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Availability: ISIS, FleetSIS

Major System: ACCESSORIES

Current Language: English

Other Languages: [Français](#), [Español](#)

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Created: 8/16/2014

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Coding Information

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Title: Air Conditioning Electrical Diagnostics

Applies To: Post 2010 NGV

CHANGE LOG

06/05/2016 - corrected wiring call out in step 10
 06/15/2015 - updated step 1 and added a temperature chart
 05/04/2015 - updated steps 14 and 15 and added wiring diagrams
 03/26/2015 - updated process flow to include 3 and 4 wire P+T Transducer
 12/8/2014 - Formatted article to template standard.
 10/28/2014 - Author updated for feedback purposes
 9/8/2014 - Updated SRT, special tools and coding.

DESCRIPTION

This document is supplemental to [IK1900228](#) and addresses sensor and electronic issues.

SYMPTOM(s)

Compressor clutch does not engage.

Possible Causes:

- Failed compressor clutch coil
- No ignition and accessory voltage at body controller
- No A/C request from HVAC control head to body controller (B/C)
- No engine running signal at B/C
- Engine speed signal to B/C
- Low pressure switch input
- Freeze probe
- A/C high side pressure

Diagnostic Trouble Code(s) & Dashboard Indicator Light(s):

DTC/Light	Description
Not Applicable	Not Applicable

Customer Observations or Concerns: Not Applicable

SPECIAL TOOL(s) / SOFTWARE

Tool Description	Tool Number	Comments	Instructions
Fluke DVOM Universal	ZTSE4357	Used for checking electrical connections	Not Applicable

SERVICE PARTS INFORMATION

Kit Description	Part Number	Quantity Required	Notes
Not Applicable	Not Applicable	Not Applicable	Not Applicable

Air Conditioning Electrical Diagnostic Steps

NOTE:

Body controller will not engage the clutch when A/C related DTCs are active. The following procedures are ONLY VALID if the A/C system is fully charged and the A/C system checks in [IK1900228](#) were performed.

NOTE:

When a failed circuit or component is detected, repair as needed and retest for original problem.

Step	Action	Decision
1	<p>Clutch Engagement Requirements:</p> <p>A. Start engine</p> <p>B. Turn the A/C Control to NORM, Fan On, and Temp control to coldest setting.</p> <p>C. Start Diamond Logic Builder (DLB).</p> <p>D. Watch the following DLB signals:</p> <ul style="list-style-type: none"> · <i>Ignition</i> · <i>Accessory_Signal_Input</i> · <i>HVAC_Low_Pressure_Switch</i> · <i>A/C_Request</i> · <i>Engine_Running</i> · <i>HVAC_Freeze_Protect</i> · <i>HVAC_High_Side_Pressure</i> <p>E. If the High Pressure Transducer has four wires, also watch for the following signal:</p> <ul style="list-style-type: none"> · <i>BC_RCD_PT_Temp_Signal</i> <p>Note: The signals must be check marked or have the correct value for the Body Controller to engage the A/C clutch.</p> <p>Is <i>Ignition</i> check marked?</p> <p>Is <i>Accessory_Signal_Input</i> check marked?</p> <p>Is <i>HVAC_Low_Pressure_Switch</i> check-marked?</p> <p>Is <i>A/C_Request</i> check marked?</p> <p>Is <i>Engine_Running</i> check marked?</p> <p>Is <i>HVAC_Freeze_Protect</i> value less than 507?</p>	<p>Yes: all signals are correct: Leave engine and go to step-2.</p> <p>No: <i>Ignition</i> is not check marked: Shut engine off and then go to IK0800092</p> <p>No: <i>Accessory_Signal_Input</i> is not check marked: Shut engine off and then go to IK0800092</p> <p>No: <i>HVAC_Low_Pressure_Switch</i> is marked: Shut engine off and then go to step 5.</p> <p>No: <i>A/C_Request</i> is not check marked engine off and then go to A/C Control h diagnostics (IK1900226)</p> <p>No: <i>Engine_Running</i> is not check marked engine off and then go to IK0800080</p>

Step	Action	Decision
2	<p>HVAC High Side Pressure:</p> <p>A. Start engine, turn the A/C Control to NORM, Fan On, and Temp control to coldest setting.</p> <p>B. Use DLB to monitor <i>HVAC_High_Side_Pressure</i>.</p> <p>C. Use the A/C charging station gauges to monitor high-side pressure.</p> <p>D. When the gauge pressure is stable, record the gauge value and the DLB value</p> <p>E. Compare the DLB value to the high-side gauge reading.</p> <p>Does HVAC_High_Side_Pressure match the gauge within +/- 10 psi?</p>	<p>Yes: Leave engine running. If unit is ec with the four wire transducer go to step equipped with three wire transducer go</p> <p>No: If unit is equipped with the four wire transducer go to step 8; if equipped with wire transducer go to step 10.</p>

Step	Action	Decision
3	<p>Temperature Reading Check:</p> <p>A. Start engine, turn the A/C Control to NORM, Fan On, and Temp control to coldest setting.</p> <p>B. Use DLB to monitor BC_RCD_PT_Temp_Signal</p> <p>C. Use the Infrared Thermometer (ZTSE4799) to check the temperature of the High Pressure line near the P+T transducer.</p> <p>Is the temperature from IR thermometer and DLB within 15 degrees F?</p>	<p>Yes: Go to step 4.</p> <p>No: Go to step 14.</p>

Step	Action	Decision
4	<p>A/C Clutch Output:</p> <p>A. Start engine</p> <p>B. Turn the A/C Control to NORM, Fan On, and Temp control to coldest setting.</p> <p>C. Locate A/C Clutch on the DLB signal column.</p> <p>Is there a check mark for A/C_Clutch in the value column?</p> <p>Is the clutch engaged?</p>	<p>Yes: A/C_Clutch is check-marked in DL clutch is engaged: Verify A/C system operates correctly.</p> <p>No: A/C_Clutch is check-marked in DLE clutch does not engage: Stop engine and go to step 12.</p> <p>No: A/C_Clutch is not check-marked: Repeat step 1 and step 2. If all values or all other check marks are there, the bod controller has failed. After repairs are made, reassemble and operator concern</p>

Step	Action	Decision
5	<p>Low Pressure Switch Continuity Test:</p> <p>A. Shut engine off.</p> <p>B. Disconnect the harness from the low pressure switch.</p> <p>C. Use a DMM to check for continuity across the switch terminals.</p>	<p>Yes: Leave switch harness unplugged i step 6.</p> <p>No: Switch has failed, repair as needed</p> <p>After repairs are made, reassemble unit and retest for operator concern.</p>

	<p>Note: Switch should have continuity with a fully charged system. The system must have the correct charge for this test to be valid.</p> <p>Is there continuity across the switch?</p>	
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Step	Action	Decision
6	<p>Low Pressure Switch Diagnostics Key On Voltage Test:</p> <p>A. Turn ignition Key-On.</p> <p>B. Use a DMM to measure voltage between each terminal of the low pressure switch harness connector and a good ground. Note: One terminal should have 10V+/- 1.0V; the other terminal should have near 0V.</p> <p>C. Use a DMM to measure voltage between the two terminals of the low pressure switch harness connector. Voltage should be 10V+/- 1.0V</p> <p>D. Turn Key-Off</p> <p>Are the voltages in step B and step C correct?</p>	<p>Yes: Circuits are good.</p> <p>Verify steps 4 and 5 were performed and the correct decisions were made.</p> <p>Recheck <i>HVAC_Low_Pressure_Switch</i> on DLB.</p> <hr/> <p>No: There is no voltage on either terminal B:</p> <p>Check HVAC Unit Connector (1210) for back or damaged pins-K and J.</p> <p>Check Body Controller connector J3 (16 pushed back or damaged Pin-B5.</p> <p>Check voltage at B5 with low pressure disconnected and J3 connected. Pin-B5 have 10v +/- 1.0</p> <hr/> <p>No: Voltage in step B is correct. Voltage is low or zero:</p> <p>Check continuity from connector 1602 F both terminals of the low pressure switch connector. One terminal must have con</p>

Step	Action	Decision										
7	<p>Freeze Probe Diagnostics:</p> <p>A. Disconnect the freeze probe from the HVAC Unit harness.</p> <p>B. Measure resistance between freeze probe connector Pin-A and Pin-B. Record the reading and reconnect the probe to the HVAC harness.</p> <p>C. Use the temperature probe on the A/C charging station or a digital thermometer to measure cab temperature. Record the value.</p> <p>D. Disconnect the HVAC Unit connector (1210). Turn the ignition key-On.</p> <p>E. Use DMM to measure voltage between connector 1210 Pin-G and a known good ground. Record the reading.</p> <p>F. Turn Ignition key-Off.</p> <p>G. Disconnect body controller connector J3 (1600) and J5 (1602).</p> <p>H. Measure resistance between connector 1600 Pin-B13 and connector 1602 Pin-E5.</p> <p>I. Compare measured resistance in step-B, and current temperature in the cab, to Thermistor Cross Reference Table shown below.</p> <p>J. Compare step-B measurement to step-H measurement. Is step-B measurement correct for the temperature? Is step-E measurement 10V +/- 1.0?</p> <p>Are step-B and step F measurements correct for the temperature, and equal +/- 250 ohm?</p> <p>Thermistor (Freeze Probe) Cross Reference Table</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">TEMP (C°)</th> <th style="width: 20%;">TEMP (F°)</th> <th style="width: 15%;">MIN Ω (kohms)</th> <th style="width: 15%;">NOMINAL Ω (kohms)</th> <th style="width: 30%;">MAX Ω (kohms)</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	TEMP (C°)	TEMP (F°)	MIN Ω (kohms)	NOMINAL Ω (kohms)	MAX Ω (kohms)						<p>No: Step-B measurement is out of chart specifications:</p> <p>Replace freeze probe. After repairs are made, reassemble unit and retest.</p> <hr/> <p>No: Step-E has less than 9.0V: Check the following circuit for open or ground:</p> <p>Check Body controller connector J3 (16 B13 to freeze probe connector A.</p> <hr/> <p>No: Step B measurement is correct, but greater than step B by more than 250 oh</p> <p>Check the following two circuits for open resistance:</p> <ol style="list-style-type: none"> 1. Body controller connector J3 (1600) freeze probe connector A 2. Body controller connector J5 (1602) freeze probe connector B.
TEMP (C°)	TEMP (F°)	MIN Ω (kohms)	NOMINAL Ω (kohms)	MAX Ω (kohms)								

-15	5	35.03	35.67	36.32
-10	14	26.65	27.06	27.48
-5	23	20.46	20.72	20.98
0	32	15.84	16.00	16.16
5	41	12.30	12.46	12.61
10	50	9.626	9.771	9.918
15	59	7.589	7.722	7.856
20	68	6.025	6.144	6.265
25	78	4.816	4.922	5.030
30	86	3.874	3.968	4.064

Step	Action	Decision
8	<p>P+T Transducer VREF and GND Check:</p> <p>A. Turn ignition Key-On.</p> <p>B. Disconnect the connector (6201) from the P+T transducer.</p> <p>C. Measure voltage between harness connector Pin-4 and a good ground. There should be 5 volts at pin 4.</p> <p>D. Measure the voltage between harness connector Pin-4 and Pin-1. There should be 5 volts.</p> <p>Are both step C and step D measurements 5V?</p>	<p>Yes: Go to step 9.</p> <p>No: Step C measures less than 5V:</p> <p>Check IP/Engine connector (1702) for d. corroded, or pushed back Pin-3.</p> <p>Check voltage at Pin-E6 of Body Contro connector-J5. If 5V exist at Pin-E6: Check the following for open or high resistance:</p> <p>Circuit A6DB (connector 1602 J5 Pin-E6 connector 1702 Pin-3) Circuit K6DB (connector 1702 Pin-3 to c 6201 Pin-4)</p> <p>No: step C has 5V, but step D has <5V:</p> <p>1. Check the following circuits for open c high resistance: Circuit A9AA (connector 1602 J5 Pin-E5 connector 1702 Pin-2) Circuit K9AA (connector 1702 Pin-2 to c 6201 Pin-1)</p>

Step	Action	Decision
9	<p>P+T Transducer Circuit Resistance Check:</p> <p>A. Turn the ignition Key-OFF.</p> <p>B. Disconnect the Body Controller J3 connector (1600).</p> <p>C. Disconnect the connector (6201) from the P+T transducer.</p> <p>D. Measure resistance between Body Controller connector J3 Pin-B12 and Pin-2 of P+T transducer connector 6201.</p> <p>Is Resistance is <1 Ohm.</p>	<p>Yes: Replace pressure transducer. Afte are made, reassemble unit to run and r</p> <p>No:Check IP/Engine connector (1702) i damaged, corroded, or pushed back Pin</p> <p>Check the following circuits for circuit o high resistance:</p> <p>Circuit A77B(connector 1600 J3 Pin-B1 connector 1702 Pin-4) Circuit K77B(connector 1702 Pin-4 to c 6201 Pin-2).</p>

Step	Action	Decision

10	<p>Pressure Transducer Key-On Circuit Resistance Check:</p> <p>A. Turn ignition Key-On.</p> <p>B. Disconnect the A/C pressure transducer connector (6201) from the sensor.</p> <p>C. Measure voltage between harness connector Pin-2 and a good ground. There should be 5 volts at terminal 2.</p> <p>D. Measure the voltage between harness connector Pin-2 and Pin-1. There should be 5 volts.</p> <p>Are both step C and step D measurements 5V?</p>	<p>Yes: Go to step 11.</p> <hr/> <p>No: Step C measures less than 5V: Check IP/Engine connector (1702) for corrosion, or pushed back Pin-3. Check voltage at Pin-E6 of Body Controller connector-J5. If 5V exist at Pin-E6: Check the following for open or high resistance: Circuit A6DB (connector 1602 Pin-E6 to connector 1702 Pin-3) Circuit K6DB (connector 1702 Pin-3 to connector 6201 Pin-4)</p> <hr/> <p>No: Step C has 5V, but step D has <5V: 1. Check the following circuits for open circuit resistance: Circuit A9AA (connector 1602 Pin-E5 to connector 1702 Pin-2) Circuit K9AA (connector 1702 Pin-2 to connector Pin-1)</p>

Step	Action	Decision
11	<p>Pressure Transducer Circuit Resistance Check:</p> <p>A. Turn the ignition Key-OFF.</p> <p>B. Disconnect the Body Controller J3 connector (1600).</p> <p>C. Disconnect the A/C pressure transducer connector (6201) from the sensor.</p> <p>D. Measure resistance between Pin-B12 of connector 1600 and Pin-3 of connector 6201.</p> <p>Is Resistance is <1 Ohm</p>	<p>Yes: Replace pressure transducer. After repairs are made, reassemble unit to run and retest.</p> <hr/> <p>No: Check IP/Engine connector (1702) for corrosion, or pushed back Pin-4. Check the following circuits for circuit open or high resistance: Circuit A77B(connector 1600 Pin-B12 to connector 1702 Pin-4) Circuit K77B(connector 1702 Pin-4 to connector 6201 Pin-3).</p>

Step	Action	Decision
12	<p>Compressor Clutch Diagnostics - Clutch Voltage</p> <p>A. Disconnect the chassis harness from the clutch.</p> <p>B. Request A/C Clutch engaged using DLB.</p> <p>C. Measure voltage between Pin-B of chassis connector (6200) and a good ground.</p> <p>Is voltage greater than 11.5V?</p>	<p>Yes: Go to step 13.</p> <hr/> <p>No: Check IP/Engine connector (1702) for damage, corrosion, or pushed-back Pin-10. Check Pin-C of body controller connector voltage. Check the following circuits for open or high resistance: Circuit A77(Body controller connector to IP/Engine connector (1702) Pin-10)</p>

		Circuit K77 (IP/Engine connector 1702 connector 6200 Pin-B)
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Step	Action	Decision
13	<p>Compressor Clutch Diagnostics - Clutch Resistance</p> <p>A. Disconnect the chassis harness connector (6200) from compressor clutch.</p> <p>B. Measure resistance terminal A to terminal B on the clutch coil.</p> <p>Is resistance 2.8 to 4.4 ohms at room temperature?</p>	<p>Yes: Check Pin-A of chassis harness cc (6200) continuity to ground through crar connection. After repairs are made, reassemble unit and retest.</p> <p>No: Replace Compressor. After repairs reassemble unit to run and retest for opt concern.</p>

Step	Action	Decision
14	<p>Temperature to GND Check:</p> <p>A. Turn ignition Key-On.</p> <p>B. Use DLB to monitor BC_RCD_PT_Temp_Signal</p> <p>Is the temperature -16 deg F (-9 deg C)?</p> <p>Is the temperature 302 deg F (150 deg C)?</p>	<p>Yes, temperature is -16 deg F (-9 deg Investigate for open Gnd in temperature between PT transducer Pin-3 and Body connector J3 Pin B9</p> <p>Yes, temperature is 302 def F (150 de Investigate for a short to Gnd in temper circuit between PT transducer Pin-3 anc Controller connector J3 Pin B9.</p> <p>No: Go to step 15.</p>

Step	Action	Decision
15	<p><u>Temperature Circuit Resistance Check:</u></p> <p><u>A. Key OFF.</u></p> <p><u>B. Using Digital Multimeter (DMM), measure resistance between Body controller connector J3 pin B9 and P+T transducer connector pin-3.</u></p> <p><u>Is resistance Less than 10 ohms?</u></p>	<p><u>Yes: Replace P/T Sensor</u></p> <p><u>No: Repair Open or high resistance resistance in temp circuit between B controller connector J3 pin B9 and P transducer pin-3</u></p>

FIGURE 1 - Wiring Diagram

<u>509</u>	<u>33.71</u>
<u>510</u>	<u>32.86</u>
<u>511</u>	<u>32</u>
<u>512</u>	<u>31.14</u>
<u>513</u>	<u>30.29</u>
<u>514</u>	<u>29.43</u>
<u>515</u>	<u>28.57</u>

WARRANTY INFORMATION

NOTE:

There are multiple noun groups that the diagnostic time could be charged to.

Warranty Claim Coding:

Group:	19000 - Truck Air Conditioner
Noun:	Multiple Nouns - Code to repair made

[Warranty Coding Manual](#)

Standard Repair Times:

19 - AIR CONDITIONING SYSTEM INSPECTION/PERFORMANCE DIAGNOSTICS

Hours	Code	Model	Engine
Varies by Model	A/C ELECTRICAL DIAGNOSIS (EXCEPT 5000, 9000 SERIES) , PERFORM	All	All

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