Even though this system is typically trouble-free, it’s on so many vehicles you need to know about it.

by Greg McConiga

Every so often somebody actually thinks ahead and designs a system to overcome a problem that just might arise. Appearing in two versions on GM’s second and third generation kid-haulers (1997 to current production Venture/Uplander, Transport/Montana, Terraza and Silhouette, as well as the 2001-2005 Aztec and 2002 and up Rendezvous), the rear-only automatic level control system came about because someone thought about how these famously utilitarian and cavernous family cargo haulers would actually end up being used. I had one, and it transported everyone and everything at one point or another. From four-by-eight sheet stock to ladders and tools, it cheerfully...
moved everything we stuffed into it while getting about 19 mpg city and 24 highway – not bad for a blunt-nosed, flat-sided aerodynamic nightmare on wheels.

### Level's important

Rear level control systems are likely to appear where vehicle loading varies considerably. Large cars with room for three plus-size people in the back seat are candidates, as well as our topic du jour, the minivan and its SUV spinoffs. If you think about it, you’ll see that automatic rear level control systems are actually safety systems -- crash safety, vehicle dynamics and braking are all dramatically affected by vehicle trim.

In a collision, maintaining proper ride height is one key to making sure that all parties involved are properly protected. In a rear hit, a low riding rear bumper could allow the colliding vehicle to ride up over the rear sill and into the cabin area. In a frontal impact, if the front of the van/SUV is tipped up, the colliding vehicle could dive under, perhaps decapitating the occupants or causing an unintended “launch” of the van/SUV. Additionally, having your tail dragging can bypass the crush and crumple zones that are built around the “normal” impact areas of either front or rear, thus circumventing the impact reducing effects that are engineered into those controlled crush zones. And don’t forget what happens to the headlights! Blinding oncoming drivers is just plain inconsiderate at best, but it’s dangerous to family and friends when you can’t see where you’re going on dark twisty roads because you’ve got the headlights tipped up to the “tree-top inspection” setting. Extra weight affects handling even when trim is maintained, and that’s bad enough, but tilting the weight distribution rearward and off the front tires makes a mildly under-steering vehicle misbehave even more. Vehicle handling and roll characteristics also change for the worse, as does braking performance. All good reasons to keep the vehicle at or near a standard trim specification.

There are two variants of the system, one from 1997 until 2002, and another from 2003 through the current model year. Both systems are available with or without the inflator option, which allows you access to the onboard air compressor for chores like pumping up tires or inflatable toys. From 1997 until 2002, the system had no self-diagnostics, but starting in 2003 a limited self-diagnostic capability was embedded into the height sensor. The actual function of both systems is identical, with the exception of being able to flash codes at the inflator control switch, and the addition of
a circuit to the height sensor that controls the inflator solenoid valve, so we'll discuss the later system in this article. When working on the first generation system you'll simply stick to symptom-based diagnostics and follow the appropriate flow chart.

**Components**

The air shocks are conventional with the addition of a rubber sleeve that’s attached between the dust tube and the reservoir, which creates a flexible air chamber -- you’ll never see them leak unless the boot fails. Minimum residual pressure is maintained at eight psi by the air drier assembly. The shocks are connected to the compressor by plastic lines and couplers that are double o-ringed and retained by clips. The compressor is a 12 volt permanent magnet DC motor, positive displacement piston compressor with a serviceable cylinder head assembly containing inlet and outlet valves and the exhaust vent solenoid. The compressor is mounted under the left rear corner of the vehicle and is tucked up into the left rear quarter panel area.

The electronic height sensor is the brains of the outfit and attaches to the body while the non-adjustable linkage attaches to the rear axle. The height sensor controls the compressor exhaust valve, the inflator solenoid valve and the compressor, and houses the self-diagnostic electronics and compressor run logic. An inlet filter that limits the ingestion of dirt is a simple foam filter that snaps into a hole in the frame rail. On the discharge side the desiccant-type drier mounts to the top of the compressor assembly between the compressor discharge and the plastic lines that connect the inflator with the system. With the inflator option you also get limited self-diagnostic capability.
(Below) The rear shocks are standard design with the exception of the added air bladder. Don’t be tempted to replace the air shock system with standard shocks for all the safety reasons previously mentioned. No point in asking for additional liability exposure.

(Above) The inflator solenoid assembly is mounted on the backside of the inflator control panel, located in the left rear inside quarter of the vehicle. (NOTE: Color is added for viewing enhancement only.)

to the shocks. On those systems with an inflator system, there is an inflator control panel containing the switch and a high pressure air supply port in the left rear quarter panel under a removable cover. The inflator solenoid is attached to the backside of the inflator control panel in the left rear.

Operation

At key up the height sensor checks ride height. If it’s within four millimeters of the set point, there’ll be a 30 second wait, then the compressor runs for four seconds to guarantee adequate reserve air pressure of eight psi. If the vehicle is out of trim, after 20 seconds the compressor will start and run until the desired attitude is reached – or 255 seconds, whichever comes first. The compressor protection portion of the height sensor logic limits run time to 255 seconds at each key cycle to prevent compressor
damage in the event of a pressure leak. The start is always delayed 20 seconds from the call for ride height adjustment to compensate for normal vehicle movement and suspension travel, thereby avoiding compressor short cycling or needless starts. The exhaust solenoid valve actuates for 1.5 seconds with each compressor start to reduce pressure in the compressor head cavity and reduce startup current.

**Diagnosis**

The system has ten DTCs you can call up using the inflator switch. To extract codes, press and hold the accessory inflator switch for three seconds. From initiation the self-test takes 200 seconds to complete. The number of flashes on the switch LED represents the currently present codes and all codes will flash until acknowledged by pressing the inflator switch, or until the module goes to sleep. The LED will flash the first digit of the two digit trouble code at half second intervals followed by a one second delay and then the second digit will flash. Each code cycle will be separated by a three second delay. Once the conditions that set the code are repaired, the codes will automatically clear when the ignition is cycled.

Located on the left rear inside quarter panel trim the inflator panel has an auxiliary power outlet, the control switch and an air fitting. These vehicles have a hose and inflator kit supplied with them that can stretch to reach all four tires.

(Above) Three bolts, one electrical connector and two air connections later and the whole shootin’ match is on the bench. Be prepared to work a bit to get the bolts loose, remember this thing is right behind the left rear wheel. You can see the compressor ground, the exhaust solenoid in the head, the drier and part of the tabbed bracket that holds it in the frame when the bolts are removed.

(Below) The drier keeps moisture out of line and shocks. Technically it should be replaced periodically, but I didn’t find any published recommendations for replacement.
1- The foam air filter clips on the end of the intake line and snaps into the frame high up to avoid water ingestion.
2- Rubber splash shield
3- Mounting bracket

Real world

This system can only be called reliable and robust. Of all the people I spoke with, not one saw any significant failure patterns, which mirrors my experience. We’ve replaced a few lines attacked by rodents (if someone can explain the affinity rodents have for plastic and wiring insulation, I’d sure like to hear it!), and a few shock units that were worn out, or with blown out air bags, but that’s about it. The ability to pump up a flat tire with your own vehicle is a great idea (I’ve done that at least once), and it’s nice to be able pump up pool toys and bike tires as well. It’s a good system that is well executed. Really, I’m on the level!

Diagnostic Trouble Codes

**DTC 11** is related to the accessory inflator solenoid, and will set for short to power, short to ground or a malfunctioning solenoid.

**DTC 12** is the system okay code.

**DTC 13** sets if the ride height is out of specification.

**DTC 21** sets if the compressor relay coil control circuitry shorts to ground.

**DTC 22** sets if the compressor relay coil circuitry opens or shorts to battery.

**DTC 23** sets if the compressor runs for 255 seconds during a leveling function.

**DTC 31** sets if the exhaust solenoid control circuit shorts to ground.

**DTC 32** sets if the exhaust solenoid control circuit opens or shorts to battery.

**DTC 33** sets if the exhaust solenoid has been energized for 255 seconds and the height sensor did not detect the proper downward movement.

As is typical, each of these trouble codes refers you to a multiple-page diagnostic flow chart to accurately complete the diagnosis.