

EVANS ELECTRONIC TEMPERATURE CONTROL TROUBLESHOOTING GUIDE **for systems equipped with electric coolant valve and external PC board.**

This Troubleshooting Guide covers the electric coolant valve and control system only. For other HVAC system components, diagnosis, and repair, refer to the separate Evans Tempcon publication titled "Dash Heater-Air Conditioner Troubleshooting Guide, Book Two, Rotary Control Panel Systems".

NOTE – IF TESTING INDICATES A REPLACEMENT VALVE IS NEEDED, IT WILL NEED TO BE REPLACED WITH OUR KIT RV218809, WHICH INCLUDES A NEW STYLE VALVE, WIRING HARNESS, AND INSTRUCTIONS FOR INSTALLATION. THE STYLE OF VALVE COVERED BY THESE INSTRUCTIONS IS NO LONGER AVAILABLE. IF TESTING INDICATES THAT A REPLACEMENT CIRCUIT BOARD IS NEEDED, IT WILL BE AVAILABLE FOR A LIMITED TIME AS OUR SERVICE PACKAGE RV218547. WHEN CURRENT INVENTORY IS GONE, IT TOO WILL NEED TO BE REPLACED BY A KIT RV218809. REPLACEMENT POTENTIOMETERS WILL CONTINUE TO BE AVAILABLE AS OUR SERVICE PACKAGE RV218549 FOR AN INDEFINITE PERIOD.

There are three common symptoms of an improperly operating electric coolant control system:

- No heat in the heat mode (Steps 2.1 - 8.1)
- Unable to control the temperature in any operating mode (Steps 1.1 - 8.1)
- Poor cooling, no cooling, or even heat while operating in A/C mode (Steps 1.1 - 8.1)

1.1 Before attempting to troubleshoot, verify that the HVAC system (other than temperature control) is operating correctly. With the vehicle running, test-operate the system and check the following:

- Blower Motor and 4 operating speeds
- Mode selector switch and air distribution system
- A/C system (engine-driven compressor, refrigeration system, etc.).

1.2 With the vehicle running and the A/C system engaged (Blower turned on, Mode selector set to "MAX A/C", Temperature dial rotated to full cool), clamp off the heater inlet hose to see if the A/C system is cooling properly. Test the A/C performance using the **EVANS A/C SYSTEM OPERATIONAL CHECK AND PERFORMANCE GUIDELINES**. Once this has been determined (and corrected if necessary), remove the clamp from the coolant inlet hose.

1.3 If a significant loss in cooling capacity in the A/C system occurs when the clamp is removed, shut the vehicle off, and carefully follow the step-by-step directions listed below for troubleshooting the coolant control system. If a problem is found, repair/correct the fault before proceeding to the next step. When troubleshooting electric and/or electronic components, care must be taken to prevent component

damage while inspecting, using a test meter, light, etc. If questions or concerns arise during the troubleshooting process, contact Evans Tempcon for telephone assistance *before* proceeding further (1-800-878-7174).

- 2.1 Remove and inspect the temperature control circuit board, located behind the dashboard. This circuit board is located inside a black plastic housing, which is part of the HVAC wire harness, immediately behind the dash-mounted HVAC control panel.
 - 2.2 The back of the circuit board (smooth side) should be marked with a black letter "B" or "C" stamped in the upper left corner. If a "B" or "C" is not found, replace the circuit board with a new marked board. **"B" and "C" boards are physically and electronically identical.** The "C" simply designates a supplier labeling change.
 - 2.3 Look for any visual signs of electronic component damage, such as a burned circuit trace or the odor of burnt electronics. If any damage is detected, replace the board. **Do Not** attempt to solder and/or repair a board. The failure will simply re-occur.
 - 2.4 Check all of the electrical connections in the black plastic housing. Make sure all of the terminals are properly locked in position, in the housing bottom. Check the terminal/wire crimps in this area for secure crimps and positive electrical contact. If damaged terminals or wires are found, replace the wire harness. Refer to attached wiring diagram to verify correct wire color and location in the housing.
 - 2.5 With the engine running, and the HVAC system operating, use a DC voltmeter to verify 12 volt power to the board housing terminals. Terminal "A" is negative (-), and Terminal D is positive (+). With the board removed, 11-15 volts should be measured across these terminals. If no voltage can be measured across the "A" and "D" terminals, check for a blown fuse, bad ground connection (see Item 7.2), or bad power wire connection.
- 3.1 The temperature dial on the control panel is a potentiometer control. Unplug the 3-wire connector from the back of this control. Make sure the socket terminals are fully engaged and locked into the wire connector.
 - 3.2 Verify correct wire colors and locations in the connector. Check the 3 pin terminals on the potentiometer for damage.
 - 3.3 Rotate the potentiometer knob to verify smooth operation. The knob should rotate freely from the cool stop (blue), to the warm stop (red). Do not force the knob to rotate past the cool or warm stops. Doing so will cause irreparable damage to the potentiometer control. If the knob can be rotated past the internal stop at the full cool and full heat positions, the potentiometer must be replaced.

- 4.1 Locate the electric coolant valve assembly in the heater base unit compartment, near the Evans Heater-Evaporator unit (on the firewall). The electrical connector is located on the outlet side of the valve.
- 4.2 Verify positive electrical connections at the coolant valve. Unplug the wire harness connector from the coolant valve. The orange connector cap (containing 6 pin holes) can then be removed from the gray connector body. Loose wires/terminals cannot be locked into place in the connector if the orange connector cap is installed. Use a small screwdriver to pry the orange cap off. With the cap removed, verify that each of the 5 socket terminals is pushed into the gray connector until the retaining ring on the terminal is past the locking tab inside the connector housing. The center tab on the orange cap acts as a secondary lock that holds the socket terminals in place within the gray connector body. Check the socket terminals for damage. Refer to the attached wiring diagram to verify correct wire color and pin location in the gray connector. Re-install the orange locking cap. Inspect the pin terminals on the coolant valve for damage. If any pins (5) in the valve are loose, broken, or missing, replace the valve.
- 4.3 Verify that the port on the outlet side of the valve is connected to the inlet tube on the heater coil. The coolant supply hose from the engine connects to the inlet side of the valve. Using the attached coolant valve installation diagram, verify that the coolant valve is properly installed in the heater supply hose with the valve ports in a horizontal position as shown in figure 2 of the installation diagram.

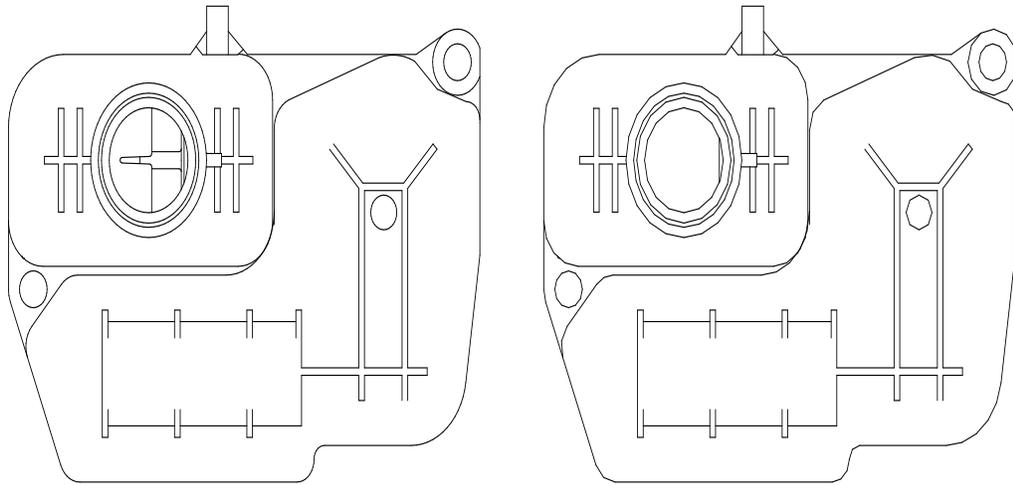
NOTE: The electric coolant valve is a "directional" valve, and must be correctly installed, or it will not function properly. Coolant valves installed with the coolant flow reversed will leak coolant past the valve gates resulting in poor A/C performance. Valves that have been installed backwards can be reused, but should first be inspected and tested (refer to Step 5.2 - 5.9).

- 4.4 Verify that the heater supply hose (containing the coolant valve) is actually the hose coming from the supply port on the engine. The supply port is usually on, or near the engine thermostat housing. To positively identify the supply line, remove the valve from the coolant lines and place both ends of the lines into a container to capture escaping fluid. Have an assistant "turn over" the engine while you observe the coolant lines. ***The line that discharges coolant when the engine is turned over is the supply line for the HVAC system.***

CAUTION: Removal of the coolant valve should be performed when the engine is cold. Removing the valve from the system when the engine is hot could result in burns and/or serious injury due to extremely hot coolant escaping under pressure. Do not start the engine while the coolant lines are disconnected as the engine will quickly pump the system dry, which could result in damage to the engine.

If you have reached this point in the troubleshooting sequence, ***and no problems or faults have been found***, operational testing will be necessary to isolate a faulty component.

- 5.1 Install a 3/4" O.D. hose splice into the valve location, so the vehicle can be started if necessary.
- 5.2 Use a wire tie to hang the valve from the heater hose, so the electrical connector can remain plugged in. Position the valve so that you can look into the ***inlet port*** of the valve and view the valve gate mechanism operation.
- 5.3 Turn the vehicle ignition switch to the ignition position; it is not necessary to actually start the vehicle at this time.



- 5.4 Have a helper slowly rotate the temperature dial from full cool (blue), to full heat (red) while you are watching the white valve gate. As the dial is rotated towards full heat, gate movement should be seen. A small slot will slowly appear, and then a larger opening will appear as the valve fully opens. Then have the helper slowly rotate the temperature dial back to full cool (blue). The valve gate should now move slowly to the closed position.

VALVE WITH GATE FULL OPEN

VALVE WITH GATE FULL CLOSED

NOTE: By nature of the design of the valve, when the coolant valve gate is fully open, half of the valve port opening appears to be blocked. At no time will the valve port appear to be empty.

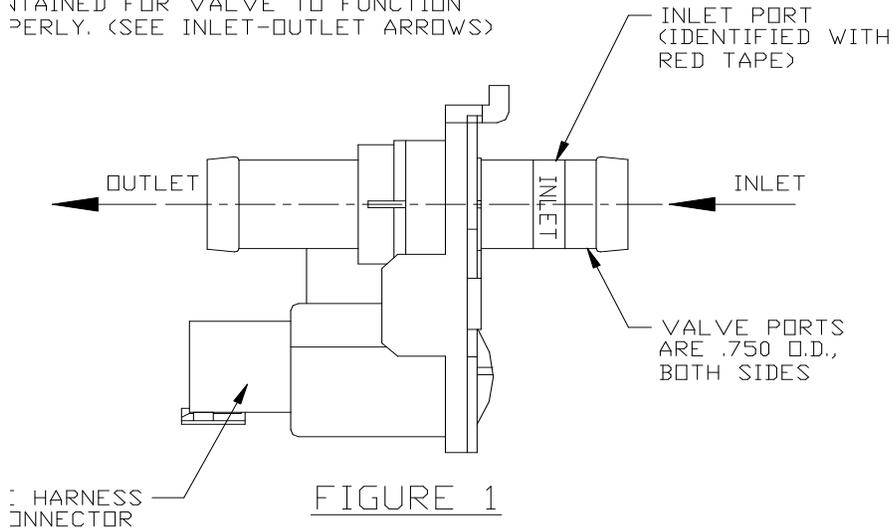
- 5.5 If the valve does not operate, disconnect the valve from the wire harness and apply 12 VDC power from an alternate power source directly to the #4 and #6 pins on the valve to determine if the valve gate will open and close. (12 VDC positive to the #4 pin and 12 VDC negative to the #6 pin to close the valve gate -- 12 VDC positive to the #6 pin and 12 VDC negative to the #4 pin to open the valve gate)

- 5.6 If the valve operates, proceed to Step 5.7. If the valve does not operate, replace the valve and repeat function test (Step 5.2 - 5.4). If the replacement valve does not operate, replace the circuit board and go to Step 6.1.
- 5.7 With the valve gate open, inspect the valve for debris which may cause the valve to not seal properly. Flush the valve with water to remove any visible debris.
- 5.8 Close the valve gate and test the valve under pressure to determine if the valve is sealing properly. This can be done by securely attaching a water hose to the inlet port on the valve and engaging the source. If a steady stream of water escapes through the outlet port, the valve is defective and must be replaced.
- 5.9 If the valve operates and seals, replace the circuit board for test purposes.
- 6.1 Re-test for operation with the new coolant valve and/or circuit board plugged into the harness for test purposes. If coolant valve does not operate, plug a new potentiometer into the harness for test purposes.
- 7.1 Re-test with the new potentiometer plugged into the harness. If the valve fails to operate, run a complete continuity test of the HVAC electrical system harness to determine if there is a broken or shorted wire, faulty or corroded terminal, etc.
- 7.2 The HVAC wire harness is supplied with two (2) ground leads crimped into a common terminal. The 16 gauge black wire is the ground lead for the coolant valve circuit. Often, body builders will cut the common terminal off the ground leads and butt splice the leads to the existing chassis ground circuit. The 16 gauge black ground lead for the coolant control circuit should be physically traced back to the grounding source to ensure proper grounding. Check any splices in the leads for continuity. Examine the grounding terminal to determine if it is secure, and the grounding location to determine if it is a good grounding source.
- 7.3 If a defect is found in the harness, other than any butt spliced connections to the vehicle wiring, the entire harness should be replaced. Any defective butt splices from the HVAC wire harness to the vehicle electrical system should be cut out and replaced.
- 8.1 Once the faulty component has been identified, the new replacement can be permanently installed. The coolant valve can then be re-installed back into the heater hose. Once everything is buttoned back up, perform an actual function test for warm and cool air with the vehicle running. Test A/C performance using the **EVANS A/C SYSTEM OPERATIONAL CHECK AND PERFORMANCE GUIDELINES**.

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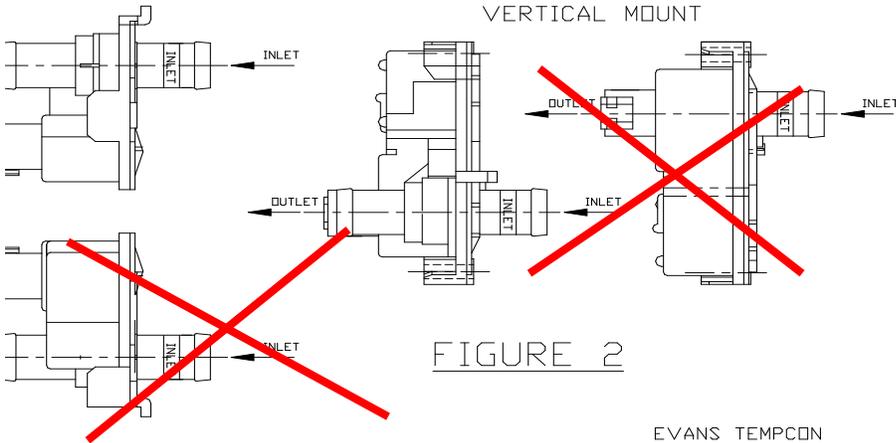
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NOTE: DIRECTION OF FLOW MUST BE MAINTAINED FOR VALVE TO FUNCTION PROPERLY. (SEE INLET-OUTLET ARROWS)



HORIZONTAL MOUNT

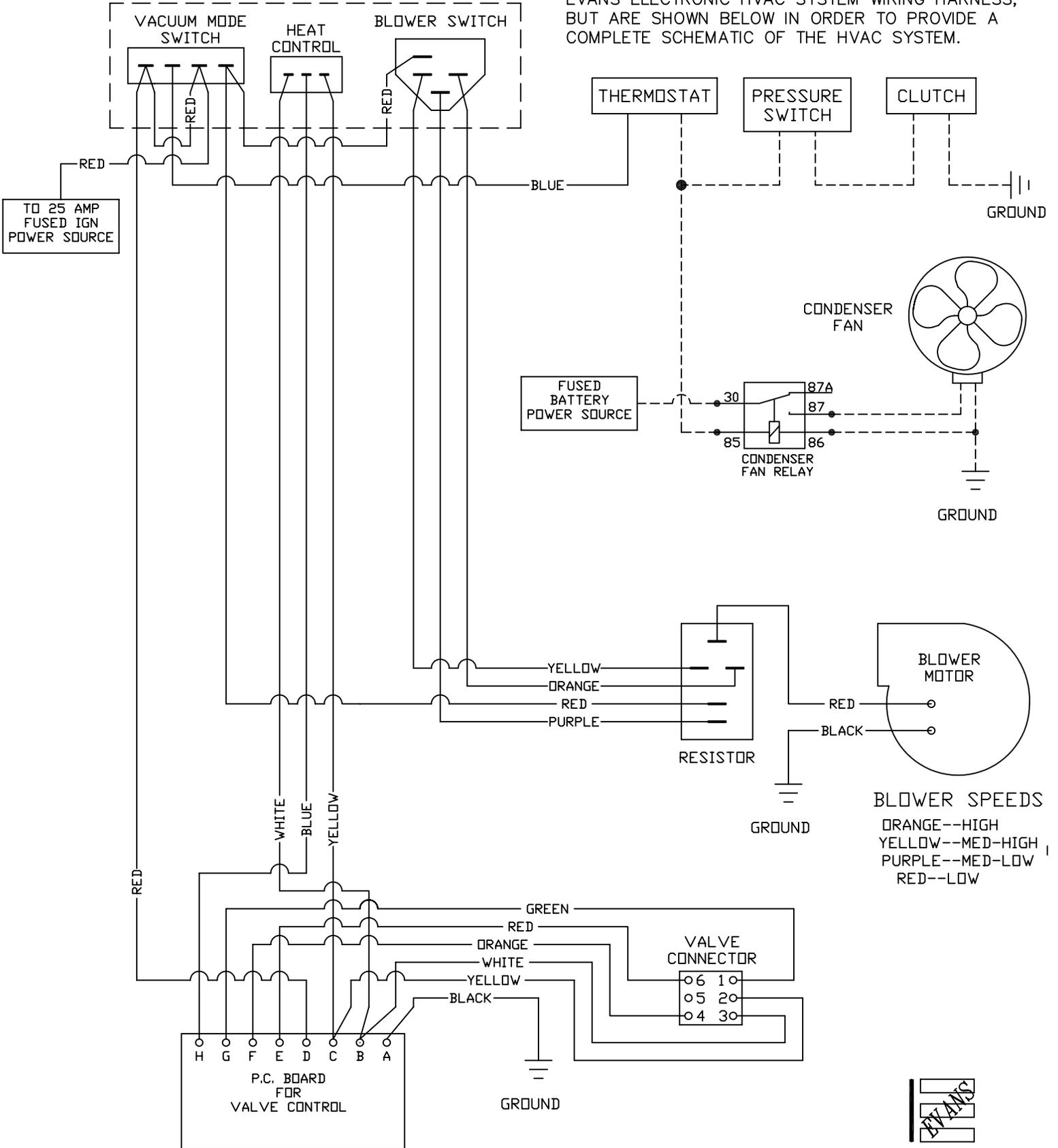
VERTICAL MOUNT



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5/15/97

NOTE:
 ELECTRICAL CIRCUITS FROM THE THERMOSTAT TO THE PRESSURE SWITCH, CLUTCH, AND CONDENSER FAN COMPONENTS ARE NOT TYPICALLY SUPPLIED WITH THE EVANS ELECTRONIC HVAC SYSTEM WIRING HARNESS, BUT ARE SHOWN BELOW IN ORDER TO PROVIDE A COMPLETE SCHEMATIC OF THE HVAC SYSTEM.

CONTROL PANEL BACKSIDE



BLOWER SPEEDS
 ORANGE--HIGH
 YELLOW--MED-HIGH
 PURPLE--MED-LOW
 RED--LOW



TEMPCON

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