HVAC Compressor Clutch Does Not Engage

Diagnostic Aids

The air conditioning (A/C) compressor clutch will not engage under the following conditions:

- The A/C high side line pressure is over 2 957 kPa (429 psi).
- The A/C low side line pressure is under 138-172 kPa (20-25 psi).
- The throttle angle is at 100 percent.
- The engine speed is more than 5,500 RPM.
- The engine coolant temperature (ECT) is more than 121°C (250°F).
- The ambient air temperature (AAT) is less than 5°C (40°F).
- The engine is idling at a low unstable RPM.

Compressor clutch engagement cannot be used to determine the status of the low pressure switch. The low pressure switch is one of several inputs to the HVAC control module for A/C request authorization. A/C request is one of several inputs to the powertrain control module (PCM) that control A/C compressor clutch engagement.

To accurately determine what pressure the A/C low pressure switch opens and closes at use Kent Moore GE-47742 which will allow the technician to measure the switch point pressure at the switch.

Using a scan tool, monitor the "low pressure switch" status while monitoring the "low side" pressure at the switch to determine the switch points of the low pressure switch.

The low pressure switch "connector seal" must be removed before plugging it into the switch for testing. The "plunger effect" of plugging the connector with seal into the switch induces a pressure on the back side of the switch, this pressure will skew the opening/closing characteristics of the switch 5-10 psi until the pressure bleeds off. The time required for the connection induced pressure to bleed off can take 20 minutes or longer.

Test Description

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

2. The A/C compressor output is disabled if the engine is idling at a low unstable RPM.

3. The A/C compressor relay output is disabled if ECT is above 121°C (250°F). The Engine Coolant indicator will illuminate at this temperature.

4. This step ensures that the HVAC control module is receiving an input from the A/C switch.

5. These actions will enable the A/C compressor to operate.

6. This test ensures that there is sufficient refrigerant in the A/C system. The specific values come from the A/C System Performance Test in Heating, Ventilation and Air Conditioning.

8. The A/C Low Pressure Switch parameter is out of range when the HVAC control module interprets the signal being below 138-172 kPa (20-25 psi).

9. This action will simulate a closed switch condition. If the Pressure Cycle Switch parameter reads Low Pressure than there is a circuit condition or a condition with the HVAC control module.

12. The A/C compressor relay output from the PCM is disabled if the A/C high side system pressure is interpreted to be higher than 2 958 kPa (429 psi).

Step	Action	Values	Yes	No
Schematic Reference: HVAC Schematics *Connector End View Reference:* HVAC Connector End Views DEFINITION: The A/C compressor clutch will not engage when an A/C request has been made and a Powertrain DTC has not been set.				
1	Did you perform the Diagnostic System Check - HVAC Systems - Manual?	--	Go to Step 2	Go to Diagnostic System Check - HVAC Systems - Manual
2	1. Start the engine. 2. Set the parking brake. 3. Place the vehicle in Drive, and allow the engine to idle. 4. Observe the engine RPM. Does the engine idle at a steady RPM?	--	Go to Step 3	Go to Rough, Unstable, or Incorrect Idle and Stalling in Engine Controls - 4.8L, 5.3L and 6.0L, Rough, Unstable, or Incorrect Idle and Stalling in Engine Controls - 4.3L, Rough, Unstable, or Incorrect Idle and Stalling in Engine Controls - 6.6L (LB7), or Rough, Unstable, or Incorrect Idle and Stalling in Engine Controls - 8.1L
3	1. Start the engine. 2. Observe the Coolant Temperature indicator. Is the engine coolant temperature (ECT) indicator illuminated?	--	Go to Diagnostic System Check - Engine Cooling in Engine Cooling	Go to Step 4
4	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the A/C Switch parameter in the Heating and Air Conditioning data list. 4. Activate the A/C request switch. Does the scan tool indicate	--		

	that the A/C Switch parameter changes states?		Go to Step 5	Go to Step 26
5	**Important:** For A/C compressor operation, the ambient air temperature (AAT) must be above 5°C (40°F). 1. Start the engine. 2. Place the blower motor switch in the maximum speed position. 3. Place the A/C request switch in the ON position. 4. Place the left air temperature switch in the coldest position. Does the A/C compressor clutch engage?	--	Go to Testing for Intermittent Conditions and Poor Connections in Wiring Systems	Go to Step 6
6	1. Park the vehicle inside or out of direct sunlight. 2. Open the window in order to ventilate the interior of the vehicle. 3. Turn OFF the ignition. 4. If the A/C system was operating, then wait for approximately 2 minutes. 5. Install the J 43600 ACR 2000 Air Conditioning Service Center. 6. Record the ambient temperature at the vehicle. 7. Record readings of the low and high side STATIC pressures. 8. Compare the low and the high side pressure values with the allowable limits for the recorded AAT. Are the low and the high side pressure values within the allowable limits for the recorded AAT? Are the pressure values within 103 kPa (15 psi) of each other?	Above 16°C (60°F) 345 kPa (50 psi) Above 24°C (75°F) 483 kPa (70 psi) Above 33°C (90°F) 690 kPa (100 psi)	Go to Step 7	Go to Leak Testing in Heating, Ventilation and Air Conditioning
	1. Start the engine. 2. With a scan tool, observe the A/C			

7	Permission parameter in the Heating and Air Conditioning data list. Does the A/C Permission parameter display Granted?	--	Go to Step 14	Go to Step 8
8	1. Turn the ignition OFF. 2. Turn ON the ignition, with the engine OFF. 3. With a scan tool, observe the Pressure Cycle Switch parameter in the Heating and Air Conditioning data list. Does the Pressure Cycle Switch parameter display Normal?	--	Go to Step 12	Go to Step 9
9	1. Turn OFF the ignition. 2. Disconnect the A/C low pressure switch. 3. Turn ON the ignition, with the engine OFF. 4. Connect a 3-amp fused jumper between the signal circuit and the ground circuit of the A/C low pressure switch. 5. Observe the Pressure Cycle Switch parameter in the Heating and Air Conditioning data list. Does the Pressure Cycle Switch parameter display Normal?	--	Go to Step 23	Go to Step 10
10	Test the signal circuit of the A/C low pressure switch for a high resistance or for an open. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	--	Go to Step 35	Go to Step 11
11	Test the ground circuit of the A/C low pressure switch for a high resistance or for an open. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the	--		

	condition?		Go to Step 35	Go to Step 23
12	With a DVOM, check the voltage on the A/C pressure sensor signal circuit. Is the voltage less than the specified value?	4.9 volts	Go to Step 26	Go to Step 13
13	1. Turn OFF the ignition. 2. If the A/C system was operating, then wait for approximately 2 minutes. 3. Install J 43600 . 4. Turn ON the ignition, with the engine OFF. 5. With a scan tool, observe the A/C Pressure Sensor parameter. 6. Compare the A/C Pressure Sensor parameter on the scan tool to the A/C high side pressure on J 43600 . Are the high side pressure values within 103 kPa (15 psi) of each other?	--	Go to Air Conditioning (A/C) System Performance Test in Heating, Ventilation and Air Conditioning	Go to Step 24
14	1. Start the engine. 2. With a scan tool, command the A/C Permission to Granted and Withheld. Does the relay turn ON and OFF with each command?	--	Go to Step 15	Go to Step 19
15	1. Turn OFF the ignition. 2. Test the battery positive voltage circuit of the A/C compressor clutch relay for a high resistance or for an open. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	--	Go to Step 35	Go to Step 16
	1. Turn OFF the ignition. 2. Connect a 10-amp fused jumper between the battery positive circuit of the A/C compressor			

16	relay and the A/C compressor supply voltage circuit. 3. Disconnect the A/C compressor connector. 4. Turn ON the ignition, with engine OFF. 5. Connect a test lamp between the A/C compressor supply voltage circuit and the ground circuit of the A/C compressor. Does the test light illuminate?	--	Go to Step 25	Go to Step 17
17	Test the supply voltage circuit of the A/C compressor clutch for a high resistance or for an open. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	--	Go to Step 35	Go to Step 18
18	Test the ground circuit of the A/C compressor clutch for a high resistance or for an open. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	--	Go to Step 35	Go to Step 22
19	1. Turn OFF the ignition. 2. Disconnect the A/C compressor clutch relay. 3. Turn ON the ignition, with the engine OFF. 4. Probe the ignition 3 voltage circuit of the A/C compressor clutch relay with a test lamp that is connected to ground. Does the test lamp illuminate?	--	Go to Step 20	Go to Step 28
20	1. Start the engine. 2. Connect a test lamp between the control circuit and the ignition 3 voltage circuit of the A/C compressor clutch relay. 3. With a scan tool, command the A/C	--		

	Permission to Granted. Does the test lamp illuminate?		Go to Step 22	Go to Step 21
21	1. Turn OFF the ignition. 2. Test the A/C compressor clutch control circuit of the A/C compressor clutch relay for a high resistance or for an open. Refer to Circuit Testing and Wiring Repairs in Wiring Systems. Did you find and correct the condition?	--	Go to Step 35	Go to Step 27
22	1. Turn OFF the ignition. 2. Inspect for poor connections at the A/C compressor clutch relay. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	--	Go to Step 35	Go to Step 29
23	Inspect for poor connections at the harness connector of the A/C low pressure switch. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	--	Go to Step 35	Go to Step 30
24	Inspect for poor connections at the harness connector of the A/C refrigerant pressure sensor. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	--	Go to Step 35	Go to Step 31
	Inspect for poor connections at the harness connector of the A/C compressor. Refer to			

25	Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	--	Go to Step 35	Go to Step 32
26	Inspect for poor connections at the harness connector of the HVAC control module. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	--	Go to Step 35	Go to Step 33
27	Inspect for poor connections at the harness connector of the powertrain control module (PCM) or engine control module (ECM). Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems. Did you find and correct the condition?	--	Go to Step 35	Go to Step 34
28	Repair the ignition 3 voltage circuit of the A/C compressor clutch relay. Refer to Wiring Repairs in Wiring Systems. Did you complete the repair?	--	Go to Step 35	--
29	Replace the A/C compressor clutch relay. Did you complete the replacement?	--	Go to Step 35	--
30	Replace the A/C low pressure switch. Refer to Air Conditioning Cycling Switch Replacement in Heating, Ventilation and Air Conditioning. Did you complete the replacement?	--	Go to Step 35	--
	Replace the A/C refrigerant pressure sensor. Refer to Air Conditioning (A/C) Refrigerant			

31	Pressure Sensor Replacement in Heating, Ventilation and Air Conditioning. Did you complete the replacement?	--	Go to Step 35	--
32	Replace the A/C compressor clutch. Refer to Compressor Clutch Plate/Hub Assembly Replacement in Heating, Ventilation and Air Conditioning. Did you complete the replacement?	--	Go to Step 35	--
33	Replace the HVAC control module. Refer to HVAC Control Module Replacement. Did you complete the replacement?	--	Go to Step 35	--
34	**Important:** Program the PCM/ECM. Replace the PCM/ECM. Refer to the appropriate procedure: • Powertrain Control Module Replacement in Engine Controls - 4.3L • Powertrain Control Module Replacement in Engine Controls - 4.8L, 5.3L, 6.0L • Engine Control Module Replacement in Engine Controls - 6.6L (LB7) • Powertrain Control Module Replacement in Engine Controls - 8.1L Did you complete the replacement?	--	Go to Step 35	--
35	Operate the system in order to verify the repair. Did you correct the condition?	--	System OK	Go to Step 5