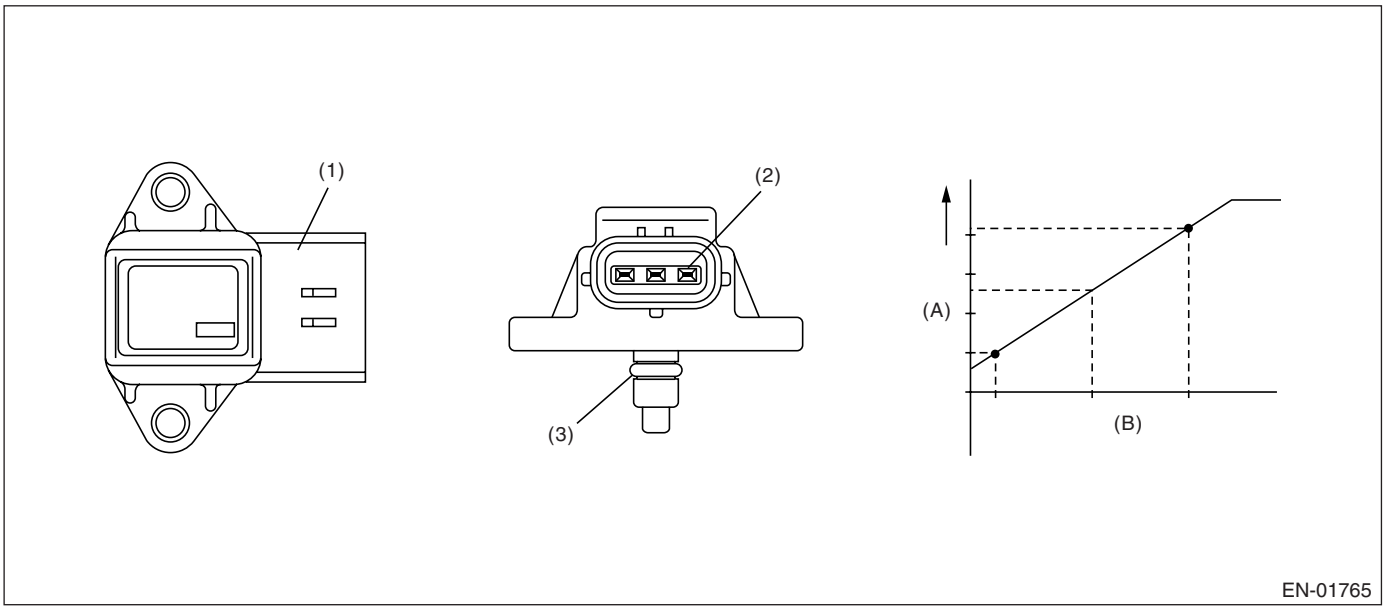
Memorize the freeze frame data. (For test mode $02)

M: 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 NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.93 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was 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.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATING AT DTC SETTING

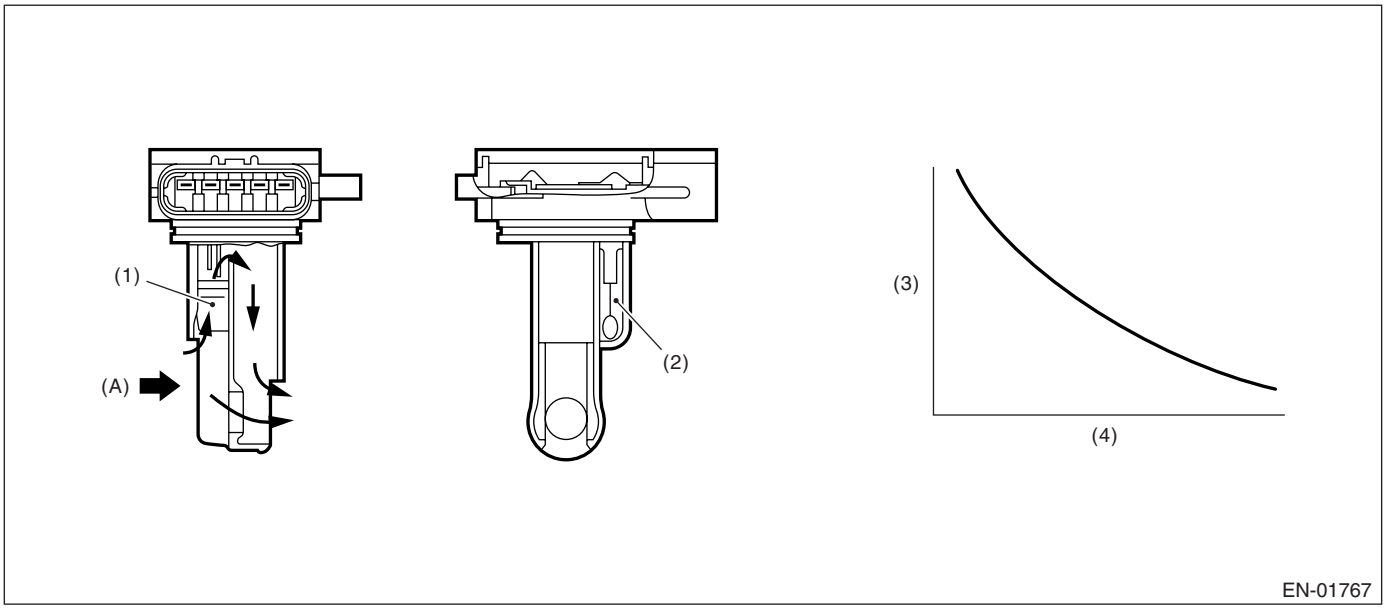
Memorize the freeze frame data. (For test mode $02)

N: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property. Judge NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temp. before engine start	< 30°C (86°F)
Coolant temperature	> 75°C (167°F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 50 km/h (31 MPH)	600 seconds or more
Exhaust temperature ≥ 500°C (932°F) is continued for 60 seconds or more	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 20 mV (It is equal to approx. 0.5°C (33°F) around 25°.)
Exhaust temperature above 500°C (932°F)	60 seconds or more

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

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

• Judgment Value

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

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

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

9. ECM OPERATING AT DTC SETTING

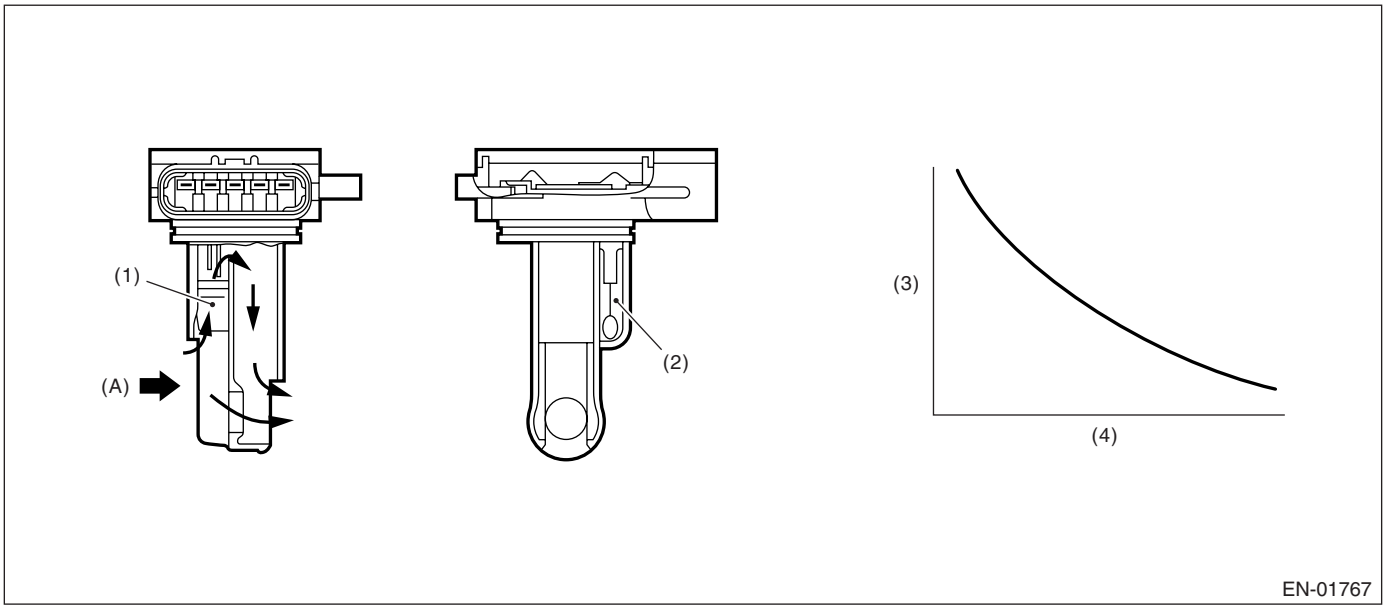
Memorize the freeze frame data. (For test mode $02)

O: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance (Ω)
(4) Intake air temperature °C (°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 NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.165 V
Ignition switch	ON

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

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

9. ECM OPERATING AT DTC SETTING

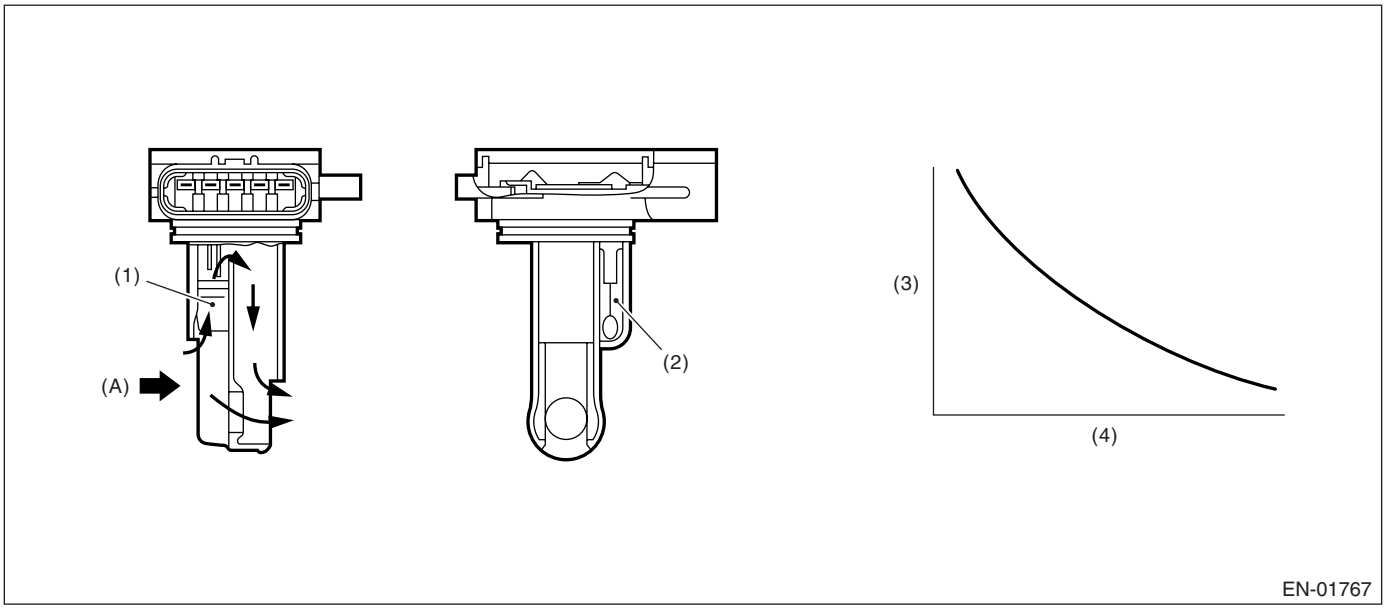
Memorize the freeze frame data. (For test mode $02)

P: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance (Ω)
(4) Intake air temperature °C (°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 NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.72 V
Ignition switch	ON

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

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

9. ECM OPERATING AT DTC SETTING

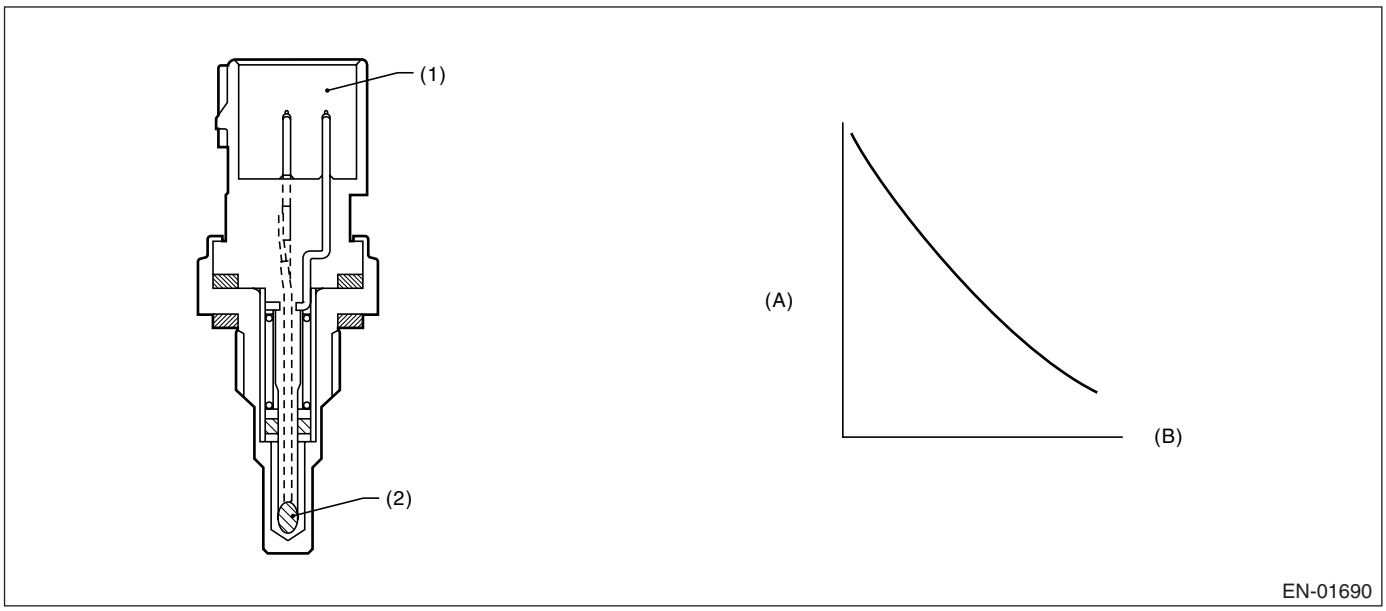
Memorize the freeze frame data. (For test mode $02)

Q: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(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 NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATING AT DTC SETTING

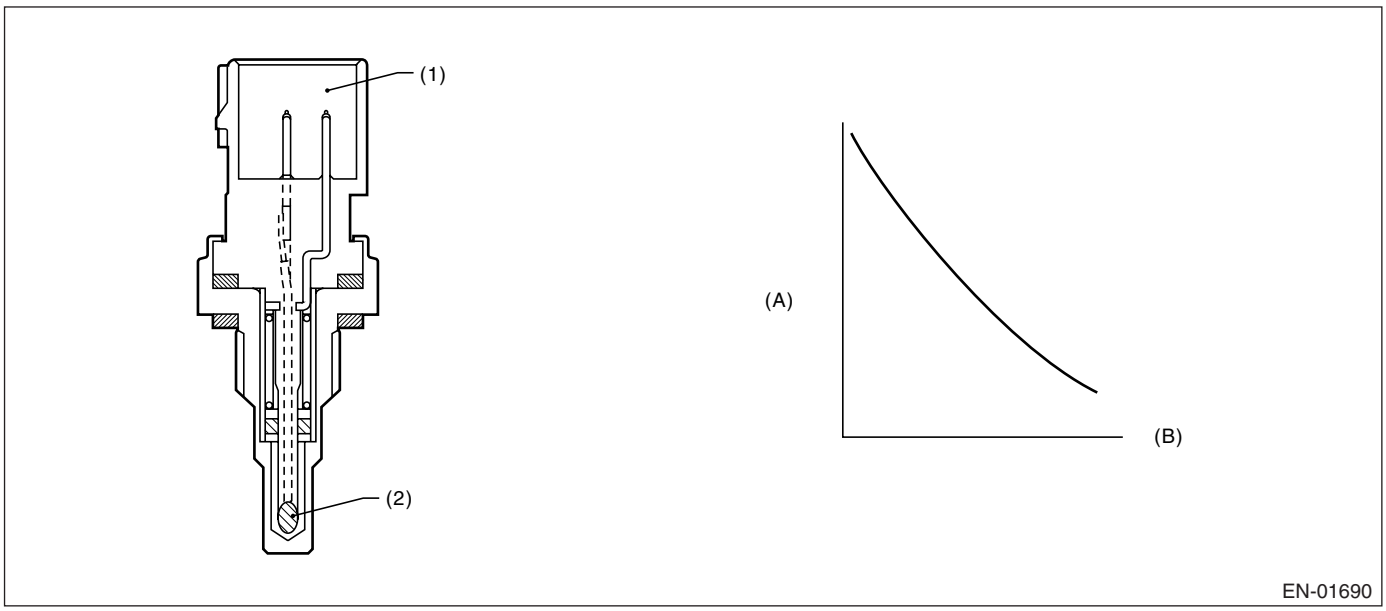
Memorize the freeze frame data. (For test mode $02)

R: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(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 NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATING AT DTC SETTING

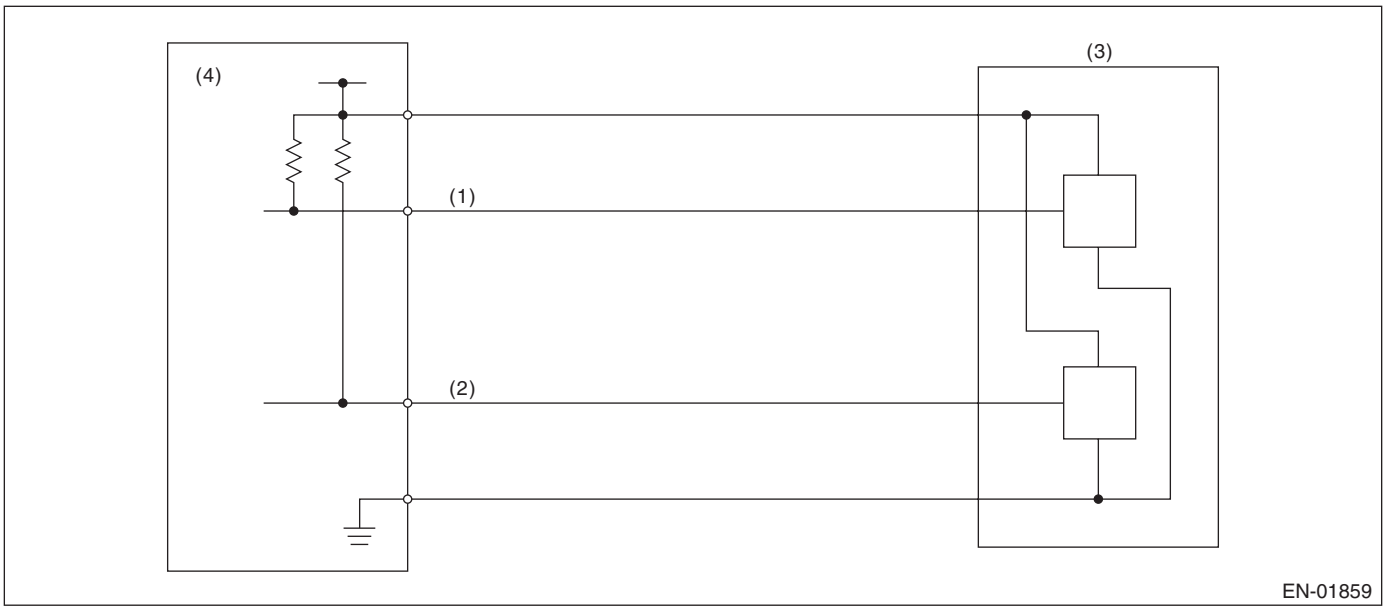
Memorize the freeze frame data. (For test mode $02)

S: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge NG when out of the standard value.

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.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
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 malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

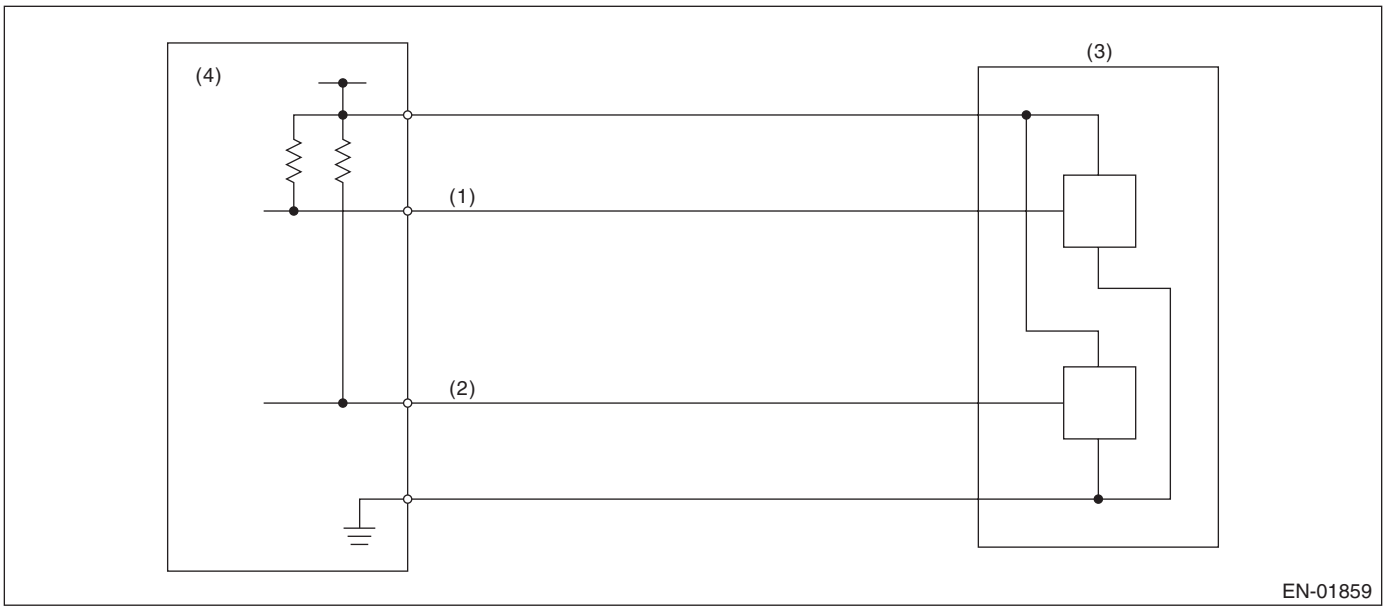
Memorize the freeze frame data. (For test mode $02)

T: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge NG when out of the standard value.

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.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
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 malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

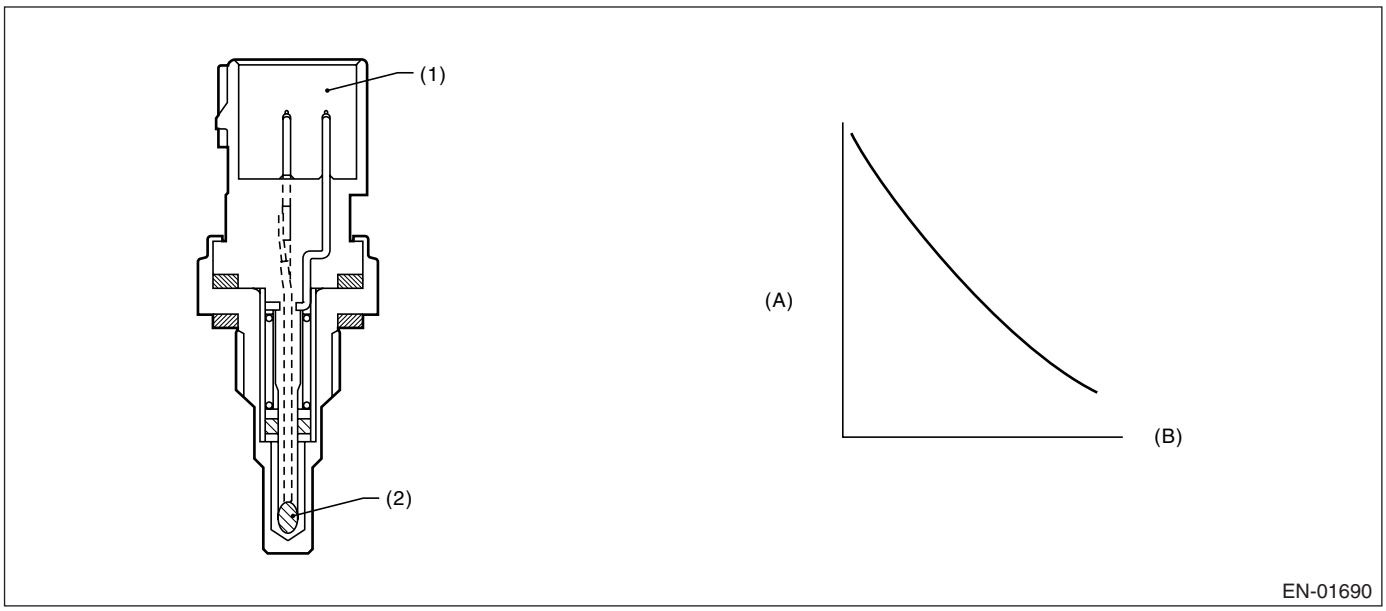
Memorize the freeze frame data. (For test mode $02)

U: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property. Judge NG when the engine coolant temperature does not rise whereas it seemed to rise from the viewpoint of the engine condition.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°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 starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20°C (68°F)
Timer for diagnosis after engine starting	≥ Timer judgment value after engine starting

Timer for diagnosis after engine starting
a) Timer stop at fuel cut mode.
b) During the driving conditions except a) above, timer count up by 64 milliseconds + TWCNT milliseconds at every 64 milliseconds.
Where,TWCNT is determined 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
$t = 451.1 - 25.9 \times Ti$
Ti is the lowest coolant temperature after starting the engine.
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 2 continuous driving cycles.

• Normality Judgment

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

• Judgment Value

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

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATING AT DTC SETTING

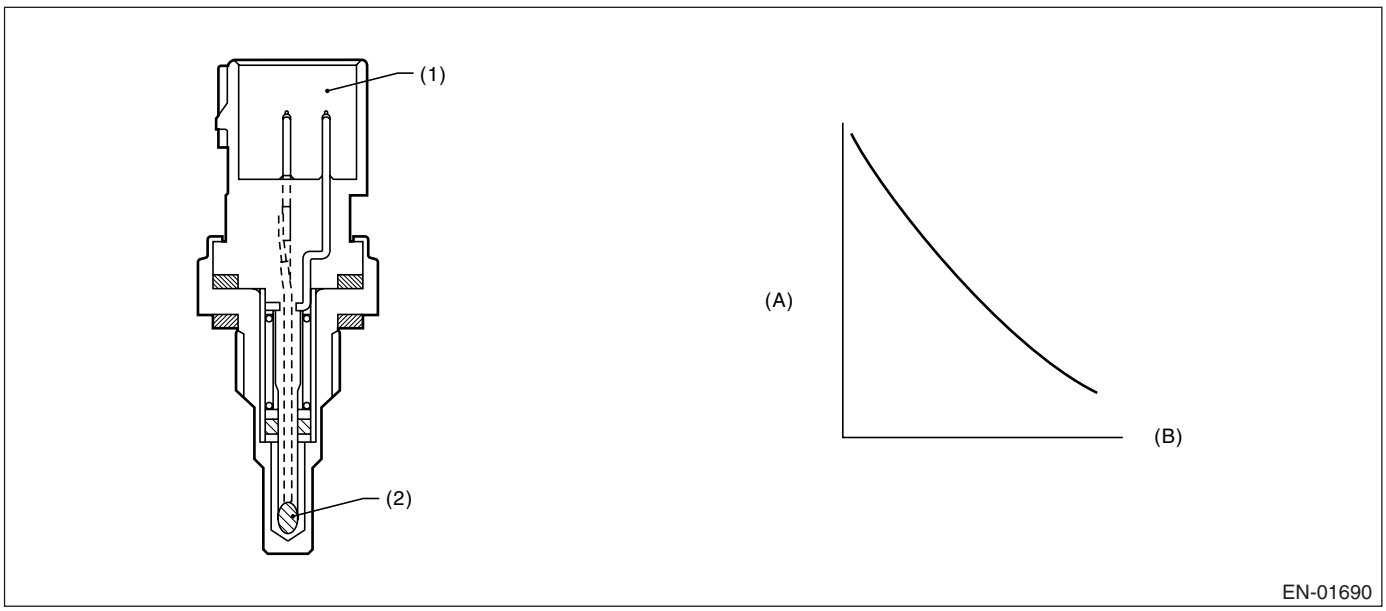
Memorize the freeze frame data. (For test mode $02)

V: DTC P0126 — INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION —

1. OUTLINE OF DIAGNOSIS

Detect the characteristic malfunction of the engine coolant temperature sensor.
Has memorized the engine coolant temperature and the fuel temperature at the last engine stop. Judge NG when the engine coolant temperature has not lowered after the engine start of this time when the engine coolant temperature should lower.

2. COMPONENT DESCRIPTION



(A) Resistance value (kΩ)
(B) Temperature °C (°F)
(1) Connector
(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Refilling between the last engine stop and the engine start of this time	None
Fuel remaining	≥ 15 ℓ
Engine coolant temperature at the last engine stop	≥ 75°C (167°F) and < 95°C (203°F)

4. GENERAL DRIVING CYCLE

Perform only one diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Abnormality Judgment
Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.
Judgment Value

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

Normality Judgment
Judge OK when all of the malfunction criteria below are completed successfully.
Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature at the last engine stop — Minimum engine coolant temperature after engine starting	≥ 2.5 °C (5 °F)

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

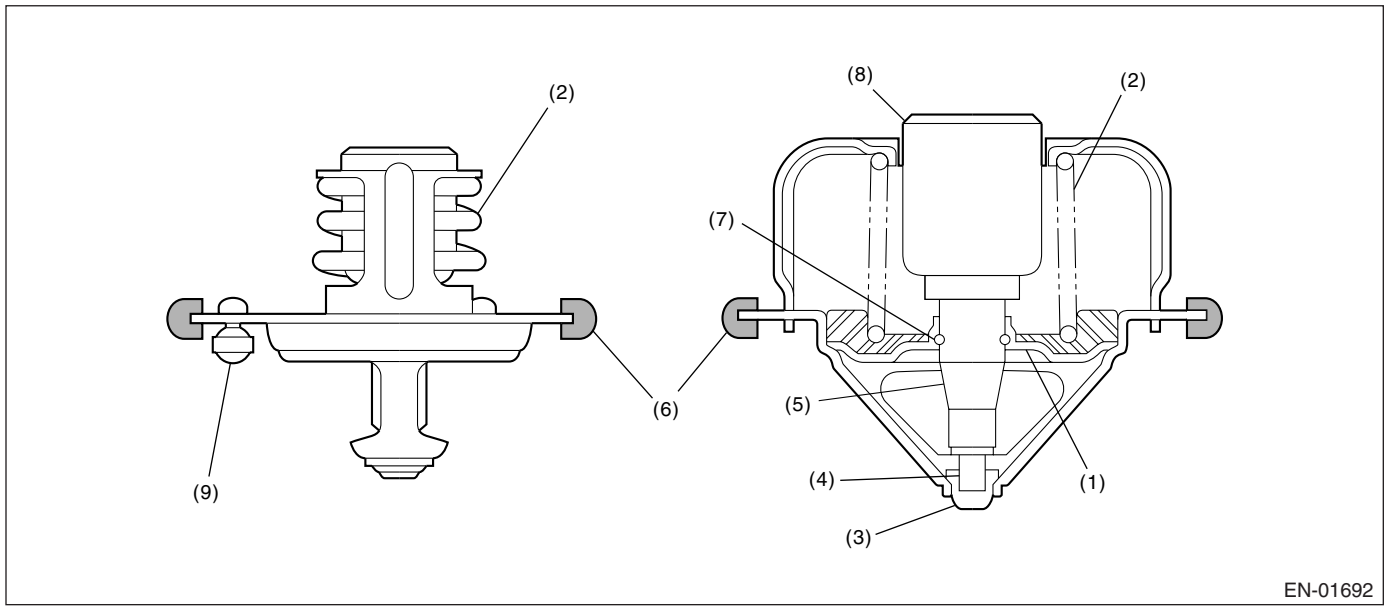
Memorize the freeze frame data. (For test mode $02)

W: DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —

1. OUTLINE OF DIAGNOSIS

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

2. COMPONENT DESCRIPTION



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

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 30 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 30 km/h (19 MPH)
Battery voltage	≥ 10.9 V
Estimated ambient air temperature	≥ –7°C (19.4°F)
Engine coolant temperature at engine starting	< 55°C (131°F)
Estimated coolant temperature	≥ 75°C (167°F)
Engine coolant temperature	< 75°C (167°F)
(Estimated – measured) coolant temperature	> 30°C (54°F)

Time Needed for Diagnosis: 30 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimated ambient air temperature	≥ –7°C (19.4°F)
Thermostat malfunction diagnosis	Not finished
Engine coolant temperature at engine starting	< 55°C (131°F)
Engine coolant temperature	≥ 75°C (167°F)
(Estimated – measured) coolant temperature	≤ 30°C (54°F)

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

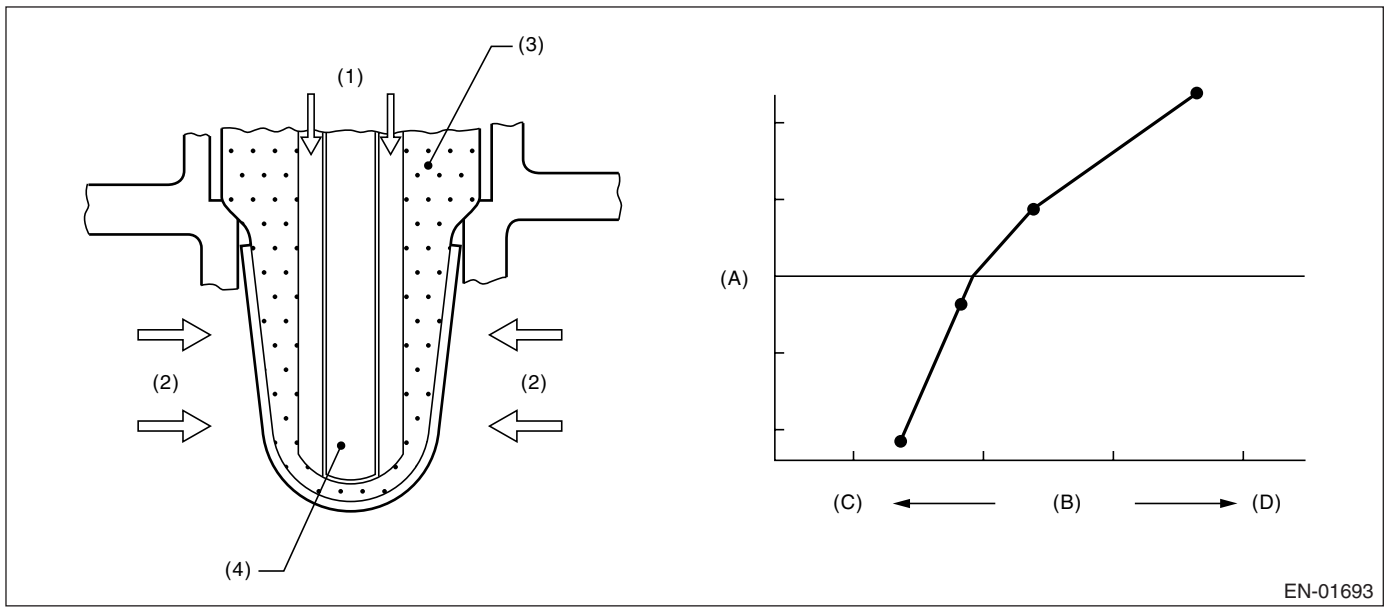
Memorize the freeze frame data. (For test mode $02)

X: DTC P0131 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.
Judge NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(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 NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

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 the malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

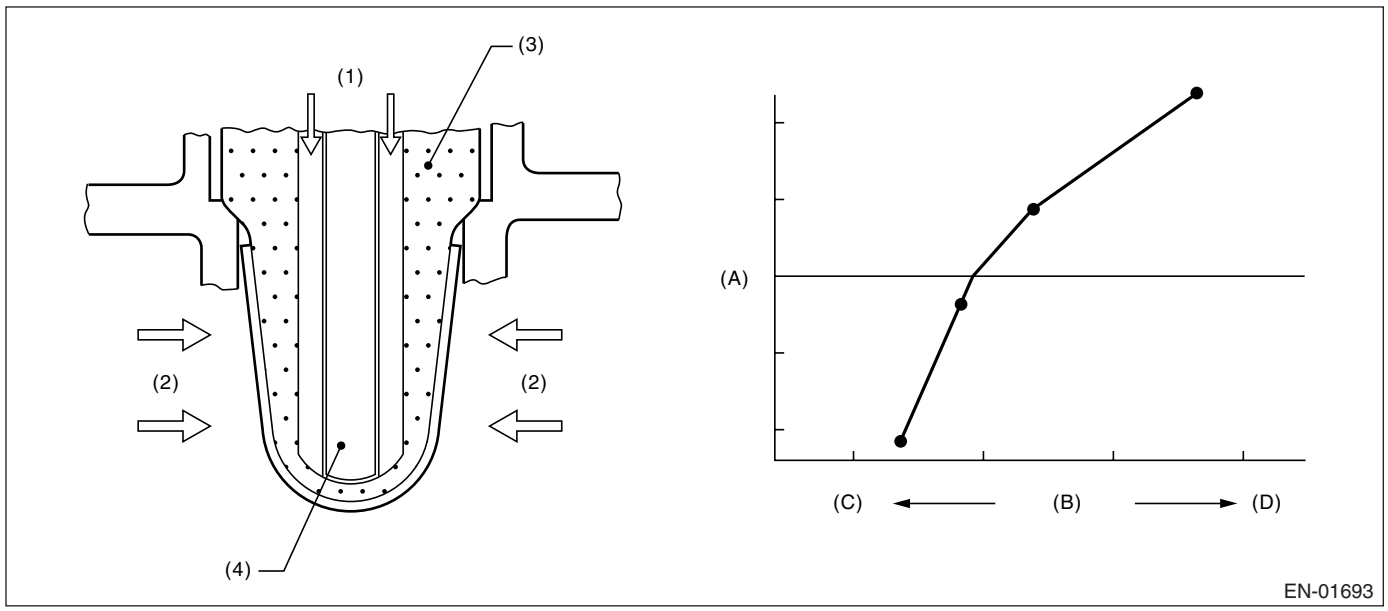
Memorize the freeze frame data. (For test mode $02)

Y: DTC P0132 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.
Judge NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(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 NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	≥ 3.8 V
Input current	≥ 0.01 A

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Purge control: Not allowed to purge.

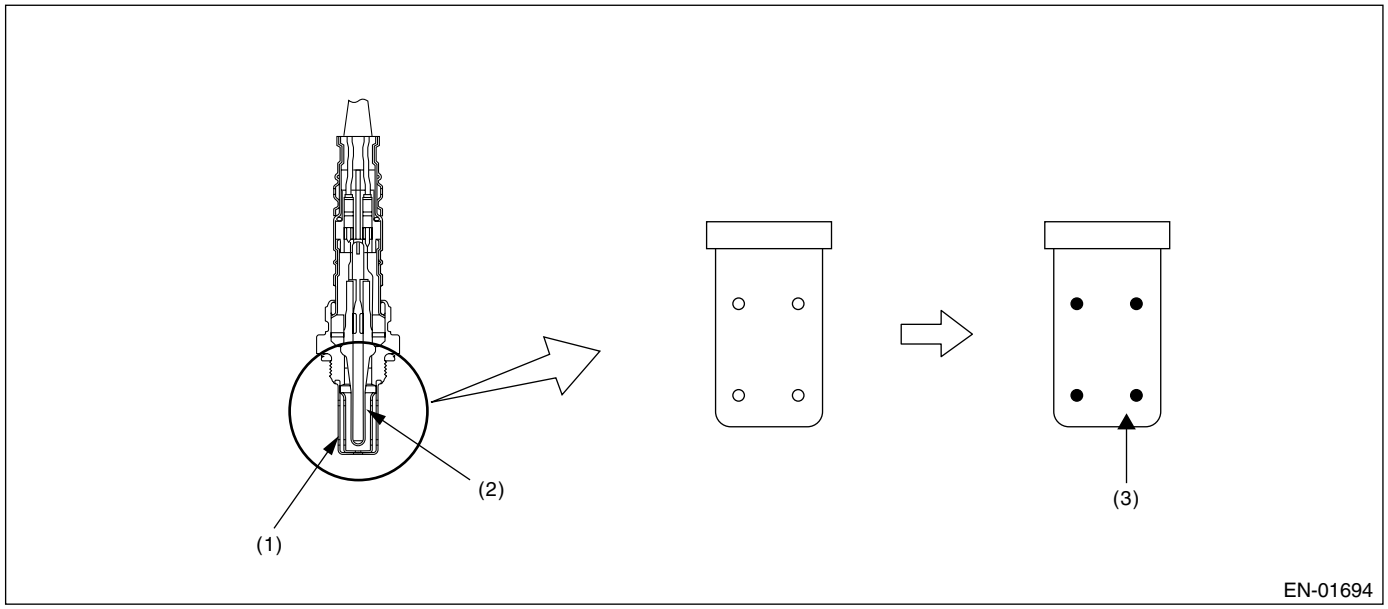
9. ECM OPERATING AT DTC SETTING

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

Z: DTC P0133 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —

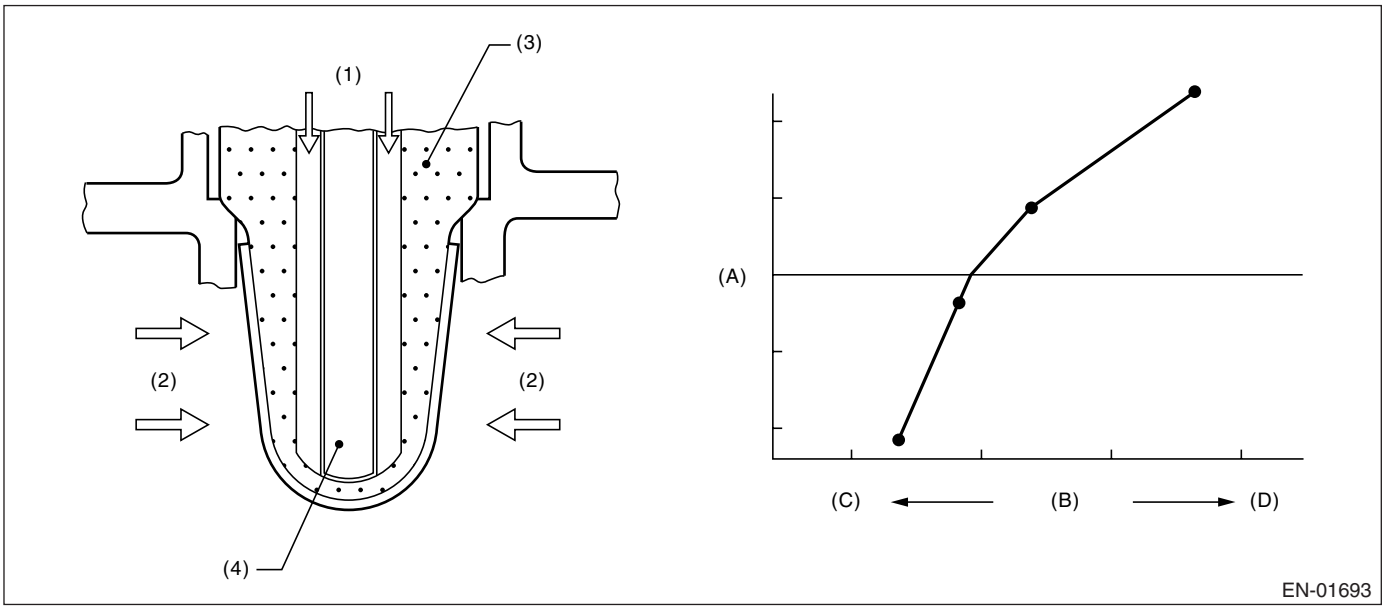
1. OUTLINE OF DIAGNOSIS

Detect time-lag of front oxygen (A/F) sensor response. 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 cover has clogged holes, the rich to lean judgment in ECM is delayed when the change from rich to lean is caused.



(1) Cover (2) Zirconia (3) Clogging

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameter enable conditions	more than 1 second
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	operating
Impedance of front oxygen (A/F) sensor	0 ←→ 50 Ω
After starting engine	120 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Engine speed	1000 ←→ 3200 rpm
Vehicle speed	10 ←→ 120 km/h (6.21 ←→ 74.6 MPH)
Amount of intake air	10 ←→ 31 g (0.35 ←→ 1.09 oz)/s
Engine load change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
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) in 120 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Integrate the difference of faf in every 128 milliseconds and difference of λ value.
After integrate 1640 times (210 seconds), calculate the diagnosis value.
Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
parafca = td2faf/td2lmd where, td2faf (N) = td2faf (n−1) + |d2faf (n)| td2lmd (N) = td2lmd (n−1) + |d2lmd (n)| add up for a total of 210 seconds d2faf (n) = (faf (n) − faf (n−1)) − (faf (n−1) − faf (n−2)) d2lmd (n) = (lmd (n) − lmd (n−1)) − (lmd (n−1) − lmd (n−2)) faf = main feedback compensation coefficient every 128 milliseconds lmd = output lambda every 128 milliseconds	≥ 0.367

Time Needed for Diagnosis: 210 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

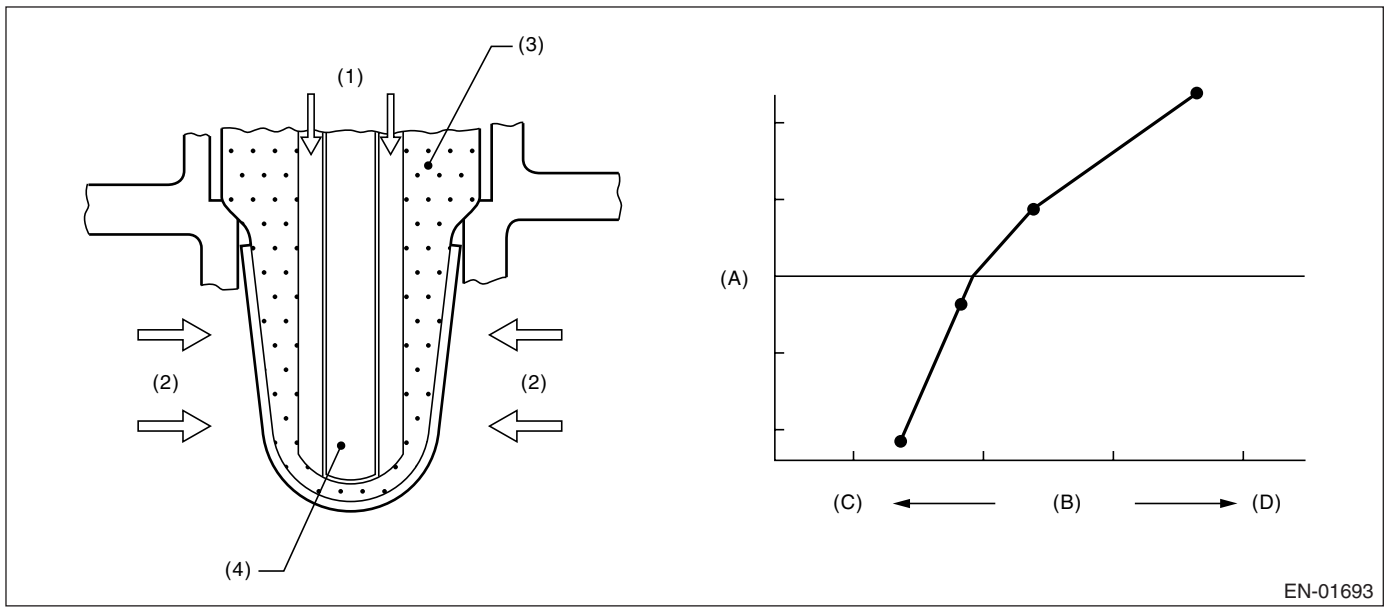
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AA:DTC P0134 — O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open circuit of sensor.
Judge NG when the element impedance is large.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Time after engine starting	≥ 50 seconds
Cumulative amount of Front O_2 (A/F) sensor heater control duty every 128 milliseconds	≥ 28000%
Front lambda sensor impedance	≥ 500 Ω

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

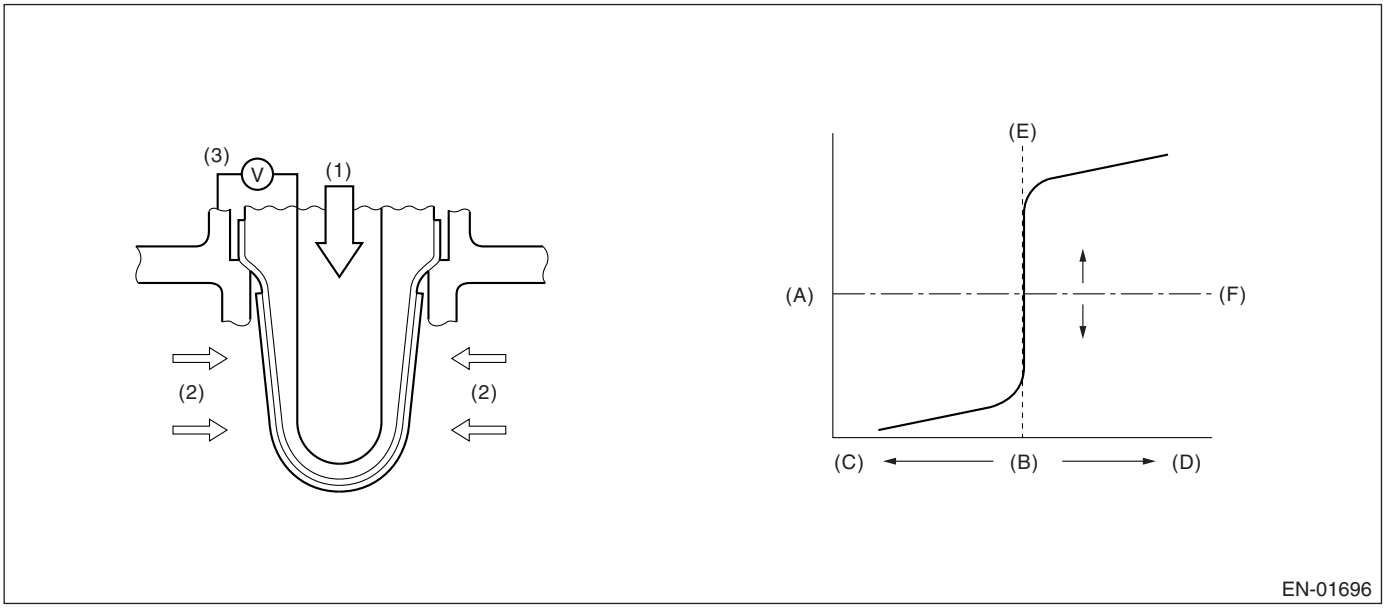
Memorize the freeze frame data. (For test mode $02)

AB:DTC P0137 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal from rear oxygen sensor voltage value with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(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 (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control with main feedback control	In operation
Target output voltage of rear oxygen sensor	≥ 0.55 V
Amount of intake air	≥ 10 g (0.35 oz)/s
Engine coolant temperature	≥ 70°C (158°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor with main feedback control	Not in limit value
Battery voltage	> 10.9 V
5 seconds or more fuel shut-off in decel.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after warming up the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Max. output voltage	< 550 mV

Time Needed for Diagnosis: 200 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side diagnosis of rear oxygen sensor voltage	Incomplete
Max. output voltage	≥ 550 mV

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

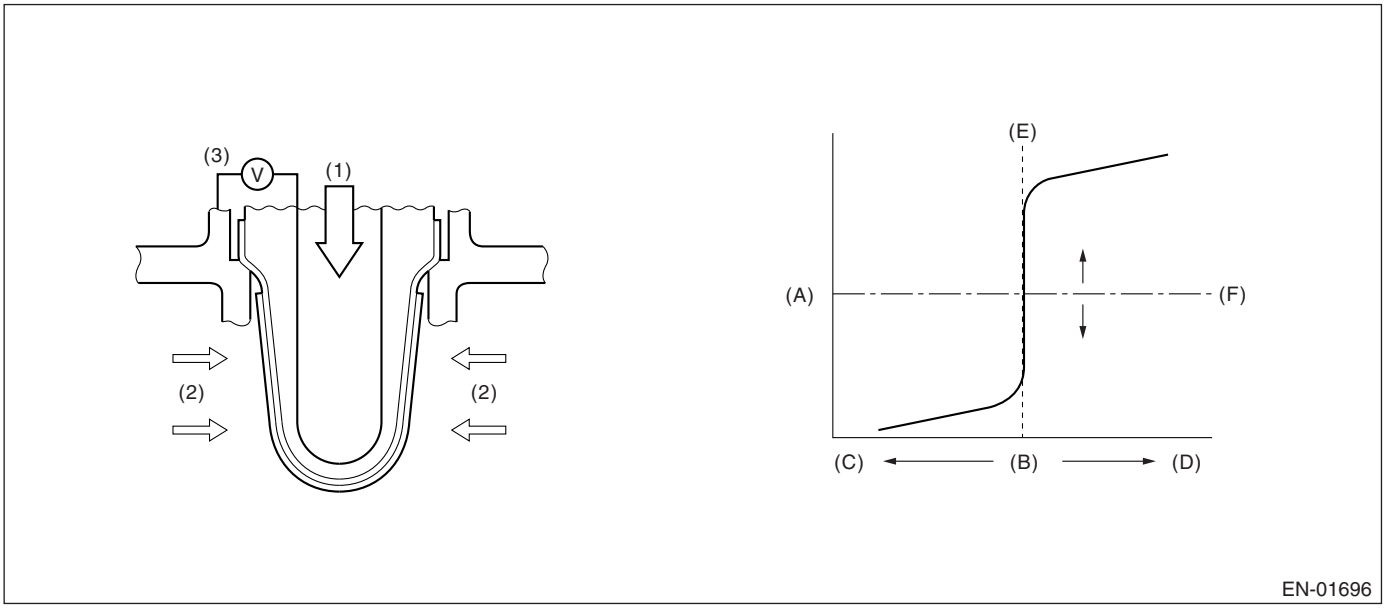
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AC:DTC P0138 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(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 (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control with main feedback control	In operation
Target output voltage of rear oxygen sensor	≥ 0.55 V
Amount of intake air	≥ 10 g (0.35 oz)/s
Engine coolant temperature	≥ 70°C (158°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor with main feedback control	Not in limit value
Battery voltage with main feedback control	> 10.9 V
5 seconds or more fuel shut-off in decel.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after warming up the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Min. output voltage	> 250 mV

Time Needed for Diagnosis: 200 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
High side diagnosis of rear oxygen sensor voltage	Incomplete
Min. output voltage	≤ 250 mV

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

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

AD:DTC P0139 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —

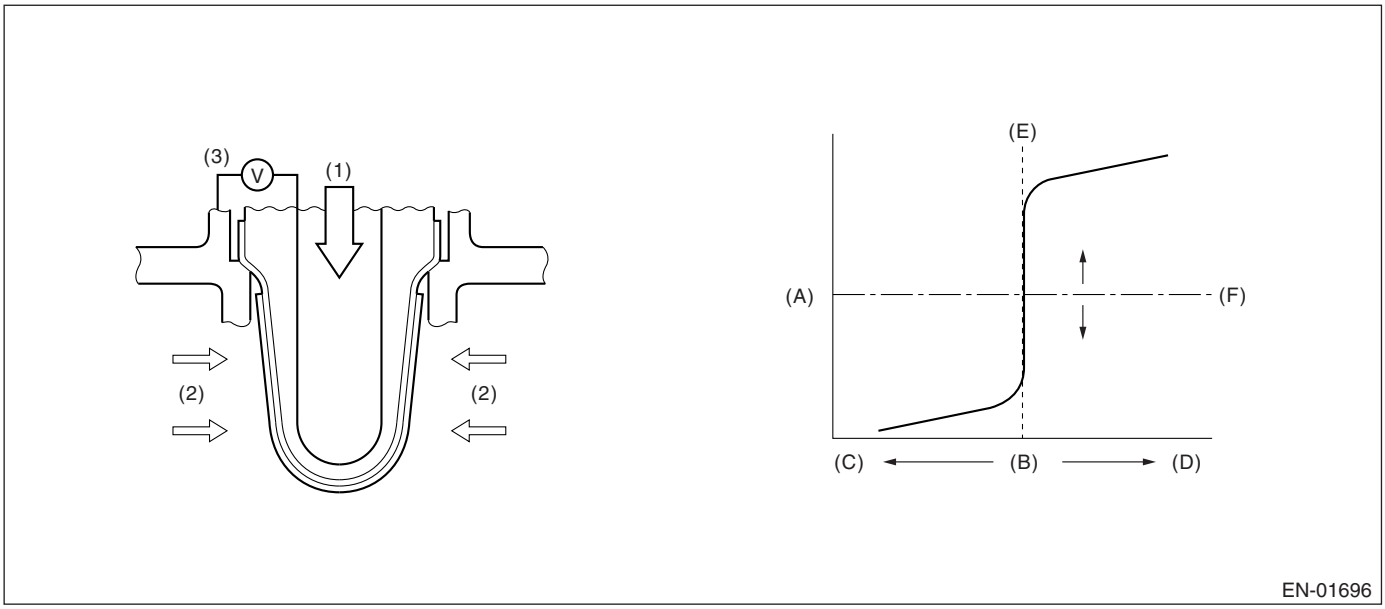
1. OUTLINE OF DIAGNOSIS

Detect the slow response of rear oxygen sensor.

• Diagnostic Method

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

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(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

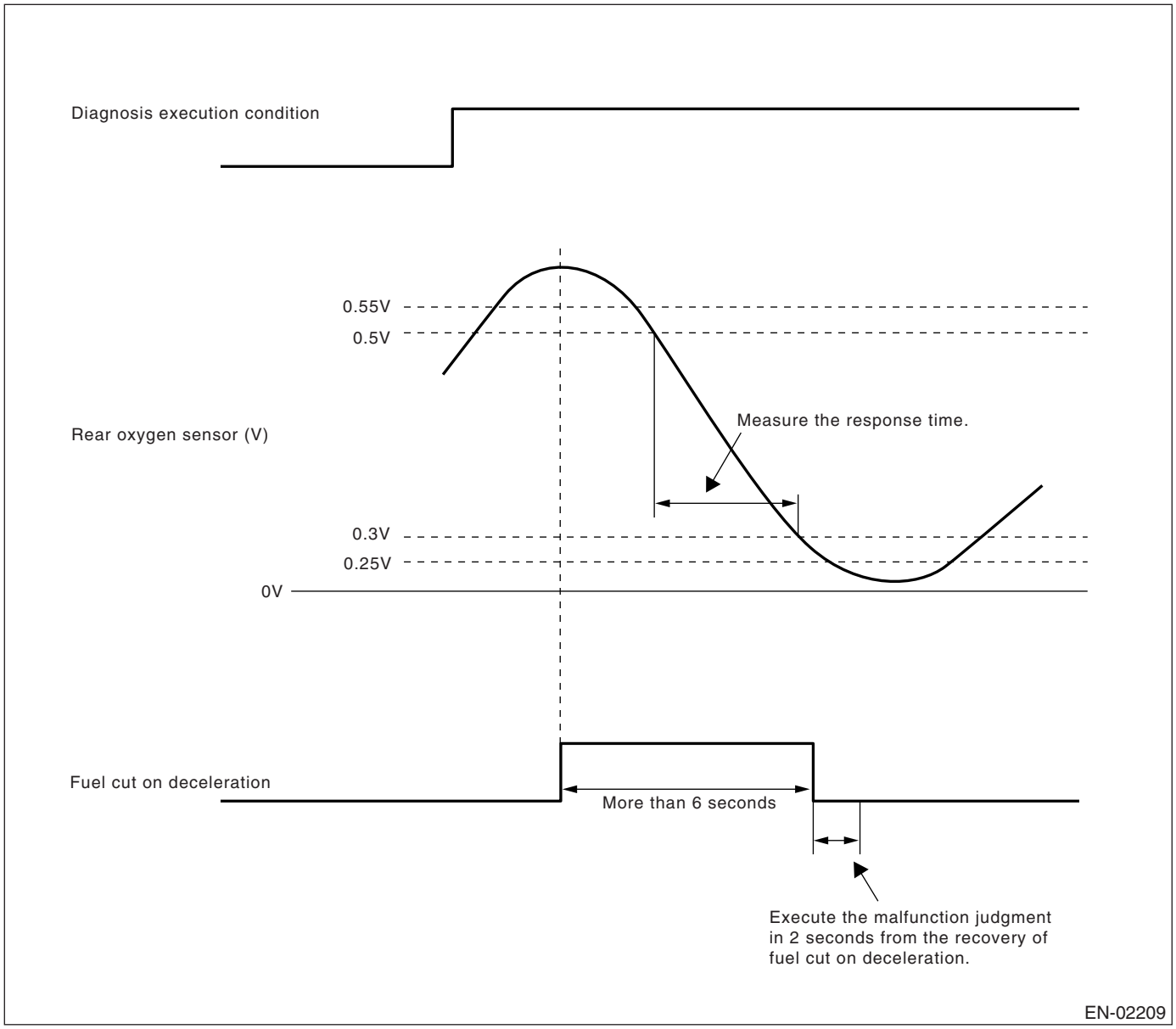
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
5 seconds or more fuel shut-off in deceleration	Experienced
Number of times for fuel cut at deceleration	1 time
After fuel shutting-off	≥ 2 seconds
Time elapsed for rear oxygen sensor heater ON	≥ 60 seconds
Continuous time for rear oxygen sensor heater ON	≥ 30 seconds
Catalytic warm-up counter <Ref. to GD(H4DOTC)-119, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>	≥ 8,000 times

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration in order to calculated the diagnostic value.)

5. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes 0.55 V (rich) to 0.25 V (lean), caluculate the Min. value of response time regarded as judgment value while the output varies from 0.5 V to 0.3 V.



• Abnormality Judgment

1) Judge NG when the judgment value is larger than the threshold value after fuel cut at deceleration.
Response time (Diagnosi value) > Threshold value → Abnormal

NOTE:
Variation time of rear oxygen sensor output voltages is short during fuel cut at deceleration. Carry out the NG judgment only after the fuel cut at deceleration. As for OK judgment, without the condition of fuel cut at deceleration, judge OK if the value is below the threshold value.
Judge NG when the malfunction criteria below are completed in 2 seconds after the recovery of fuel cut at deceleration which requires 6 seconds or more.

2) Judge NG when the O_2 sensor voltage after recovery of fuel cut at deceleration is large. Judge NG when fuel cut at deceleration is also long (6s or more), and although carried out the recovery of fuel cut at deceleration, when O_2 sensor voltage is large (more than 0.55V).

• Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (500 mV O_2 output) to lean (300 mV) if voltage reduces from 550 mV to 250 mV.	> 0.327 seconds
Or, longest time when more than 550 mV	> 2 seconds

Time Needed for Diagnosis: Once

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

• Normality Judgment

1) Judge Normal When the response time (diagnostic value) is smaller than threshold (judgment value) when oxygen sensor voltage changes from rich to lean, even with or without fuel cut at deceleration.
2) A normal judging is not carried out.

• Judgment Value

Judge OK when the following standards value are completed.

Malfunction Criteria	Threshold Value
Shortest time change from rich (500 mV O_2 output) to lean (300 mV) if voltage reduces from 550 mV to 250 mV.	≤ 0.327 seconds

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING 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 CONDITON

- Lean → Rich response diagnosis

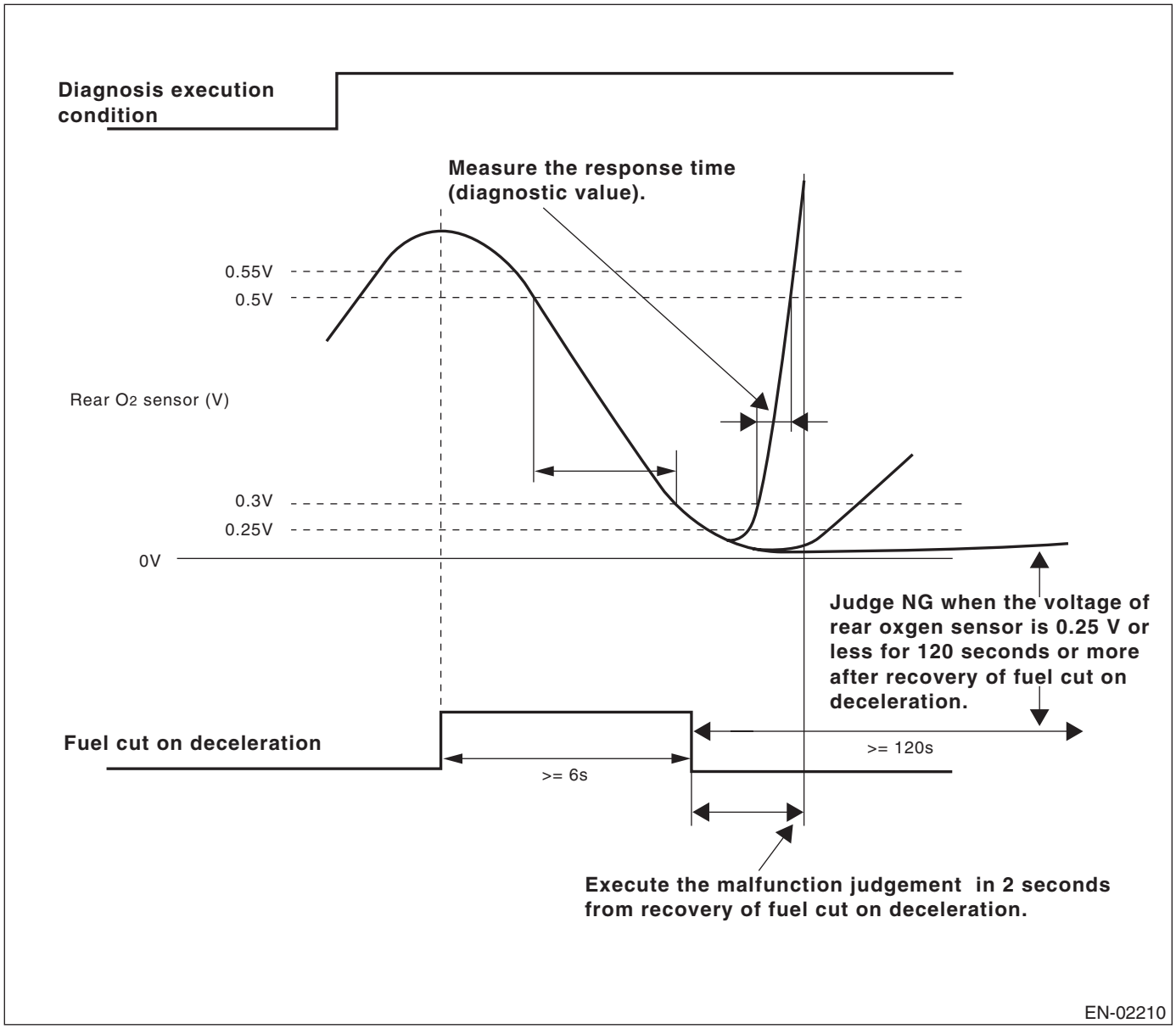
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
Fuel cut at deceleration ≥ 5 seconds	Experienced
Number of times for fuel cut at deceleration	1 time
After fuel cut	≥ 2 seconds
Time elapsed for rear oxygen sensor heater ON	≥ 60 seconds
Continuous time for rear oxygen sensor heater ON	≥ 30 seconds

11.GENERAL DRIVING CYCLE

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

12.DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes 0.25 V (lean) to 0.55 V (rich), caluculate the Min. value of response time regarded as judgment value while the output varies from 0.3 V to 0.5 V.



• Abnormality Judgment

1) Judge NG when the judgment value is larger than the threshold value after recovery of fuel cut at deceleration.
Response time (Diagnosis time) > Threshold value → Abnormal
2) Judge NG when the O_2 sensor voltage after recovery of fuel cut at deceleration is small.

• Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (300 mV O_2 output) to rich (500 mV) if voltage reduces from 500 mV to 250 mV.	> 2 seconds
Or, time that is less than 250 mV	> 120 seconds

Time Needed for Diagnosis: Once
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

1) Judge Normal When the response time (diagnostic value) is smaller than threshold (judgment value) when oxygen sensor voltage changes from rich to lean, even with or without fuel cut at deceleration.
Response Time (diagnosis value) ≤ Threshold value → Normal
2) A normal judging is not carried out.

• Judgment Value

Judge OK when the following standards value are completed.

Malfunction Criteria	Threshold Value
Shortest time change from lean (300 mV O_2 output) to rich (500 mV) if voltage reduces from 550 mV to 250 mV.	≤ 2 seconds

13.DTC CLEAR CONDITION

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

14.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

15.FAIL SAFE

Sub feedback control: Not allowed

16.ECM OPERATION AT DTC SETTING

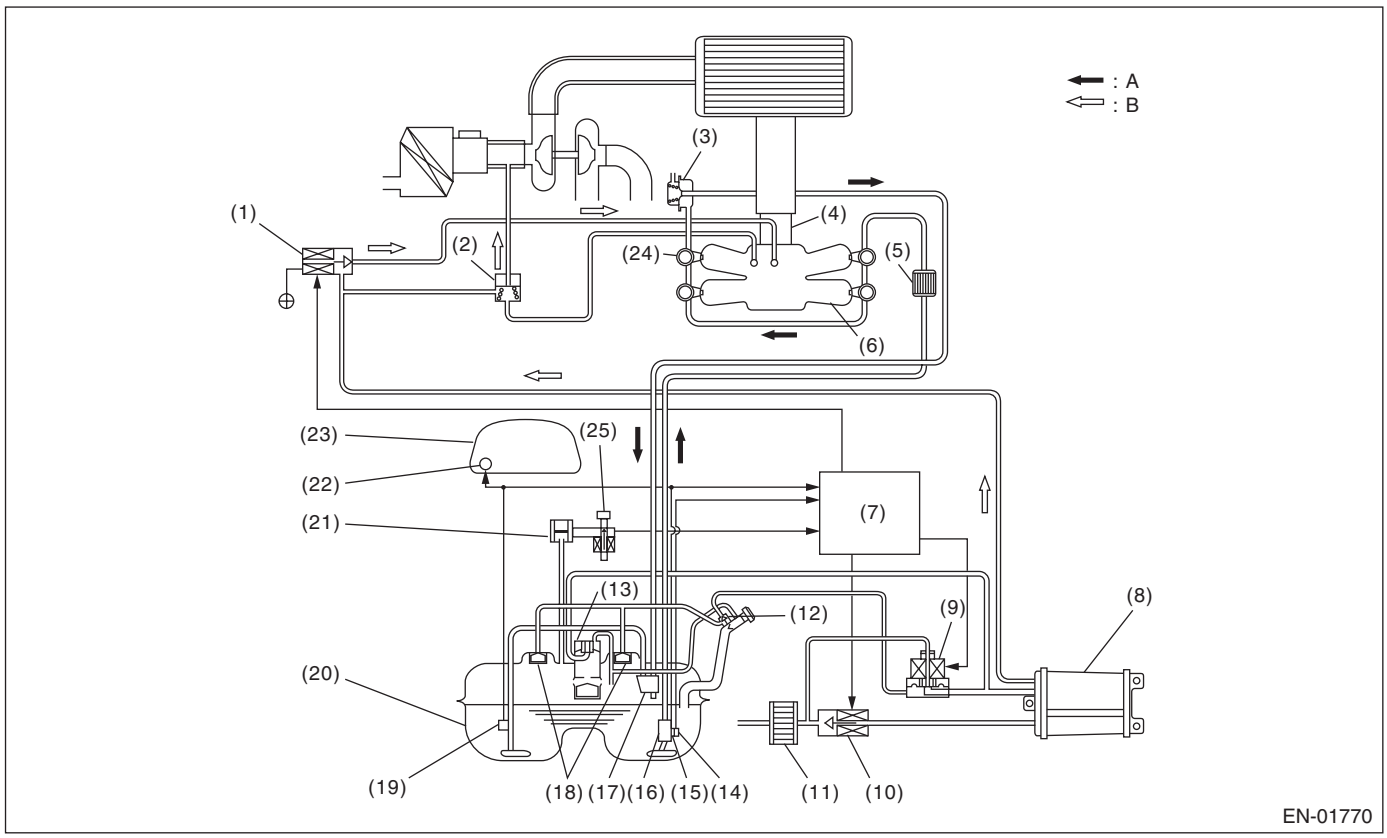
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AE:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

1. OUTLINE OF DIAGNOSIS

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

• Fuel System Diagnosis



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

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	≥ 75 °C (167°F)
Engine load	≥ Map 5
Intake air change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev

Map 5

Engine speed (rpm)	idle	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Measured value (g (oz)/rev)	NA	0.236 (0.008)	0.232 (0.008)	0.226 (0.008)	0.231 (0.008)	0.252 (0.009)	0.262 (0.009)	0.243 (0.009)	0.243 (0.009)	0.267 (0.009)	0.270 (0.010)

3. GENERAL DRIVING CYCLE

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

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

• Judgment Value

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

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g (oz)/s)	0 (0)	2.4 (0.085)	4.7 (0.166)	7 (0.247)	9.4 (0.332)	11.7 (0.413)	14.1 (0.497)
fsobdL1 (%)	40	40	36.9	32.0	27.0	26.5	26.5

Time Needed for Diagnosis: 10 seconds × 5 times

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

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

• Judgment Value

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

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 driving cycles.
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATING AT DTC SETTING

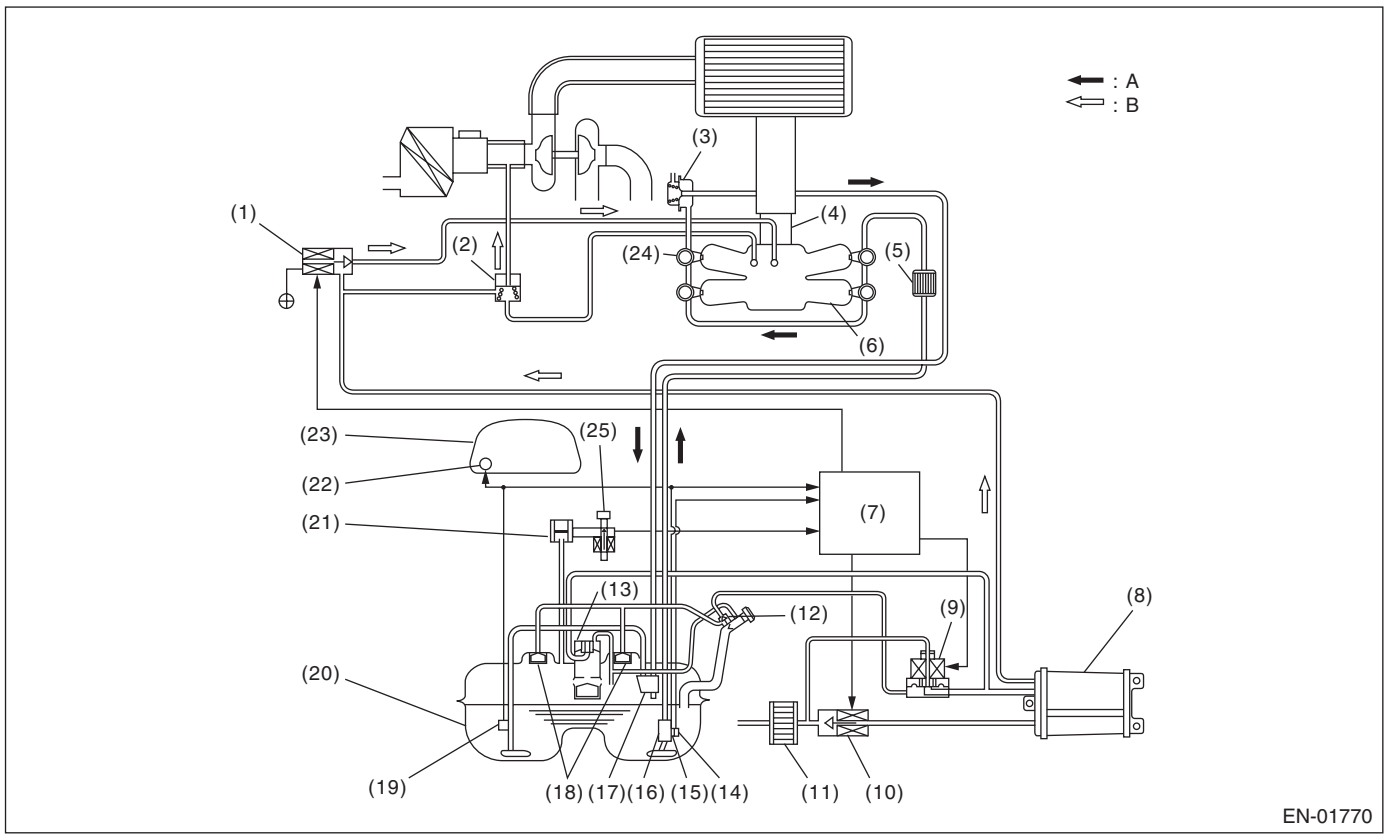
Memorize the freeze frame data. (For test mode $02)

AF:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

1. OUTLINE OF DIAGNOSIS

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

• Fuel System Diagnosis



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

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	≥75°C (167°F)
Engine load	≥ Map 5
Intake air change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/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)	idle	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Measured value (g (oz)/ rev)	NA	0.236 (0.008)	0.232 (0.008)	0.226 (0.008)	0.231 (0.008)	0.252 (0.009)	0.262 (0.009)	0.243 (0.009)	0.243 (0.009)	0.267 (0.009)	0.270 (0.010)

3. GENERAL DRIVING CYCLE

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

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

• Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	≤ fsobdR1
where,	See Map 4
sglmd = measured lambda	fsobdR1 = rich side threshold value of fsobd
tglmda = target lambda	
faf = main feedback compensation coefficient every 64 milliseconds	
flaf = main feedback learning compensation coefficient	

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g/s)	0 (0)	2.4 (0.085)	4.7 (0.166)	7 (0.247)	9.4 (0.332)	11.7 (0.413)
fsobdR1 (%)	–40	–40	–36.9	–32.0	–27.0	–27.0

Time Needed for Diagnosis: 10 seconds × 5 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	≥ –20%

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When “Clear Memory” was performed

7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.

8. ECM OPERATING AT DTC SETTING

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

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

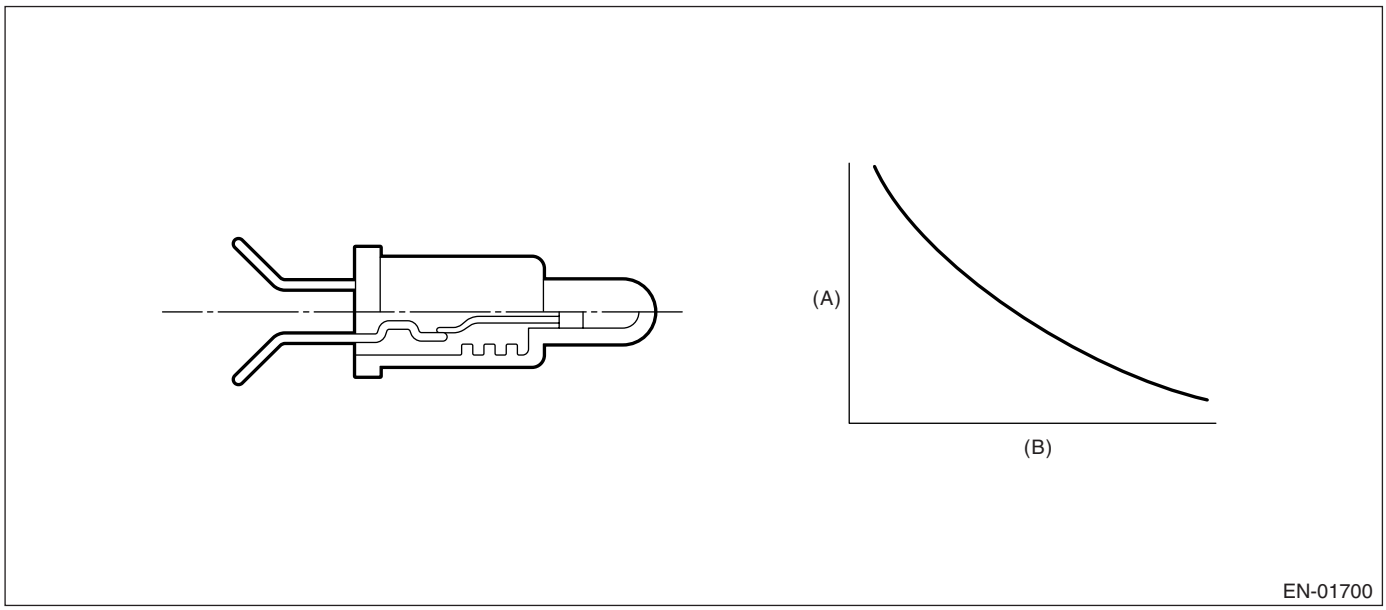
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel temperature sensor output property. Perform the diagnosis in two methods; namely, drift diagnosis and stuck diagnosis. Judge NG when either of them results in NG, and judge OK when both of them result in OK.

• 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 make an NG judgment.

2. COMPONENT DESCRIPTION



(A) Resistance (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 NG when the continuous time of completing the malfunction criteria below becomes more than 120 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 10 ℓ (2.64 US gal, 2.20 Imp gal)
After starting engine	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	> 10°C (18°F)
Fuel temperature – engine coolant temperature	≥ 10°C (18°F)
Battery voltage	> 10.9 V

Time Needed for Diagnosis: 120 seconds

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

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 10 ℓ (2.64 US gal, 2.20 Imp gal)
After starting engine	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	> 10°C (18°F)
Fuel temperature – engine coolant temperature	< 10°C (18°F)
Engine coolant temperature	< 70°C (158°F)
Battery voltage	> 10.9 V

• Stuck Diagnosis

If the fuel temperature which might rise along with the engine idling (the cumulative amount of intake air after engine starting is large) does not increase, the engine is considered to be stuck and make an NG judgment.

6. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After starting engine	20 seconds or more
Battery voltage	> 10.9 V

7. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 20 seconds or more after starting the engine.

8. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1212.5 lb)
Fuel temperature difference between Max. and Min.	< 3°C (5°F)

Time Needed for Diagnosis: To be determined.

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

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1212.5 lb)
Fuel temperature difference between Max. and Min.	≥ 3°C (5°F)

9. DTC CLEAR CONDITION

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

10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

11.FAIL SAFE

None

12.ECM OPERATING AT DTC SETTING

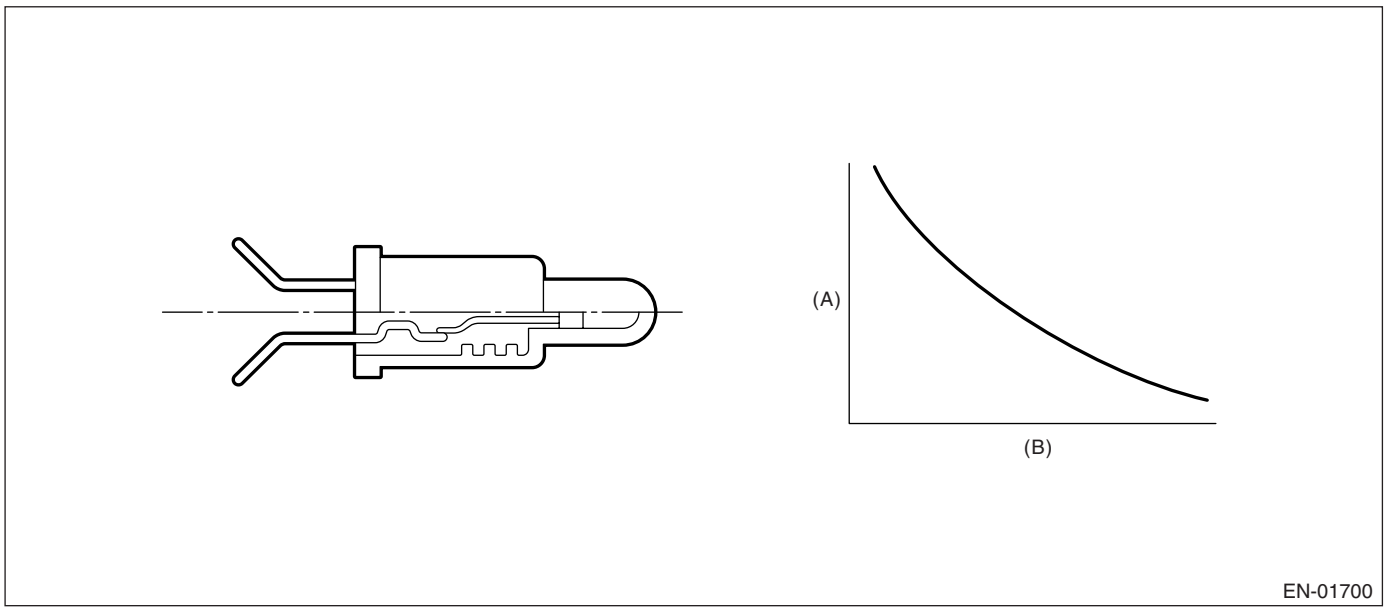
Memorize the freeze frame data. (For test mode $02)

AH:DTC P0182 — FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance (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 NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.1646 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.1646 V
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

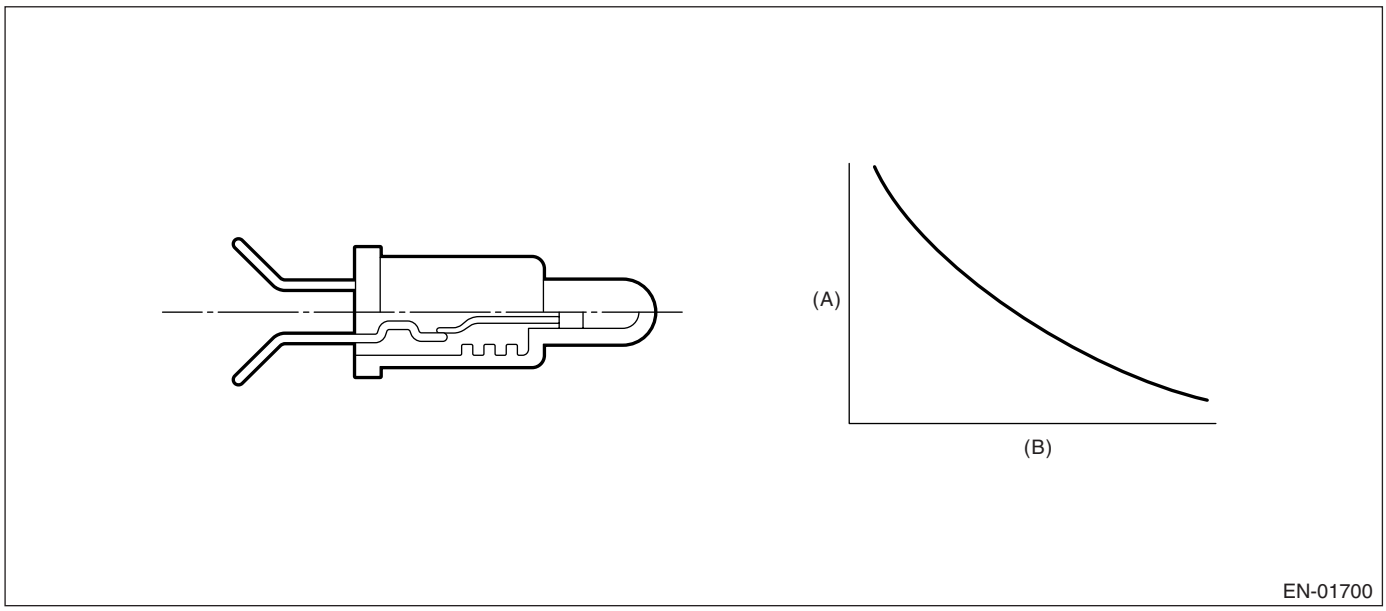
Memorize the freeze frame data. (For test mode $02)

AI: DTC P0183 — FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance (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 NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.72 V
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

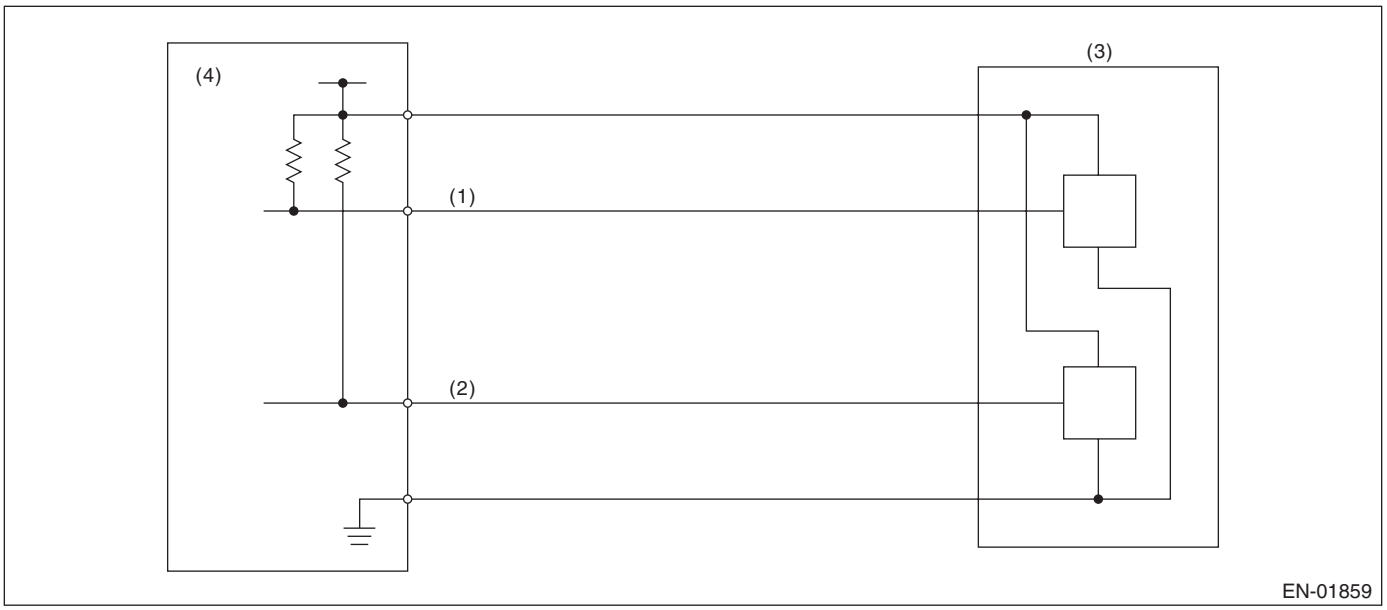
Memorize the freeze frame data. (For test mode $02)

AJ:DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge NG when out of the standard value.

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.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
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 malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

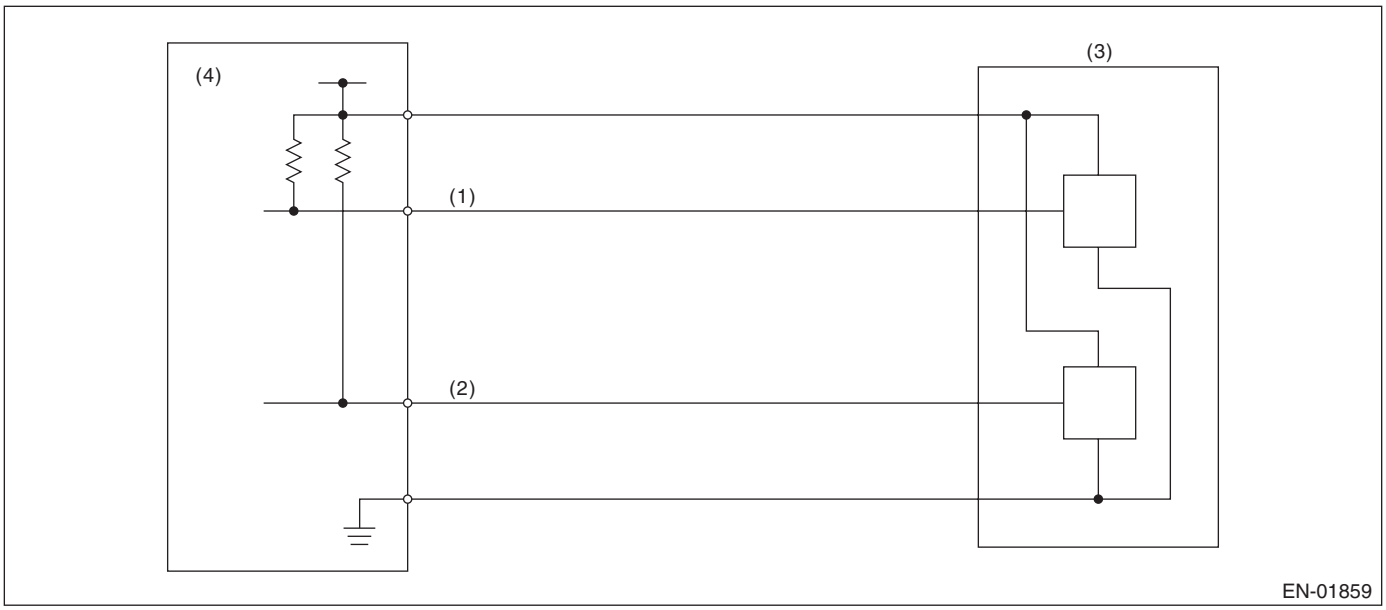
Memorize the freeze frame data. (For test mode $02)

AK:DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge NG when out of the standard value.

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.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
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 malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

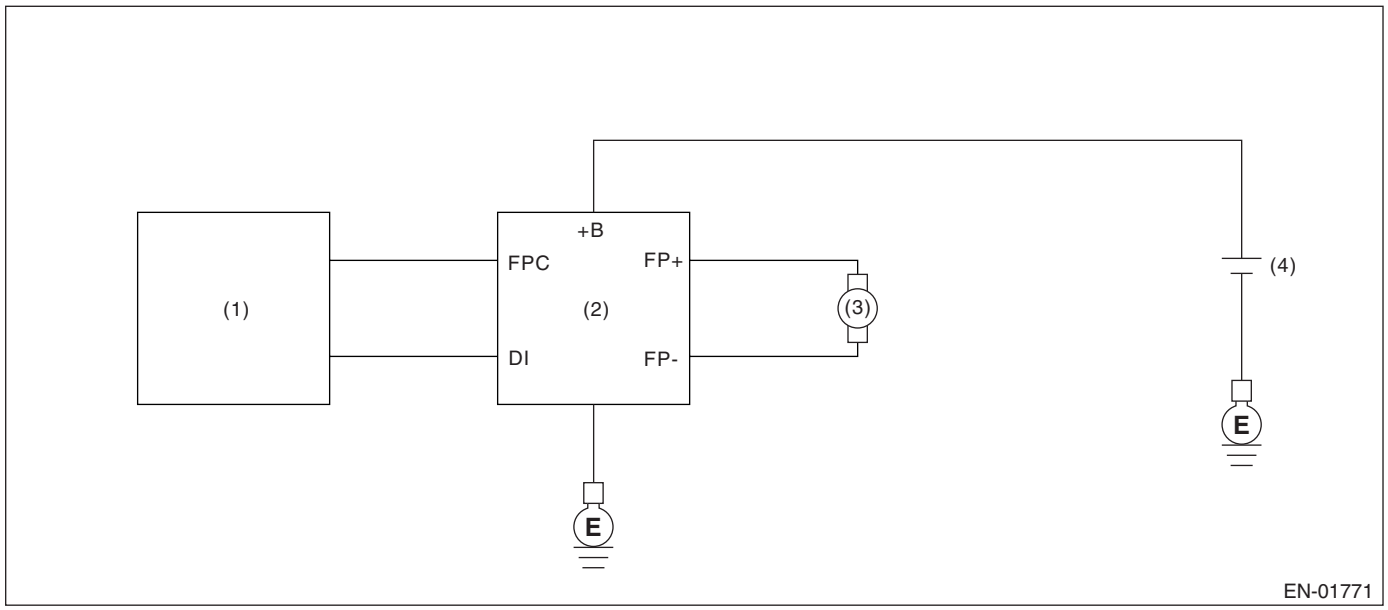
Memorize the freeze frame data. (For test mode $02)

AL:DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit. Judge 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)
(2) Fuel pump control unit
(3) Fuel pump
(4) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After starting engine	≥ 180 seconds
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	Low
Fuel level	≥ 10 ℓ

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After starting engine	≥ 180 seconds
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	High

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

OFF setting may be needed depending on the NG portion.

9. ECM OPERATING AT DTC SETTING

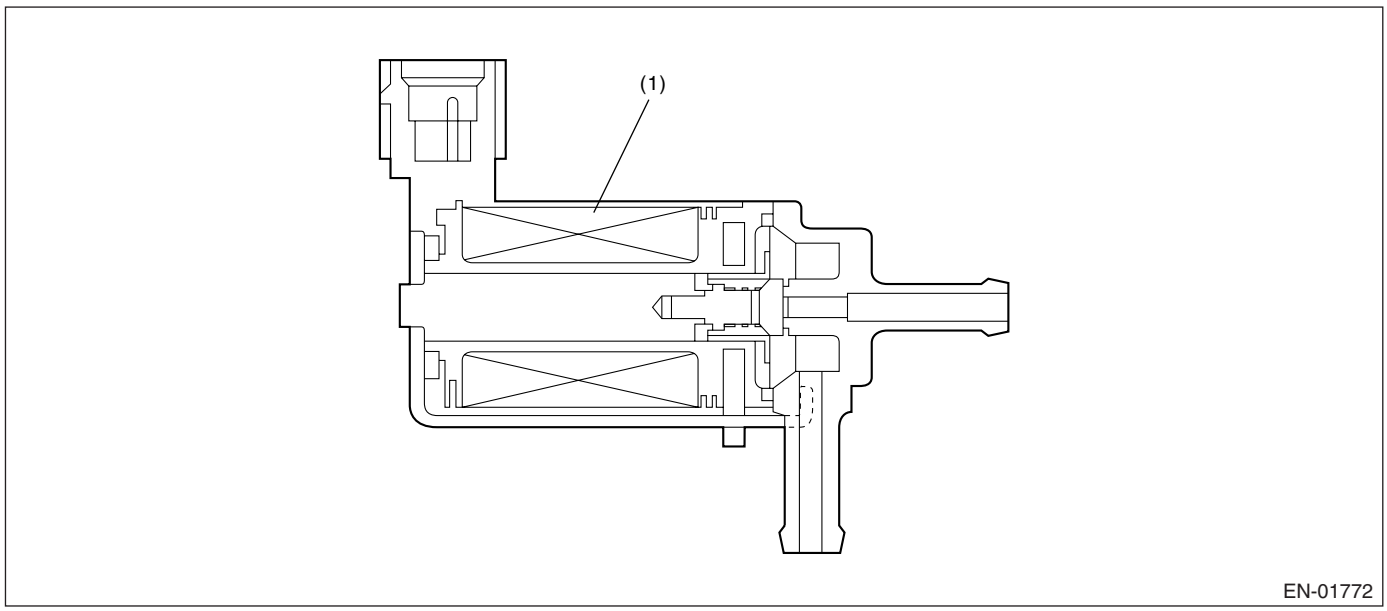
Memorize the freeze frame data. (For test mode $02)

AM:DTC P0244 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of wastegate control solenoid valve function. Judge 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.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• 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))	152.6 (1145, 45.08)	165.4 (1241, 48.8)	177.2 (1329, 52.3)	189.0 (1418, 55.8)	200.7 (1506, 59.3)	212.5 (1594, 62.8)
Normal threshold (kPa (mmHg, inHg))	130.2 (977, 38.5)	143.0 (1073, 42.2)	154.8 (1161, 45.7)	166.6 (1250, 49.2)	178.4 (1338, 52.7)	190.1 (1426, 56.1)

Time Needed for Diagnosis: 1 second

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

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	< Map 10

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

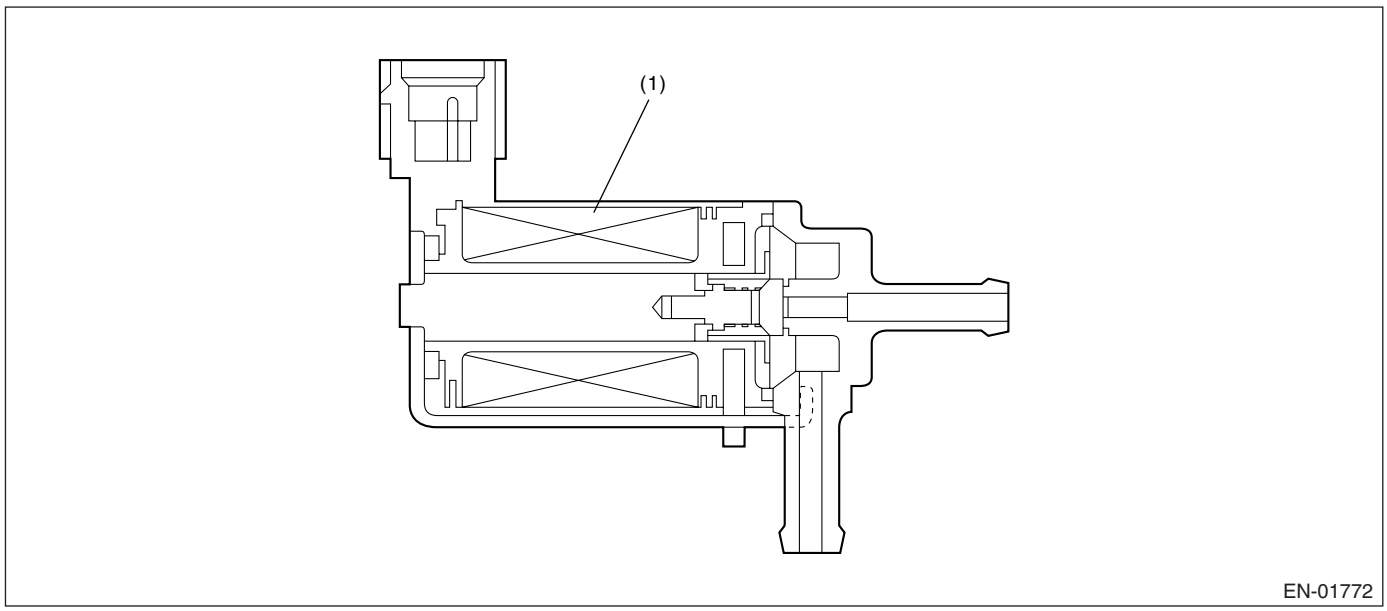
Memorize the freeze frame data. (For test mode $02)

AN: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 NG when the terminal output voltage remains Low during outputting the duty signal.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

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

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low
Duty ratio for turbocharged pressure control	< 75%

Time Needed for Diagnosis: 655 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

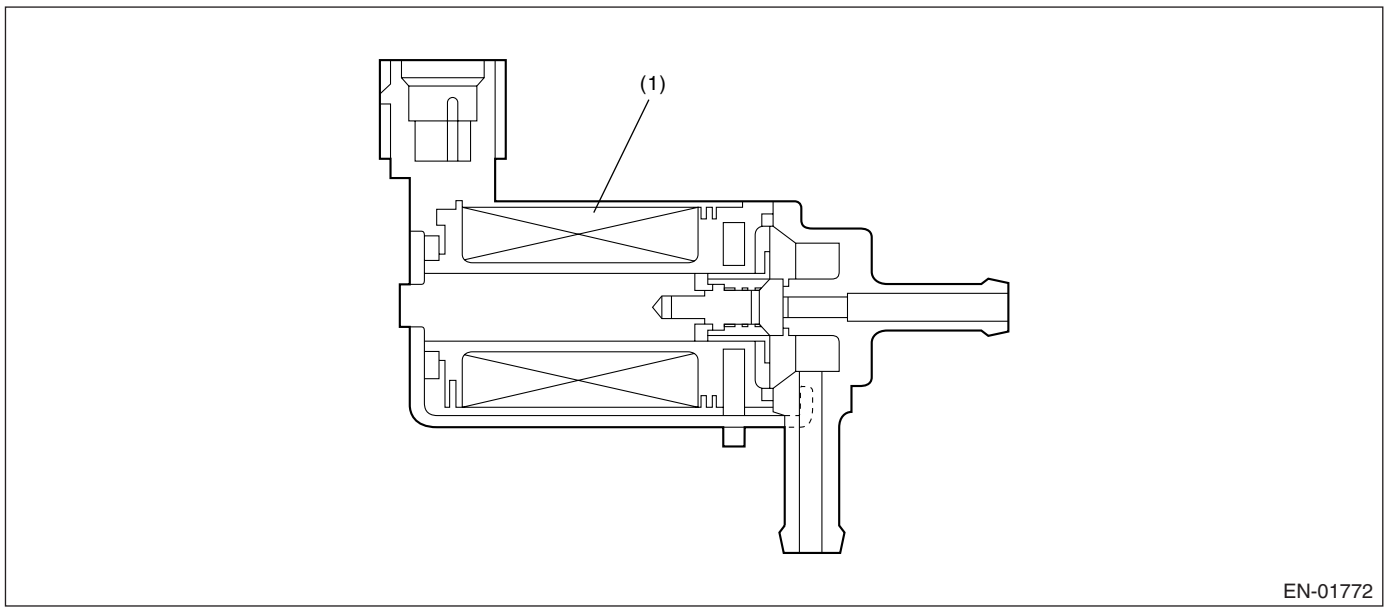
Memorize the freeze frame data. (For test mode $02)

AO: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 NG when the terminal output voltage remains Low or High during outputting the duty signal.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

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

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High
Duty ratio for turbocharged pressure control	> 25%

Time Needed for Diagnosis: 655 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

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

AP:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Revolution fluctuation method) Monitoring the 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 less)

2) Every time misfire: FTP 1.5 times misfire, Catalyst damage misfire
- 360° Interval Difference Method

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters approval continuation time	1 second or more
Intake manifold pressure change during 0.5 engine rev.	< 16.0 kPa (120 mmHg, 4.72 inHg) (MT) < 14.7 kPa (110 mmHg, 4.33 inHg) (AT)
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	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Evaporative system leak check	Not in operation
Engine speed	550 — 6700 rpm
Intake manifold pressure	> Map 3 or more
Battery voltage	≥ 8 V

Map3

- MT

Vehicle Speed < 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	25.1 (188, 7.40)	24.8 (186, 7.32)	25.6 (192, 7.56)	23.3 (175, 6.89)	26.3 (197, 7.76)	25.9 (194, 7.64)	28.9 (216.5, 8.52)	30.0 (225, 8.86)	31.7 (237.5, 9.35)	33.0 (248, 9.76)	37.1 (278.5, 11.0)	41.9 (314, 12.4)	47.0 (352.5, 13.9)	51.1 (383, 15.1)

Vehicle Speed ≥ 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	25.5 (191, 7.52)	25.1 (188, 7.40)	30.4 (227.7, 8.96)	35.6 (267.4, 10.5)	38.5 (288.9, 11.4)	40.4 (302.9, 11.9)	41.1 (308.6, 12.1)	40.8 (306, 12.0)	44.8 (335.8, 13.2)	47.3 (354.5, 14.0)	49.1 (368.2, 14.5)	50.9 (381.9, 15.0)	52.8 (396, 15.6)	52.8 (396, 15.6)

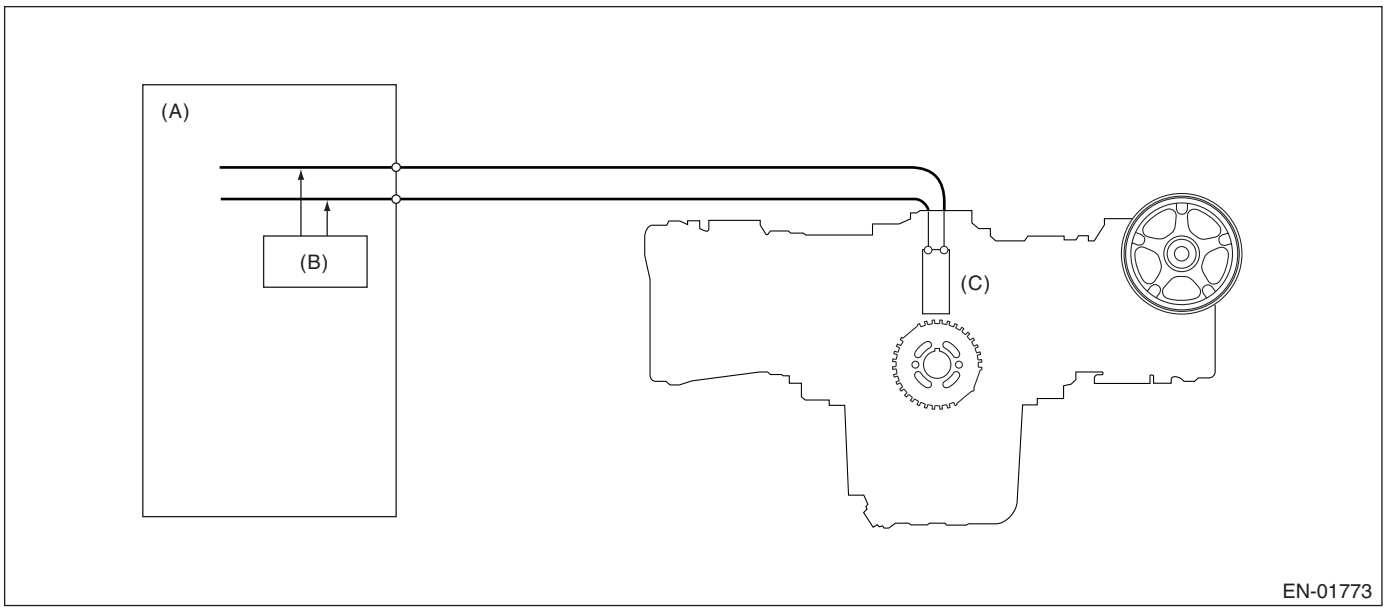
- AT

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	26.3 (197, 7.76)	24.7 (185, 7.28)	23.6 (177, 6.97)	25.5 (191, 7.52)	27.3 (205, 8.07)	26.1 (196, 7.72)	29.5 (221.5, 8.72)	31.3 (235, 9.25)	32.7 (245.5, 9.67)	34.1 (256, 10.08)	38.2 (286.5, 11.3)	33.6 (252.3, 9.93)	49.5 (371.5, 14.62)	51.5 (386, 15.20)

3. GENERAL DRIVING CYCLE

- Detecting misfire is able to be carried out in the condition between idling and high revolution.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD



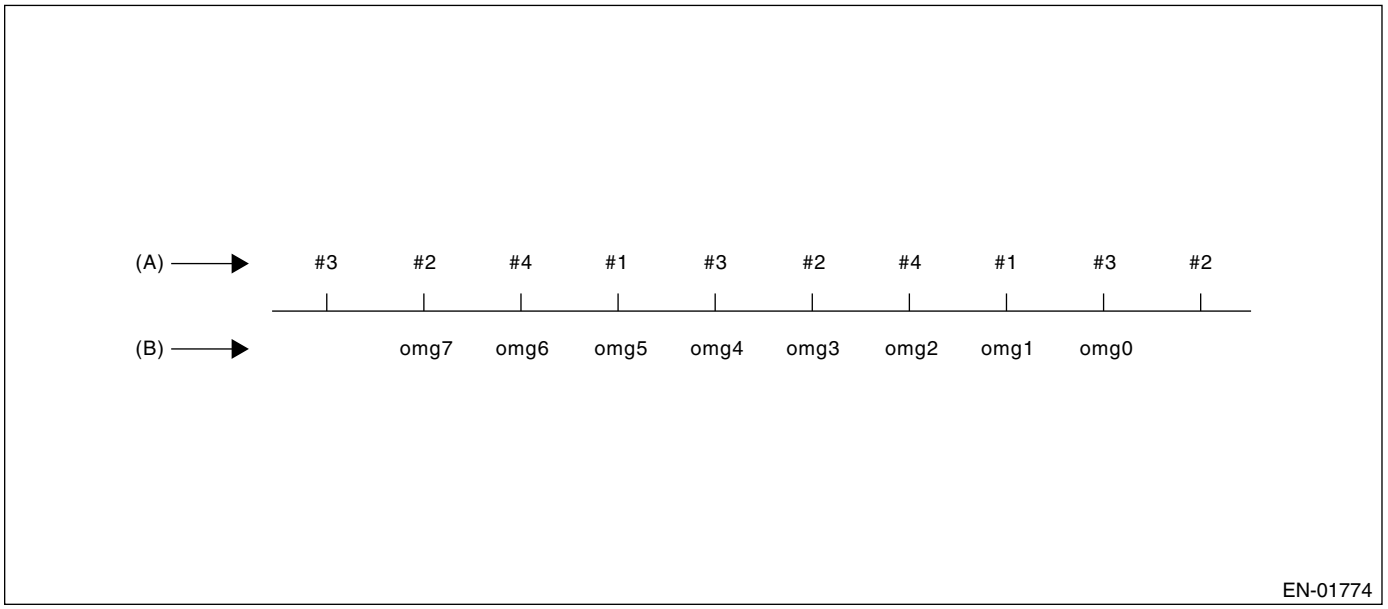
(A) Engine control module (ECM) (B) Diagnosis circuit (C) Crankshaft position sensor

When the misfire occurred, the engine speed is 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 the misfire occurs or not comparing the calculated result with judgment value. Counting the number of misfire up, and if the misfire ratio is higher during 1000 rev. or 200 rev., judge NG for the corresponding cylinder.

Calculate the diagnostic value (from crankshaft position speed) → Misfire detection every single ignition (Compare diagnostic value with judgment value)
- 180° Interval Difference Method
- 360° Interval Difference Method
- 720° Interval Difference Method

→ NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment)
- FTP1.5 times misfire NG judgment
- Catalyst damage misfire NG judgment

As the following figure, pick out a random 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, and the following is the same.



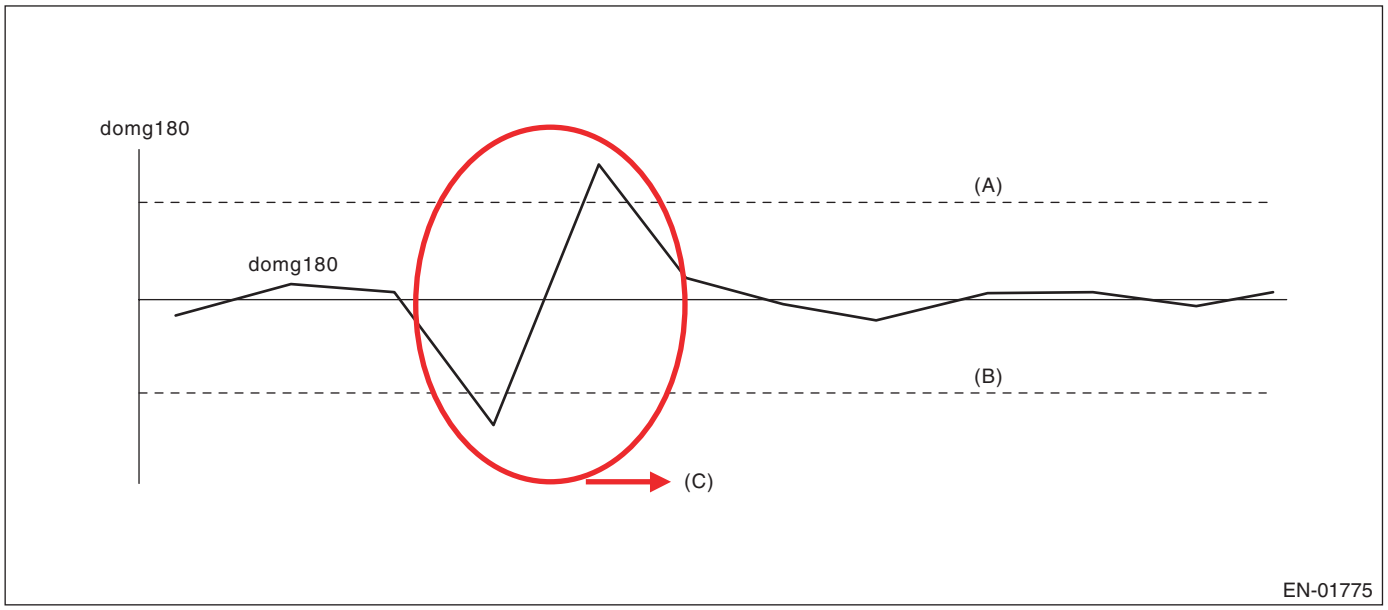
(A) Ignition order (B) Crankshaft position speed

• 180° Interval Difference Method

Diagnosis value domg 180 = (omg –1 omg 0) – (omg 7 – omg 1)/6
Judge misfire occurs in the following cases.

- domg 180 > judgment value of positive side
- domg 180 ≤ judgment value of negative side

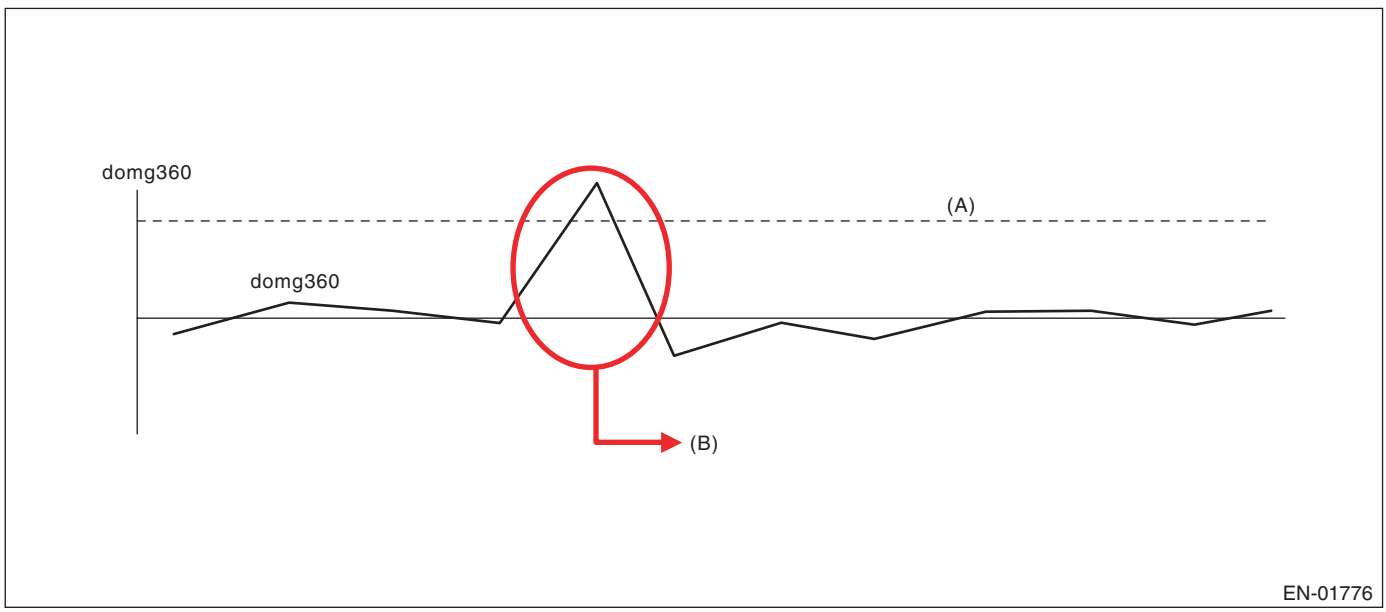
(judgment value before 180°CA)



(A) Threshold value (positive judged value)
(B) Threshold value (negative judged value)
(C) Judged as misfire

• 360° Interval Difference Method

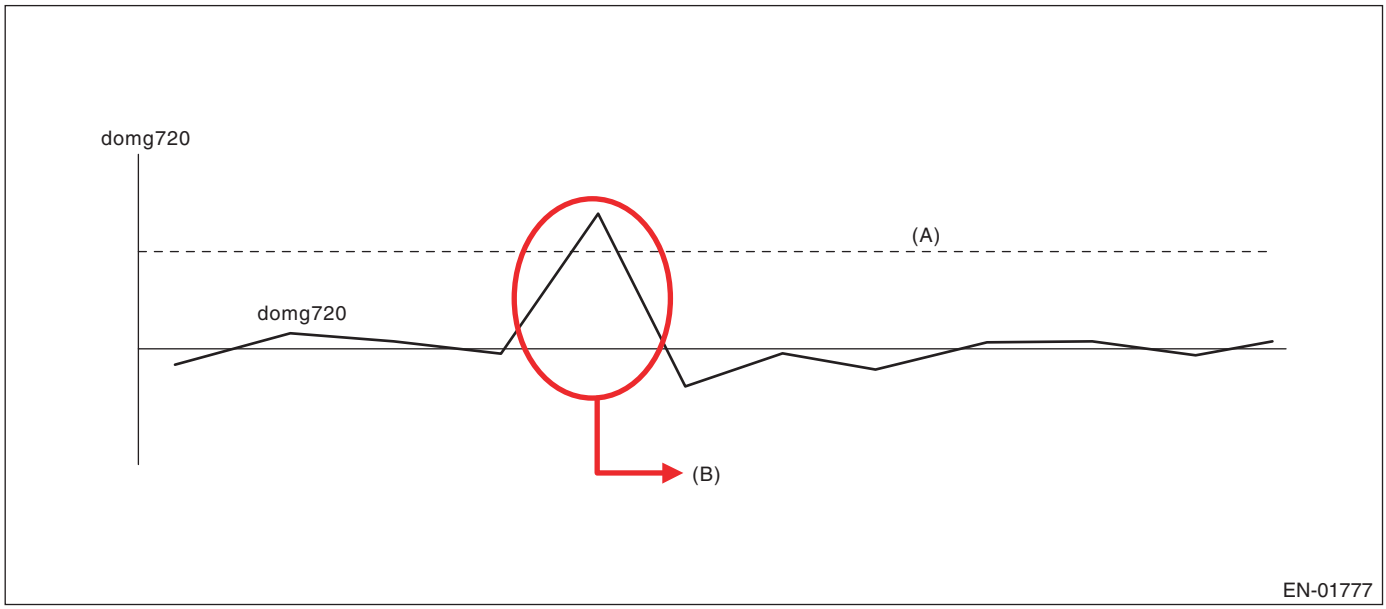
Diagnosis value domg 360 = (omg 1 – omg 0) – (omg 4 – omg 3)
Misfire judgment domg 360 > judgment value → Misfire occurs



(A) Threshold value
(B) Judged as misfire

• 720° Interval Difference Method

Diagnosis value	domg 720 = (omg 1 – omg 0) – (omg 7 – omg 6)		
Misfire judgment	domg 720 > judgment value	→	Misfire occurs



(A) Threshold value (B) Judged as misfire

• FTP 1.5 times misfire (Misfire occurrence level affecting exhaust gas)

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

Malfunction Criteria	Threshold Value
FTP emission judgment value	> 1.0% in 1000 revs.

Time Needed for Diagnosis: 1000 engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 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

percentage		Intake air (g (oz)/gev.)									
		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)	1000	37.0	32.0	28.5	26.0	23.0	21.3	21.3	—	—	—
	1500	35.0	29.5	25.5	22.5	21.3	21.3	21.3	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	—	15.3	10.0	6.8	5.5	5.0	5.0	5.0	5.0	5.0
	4500	—	13.8	8.5	6.3	5.0	5.0	5.0	5.0	5.0	—
	5000	—	13.8	8.5	5.8	5.0	5.0	5.0	5.0	5.0	—
	5500	—	13.5	8.3	5.5	5.0	5.0	5.0	5.0	5.0	—
	6000	—	13.0	8.0	5.3	5.0	5.0	5.0	5.0	5.0	—
	6500	—	12.5	7.5	5.0	5.0	5.0	5.0	5.0	—	—
	6700	—	12.3	7.3	5.0	5.0	5.0	5.0	5.0	—	—

These figures mean the misfire ratio (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) or more, so this case is judged misfire.
Time Needed for Diagnosis: 200 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATING AT DTC SETTING

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

AQ:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-99, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —.>

AR:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-99, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —.>

AS:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

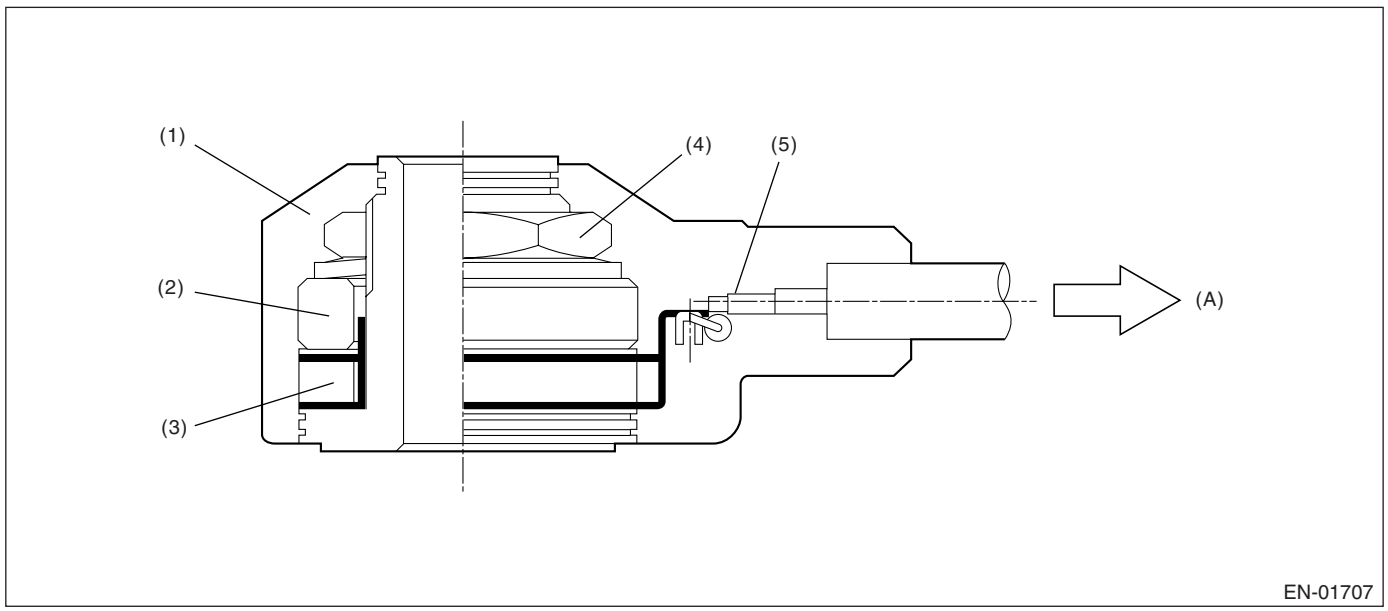
NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-99, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —.>

AT:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

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.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• 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 the malfunction occurs.

• Normality Judgment

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

• Judgment Value

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

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

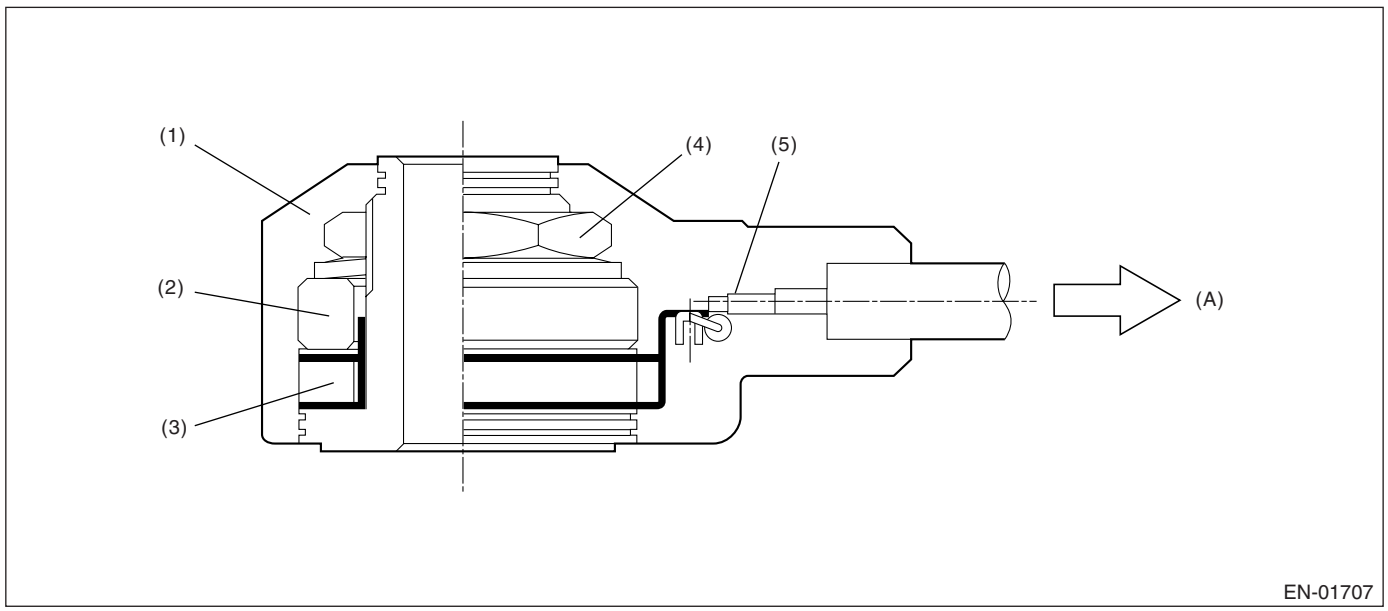
Memorize the freeze frame data. (For test mode $02)

AU:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

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 diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• 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 the malfunction occurs.

• Normality Judgment

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

• Judgment Value

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

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

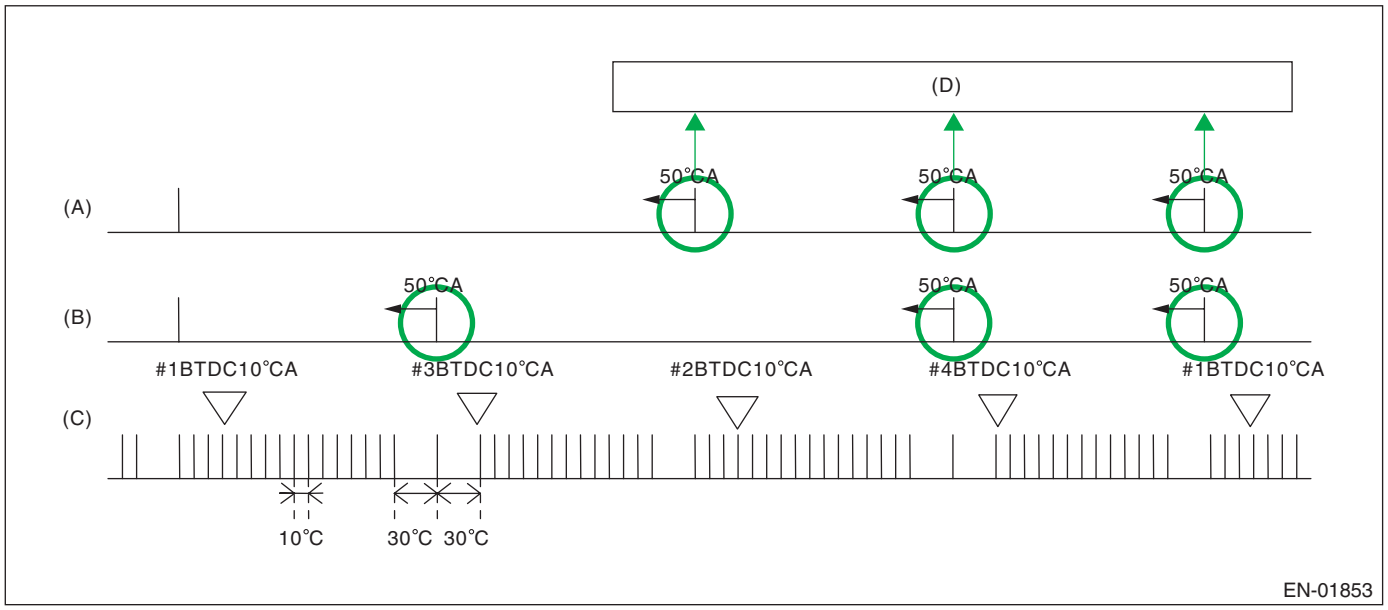
Memorize the freeze frame data. (For test mode $02)

AV:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

1. OUTLINE OF DIAGNOSIS

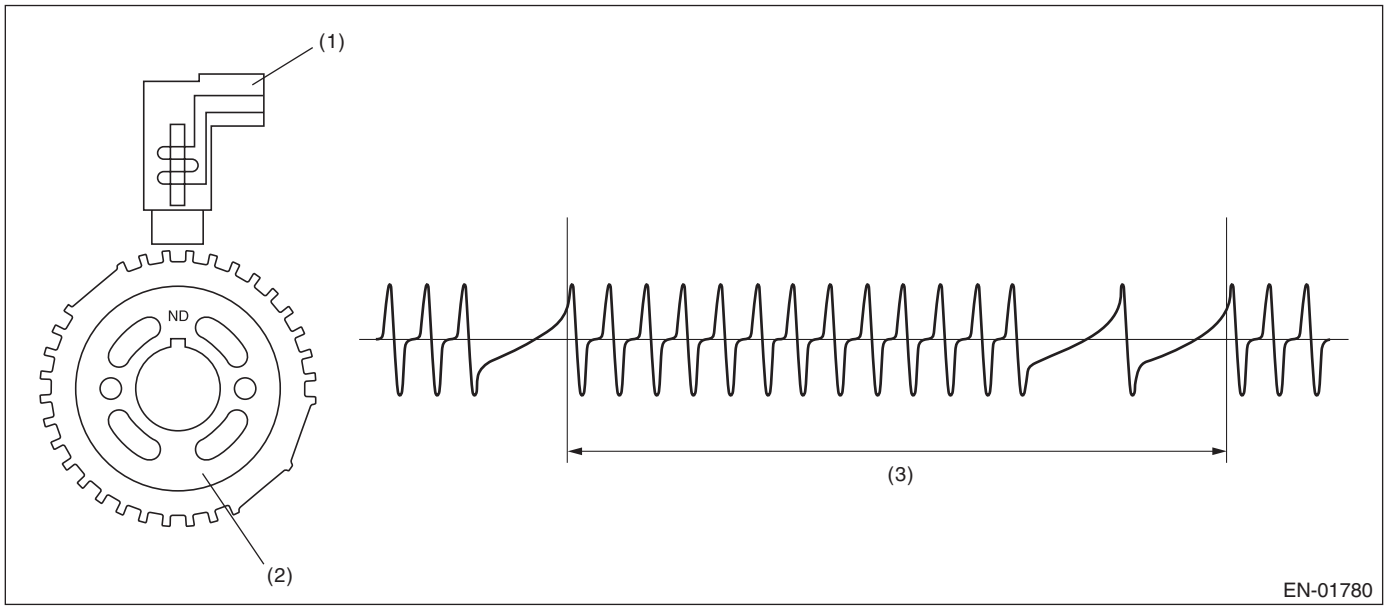
Detect the open or short circuit of crankshaft position sensor. Judge NG when the crankshaft signal does not input regardless of turning the starter.

2. COMPONENT DESCRIPTION



(A) Camshaft signal

(B) Crankshaft signal



(1) Crankshaft position sensor

(2) Crankshaft sprocket

(3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

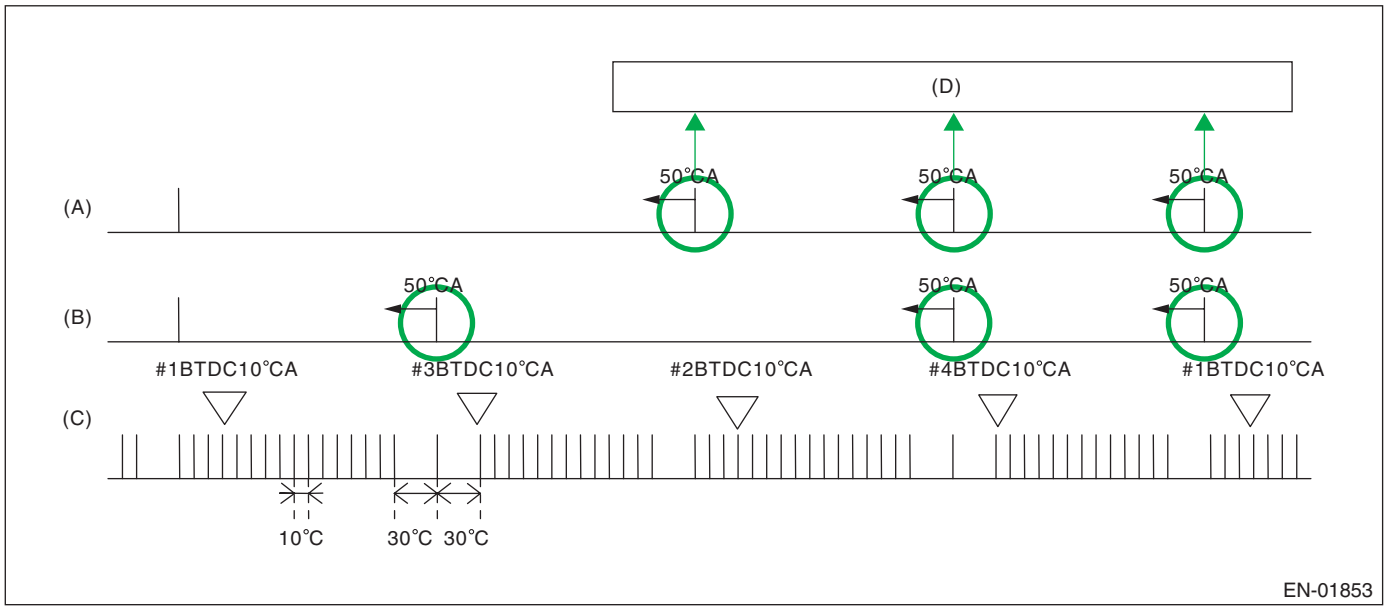
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property. Judge NG when the number of crankshaft signal every 1 revolution becomes abnormal.

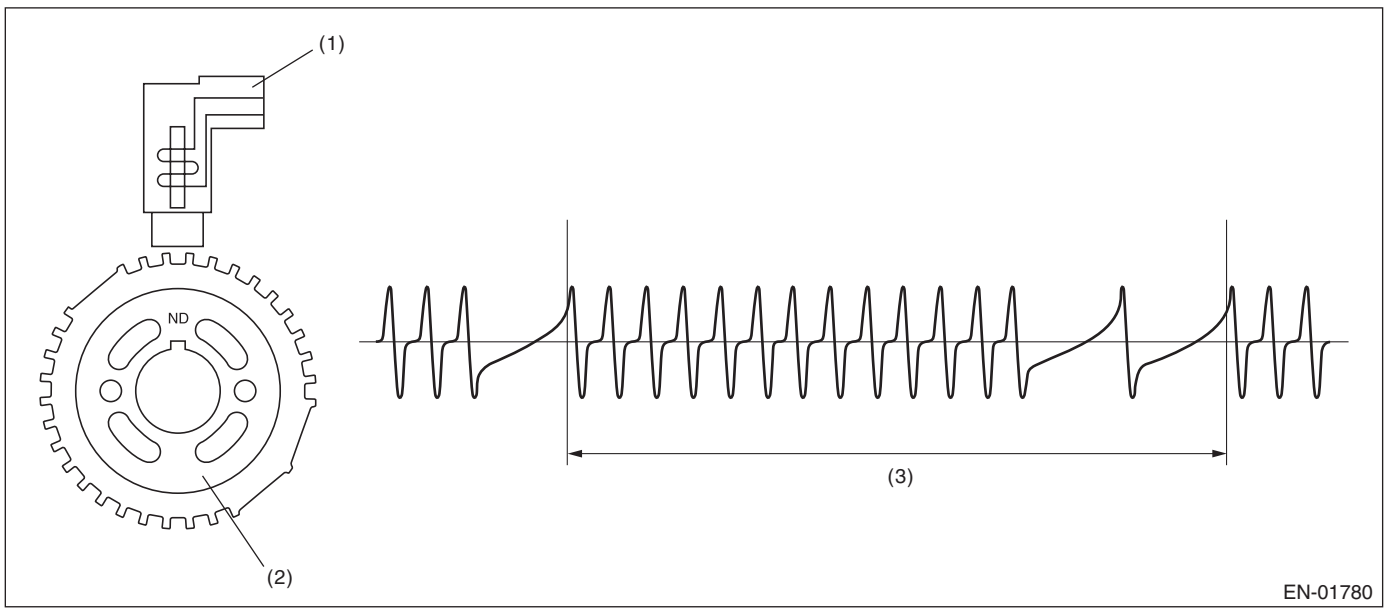
2. COMPONENT DESCRIPTION



(A) Camshaft signal

(B) Crankshaft signal

(C) Number of crankshaft signal = 30 is normal.



(1) Crankshaft position sensor

(2) Crankshaft sprocket

(3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V
Engine speed	< 3000 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3000 rpm engine speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when all the malfunction criteria below are completed more than 10 engine revs in a row.

• Judgment Value

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

Time Needed for Diagnosis: 10 engine revs.

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

• Normality Judgment

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

• 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 was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

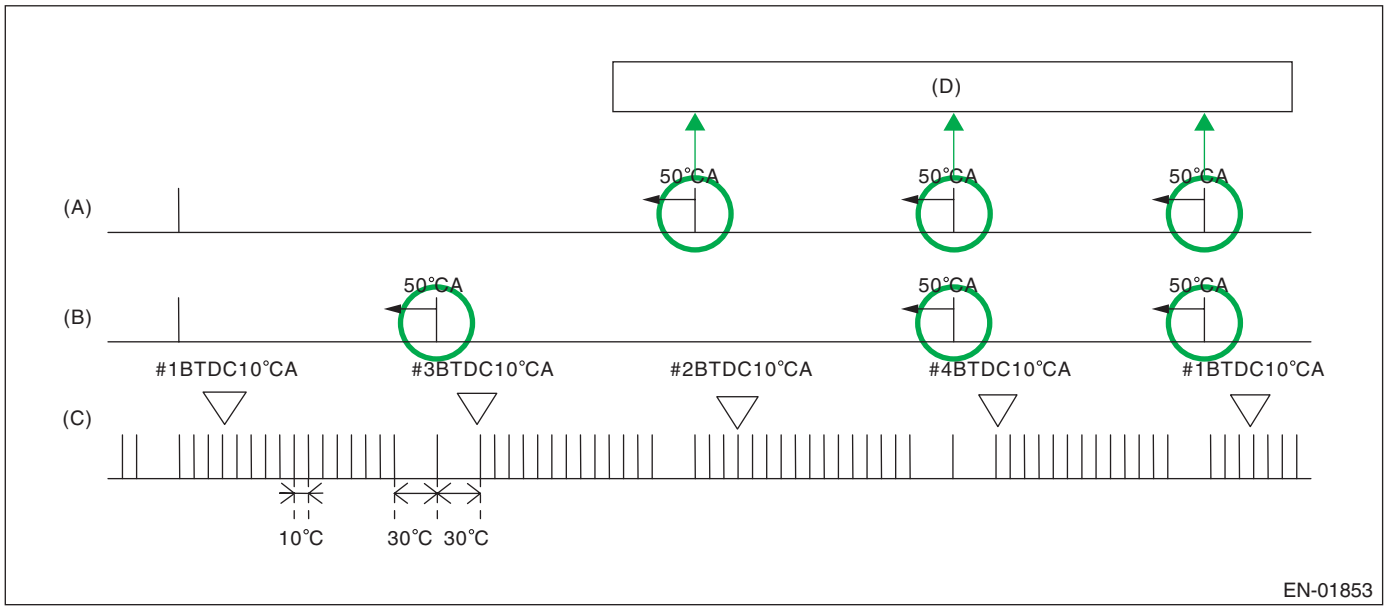
Memorize the freeze frame data. (For test mode $02)

AX:DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of camshaft position sensor. Judge NG when the number of camshaft signal remains to be abnormal.

2. COMPONENT DESCRIPTION



(A) Camshaft signal RH
(B) Camshaft signal LH
(C) Crankshaft signal
(D) Number of camshaft position signals = Recieve camshaft position signal 3 times per tow engine revolutions.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 8 V
Engine speed	≥ 600 rpm

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

The camshaft signal normally enters three times by two rev. of engine speed; however, judge NG when the camshaft signal does not enter three times continuously.
Judge NG when the malfunction criteria below are completed more than 100 rev. of engine speed. Judge OK and clear NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Number of camshaft sensor signal during 2 rev.	Except 3

Time Needed for Diagnosis: 100 rev.
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Number of camshaft sensor signal during 2 revs.	= 3

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

AVCS control: Make the OCV driving Duty to be the given value (9.36%).

9. ECM OPERATING AT DTC SETTING

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

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

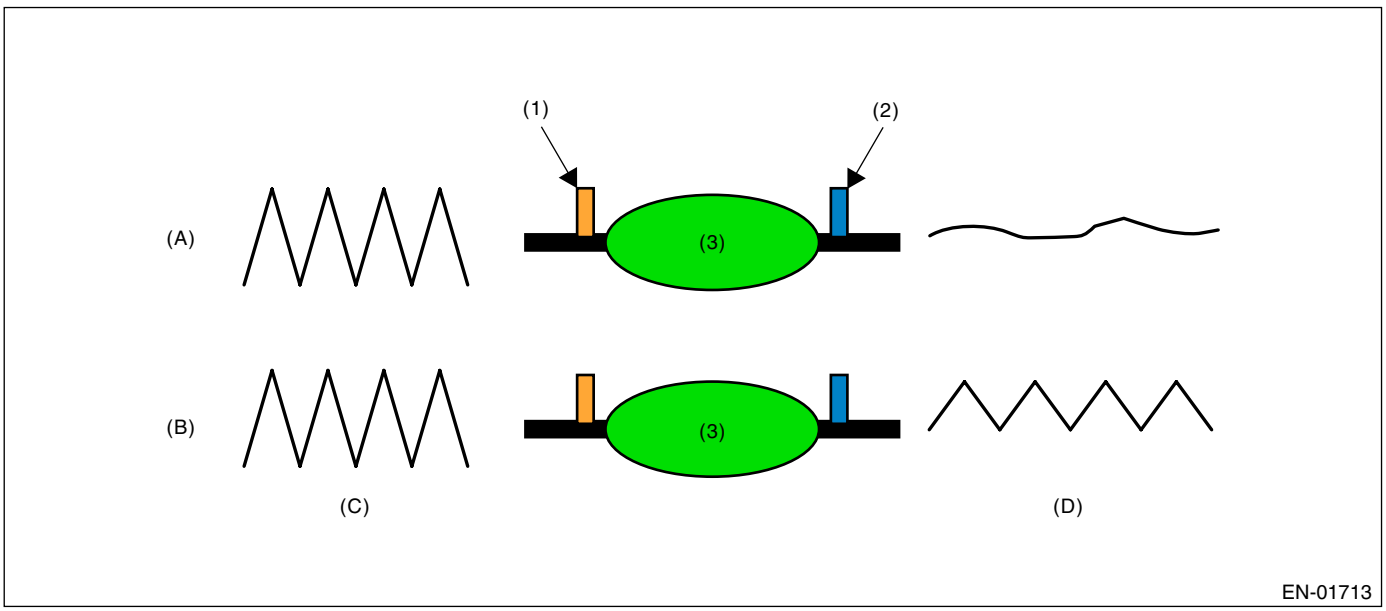
NOTE:
For diagnostic procedure, refer to DTC P0340. <Ref. to GD(H4DOTC)-116, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —.>

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

1. OUTLINE OF DIAGNOSIS

Detect the deterioration of 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 A/F sensor output.

2. COMPONENT DESCRIPTION



(1) Front oxygen (A/F) sensor
(2) Rear oxygen sensor
(3) Catalyst

(A) Normal
(B) Deterioration

(C) Front oxygen (A/F) sensor waveform
(D) Rear oxygen (A/F) sensor waveform

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 65°C (149°F)
Catalyst warm-up counter on Map 2	≥ 8000
Misfire detection during 200 engine revs.	< 5 times
Learning value of evaporation gas density	< 0.20
Sub feedback	In operation
Evaporative system diagnostic	Not in operation
Difference between actual and target time lambda < 0.10	1000 milliseconds or more
Vehicle speed	≥ 85 km/h (53 MPH)
Amount of intake air	12 — 40 g (0.35 ←→ 1.41 oz)/s
Engine load change every 0.5 engine revs.	< 0.03 g (0.001 oz)/rev
Rear O_2 output change from below 600 mV to over	Experienced after fuel cut
After starting engine	≥ 200 seconds
Cumulative time for canister purge after starting engine	≥ 19.9 seconds

• Map 2

Add the following value every 512 milliseconds.

• Catalyst warm-up counter ≤ 9000

Amount of intake air (g (oz)/s)	0 (0)	5 (0.18)	7.5 (0.265)	10 (0.35)	15 (0.53)	20 (0.71)	25 (0.88)	30 (1.06)	35 (1.23)	40 (1.41)	45 (1.59)	50 (1.76)
Integrated value for warm-up counter	–18	–5	3	11	25	40	57	72	87	100	100	100

• Catalyst warm-up counter > 8000

Amount of intake air (g (oz)/s)	0 (0)	5 (0.18)	7.5 (0.265)	10 (0.35)	15 (0.53)	20 (0.71)	25 (0.88)	30 (1.06)	35 (1.23)	40 (1.41)	45 (1.59)	50 (1.76)
Integrated value for warm-up counter	–8	–4	–1	3	6	8	9	11	13	14	14	14

4. GENERAL DRIVING CYCLE

Perform the diagnosis once at the constant vehicle speed of 85 km/h (53 MPH) or more after warming up the engine.

5. DIAGNOSTIC METHOD

After the malfunction criteria are completed, 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 more than specified value.
Regard the A/F response properties and diagnosis value as parameters for judgment value.
Judge NG when the malfunction criteria below are completed, and judge OK when they are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Accumulated variation of output voltage of rear oxygen sensor per 32 milliseconds divided by accumulated variation of lambda of front oxygen (A/F) sensor per 32 milliseconds	≥ 7.0

Time Needed for Diagnosis: 30 to 55 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

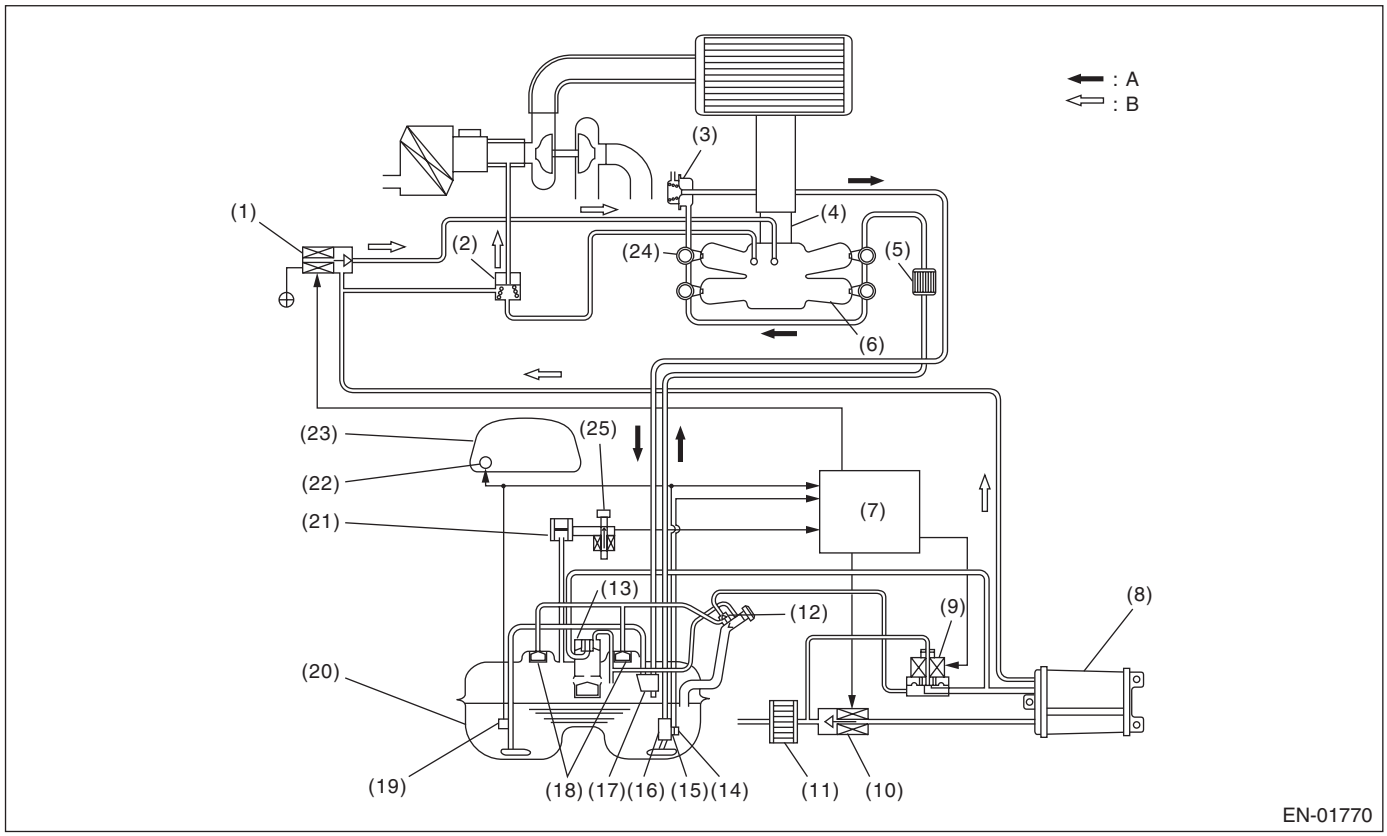
9. ECM OPERATION AT DTC SETTING

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

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

1. OUTLINE OF DIAGNOSIS

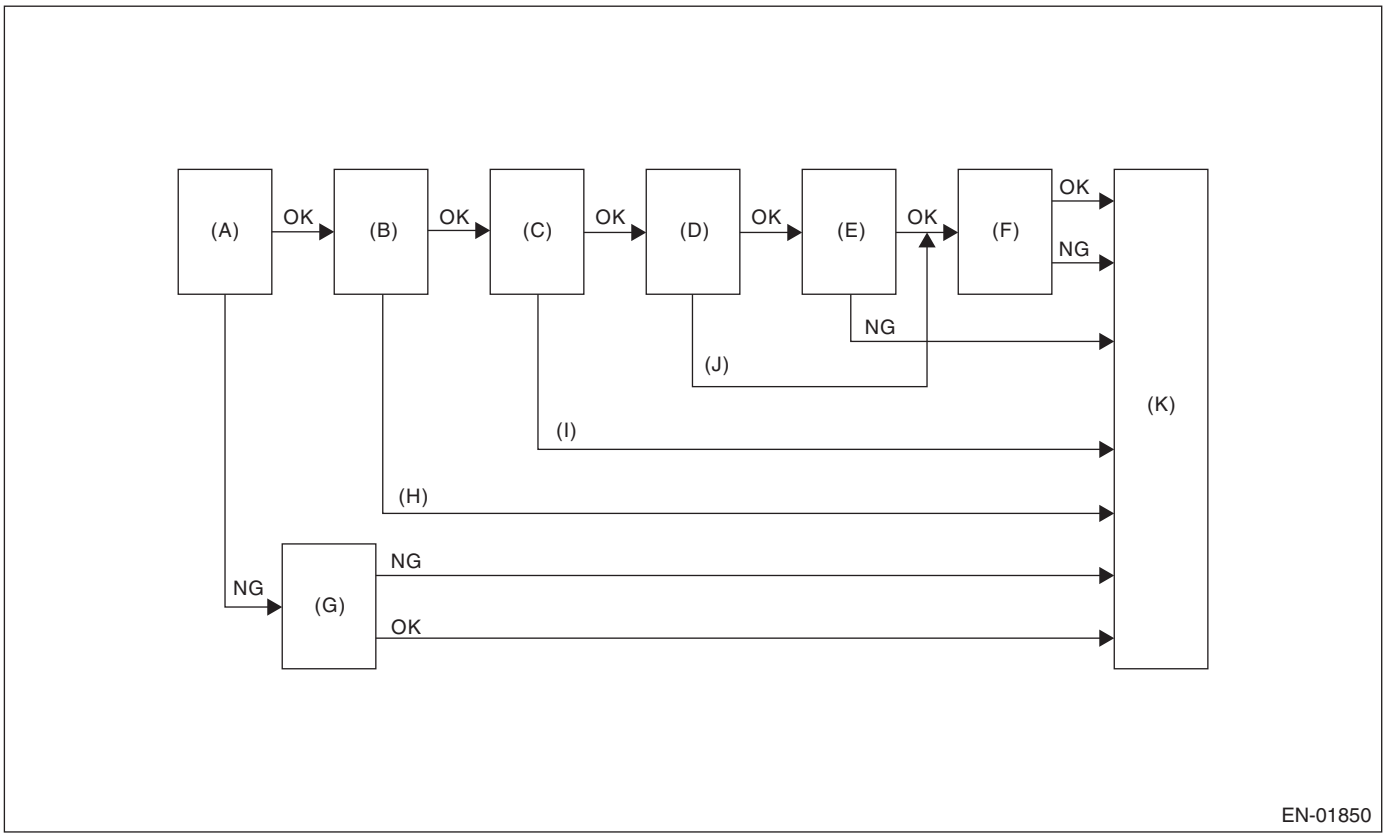
Perform the diagnosis of leakage of fuels system and valve functions.



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

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

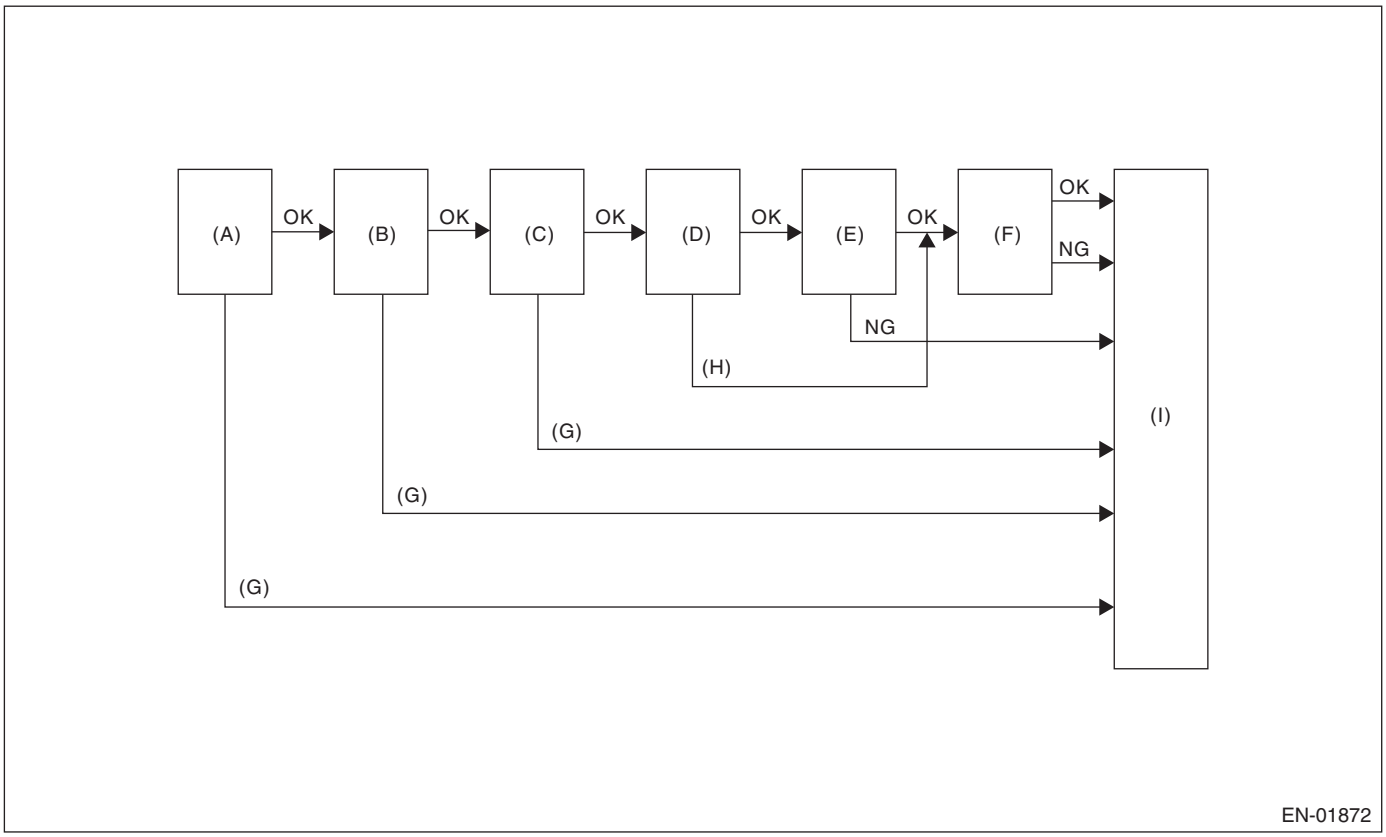
• 0.04-inch Diagnosis



(A) Mode Z
(B) Mode A
(C) Mode B
(D) Mode C
(E) Mode D
(F) Mode E
(G) Mode Z Extend
(H) Cancel
(I) Large leakage diagnosis
(J) Quick OK judgement
(K) END

Mode	Mode Description	Diagnosis Period
Mode Z (CCV close trouble diagnosis)	Perform CCV close stick fast diagnosis according to tank pressure change amount after the diagnosis has started.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	16 seconds
Mode B (Sealed negative pressure, large leakage judgment)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value. If the tank pressure cannot be reduced, it is diagnosed as large leak.	4 — 35 seconds
Mode C (Pressure increase check advanced OK judgment)	Wait until the tank pressure becomes the desired value (detection starting pressure of P2). If the tank pressure does not become the value, make advanced OK judgment.	4 — 15 seconds
Mode D (Negative pressure variation measurement evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.	12 — 16 seconds
Mode E (CCV property abnormal diagnosis)	Perform the CCV property abnormal diagnosis according to the tank pressure change amount after the leak diagnosis has finished.	4 seconds

• 0.02-inch Diagnosis



(A) Mode Y
(B) Mode A
(C) Mode B
(D) Mode C
(E) Mode D
(F) Mode E
(G) Cancel
(H) Quick OK judgement
(I) END

Mode	Mode Description	Diagnosis Period
Mode Y (Tank pressure stabilization)	Return the tank pressure to atmosphere.	15 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	29 seconds
Mode B (Negative pressure sealed)	Intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value.	10 — 20 seconds
Mode C (Pressure increase check advanced OK judgment)	Wait until the tank pressure becomes the desired value (detection starting pressure of P2). If the tank pressure does not become the value, make advanced OK judgment.	5 — 20 seconds
Mode D (Negative pressure variation measurement evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.	20 — 25 seconds
Mode E (CCV property abnormal diagnosis)	Perform the CCV property abnormal diagnosis according to the tank pressure change amount after the leak diagnosis has finished.	4 seconds

• Mode Table for Evaporative Emission Control System Diagnosis

• 0.04-inch Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Z	Nearly same as atmospheric pressure [equivalent pressure of 0 kPa (0 mmHg, 0 inHg)]	CCV is judged to be stuck closed.	P1443
Mode A	Pressure is in proportion to amount of evaporative emission.		
Mode B	Negative pressure is formed due to intake manifold negative pressure	Large leakage	P0457
Mode C	Target pressure is reached		None
Mode D	Pressure change is small.	EVAP system is judged to have large leak [1.0 mm (0.04 in)].	P0442
Mode E	Return to atmosphere	CCV property	P1443

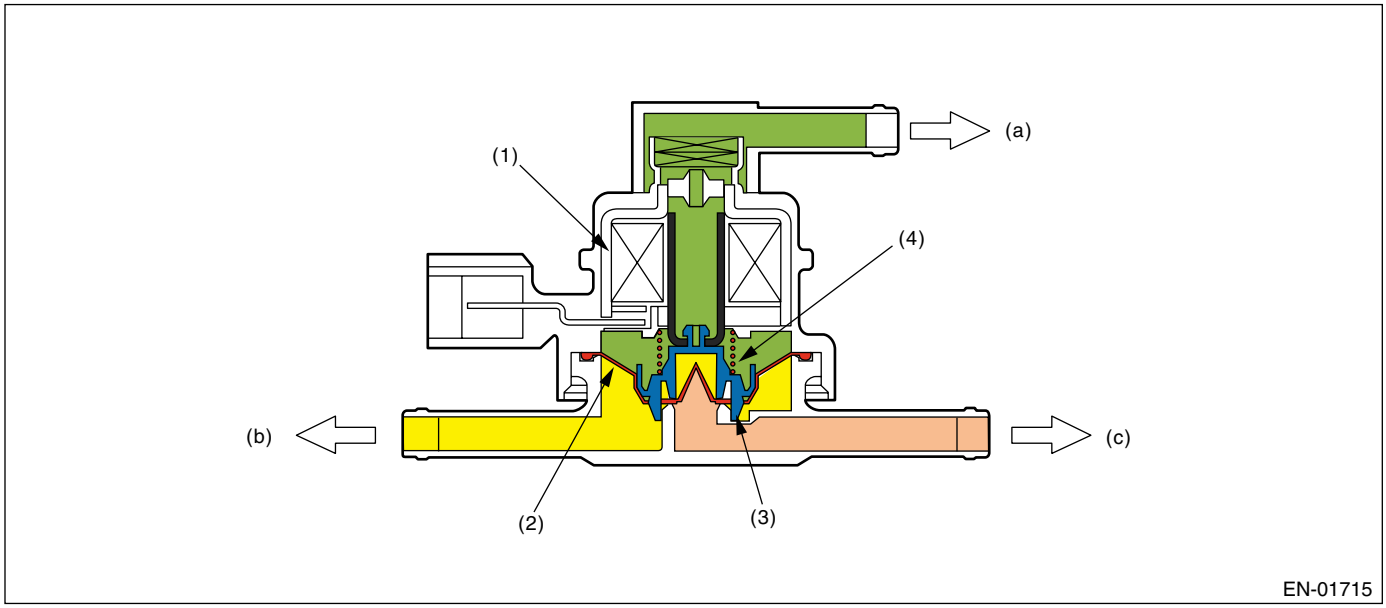
• 0.02-inch Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Y	Return to atmosphere		
Mode A	Pressure is in proportion to amount of evaporation gas occurrence.		
Mode B	Negative pressure is formed due to intake manifold negative pressure		
Mode C	Target pressure is reached		
Mode D	Pressure change is small.	P2 measurement of small leak in system. Evaporation system is judged to have small leak [0.5 mm (0.02 in.)].	P0456
Mode E	Return to atmosphere	CCV property judgment	P1443

2. COMPONENT DESCRIPTION

• Pressure Control Solenoid Valve

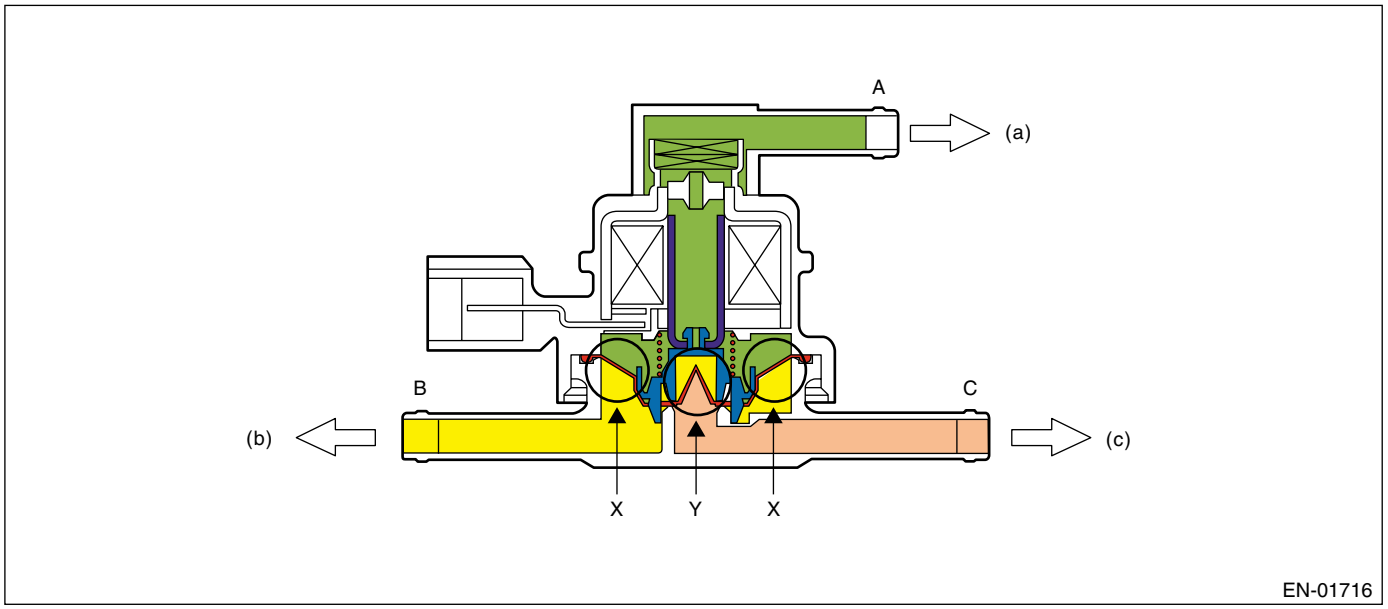
PCV controls the fuel tank pressure to be equal to the atmospheric air pressure.
Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.
Also the valve can be forcibly opened by setting the solenoid to ON.



(1) Solenoid
(2) Diaphragm
(3) Valve
(4) Spring
(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

• Valve Operation and Air Flow

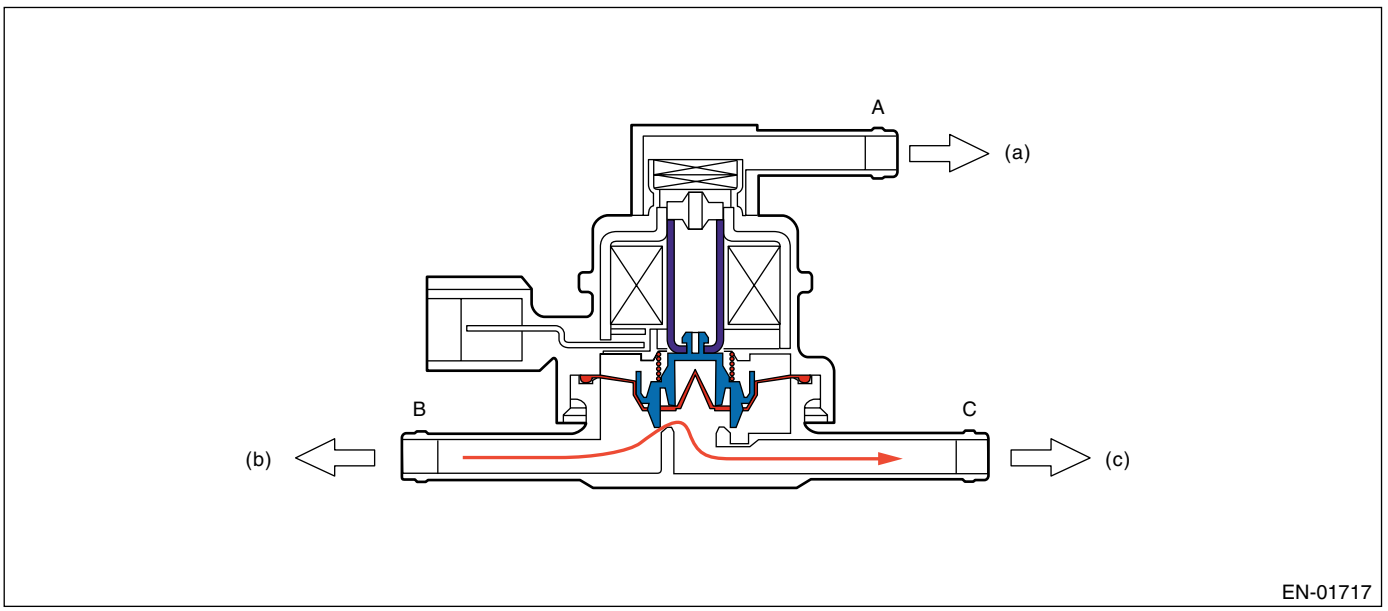
In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.
If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



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

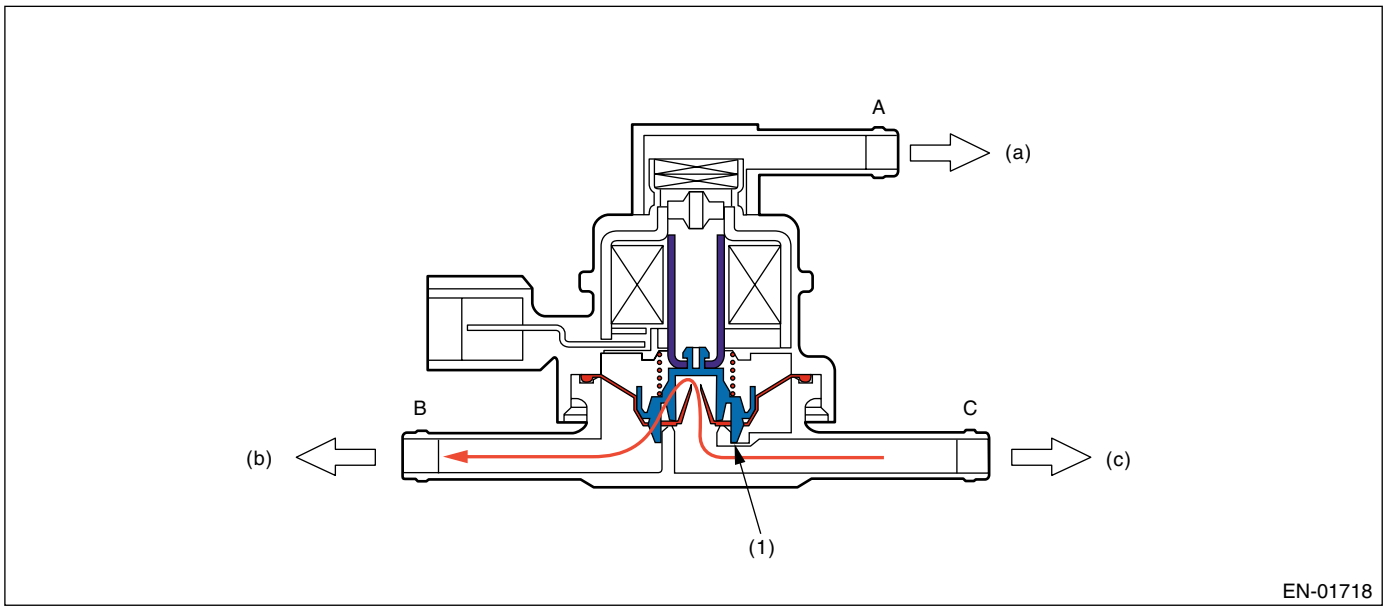
Condition of pressure	Flow
A < B (solenoid OFF)	B → C
B < C (solenoid OFF)	C → B
Solenoid ON	B ←→ C

• When A < B (Solenoid OFF)



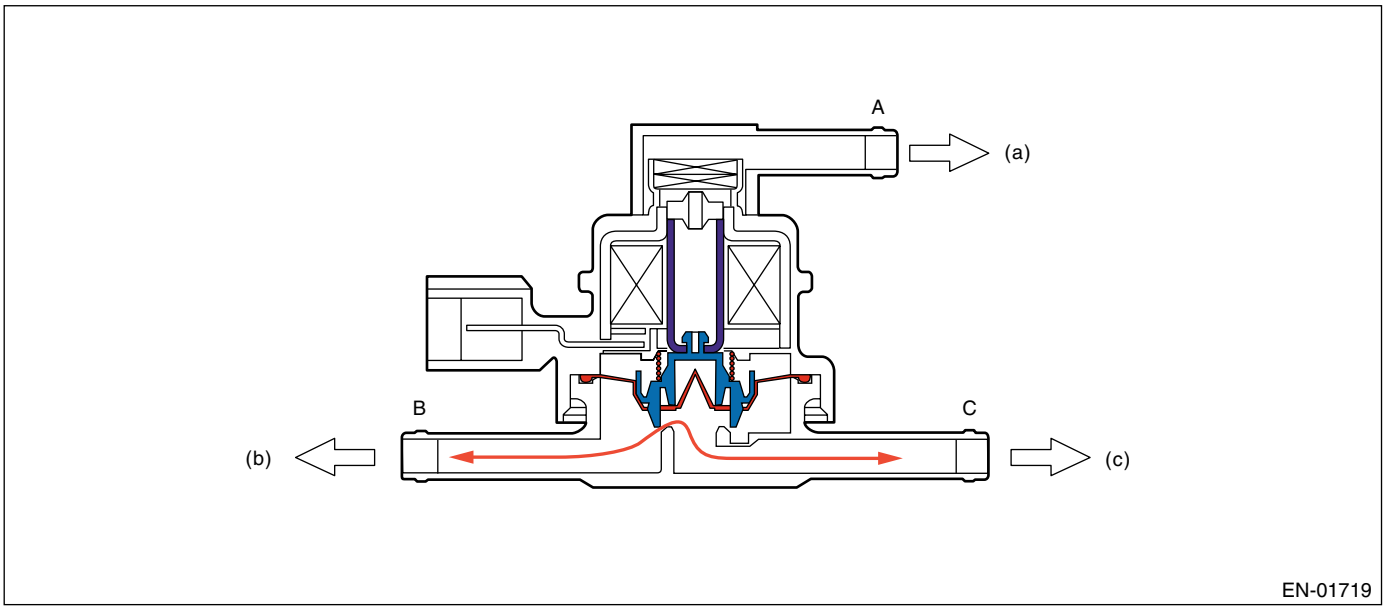
(a) Atmospheric pressure (b) Fuel tank (c) Canister

• When B < C (Solenoid OFF)



(1) Valve
(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

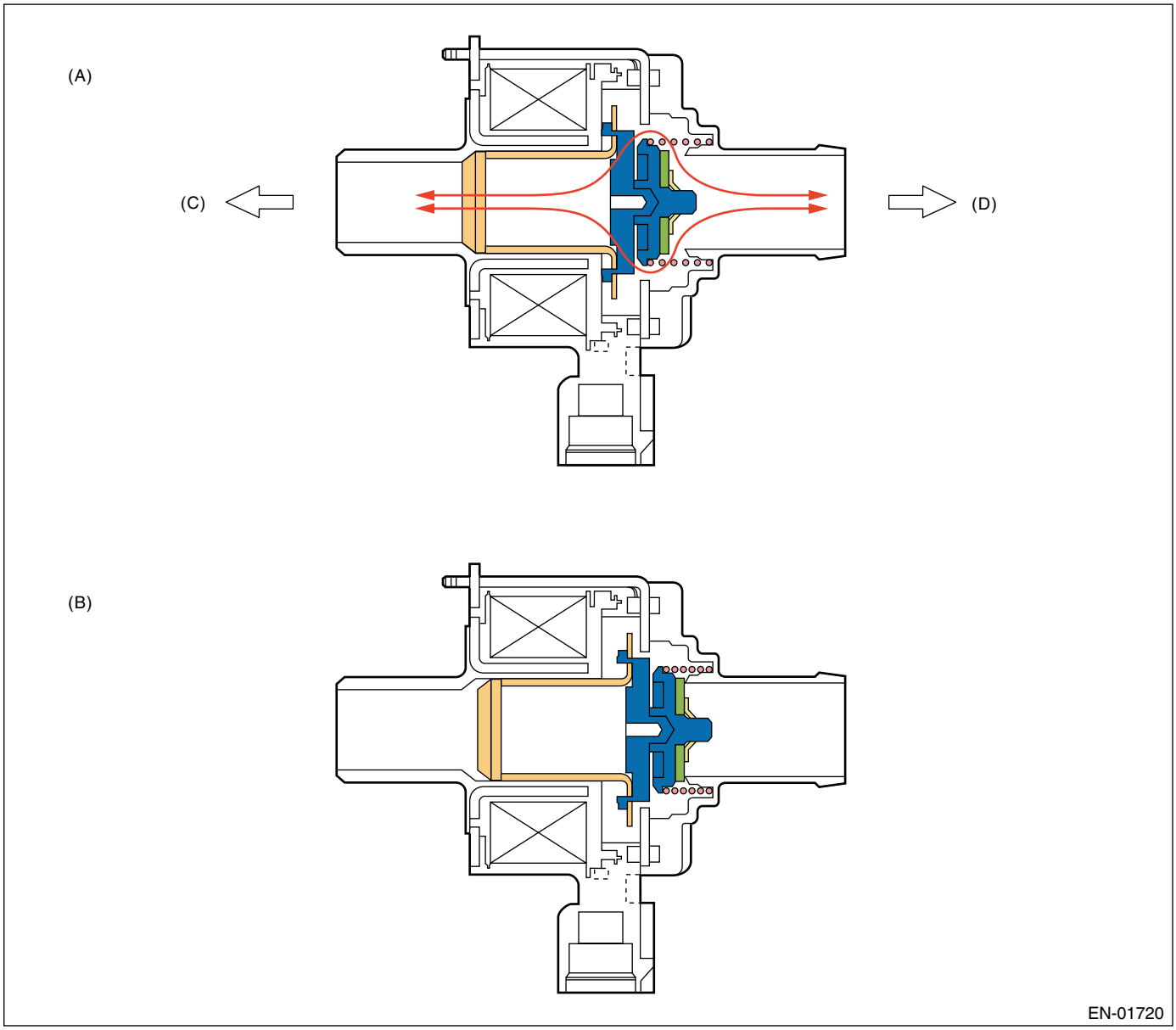
• When Solenoid is ON



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

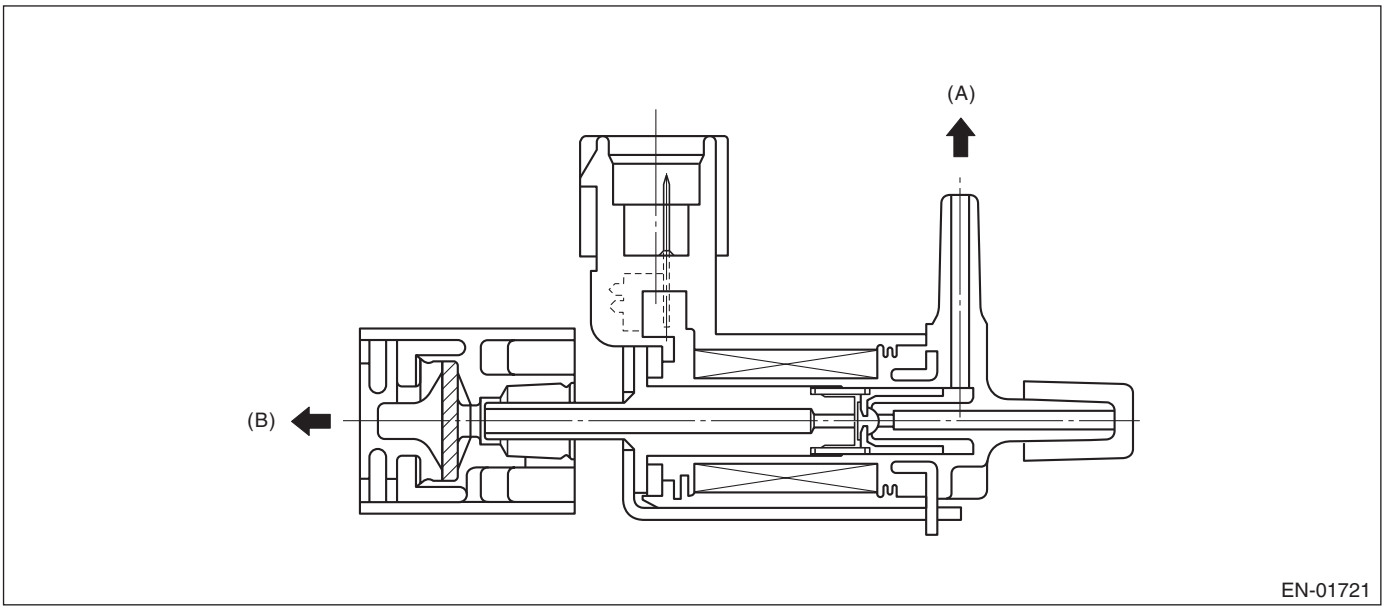
• CCV

CCV controls the ambient air to be introduced to the canister.



(A) Open (Solenoid OFF)
(B) Close (Solenoid ON)
(C) Filter
(D) Canister

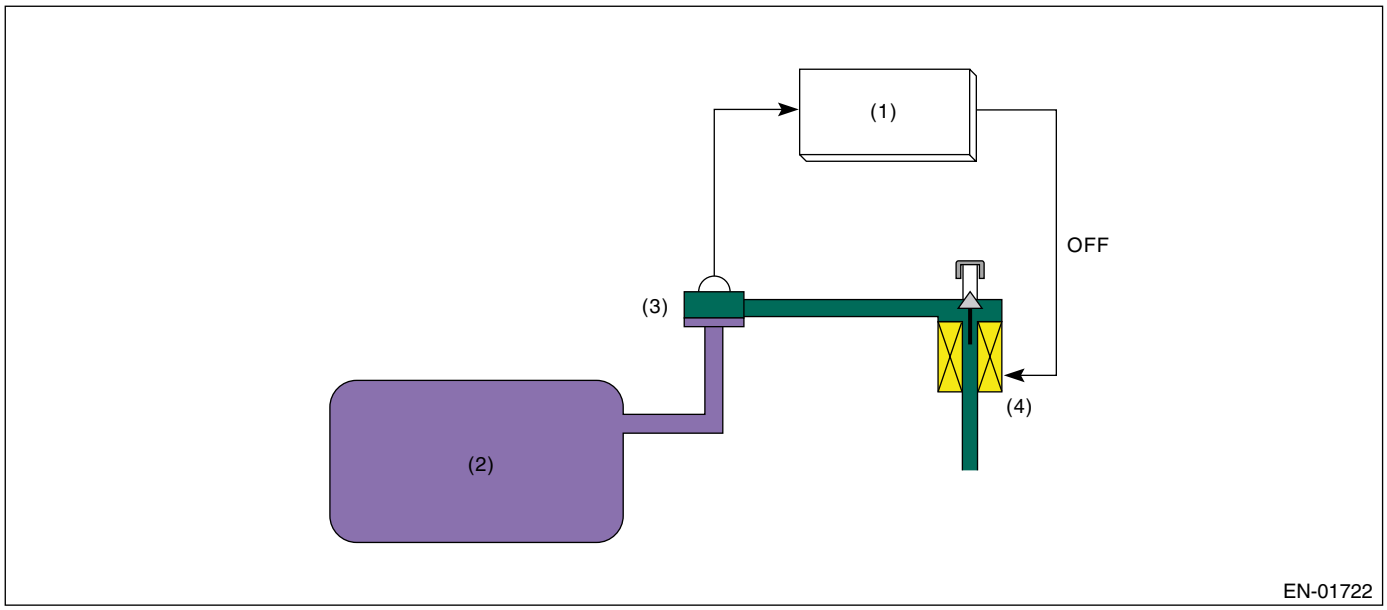
• Tank Pressure Switching Solenoid



(A) Fuel tank pressure sensor (B) Atmosphere

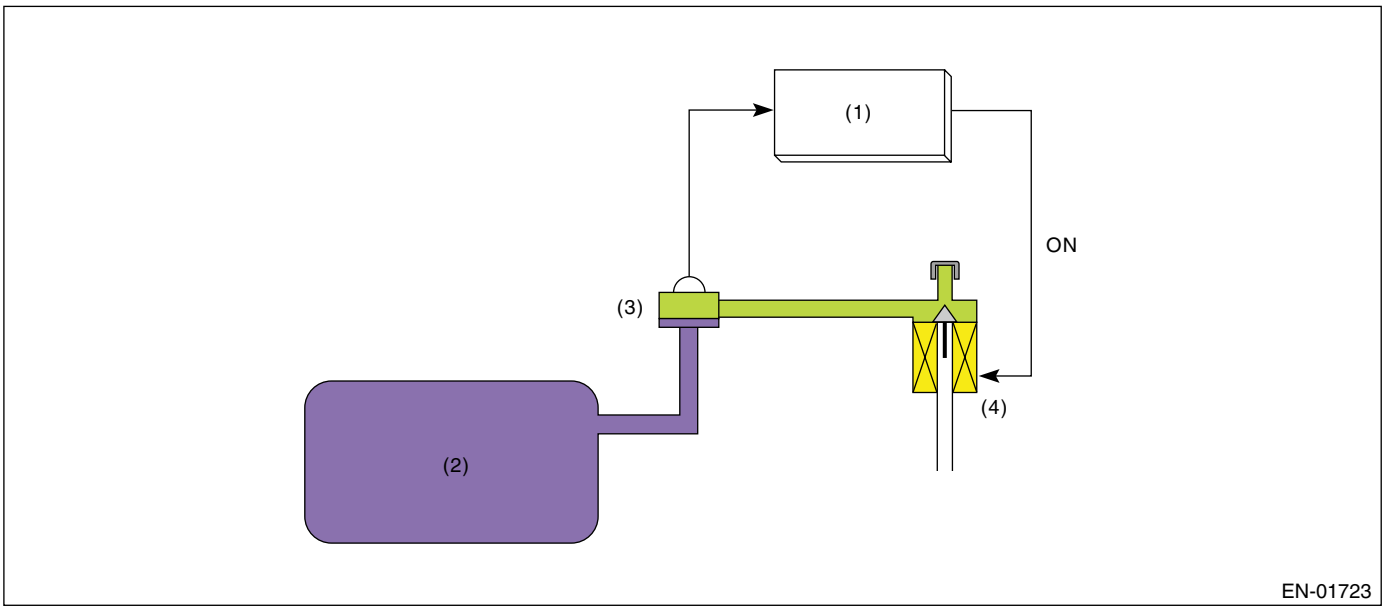
• Purpose of this solenoid

Fuel tank pressure sensor detects the difference between the atmospheric air pressure and the tank pressure and the ECM monitors the pressure difference.
Even if the tank pressure is constant, the atmospheric air pressure varies depending on the driving height, and the pressure signal transmitted to ECM will change.



(1) Engine control module (ECM)
(2) Fuel tank
(3) Fuel tank pressure sensor
(4) Atmospheric pressure switching solenoid

Especially, in the small leakage [0.5 mm (0.02 in)], minute change in the tank pressure has to be detected. This diagnosis period is long (approx. 29 seconds). And if the driving height changes during the diagnosis, the atmospheric air pressure changes. In this case, it becomes difficult to precisely detect the tank pressure variation, causing erroneous diagnosis. Therefore, using the atmospheric pressure switching solenoid, atmospheric air is sealed between the fuel tank pressure sensor and atmospheric pressure switching solenoid, maintaining the air pressure constant and enabling the detection of minute variation of tank pressure.



(1) Engine control module (ECM)
(2) Fuel tank
(3) Fuel tank pressure sensor
(4) Atmospheric pressure switching solenoid

NOTE:
ECM also has the atmospheric air pressure sensor, and always monitors atmospheric air. However, as the monitoring range is large, that is, 53 to 107 kPa (400 to 800 mmHg, 16 to 32 inHg) it is not suitable for detection of minute pressure variation.
In the case of small leakage diagnosis, the tank pressure variation is very small, that is, 0.13 to 0.27 kPa (1 to 2 mmHg, 0.04 to 0.08 inHg) and the fuel tank pressure sensor is equipped.

3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Total time of canister purge operation	120 seconds or more
After starting engine	856 seconds or more
Learning value of evaporation gas density	≤ 0.04
Engine speed	1050 ←→ 6500 rpm
Fuel tank pressure	< 1.03 kPa (7.72 mmHg, 0.30 inHg)
Intake manifold vacuum (relative pressure)	< −13.3 kPa (−100 mmHg, −3.92 inHg)
Vehicle speed	≥ 32 km/h (20 MPH)
Fuel level	9.6 ←→ 48 ℓ (2.54 ←→ 12.7 US gal, 2.11 ←→ 10.6 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	< 0.13 kPa (0.95 mmHg, 0.037 inHg)
Min. pressure change per second − Max. pressure change per second	< 0.23 kPa (1.75 mmHg, 0.07 inHg)
Fuel level change	< 3.0 ℓ (3.2 US gal, 2.6 Imp gal)/128 milliseconds
Air fuel ratio	0.76 — 1.25

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
(At starting a diagnosis)	
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75.7 kPa (568 mmHg, 22.4 inHg)
Since last incomplete diagnosis event of 0.02-inch leakage	> 120 seconds
Total time of canister purge operation	120 second or more
After starting engine	335 second or more
Fuel temperature	–10 ←→ 35°C (14 ←→ 95°F)
Or engine coolant temperature at engine start	< 45°C (113°F)
And time after engine start	< 2400 seconds
Fuel level	9.6 ←→ 48 ℓ (2.54 ←→ 12.7 US gal, 2.11 ←→ 10.6 Imp gal)
Ambient temperature	≥ –10°C (14°F)
(Ambient – fuel) temperature	< 1°C (1.8°F)
Fuel tank pressure below –3.01 kPa (–22.8 mmHg, –0.88 inHg) (during same driving cycle)	Up to 2 times
Intake manifold vacuum (relative pressure)	< –13.3 kPa (–100 mmHg, –3.92 inHg)
Fuel tank pressure	–0.67 — 1.27 kPa (–5 — 9.5 mmHg, –0.197 — 0.374 inHg)
Vehicle speed	≥ 68 km/h (42 MPH)
Closed air/fuel ratio control	In operation
Engine speed	1500 ←→ 6500 rpm
(During diagnosis)	
P1	–0.13 ←→ 0.13 kPa (–1 ←→ 1 mmHg, –0.04 ←→ 0.04 inHg)
Pressure change per second	< 0.13 kPa (0.95 mmHg, 0.037 inHg)
Fuel level change	2 ←→ 3 ℓ (2.1 ←→ 3.2 US gal, 1.8 ←→ 2.6 Imp gal)
Min. tank pressure change per second – Max. tank pressure change per second	< Mode A: 0.23 kPa (1.75 mmHg, 0.07 inHg) Mode D: 0.13 kPa (1.00 mmHg, 0.04 inHg)
Change of atmospheric pressure during P1 calculation	–0.04 ←→ 0.17 kPa (–0.3 ←→ 1.3 mmHg, –0.01 ←→ 0.05 inHg)
Change of atmospheric pressure during P2 calculation	–0.08 ←→ 0.12 kPa (–0.6 ←→ 0.9 mmHg, –0.024 ←→ 0.035 inHg)

4. GENERAL DRIVING CYCLE

• 0.04-inch Diagnosis

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

• 0.02-inch Diagnosis

• Perform diagnosis in more than 335 seconds after engine start at the constant speed of 68 km/h (42 MPH) or more, and then terminate the diagnosis when judged OK or NG.
• If not judged OK or NG, repeat the diagnosis until judged OK or NG.
• Pay attention to the fuel temperature and fuel level.

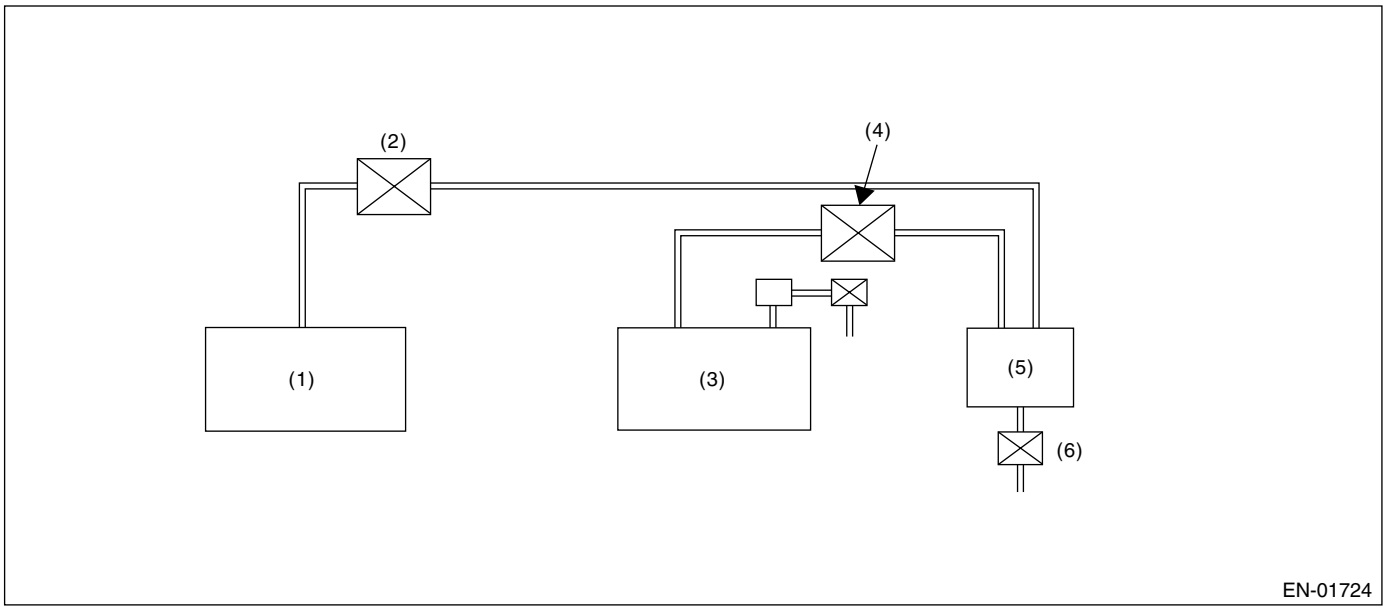
5. DIAGNOSTIC METHOD

• MODE Z (CPC close trouble diagnosis)

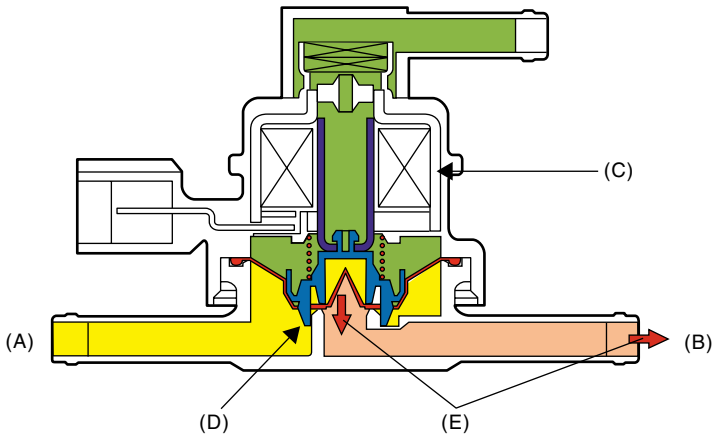
DTC P0457
DTC P1443

• Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, CCV have to operate normally. Therefore, mode Z is used to diagnose the CCV close fixation.
If the CCV closed fixation trouble is detected, the EVAP system leakage diagnosis is cancelled.
If the CCV closed fixation trouble occurred, negative pressure is generated from the engine to pressure control solenoid valve when pressure control solenoid valve is closed and CPC is opened. When this status occurs the valve cannot be opened for the pressure control solenoid valve structure if the negative pressure is larger than electromagnetic force when pressure control solenoid valve solenoid is set to ON in order to open the valve.



(1) Engine
(2) Purge control solenoid valve open
(3) Fuel tank
(4) Pressure control solenoid valve close
(5) Canister
(6) CCV stuck close

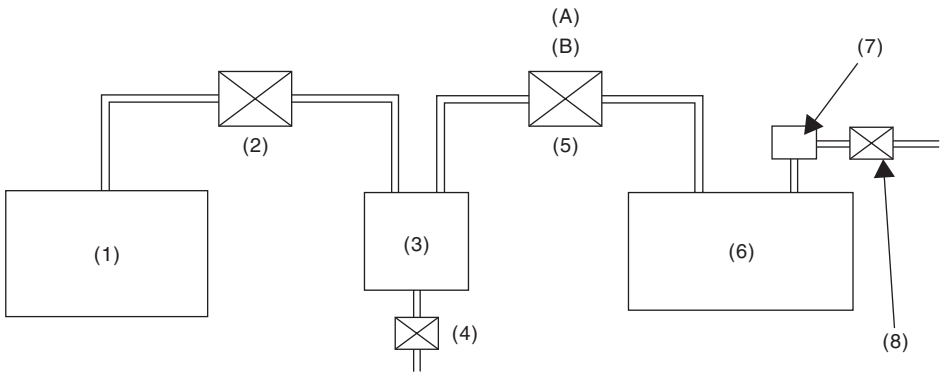


EN-01725

(A) To fuel tank
(B) To canister (Negative pressure)
(C) Solenoid ON
(D) Valve cannot be open.
(E) Negative pressure

• Diagnostic method

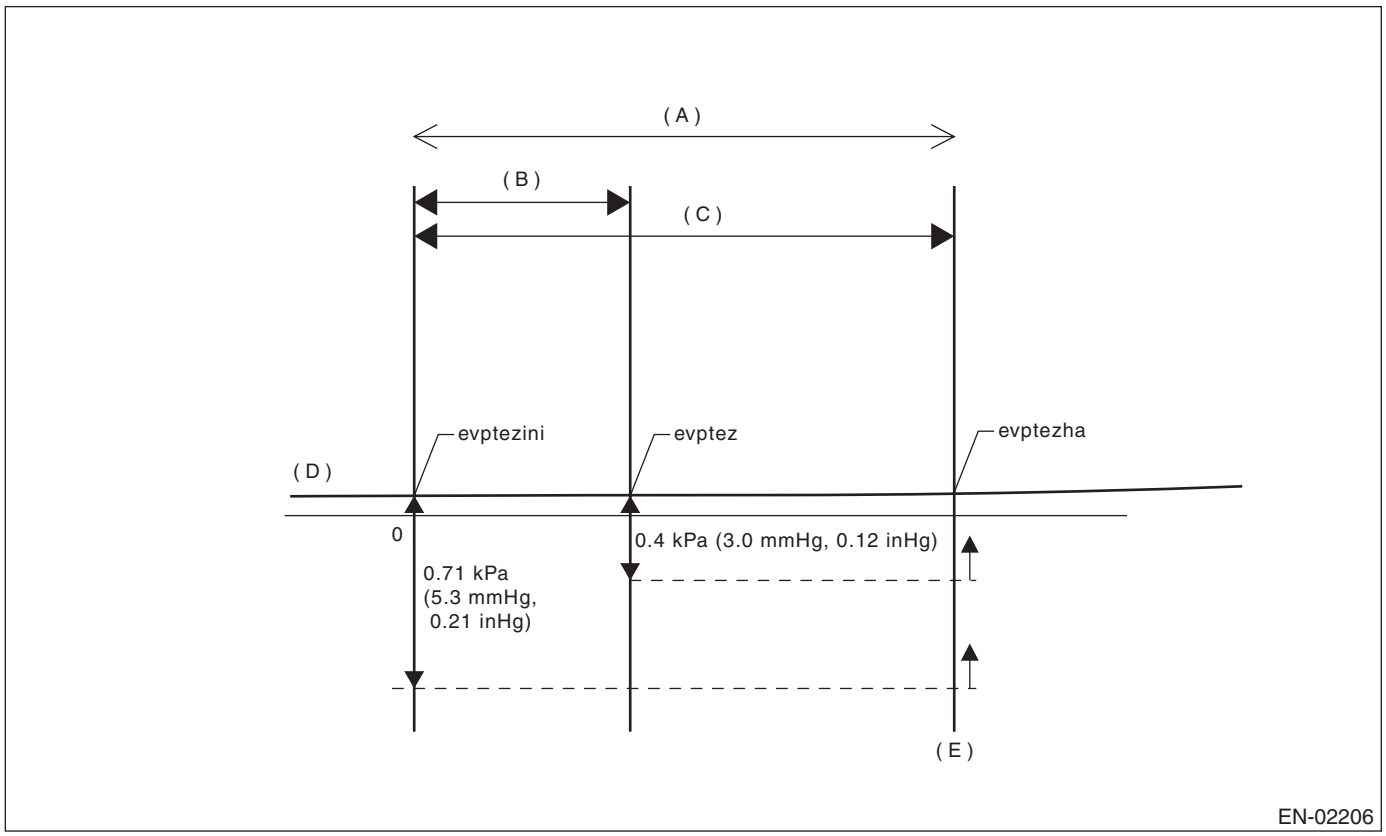
CCV closed fixation diagnosis is performed in mode Z as shown in the figure below.



EN-01726

(1) Engine
(2) Purge control solenoid valve
(3) Canister
(4) Drain valve
(5) Pressure control solenoid valve
(6) Fuel tank
(7) Fuel tank pressure sensor
(8) Tank pressure switching solenoid valve
(A) Normal condition: mechanical control
(B) Under the diagnosis: electronic control

• Normal Operation

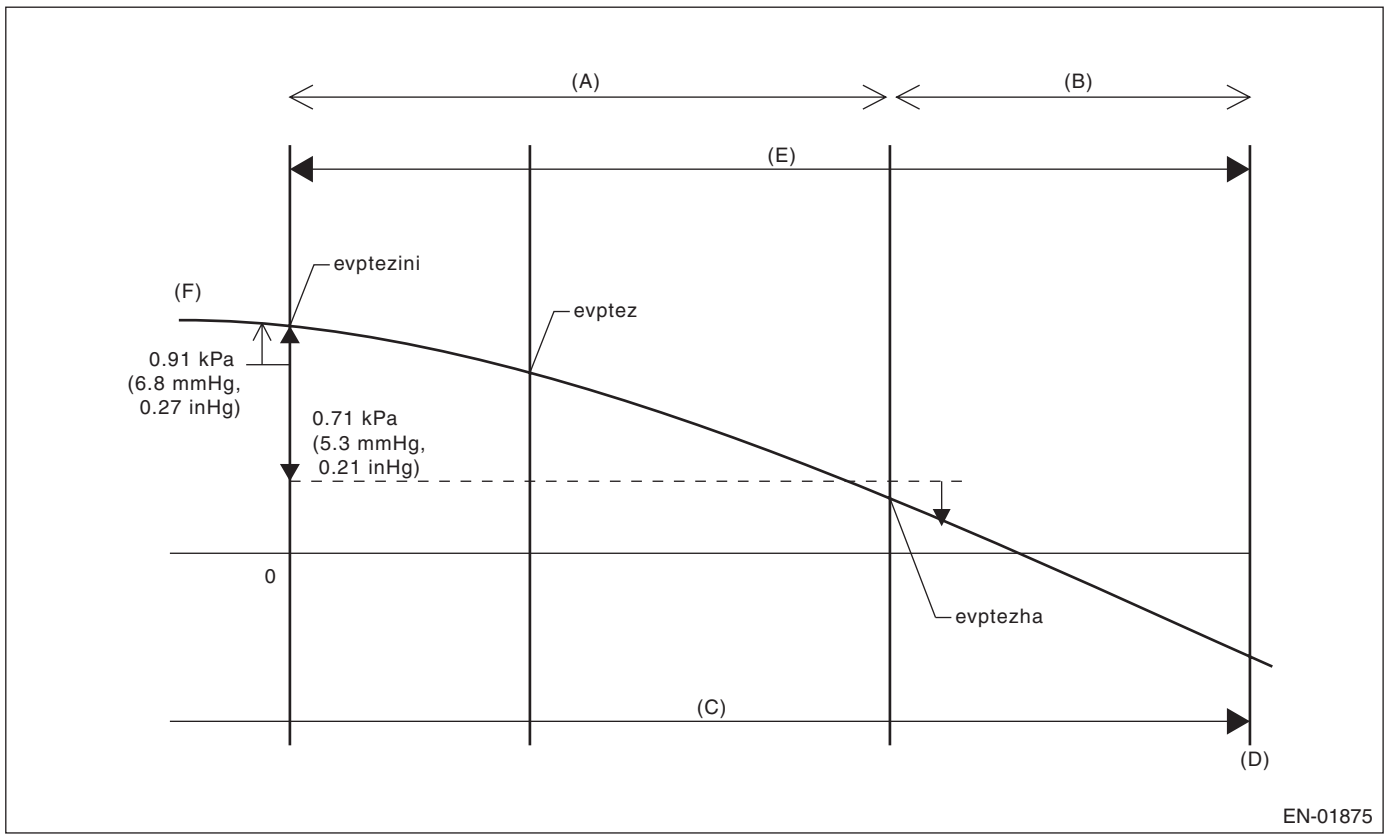


(A) Mode Z
(B) 1 second
(C) 3 seconds
(D) Fuel tank pressure
(E) OK judgement

- evptez – evptezha ≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)
- evptezini – evptezha ≤ 0.71 kPa (5.3 mmHg, 0.21 inHg)

Judge normal when these calculations are completed.

• Drain Valve close fixation



(A) Mode Z
(B) Mode Z extened
(C) Fuel does not waver more than 3 seconds.
(D) Judgement
(E) 16 seconds
(F) Fuel tank pressure

- evptezini – evptezha > 0.71 kPa (5.3 mmHg, 0.21 inHg)
- evptezini > 0.91 kPa (6.8 mmHg, 0.27 inHg)

Judge normal when these calculations are completed.

• Diagnosing Function of CCV [P1443]

CCV functional diagnosis is performed by monitoring the tank pressure variation in Mode Z.

Normality Judgment

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

• Judgment Value

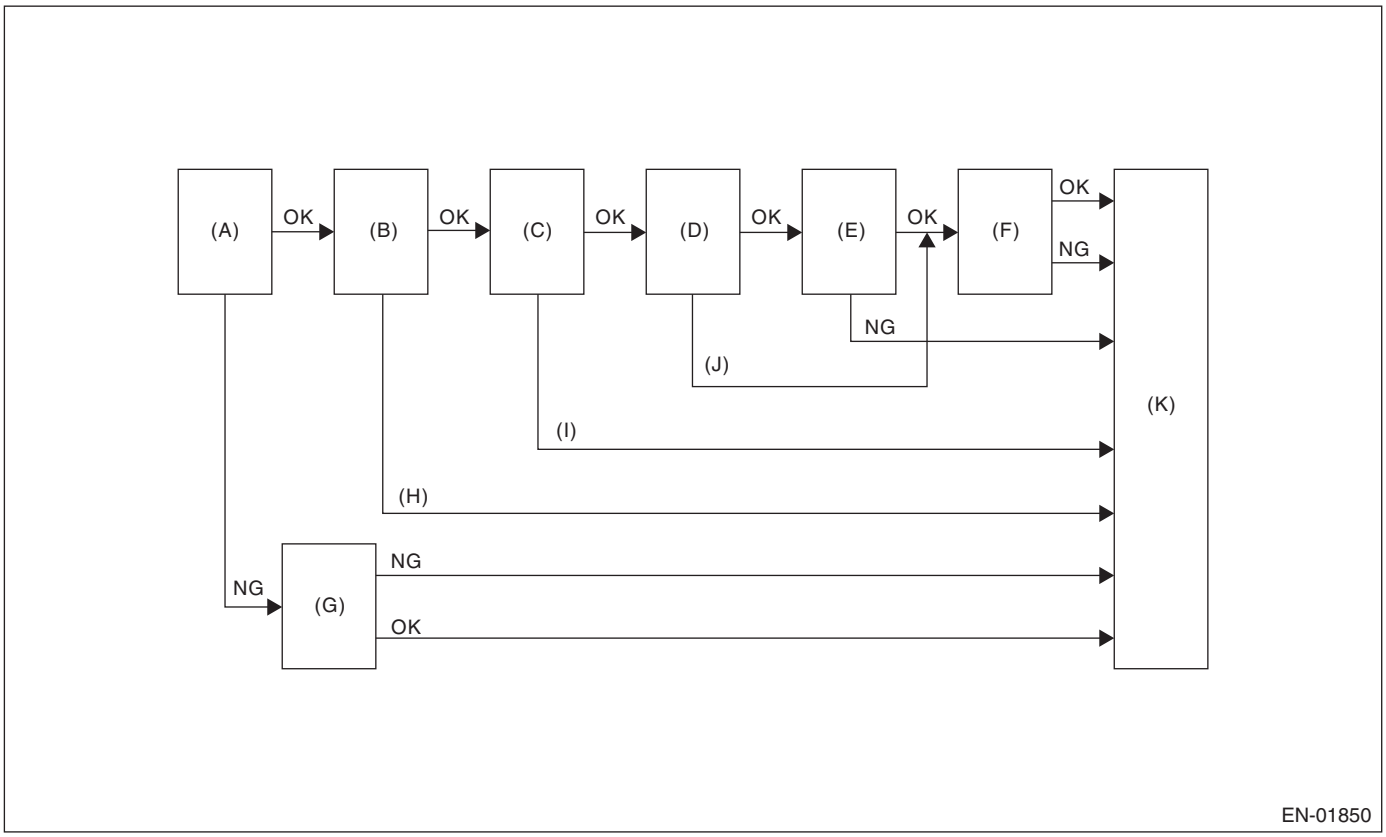
Malfunction Criteria	Threshold Value	DTC
(Tank pressure in 3 seconds after Mode Z started) – (Tank pressure when Mode Z finished)	≤ 0.71 kPa (5.3 mmHg, 0.209 inHg)	P1443

Abnormality Judgment
If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
Tank pressure when Mode Z started	> 0.91 kPa (6.8 mmHg, 0.27 inHg)	P1443
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	> 0.7 kPa (5.3 mmHg, 0.21 inHg)	

Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
Finish the Evap. diagnosis when making NG judgment for drain valve close fixation.
Cancel the Evap. diagnosis when the OK/NG judgment for drain valve close fixation cannot be made in Mode Z.



(A) Mode Z
(B) Mode A
(C) Mode B
(D) Mode C
(E) Mode D
(F) Mode E
(G) Mode Z Extend
(H) Cancel
(I) Large leakage diagnosis
(J) Quick OK judgement
(K) END

• Leak Diagnosis

DTC P0442
DTC P0456
DTC P0457

• 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 atmospheric pressure.
• The diagnosis is divided into the following five phases.

Mode A: (Estimation of evaporation gas yield)

The tank pressure variation amount in Mode A is calculated as P1. The tank pressure variation amount in Mode A is calculated as P1. After calculating P1, change to Mode B.

Mode B: (Seal negative pressure)

Introduce the negative pressure in the intake manifold to the tank.
Approx. 0 → –1.4 kPa (0 → –10.5 mmHg, 0 → –0.41 inHg) (0.04-in diagnosis)
Approx. 0 → –3.05 kPa (0 → –22.9 mmHg, 0 → –0.9 inHg) (0.02-in diagnosis)
When the pressure above (desired negative pressure) is reached, Mode C is entered.
In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage in the system.
Judge NG when the malfunction criteria below is completed.
Finish the Evap. diagnosis when judging large leak (10 seconds) in 0.04-inch diagnosis. Cancel the diagnosis (10 to 20 seconds) in 0.02-inch diagnosis.

Abnormality Judgment

Judge NG (large leak) when the criteria below are completed in the specified time.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
(0.04-inch diagnosis)		P0457
Time for Mode B	10 seconds	
(Tank pressure during Mode B) – (Tank pressure when Mode B started)	< –0.3 kPa (–2 mmHg, –0.08 inHg)	

Mode C: (Check increasing pressure)

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)
Change to Mode D when the tank pressure returns to the start level of P2 calculation.
Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

	Tank pressure when P2 calculation started	Time for immediate OK judgment
0.04-inch diagnosis	–1.3 kPa (–9.75 mmHg, –0.38 inHg)	15 seconds
0.02-inch diagnosis	–3 kPa (–22.5 mmHg, –0.89 inHg)	20 seconds

Mode D: (Measurement of negative pressure changes)

Monitor the pressure variation in the tank in Mode D. In this case, the tank pressure increases, that is, the pressure becomes as high as the atmospheric air pressure, because evaporator is generated. 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 small leak diagnosis and change to Mode E if normal. Complete Evap. diagnosis if abnormal.

• After Mode D

Assigning P1 and P2, which are tank variations measured in Mode A and Mode B, to the formula below, judge the small leakage of the system. If the measured judgment value exceeds the threshold value, it is judged to be malfunction.

• 0.04-inch Diagnosis

Abnormality Judgment

Judge NG when the criteria below are completed and judge OK when not completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1 P2: Change of tank pressure within 16 seconds on Mode D P1: Change of tank pressure within 16 seconds on Mode A	> Value on map 7. *Threshold value: Figure (Fuel level vs Tank temperature)	P0442

***1.5:** Compensation value of the amount of evaporator occurrence. (Because evaporator increases more when becoming negative pressure.)

• Map 7 Limit of malfunction criteria for 0.04-inch leak as Evap. diagnosis.

Fuel temperature & Fuel level	5°C (41°F)	15°C (59°F)	25°C (77°F)	35°C (95°F)	45°C (113°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.31 kPa (2.34 mmHg, 0.092 inHg)	0.31 kPa (2.34 mmHg, 0.092 inHg)	0.33 kPa (2.49 mmHg, 0.098 inHg)	0.35 kPa (2.64 mmHg, 0.104 inHg)	0.37 kPa (2.80 mmHg, 0.110 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.35 kPa (2.64 mmHg, 0.104 inHg)	0.35 kPa (2.64 mmHg, 0.104 inHg)	0.38 kPa (2.84 mmHg, 0.112 inHg)	0.41 kPa (3.08 mmHg, 0.121 inHg)	0.44 kPa (3.28 mmHg, 0.129 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.39 kPa (2.94 mmHg, 0.116 inHg)	0.39 kPa (2.94 mmHg, 0.116 inHg)	0.42 kPa (3.18 mmHg, 0.125 inHg)	0.47 kPa (3.52 mmHg, 0.139 inHg)	0.50 kPa (3.76 mmHg, 0.148 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.45 kPa (3.35 mmHg, 0.132 inHg)	0.45 kPa (3.35 mmHg, 0.132 inHg)	0.47 kPa (3.49 mmHg, 0.137 inHg)	0.50 kPa (3.74 mmHg, 0.147 inHg)	0.52 kPa (3.88 mmHg, 0.153 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.50 kPa (3.76 mmHg, 0.148 inHg)	0.50 kPa (3.76 mmHg, 0.148 inHg)	0.51 kPa (3.80 mmHg, 0.150 inHg)	0.53 kPa (3.95 mmHg, 0.156 inHg)	0.53 kPa (3.99 mmHg, 0.157 inHg)

• 0.02-inch Diagnosis

Abnormality Judgment

Judge NG when the criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1 P2: Change of tank pressure within 22 seconds on Mode D P1: Change of tank pressure within 22 seconds on Mode A	> Value on map 8. *Threshold value: Figure (Fuel level vs Tank temperature)	P0456

• Map 8 Limit of malfunction criteria for 0.04-inch leak as Evap. diagnosis.

Fuel temperature & Fuel level	15°C (59°F)	25°C (77°F)	35°C (95°F)	40°C (104°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.34 kPa (2.57 mmHg, 0.101 inHg)	0.37 kPa (2.80 mmHg, 0.110 inHg)	0.44 kPa (3.30 mmHg, 0.130 inHg)	0.73 kPa (5.49 mmHg, 0.216 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.38 kPa (2.83 mmHg, 0.111 inHg)	0.42 kPa (3.12 mmHg, 0.123 inHg)	0.49 kPa (3.70 mmHg, 0.146 inHg)	0.79 kPa (5.92 mmHg, 0.233 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.41 kPa (3.09 mmHg, 0.122 inHg)	0.46 kPa (3.43 mmHg, 0.135 inHg)	0.55 kPa (4.10 mmHg, 0.161 inHg)	0.85 kPa (6.34 mmHg, 0.250 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.46 kPa (3.46 mmHg, 0.136 inHg)	0.49 kPa (3.66 mmHg, 0.144 inHg)	0.56 kPa (4.18 mmHg, 0.165 inHg)	0.89 kPa (6.70 mmHg, 0.264 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.51 kPa (3.83 mmHg, 0.151 inHg)	0.52 kPa (3.89 mmHg, 0.153 inHg)	0.57 kPa (4.25 mmHg, 0.167 inHg)	0.93 kPa (7.00 mmHg, 0.276 inHg)

Normality Judgment

Judge OK when the criteria below are completed.

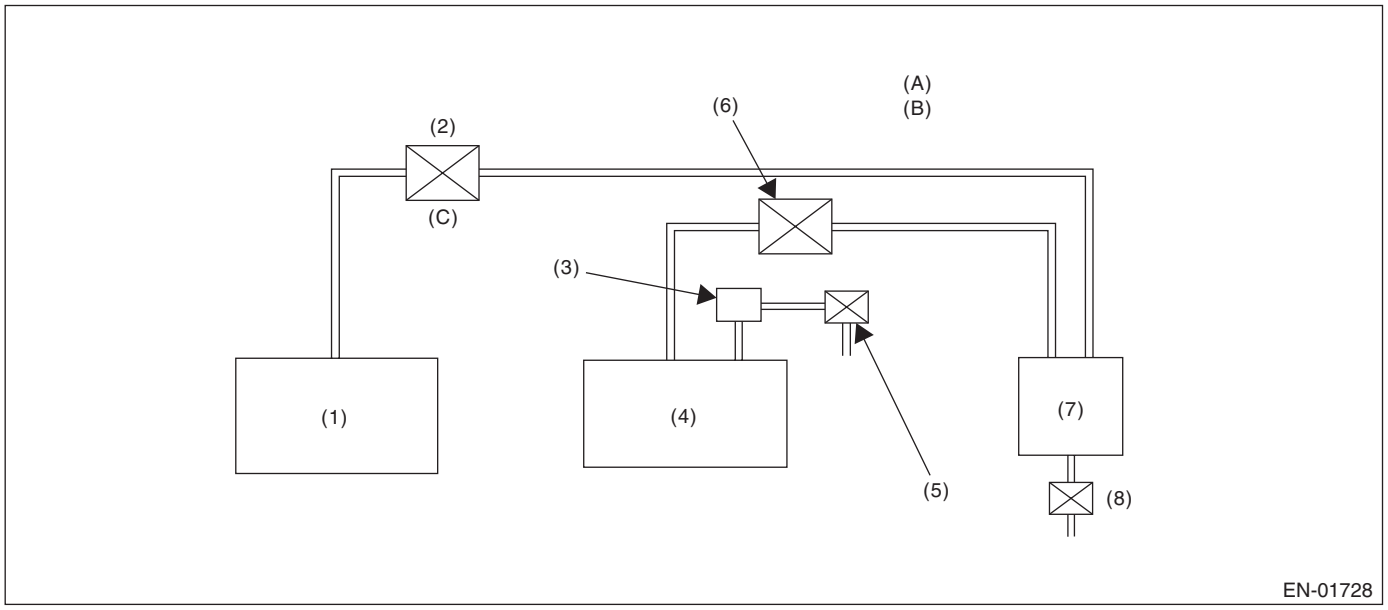
• Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1	> Valve on map 9.	P0456

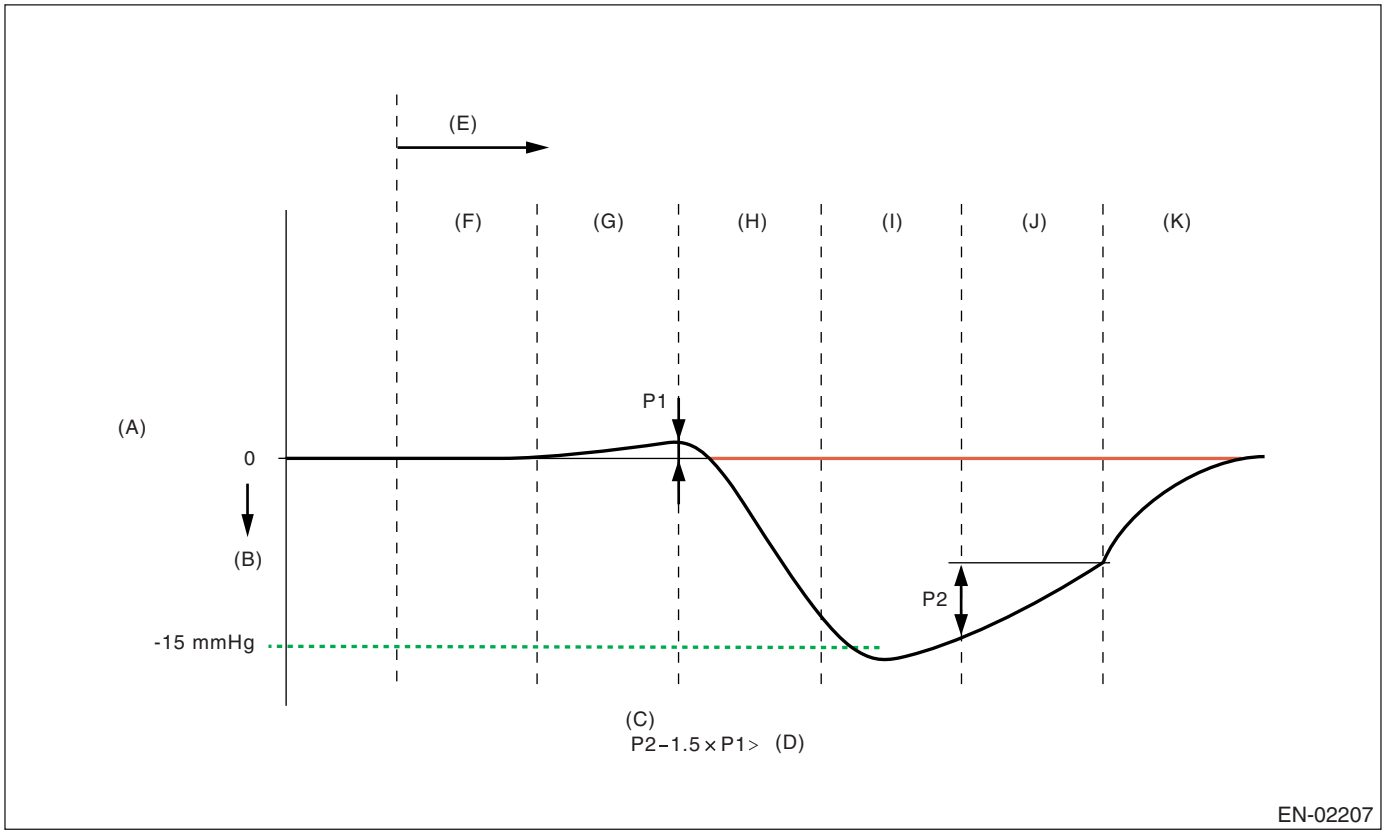
• Map 9.

Fuel temperature & Fuel level	15°C (59°F)	25°C (77°F)	35°C (95°F)	40°C (104°F)	45°C (113°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.21 kPa (1.59 mmHg, 0.063 inHg)	0.21 kPa (1.59 mmHg, 0.063 inHg	0.26 kPa (1.97 mmHg, 0.078 inHg)	0.31 kPa (2.36 mmHg, 0.093 inHg)	0.37 kPa (2.74 mmHg, 0.108 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.28 kPa (2.09 mmHg, 0.082 inHg)	0.28 kPa (2.09 mmHg, 0.082 inHg	0.33 kPa (2.45 mmHg, 0.096 inHg)	0.37 kPa (2.81 mmHg, 0.111 inHg)	0.42 kPa (3.17 mmHg, 0.125 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.35 kPa (2.59 mmHg, 0.102 inHg)	0.35 kPa (2.59 mmHg, 0.102 inHg)	0.39 kPa (2.92 mmHg, 0.115 inHg)	0.43 kPa (3.26 mmHg, 0.128 inHg)	0.48 kPa (3.59 mmHg, 0.141 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.30 kPa (2.26 mmHg, 0.089 inHg)	0.30 kPa (2.26 mmHg, 0.089 inHg)	0.35 kPa (2.64 mmHg, 0.104 inHg)	0.40 kPa (3.02 mmHg, 0.119 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.26 kPa (1.93 mmHg, 0.076 inHg)	0.26 kPa (1.93 mmHg, 0.076 inHg)	0.31 kPa (2.36 mmHg, 0.093 inHg)	0.37 kPa (2.78 mmHg, 0.109 inHg)	0.43 kPa (3.21 mmHg, 0.126 inHg)

If not judged OK or NG, repeat the diagnosis until judged OK or NG.



(1) Engine
(2) Purge control solenoid valve
(3) Fuel tank pressure sensor
(4) Fuel tank
(5) Atmospheric pressure switching solenoid
(6) Pressure control solenoid valve
(7) Canister
(8) Drain valve
(A) Normal condition: mehcanical control
(B) Under the diagnosis electronic control
(C) Duty control



(A) Fuel tank pressure
(B) Negative pressure
(C) Small leakage
(D) Threshold value
(E) Diagnosis start
(F) Mode Z
(G) Mode A
(H) Mode B
(I) Mode C
(J) Mode D
(K) Mode E

• CCV Property Diagnosis [P1443]

Mode E:
The tank pressure must become again as high as the atmospheric air pressure, after the evaporation diagnosis (normal judgment on Mode C or after Mode D). If the tank pressure does not become as high as the atmospheric air pressure, judge that CCV is blocked.
Judge NG when the criteria below are completed.

Malfunction Criteria	Threshold Value	DTC
Fuel tank pressure difference from the end of EVAP sys. diagnosis to 4 seconds later	< 0.36 kPa (2.72 mmHg, 0.11 inHg)	P1443

• Time Needed for Diagnosis:

0.04-inch: 30 — 100 seconds
0.02-inch: 30 — 100 seconds

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

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric purge solenoid function malfunction; Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

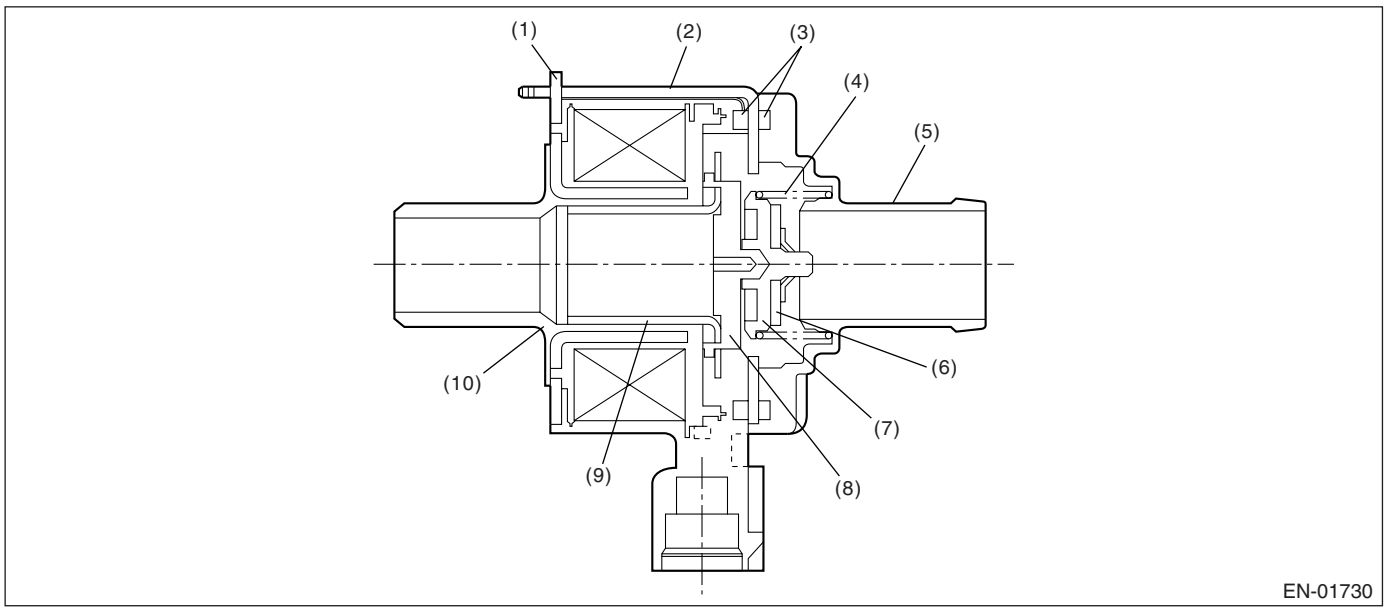
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

BB:DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.
Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION



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

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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

• Judgment Value

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

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

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

• Judgment Value

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

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

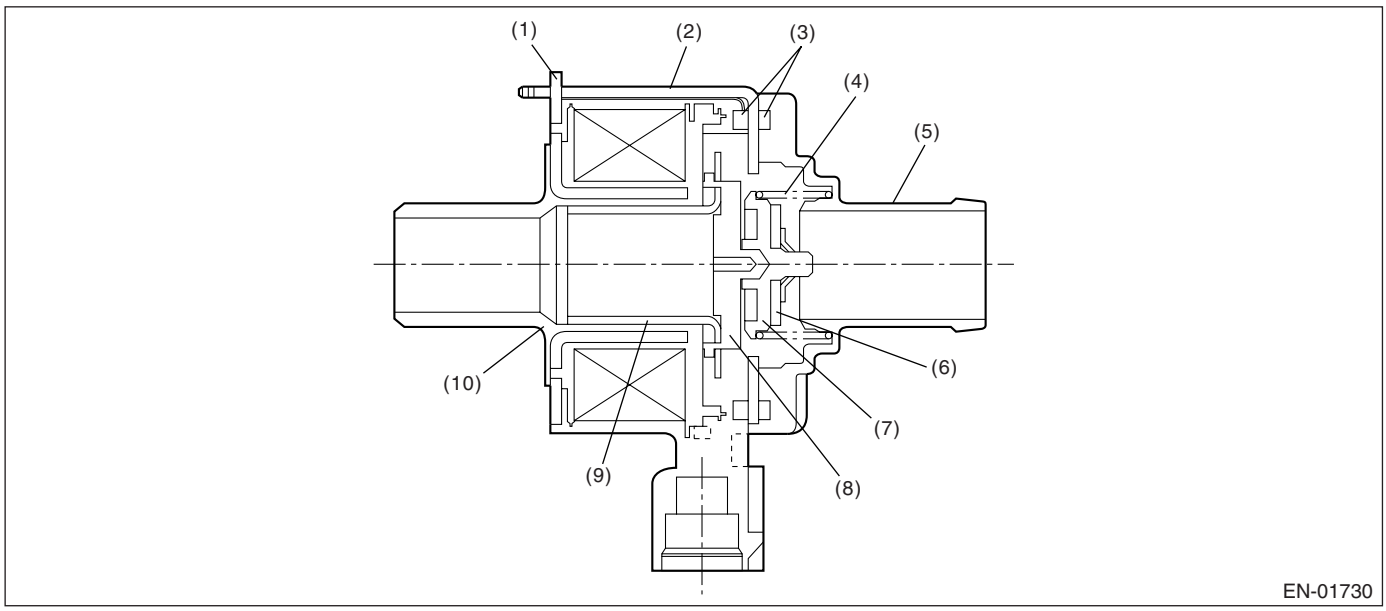
Memorize the freeze frame data. (For test mode $02)

BC:DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.
Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION



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

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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

• Judgment Value

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

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

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

• Judgment Value

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

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

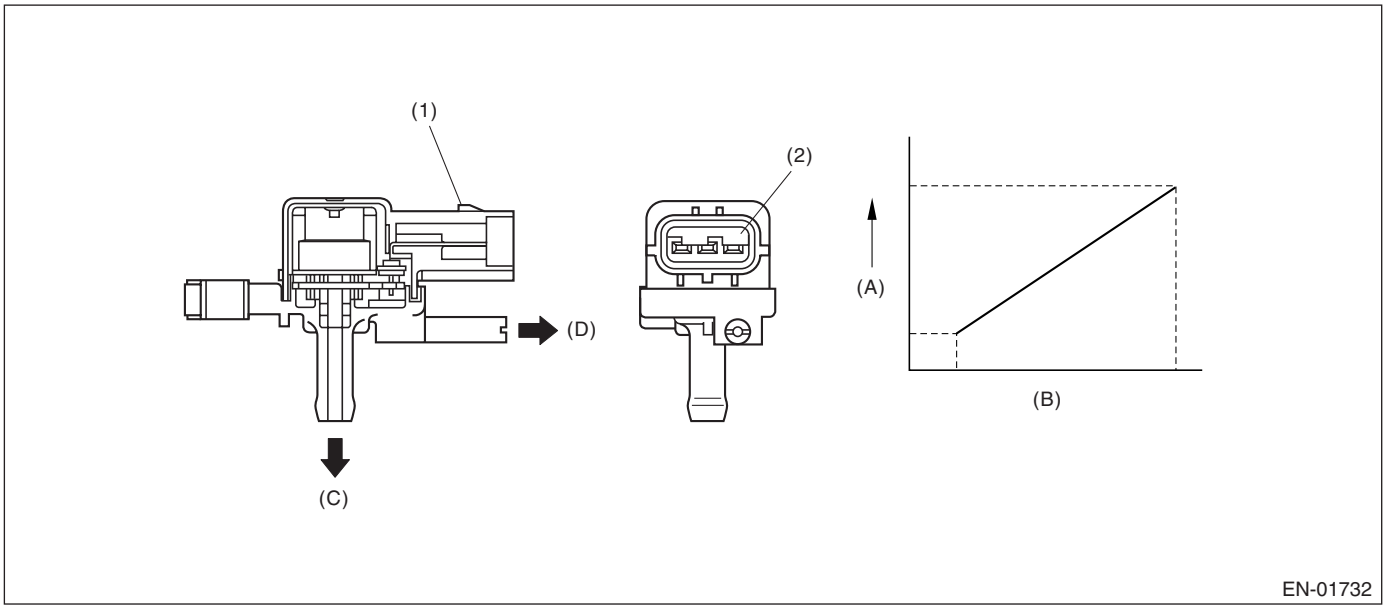
Memorize the freeze frame data. (For test mode $02)

BD:DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.
Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After starting engine	60 second or more
Fuel level	≥ 9.6 ℓ (10.1 US gal, 8.4 Imp gal)
Fuel temperature	< 35°C (95°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine speed	< 6500 rpm
Purge control solenoid valve ON/OFF	Experienced

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in 60 seconds or more after starting the engine.
- Be sure to check the fuel level and fuel temperature.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Number of times when the difference between the Max. fuel level and the Min., fuel level every 60 seconds is 5 ℓ (0.53 US gal, 0.44 Imp gal) or more (with enable condition completed)	≥ 16 times
Max. – Min. tank pressure (with enable condition completed)	< 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max. – Min. fuel temperature (with enable condition completed)	≥ 7°C (44.6 °F)

If the fuel level (Max. – Min.) in every 60 seconds is less than 5 ℓ , extend 60 seconds more and make judgment with the Max. and Min. fuel level in 120 seconds.
If the difference did not appear though the time extended, extend the time (180, 240, 300 seconds) and continue the judgment.
Diagnosis counter will count up when the difference of fuel level (Max. – Min.) is more than 5 ℓ .
Time Needed for Diagnosis: 1 minute × 16 times or more
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Max. – Min. tank pressure	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

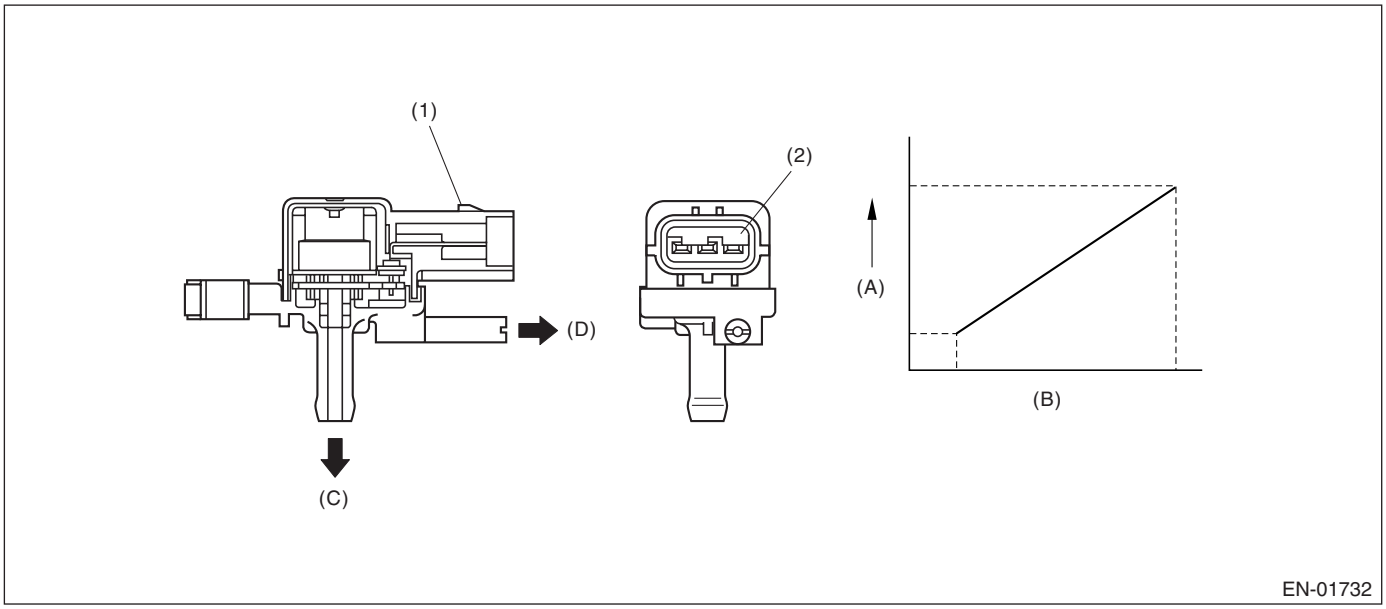
Memorize the freeze frame data. (For test mode $02)

BE: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 NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 15 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< –7.48 kPa (–56.15 mmHg, –2.211 inHg)

Time Needed for Diagnosis: 15 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ –7.33 kPa (–55 mmHg, –2.17 inHg)
Feedback lambda coefficient	≥ 0.9

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

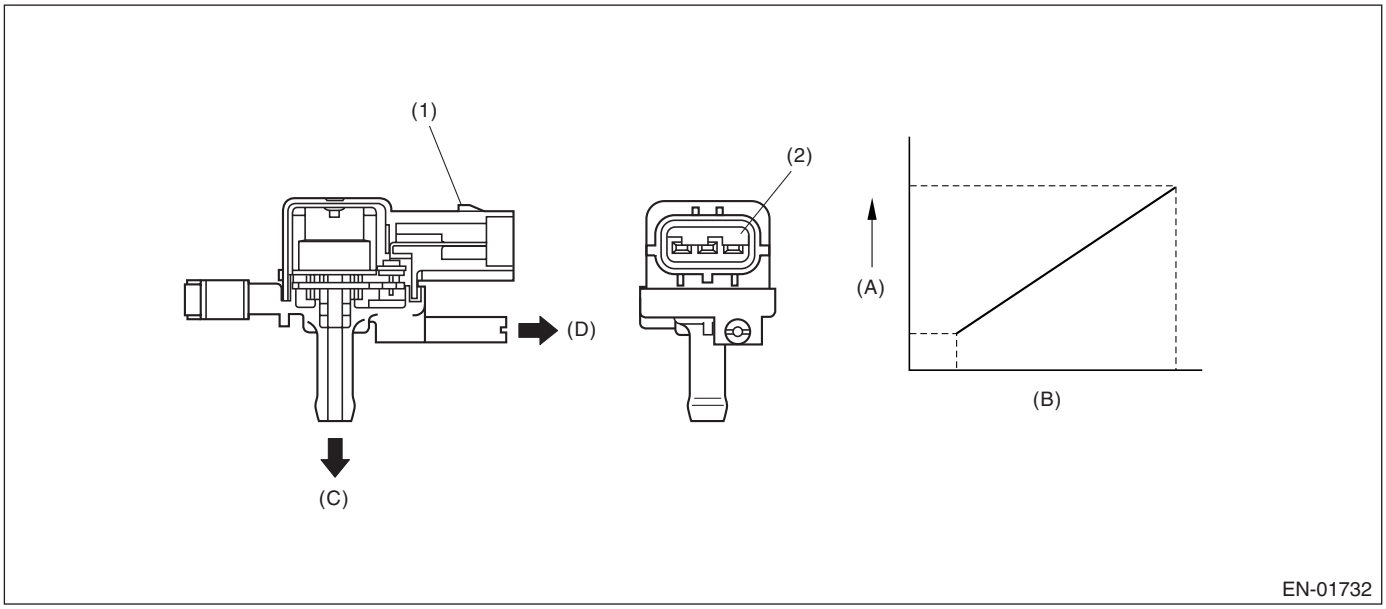
Memorize the freeze frame data. (For test mode $02)

BF:DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the breaking/shortage of the fuel tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when all conditions are completed.	≥ 5 seconds
Vehicle speed	≥ 2 km/h (1.24 MPH)
All conditions of EVAP canister purge	Complete
Evaporation gas density learning value	≤ 0.08
Main feedback compensation coefficient	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when purging.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 15 seconds.

• 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 malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

• 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 was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

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

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

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4DOTC)-122, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —.>

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

1. OUTLINE OF DIAGNOSIS

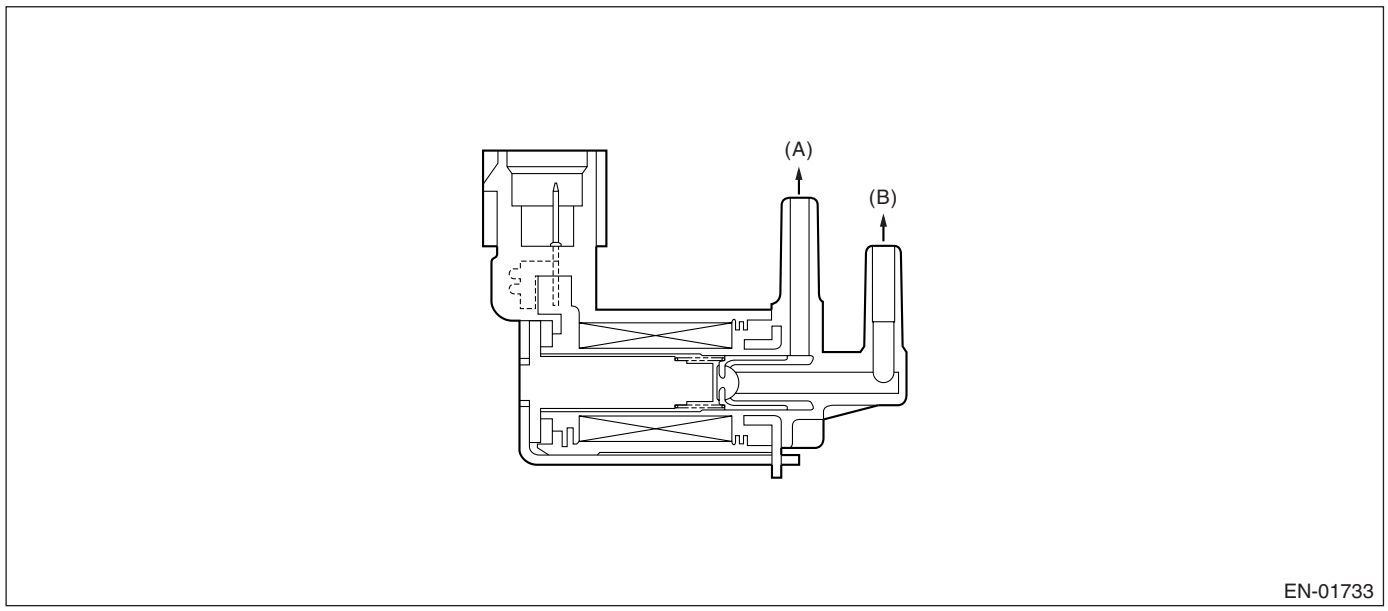
For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4DOTC)-122, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —.>

BI: DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) To canister
(B) To intake manifold

3. ENABLE CONDITION

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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of completing criteria below.	≥ 2.5 seconds
Duty ratio of 'ON'	< 75%
Terminal output voltage	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

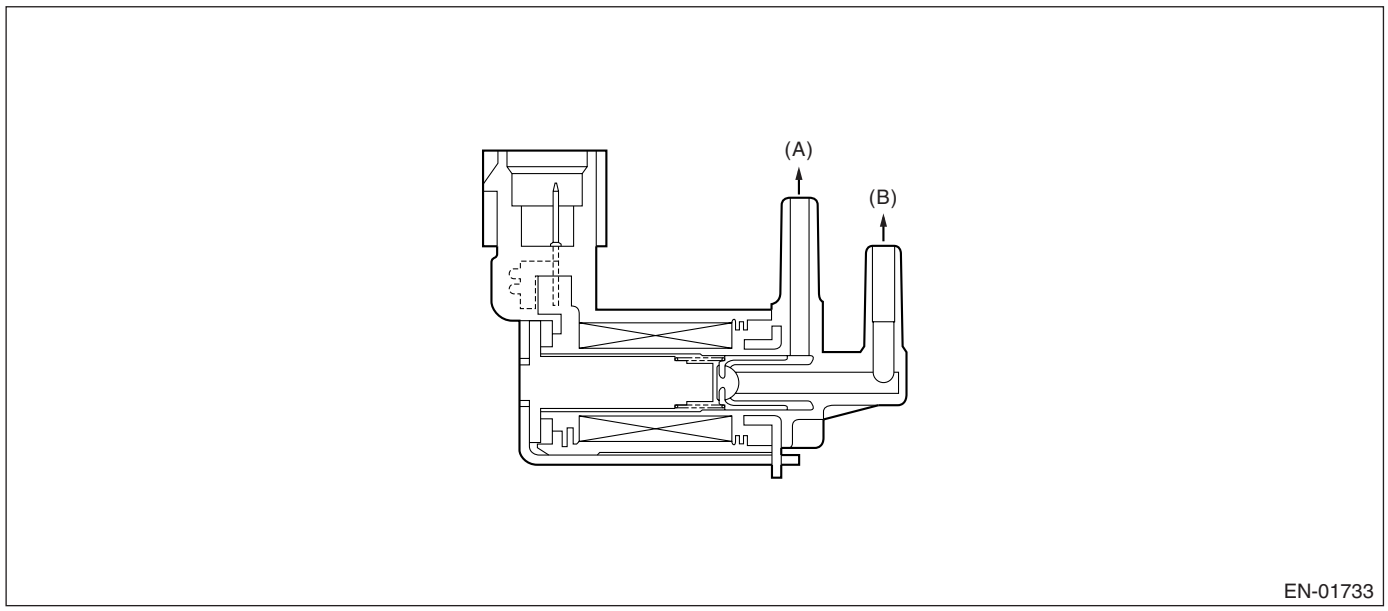
Memorize the freeze frame data. (For test mode $02)

BJ:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) To canister (B) To intake manifold

3. ENABLE CONDITION

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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of completing criteria below.	≥ 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 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

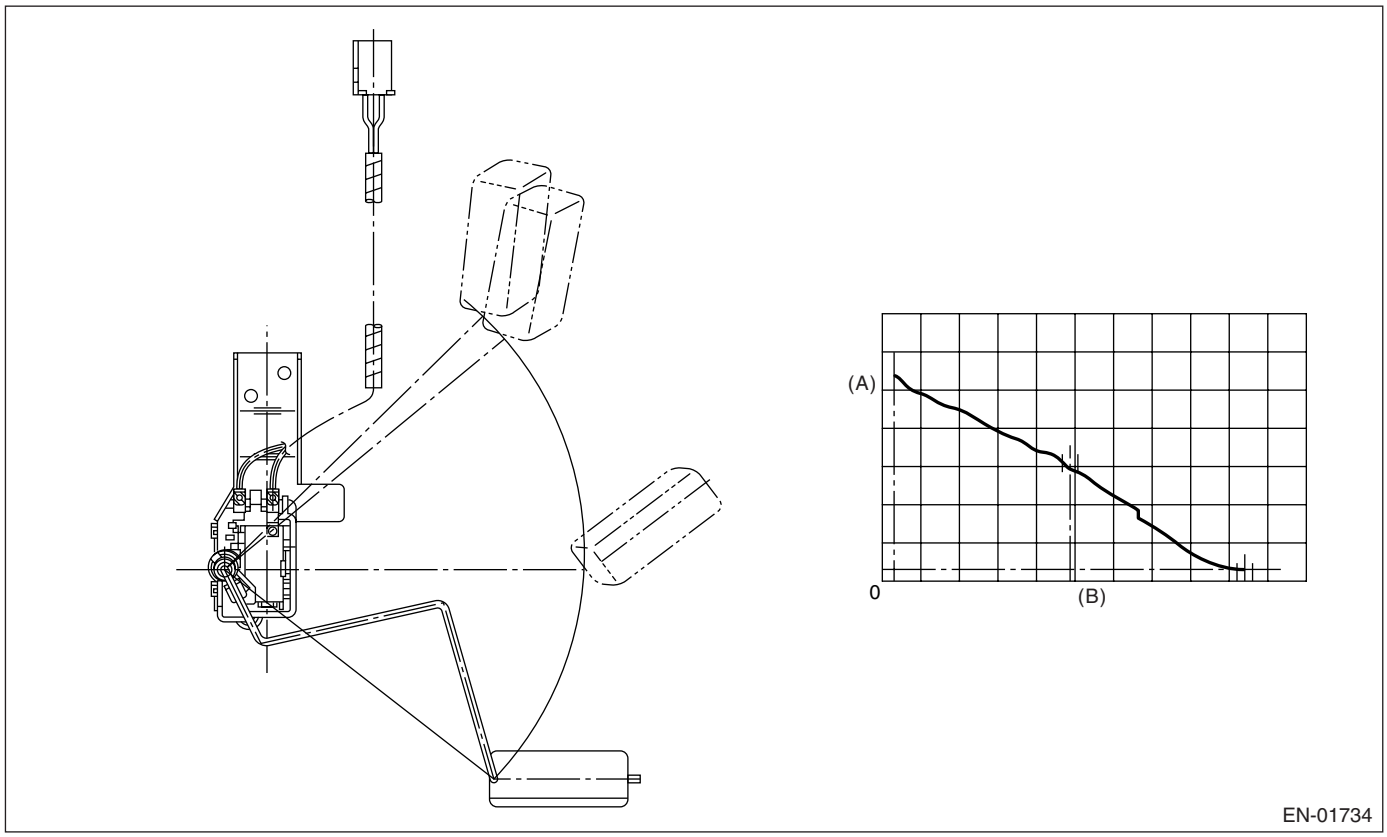
Memorize the freeze frame data. (For test mode $02)

BK:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel level sensor output property.
Judge NG when the fuel level does not vary whereas it seemed to vary be in a usual driving speed.

2. COMPONENT DESCRIPTION



(A) Fuel level (L)
(B) Resistance (Ω)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max.– Min. fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After starting engine	More than 10 seconds

Time Needed for Diagnosis: To be determined.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max.– Min. fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After starting engine	More than 10 seconds

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

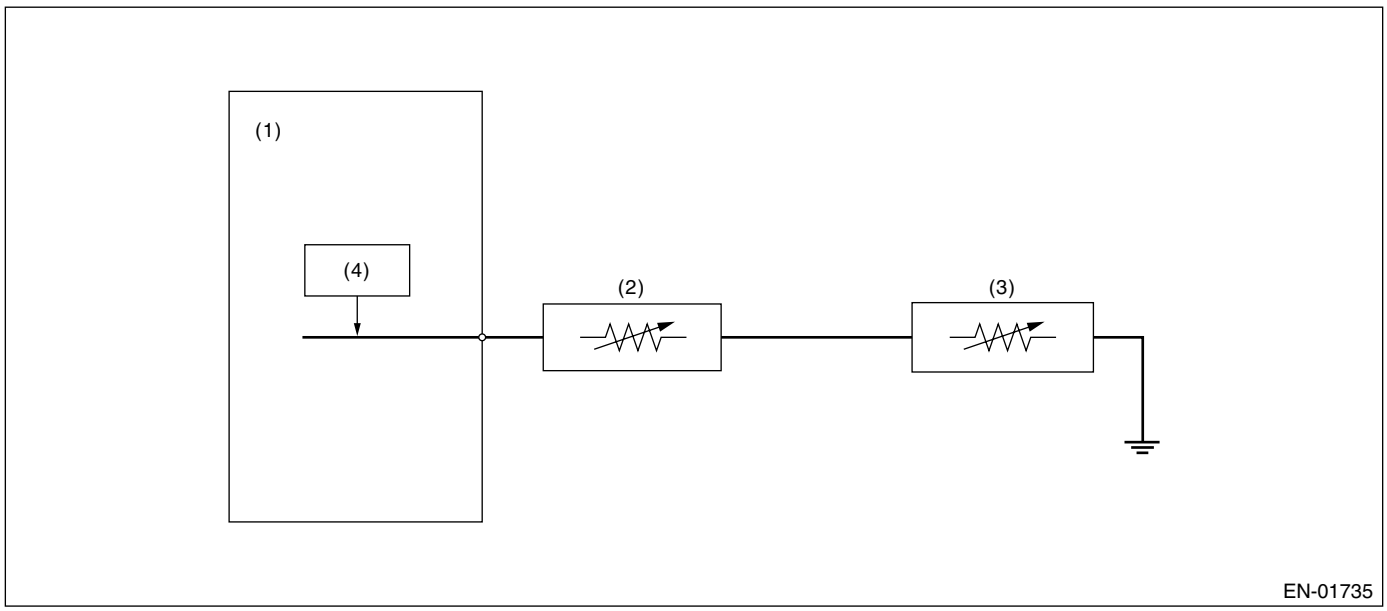
Memorize the freeze frame data. (For test mode $02)

BL:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	3 seconds or more
Output voltage	< 0.02 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	3 seconds or more
Output voltage	≥ 0.02 V

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

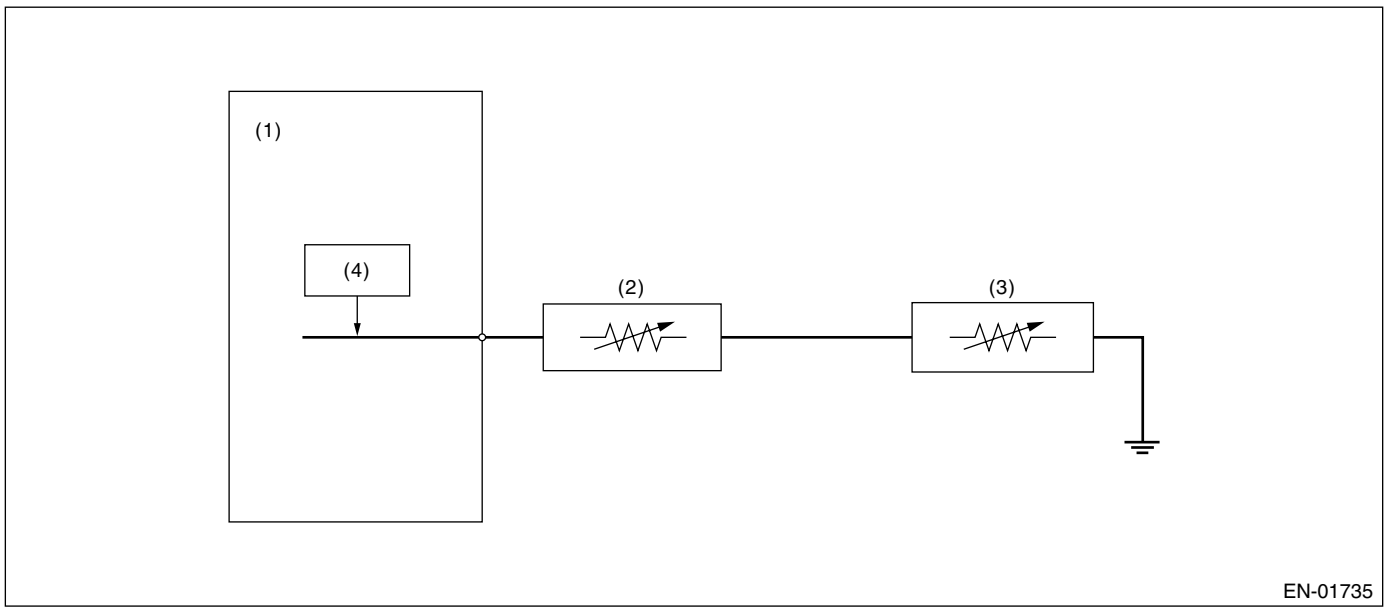
Memorize the freeze frame data. (For test mode $02)

BM:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (1 second).

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	3 seconds or more
Output voltage	≥ 4.95 V

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	3 seconds or more
Output voltage	< 4.95 V

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

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

BN:DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —

1. OUTLINE OF DIAGNOSIS

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

2. ENABLE CONDITION

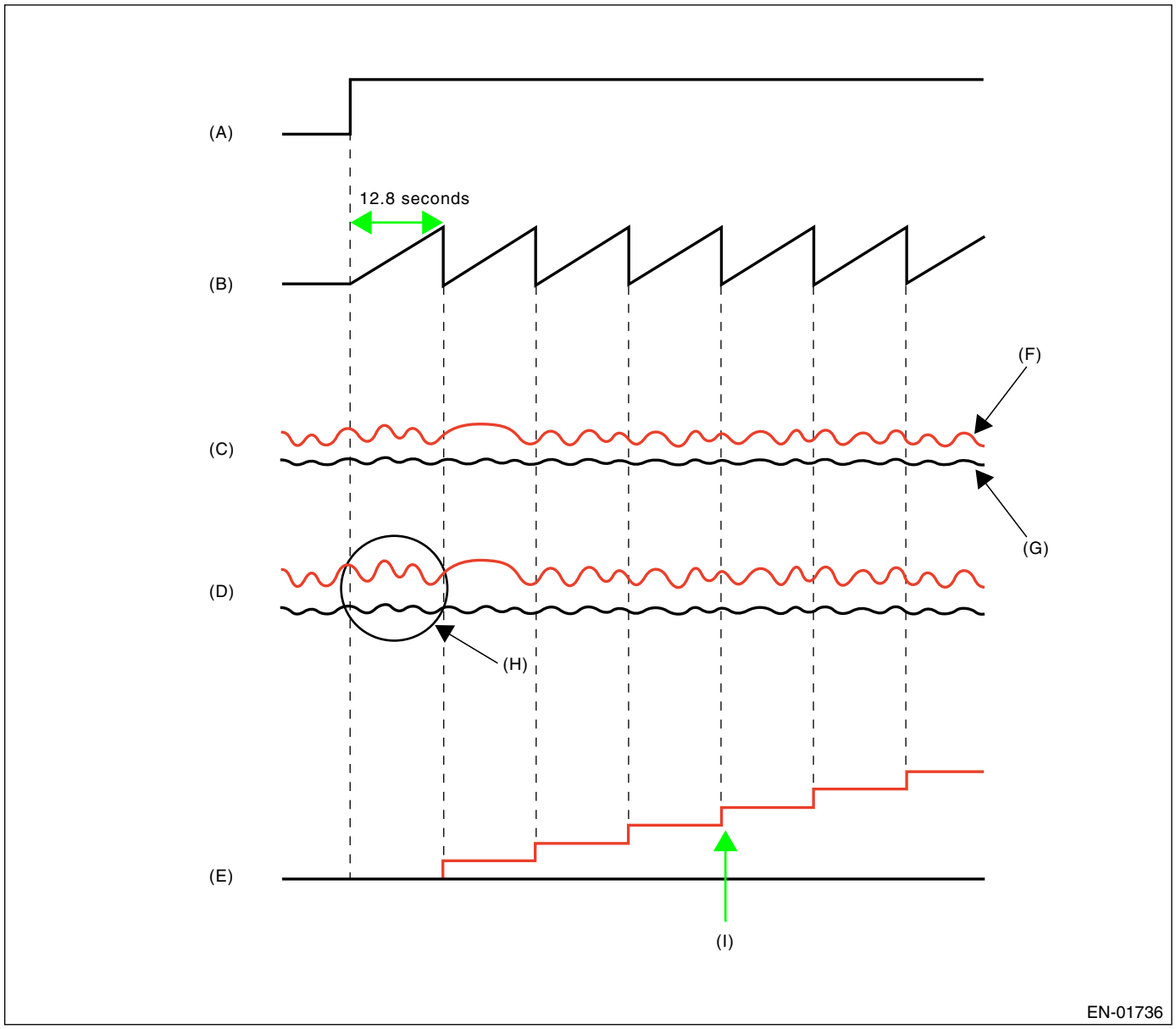
Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
After starting engine	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9.6 ←→ 54.4 ℓ (2.5 ←→ 14.4 US gal, 2.11 ←→ 12.0 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

3. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in idling condition.
- Pay attention to the fuel level.

4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 12.8 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, count the diagnosis counter up. And judge NG if the counter indicated 6 counts.



(A) Diagnosis condition
(B) Diagnosis time
(C) Fuel level sensor at idle
(D) Amount of fuel level output voltage variation
(E) Diagnosis counter
(F) Malfunction
(G) Normal
(H) Calculate the Max. value (delvfmx) and the cumulative value (sumvfl)
(I) NG at 4 counts

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, DELFLMAX ≥ 0.2 V or SUMFL ≥ 19.2 V where, DELFLMAX is Max. deviation of sensor output during 12.8 seconds. SUMFL is integrated value of sensor output deviation during 12.8 seconds.	≥ 4 times

Do not count the diagnosis counter up when the following conditions are completed during 12.8 seconds.

Max – Min of tank pressure during 12.8 seconds	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max – Min of battery voltage during 12.8 seconds	≥ 0.465 V

Time Needed for Diagnosis: 12.8 seconds × 4 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
DELFLMAX	< 0.2 V
SUMFL Where, DELFLMAX is Max. deviation of sensor output during 12.8 seconds. SUMFL is integrated value of sensor output deviation during 12.8 seconds.	< 19.2 V

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

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

BO:DTC P0483 — COOLING FAN RATIONALITY CHECK —

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.
Judge NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

2. ENABLE CONDITION

Diagnostic enable condition is completed if the radiator fan changes from OFF to ON when all of the conditions below are completed. When one of the conditions below is not completed, the diagnostic enable condition is not completed.

Secondary Parameters	Enable Conditions
Engine Speed	500 — 900 rpm
Idle switch	ON
Vehicle speed	0 km/h (0 MPH)
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when idling.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 minutes.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 95°C (203°F)
Radiator fan	OFF → ON
Engine coolant temperature	not reduce

Time Needed for Diagnosis: 5 minutes
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

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

• Judgment Value

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

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

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

BP:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.
Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4000 rpm
Fuel cut in decel.	In operation
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration at engine speed of 4000 rpm or less.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 4 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1

Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

• Judgment Value

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

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- ISC control: Not allowed ISC feedback volume calculation.
- Radiator fan control: Hi drive both main/sub.
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

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

BQ:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.
Judge NG when high vehicle speed (300 km/h (186 MPH) or more) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4000 rpm
Fuel cut in decel.	In operation
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration at engine speed of 4000 rpm or less.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 4 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 300

Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 300
Starter switch	OFF
Time after starter switch ON → OFF	≥ 3 seconds

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- ISC control: Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi drive both main/sub.
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

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

BR:DTC P0506 — IDLE 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 NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°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 starting engine	10 seconds or more
Feedback in ISC	In operation
Measured lambda	0.90 ←→ 1.1
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	> 5 seconds
After neutral switch ON-OFF event	> 5 seconds
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during idling, 10 seconds after starting and warming up.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	< –100 rpm
Feedback correction for idle air control solenoid valve	Max.

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

• Judgment Value

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

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

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

BS:DTC P0507 — IDLE 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 NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°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 starting engine	10 seconds or more
Feedback in ISC	In operation
Lambda	0.90 ←→ 1.1
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	> 5 seconds
After neutral switch ON-OFF event	> 5 seconds
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during idling, 10 seconds after starting and warming up.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	≥ 200 rpm
Feedback correction for idle air control solenoid valve	Min.

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	< 200 rpm

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

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

BT:DTC P0512 — STARTER REQUEST CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge ON NG when the starter SW signal remains to be on.
Judge 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 NG when the continuous time of completing the malfunction criteria below becomes more than 3 minutes.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	> 500 rpm
Starter OFF signal	Not detected
Battery voltage	> 8 V

Time Needed for Diagnosis: 180 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

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

• Judgment Value

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

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

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

BU:DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Feedback in ISC	In operation
Vehicle speed	< 4 km/h (2.49 MPH)
After engine starting	1 seconds or more

3. GENERAL DRIVING CYCLE

Always perform diagnosis at less than 4 km/h (2.49 MPH) of vehicle speed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (2 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	≥ 1000 rpm
Feedback value for ISC	≤ 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 malfunction occurs.

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

• Normality Judgment

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	< 200 rpm

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

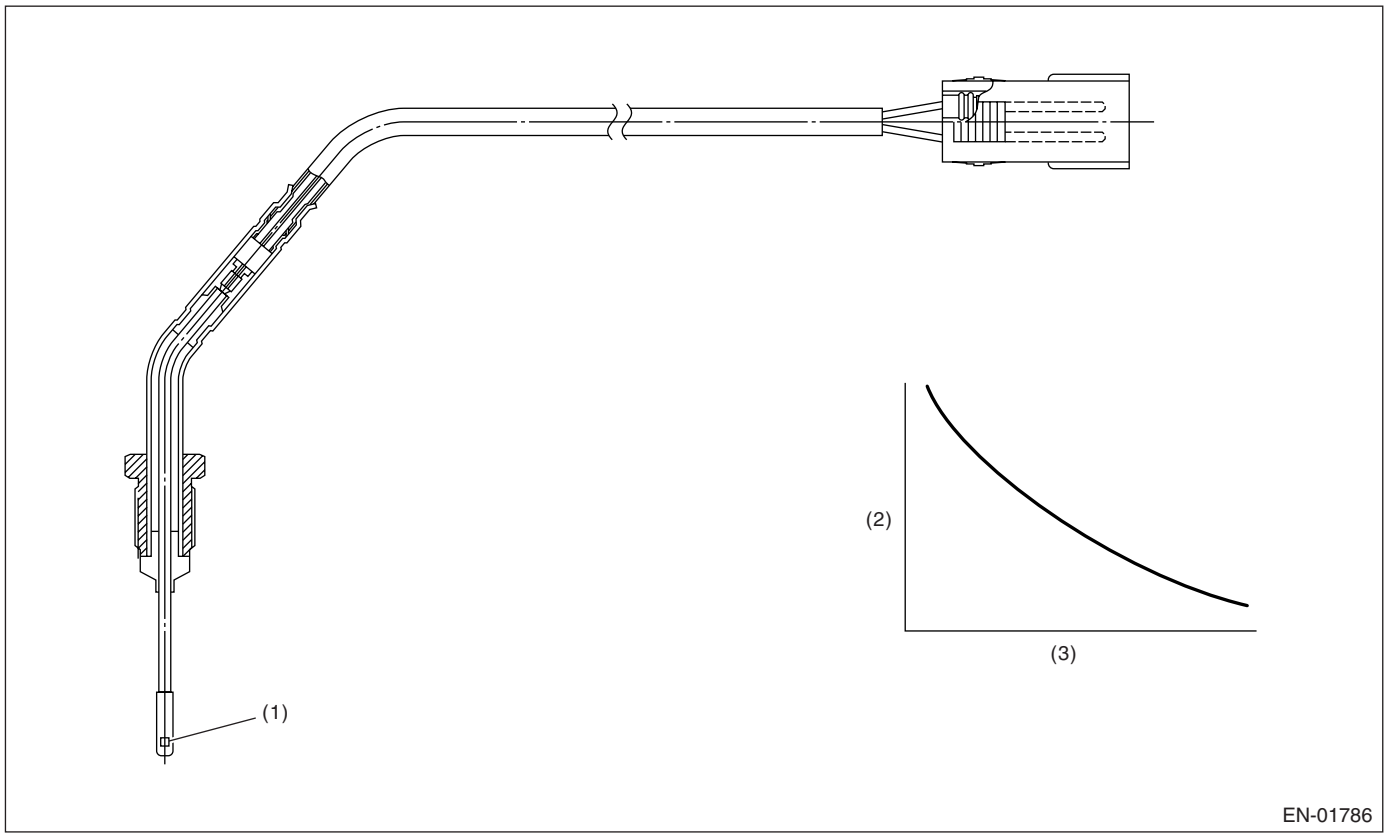
Memorize the freeze frame data. (For test mode $02)

BV:DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1 —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of exhaust temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Thermistor (2) Resistance value (kΩ) (3) Exhaust 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 NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Sensor output voltage	< 0.15 V
Amount of intake air	< 100 g (3.53 oz)/s

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Sensor output voltage	≥ 0.15 V

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

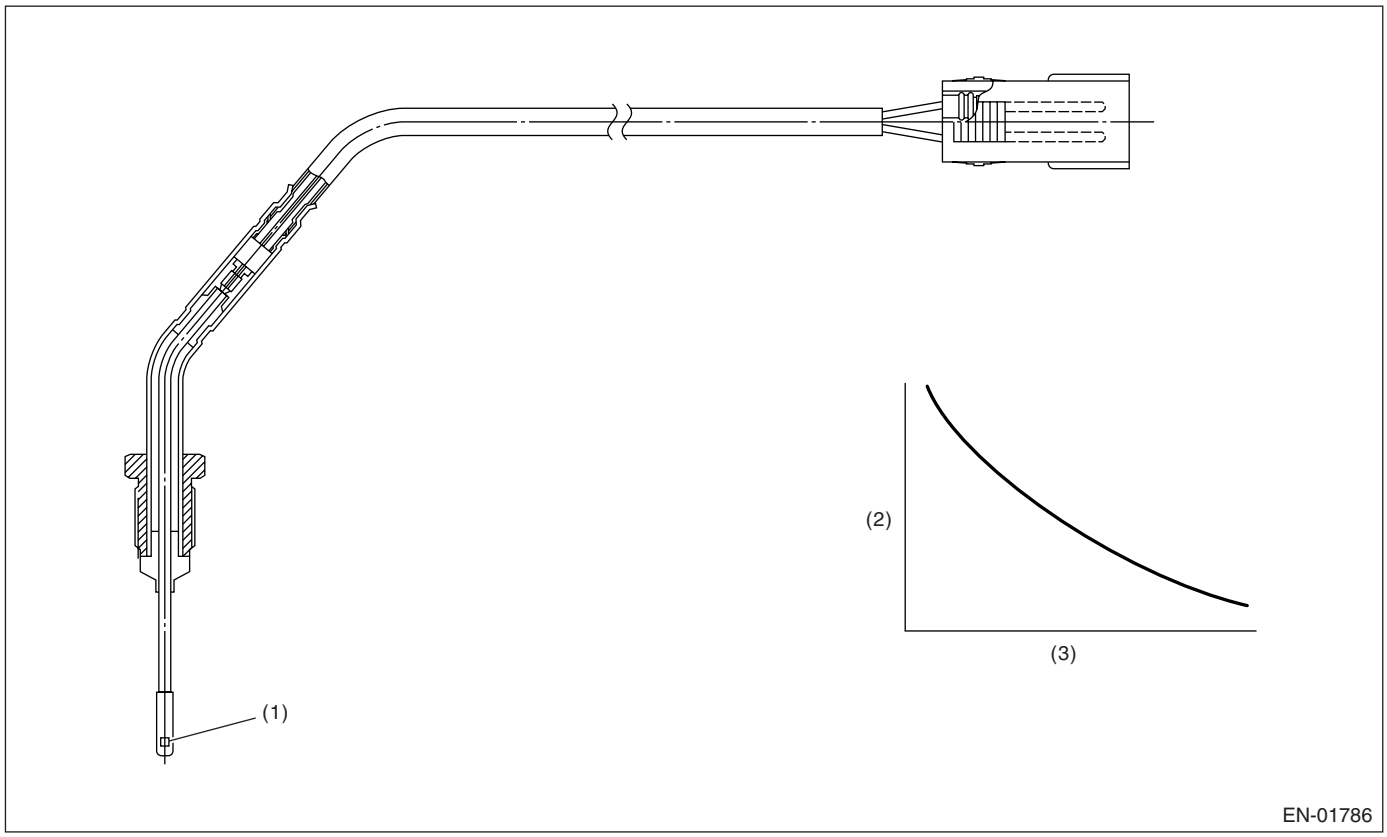
Memorize the freeze frame data. (For test mode $02)

BW:DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1 —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of exhaust temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Thermistor (2) Resistance value (kΩ) (3) Exhaust 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 NG when the cumulative time of completing the malfunction criteria below becomes more than the time needed for diagnosis (30 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
After starting engine	240 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 65 km/h (40.4 MPH)
Engine speed	≥ 1800 rpm
Engine load (gn)	≥ 0.6 g (0.021 oz)/rev
Fuel cut event	Not in operation
After the recovery from fuel cut event	30 seconds or more
Sensor output voltage	≥ 4.72 V

Time Needed for Diagnosis: 30 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Sensor output voltage	< 4.72 V

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

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

BX:DTC P0600 — CAN COMMUNICATION CIRCUIT—

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of CAN communication.
It judges as NG when CAN communication becomes impossible, the CAN communication with AT becomes impossible, and the data from AT is not normal.

2. COMPONENT DISCRIPTION

CAN connects between ECU and TCU with high speed.

(Common Specification)
CAN PROTCOL 2.0B (active)
Frame format: 11 bit ID Frame (Standard frame)
(High Speed CAN)
ISO 11898 compliance
Communication Speed: 500 kbps

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery Voltages	≥ 10.9 V
Starter switch	OFF
Engine	run

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• JUDGMENT OF MALFUNCTION

It judges as NG if any of the following conditions are judged as NG. It judges as OK if all of the following conditions are judged as OK within 1s, and the NG memory is cleared.

• Judgement Value

Malfunction Criteria	Threshold Value
Buss off flag or warning flag	Set
ID cannot be received from TCU	= 500 m/s

Time needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates simultaneously when malfunction is detected.

6. DTC CLEAR CONDITION

When the OK driving cycle was completed 40 consecutive times.
When “Clear Memory” was performed.

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When “Clear Memory” was performed.

8. FAIL-SAFE

None

9. ECM OPERATING AT DTC SETTING

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

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

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the micro-computer (RAM).
Write zero to all area of RAM. After the zero initialization, judge NG when the result of addition of all values in area of RAM is not zero.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	OFF → ON

Perform the diagnosis in the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis immediately after IG key SW is turned ON.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below is completed, and judge OK when it is not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Result of RAM data addition, after zero initialization	Outside the standard

Time Needed for Diagnosis: To be determined.
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

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

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

1. OUTLINE OF DIAGNOSIS

Judge NG when SUM value of ROM is out of 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 OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
SUM value of ROM	Standard value

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only at engine stop)

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

8. ECM OPERATION AT DTC SETTING

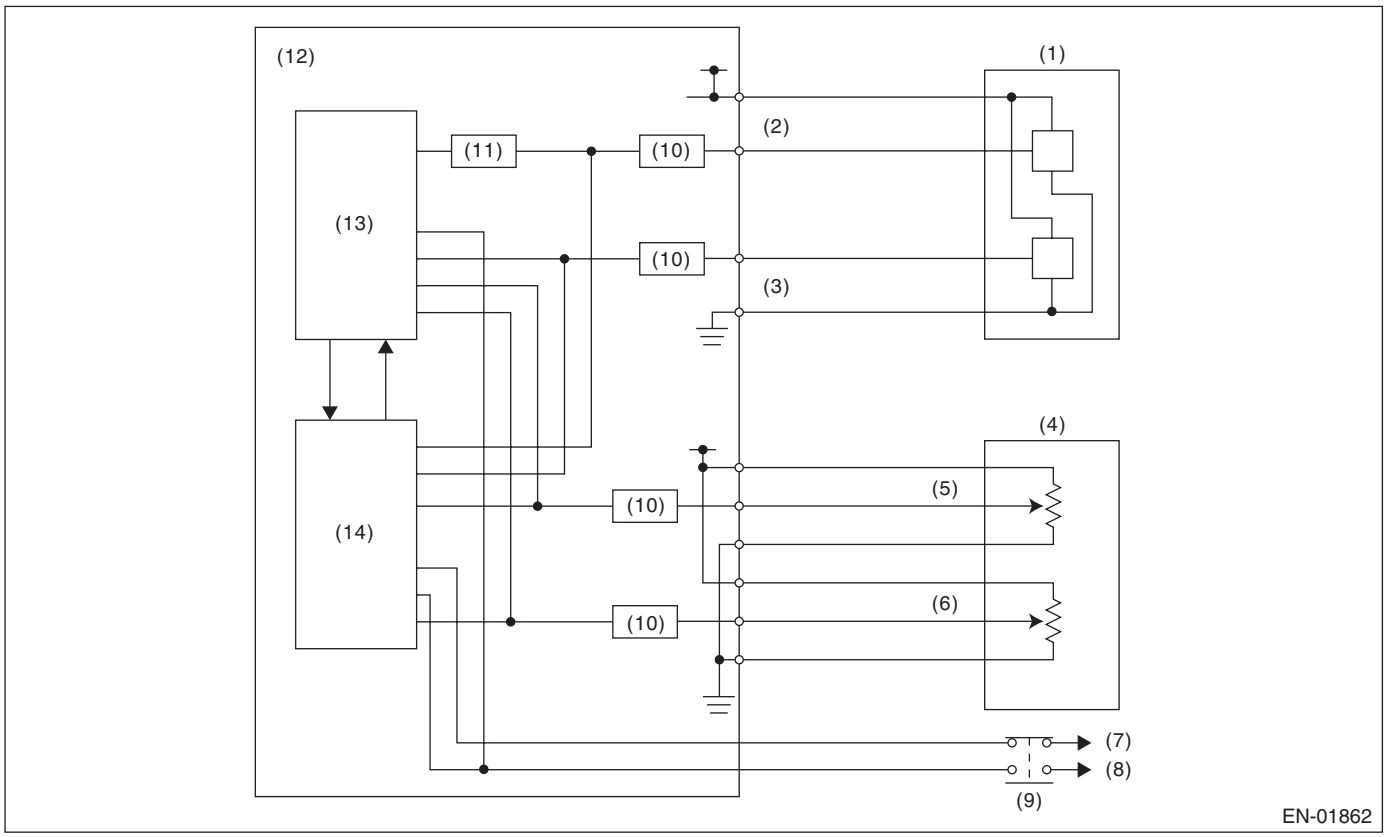
Memorize the freeze frame data. (For test mode $02)

CA:DTC P0607 — CONTROL MODULE PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when either the following is completed.
- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU and 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 directed angle from main CPU is abnormal.

2. COMPONENT DESCRIPTION



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

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 SW (with cruise control)	ON
(7) None	—

4. GENERAL DRIVING CYCLE

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

5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
(1) Difference of CPU on reading value of throttle position sensor signal	Within 0.0858 V
(2) Difference of CPU on reading value of accelerator position sensor signal	Within 0.082 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 3 deg × 4
(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 malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

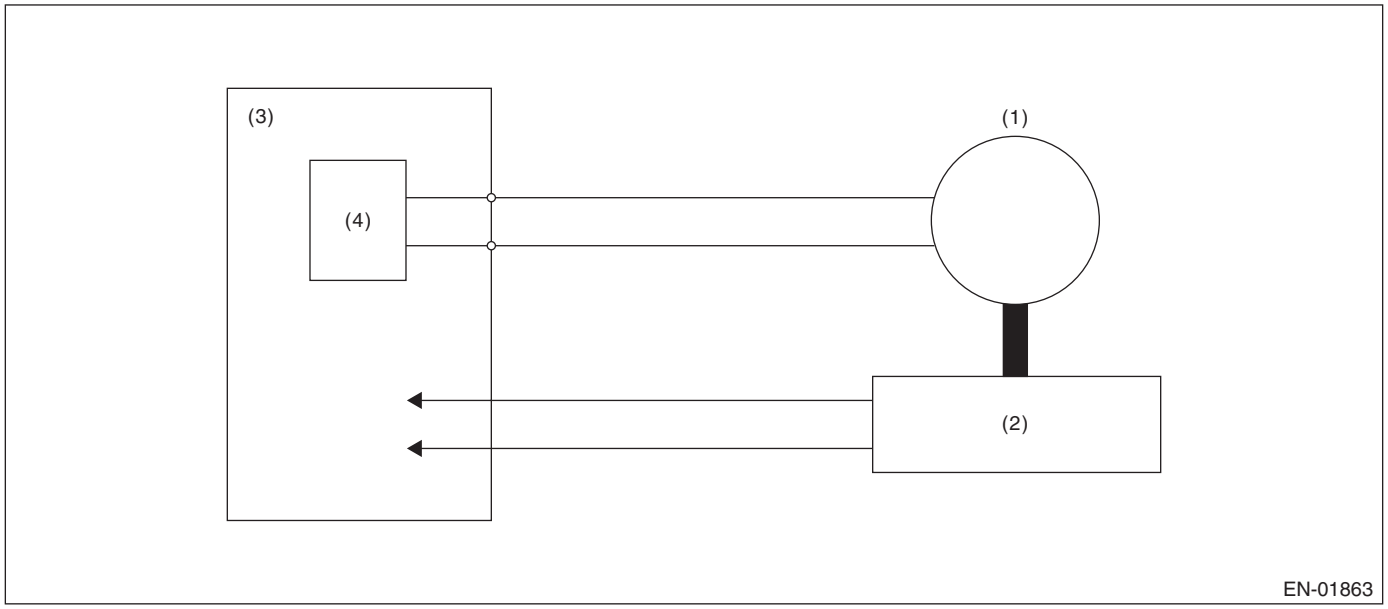
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Judge NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty 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 electric control throttle	ON

4. GENERAL DRIVING CYCLE

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

5. DIAGNOSTIC METHOD

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

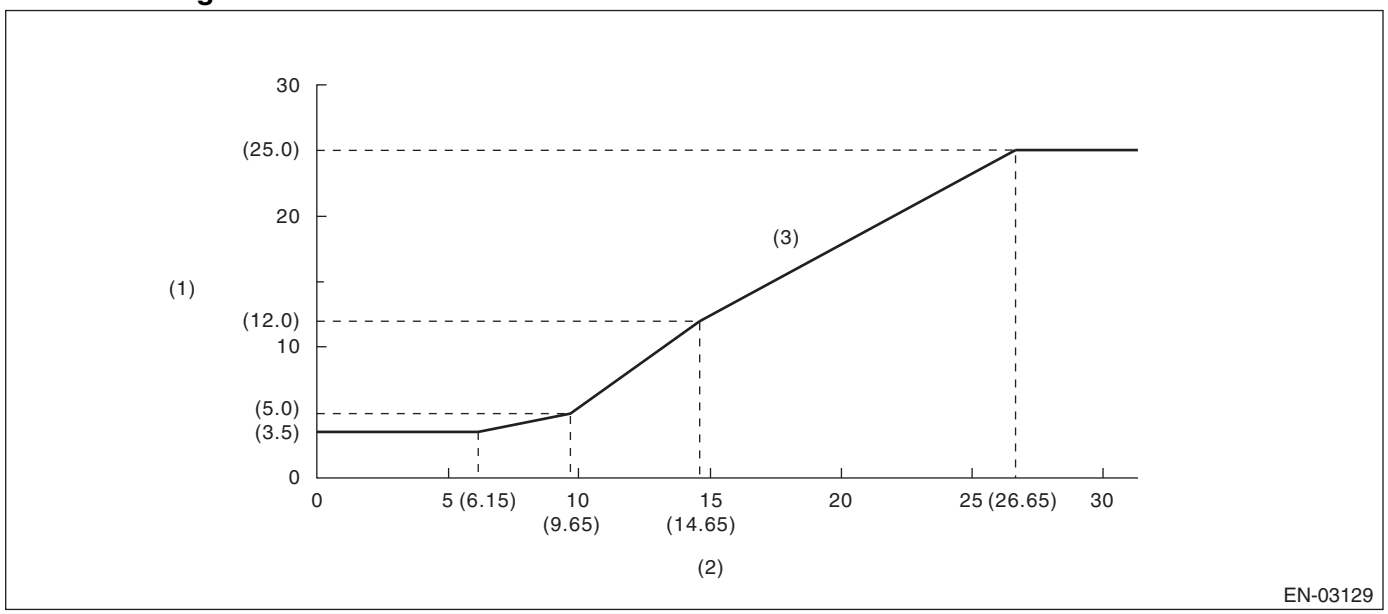
Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	Less than 3.5°
Output duty to drive circuit	Less than 95%

Time Needed for Diagnosis:

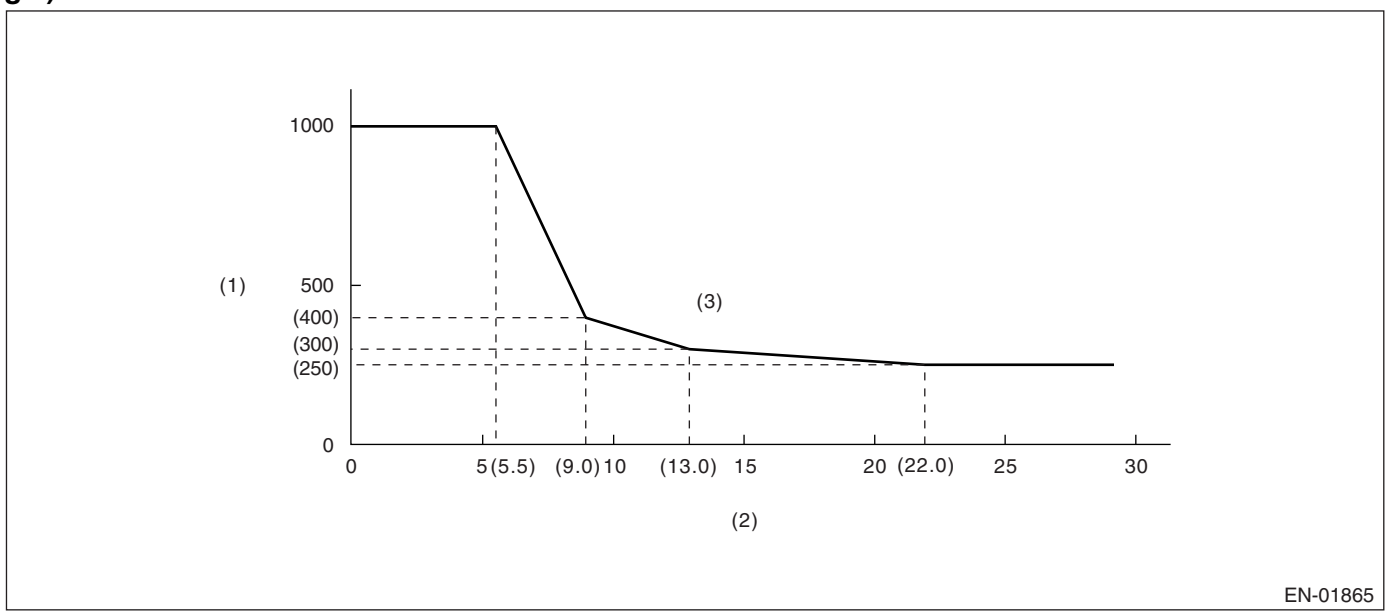
Target opening angle and actual opening angle: 250 milliseconds (For NG) 2000 milliseconds (For OK)
Output duty to drive circuit: 2000 milliseconds

Details of Judgment



(1) Difference between target opening angle and actual opening angle (°)
(2) Target throttle opening angle (°)
(3) NG area

Details of Judgment (Always 1000 milliseconds when the actual opening angle ≤ target opening angle)



(1) Judgment time (milliseconds)
(2) Throttle position sensor 1 opening angle
(3) NG area

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

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stopped)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

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

CC:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.
Judge 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 NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
After starting engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
After starting engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	High level

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

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

CD:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.
Judge 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 NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Valueg

Malfunction Criteria	Threshold Value
After starting engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	High level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
After starting engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	Low level

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

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

CE:DTC P0700 — AT MIL LIGHT UP REQUEST —

1. OUTLINE OF DIAGNOSIS

AT C/U performs CAN communication. It judges as NG if malfunction is detected.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Batery Voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform diagnosis continously.

4. DIAGNOSTIC METHOD

It judges as NG if the following condition becomes more than the predetermined time (2.5s). It judges as OK if the following condition is not complated, and the NG memory is cleared.

Judgement Value

Malfunction Criteria	Threshold Value
MIL light up request from TCU	set

Time needed for diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates simultaneously when malfunction is detected.

5. DTC CLEAR CONDITION

- When the OK driving cycle was completed 40 consecutive times.
- When “Clear Memory” was performed.

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When “Clear Memory” was performed.

7. FAIL-SAFE

None

8. ECU OPERATING AT DTC SETTING

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

CF:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT model) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.
Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 6.5 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = “OFF” & any other switches = “ON” on AT	ON (Low)

Time Needed for Diagnosis: 6.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

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

CG:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT model) —

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.
Judge 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 starting engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time 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)	ON (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 1600 — 2550 rpm	

Time Needed for Diagnosis: 3 monitoring
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Cruise control command: Not allowed to command cruise control

8. ECM OPERATION AT DTC SETTING

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

CH:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT model) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.
Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 6.5 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = “ON” & any other switches = “OFF” on AT	OFF (High)

Time Needed for Diagnosis: 6.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

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

CI: DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT model) —

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.
Judge 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 starting engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time 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)	OFF (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 1600 — 2550 rpm	

Time Needed for Diagnosis: 3 monitoring
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

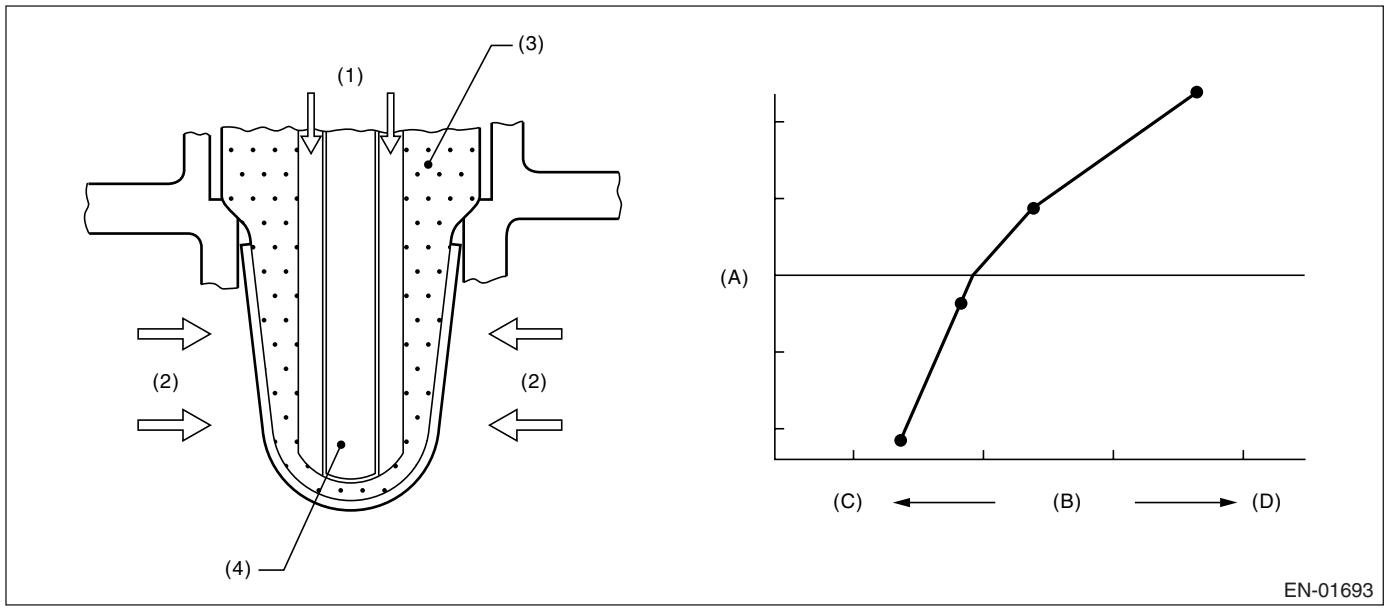
Memorize the freeze frame data. (For test mode $02)

CJ:DTC P1152 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains Low.
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.
Lambda value = Actual air fuel ratio/Theoretical air fuel ratio
Lambda > 1: Lean
Lambda < 1: Rich

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in 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	In operation
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 starting engine	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g (0.21 oz)/s
Load change during 0.5 engine rev.	≤ 0.01 g (0.0003 oz)/rev
Impedance of front oxygen (A/F) sensor	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 since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear oxygen sensor sub feedback compensation coefficient being at not high limit	≤ 0.85

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Purge control: Not allowed to purge

9. ECM OPERATION AT DTC SETTING

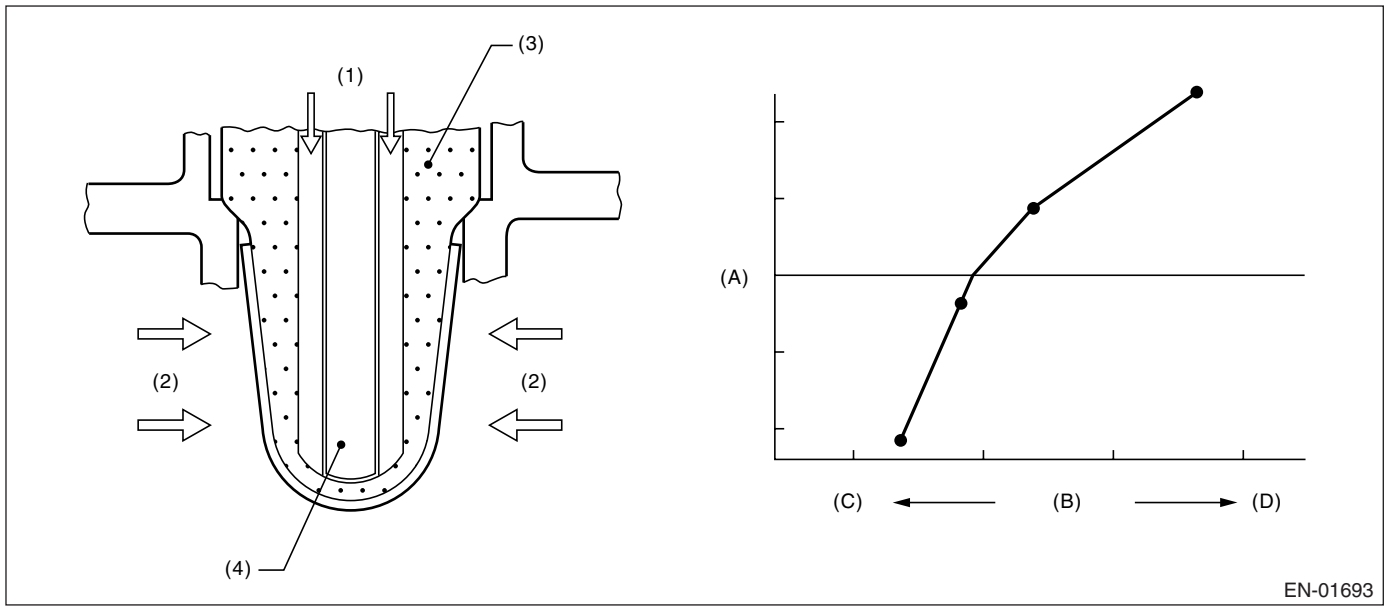
Memorize the freeze frame data. (For test mode $02)

CK:DTC P1153 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains High.
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.
Lambda value = Actual air fuel ratio/Theoretical air fuel ratio
Lambda > 1: Lean
Lambda < 1: Rich

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in 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	In operation
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	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g (0.21 oz)/s
Load change during 0.5 engine rev.	≤ 0.01 g (0.0003 oz)/rev
Impedance of front oxygen (A/F) sensor	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 since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear O_2 sensor sub feedback compensation coefficient value being at not low limit	≥ 1.15

Time Needed for Diagnosis: 10 seconds

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

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Purge control: Not allowed to purge

9. ECM OPERATION AT DTC SETTING

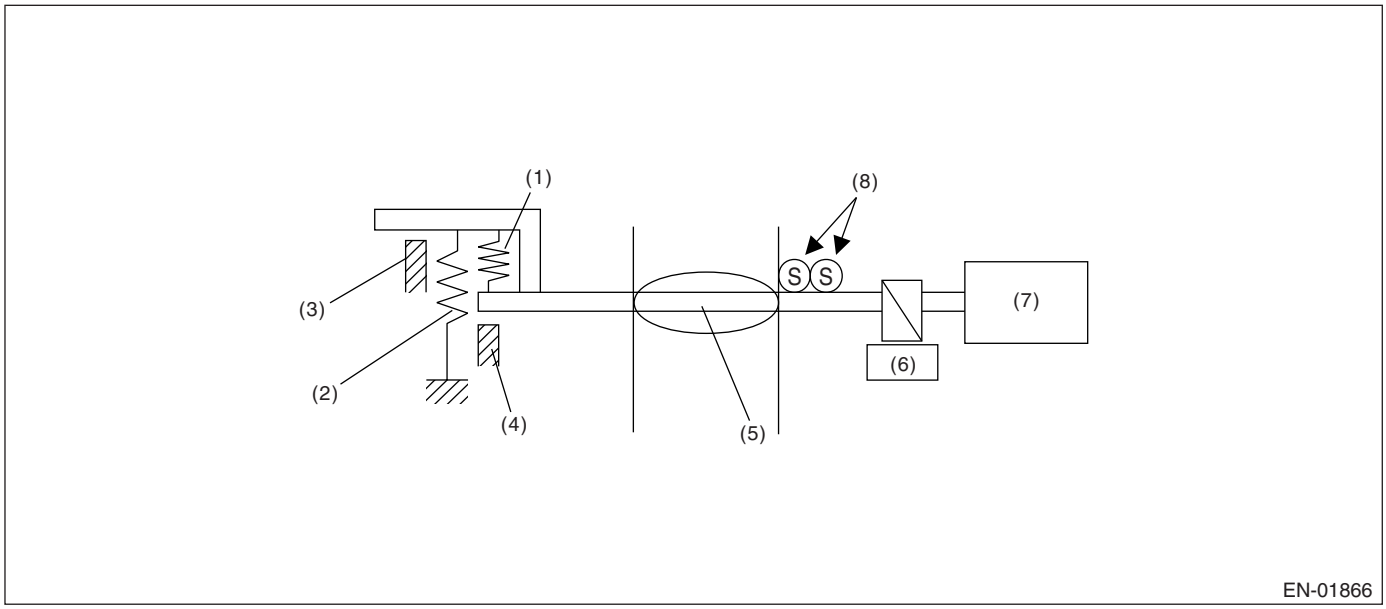
Memorize the freeze frame data. (For test mode $02)

CL:DTC P1160 — RETURN SPRING FAILURE —

1. OUTLINE OF DIAGNOSIS

Judge NG when the valve does not move to the close direction with the motor power stopped and the valve open more than the default opening.

2. COMPONENT DESCRIPTION



(1) Opener spring
(2) Return spring
(3) Intermediate stopper
(4) Full closed stopper
(5) Throttle valve
(6) Gear
(7) DC motor
(8) Main and sub throttle sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Motor continuity	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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

• 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 malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

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

CM:DTC P1301 — MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS) —

1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Exhaust temperature method)
Judge NG when the exhaust temperature is high.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters approval continuation time	1 second or more
Intake manifold pressure change during 0.5 engine rev.	< 16.0 kPa (120 mmHg, 4.72 inHg) (MT) < 14.7 kPa (110 mmHg, 4.33 inHg) (AT)
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	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Evaporative system leak check	Not in operation
Engine speed	550 — 6700 rpm
Intake manifold pressure	> Map3 or more
Battery voltage	≥ 8 V

Map3

- MT

Vehicle Speed < 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	25.1 (188, 7.40)	24.8 (186, 7.32)	25.6 (192, 7.56)	23.3 (175, 6.89)	26.3 (197, 7.76)	25.9 (194, 7.64)	28.9 (216.5, 8.52)	30.0 (225, 8.86)	31.7 (237.5, 9.35)	33.0 (248, 9.76)	37.1 (278.5, 11.0)	41.9 (314, 12.4)	47.0 (352.5, 13.9)	51.1 (383, 15.1)

Vehicle Speed ≥ 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	25.5 (191, 7.52)	25.1 (188, 7.40)	30.4 (227.7, 8.96)	35.6 (267.4, 10.5)	38.5 (288.9, 11.4)	40.4 (302.9, 11.9)	41.1 (308.6, 12.1)	40.8 (306, 12.0)	44.8 (335.8, 13.2)	47.3 (354.5, 14.0)	49.1 (368.2, 14.5)	50.9 (381.9, 15.0)	52.8 (396, 15.6)	52.8 (396, 15.6)

- AT

Vehicle Speed ≥ 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	26.3 (197, 7.76)	24.7 (185, 7.28)	23.6 (177, 6.97)	25.5 (191, 7.52)	27.3 (205, 8.07)	26.1 (196, 7.72)	29.5 (221.5, 8.72)	31.3 (235, 9.25)	32.7 (245.5, 9.67)	34.1 (256, 10.08)	38.2 (286.5, 11.3)	33.6 (252.3, 9.93)	49.5 (371.5, 14.62)	51.5 (386, 15.20)

3. GENERAL DRIVING CYCLE

- Detecting misfire is able to be carried out in the condition between idling and high revolution.
- Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below continue 200 engine revs. (400 ignitions) in a row.
Judgment Value

Malfunction Criteria	Threshold Value
Exhaust temperature	> 1050°C (1922°F)

Time Needed for Diagnosis: 200 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

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

CN:DTC P1312 — EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of exhaust temperature sensor output property.
Judge NG when the exhaust temperature remains high or low whereas it seemed to vary from the viewpoint of driving condition.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After starting engine	240 seconds or more
Engine coolant temperature at engine start	≤ 40°C (104°F)
Engine coolant temperature	≥ 75°C (167°F)
Intake air temperature at engine start	≥ 0°C (32°F)
Estimate ambient temperature	≥ 0°C (32°F)
Engine speed	≥ 2400 rpm
Engine load	≥ 0.85 g (0.030 oz)/rev
Lambda value	0.75 ←→ 1.25

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at more than 2400 rpm of engine speed in 240 seconds and more after starting the engine in cool condition.
Pay attention to the coolant temperature at engine starting.

4. DIAGNOSTIC METHOD

Judge NG when one of the malfunction criteria below is completed, and judge OK and clear the NG when all of the malfunction criteria below are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Min. exhaust temperature from engine starting	≥ 700°C (1292°F)
Max. exhaust temperature from engine starting	< 500°C (932°F)

Time Needed for Diagnosis: 30 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

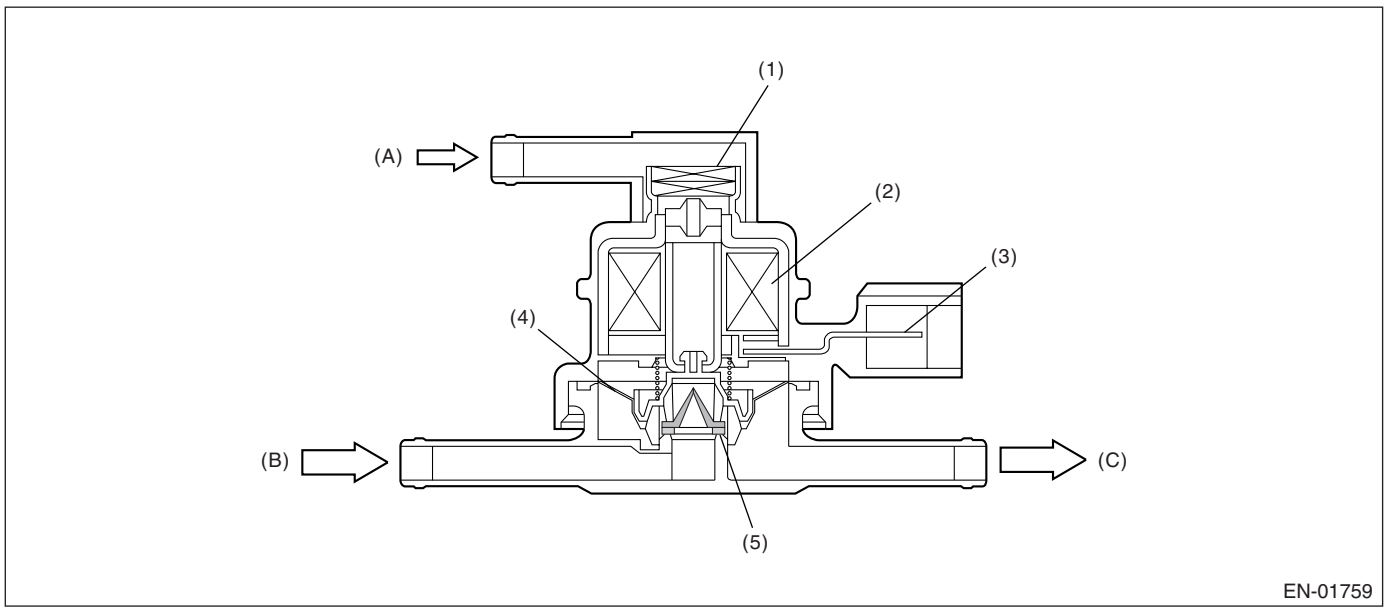
Memorize the freeze frame data. (For test mode $02)

CO:DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve. Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Atmospheric pressure
(B) Shut off valve
(C) To fuel tank

3. ENABLE CONDITION

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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal 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 drive cycles.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

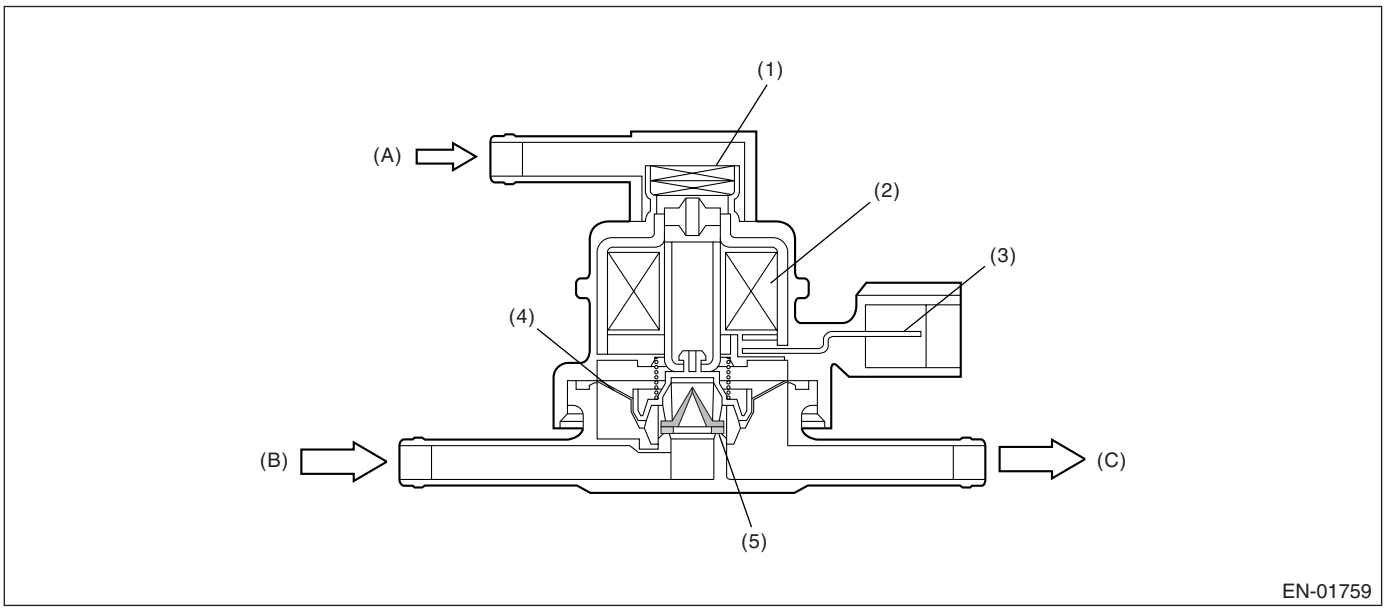
Memorize the freeze frame data. (For test mode $02)

CP:DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Atmospheric pressure
(B) Shut off valve
(C) To fuel tank

3. ENABLE CONDITION

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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

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

CQ:DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —

1. OUTLINE OF DIAGNOSIS

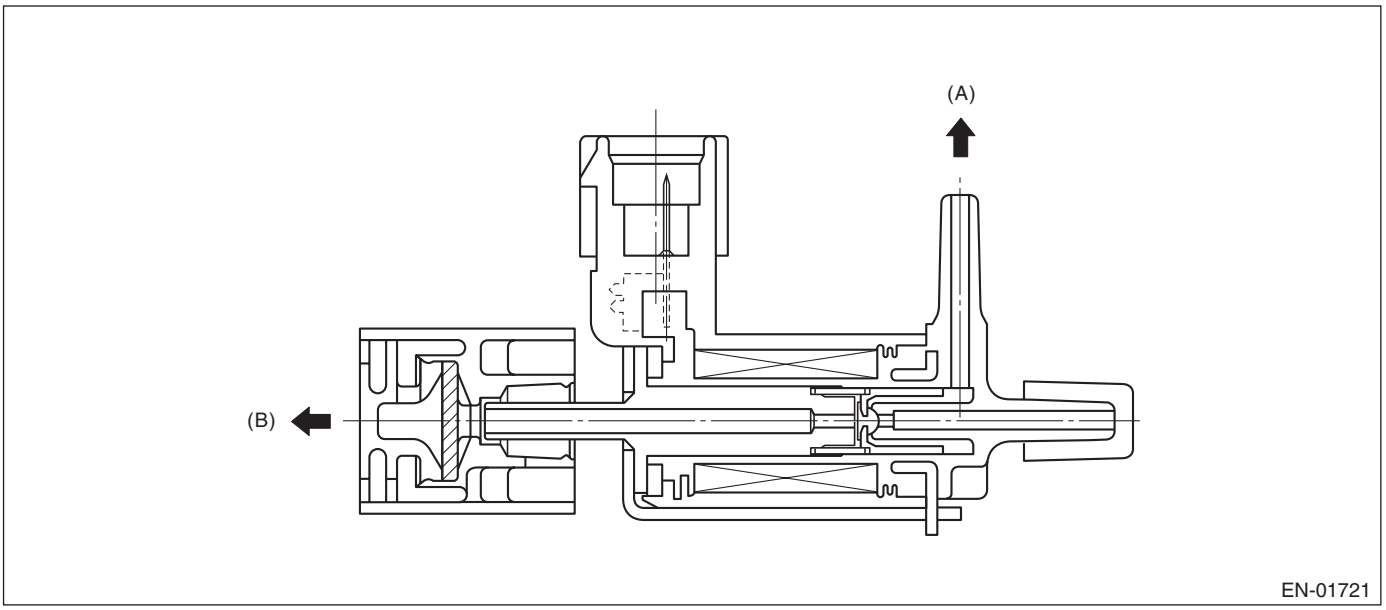
For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4DOTC)-122, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —.>

CR:DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.
Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor (B) Ambient air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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

• Judgment Value

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

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

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

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

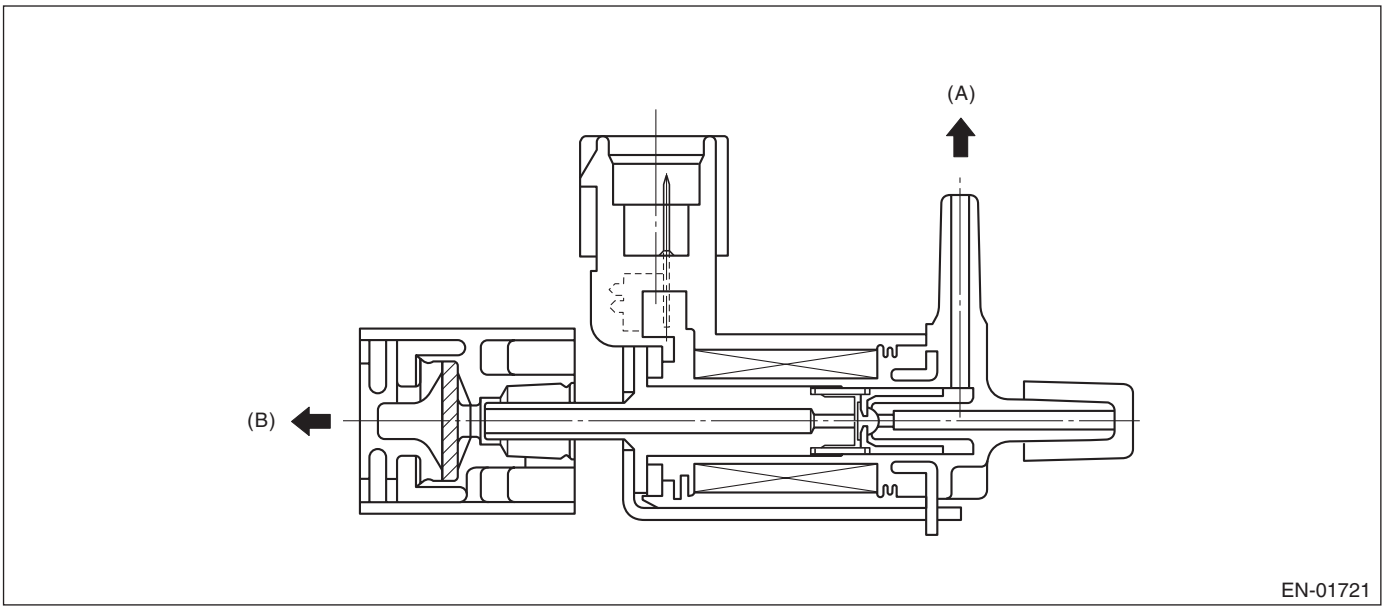
Memorize the freeze frame data. (For test mode $02)

CS:DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.
Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor (B) Ambient air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

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

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

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

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

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

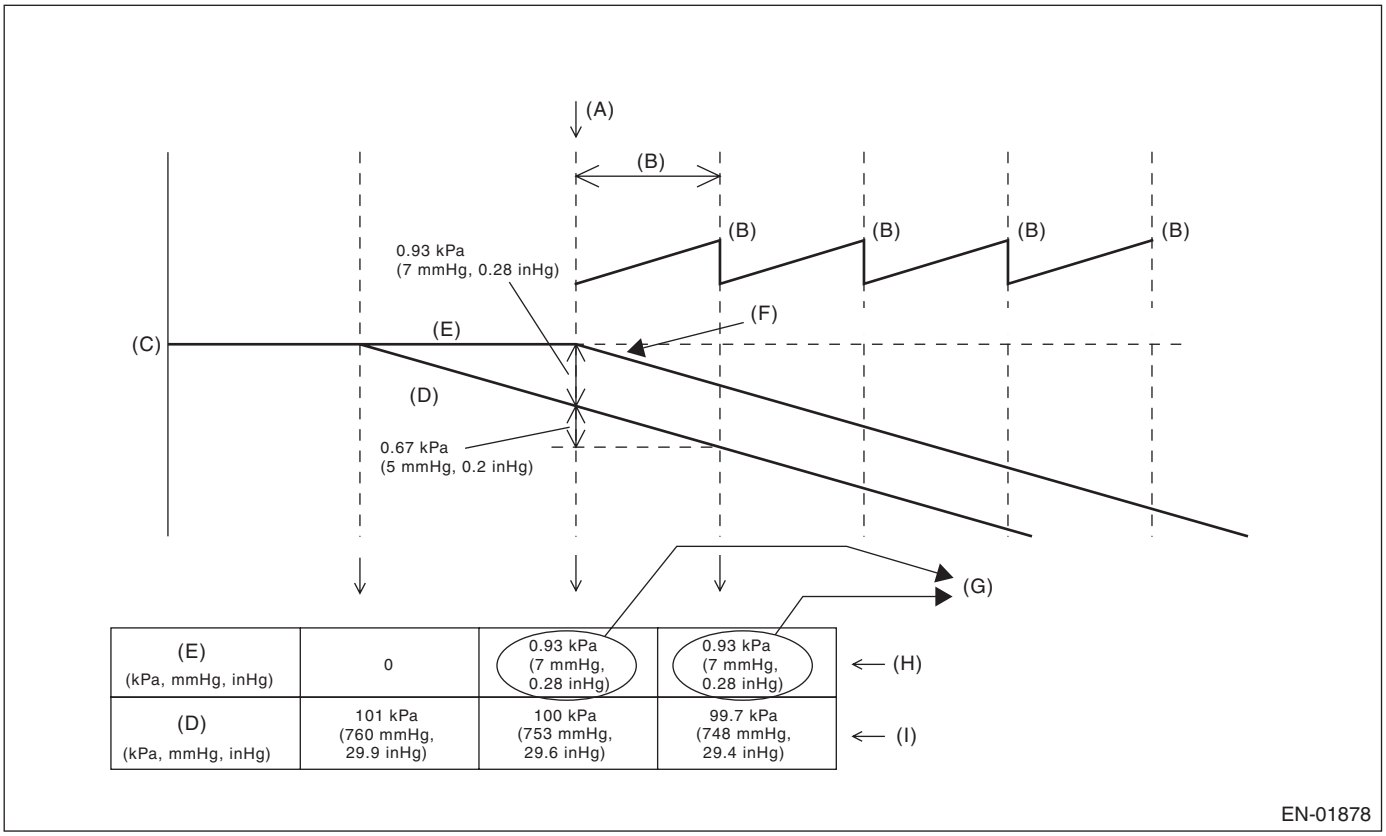
CT:DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure switching solenoid function abnormality.
The tank pressure sensor is a relative pressure sensor, which normally compares the pressure with the atmospheric pressure. The tank pressure switching solenoid is a solenoid, which shifts the compare space from opening to closed during the EVAP diagnosis. Detect the malfunction that the compare space remains closed. (Not judge NG after enable condition completed but assume NG before enable condition completed.)

• Normality Judgment

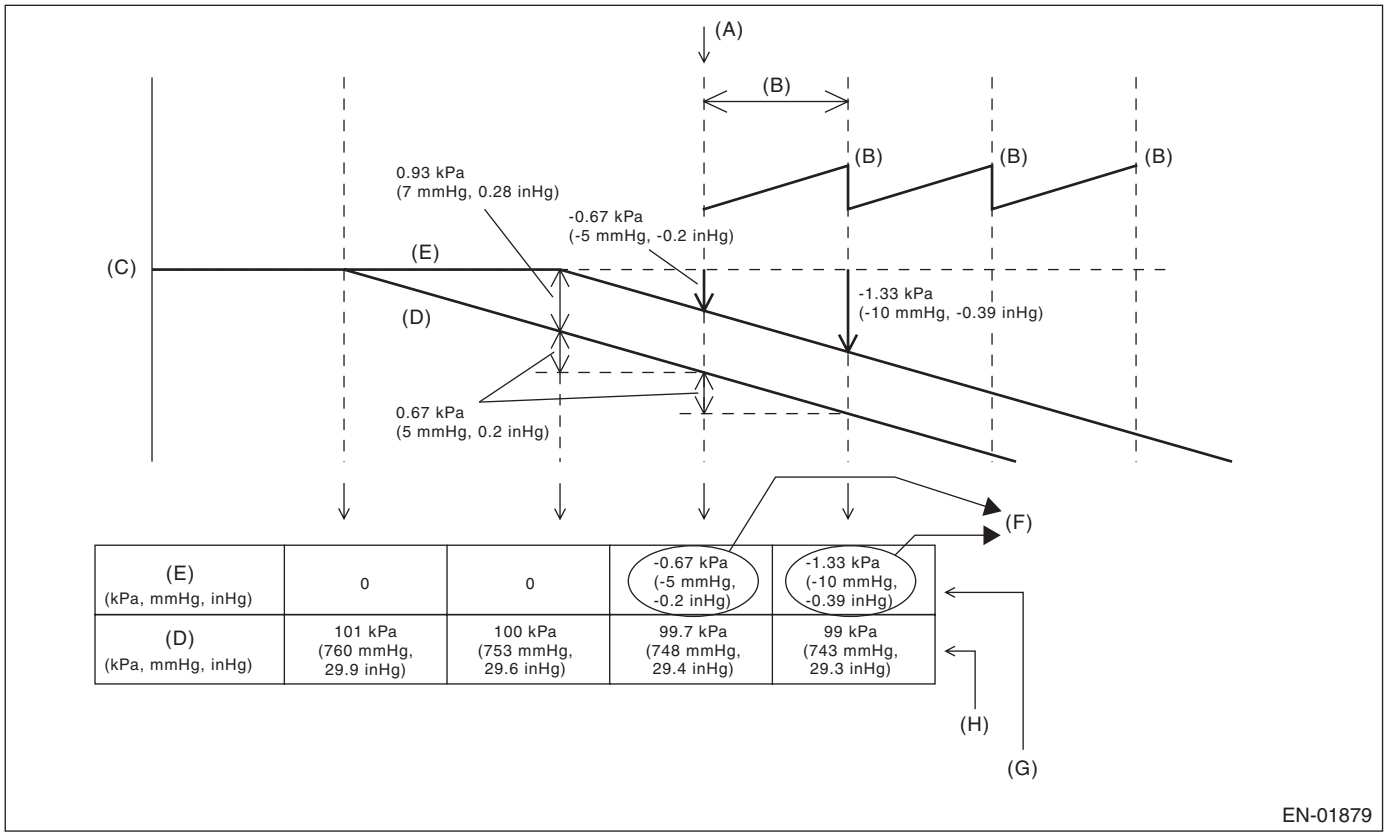
Judge OK when the fuel tank pressure does not change (or changes by less than 0.60 kPa (4.5 mmHg, 0.18 inHg)) at atmospheric pressure changing by 0.60 kPa (4.5 mmHg, 0.18 inHg) or more per 80 seconds.



(A) Enable conditions are completed.
(B) 80S
(C) Pressure
(D) Atmospheric pressure
(E) Tank pressure
(F) PCV function reduces the tank pressure
(G) Judge OK when the tank pressure does not change.
(H) The tank pressure is relative pressure against atmospheric pressure
(I) Change of atmospheric pressure

• Abnormality Judgment

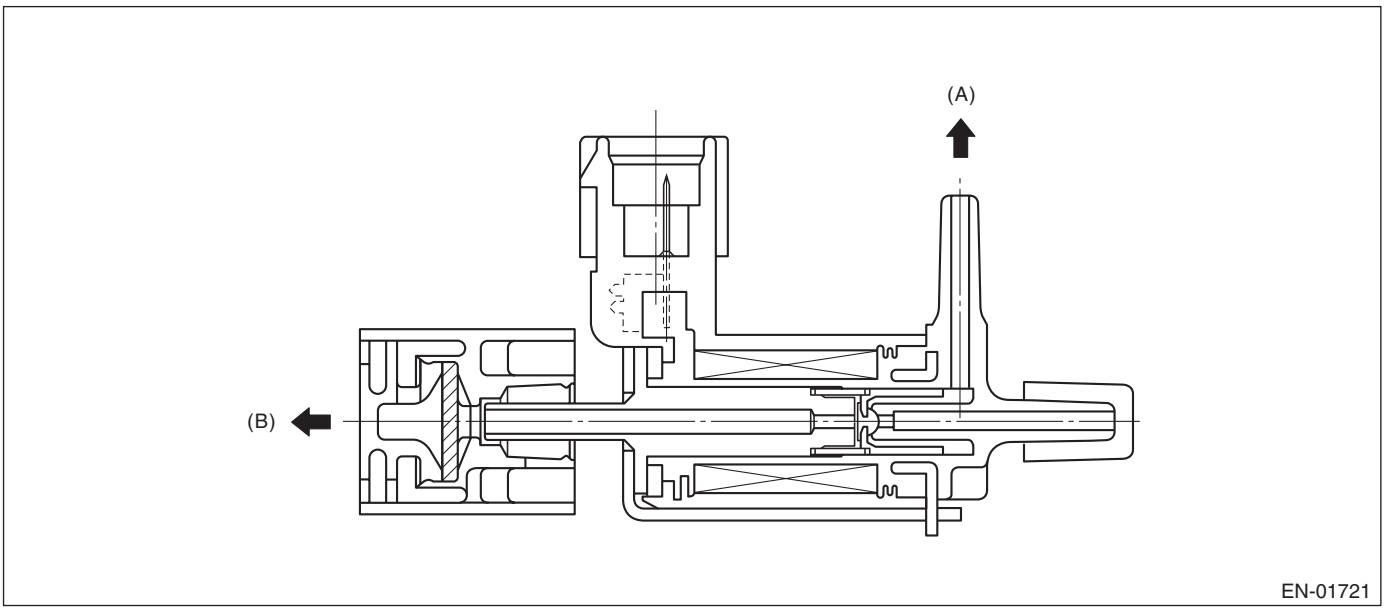
Judge NG temporarily when the fuel tank pressure changes by 0.60 kPa (4.5 mmHg, 0.18 inHg) or more at atmospheric pressure changing by 0.60 kPa (4.5 mmHg, 0.18 inHg) or more per 80 seconds, and then judge NG when the previous condition is completed 5 times in a row.



(E) (kPa, mmHg, inHg)	0	0	-0.67 kPa (-5 mmHg, -0.2 inHg)	-1.33 kPa (-10 mmHg, -0.39 inHg)
(D) (kPa, mmHg, inHg)	101 kPa (760 mmHg, 29.9 inHg)	100 kPa (753 mmHg, 29.6 inHg)	99.7 kPa (748 mmHg, 29.4 inHg)	99 kPa (743 mmHg, 29.3 inHg)

(A) Enable conditions are completed.
(B) 80S
(C) Pressure
(D) Atmospheric pressure
(E) Tank pressure
(F) Judge NG temporarily the tank pressure changes once, and then judge NG the tank pressure changes five consecutive times
(G) The tank pressure is relative pressure against atmospheric pressure. Ordinary, part of pressure comparison is atmospheric pressure.
101 kPa (760 mmHg, 29.9 inHg)
(H) Atmospheric pressure is absolute pressure.

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor (B) Ambient air

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V
Fuel level	9.6 ←→ 51 ℓ (2.54 ←→ 13.47 US gal, 2.11 ←→ 11.22 Imp gal)
Evaporation system diagnosis	Not in operation
After starting engine	80 seconds or more
Fuel tank pressure	< –0.67 kPa (–5 mmHg, –0.2 inHg) or > –0.93 kPa (7 mmHg, 0.28 inHg)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the fuel tank pressure is large or small in 80 seconds or more after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed 5 times.

• Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	≥ 0.67 kPa (4.5 mmHg, 0.2 inHg)
Fuel tank pressure change in 80 seconds	≥ 0.67 kPa (4.5 mmHg, 0.2 inHg)
Fuel level change	< 3 ℓ (3.2 US gal, 2.6 Imp gal)

Time Needed for Diagnosis: 80 seconds × 5 times

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

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	≥ 0.67 kPa (4.5 mmHg, 0.2 inHg)
Fuel tank pressure change in 80 seconds	< 0.67 kPa (4.5 mmHg, 0.2 inHg)

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

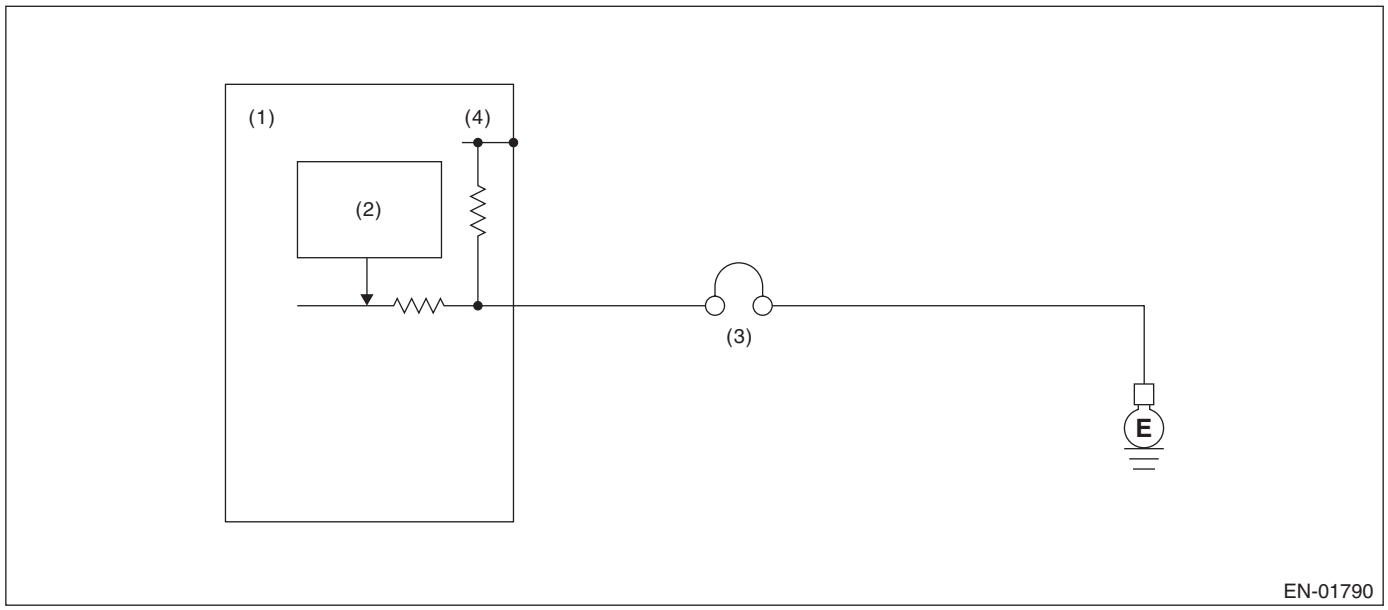
Memorize the freeze frame data. (For test mode $02)

CU:DTC P1491 — POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM —

1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.
Judge NG when the diagnosis terminal voltage is high.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) PCV diagnosis connector
(4) 5 V

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSIS METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Engine speed	≥ 500 rpm
Positive crankcase ventilation diagnosis voltage	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Engine speed	≥ 500 rpm
Positive crankcase ventilation diagnosis voltage	Low

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was performed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

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

CV:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge OFF NG when it turns to “after engine starting” while the starter has never been set to ON.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge OFF NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1 km/h (0.62 MPH)
Starter ON signal	Not detected
Engine speed after the engine speed of 500 rpm or less has continued for 0.8 seconds or more	≥ 500 rpm

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OFF OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Starter ON diagnosis	Not diagnosis
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

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

CW:DTC P1544 — EXHAUST GAS TEMPERATURE TOO HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of high exhaust gas temperature.
Judge NG when the exhaust gas becomes too high.

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 NG when the continuous time of completing the malfunction criteria below becomes more than 8.2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel cut event	Not in operation
After fuel cut	≥ 1 milliseconds
Exhaust temperature	≥ 1050°C (1922°F)

Time Needed for Diagnosis: 8.2 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 8.2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Exhaust temperature	< 550°C (1022°F)

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

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

CX:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the back-up voltage circuit.
Judge NG when the back-up voltage becomes smaller than the battery voltage.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power	< Battery voltage × 0.7
Battery voltage	≥ 10.9 V
Before/After starting engine	After starting engine

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	≥ Battery voltage × 0.7
Battery voltage	≥ 10.9 V
Before/After starting engine	After starting engine

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

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

CY:DTC P2004 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge open fixing malfunction when the opening degree is large even after finishing the tumble generated valve close driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 67.4°
Tumble generated valve “close” signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 67.4°
Tumble generated valve “close” signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve control
- Output the open signal.

8. ECM OPERATION AT DTC SETTING

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

CZ:DTC P2005 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge open fixing malfunction when the opening degree is large even after finishing the tumble generated valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 67.4°
Tumble generated valve “close” signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 67.4°
Tumble generated valve “close” signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve control
- Output the open signal.

8. ECM OPERATION AT DTC SETTING

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

DA:DTC P2006 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge close fixing malfunction when the opening degree is small even after finishing the tumble generated valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 67.4°
Tumble generated valve “open” signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 67.4°
Tumble generated valve “open” signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve control
- Output the close signal.

8. ECM OPERATION AT DTC SETTING

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

DB:DTC P2007 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge close fixing malfunction when the opening degree is small even after finishing the tumble generated valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 67.4°
Tumble generated valve “open” signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 67.4°
Tumble generated valve “open” signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve control
- Output the close signal.

8. ECM OPERATION AT DTC SETTING

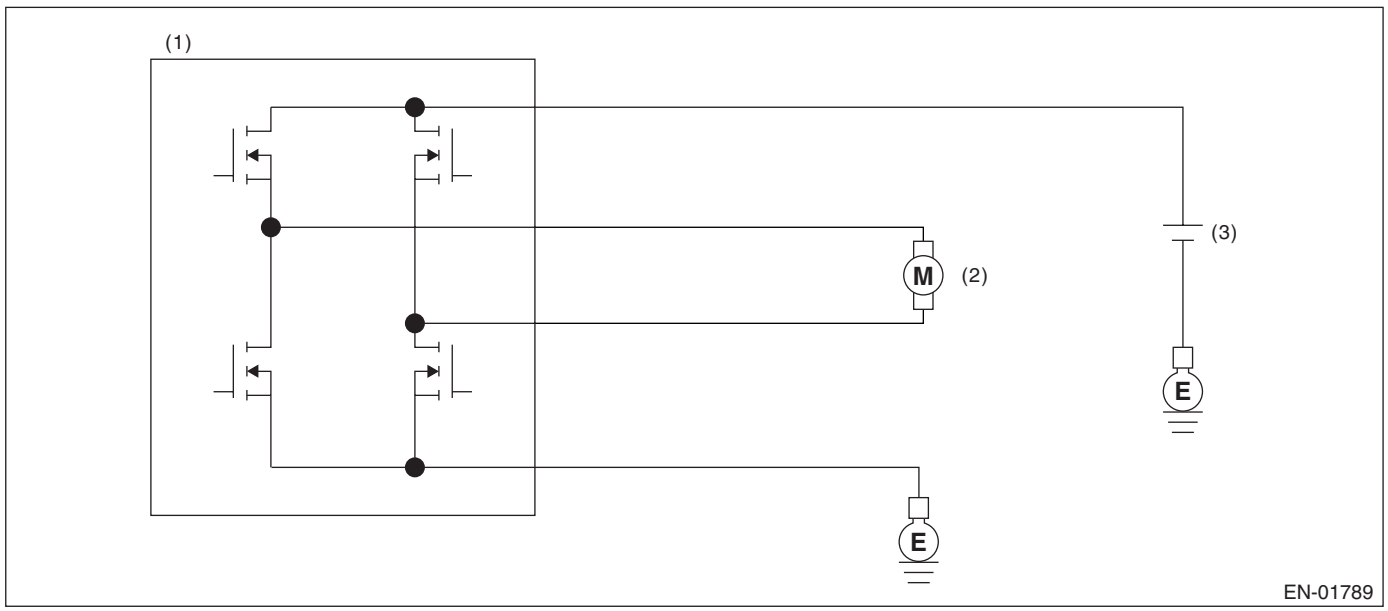
Memorize the freeze frame data. (For test mode $02)

DC:DTC P2008 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the open signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generated valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	before set ON → OFF
Tumble generated valve ON signal output	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON and OFF, and judge open NG when the open NG signal is sent during 2 seconds in a row. Judge 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 malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

9. ECM OPERATION AT DTC SETTING

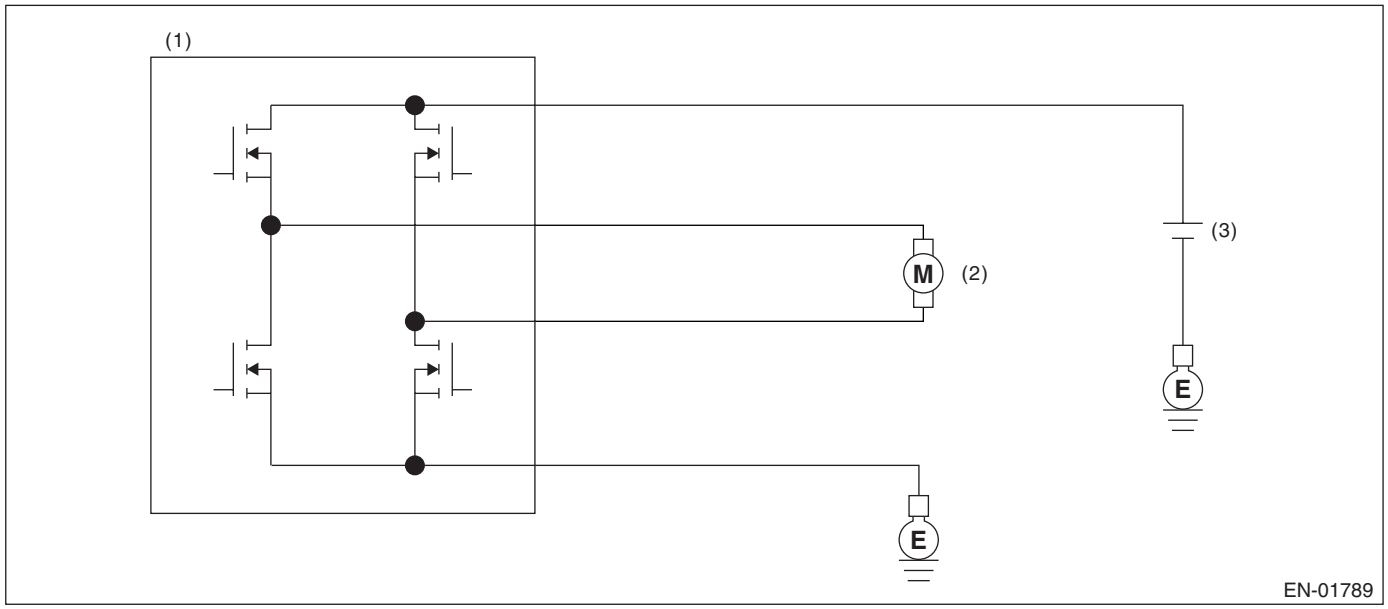
Memorize the freeze frame data. (For test mode $02)

DD:DTC P2009 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the overcurrent signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generated valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	before set ON → OFF
Tumble generated valve ON signal output	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent during 1 second in a row. Judge 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 malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

9. ECM OPERATION AT DTC SETTING

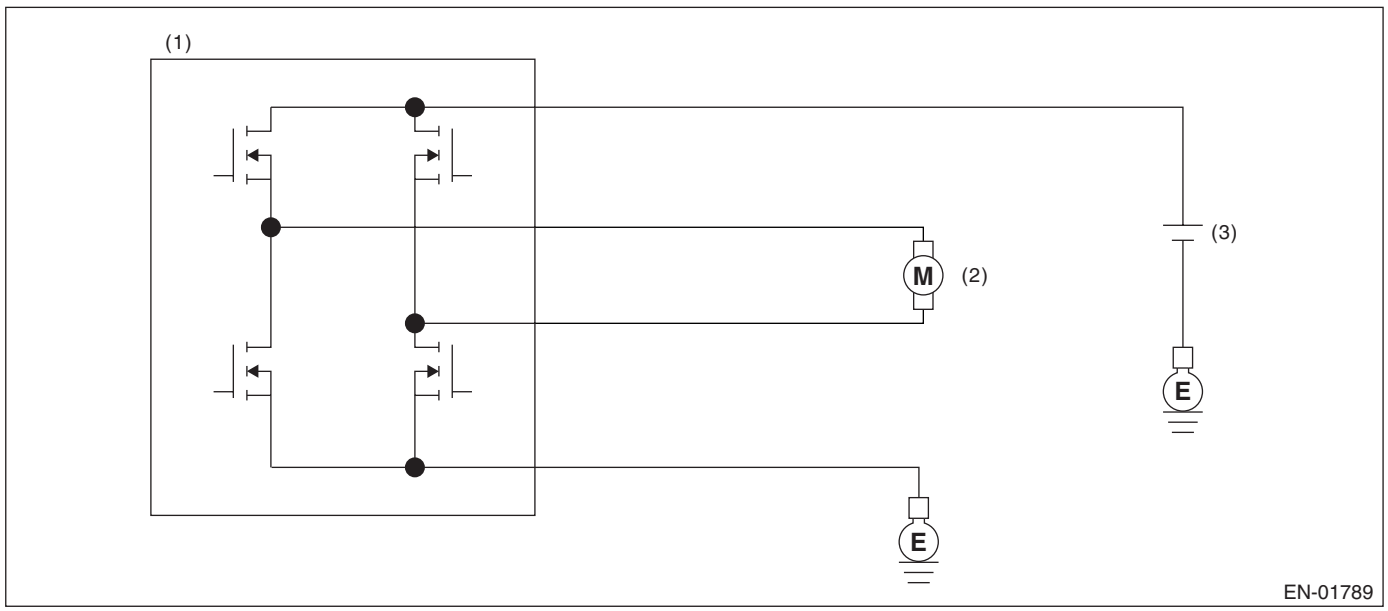
Memorize the freeze frame data. (For test mode $02)

DE:DTC P2011 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the open signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generated valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	before set ON → OFF
Tumble generated valve ON signal output	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON and OFF, and judge open NG when the open NG signal is sent during 2 seconds in a row. Judge 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	Hight

Time Needed for Diagnosis: 2 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

9. ECM OPERATION AT DTC SETTING

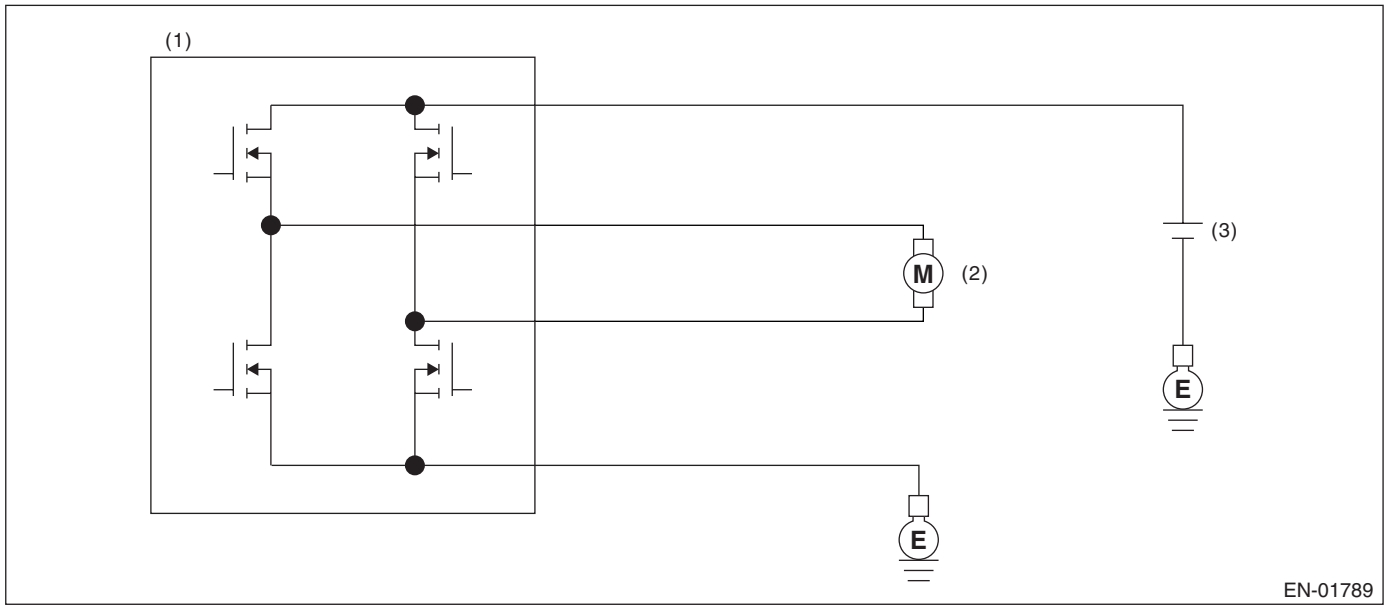
Memorize the freeze frame data. (For test mode $02)

DF:DTC P2012 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the overcurrent signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generated valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	before set ON → OFF
Tumble generated valve ON signal output	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent during 1 second in a row.
Judge 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 malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

9. ECM OPERATION AT DTC SETTING

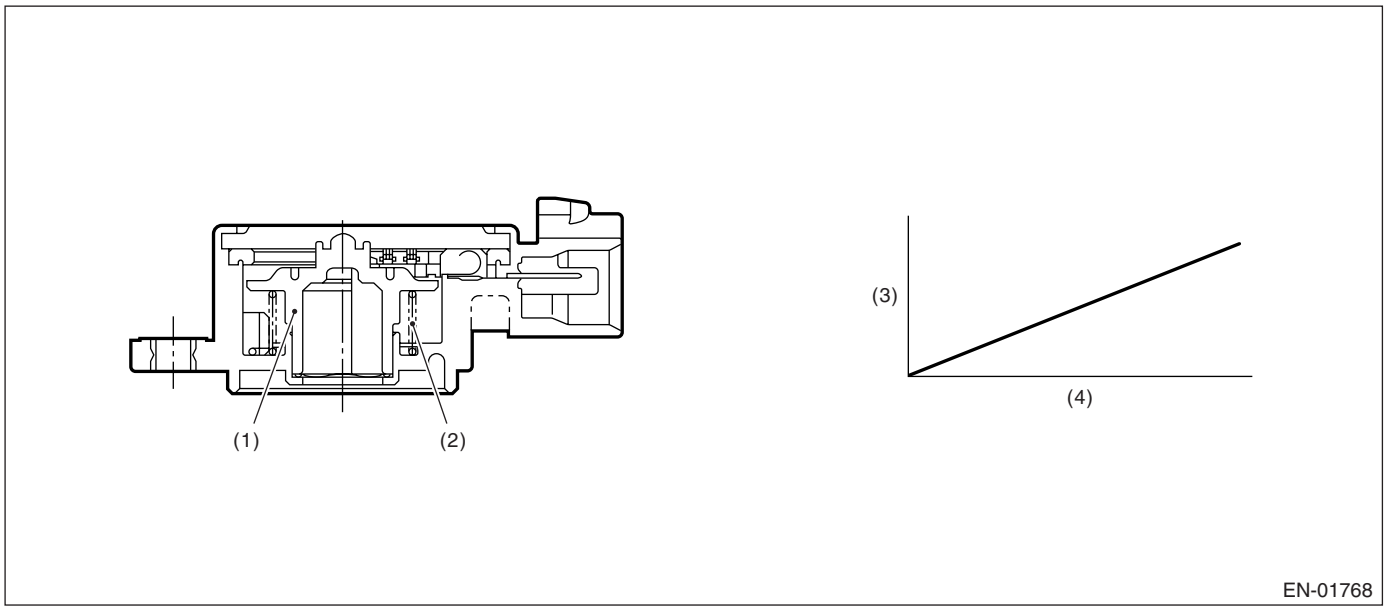
Memorize the freeze frame data. (For test mode $02)

DG:DTC P2016 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

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 malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

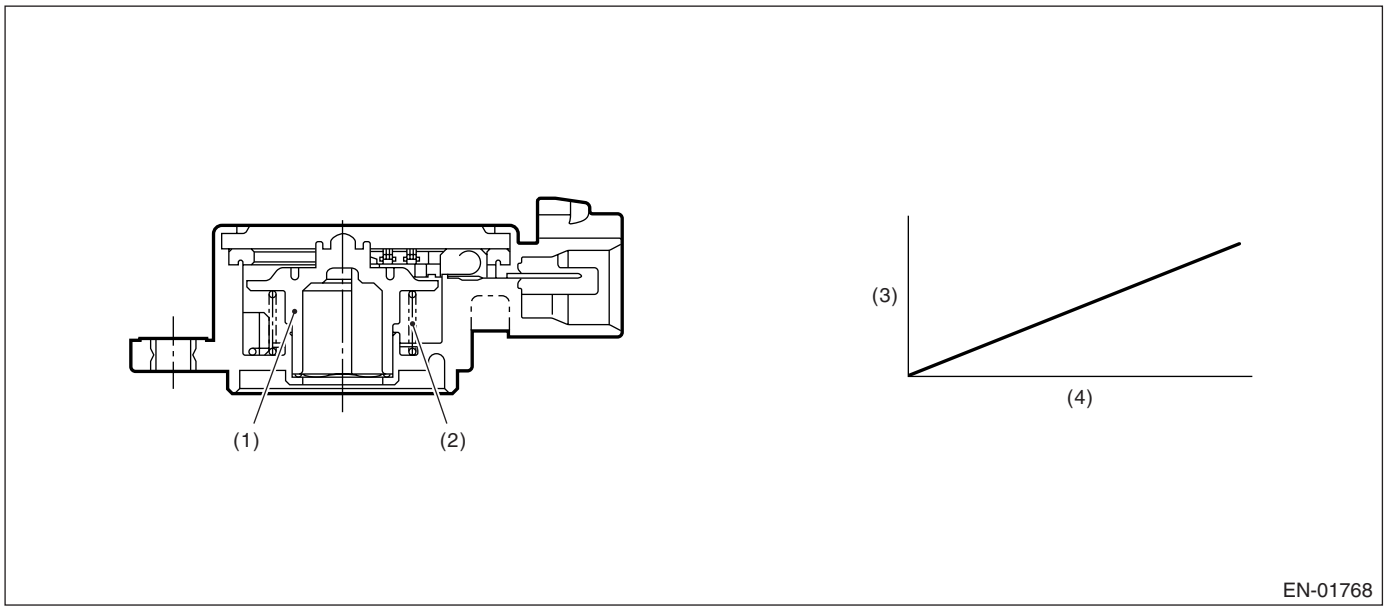
Memorize the freeze frame data. (For test mode $02)

DH:DTC P2017 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

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 malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

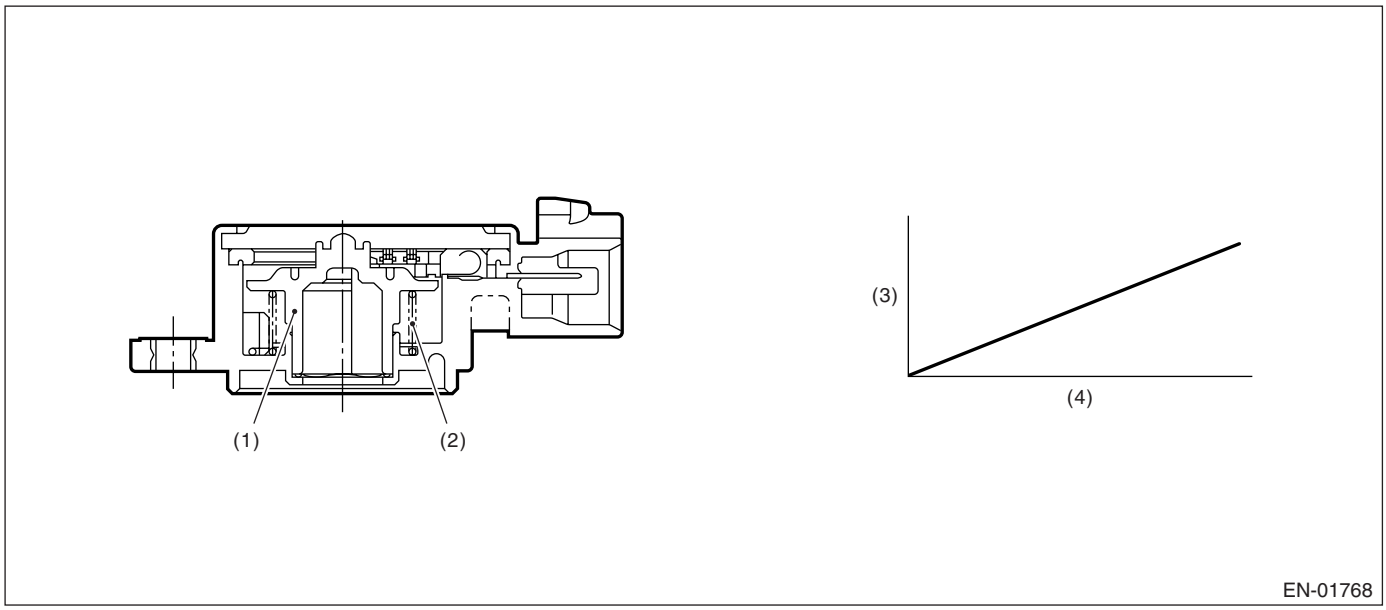
Memorize the freeze frame data. (For test mode $02)

DI: DTC P2021 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

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 malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

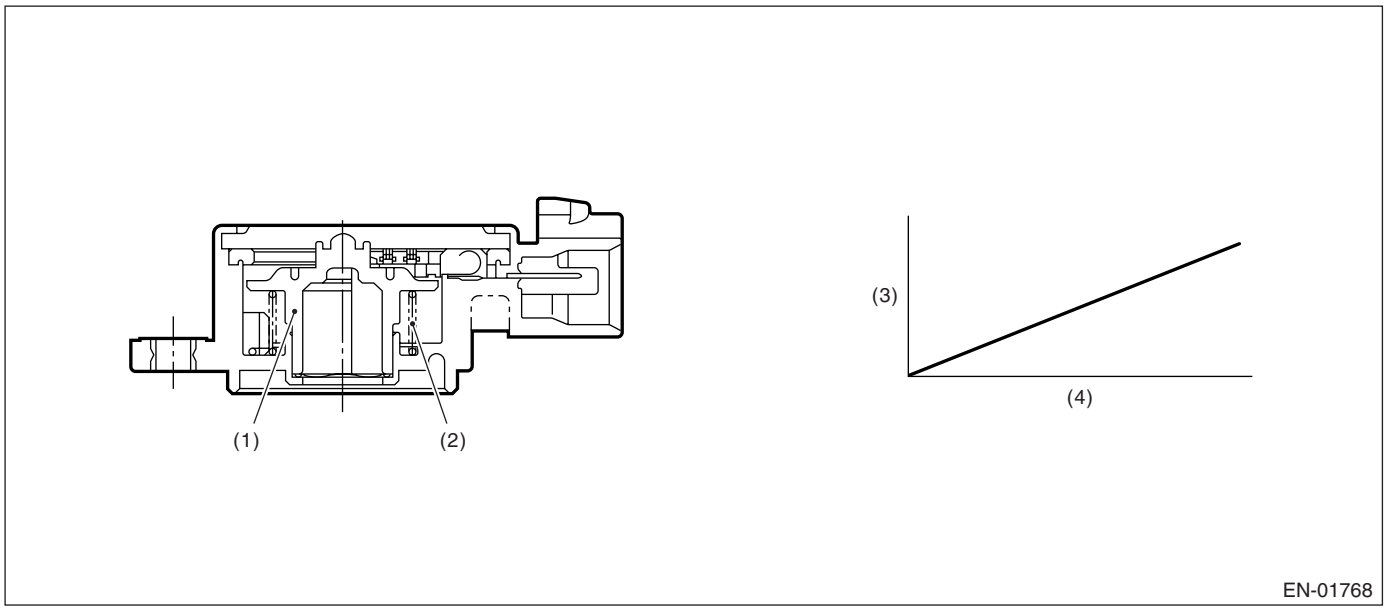
Memorize the freeze frame data. (For test mode $02)

DJ:DTC P2022 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

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 malfunction occurs.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

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

DK:DTC P2088 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	≥ 99.61%
OCV control present current	< 0.306 A

Time Needed for Diagnosis: 2000 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Target current value of OCV	≥ 0.14 A
| Target current value of OCV – Control current value of OCV |	≥ 0.08 A

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

AVCS control: Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

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

DL:DTC P2089 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	< 0.39%
OCV control present current	≥ 0.306 A

Time Needed for Diagnosis: 2000 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
I Target current value of OCV – Control current value of OCV I	< 0.08 A

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

AVCS control: Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

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

DM:DTC P2092 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2) —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	≥ 99.61%
OCV control present current	< 0.306 A

Time Needed for Diagnosis: 2000 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Target current value of OCV	≥ 0.14 A
| Target current value of OCV – Control current value of OCV |	≥ 0.08 A

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

AVCS control: Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

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

DN:DTC P2093 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2) —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	< 0.39%
OCV control present current	≥ 0.306 A

Time Needed for Diagnosis: 2000 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
| Target current value of OCV – Control current value of OCV |	< 0.08 A

5. DTC CLEAR CONDITION

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

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

AVCS control: Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

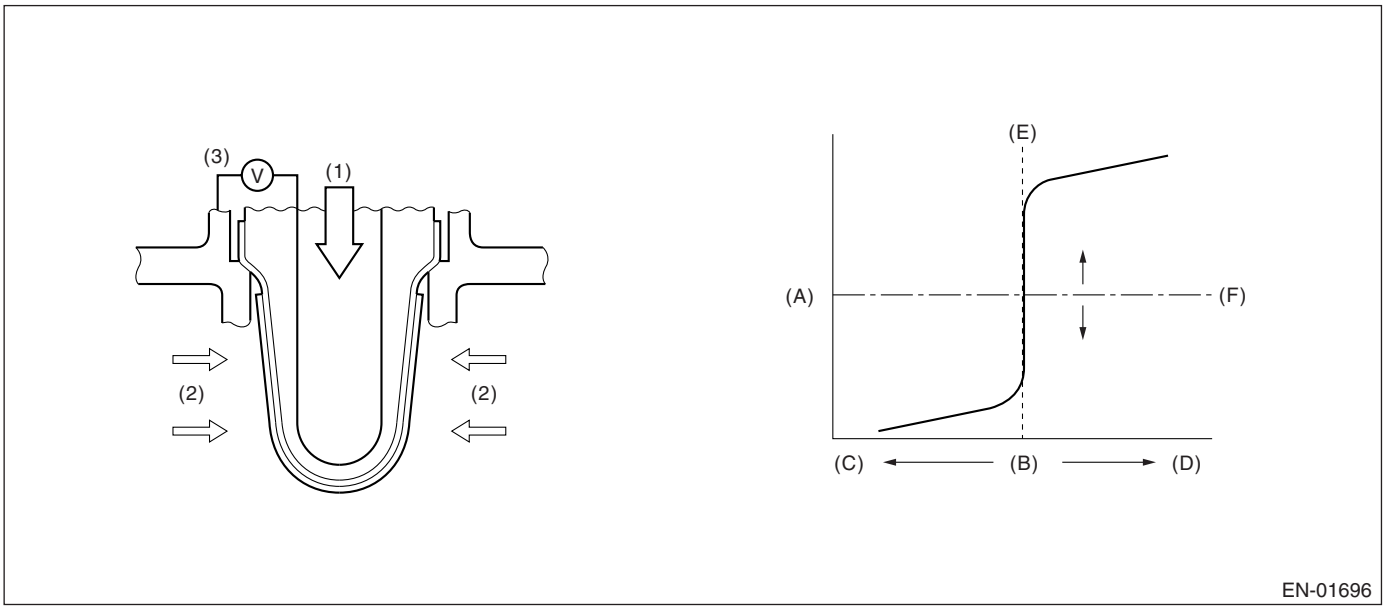
Memorize the freeze frame data. (For test mode $02)

DO:DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system whether the amount of sub feedback correction shifts to lean or not. Judge poor correction amount when the amount of sub feedback correction from the start to switching ignition OFF shifts to lean. Change the sub feedback correction amount guard value and shift judgment line and count up the guard operation counter (temporary NG counter) if it is a poor correction amount. Judge NG when the value of guard operation counter exceeds the specified value and when the amount of sub feedback correction shifts to lean.

2. COMPONENT DESCRIPTION



(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
Engine coolant temperature	40°C (104°F) - 105°C (221°F)
Accumulation time of closed loop control by rear oxygen sensor	200 seconds
Closed loop control by rear oxygen sensor	In operation
Idle switch	ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis at a speed of 75 km/h (47 MPH) or more.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time that the malfunction criteria below are completed is 5 seconds or more. Judge OK when the continuous time that the malfunction criteria below are not completed is 5 seconds or more, and then clear NG.

• Judgment Value

Malfunction Criteria	Threshold Value
Mean value of fuel trim parameter based on rear oxygen sensor	< −0.03 V
Limit of frequency that shifts to rich	≥ 4 times
Ratio of up/down time or rich/lean time of oxygen sensor	≥ 0.4

Time Needed for Diagnosis: 600 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

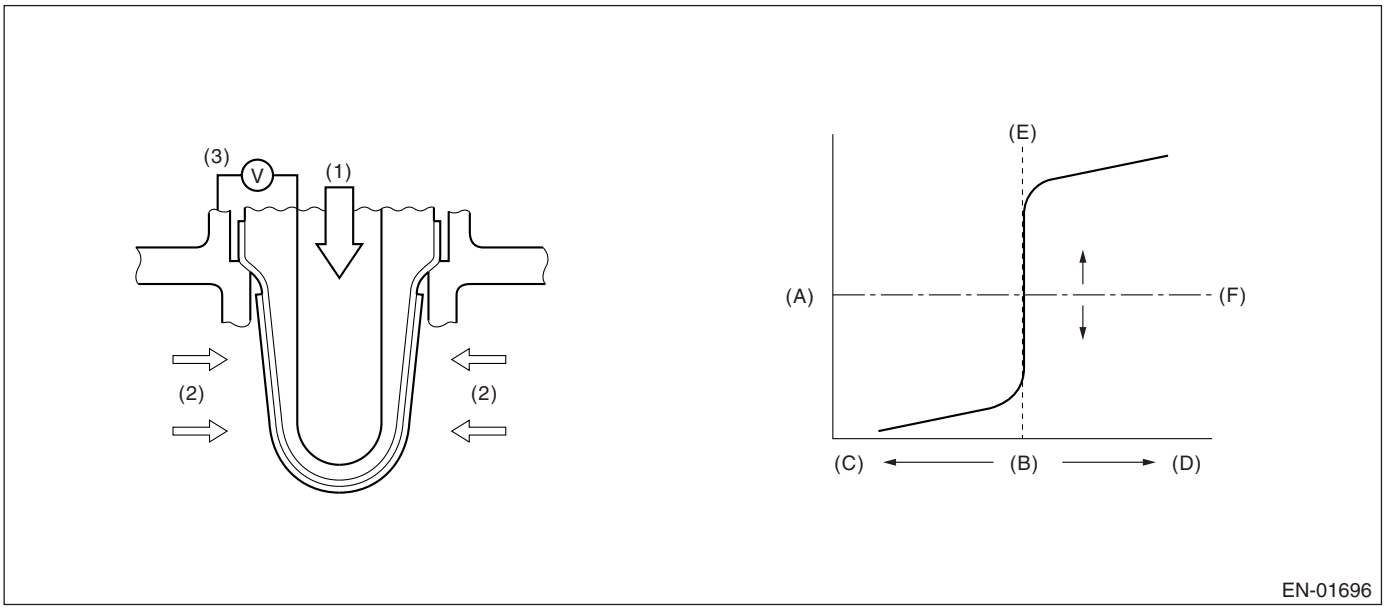
Memorize the freeze frame data. (For test mode $02)

DP:DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system whether the amount of sub feedback correction shifts to rich or not. Judge poor correction amount when the amount of sub feedback correction from the start to switching ignition OFF shifts to rich. Change the sub feedback correction amount guard value and shift judgment line and count up the guard operation counter (temporary NG counter) if it is a poor correction amount. Judge NG when the value of guard operation counter exceeds the specified value and when the amount of sub feedback correction shifts to rich.

2. COMPONENT DESCRIPTION



(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
Engine coolant temperature	40°C (104°F) - 105°C (221°F)
Accumulation time of closed loop control by rear oxygen sensor	200 seconds
Closed loop control by rear oxygen sensor	In operation
Idle switch	ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis at a speed of 75 km/h (47 MPH) or more.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time that the malfunction criteria below are completed is 5 seconds or more. Judge OK when the continuous time that the malfunction criteria below are not completed is 5 seconds or more, and then clear NG.

• Judgment Value

Malfunction Criteria	Threshold Value
Mean value of fuel trim parameter based on rear oxygen sensor	≥ 0.025
Limit of frequency that shifts to lean	≥ 4 times
Ratio of up/down time or rich/lean time of oxygen sensor	≤ 2.3

Time Needed for Diagnosis: 600 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous drive cycles.

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

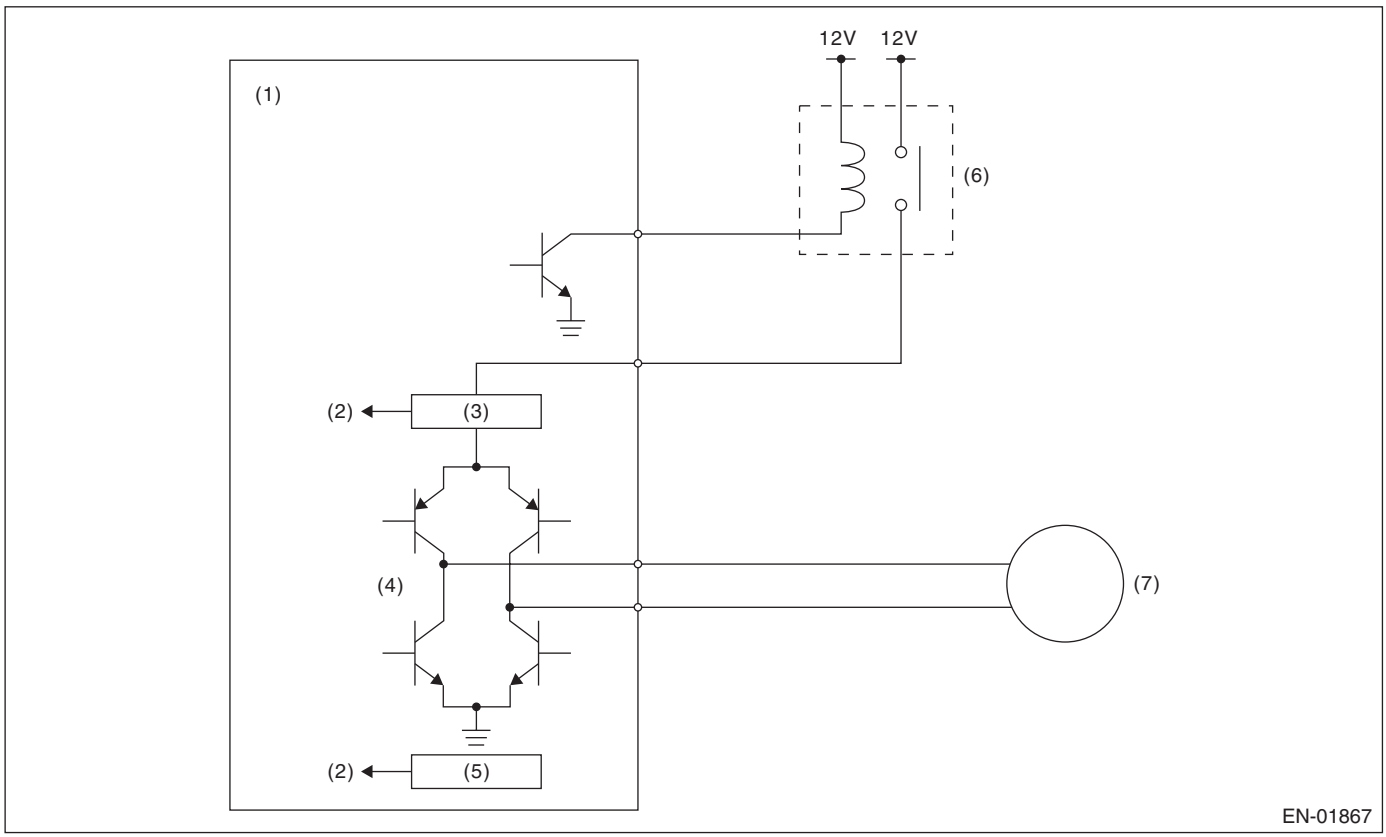
Memorize the freeze frame data. (For test mode $02)

DQ:DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when the motor current becomes large or drive circuit is heated.

2. COMPONENT DESCRIPTION



(1) Engine control unit (ECM)
(2) Detection circuit
(3) Overcurrent detection circuit
(4) Drive circuit
(5) Temperature detection circuit
(6) Electronic control throttle relay
(7) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Under control of electronic control throttle	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Motor current	≤ 8 A
Drive circuit inner temperature	≤ 175°C (347°F)

Time Needed for Diagnosis:

- 500 milliseconds (NG judgment)
- 2000 milliseconds (OK judgment)

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

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

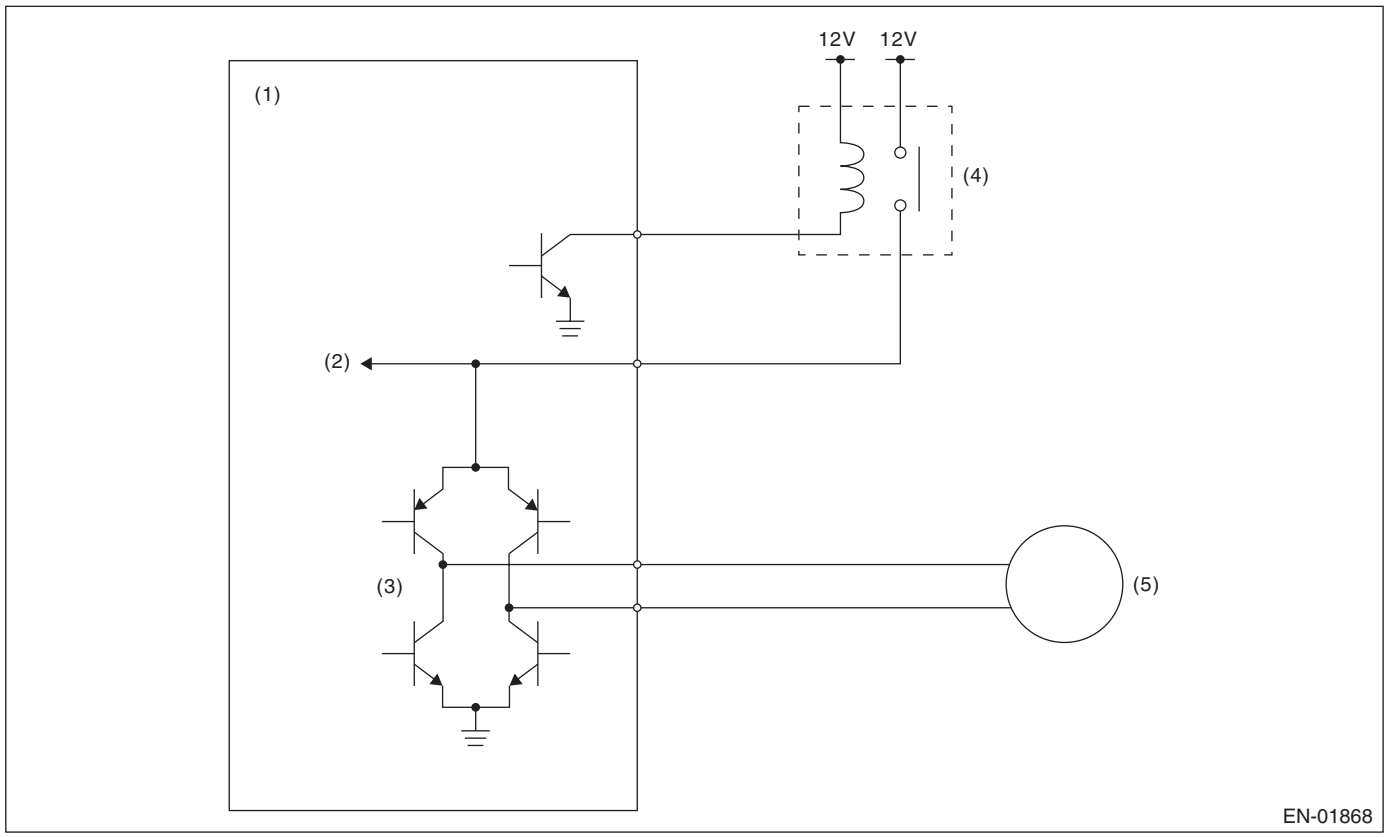
Memorize the freeze frame data. (For test mode $02)

DR:DTC P2102 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electric control throttle relay to ON.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Voltage detection circuit
(3) Drive circuit
(4) Electronic control throttle relay
(5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic control throttle relay output	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≥ 5 V

Time Needed for Diagnosis:

- 400 milliseconds (For NG)
- 2000 milliseconds (For OK)

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

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

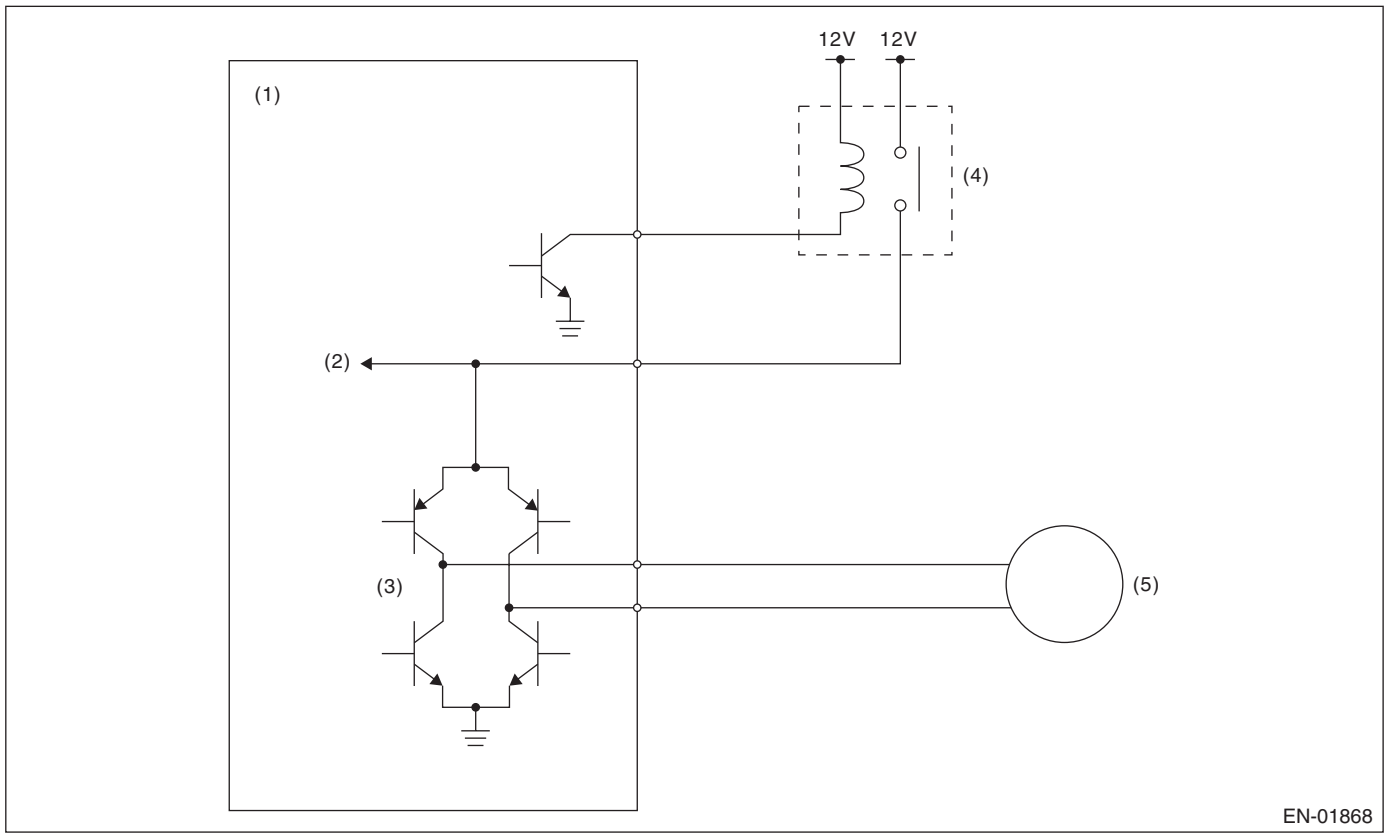
Memorize the freeze frame data. (For test mode $02)

DS:DTC P2103 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Judge NG when the power for electronic throttle control system is not supplied even when ECM sets the electric throttle control relay to OFF.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Voltage detection circuit
(3) Drive circuit
(4) Electronic throttle control relay
(5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic throttle control relay output	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≤ 5 V

Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

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

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

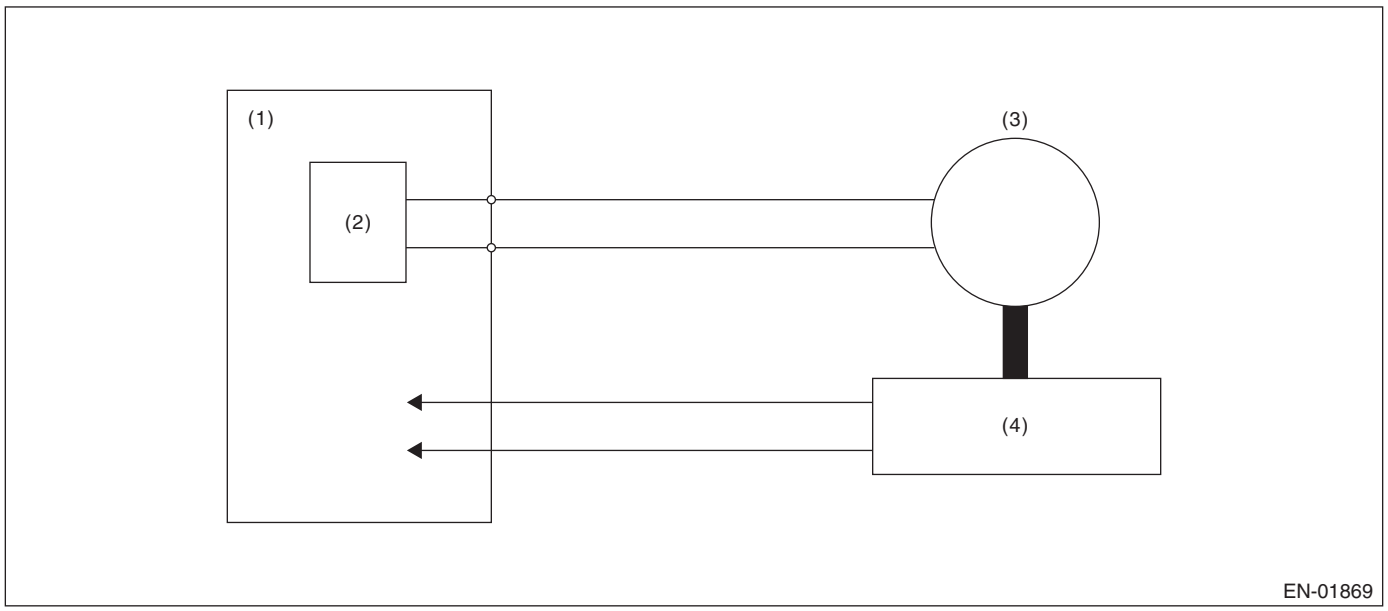
Memorize the freeze frame data. (For test mode $02)

DT:DTC P2109 — THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when all close point learning cannot conducted or abnormal value is detected.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Drive circuit
(3) Motor
(4) Throttle position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON → OFF
Ignition switch (after clear memory only)	OFF → ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis at all close point learning.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Throttle angle at all close point learning	10.127 — 19.872 deg
Throttle angle with ignition switch ON — Throttle all closed position	≥ 1.683 deg

Time Needed for Diagnosis: 8 — 80 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

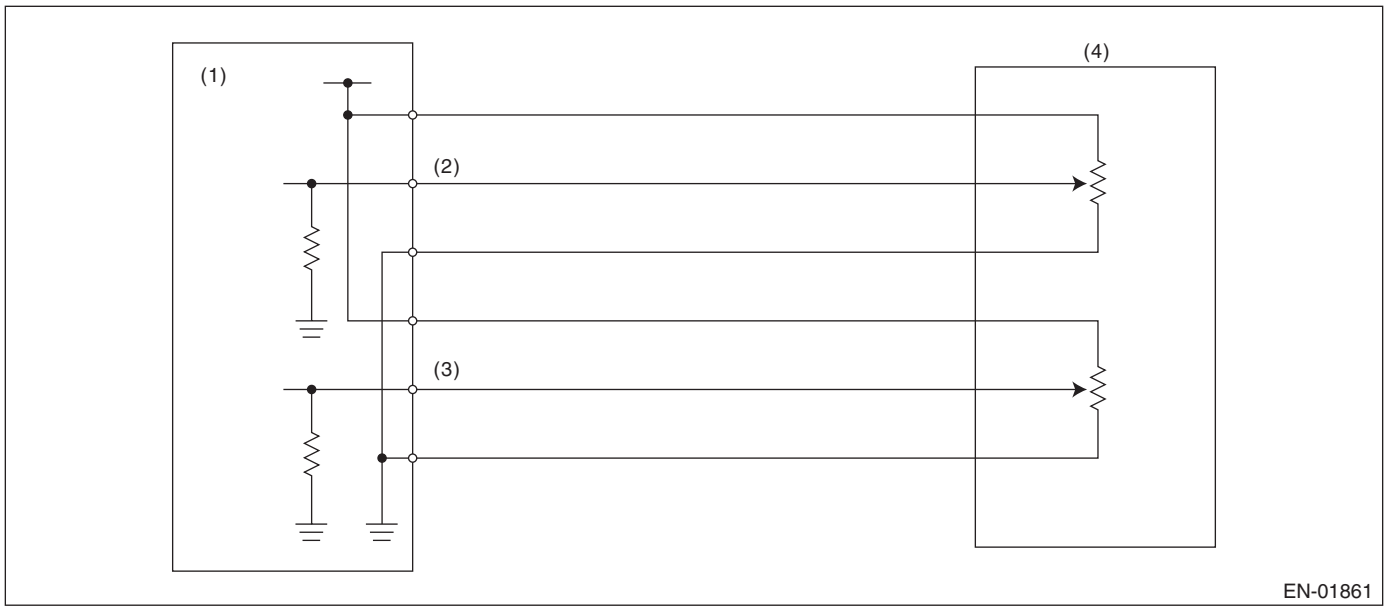
Memorize the freeze frame data. (For test mode $02)

DU: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 NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
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 malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

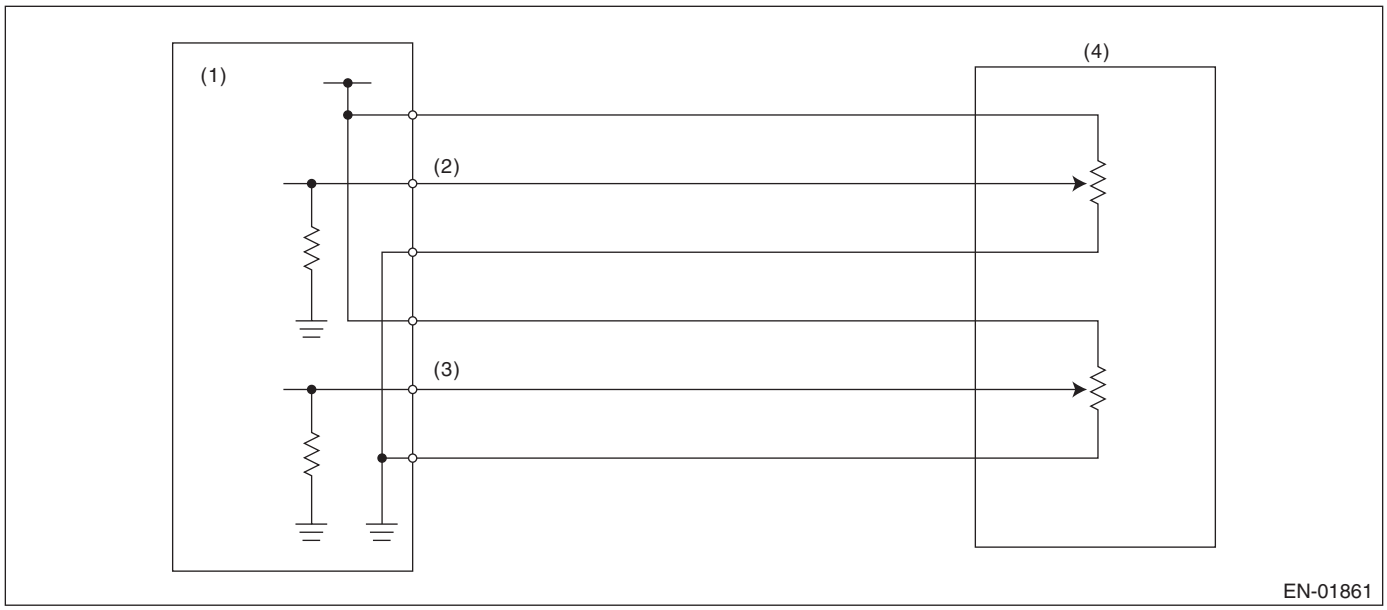
Memorize the freeze frame data. (For test mode $02)

DV: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 NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
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 malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

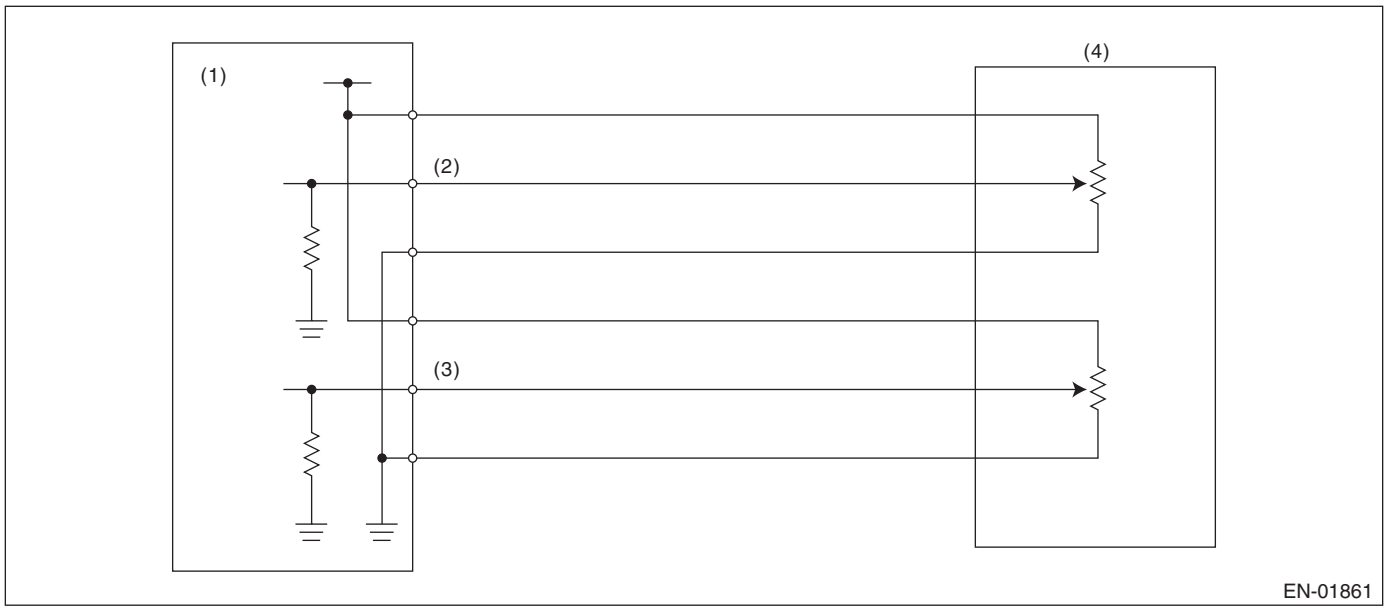
Memorize the freeze frame data. (For test mode $02)

DW: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 NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
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 malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

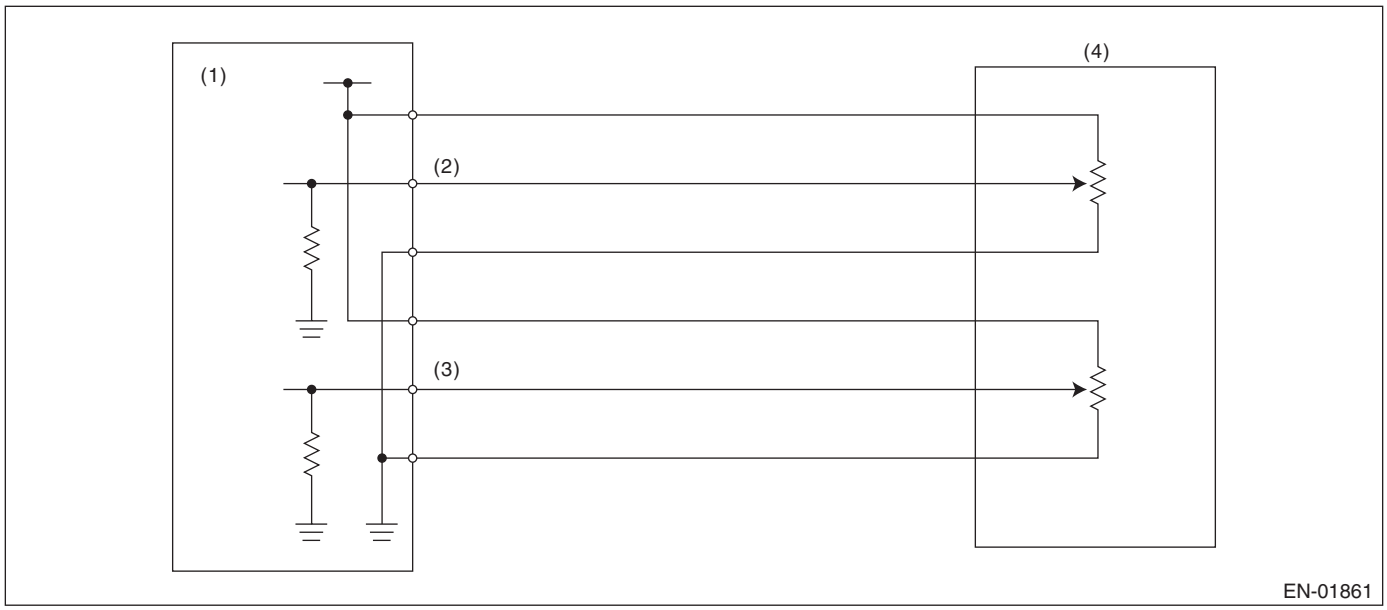
Memorize the freeze frame data. (For test mode $02)

DX: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 NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
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 malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

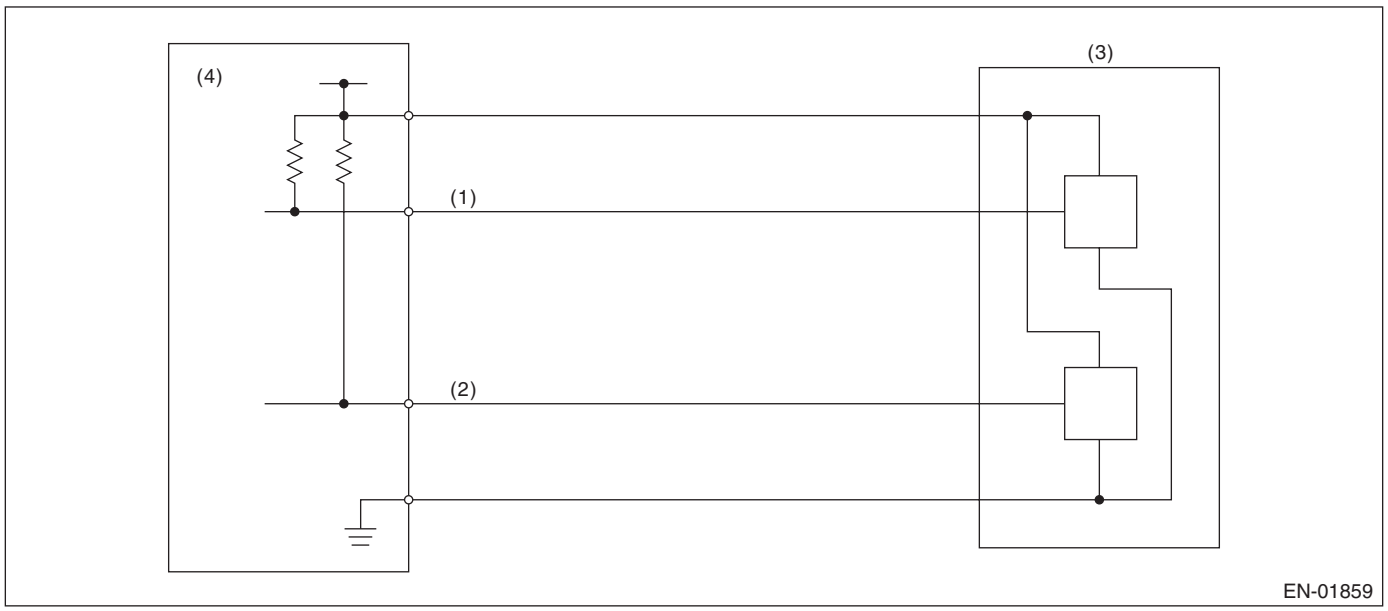
Memorize the freeze frame data. (For test mode $02)

DY:DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY —

1. OUTLINE OF DIAGNOSIS

Judge 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.

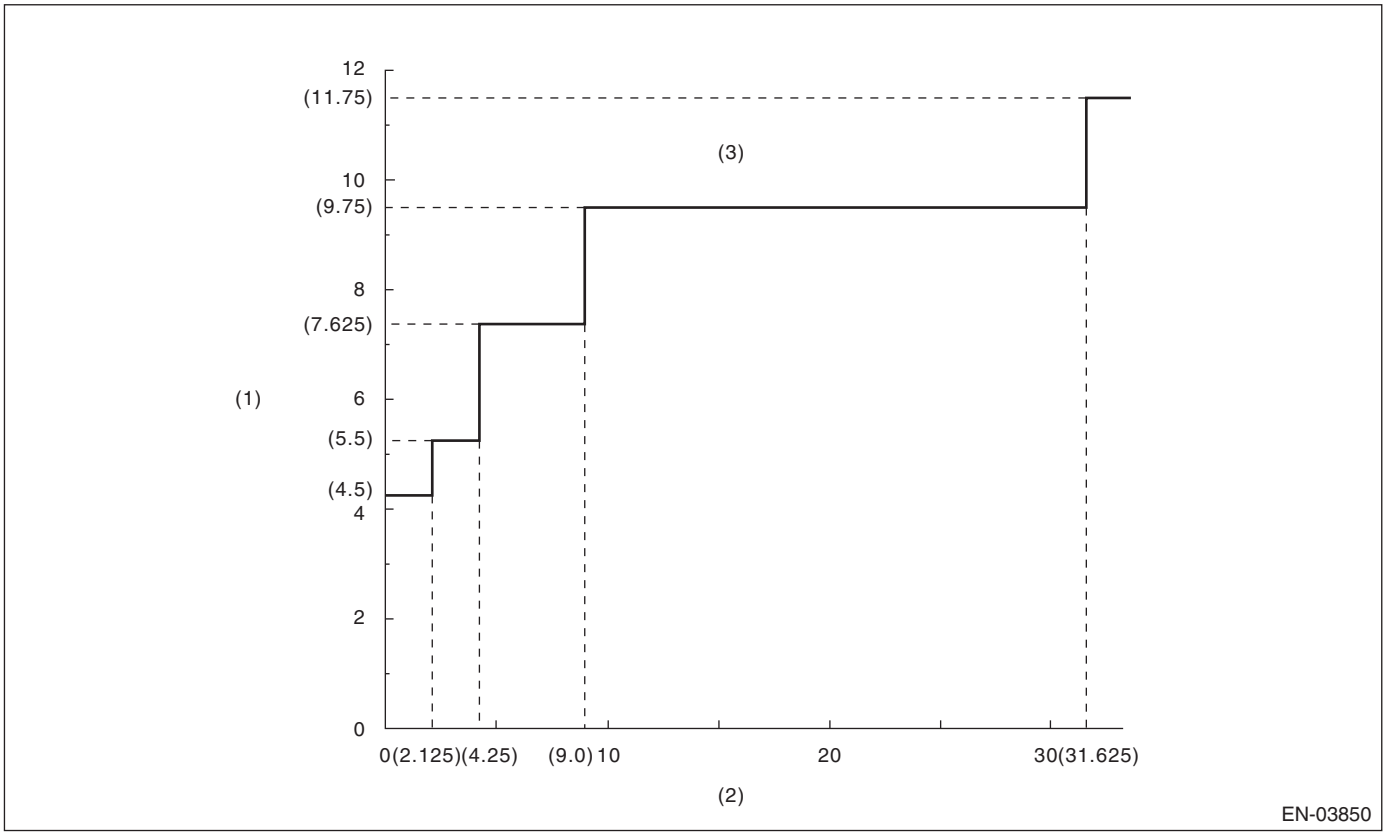
5. DIAGNOSTIC METHOD

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

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≤ 4.5 deg

Details of Judgment Value



(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 malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

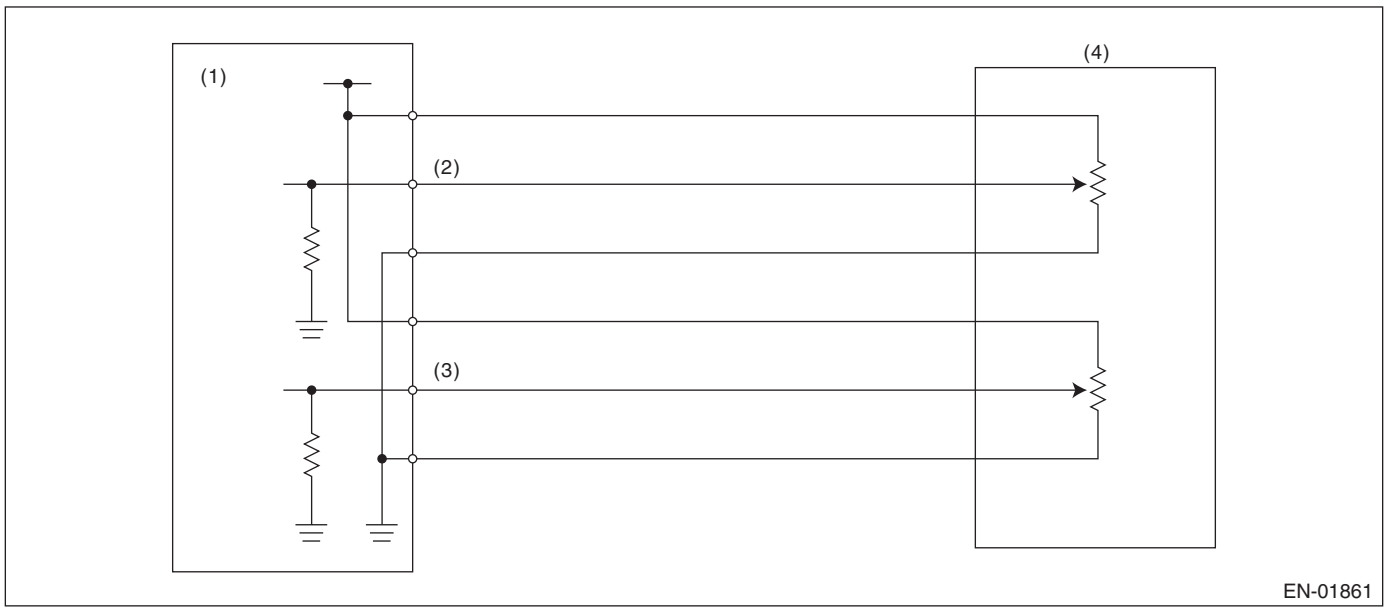
Memorize the freeze frame data. (For test mode $02)

DZ:DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY —

1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

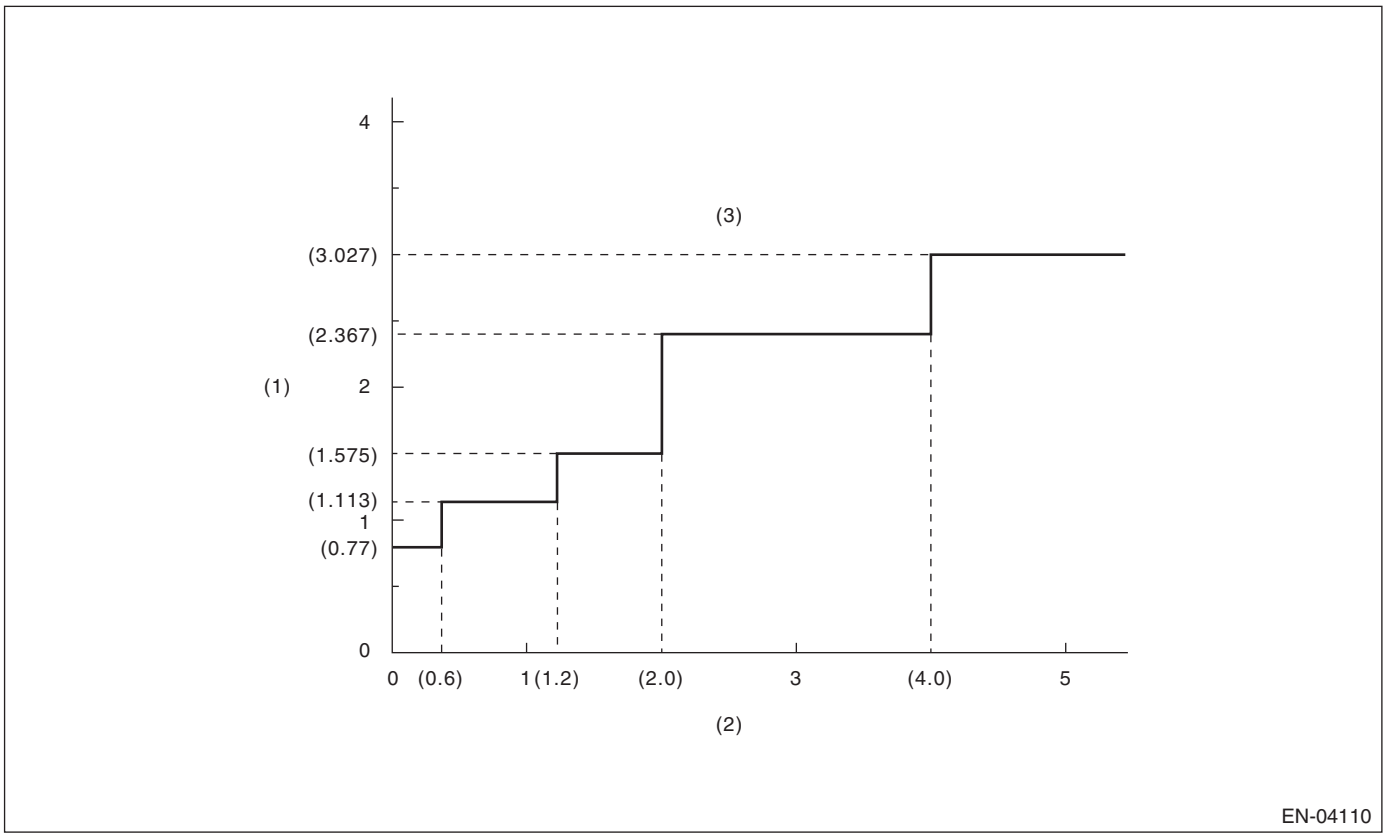
5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≥ 0.77 deg

Details of Judgment Value



(1) Sensor output difference (°)
(2) Accelerator pedal position sensor 2 opening angle (°)
(3) NG area

Time Needed for Diagnosis:
- 116 milliseconds (For NG)
- 1000 milliseconds (For OK)

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

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was 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)

EA:DTC P2227 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property. Judge NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine starting.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 300 rpm
Vehicle speed	< 1 km/h (0.62 MPH)

4. GENERAL DRIVING CYCLE

Perform the diagnosis once before engine starting with the ignition switch ON.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
|Atmospheric – manifold absolute pressure|	≥ 26.7 kPa (200 mmHg, 7.88 inHg)
|Intake manifold pressure at engine starting – Manifold absolute pressure|	< 1.33 kPa (10 mmHg, 2.95 inHg)

Time Needed for Diagnosis: 0.3 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.26 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric – Manifold absolute pressure	< 26.7 kPa (200 mmHg, 7.88 inHg)

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

9. ECM OPERATING AT DTC SETTING

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

EB:DTC P2228 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 0.118 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 0.118 V

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

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

EC:DTC P2229 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 4.936 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

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

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 4.936 V

6. DTC CLEAR CONDITION

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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

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

TRANSMISSION SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.