Decreased Cooling In GM And VW Cars And Trucks Could Mean A Faulty Refrigerant Control Valve, Not A Failed Compressor

Don't change out a compressor if all that's needed is a Refrigerant Control Valve. Here's how it's done.

By Ignacio (Nacho) Corella

Your customer comes in complaining that their car's A/C loses cooling at idle or that they have to rev up the engine to get it to cool. You throw on the gauges and find that the suction is up or discharge won't move; obviously, the compressor needs to be replaced. But does it?

In many cases, with a fixed-stroke type compressor, that may be true. However, if the car or truck uses a variable-stroke compressor, there might be another reason for the decreased performance.

Many GM vehicles use a variable displacement compressor, which is also known as the V5 and V7. Some of the models using them are the Cavalier, Malibu, Cutlass Ciera, Century, Sunfire, Venture Minivan (up to 2000), S10 trucks with 4-cyl engines and dozens of others going back to the mid 80's and up to current production. More frequently, you'll also see this performance problem in Volkswagen products using the Sanden SD7V16 compressor, dating back to the early 90's and through today. Note that most variable displacement compressors are used in smaller, 4 and 6-cylinder engines; larger GM V6's (like the 3.8 or 4.3L) use a fixed displacement compressor. Another common variable stroke compressor is Nippondenso's 6C17 used by Chrysler between 1992 and 1989 in many of its V6 minivans and sedans.

Instead of a failed compressor, the cooling loss is due to a faulty ***Refrigerant Control Valve (RCV)***. The symptoms are suction pressures above normal, anywhere from 45-80 psi, while the discharge pressure remains somewhat normal. Air from the vent is merely "fresh" or even somewhat warm.

The RCV is a more sophisticated method of controlling A/C system operating pressures. It works by adjusting, actually optimizing, the compressor's piston gear traveling stroke, by determining the compressor's internal refrigerant pressure (inside the compressor's housing). RCV's are spring-loaded, pressure-sensitive devices that sense the compressor's internal pressure and "push or pull" the piston gear or increase a swash plate angle, depending on the compressor's type.

The main reason for using a variable stroke compressor is that it is a more efficient pump; it reduces fuel consumption compared to conventional compressors. Additionally, if working correctly, these compressors also allow for a smoother engine operation as they never cycle on and off, something that is annoying to many drivers. Conventional systems (fixed stroke) use thermostats or low-pressure cutoff switches and compressor operation is intermittent.

GM systems equipped with variable stroke compressors do not have a low pressure cut off switch and they can run with as little as 15% of the system's charge. They do, however, have switches to cut the compressor off if a high-pressure condition is detected. This may disconcert the driver because they will notice their compressor is still running yet no cold air comes through the vents. RCV failures won't keep the compressor from running either. If it quits, the compressor's ability to move the refrigerant inside the system is just reduced. On the other hand, VW systems, with the SD7V16 compressor, shut the compressor down if a low-pressure condition is detected (thanks to a trinary switch in the drier).

Replacing the RCV is not a big job in any of the applications. But better yet is that the compressor, with some minor modifications, can work just fine without the RCV (if perhaps you get stuck and can't find a replacement).

VERY IMPORTANT: The A/C system must be discharged before attempting this repair—always wear safety goggles!

In GM products with the V5 and V7 compressors, the RCV is located in the rear cover of the compressor, and looks like a nipple on the outside (Photo 1). It's held in place by a snap ring and looks like spinning top (Photo 2). In most or all

Photo 1. Locating the RCV on a GM V5 compressor

Photo 2. An actual RCV for both the V5 and V7

FWD models, the RCV points down to the ground and can be replaced easily. The vehicle must be jacked up and blocked to provide proper access space. In fact, in most cases the compressor does not even have to be removed.

Once you locate the valve, simply remove the snap ring and pull the valve out. Insert the new valve and re-install the snap ring. Pull a vacuum and charge to specs. That's all there is to it.

As far as the VW Golf, Jetta, Passat and a few others, more work is required to replace the RCV than on the GM models. Yet, it is still fairly easy and certainly worth giving it a try. The RCV is INSIDE the compressor. To get to it, you have to remove the rear compressor cover (again, no need to remove the compressor).

Remove the rear cover carefully. It's held in place by 7 bolts. Avoid damaging the gaskets between the cover and the compressor's body (Photo 2A). Once the cover is off, the reed valve plate will come off. Installed in it, you'll see the RCV (Photos 3, 4, and 5).

The valve is held in place by a 7/16" nut in the opposite side. Remove the nut (Photo 6), remove the valve, replace it, and re-install the gear plate and cover. Pull a vacuum and charge to specs.

In both cases, replenish the system

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Photo 2A. SD7V16 gasket top view

with 3-4 ounces of specified PAG or mineral oil.

Now, remember from above when we told you that with some modifications you could get by without the valve (if by chance you can't get them)?

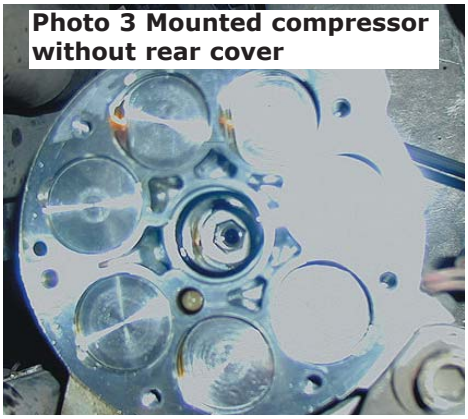

Photo 3 Mounted compressor without rear cover

Doing it will essentially convert your variable displacement compressor into a fixed displacement compressor. Simply stated, either eliminating or blocking the valve does it. You will, however, need to install a low-pressure switch or a conventional thermostat to keep the evaporator from freezing.

Right: Photo 4 Rear compressor cover internal view

The procedure in both cases is simple.

For the V5/V7 compressor, you have to remove the RCV's as shown. (Photos 7, 8, & 9). Now, with a tailored top (it can be aluminum or steel, or even aluminum brazing), seal the orifice. Make sure the top is secured by pressing it into the receptacle. (Photos 10 & 11)

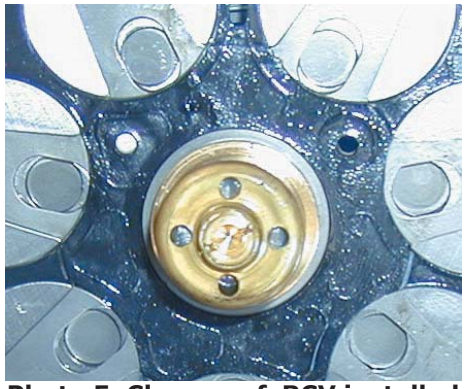

Photo 5. Closeup of RCV installed in compressor

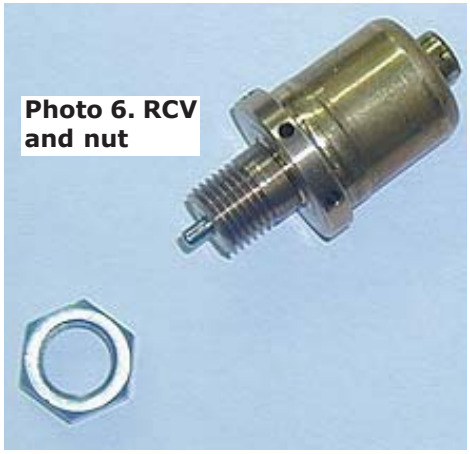

Photo 6. RCV and nut

Photo 7. V5 RCV snap ring

Photo 8. Pulling RCV on a V5

Photo 9. Removing the RCV from a V5

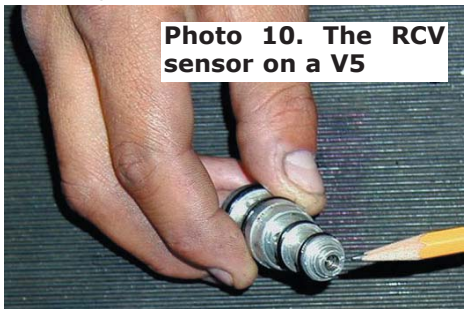

Photo 10. The RCV sensor on a V5

Photo 11. A V5 RCV with the sensor removed

Re-install the valve in the compressor and secure it with the snap ring.

Photo 12. A SD7V16 with the RCV removed

This cancels the variable stroke design feature of the compressor; it is now a fixed stroke. Therefore, a compressor cutoff means must be provided to avoid evaporator freezing. It can either be a thermostat or a low pressure cycling switch that's wired into the vehicle's electrical system.

For the SD7V16 Volkswagen compres-

sor, the RCV is simply replaced by a 7/16" X 1" bolt and nut as shown (picture 12).

Photo 13. SD7V16 RCV eliminated

In the case of the SD7V16, don't be surprised by a noticeable suction pressure drop below 15 at once. Given the compressor's design, it is normal.

Like in the GM compressors, a clutch cutoff method must be provided to avoid evaporator freezing. **$$$**