

FUNCTIONAL TESTING AND DIAGNOSTICS PROCEDURE

A/C COOLING, HEATING, AND ATC FEATURES TESTING

This procedure is intended for use by production personnel at the vehicle manufacturer. It is designed to be integrated with the standard bodybuilder vehicle road testing and pre-delivery inspection (PDI) process. The procedure can also be used by field service technicians as part of an evaluation and diagnosis process.

1. Prior to departing on the standard road test, check initial operation of the ATC system by following the test procedure in **Section IX. Initial Operation and Road Test**. On this document, Steps 1 - 4 are performed prior to the road test drive, and Step 5 is performed during the test drive.
2. After returning from the road test drive, park the vehicle in a location that will provide an ambient temperature of 70 degrees (F) or greater. Turn the vehicle into any breeze or wind, to aid condenser cooling. If the outside ambient temperature is less than 70 degrees (F), an indoor location is recommended (service bay, paint booth, etc.) for meaningful test results.
3. Set engine idle speed at 1200 - 1500 RPM. Use the vehicle fast idle switch (if equipped) to maintain this engine RPM. Place the ATC system in the "diagnostic" mode. See **Section VIII. Systems Diagnostics**
4. Using the diagnostic functions, set the system for the following operations:
 - Blower locked onto the highest speed setting (16).
 - A/C clutch locked into the "A/C ON" setting.
 - Water Valve (Heat) locked in the closed setting (heater bypass).
 - Set the mode selector knob to the "PANEL / RECIRC" mode.
5. Visually verify that the A/C Compressor Clutch is engaged, and the compressor is operating. The heater coil inlet and outlet tubes should be neutral, or even cool to the touch (no hot water flow through heater coil).
6. The Suction hose fitting (at Evaporator Outlet) should be cold to the touch. This cold fitting may sweat, or even frost lightly.
7. Chilled Air being discharged from the dash louvers. After 3 - 5 minutes of A/C operation, this chilled air should be approximately 25-30 degrees (F) cooler than the inside ambient air entering the recirc air inlet (interior firewall opening, near passenger foot area). Air Inlet / Outlet Temperature differentials ("splits") are greatly affected by ambient temperature and relative humidity. In cool ambient conditions, differentials smaller than 25-30 degrees (F) may be seen. Air can only be chilled to a certain level, with an evaporator coil controlled to remain at a fin temperature above freezing. High

Humidity conditions will also result in smaller differentials; a large amount of cooling capacity is used to dehumidify air, as well as cool it.

ESTIMATED A/C PERFORMANCE GUIDELINES WITH HIGH-PERF. BASE UNIT

These performance guidelines are based on the Idle Test Conditions described in Steps 2 - 4 (Page 1). Variables such as engine speed, condenser airflow, sun load, blower speed, and chassis voltage will all affect A/C cooling performance. With vehicle parked, body and cap design restrictions may result in trapped heat and poor condenser cooling. A large floor fan may be needed to help cool the condenser. ***Poor condenser cooling will result in poor A/C performance!***

Air Entering A/C Unit <u>Recirc or Fresh (F)</u>	Inlet / Outlet Air Temperature Differential *	
	<u>@ Low Humidity</u> (below 50%)	<u>@ High Humidity</u> (above 50%)
50	10-15	10-15
60	20-25	15-20
70	25-30	20-25
80	30-35	25-30
90	35-40	30-35
100	40-45	35-40
110	45	40

*The dash louver closest to the A/C unit usually discharges the coldest air. To calculate differential, subtract Louver air temperature (F) from Recirc air temperature (F). If A/C system is ***not*** operating in Recirc mode, the Fresh Air Inlet temperature (F) must be measured and used for the differential calculation.

A/C SYSTEM OPERATING PRESSURES (APPROXIMATE)**

Ambient Air Temp (F) <u>Entering Condenser</u>	Suction Press. (PSIG) <u>@ Evaporator Outlet</u>	Discharge Press. (PSIG) <u>@ Rec. Drier / Liq. Hose</u>
50	5 - 15	75 - 125
60	5 - 15	100 - 150
70	10 - 20	125 - 175
80	10 - 20	150 - 200
90	15 - 25	175 - 225
100	15 - 30	200 - 250
110	20 - 35	225 - 325

** Pressure readings are optional, and not required unless diagnosing a suspected problem within the mechanical refrigeration system.

8. After the air conditioning idle testing is complete (cooling test), the system can then be tested for heat. Refer to the document titled **Section VIII. Systems Diagnostics** - for specific instructions to lock the HVAC system into a full-heat mode (water valve fully open).
9. Using the diagnostic functions, set the system for the following operation:
 - * Blower locked into the highest speed setting (16).
 - * A/C clutch locked into the "A/C ON" setting.
 - * Water Valve (Heat) locked into the Open setting, allowing full coolant flow to the heater coil.
 - * Set the mode selector knob to the "PANEL / RECIRC" mode.
 - * Engine fully warmed up, and at fast-idle speed (1200-1500 RPM).

The purpose of locking on the A/C clutch is to provide chilled air into the heater coil, for a more realistic heat test under all ambient conditions. "PANEL / RECIRC" mode will also help to provide the coldest chilled air for this test. This mode also provides the highest system airflow, placing the greatest test load on the heating system.

10. After 3-5 minutes of operation, measure discharge air temperature at the same dash louver used for the A/C cooling test (usually closest to the HVAC unit). Air temperature should be approximately 130-140 degrees (F), providing the coolant inlet temperature is approximately 180 degrees (F), ***OR a temperature which is approximately 40 degrees (F) less than the hot water (coolant) temperature entering the heater coil.*** Do not use a coolant temperature reading taken at the engine. Do not use a reading taken from the temperature gauge in the vehicle instrument cluster.
11. Refer to **Section VII. Systems Diagnostics** to continue with the ATC testing