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Countries:

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Title: Air Conditioning Electrical Diagnostics

Applies To: Post 2010 NGV

CHANGE LOG

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.
8/05/2014 - Initial Article Release

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
	Clutch Engagement Requirements: A. Start engine B. Turn the A/C Control to NORM, Fan On, and Temp control to coldest setting. C. Start Diamond Logic Builder (DLB). D. Watch the following DLB signals: - Ignition - Accessory_Signal_Input - HVAC_Low_Pressure_Switch - A/C_Request - Engine_Running - HVAC_Freeze_Protect - HVAC_High_Side_Pressure	Yes: all signals are correct: Leave engine and go to step-2. No: Ignition is not check marked: Shut engine off and then go to IK0800092 No: Accessory Signal Input is not check marked: Shut engine off and then go to IK0800092 No: HVAC_Low_Pressure_Switch is marked: Shut engine off and then go to step 5.
1	E. If the High Pressure Transducer has four wires, also watch for the following signal: BC_RCD_PT_Temp_Signal Note: The signals must be check marked or have the correct value for the Body Controller to engage the A/C clutch. Is Ignition check marked? Is Accessory_Signal_Input check marked? Is HVAC_Low_Pressure_Switch check-marked? Is A/C_Request check marked? Is Engine_Running check marked? Is HVAC_Freeze_Protect value less than 507?	No: A/C_Request is not check marked engine off and then go to A/C Control h diagnostics (IK1900226) No: Engine_Running is not check marked engine off and then go to IK0800080

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

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

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

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

Note: Switch should have continuity with a fully charged system. The system must have the correct charge for this test to be valid.

Is there continuity across the switch?

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

Step	Action	Decision										
7	Freeze Probe Diagnostics: A. Disconnect the freeze probe from the HVAC Unit harness. B. Measure resistance between freeze probe connector Pin-A and Pin-B. Record the reading and reconnect the probe to the HVAC harness. C. Use the temperature probe on the A/C charging station or a digital thermometer to measure cab temperature. Record the value. D. Disconnect the HVAC Unit connector (1210). Turn the ignition key-On. E. Use DMM to measure voltage between connector 1210 Pin-G and a known good ground. Record the reading. F. Turn Ignition key-Off. G. Disconnect body controller connector J3 (1600) and J5 (1602). H. Measure resistance between connector 1600 Pin-B13 and connector 1602 Pin-E5. I. Compare measured resistance in step-B, and current temperature in the cab, to Thermistor Cross Reference Table shown below. J. Compare step-B measurement to step-H measurement. Is step-B measurement correct for the temperature? Is step-E measurement 10V +/- 1.0? Are step-B and step F measurements correct for the temperature, and equal +/- 250 ohm? Thermistor (Freeze Probe) Cross Reference Table <table><tr><th>TEMP (C°)</th><th>TEMP (F°)</th><th>MIN Ω (kohms)</th><th>NOMINAL Ω (kohms)</th><th>MAX Ω (kohms)</th></tr><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>	TEMP (C°)	TEMP (F°)	MIN Ω (kohms)	NOMINAL Ω (kohms)	MAX Ω (kohms)						No: Step-B measurement is out of chart specifications: Replace freeze probe. After repairs are made, reassemble unit and retest. No: Step-E has less than 9.0V: Check the following circuit for open or short to ground: Check Body controller connector J3 (1600) Pin-B13 to freeze probe connector A. No: Step B measurement is correct, but less than step E by more than 250 ohms. Check the following two circuits for open or short to ground: - Body controller connector J3 (1600) Pin-B13 to freeze probe connector A - Body controller connector J5 (1602) Pin-E5 to 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+T Transducer VREF and GND Check: A. Turn ignition Key-On. B. Disconnect the connector (6201) from the P+T transducer. C. Measure voltage between harness connector Pin-4 and a good ground. There should be 5 volts at pin 4. D. Measure the voltage between harness connector Pin-4 and Pin-1. There should be 5 volts. Are both step C and step D measurements 5V?	Yes: Go to step 9. No: Step C measures less than 5V: Check IP/Engine connector (1702) for d. corroded, or pushed back Pin-3. Check voltage at Pin-E6 of Body Contro connector-J5. If 5V exist at Pin-E6: Check the following for open or high resistance: Circuit A6DB (connector 1602 J5 Pin-E6 connector 1702 Pin-3) Circuit K6DB (connector 1702 Pin-3 to c 6201 Pin-4) No: step C has 5V, but step D has <5V: 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)

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

Step	Action	Decision

	Pressure Transducer Key-On Circuit Resistance Check: A. Turn ignition Key-On. B. Disconnect the A/C pressure transducer connector (6201) from the sensor. 10 C. Measure voltage between harness connector Pin-2 and a good ground. There should be 5 volts at terminal 2. D. Measure the voltage between harness connector Pin-2 and Pin-1. There should be 5 volts. Are both step C and step D measurements 5V?	Yes: Go to step 11. 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 1601 Pin-2) 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 1601 Pin-1)
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Step	Action	Decision
11	Pressure Transducer Circuit Resistance Check: A. Turn the ignition Key-OFF. B. Disconnect the Body Controller J3 connector (1600). C. Disconnect the A/C pressure transducer connector (6201) from the sensor. D. Measure resistance between Pin-B12 of connector 1600 and Pin-3 of connector 6201. Is Resistance is <1 Ohm	Yes: Replace pressure transducer. After repair is made, reassemble unit to run and retest. 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).

Step	Action	Decision
12	Compressor Clutch Diagnostics - Clutch Voltage A. Disconnect the chassis harness from the clutch. B. Request A/C Clutch engaged using DLB. C. Measure voltage between Pin-B of chassis connector (6200) and a good ground. Is voltage greater than 11.5V?	Yes: Go to step 13. No: Check IP/Engine connector (1702) for corrosion, damaged, corroded, 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)

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

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

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

12.1. AIR CONDITIONING, P. 1

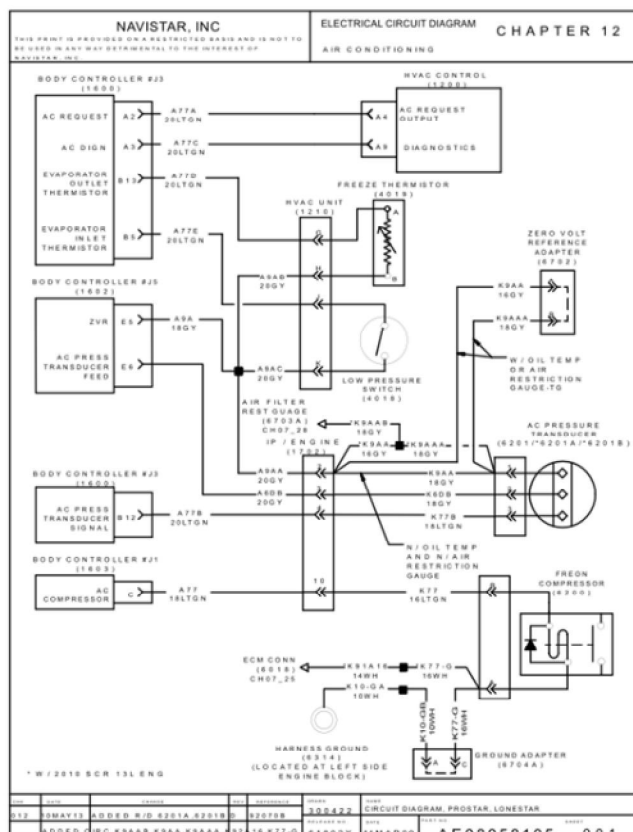


Figure 339 Air Conditioning

FIGURE 1 - Wiring Diagram

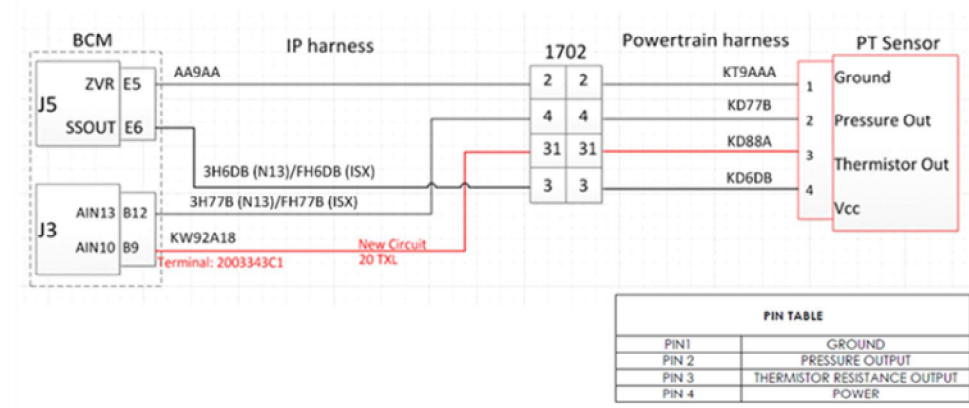


FIGURE 2 - Wiring Diagram

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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