

# DTC P0646 or P0647

## Circuit Description

The following DTCs are for the A/C compressor clutch relay:

- DTC P0646 A/C clutch relay control circuit low voltage.
- DTC P0647 A/C clutch relay control circuit high voltage.

Ignition voltage is supplied directly to the A/C compressor clutch relay. The engine control module (ECM) controls the relay by grounding the control circuit via an internal solid state device called a driver. The primary function of the driver is to supply the ground for the component being controlled. Each driver has a fault line which is monitored by the ECM. When the ECM is commanding a component ON, the voltage of the control circuit should be near 0 volts. When the ECM is commanding the control circuit to a component OFF, the voltage potential of the circuit should be near battery voltage. If the fault detection circuit senses a voltage other than what is expected, this DTC will set.

## Conditions for Running the DTC

- The ignition must be ON and the voltage must be between 9.0–18.0 volts.
- The ECM driver is activated or deactivated.

## Conditions for Setting the DTC

- The ECM detects an improper voltage level on the output circuit that controls the A/C relay.
- The condition is present for at least 5 seconds.

## Action Taken When the DTC Sets

- The ECM will not illuminate the malfunction indicator lamp (MIL).
- The ECM will not store Freeze Frame or Failure Records.
- The A/C compressor clutch is disabled for the ignition cycle.

## Conditions for Clearing the DTC

- The DTC will become history if the ECM no longer detects a failure.
- The history DTC will clear after 40 fault-free ignition cycles.
- The DTC can be cleared with a scan tool.

## Test Description

The numbers below refer to the step numbers on the diagnostic table.

- Listen for an audible click when the A/C compressor clutch relay operates. Command both the ON and OFF states. Repeat the commands as necessary.
- Tests for voltage at the coil side of the A/C compressor clutch relay. The 10-amp fuse supplies power to the coil side of the A/C compressor clutch relay.
- Verifies that the engine control module is providing ground to the A/C compressor clutch relay. If light always on circuit shorted to ground.
- Tests for a short to voltage or an open.
- If the A/C fuse is open ensure to test the A/C compressor clutch supply voltage circuit for short to ground.

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Step	Action	Yes	No
<b>Schematic Reference: HVAC Schematics on page 1-4</b>			
<b>Connector End View Reference: HVAC Connector End Views on page 1-21</b>			
1	Did you perform the Vehicle Diagnostic System Check?	Go to Step 2	Go to Diagnostic System Check - Vehicle in Vehicle DTC Information

Step	Action	Yes	No
2	<p>1).Install a scan tool.</p> <p>2).Turn ON the ignition, with the engine OFF.</p> <p>3).With a scan tool, command the A/C Relay ON and OFF in the HVAC Systems Automatic Special Functions, HVAC list.</p> <p>Does the A/C Relay turn ON and OFF with each command?</p>	Go to Testing for Intermittent and Poor Connections on Systems	Go to Step 3
3	<p>1).Turn OFF the ignition.</p> <p>2).Disconnect the A/C compressor clutch relay.</p> <p>3).Turn ON the ignition, with the engine OFF.</p> <p>4).Probe the battery positive voltage circuit of the A/C compressor clutch relay with a test lamp that is connected to a good ground</p> <p>Does the test lamp illuminate?</p>	Go to Step 4	Go to Step 8
4	<p>1).Connect a test lamp between the control circuit of the A/C compressor clutch relay and the battery positive voltage circuit of the A/C compressor clutch relay.</p> <p>2).With a scan tool, command the A/C Relay ON and OFF. Does the test lamp turn ON and OFF with each command?</p>	Go to Step 6	Go to Step 5
5	Test the control circuit of the A/C compressor clutch relay for a short to ground, short to voltage or an open. Did you find and correct the condition?	Go to Step 11	Go to Step 7
6	Inspect for poor connections at the A/C compressor clutch relay. Did you find and correct the condition?	Go to Step 11	Go to Step 9
7	Inspect for poor connections at the harness connector of the engine control module. Did you find and correct the condition?	Go to Step 11	Go to Step 10

Step	Action	Yes	No
8	Repair the battery positive voltage circuit of the A/C compressor clutch relay. Did you complete the repair?	Go to Step 11	—
9	Replace the A/C compressor clutch relay. Did you complete the replacement?	Go to Step 11	—
10	Important: Perform the recalibration procedure for the engine control module. Replace the engine control module. Did you complete the replacement?	Go to Step 11	—
11	1).Use the scan tool in order to clear the DTCs. 2).Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	Go to Step 2	System OK

LAUNCH