

Converting the ZR-1 Air Conditioning to use Modern R-134a Refrigerant

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Pros and Cons

The OE R-12 refrigerant is hard to find and expensive when it can be found. It has not been manufactured in the US since 1995. Unless old stock is purchased from a trusted source, it's difficult to determine exactly what you might be buying.

R-12 absorbs more heat than R-134a. In general the evaporator will run about five degrees cooler with R-12. On a 90 degree day with 60% humidity the temperature of the air coming out of the center vent will be 63 degrees with R-134a and 58 degrees with R-12.

If there should be a refrigerant leak the loss of R-12 would also result in the loss of a lot of money. In 2025 the complete loss of a charge of R-134a would cost about \$36.

How to Perform a Conversion

GM issued service bulletin 43-12-07E describing the details of a conversion to R-134a refrigerant for all 1984 to 1994 vehicles. These are the major points for the ZR-1:

- The O-rings do not need to be replaced.
- The mineral oil does not need to be removed. With R-134a the mineral oil will eventually collect safely in the bottom of the accumulator.
- Eight ounces of 46 viscosity PAG oil must be entered into the accumulator. GM part number 88901445 or equivalent.
- Install one pound and 14.5 ounces of R-134a.

R-134a service port adapter fittings are available from Santech. Part number MT0111 for the low side and part number MT0112 for the high side.

The R-12 refrigerant must be transferred to a recovery tank. An AC service shop can do that.

The system needs to be leak tested. The most common leak on the ZR-1 is the high side Schrader valve. I do not recommend replacing the valve. Too often there can still be a leakage after replacing the valve. I recommend installing a sealing cap on the high side R-134a service port. Dorman part number 902-025.

To remove the R-12 entrained in the mineral oil, the system must be evacuated to -29 inches-HG or less for thirty minutes.

Working With the ZR-1 C68 Electronic HVAC Control System

The compressor cycle switch must be bypassed in order to operate the compressor when installing the refrigerant. The switch is located under the large tube going into the top of the evaporator box. Place a jumper wire in the connector.

The system watches for an undercharged system by monitoring the compressor cycle time. If it cycles too often the system will lock out the compressor. This is done to protect the compressor from damage due to under lubrication. If the compressor is not running, press the up and down arrow fan buttons on the HVAC control panel for a few seconds. A -00 will appear in the display. Press the button with the fan icon and the error code will display. Code 09 indicates a compressor safety lockout. The easiest way to clear the code is to remove the battery cable for 10 seconds.

This is how the compressor is controlled. The control panel commands the HVAC Programmer located under the left side of the instrument panel to send a request to the ECM to compensate the idle speed and drive the compressor relay.

Connect a pressure gauge to the low side service port. The high side port gauge is not needed when recharging.

Install a temperature probe in the center AC duct.

Connect the source of the refrigerant. And start the engine.

Press the Auto button on the HVAC control panel and set the temperature to 60 degrees.

Both engine cooling fans must turn on by the time about 10 ounces of refrigerant are installed.

Maximum AC performance occurs with about one pound and 12 ounces of the refrigerant. The additional 2.5 ounces to get to one pound 14.5 ounces is a reserve over charge.

Rate the system performance with the performance chart.

Remove the jumper from the cycle switch connector and reconnect it to the cycle switch. Verify that the compressor runs. If the compressor does not run, the cycle switch is defective. There is a Schrader valve under the cycle switch. The refrigerant does not need to be removed when the removing the switch.

A link to GM service bulletin 43-12-07E. The ZR-1 relevant pages are:

- Refrigerant weight formula. Page 9.
- O-ring compatibility. Page 18.
- Mineral oil and PAG oil compatibility. Page 19.

<http://www.zr1specialist.com/HAT%20Web/Tech%20Info/AC%20Service%20Bulletin.pdf>

If the HVAC control panel buttons do not respond or LEDs do not light, the problem is in the button panel box. Clean the connector between the two circuit boards to resolve the problem.

The GM AC Performance Rating Chart

RELATIVE HUMIDITY (%)	AMBIENT AIR TEMP		LOW SIDE PSIG	ENGINE SPEED (RPM)	CENTER DUCT AIR TEMPERATURE		HIGH SIDE PSIG
	°F	°C			°F	°C	
20	70	21	29	2000	40	4	150
	80	27	29		44	7	190
	90	32	30		48	9	245
	100	38	31		57	14	305
30	70	21	29	2000	42	6	150
	80	27	30		47	8	205
	90	32	31		51	11	265
	100	38	32		61	16	325
40	70	21	29	2000	45	7	165
	80	27	30		49	9	215
	90	32	32		55	13	280
	100	38	39		65	18	345
50	70	21	30	2000	47	8	180
	80	27	32		53	12	235
	90	32	34		59	15	295
	100	38	40		69	21	350
60	70	21	30	2000	48	9	180
	80	27	33		56	13	240
	90	32	36		63	17	300
	100	38	43		73	23	360
70	70	21	30	2000	50	10	185
	80	27	34		58	14	245
	90	32	38		65	18	305
	100	38	44		75	24	365
80	70	21	30	2000	50	10	190
	80	27	34		59	15	250
	90	32	39		67	19	310
90	70	21	30	2000	50	10	200
	80	27	36		62	17	265
	90	32	42		71	22	330

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Figure 39 - A/C System Performance Test