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**Title: Air Conditioning Mechanical Pressures Diagnostics**

**Applies To: All**

## CHANGE LOG

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8/05/2014 - Initial Article Release

## DESCRIPTION

This document is supplemental to IK1900228 and addresses Refrigerant Issues. The following procedures will guide the user through diagnostics of refrigerant issues.

## SYMPTOM:

Incorrect gauge readings are detected during Static Pressure test or the Performance test.

## REFRIGERANT ISSUES

WARNING 1

WARNING 2

WARNING 3

## POSSIBLE CAUSES:

Incorrect Static Pressures

Incorrect Performance Test Gauge Readings

### ABNORMAL GAUGE READING DIAGNOSTICS

**Note-Body controller will not engage the clutch when A/C related DTCs are active.**

**Note-The following procedures are ONLY VALID if 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.**

| 1 | Static Gauge Readings | Decision |
|---|---|---|
| A. Compare static gauge readings taken in **IK1900228** to Pressure Temperature Relationship chart at the end of this document.<br><br>**Note:**If gauges are 10 psi higher than the chart values, system contains air or some non-condensable gas. If gauges are 10 psi lower than the table listings, system is undercharged.<br><br>Are the static readings correct for the ambient temperature? | | Yes: Go to step 2<br><br>No, readings are low: Go to step 3<br><br>No, Readings are high: Go to step-4. |

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| 2 | Performance Test Gauge Readings | Decision |
|---|---|---|

| | |
|---|---|
| A. Compare gauge readings taken during the performance test performed in **IK1900228** to the appropriate HVAC System Pressure Test Chart located at the end of this document<br><br>Are the High Side and Low Side pressures correct? | Yes: If static and performance test pressure is correct, return to **IK1900228** and retest system. |
| | No, both Low-Side and High-Side pressures are lower than normal Go to step 5. |
| | No, system has lower Low-Side and higher High-Side pressures: Go to step 7. |
| | No, system has extremely low Low-Side and normal to low High-Side pressures: Go to step 10. |
| | No, system has higher Low-Side and slightly low to normal High-Side pressures: Go to step 14. |
| | No, both Low-Side and High-Side pressures are higher than normal: Go to step 17. |
| | No, system has higher Low-Side and normal to slightly higher High-Side pressures: Go to step 21. |

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| 3 Leak Detection | Decision |
|---|---|
| A. Perform Leak Detection as outlined in 2010 HVAC Manual 02221.<br><br>Repair the A/C system as needed based on leak detection results. Click the following link to check for system damage:<br>TSI–12-16-04R1 | After inspection and any required repairs go to step 24. |

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| 4 Refrigerant Identification | Decision |
|---|---|
| A. Identify Refrigerant as outlined in 2010 HVAC Manual 02221.<br><br>**CAUTION:**<br>In the event that contaminated or unfamiliar refrigerant is detected: Recovery of contaminated refrigerant can damage recovery equipment. It is recommended to have a dedicated recovery machine when contaminated refrigerant is suspected. | Recover contaminated refrigerant, and then go to step 24. |

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**Both Low-Side and High-Side pressures are lower than normal: Step 5-6**

| 5 | Compressor Rotation | Decision |
|---|---|---|
| **Warning:**When turning the compressor by hand, only turn the unit clockwise.<br><br>A. Use a clutch wrench to rotate the clutch in a CW direction. Verify clutch turns compressor when engaged.<br><br>Is compressor seized? | | Yes: Replace compresso following link to check for damage:<br>TSI–12-16-04R1<br>After repairs are complet |
| | | No: Go to step 6. |

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| 6 | Charge Quantity Measurement | Decision |
|---|---|---|
| A. Use a recovery station to recover the refrigerant from the system and record the quantity of refrigerant recovered.<br>B. Compare recovered quantity to charge specifications.<br><br>Was the charge quantity correct? | | Yes: Replace the compressor. |
| | | No:<br>Leak test system and repair as needed and then go to step 24. |

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**Step7-9: Lower Low-Side pressure and higher High-Side pressure**

| 7 | Compressor outlet to Filter-Drier Outlet Inspection | Decision |
|---|---|---|
| A. Start engine.<br><br>B. Set controls for NORM A/C operation.<br><br>C. Inspect compressor -to- condenser line, condenser, condenser-to- filter/drier line, and filter drier body for frost or a cold spot that indicates a restriction.<br><br>**NOTE:**This symptom would only occur on sleeper vehicles if the restriction occurs in the section of High-Side line common to both front and rear A/C systems<br><br>Is the restriction located? | | Yes: Repair restriction as needed and then go to step 24. |
| | | No: Go to step 8. |

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| 8 | Cooling Fan Operation | Decision |
|---|---|---|
| A. Check the operation of the engine cooling fan, and the fan drive.<br><br>Are the fan, fan shroud, and the fan drive working properly? | | Yes: Got to step 9.<br><br>No: Repair fan, shroud, and drive as needed and then go to step 24. |

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| 9 | Pressure Transducer Check | Decision |
|---|---|---|
| A. Start engine<br>B. Turn the A/C Control to Max, Fan On, and Temp control to coldest setting.<br>C. Use DLB to monitor A/C_High_Side_Pressure signal.<br>D. Use the A/C charging station gauges to monitor high-side pressure.<br>E. When the gauge pressure is stable, record the gauge value and the DLB signal value.<br>F. Use the Pressure Transducer Voltage Table to convert the DLB voltage signal to PSI.<br>G. Compare the DLB value in PSI to the high-side gauge reading.<br><br>Does the HVAC _High_Side_Pressure value converted to PSI match the gauge within +/- 10 psi? | | Yes: There is moisture or too much oil in system. Repair as need and the go to step 24.<br><br>No: Repair as needed (See Pressure Transducer Diagnostics in IK1900223)and then go to step 24. |

**Pressure Transducer Voltage Table**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **PSI** | 0 | 20 | 25 | 40 | 50 | 75 | 100 | 150 | 185 | Continues in Row 3 |
| 2 | **V** | 0.25 | 0.42 | 0.48 | 0.62 | 0.71 | 0.92 | 1.15 | 1.59 | 1.90 | Continues in Row 4 |
| | | | | | | | | | | | |
| 3 | **PSI** | 200 | 250 | 285 | 300 | 350 | 400 | 420 | 450 | 475 | 500 |
| 4 | **V** | 2.03 | 2.48 | 2.80 | 2.92 | 3.38 | 3.81 | 3.99 | 4.26 | 4.48 | 4.71 |

Does the pressure transducer operate properly?

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**Step10-13: Extremely low Low-Side pressure and normal to low High-Side pressure**

| 10 | Hose/Line Visual Inspection | Decision |
|---|---|---|
| A. Perform visual inspection of hose/line between evaporator housing and the Low-Side side of the compressor.<br><br>**NOTE:**On sleeper vehicles this symptom would occur only if the hose/line damage (restriction) occurs in the section of Low-Side line common to both front and rear A/C systems.<br><br>Is the hose/line damaged? | | Yes: Repair as needed and the go to step 24.<br><br>No: Go to step 11. |

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| 11 | Low refrigerant charge | Decision |
|---|---|---|
| A. Visually inspect all joints and seals in the air conditioning system. Look for joints and seals that are dirty.<br>B. Clean area around dirty seal or joint and then starting with the dirty joints and seals use leak detection tool to test for leaks.<br><br>Was a leak located? | | Yes: Repair leak and then go to step 24.<br><br>No: Go to step 12. |

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| 12 | Verify Charge Quantity | Decision |
|---|---|---|
| A. Use a recovery station to recover the refrigerant from the system and record the quantity of refrigerant recovered.<br>B. Compare recovered quantity to charge specifications.<br><br>Was the charge quantity low? | | Yes: Evacuate system until pressure measure 1000 microns or less. If this value cannot be reached, refer to LEAK DETECTION. Go to step 24.<br><br>No: Go to step 13. |

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| 13 | Expansion Valve Debris/Moisture | Decision |
|---|---|---|
| A. Remove expansion valve.<br>B. Check for debris in inlet port.<br><br>**NOTE:**On sleeper vehicles this symptom would only occur if BOTH expansion valves are blocked by debris or freeze up from moisture.<br><br>Is there debris in the system? | | Yes: After flushing is comp 24.<br><br>No: Evacuate system until 1000 microns or less. Afte evacuation is reached, go |

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**Step 14-16: Higher Low-Side pressure and slightly low to normal High-Side pressures**

| 14 | Expansion Valve Check | Decision |
|---|---|---|
| A. Start engine and turn A/C to NORM, highest fan speed, and coldest temperature.<br>B. After 5 minutes of operation, feel the expansion valve.<br><br>Is the expansion valve extremely cold? | | Yes: Go to step 15.<br><br>No: Replace compressc and then flush system if Replace expansion valv step 24. |

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| 15 | Expansion Valve Debris | Decision |
|---|---|---|
| A. Remove the expansion valve and check for debris at the inlet port.<br><br>Are there traces of aluminum or desiccant particles? | | Yes: go to step 16<br><br>No: Obtain replacemen do not install until comp |

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| 16 debris in system | Decision |
|---|---|
| A. Click the following link to check for system damage:A/C system flush tool | After inspection and any go to step 24. |

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**Step 17-20: Both Low-Side and High-Side pressures are higher than normal**

| 17 | Added Air Flow | Decision |
|---|---|---|
| **NOTE:** These readings may indicate normal operation for a stationary vehicle.<br><br>A. Operate a large fan in front of the condenser and recheck readings.<br><br>Are readings normal with the fan blowing in front of the condenser? | | Yes: Readings are norma IK1900000 and continue with fan.<br><br>No: Go to step 18. |

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| 18 | Static pressure | Decision |
|---|---|---|
| **Note:**If static pressure were not measured, see Static Pressure in IK190000 for test conditions.<br><br>A. Review static pressure recorded in IK190000.<br><br>Was static pressure correct? | | Yes: Go to step 19.<br><br>No: If static pressure is step 1 of this procedur |

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| 19 | Cooling Module Inspection | Decision |
|---|---|---|
| B. Inspect Radiator, CAC, and A/C Condenser, for debris between the components and clogged fins.<br><br>Is air flow restricted? | | Yes: Go to step 20.<br><br>No: Go to step 21 |

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| 20 | Radiator Exterior Back-Flush | Decision |
|---|---|---|
| **CAUTION:**To prevent radiator damage, do not hold direct high pressure water or air close to the radiator fins.<br>A. Use a pressure washer on the fan side of the system to back flush the debris out the front of the cooling module. | | Yes: return vehicle to th |

| | |
|---|---|
| B. Start engine and turn A/C to NORM, highest fan speed, and coldest temperature.<br>C. After 5 minutes of operation use temperature probe to measure vent temperature.<br>D. Compare vent temperature to HVAC System Pressure Chart values<br><br>Is system performance correct? | No: Check engine fan, fa clutch operation. Repair then go to step 24. |

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**Step 21-23: Higher Low-Side pressure and normal to slightly higher High-Side pressure**

| 21 | Cab Air Leak | Decision |
|---|---|---|
| A. Check for exterior air leaks into the cab.<br><br>Are there exterior air leaks? | | Yes: Repair cab fresh-air and then go to step 24.<br>No: Go to step 22. |

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| 22 | Heater Shut Off Valves | Decision |
|---|---|---|
| A. Verify heater shut off valve is closed (If equipped).<br><br>Is heater valve closed? | | Yes: Go to step 23.<br>No: Close valve and retes |

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| 23. | Blend Door Calibration | Decision |
|---|---|---|
| Recalibrate the front interior actuator / door position by performing the following steps:<br>A. Turn the ignition switch to the ON position.<br>B. Set Blower Fan Speed Control to any speed (1 - 7).<br>C. Set Mode Control to Defrost.<br>D. Remove fuse panel cover, and remove the 5 Amp fuse for BTRY to HVAC Control (fuse position F1-B).<br>**NOTE**: Do not operate the HVAC control panel controls during the recalibration.<br>E. Wait approximately 30 seconds, and reinstall the fuse.<br>F. Listen for the sound of actuators moving the Mode, Blend, and Fresh / Recirculate doors through their full range of motion.<br>G. Start the vehicle, and check for correct operation of all HVAC modes and temperature.<br><br>Did recalibration fix the issue? | | Yes: Go to step 24.<br>No: Go to step 10 of HVAC (IK1900226) |

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| 24. | Assemble and Test | Decision |
|---|---|---|
| After problem is detected and repaired, perform A/C recovery, oil calculations, pressure test, flush, evacuation, and recharge **IF** required to return system to working condition. Verify system works correctly and customer complain is corrected. | | Return vehicle to custom |

# WARRANTY INFORMATION

Warranty Claim Coding:

Standard Repair Time(s):

## OTHER RESOURCES

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