

Improving AC Performance on the ZR-1

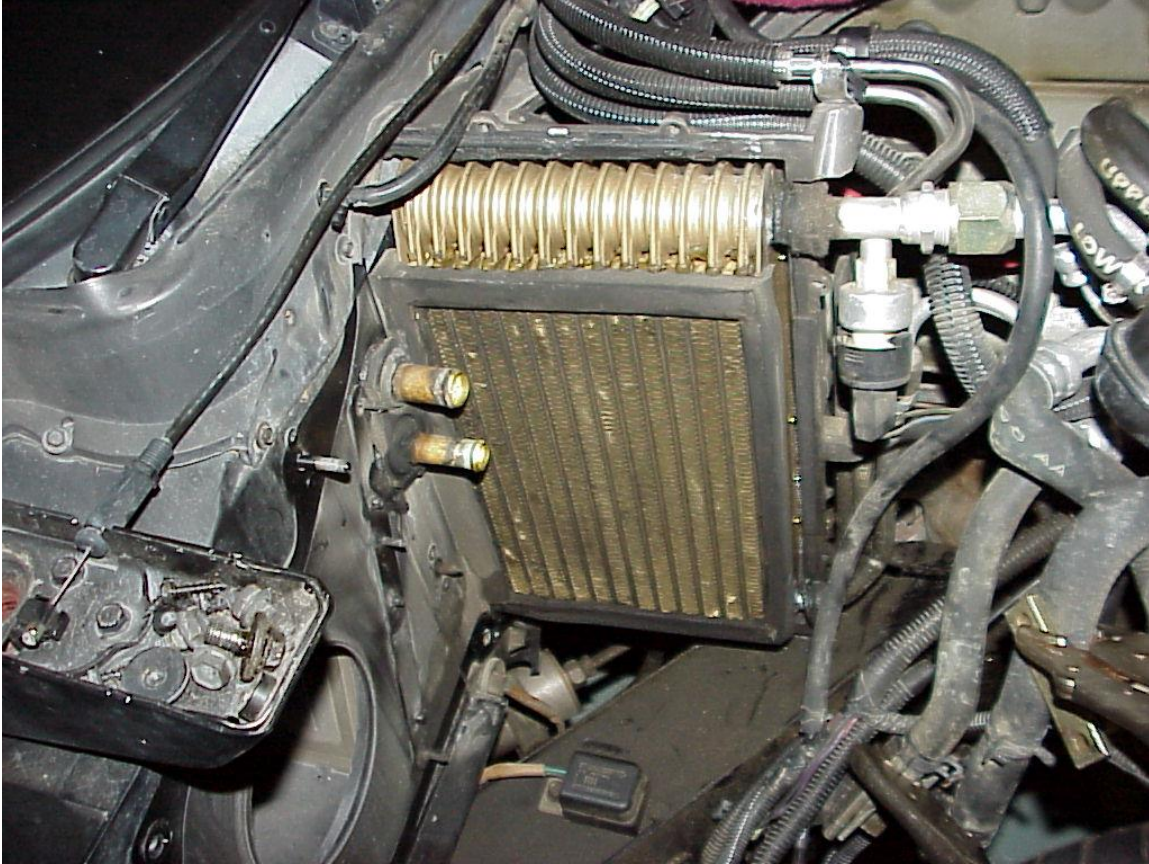
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The normal AC cooling performance on the ZR-1 can only be described as good. Typically, the system can't keep up with the heat load in traffic when the ambient temperature is over 90 degrees. The AC compressor size was reduced by 10% to fit under the plenum for the beautiful engine packaging. This was compensated for with the metallic coating on the windshield. Also, there is a lot of glass or glass like areas like the transparent roof panel. A dark colored car adds to the dilemma.

I don't know of a way to increase the performance of the refrigerant system. Make sure that the radiator and the condenser are free of debris. One area that is easy to overlook is the face of the evaporator. I have found restricted airflow on a few evaporators. It's usually the worst on the lower end. The lower end can be viewed by removing the blower motor and looking in with a mirror or a scope. This is the worst obstruction that I have seen.





After cleaning.

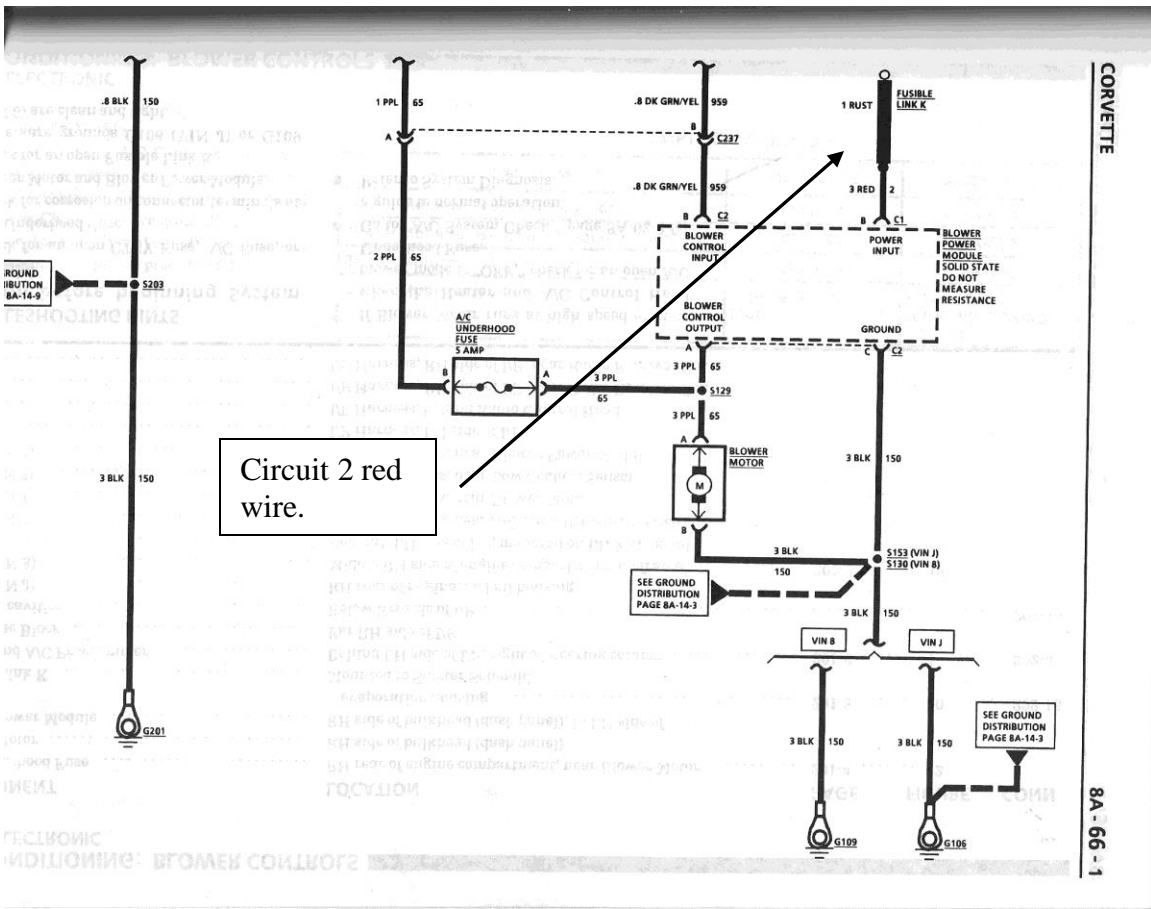
The material often has a fiber like texture. This makes me wonder if the source is from the interior of the car. In Recirculation mode the air going to the evaporator is drawn from the interior of the car. The debris in the picture included a lot of dog hair.

I have found two easy to do modifications that will improve AC cooling performance. When implemented together they add up for a significant improvement.

Reduce the Voltage Drop to the Blower Motor

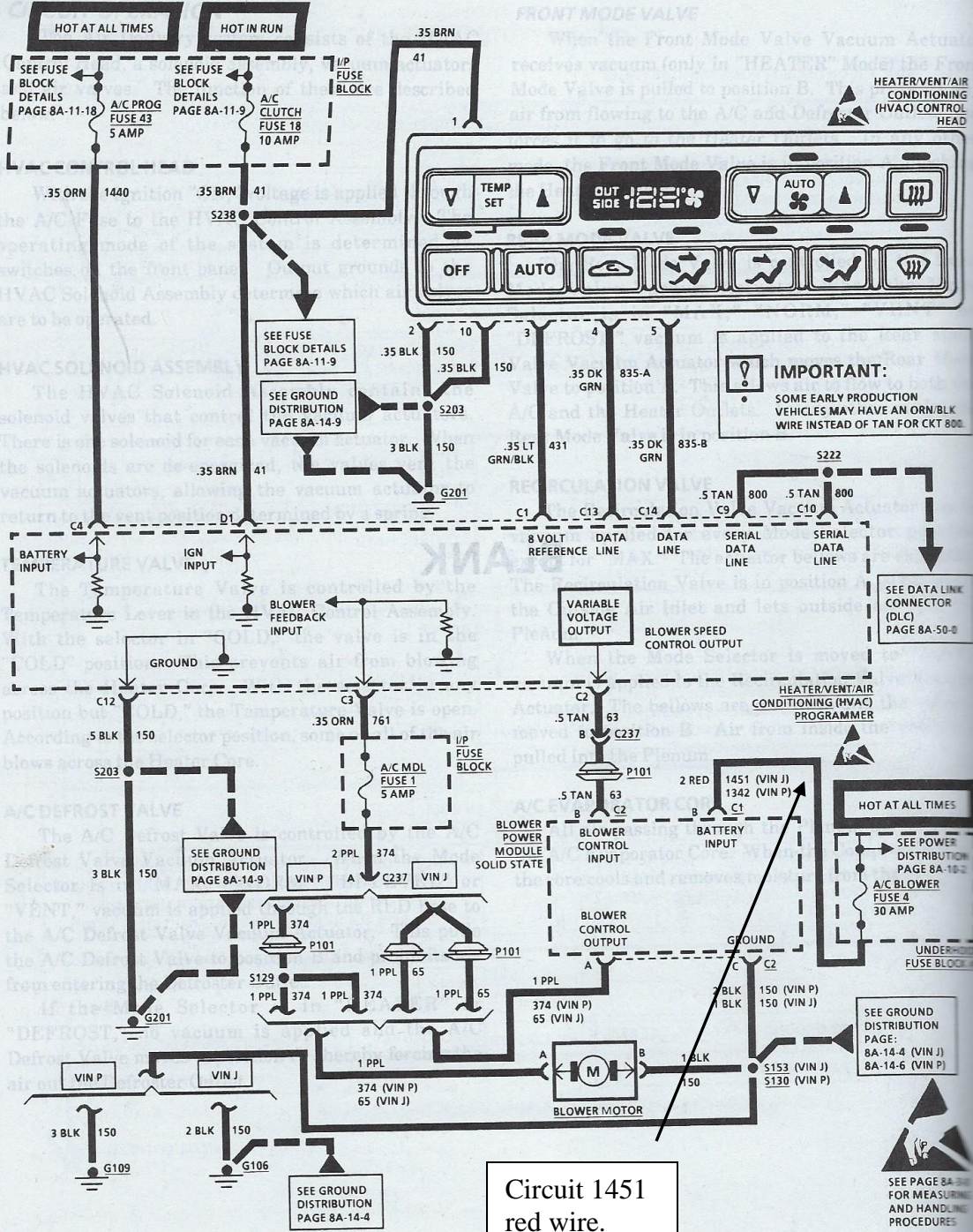
On '90 – '92 cars there is a .25 volt drop in the power feed wire to the blower motor. The wire runs from the terminal block on the left side of the car to the blower motor speed control module on the AC evaporator housing. It is circuit #2. The red wire is 3mm/12 gauge. Run a 12-gauge wire in parallel with the wire. Use a 20 ampere ATO fuse. This will reduce the voltage drop to .040 volt. The typical maximum airflow from the center duct in the dash is 1056 feet per minute. The increased voltage to the motor will add 44 ft./min. or +4% airflow.

On '93 – '95 circuit #1451 the red wire is 2mm/14 gauge.



'90 - '92 C68

HVAC BLOWER CONTROL
C68, ELECTRONIC



Install a 200 Ampere Alternator

The OE alternator is rated at 124 amperes. The Powermaster 47864 alternator is rated at 200 amperes. It is a drop-in replacement with three minor modifications:

- The case halves need to be clocked to match the OE alternator's shape.
- An optional 2.6" pulley needs to be used to prevent the alternator from exceeding the 18,000 rpm speed limit when used on a 7000 rpm engine. Powermaster part number 186.
- Install a .045" shim under the pulley so that it does not crush the fan.
- The upper mounting hole is threaded. Drill out the threads to use the LT5 through bolt.
- Test fit the plenum to check for interference between the alternator's high efficiency fan and the air horn. If the fan contacts the air horn use a die grinder to make about .025" of clearance.
- This high performance alternator makes a humming sound that is noticeable when the hood is open.

\$316 from Summit Racing. The 2.6" pulley costs \$21.

An additional improvement should be made to receive the full benefit of the high output alternator. The OE alternator output wire is 8mm/8gauge. Add a parallel 8 gauge wire from the alternator to the battery terminal block. Install a Littlefuse MEG150 fuse at the terminal block. The fuse is available from McMaster-Carr as pn 9180K93. Also as pn 9180K1. 150 amperes.

The following measurements are typical at 70 degrees ambient temperature and 650 rpm idle speed.

With the OE alternator the system voltage at the battery with the headlights on, both cooling fans running, the AC blower running at full speed and the brake pedal depressed drops from 14.4 to 13.5 volts.

With the Powermaster alternator and the same conditions described above the system voltage holds steady at 14.5 volts.

With the one volt increase in system voltage and the .2 volt reduction in blower motor voltage drop, the velocity of the AC airflow at the center duct increases by about 23% or 264 ft./min.

Brake Lights and the OE Alternator

When using the OE alternator and system voltage drops are adding up, an interesting area for improvement in system voltage is the brake lights.

Brake lamp current draw.	OE	LED
Center brake light.	2.4 A	.2 A
Four brake lamp bulbs.	8.8 A	1.3 A
Totals.	11.2 A	1.5 A

The 11.2 ampere draw causes a .3 volt drop in system voltage. This is a factor if the car is in traffic and the AC system is struggling. LED brake lights will help a little when you need everything that you can get.

The center brake light from a '07 Chevrolet Highlander can be fitted to the ZR-1 brake light housing with small modifications. The Highlander light circuit board needs to be shortened about 1.5 inches. A jumper wire needs to be connected to the circuit board after cutting the end off. PN 15264475 About \$130. An electronic flasher is needed for the LED lamps. Novita EL12.

SPAL Cooling Fans

I tested the SPAL SP846 cooling fans available from DeWitts Radiator. I was not impressed with the performance of the fans.

Measurements made at 12 volts with zero backpressure, six inches in front of the fans.

	Current draw.	Air velocity.	Weight.
OE	9 amps each.	2024 ft./min.	14 lbs.
SPAL	11.3 amps each.	2024ft./min.	9 lbs.

The weight reduction is nice. The AC accumulator needs to be lifted in the mounting bracket.