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Title: HVAC faults 520211 and 520465

Applies To: 2007 and newer TerraStar, ProStar, DuraStar and WorkStar Models with Body Controllers

DESCRIPTION

Diagnostic information for 520211 (sleeper temp actuator fault) and 520465 (multiple motor faults)

POSSIBLE DIAGNOSTIC TROUBLE CODES

SPN	FMI	DESCRIPTION
520211	7	Actuator position not responding
520465	2	HVAC control head multiple motor faults DM1

520211

This Diagnostic code could be the result of any of the following conditions:

• Incorrect HVAC control head installed
• Blocked temperature/blend door (the actuator does not reach the position targeted by the sleeper HVAC controller).

• Faulty circuits between the sleeper HVAC controller and the temperature actuator.
• Defective temperature actuator.
• Defective sleeper HVAC controller

NOTE:

If the incorrect HVAC control head is installed, you may set codes, when the integrity of the circuits and motors is satisfactory. **Verify the correct control head is installed.**

If the temperature actuator is provided the appropriate voltage on the input control circuit, but does not move to its selected position after 20 seconds, due to an electrical or mechanical problem, the sleeper HVAC controller will sense the fault. The sleeper HVAC controller accomplishes the diagnostic test by comparing the feedback voltage from the actuator with the commanded setting. The sleeper HVAC controller will communicate this fault condition to the body controller, and the body controller will then set the appropriate diagnostic trouble code.

The actuator will attempt to move to the appropriate position once every 30 seconds up to 20 times. After 20 unsuccessful attempts, the sleeper HVAC controller sends the 2.5 volt signal to stop the actuator. This counter will be reset if the key switch is cycled from OFF to ACCESSORY. The occurrence count of the fault condition will be incremented for each unsuccessful attempt of the actuator

IMPORTANT:
The following procedure will be performed when supply voltage is first applied to the sleeper HVAC controller. There must not be any active "loss of communication" related diagnostic trouble codes to initiate calibration.

• The sleeper HVAC controller cycles the temperature actuator and air door to establish a known starting position.
Whenever the temperature actuator is energized while disconnected (such as during testing), it must be re calibrated after it is reconnected. After reassembling the door and actuator, and reconnecting the actuator connector, initiate the door position calibration procedure.

There are 2 ways to initiate temperature actuator calibration:

• Press and hold the hot and cold buttons (digital controls only) for approximately 3 seconds.
• OR command the Rear_HVAC_Actuator_Cal_Req signal using DLB. DLB displays a check mark while calibration is being requested. Check the box for approximately one second to manually initiate calibration, then ensure box is unchecked .
If fault is still present after calibration,perform **Mechanical operation test and inspection** first

Possible Causes:
• *Jammed/Damaged Door(s)*
• *Internal Actuator Slippage*
Perform the following tests with the ignition key in the OFF position.

1. Remove the door actuator. Grasp the door shaft and manually move door through its full range of movement. Door should move freely throughout its range
. If door operates correctly, proceed to the next step.

If door does not operate correctly isolate and clear cause of door jam. If door jam cannot be cleared, replace the temperature door or housing.

2. Inspect the end of the door shaft that is driven by the actuator. Door shaft should be free of excessive wear. If door shaft is not free of excessive wear:
• *Replace temperature air door.*

If door shaft is free of excessive wear - Proceed to Temperature Actuator Test

Temperature Actuator Circuit Troubleshooting

Perform the following tests at the sleeper temperature actuator connector with:

• The key switch in the ACCESSORY position (the engine does not need to be running).

• All electrical connectors connected.
1. With multi-meter connected between the supply voltage circuit (pin 5) of the temperature actuator and the ground circuit (pin 7) of the temperature actuator the meter should read 12 ± 1.5 volts with the key in the ACCESSORY position.
The voltage specified above is provided by the sleeper HVAC controller.

2. With multi-meter connected between the 5 volt reference circuit (pin 10) of the temperature actuator and the ground circuit (pin 7) of the temperature actuator the meter should read approximately 5 volts.
The voltage specified above is provided by the sleeper HVAC controller.

3. Perform the actuator calibration procedure (Rear_HVAC_Actuator_Cal_Req) using DLB or using the temperature controls (digital controls only) and monitor the voltage on the feedback circuit of the actuator.
With multi-meter connected between the feedback circuit (pin 9) of the temperature actuator and the ground circuit (pin 7) of the temperature actuator the meter reading should vary (while the actuator is moving) between 0 and 5 volts depending on the actuator's position.
The voltage specified above is provided by the temperature actuator.

4. With multi-meter connected between the input control circuit (pin 6) of the temperature actuator and the ground circuit (pin 7) of the temperature actuator the meter reading should read as follows:

• Approximately 0 volts when the sleeper temperature controls are moving towards the **COLDEST** setting.
• Approximately 5 volts when the sleeper temperature controls are moving towards the **WARMEST** setting.
• The voltage should return to approximately 2.5 volts after the actuator has reached the correct position for the commanded setting.
Correct any invalid conditions found during the above tests.

Replace the temperature actuator only If the actuator door moves freely, and all actuator voltages are within the specified ranges.

Prostar sleeper diagram

520465

This Diagnostic code is the result of two or more HVAC actuator related faults being active. The body controller prevents A/C compressor operation when this DTC is set. .
NOTE: If a problem is found in two or more of the actuator circuits, repair those circuits and clear the diagnostic trouble code.

If a problem is **NOT** found in two or more of the door circuits:

• **Verify the correct HVAC control head is installed**
• Monitor the control head diagnostic signal using DLB (HVAC_Diagnostic_Value).
(0) = No faults.
(1) = Air Inlet Fault (Re-circulation Door Fault).
(2) = Temp Mix Fault.
(3) = Mode Fault.
(4) = Multiple Faults (A/C clutch is disabled).
(5) = Control Head Fault (A/C clutch is disabled)

• If the diagnostic signal indicates a value of (4) replace the HVAC control head. (Control head is indicating a multiple fault when none exists.)
• If the diagnostic signal does not indicate a value of (4), replace the body controller(iApprove).

Note:To establish a known starting position, the control head runs the actuator motor and door through a calibration procedure when battery voltage is first applied to the HVAC control head, and then at regular intervals during normal operation. To start a calibration procedure temporarily remove battery power from the HVAC control head. If faults are still preset after calibration proceed to troubleshoot the system

TROUBLESHOOTING

For Temperature and Recirculation door mechanical test refer to **Mechanical operation test and inspection** as outlined above.

Mode Door Mechanical Test

1. With key off inspect gear train and input shaft for wear or damage that may cause slippage.

2. With the key switch is the IGNITION ON position , remove actuator from gear train that drives the mode doors.

3. Set blower speed to full clockwise.

4. Grasp the gear train input shaft (normally mates to actuator) and manually rotate the shaft through its full range of movement. This will direct the air flow as follows
• Fully counter-clockwise = dash vents

• Fully clockwise = defrost vents

• Mid position = floor ducts

If wear, damage or movement is not smooth replace the heater housing assembly.

Actuator Circuit tests

While observing the drive collar of the actuator motor use a 9 Volt battery and jumpers to apply 9 Volts dc to the terminals of the appropriate actuator motor. After noting the results, swap the jumpers to reverse the polarity of the voltage at the terminals of the actuator motor.

-The drive collar of the actuator motor should rotate to one end of its travel when voltage is first applied, and to the opposite end of its travel when the voltage polarity is reversed.
NOTE:
If the actuator motor is already at the end of its travel when voltage is first applied, it may be necessary to switch polarities twice to see rotation in both directions.

• If motor does not rotate remove from the door input and retest.If motor still does not rotate, replace motor.

• If motor rotates using 9v battery verify voltage output from control head and inspect the circuit for an open

HVAC Control (1200) pins

Recirculation Door +	Pin **B1**	**A74D**
Recirculation Door -	Pin **B2**	**A74E**
Mode Door +	Pin **B9**	**A74**
Mode Door -	Pin **B10**	**A74A**
Temp Door +	Pin **B11**	**A74B**
Temp Door -	Pin **B12**	**A74C**

(Alternating polarities on request)

Actuator Diagram

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