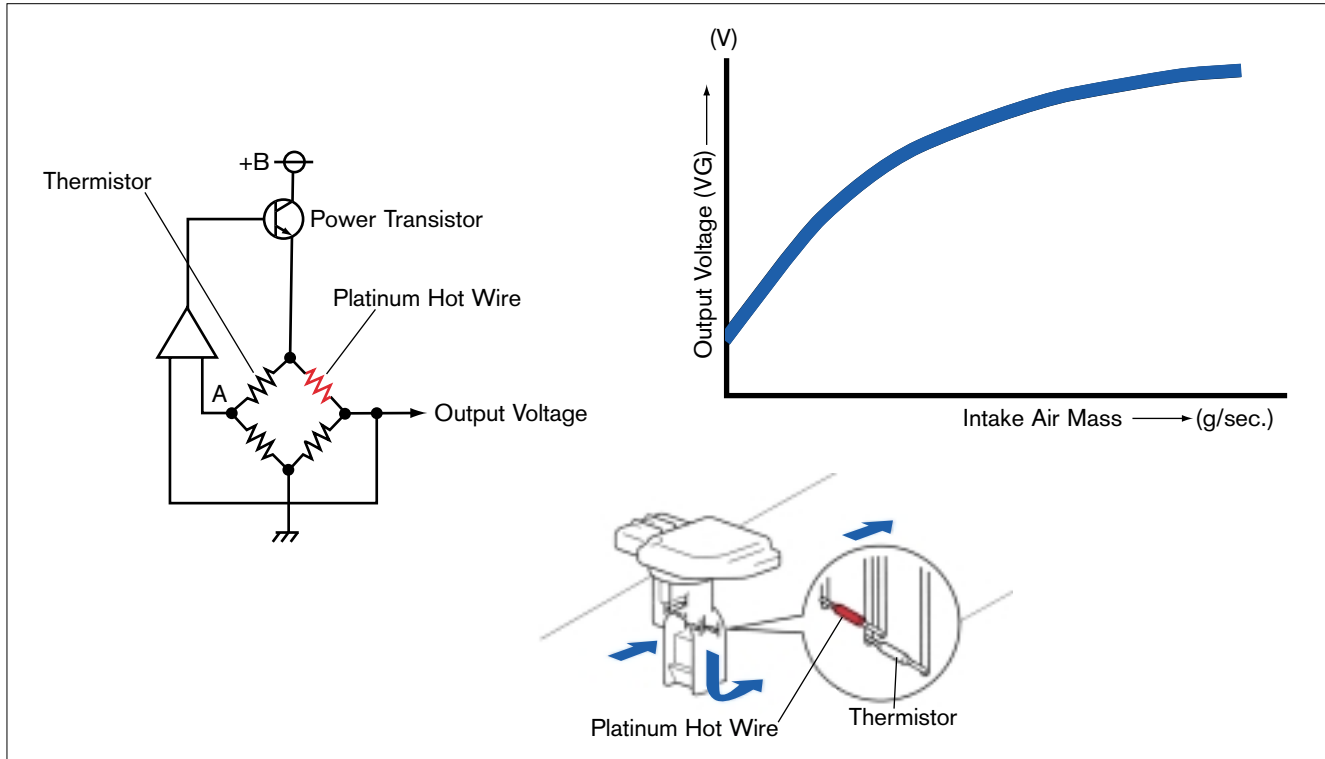


Section 3

Comprehensive Component Monitor Diagnosis



Learning Objectives:

1. Determine engine systems operation and identify faulty comprehensive components based on Data List information.
2. Explain the basic enable strategies and detecting conditions used for assessing comprehensive components and circuits.

Section 3

Comprehensive Component Monitor Diagnosis

Overview The comprehensive component monitor is used to monitor individual component operation. In many ways this is similar to the OBD systems. The comprehensive component monitor, like OBD, monitors for opens or shorts in the component or its circuit, however it also has the ability to determine the performance of a component/circuit. The ECM does this by determining if the signal is rational. For example, a MAF voltage signal of 3.0 volts with the throttle closed is not rational.

If it affects vehicle emissions, but is not part of the other monitored systems, it is a comprehensive component.

Many comprehensive components have two types of DTCs. An open, a short, or no response is a one trip DTC. A performance problem is usually a two trip DTC.

NOTE

The best source of this code setting parameter information is the Repair Manual specific to that vehicle. Some parameters may not be outlined but should be assumed, i.e. engine at operating temperature. Carefully study the information given to determine what must occur before DTC will be recorded. Remember the DTC may be the result of an out-of-spec system monitor, not a component that has failed.

ECM Detection Range Example

This graph displays the detection range for the ECT sensor. OBD II tests for these conditions and for ECT sensor performance.

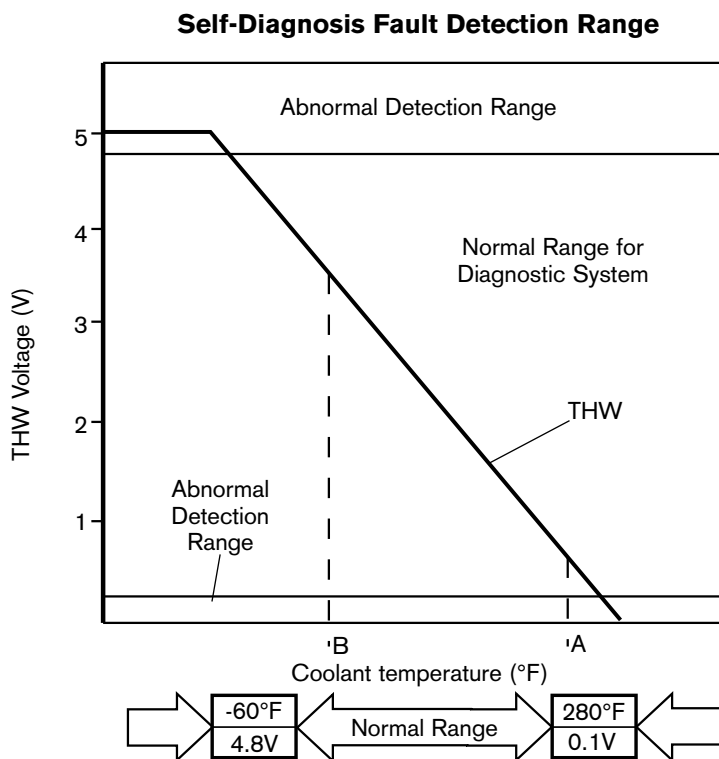


Fig. 3-1

TL874f301

MAF Sensor Circuit

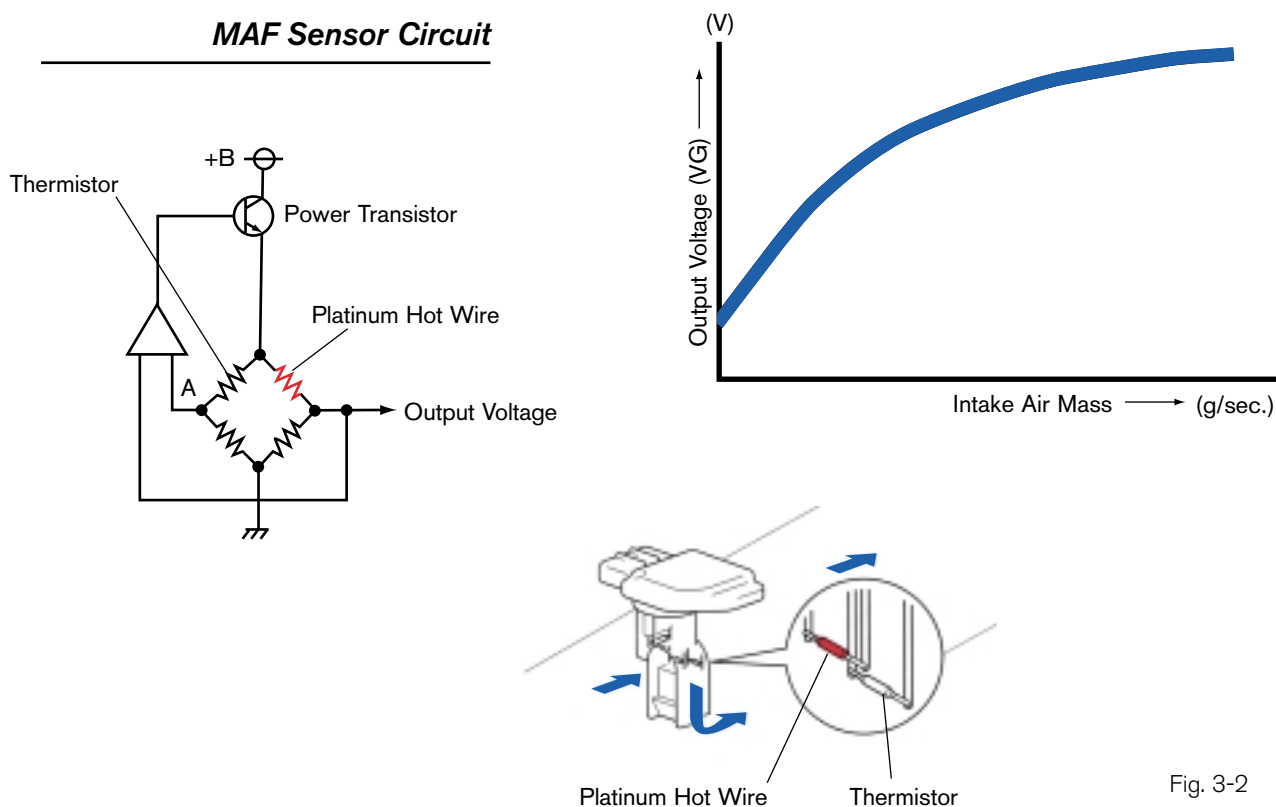


Fig. 3-2

TL874f302

Mass Air Flow (MAF) Sensor Circuit

There are two DTCs directly applicable to the MAF circuit. DTC P0100 is set when an open or short occurs in the MAF circuit. It is a one trip DTC and has Fail-Safe strategy. The Fail-Safe Strategy fixes the ignition timing and the on time of the fuel injectors according to engine conditions.

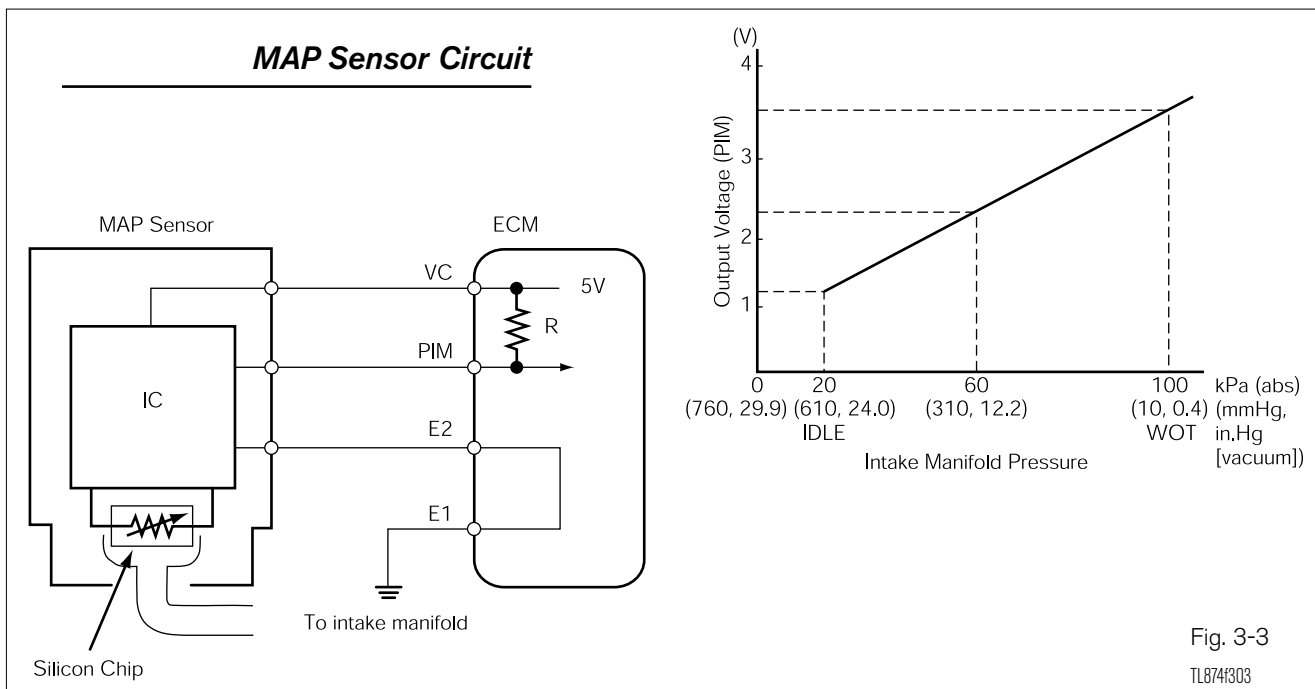
DTC P0101 has three different conditions to detect MAF sensor/circuit failure. ECM is comparing the MAF signal against the expected MAF signal when compared to throttle position and engine speed.

P0100 Mass Air Flow Sensor Circuit

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Time > 3 sec. Engine Speed ≥ 4000 rpm	0.0 gm.sec or 271 gm/sec	1	Fail-Safe Mode Ignition timing fixed Injection on time fixed

P0101 Mass Air Flow Circuit Range/Performance

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Engine warmed up Throttle Valve fully closed Engine Speed ≥ 1000 rpm Time ≥ 10 sec.	MAF output > 2.2V	2	
Engine Speed ≥ 2000 rpm Time ≥ 6 sec. VTA ≥ 0.64V	MAF output < 1.0V	2	



Manifold Absolute Pressure (MAP) Sensor Circuit

The ECM will set DTC P0105 when there is an open or short in the circuit. There is a Fail-Safe strategy when this condition is detected. DTC P0106 is a performance condition based on logic. ECM is comparing the MAP signal against the expected MAP signal when compared to throttle position and engine speed.

P0105 Manifold Absolute Pressure/Barometric Pressure Circuit Malfunction

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Key ON	MAP 0kPa or > 130kPa	1	Fail-Safe Mode Ignition timing fixed (5° BTDC)

P0106 Manifold Absolute Pressure Circuit Range/Performance Problem

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Engine warmed up Throttle Valve fully closed Engine speed 400-1000 rpm Time ≥ 10 sec.	MAP output > 3.0V	2	
Engine Speed 2500 rpm Time ≥ 5 sec. VTA ≥ 1.85V	MAP output < 1.0V	2	

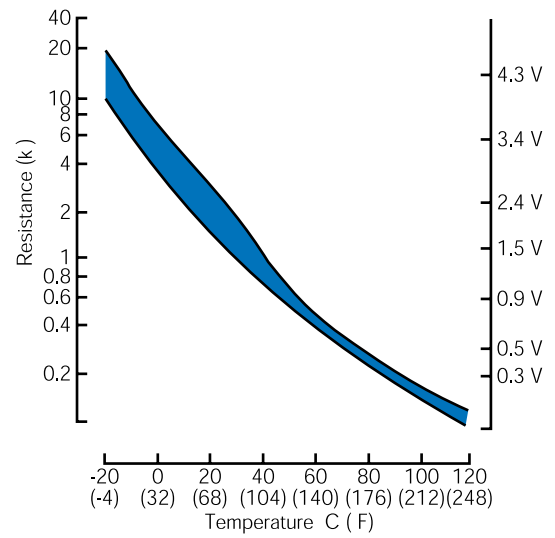
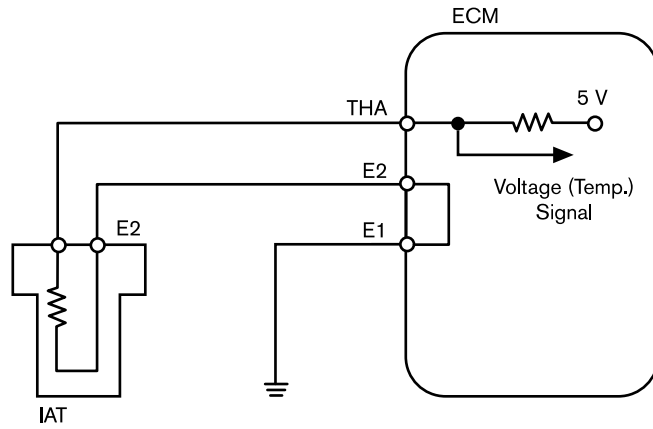
IAT Sensor Circuit

Fig. 3-4

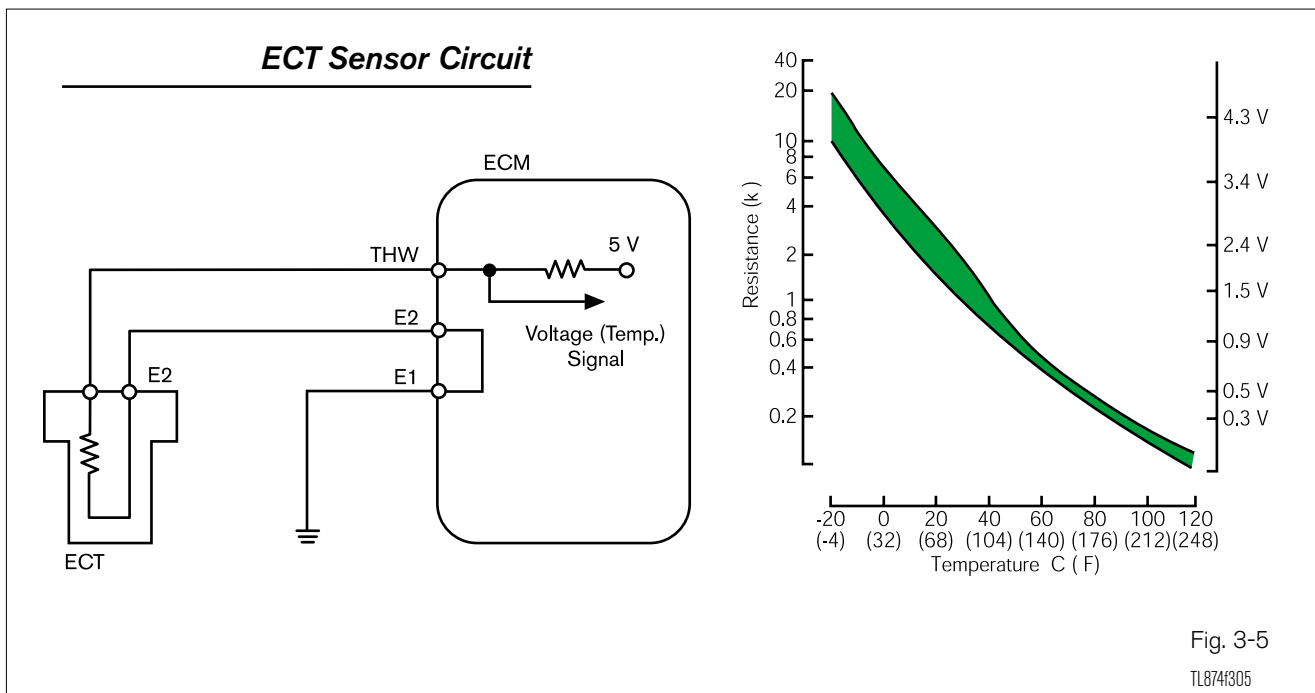
TL874f304

Intake Air Temperature (IAT) Sensor Circuit

The ECM detects an open or short in the IAT circuit. This is a one trip DTC with a Fail-Safe function.

P0110 Intake Air Temperature Sensor Circuit

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Key ON	Temperature -40°C (40°F) or $\geq 140^{\circ}\text{C}$ (284°F)	1	Fail-Safe Mode ECT is fixed @ 20°C (68°F)



Engine Coolant Temperature (ECT) Sensor Circuit

There are two DTCs that can set for the ECT sensor circuit. The first DTC P0115 is for an open or short in the circuit. Note that this is a one trip DTC and that the ECM strategy is to go to Fail-Safe Mode and substitute a value.

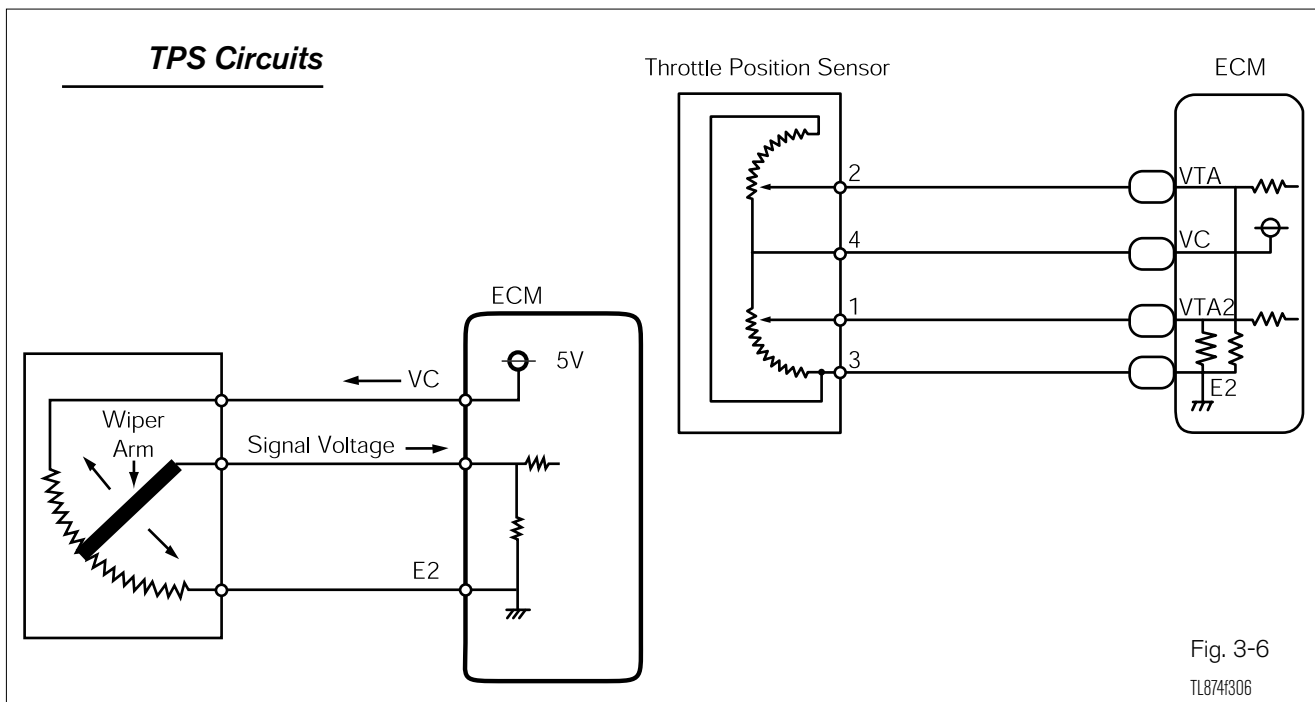
P0110 Engine Coolant Temperature Sensor Circuit

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Key ON	Temperature -40°C (40°F) or $\geq 140^{\circ}\text{C}$ (284°F)	1	Fail-Safe Mode ECT is fixed @ 80°C (176°F)

The second DTC is set when the ECT sensor does not change its signal according to the ECM logic. The ECM has been programmed to measure how quickly the ECT sensor changes as the engine warms up. This is a two trip DTC. Note the different temperature ranges the ECM uses to see if the ECT circuit is functioning correctly.

P0116 Engine Coolant Temperature Circuit Range/Performance Problem

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
If THW < -7°C (19.4°F) or THA < -7°C (19.4°F) @ Engine Start Time ≥ 20 min.	ECT Sensor is: ≤ 30°C (86°F) Non CA ≤ 20°C (68°F) CA	2	
If THW ≥ -7°C (19.4°F) and < 10°C (50°F) @ Engine Start Time ≥ 5 min. OR THA ≥ 10°C (50°F) @ Engine Start Time ≥ 2 min.	ECT Sensor is: ≤ 30°C (86°F) Non CA ≤ 20°C (68°F) CA	2	
When THW ≥ 35°C (95°F) and 60°C (140°F), THA ≥ -7°C (19.4°F) @ Engine Start	Vehicle speed not stable ECT temp change lower 3°C (37.4°F) than when engine started	2	



Throttle Position Sensor (TPS) Circuit

DTC P0120 is a one trip DTC that sets when the TPS circuit shows either open circuit voltage or closed circuit voltage.

For DTC P0121, the ECM looks at the VTA voltage from the TPS as the vehicle decelerates from 19 mph to 0 mph. The ECM compares the VTA voltage to its preprogrammed specifications to determine if the TPS is out of range. This is a one trip DTC.

P0120 Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Key ON Time ≤ 5 sec.	VTA < 0.1V or VTA > 4.9V	1	Fail-Safe Mode VTA is fixed at 0 degrees

NOTE

Throttle valve either fully closed (approx. 0%) or fully opened (approx. 100%)

P0121 Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Vehicle speed has exceeded 19 mph (30 (km/h)). Vehicle speed drops from 19 mph (30 km/h) or more to 0 mph (0 km/h), output value of the TPS is out of applicable range	VTA voltage out of range VTA < 0.7V or ≥ 5.2V	1	

NOTE These DTCs are covered in detail with the appropriate system monitor.

P0125 Insufficient Coolant Temp. for Closed Loop Fuel Control

P0130/P0150 Heated O2 Sensor Circuit Malfunction (B1,S1/B2,S1)

P0133/P0153 Heated O2 Sensor Circuit Slow Response (B1,S2/B2,S2)

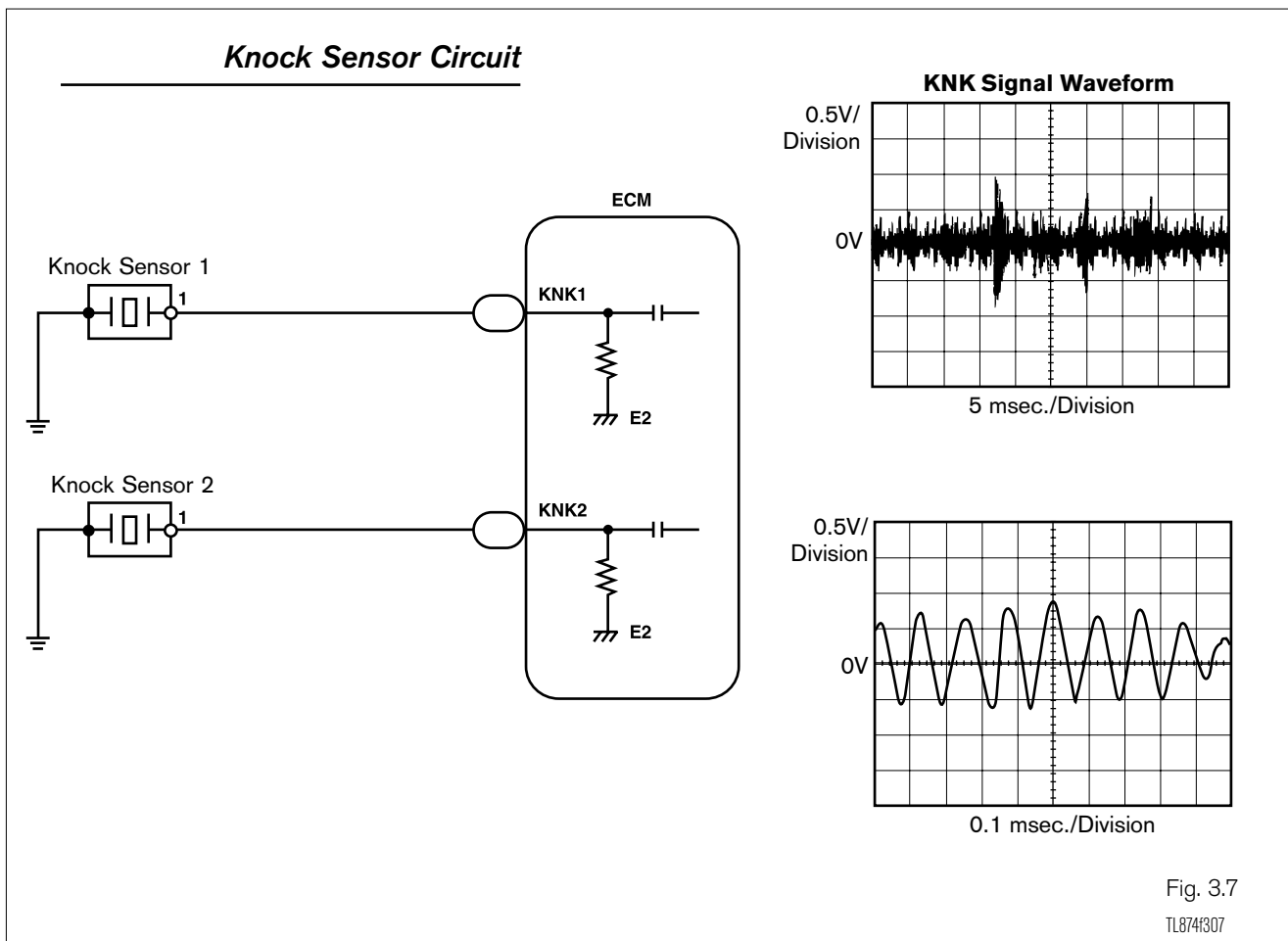
***P0135/P0141/P0155/P0161 Heated O2 Sensor Heater Malfunction
(B1,S1/B1,S2/B2,S1/B2/S2)***

***P0136/P0156 Heated O2 Sensor Circuit Malfunction (B1,S2/B2,S2)
See O2 and A/F Sensor Diagnostics section***

***P0171, P0174 System Too Lean (Fuel Trim)
See Fuel System Diagnostics section***

***P0172, P0175 System Too Rich (Fuel Trim)
See Fuel System Diagnostic section***

***P0300/P0301/P0302/P0303/P0304/P0305/P0306/P0307/P0308 Cylinders Misfire Detected
See Engine Misfire Diagnostic section***



Knock Sensor Circuit

The ECM looks for a signal from the knock sensor when the engine is operating under certain conditions. If the signal is not present, the ECM will retard the timing and the driver may notice a loss of power. The MIL will come on during the first trip.

P0325 Knock Sensor 1 Circuit

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Engine Speed 2000-5600 rpm	No Knock Sensor signal at the ECM	1	Fail-Safe Mode MIL ON Steady Max Timing retarded

P0330 Knock Sensor 2 Circuit

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Engine Speed 2000-5600 rpm	No Knock Sensor signal at the ECM	1	Fail-Safe Mode MIL ON Steady Max Timing retarded

Camshaft and Crankshaft Position Sensor Circuits

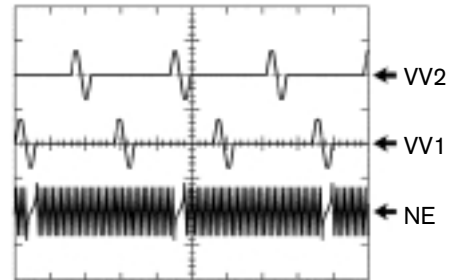
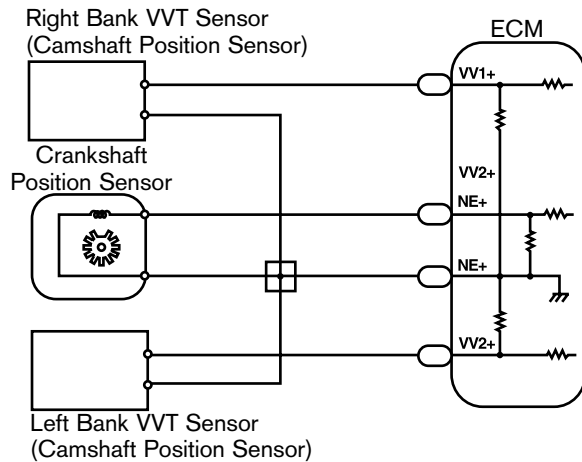


Fig. 3-8

TL874f308

Crankshaft Position Sensor Circuit The ECM has two modes for detecting a fault in the crankshaft position sensor circuit and they both set the same DTC.

P0335 Crankshaft Position Sensor "A" Circuit Malfunction

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Engine Cranking	No Crankshaft Position Sensor signal received by ECM	2	
Engine Speed \geq 600 rpm	No Crankshaft Position Sensor signal received by ECM	2	

Camshaft Position Sensor Circuit The ECM has two modes for detecting a fault in the camshaft position sensor circuit and they both set the same DTC.

P0340 Camshaft Position Sensor Circuit Malfunction

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Engine Cranking	No Camshaft Position Sensor signal received by ECM	2	
Engine Speed \geq 600 rpm	No Camshaft Position Sensor signal received by ECM	2	

P0420/P0430 Catalyst System Efficiency Below Threshold (B1/B2)
See Catalytic Converter Diagnosis section

P0440 Evaporative Emission Control System Malfunction

P0441 Evaporative Emission Control System Incorrect Purge Flow

P0446 Evaporative Emission Control System/Vent Control System Malfunction

See Evaporative System Diagnostic section

NOTE

These DTCs are the results of System Monitors.

Vehicle Speed Sensor Circuits

There are many styles of speed sensor circuits. When diagnosing a vehicle speed sensor DTC, also refer to other relevant sections such as combination meter or ABS.

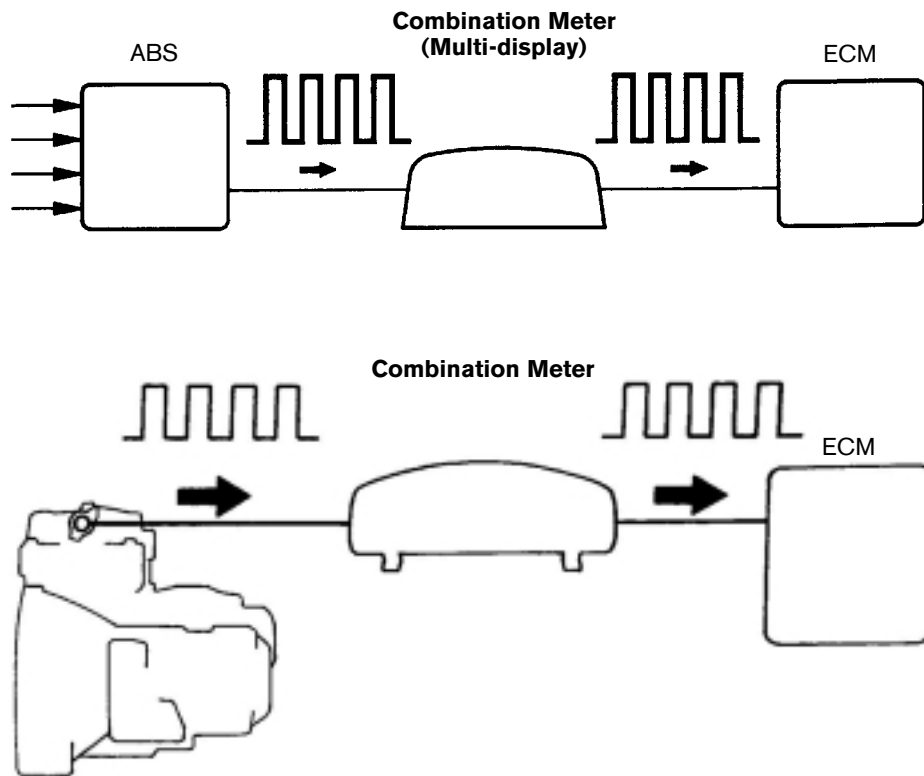


Fig. 3-9

TL874f309

Vehicle Speed Sensor Circuit

The ECM determines the vehicle speed based on the frequency of the pulse signals from the speed sensor. The speed sensor signal can come from the transmission/transaxle or ABS ECU.

P0500 Vehicle Speed Sensor Malfunction

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Park/Neutral switch is OFF Vehicle is being driven	No vehicle speed signal to ECM	2	

Idle Air Control (IAC)

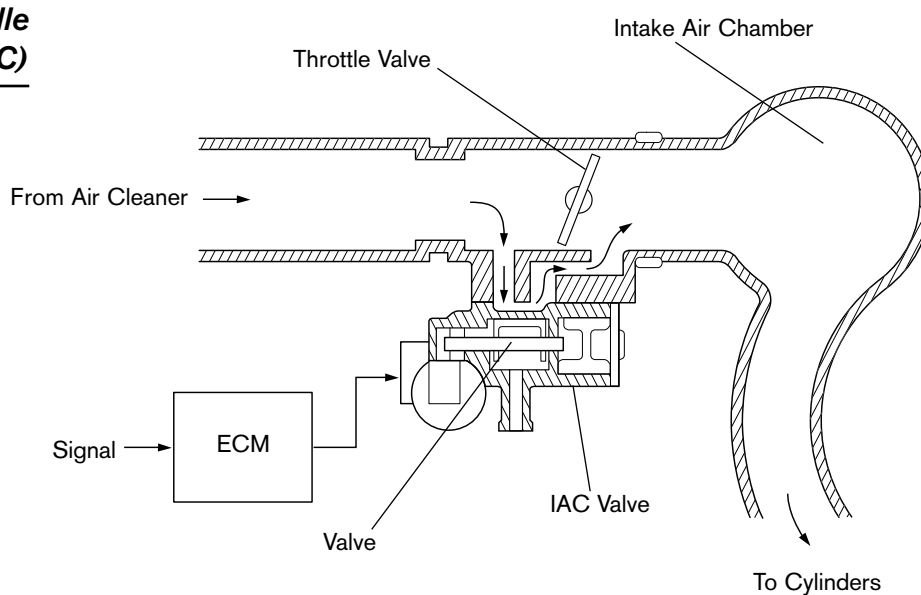


Fig. 3-10

TL874f310

Idle Air Control (IAC)

The ECM compares the actual engine idle speed to its target idle speed. If it is out of range, as determined by the ECM, the DTC will set, and the MIL will light on the second trip.

P0505 Idle Air Control Malfunction

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Engine running @ idle	Idle Speed varies greatly from Target Idle	2	

Accelerator Pedal Position Sensor Circuit

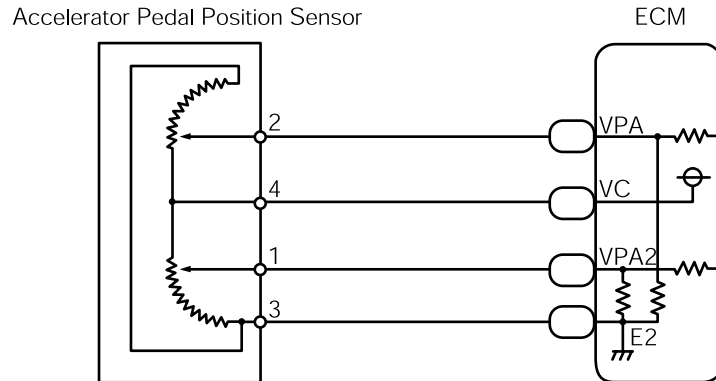


Fig. 3-11

TL874f311

Acceleration Pedal Position Sensor Circuit

DTC P1120 is a one trip DTC that sets when the accelerator pedal position sensor either shows an open or short in the circuit.

DTC P1121, the ECM calculates the output voltages between VPA and VPA2 and compares with its preprogrammed specifications to determine if the sensors are out of range.

P1120 Accelerator Pedal Position Sensor Circuit Malfunction

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Key ON	$VPA \leq 0.2V$ $VPA2 \leq 0.5V$ $VPA \geq 4.8V$ $VPA \geq 0.2V$ and $\leq 1.8V$, and $VPA2 \geq 4.97V$ Time ≥ 2 sec. OR $VPA \leq 0.2V$ and $VPA2 \leq 1.5V$ $VPA - VPA2 \leq 0.02V$ Time ≥ 0.4 sec.	1	Fail-Safe Mode

P1121 Accelerator Pedal Position Sensor Range/Performance Problem

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Key ON	Difference between VPA and VPA2 is out of threshold	1	Fail-Safe Mode

Throttle Control Motor Circuit

DTC P1125, ECM judges the throttle motor current value to determine if there is an open or short in the circuit. This is a one trip DTC.

P1125 Throttle Control Motor Circuit Malfunction

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Engine running	Throttle Control Motor output duty $\geq 80\%$ Throttle Control Motor current $\leq 0.5V$ Time = 0.5 sec. OR Throttle Control Motor current $\geq 16A$ OR Throttle Control Motor current $\geq 7A$ Time = 0.6 sec.	1	Fail-Safe Mode

Electro-magnetic Clutch Circuit

DTC P1126, ECM judges the current value to determine if there is an open or short in the circuit. This is a one trip DTC.

P1126 Electromagnetic Circuit Malfunction

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Key ON	Magnetic clutch current $\geq 1.4A$ or $\leq 0.4A$ Time = 0.8 sec. OR Magnetic clutch current $\geq 1.0A$ or $\leq 0.8A$ Time = 1.5 sec.	1	Fail-Safe Mode

ETCS Actuator Power Source Circuit

DTC P1127 is set when there is no current supplied to the ECM from the ETCS switch. This is a one trip DTC.

P1127 ETCS Actuator Power Source Circuit Malfunction

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Key ON	No current supplied to +BM terminal of ECM	1	Fail-Safe Mode

Throttle Control Motor Lock DTC P1128 is set when signal from TPS indicates that the throttle valve-opening angle is not in response with the driving condition.

P1128 Throttle Control Motor Lock Malfunction

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Engine running	Locked throttle control motor during throttle control motor mode.	1	Fail-Safe Mode

Electronic Throttle Control System DTC P1129 sets when the ETCS either electrically or mechanically malfunctions.

P1129 Electronic Throttle Control System Lock Malfunction

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Key ON	Throttle opening angle varies greatly in comparison to the target throttle opening angle	1	Fail-Safe Mode

NOTE P1120, P1121, P1125, P1126, P1127, P1128, P1129 DTCs are found in vehicles equipped with Electronic Throttle Control System (ETCS). Always refer to Repair Manual for further information.

P1130/P1150 A/F Sensor Circuit Range/Performance Malfunction (B1,S1/B2,S1)

P1133/P1153 A/F Sensor Circuit Response Malfunction (B1,S1/B2,S1)

P1135/P1155 A/F Sensor Heater Circuit Malfunction (B1,S1/B2,S1)

See O2 and A/F Sensor Diagnosis section

NOTE These DTCs are the results of System Monitors. Refer to the appropriate section for more information.