

## Regulated Voltage Control



### Basic Concept and Benefits

Traditional charging systems use an internal temperature sensor inside the generator to establish generator voltage set points. When the generator is cold, it raises the voltage output set point. When the generator is hot, it lowers the voltage output set point. This type of system tends to overcharge the battery on long trips at highway speeds and undercharge the battery on short trips with low vehicle speeds.

Regulated Voltage Control (RVC) is a new dynamic control of the vehicle's system voltage. It regulates the generator's output voltage, based mainly on estimated battery temperature and battery state-of-charge. The main benefits of this system are:

- Improved fuel economy
- Extended battery life
- Extended lamp life
- Extended switch life

### Techline News

#### Tech 2 Diagnostic Pathing Cards

GM Service Operations announces the latest revision of the Tech 2 pathing cards. These handy pocket-sized reference cards (Body, Chassis and Powertrain) help you make the most of your Tech 2 diagnostic tool.

The cards cover model year 1992 through the present.

Simply select the item(s) you are looking for from the alphabetized list, then follow the "path" provided. In most cases, you will be selecting from the numerous data and input/output controls in the Diagnostic Menu.

GM dealers will automatically receive two

each of the pathing cards at no charge. Individual cards and sets may be purchased from the DWD Online Store.

Go to [www.gm-dealerworld.com](http://www.gm-dealerworld.com). You will need your ID and password for access. Then click on the DWD Store button in the upper left corner. The most direct way to locate the item is to use Search and the item number. See the table below.

Non-dealers may purchase sets of three pathing cards from the ACDelco online store.

There are two types of RVC systems used today – integrated RVC and stand-alone RVC (SARVC).

Integrated systems use a battery current sensor to provide a body controller (BCM) the amount the battery is charging or discharging. Accurate voltage measurements are taken through the battery positive voltage and ignition 1-voltage circuits. The BCM then communicates information over serial data circuits for the ECM/PCM to directly control the generator.

SARVC systems do not use the BCM for operation. They have a generator battery control module mounted to the negative battery cable, to interpret battery current, and voltage and battery temperature inputs. The battery current sensor is internal to the module. This module also directly controls the generator L-terminal duty cycle instead of the ECM/PCM.

Both types of system have two types of corrective actions to insure the battery stays at an 80% state of charge. These include up to three levels of load shed and up to three levels of idle boost operation. Refer to the service manual Description and Operation for load shed and idle boost.

We will discuss the basic operation of the RVC system, the three different generations of systems used today on GM vehicles, components used on each separate system and a general diagnostic information section.

### System Operation

Not all systems will enter all modes of operation; refer to the applicable service manual for exact Description and Operation.

The purpose of the RVC system is to maintain the battery state-of-charge at 80% or above and support vehicle loads.

The six modes of operation include:

- Charge Mode
- Fuel Economy Mode
- Voltage Reduction Mode
- Start Up Mode
- Windshield Deice Mode
- Battery Sulfation Mode

The PCM/ECM (generator battery control module on full-size trucks) controls the generator through the generator L-terminal control circuit. It monitors the generator performance through the generator field duty cycle signal circuit. The signal is a 5 volt PWM (pulse width modulated) signal of 128 Hz with a duty cycle of 0-100%. Normal duty cycle is between 5-95%. The ranges between 0-5% and 95-100% are for diagnostic purposes. The following table shows the commanded duty cycle and output voltage of the generator:

The generator provides a feedback signal of the generator load through the generator field duty

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Go to: <http://www.acdelcotechconnect.com> and click the Training tab. Click the ACDelco Online Store link. Then click Manuals and scroll to locate the desired item.

### Functional Diagnostic Guide

A Functional Diagnostic Guide is available separately. Also pocket-sized, this handy reference card uses the "Service Category" style menu logic as found in SI. It will help you quickly locate items such as data and input/output controls on your Tech 2. It's a must for anyone performing diagnostic procedures on current and future GM vehicles utilizing GM LAN and Class 2 protocols.

- Thanks to Mark Stesney and Roger Kneip

Item	Item Number from DWD	Item Number from ACDelco
Body Card	ROM00173	-
Chassis Card	ROM00174	-
Powertrain Card	ROM00175	-
Set of cards which includes: ROM00173, ROM00174 and ROM00175	ROM00190	ROM00190
Functional Diagnostic Guide	ROM00164	ROM00164

## Correct Service Part Number for Equinox ECM

There has been some confusion regarding the proper service part number for the ECM for the 2005 Equinox. Some improper part numbers were listed on labels and in the parts system. These have been corrected. Here are the facts.

Service Part Number	Usage
12581598	will NOT work
12591027	will work fine
12591279	will work fine

All of the electronic information has been corrected and will indicate the correct service part number to order. The service CD correctly identifies the utility file that is used to flash the Equinox.

- Thanks to John Fletcher and Craig Jones



Typical Grease Purge

## Front Hub Bearing Grease Leak

On the 2004-05 Chevrolet HD Silverado, GMC HD Sierra, and Hummer H2, the front hub bearing assembly may be unnecessarily replaced for leaking grease. This condition may be normal.

The hub bearing assembly contains 15% more grease at assembly than necessary, to ensure adequate bearing performance. The additional grease will build up on the seal, which acts as an additional barrier against contamination.

This is normal grease purge, and no repair is necessary.

**TIP:** Refer to the wheel bearing diagnosis in SI if the integrity of the bearing is questionable. Replace the bearing assembly only for noise or excess end play.

- Thanks to Steve Love and Dan Stress

## Malibu Maxx Rear Sunshade

This information pertains to 2004 Chevrolet Malibu Maxx.

Some customers may comment that the rear sunshade comes unhooked from the rear sunroof trim and snaps shut. This may be caused by wind buffeting from driving with the windows open, vibration from driving over rough roads or solar exposure causing the rear sunroof trim to soften and deform.

To correct this condition, install reinforcement 15227088 on the left and right sides of the rear sunroof trim.

1. Remove any adhesive or foreign material from the back side of the rear sunroof trim in the area where the reinforcement will be installed.
2. Clean the back side of the trim with isopropyl alcohol and allow to dry.



Sunshade retaining ring



Stiffener installation

3. Remove the protective backing from the reinforcement, pull back the left side of the rear sunroof trim and carefully apply the reinforcement to the back side of the rear sunroof trim.

**TIP:** Align the slot in the reinforcement with the slot in the rear sunroof trim.

4. Repeat steps 1-3 for the right side. Watch for a future bulletin.

- Thanks to Joel Ebner

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General Motors service tips are intended for use by professional technicians, not a "do-it-yourselfer." They are written to inform those technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions and know-how to do a job properly and safely. If a condition is described, do not assume that the bulletin applies to your vehicle or that your vehicle will have that condition. See a General Motors dealer servicing your brand of General Motors vehicle for information on whether your vehicle may benefit from the information.

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## Regulated Voltage Control — from page 1

Duty Cycle	Generator Voltage Set Point
10%	11.0V
20%	11.56V
30%	12.12V
40%	12.68V
50%	13.25V
60%	13.81V
70%	14.37V
80%	14.94V
90%	15.5V

cycle signal circuit to the control module. The signal is a 5 volt PWM signal of 128 Hz, with a duty cycle of 0-100%. Normal duty cycle is between 5-99%. The ranges between 0-5% and 100% are for diagnostic purposes.

**Charge Mode** – The control module enters Charge Mode whenever one of the following conditions is met:

- Under WOT conditions and when the fuel rate (sent by the ECM/PCM) is greater than 21 g/s and the throttle position is greater than 90%.
- The headlamps are ON, low or high beam.
- The wipers are ON for more than 8 seconds.
- The electric cooling fans are ON high speed.
- The rear defogger is ON.
- The Battery SOC (state of charge) is less than 80%

When one of these conditions is met, the control module ramps up the voltage slowly to a level between 13.4 to 15.5 volts (depending upon the mode of operation the system is presently in) at a rate of 8 mV to 50 mV per second.

**Fuel Economy Mode** – The control module enters Fuel Economy Mode when the following conditions are met:

- The calculated ambient air temperature is above 0°C (32°F).
- The calculated battery current is less than 15 amperes and greater than -8 amperes.
- The battery state of charge is greater than 80%.
- The generator field duty cycle is less than 99%.

Its targeted generator output voltage is 13.0 volts. The control module will exit this mode once the criteria are met for Charge Mode.

**Voltage Reduction Mode** – The control module will enter Voltage Reduction Mode when the following conditions are met:

- The calculated ambient air temperature is above 0°C (32°F).
- The calculated battery current is less than 2 amperes and greater than -7 amperes.
- The generator field duty cycle is less than 99%.

Its targeted generator output voltage is 12.9 volts. The control module will exit this mode once the criteria are met for Charge Mode.

**Start Up Mode** – After the engine has started, the control module sets a targeted generator output voltage of 14.5 volts for 30 seconds.

**Battery Sulfation Mode** – The control module enters this mode when the battery voltage is less than 13.2 volts for 45 minutes. Once in this mode, the generator battery control module will set a targeted output voltage between 13.9 to 15.5 volts for 5 minutes. The control module will then determine which mode to enter depending on voltage requirements.

**RVC Mode** – The control module bases the charging voltage on battery state of charge (SOC). Battery SOC is estimated during a key off event every 8 hours, after 3 voltage measurements every 24 hours thereafter, and then monitored constantly while the ignition is on. These measurements of voltage are then compared to estimated battery temperature, as battery tempera-

ture vs. battery voltage directly corresponds to battery SOC. While the engine is running, the system uses both the battery voltage and estimated battery temperature to determine the battery current in and out of the battery. The control module then regulates the charging voltage to keep the battery above an 80% SOC.

### Components

**Battery Current Sensor** – The battery current

Vehicles	System Generation	Modes of Operation	Key Components
2004 Cadillac CTS	Generation II	RVC Mode	DIM, PCM
2004 Cadillac SRX	Generation II	RVC Mode	DIM, ECM
2005 Cadillac STS	Generation III	Charge Mode and Voltage Reduction Mode	Battery Current Sensor, IPM, ECM
2005 Full Size Pick and Utilities under 8600 GVW	Generation IV	Charge Mode, Fuel Economy Mode, Voltage Reduction Mode, Start Up Mode, Battery Sulfation Mode	Generator Battery Control Module, ECM/PCM
2005 Chevrolet Cobalt	Generation IV	Charge Mode, Fuel Economy Mode, Voltage Reduction Mode, Start Up Mode, Battery Sulfation Mode	Battery Current Sensor, BCM, ECM/PCM
2005 Buick LaCrosse	Generation IV	Charge Mode, Fuel Economy Mode, Voltage Reduction Mode, Start Up Mode, Battery Sulfation Mode	Battery Current Sensor, BCM, ECM/PCM
2005 Pontiac Grand Prix and Grand Prix GXP	Generation IV	Charge Mode, Fuel Economy Mode, Voltage Reduction Mode, Start Up Mode, Battery Sulfation Mode	Battery Current Sensor, BCM, PCM
2005 Chevrolet Uplander, Pontiac Montana, Buick Terazza	Generation IV	Charge Mode, Fuel Economy Mode, Voltage Reduction Mode, Start Up Mode, Battery Sulfation Mode	Battery Current Sensor, BCM, PCM

sensor is a serviceable component that is connected to the negative battery cable at the battery. The battery current sensor is a 3-wire Hall-effect current sensor. The battery current sensor monitors the battery current. It directly inputs to the BCM. It creates a 5 volt PWM signal of 128 Hz with a duty cycle of 0-100%. Normal duty cycle is between 5-95%. The ranges between 0-5% and 95-100% are for diagnostic purposes.

**Body Control Module (BCM), Instrument Panel Module (IPM) and Dash Integration Module (DIM)** – The BCM determines the output of the generator and sends the information to the ECM/PCM for control of the generator L-terminal control circuit. It monitors the generator field duty cycle signal circuit information sent from the ECM/PCM that determines the generator electrical load. It monitors the battery current sensor, the battery positive voltage circuit, and estimated battery temperature to determine battery state of charge (SOC). The BCM performs, or sends, commands to ECM or other controllers to perform idle boost and load management operations.

**ECM/PCM** – The ECM/PCM directly controls the generator field control circuit input to the generator. The ECM/PCM receives control decisions based on messages from the BCM/IPM. It monitors the generator field duty cycle signal circuit and sends the information to the BCM/IPM. On some vehicles, the ECM/PCM overrides the control decision of the BCM/PCM when the following conditions are met:

- The engine cooling fans are ON high speed.
- There is a high fuel demand.

- The calculated ambient air temperature is less than 0°C (32°F).

**Instrument Panel Cluster (IPC)** – The IPC provides a means of driver notification in case of a charging system failure. Refer to the service manual for exact operation.

**Generator Battery Control Module** – It communicates with the PCM, IPC and BCM for RVC operation. It is a serviceable component that is connected to the negative battery cable at the battery. It directly controls the generator field

control circuit input to the generator. It monitors the generator field duty cycle signal circuit, its internal battery current sensor, the battery positive voltage circuit, and estimated battery temperature to determine battery state of charge (SOC).

### Diagnostics

Diagnostics are specific for each vehicle that uses this system. Refer to the applicable service manual for DTC information.

For L-terminal diagnostics, set your DVOM to monitor frequency. When the system is operating normally, you should read a duty cycle of 5-95% depending on which mode the system is in and also the battery SOC. The 5-volt reference signal for the PWM signal is provided by the generator and cycled to ground by the ECM/PCM or generator battery control module, depending on the system.

For F-terminal diagnostics, set your DVOM to monitor frequency. When system is operating normally, you should read a duty cycle of 5-99%

depending on which mode the system is in and also the battery SOC. The ECM/PCM or generator battery control module, depending on the system, provides the 5-volt reference signal for the PWM signal and is cycled to ground by the generator.

The Tech 2 may include some of the following parameters:

ECM/PCM	BCM/DIM/IPM
Generator L-Terminal	Battery Current Sensor
Generator F-Terminal	Battery Voltage
Battery Voltage	Ignition Voltage
	Load Shed Level
	Idle Boost Level

The generator battery control module incorporates most of the scan tool parameters, except load shed and idle boost, as this system does not take corrective actions.

If you feel there is a charging system error, first check for related charging system and low voltage DTCs set in the control module.

**TIP:** Diagnose P codes first, as these DTC will set if there is a generator or control circuit failure.

If no DTCs are present, refer to the Charging System test in the service manual. If this test does not present a failure, you may need to test drive the vehicle and monitor the idle boost and load shed parameters. This may lead you to some type of high load condition that may be normal; compare to a known-good vehicle.

- Thanks to Jim Mauney and John Spidle



# Unique Features of CTS-V

Bulletin 04-00-89-027 has been released to inform dealers of the unique features of the Cadillac CTS-V. Here are highlights.

## Stiff Ride

The CTS-V has a noticeably stiffer suspension than the CTS. Those with traditional Cadillac expectations may not find this feature appealing.



## Rear Axle Hop

In extreme loss of drive wheel traction or abusive applications of power, the independent 5-link rear suspension will exhibit an abrupt wheel/axle hop.

## Handling in Snow

The P245/45WR18 Extended Mobility Tires (EMT, or run-flat) tires provide the ultimate handling for the combination street and track environment. They will not give optimum performance in mud or snow.

## Brake Dust

A key requirement of the Brembo high performance brake lining is to dissipate heat from the braking system, resisting fade, cooling rotors and preventing brake fluid boil. A by-product of heat dissipation is brake dust accumulation on wheel faces.



## Brake Bind After Sitting

The Brembo brake components have a normal tendency to a light bind, often noted as resistance, then a light clunk when attempting to move the vehicle forward or rearward after a cold soak.

## Critical Tire Pressure Monitor

The factory fill is 38 psi (260 kPa), to ensure proper bead sealing and to prevent tire damage in tied-down shipping. If not adjusted to the specified 30 psi (210 kPa), a warmed up tire will easily exceed the 42 psi (290 kPa) limit on the TPM. Excessive pressures will also turn an already very stiff ride into a harsh, poor-handling experience.

## Rough Idle

A key element of the 400 horsepower LS6 V8 engine is better breathing ability through unique valve lift and duration. A normal result of this camshaft design is an unstable idle or random roughness.

## 1-4 Skip Shift

To help achieve the best possible fuel economy, the transmission forces a 1st to 4th shift under the following conditions:

- coolant temperature above 169°F (76°C)
- vehicle speed 15-19 mph (24-31 km/h) and
- throttle at 21% or less

The 1-4 indicator in the DIC is only momentary.

## Driveline Clunk on Declutch in Parade Type Driving

A clunk-clunk noise from the driveline may be heard when depressing and releasing the clutch pedal or between shifts while driving in a steady, slow speed parade-type situation. This is



a normal characteristic of the driveline.

## Oil Life Monitor and Mobil-1 Oil

Oils other than Mobil-1 (factory fill) may be used as long as they meet GM Standard GM4718M. Oil life may seem shorter on the CTS-V than other Cadillac vehicles because the OLM algorithm uses factors of engine RPM and coolant temperature cycles, both of which the CTS-V will experience in greater fluctuations.

## Navigation But No Voice Commands

Because the steering wheel controls are for the I/P DIC, traction control, and cruise control, there are no re-configurable controls, OnStar® interface or voice command controls. Voice command is unavailable on the CTS-V.

## Memory Functions

Because the CTS-V has a manual transmission, the driver 1 and 2 seat and mirror memory functions operate only when the parking brake is set, whether the driver uses the RKE or the 1 and 2 buttons on the driver's door panel.

## G-Force Meter

A lateral accelerometer display located below the tachometer can be accessed using the outermost rocker switch on the left steering wheel spoke. To reset, press and hold the rocker switch while the G-force meter is displayed.

- Thanks to Brian Combs

# Noisy Blower Motor

According to bulletin 04-01-39-005, owners of some 2004 Buick LeSabre and Pontiac Bonneville models may comment on a noisy HVAC (heating, ventilation and air conditioning) blower motor. Others may comment that the blower motor emits a low-pitch hum.

Cadillac DeVille and Seville are covered in bulletin 03-01-37-001.

**TIP:** Although the bulletins mention 2004 only, the fix applies to 2002-03 as well.

Install a new blower motor 89018521. For replacement instructions, refer to the Blower Motor Replacement procedure in the Heating, Ventilation and Air Conditioning section of SI.

Parts are currently available from GMSPPO.

- Thanks to Bill Metoyer and Ed Kern



Old (left) and new (right) blower motors

Part Number	Description	Quantity
89018521	Motor, Blower (with impeller)	1

# Tire Pressure Sensor Learn

Owners of some 2000-04 DeVilles and Seattles may comment on a SERVICE TIRE MONITOR message being displayed through the DIC. In this case, follow the diagnostic procedures outlined in SI. If no TPM system components were replaced and normal TPM system operation was restored by performing the tire pressure sensor learn procedure only, use labor operation E0715.

Labor operation E0715 has been established for those repairs deemed warrantable. For warranty repairs, refer to Service Bulletin 04-03-16-001 for detailed information.

**TIP:** E0715 is not to be used with RCDLR replacement, or sensor replacement op codes. The labor ops for the procedure already include time for "learning" the sensors.

**TIP:** Performing the tire pressure sensor learn procedure due to customary maintenance items (such as tire rotation) are not warrantable.

- Thanks to Bill Denton

# Operating Characteristics of 5L40E/5L50E Transmissions

The Hydra-Matic 5L40E/50E automatic transmissions have some unique operating characteristics that customers may not be familiar with. They have been designed to provide more of a manual transmission feel than other Hydra-Matic automatic transmissions.

These transmissions are used in 2004-05 Cadillac CTS, SRX, STS, and XLR as indicated in the accompanying table. Here are descriptions of the unique operating characteristics.

**Normal Mode Operation (CTS, SRX, STS, XLR)** – During normal mode operation, drivers may notice increased powertrain braking after releasing the accelerator pedal. The vehicle will not coast freely when the accelerator pedal is released but will start to gradually slow down as if the brakes were lightly applied. This feels very similar to releasing the accelerator pedal on a vehicle equipped with a manual transmission.

**Sport Mode Operation (CTS, SRX, STS)** – Typically, Sport mode delays upshifts. The Sport mode simulates the performance driving of a manual transmission. Under certain conditions, the vehicle will maintain specific gears longer than a traditional automatic would. When driving in Normal mode in 5th gear, depressing the Sport button causes an immediate 5-4 downshift, which will be maintained for ten seconds. In any other gear, no downshift takes place when Sport is engaged. In Sport mode, the vehicle has firmer shifting and increased performance, and the transmission may remain in a gear longer than it would in Normal mode.

**Driver Shift Control (DSC) (SRX, STS, XLR)** – The driver manually overrides the automatic gear selection. Various mechanization options for input device and degree of override allowed.

**Performance Algorithm Shifting (PAS) (XLR, 2004 SRX)** – Override of usual automatic gear selection during closed throttle high lateral acceleration maneuver. Lower gear is accompanied by near synchronous engine speed control for quick response upon re-opening throttle (enable threshold bias in Sport mode).

**TIP:** On SRX, this feature is enabled in Sport. On XLR, it is always enabled.

**Performance Algorithm Liftfoot (PAL) (CTS, SRX, STS, XLR)** – Prevents liftfoot upshifts while maintaining engine braking during repeated aggressive cornering.

**Winter Mode (CTS)** – The vehicle launches in 2nd or 3rd gear instead of 1st, to avoid wheel spin in snow or ice, if selected by the driver.

**Shift Stabilization (CTS, SRX, STS, XLR)** – Shift stabilization is used to minimize shift busyness, or hunting between ranges. Based on several inputs and a

map of engine torque at various RPM and throttle position, the TCM determines before making an upshift whether the engine will be able to maintain vehicle speed in the next higher range. If it calculates that it cannot maintain speed, it will prevent the upshift from occurring.

**Downgrade Detection Brake Assist (CTS, SRX, STS, XLR)** – Shift to lower gear with braking on downgrade based on fuzzy logic rules calculated from a thermal brake model, terrain detection, desired acceleration, vehicle speed, and mass detection.

## Adapts (CTS, SRX, STS, XLR) –

Continual comparison of actual shift times to desired shift times. The transmission controls make hydraulic adjustments to assure the actual shift times approach the ideal shift time the next time the shift is made for similar operating conditions of vehicle rpm, engine load, and road load conditions. The adaptive shift process continues for the life of the vehicle, to provide consistent and optimized shifts.

- Thanks to Robert Martin and Chris Anderson

				
	2004-05 CTS	2004-05 SRX	2005 STS	2004-05 XLR
Transmission	5L40E	5L40E/50E	5L40E/50E	5L50E
Normal Mode Operation	X	X	X	X
Sport Mode Operation	X	X	X	
Driver Shift Control		X	X	X
Performance Algorithm Shifting		X (2004 only)		X
Performance Algorithm Liftfoot	X	X	X	X
Winter Mode	X			
Shift Stabilization	X	X	X	X
Downgrade Detection Brake Assist	X	X	X	X
Adapts	X	X	X	X

## HVAC Module Service

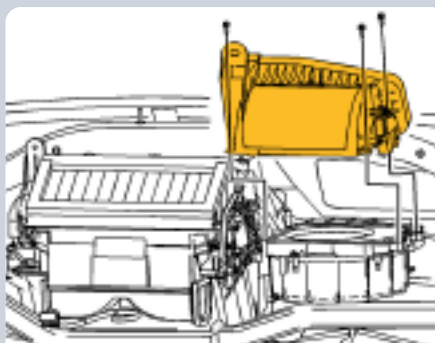
This information applies to the 2004 Cadillac XLR and the 2005 Chevrolet Corvette and newer.

Use special care when removing or installing the HVAC module for service.

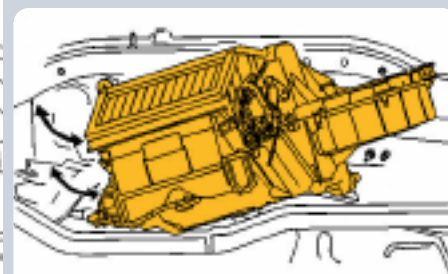
The HVAC module is seated between a non-removable upper and lower tie bar. The HVAC module must be partially disassembled before removal and installation.

Refer to SI 2000 to obtain the service procedure for correctly removing and installing the HVAC module. Failure to do could result in damage to the HVAC module.

- Thanks to Chris Semanisin



Removing recirculation housing from HVAC module



Removing HVAC module from vehicle



# Duramax Diesel 6.6L Diagnostic Tips (Changes)

Here are some diagnostic tips you may find useful when diagnosing driveability concerns on the Duramax 6.6L diesel engine. **This information replaces the July 2001 Techlink article on Duramax Diagnostic Tips.**

## Misfire

If there is a misfire code, or a misfire can be detected during operation, connect the Tech 2. Look on the Engine Data 2 list to find the Balancing Rates for the cylinders.

**Do not use Balancing Rates to diagnose symptoms that do not occur at idle. Use the fuel Injector Balance Test with Tech 2 to diagnose symptoms at higher engine and vehicle speeds.**

## Balancing Rates

Normal fuel delivery to each cylinder is around 1 cubic millimeter ( $\text{mm}^3$ ) for the pilot injection and 7  $\text{mm}^3$  for the main injection. The balancing rates are the measurements of the amount of fuel removed from or added to these normal fuel quantities during each combustion event.

Balancing rates are available and accurate only during stable idle. These numbers tell you whether or not you have a possible compression, injector control, or injector issue.

Once the misfire is detected, the balancing rate of the cylinder that has the misfire will be as high as 15  $\text{mm}^3$ . The misfire codes (P0300, P0301-P0308) will set only after the

first 90 seconds on Federal LB7s (30 seconds on California LB7) of engine operation and will set only when the balancing rate goes above 15  $\text{mm}^3$ .

The normal values that should be seen on the balancing rate parameters will range between -4.0 and +4.0 in Neutral or Park (-6.0 to +6.0 in Drive when the brake is fully applied). Suspect a possible problem when the balancing rate of a particular cylinder starts to increase out of the normal operating range. An example of a possible problem cylinder would be a balancing rate of 7  $\text{mm}^3$  or so. Once the numbers start to increase out of the normal range, the cylinder is progressively contributing less power than the other cylinders.

## Diagnosing "Fuel Knock"

Perform the diagnostics listed in the Fuel Knock symptom table.

## Vacuum/Pressure Gauge



The vacuum/pressure gauge is also useful when diagnosing the Duramax 6.6L diesel. In the case of a complaint of "starts, runs, then dies," or if the vehicle will not start after sitting for a period of 30 minutes or longer,

hook up the vacuum/pressure gauge to the Schraeder valve on the right front valve cover to determine if air intrusion into the fuel system is the root cause of the complaint. With the vacuum/pressure gauge hooked up, prime the fuel manager until 10 psi is reached. If pressure does not reach 10 psi after twenty or so pumps, air intrusion is the cause. Refer to the fuel system diagnostic in the manual.

In the case of a "cranks, no start" condition, use the Tech 2 to check for codes. If no codes are present, use the vacuum/pressure gauge to check the fuel supply system vacuum to the pump while cranking. If the vacuum increase to more than 5 in. Hg, there is a restriction in the fuel system between the fuel tank and the high pressure pump. If the vacuum is ok, ensure that pressure is being made under Engine Data 1, looking at Actual Fuel pressure.

Observe the Engine Cranks but Does Not Run Diagnostic and follow the guidelines provided in order to determine if the pump or the fuel injectors are the problem.

- Thanks to William Smithers

# A/C Low Pressure Switch Diagnosis

The A/C low pressure switch open/close pressure switch point cannot be accurately determined by measuring pressure at the low side service port on 1999-2005 C/K trucks and 2003-05 Hummer H2.

Because the evaporator is between the low side service port and the A/C low pressure switch, pressures measured at the port may not be the same as those at the switch. This difference can cause misdiagnosis of switch operation.

A new bulletin 04-01-38-010 details the use of a new A/C diagnostic tool GE-47742, available from SPX Kent-Moore. Here are the highlights.

GE-47742 allows you to monitor the actual pressures at which the switch opens and closes in the vehicle's refrigerant system. The tool is a three-way T-fitting.

With the switch removed from the accumulator, the switch installs into the GE-47742 tool. The tool installs in place of the switch in the accumulator. Finally, the low side gauge of the ACR2000 connects to the service port on the tool.

- A- GE-47742
- B- Connection to accumulator
- C- Low pressure switch
- D- ACR2000 low side gauge hose



GE-47742 installation

**IMPORTANT:** Before plugging in the switch wire harness, temporarily remove the seal from the connector. The "plunger effect" of plugging the sealed connector into the switch induces a 5-10 psig (35-69 kPa) pressure on the back side of the switch. This pressure will skew the opening/closing characteristics of the switch as much as 5-10 psi (35-69 kPa) until the pressure bleeds off, which can take 20 minutes or longer.

Operate the A/C system under the following conditions:

- Engine (On)
- 1500 RPM
- A/C (On)
- Blower (Low)
- Aux Blower (Low)
- Temperature (Full Cold)
- Aux Temp (Full Cold)
- Inside air/Re-circ
- No sun load
- (in the shade)

Use the Tech 2 to determine the low pressure switch status and the ACR2000 to determine low side pressure.

The Tech 2 displays switch status as "Normal" for Closed and "Low Pressure" for Open.

A properly operating switch should open between 20-25 psi (138-172 kPa) and close between 40-46 psi (275-317 kPa).

**IMPORTANT:** Remember to install the seal onto the A/C low pressure switch connector when the diagnosis is complete.

- Thanks to Frank Rogers and Steve Love

# Tire Pressure Monitor Diagnostic Tool



A new essential diagnostic tool J-46079 for Tire Pressure Monitor Systems (TPMS) is now being shipped to dealers. It works on all GM vehicles equipped with Radio Frequency (RF) Direct Sense TPM systems.

These TPM systems consist of an RF-transmitting pressure sensor inside each tire/wheel assembly and a receiver inside the vehicle. The pressure sensor transmits an RF signal, and the receiver interprets the signal. The diagnostic tool completely tests the TPM system.

To verify the sensors can transmit valid data with good signal strength in response to a low frequency or magnetic activation, J-46079 TPM Tester receives the RF signal from the sensor

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## Tire Pressure Monitor Diagnostic Tool — from page 6

and displays the sensor's transmitted data (tire pressure, sensor ID number, sensor mode) on the tester's LCD screen.

**TIP:** The tool cannot determine if the sensor internal roll switch is functioning. For that, a test drive is necessary.

To confirm the operation of the vehicle's receiver, J-46079 TPM Tester transmits four simulated sensor signals to the receiver. Once the vehicle receives the signals from J-46079 TPM Tester, the simulated data (tire pressure, ID number and sensor mode) can be viewed accessing the module data with a Tech 2 scan tool.

**TIP:** On some vehicles, only the tire pressure can be viewed on the scan tool.

J-46079 TPM Tester can also be used on some vehicles when performing the sensor learn procedure after tire rotation. This simplifies and speeds up the procedure.

This tool is simple and easy to use and assures that the tire pressure monitor system is functioning properly. For more information on the J-46079 Tire Pressure Monitor Tester, contact Kent-Moore at 1.800.345.2233.

- Thanks to Mike Banar and Scott Bower

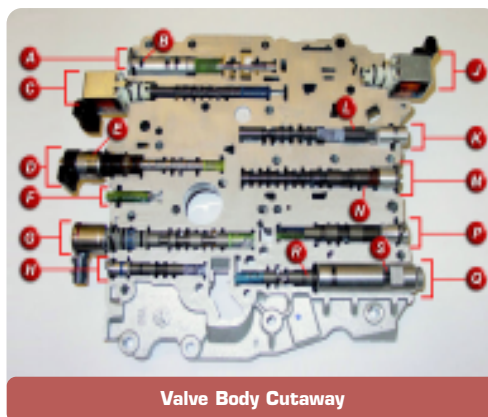
## 4T65E Valve Body

A recently released bulletin 02-07-30-013B refers to 2001-04 vehicles with 4T65E automatic transmission (RPOs M15, MN3, MN7, M76). The bulletin refers to various transmission conditions, including incorrect shifts, poor performance, harsh upshifts, slipping, TCC stuck on or off and various DTCs. The bulletin relates all of these conditions to debris in the valve body and case oil passages.

Refer to the bulletin for details.

Here is a color photo of a valve body cutaway, to show you the actual locations of various bores, items and functions mentioned in the bulletin.

- Thanks to Darryl Butler



ID	Bore	Item Name	Function
A	1	Pressure Regulator	
B	1		Reverse Boost Valve inside bushing
C	2	1-2 Shift Valve Solenoid A	
D	4	Torque Signal Valve	
E	4		Pressure Control Solenoid
F	5	Pressure Relief	
G	6	PWM and TCC Control	
H	7	TCC Regulator Apply	
J	16	Solenoid B	
K	11	3-4 Shift Valve	
L	11		4-3 Manual Downshift
M	12	2-3 Shift Valve	
N	12		3-2 Manual Downshift
P	14	Secondary 1-2 Accum	
Q	15		
R	15	2-3 Accumulator Valve	
S	15	3-4 Accumulator Valve	

## TAC Tips

### Quick Upshifts

Some 1993-2005 light duty trucks and utilities may experience quick upshifts and be in fourth gear with the TCC applied by 20 mph. Sometimes DTC P1875 may accompany the concern. The owner may also describe the condition as a lack of power, chuggle, miss, shake, or surge. This condition can also occur on 2WD models.

The ECM, PCM, or VCM may believe that the Transfer Case is in 4low and change the shift pattern accordingly. Use the Tech1/Tech2 to verify the status of the 4low input. If the 4low input status is YES or ENABLED with the Transfer Case in 2wd or 4wd High or if this is a 2wd vehicle, the 4low signal circuit is shorted

to ground. Or the TCCM and or ECM, PCM, or VCM is taking the circuit to ground.

1. Disconnect the TCCM if equipped. If the concern goes away, replace the TCCM. If the concern is still present, go to step 2.
2. Remove the 4low signal circuit from ECM, PCM, or VCM connector. If the concern goes away, inspect the 4low signal circuit for being shorted to ground. If concern is still present with the 4low signal circuit removed from ECM, PCM, or VCM connector, replace the ECM, PCM, or VCM.

- Thanks to Rusty Sampsel

### Theater Lighting

Some owners of the 2005 Chevrolet Equinox may comment that the interior lights will not theater dim.

This is normal operation. The interior lights on Equinox do not theater dim. The service information and the owner's manual will be updated to reflect the correct operation of the interior lights.

- Thanks to Chuck Krepp

### Clutch Pedal Squeak

On some 2001-03 Chevrolet Silverado and GMC Sierras with ML6 Manual Transmission, the clutch pedal may squeak. The condition typically occurs during hot ambient temperature.

Replace the clutch pedal assembly with part number 15120866.

- Thanks to Rusty Sampsel

### Axle Water Contamination

Some 2001-04 Chevrolet S-10 and GMC Sonoma 4-Door Pickups may experience water contamination inside the rear axle.

Inspect the location of the rear axle vent hose to see if it is positioned in a location that is directly below the gap between the cab and the bed. If so, relocate the vent hose to a new location that will prevent rain water from entering the vent hose.

- Thanks to Rusty Sampsel

### Chafed Wires

Some 2005 Chevrolet Equinoxes may exhibit power mirrors inoperative, seat belt warning light on, no audio/poor audio and/or various class 2 communication faults.

During assembly of the lower A-pillar trim or kick panel, the clip on the trim panel has chafed the wire(s), resulting in a short to ground or an open fuse. The C204 connector contains circuits for ignition 1, power mirrors, seatbelt warning, audio speakers and class 2 communication. Remove the lower left trim panel, inspect for any chafed wires near the C204 connector and repair as necessary. Reroute the harness to prevent future contact.

- Thanks to Chuck Krepp



## Car Issues -- Fix It Right the First Time

Model Year(s)	Vehicle Line(s) / Condition	Do This	Don't Do This	Reference Information / Bulletin
2004	Grand Prix – Steering, Suspension or Cradle Click Noise	Re-torque right steering gear mount.	Don't replace the steering gear or cradle.	03-02-32-048
2000-2003	Century, Regal, Lumina, Impala, Monte Carlo, Grand Prix, Intrigue with 3.8L L36 Engine – Coolant Leak	Replace upper intake manifold gasket only.	Don't replace upper intake manifold assembly for a coolant leak condition.	03-06-01-016
2002-2003	Impala – Snap or Clunk When Window is Rolled to Full Up Position	Replace glass run channel with revised part.	Don't replace front door window regulator, door glass or align door glass for snapping noise when window reaches full up position.	03-08-64-034
2001-2004	Aztek (01-04), Rendezvous (FWD, 02-04), Venture/Montana/Silhouette (01-04) – Pop and/or Rattle in Exhaust Down Pipe	Follow procedure in bulletin 03-06-05-003 using clamp P/N on down pipe to correct rattle/buzz noise.	Don't replace converter assembly for rattle/buzz noise without completing instructions in 03-06-05-003.	03-06-05-003
2000-2004	All Cars with 4T40/4T45E and 4T65E – Light On/Various Transmission Codes Stores	Check transmission 20-way connector for secure connection (disconnect and reconnect).	Don't replace transmission, TCC PWM, VSS, PCS or valve body.	02-07-30-022B
1998-2004	Seville – Heated Seat Inoperative	Replace only needed heating element.	Don't replace entire seat cover if heated seat element is inoperative.	01-08-50-002C
2001-2004	Century/Regal – Intermittent SES, ABS or TCS Lamp Illuminated, Engine No Crank/No Start, Various I/P Cluster Intermittents, DTCs U1000, B1422, B2957, B2958 Set, Shifter Locked in Park (BTSI Inoperative)	Check UBEC harness connectors for damage and replace damaged terminals. Use labor operation with appropriate terminal part number.	Don't replace UBEC, ignition switch, sensing diagnostic module (SDM), body control module (BCM), shifter assembly (Regal) or intermittently inoperative clusters.	03-08-45-004
2000-2004	Cavalier/Sunfire/Alero/Grand Am – Inoperative Sunroof Module	Retime module or replace only motor for inoperative complaints.	Don't replace entire sunroof module assembly.	03-08-67-009A
2003-2004	Cavalier/Sunfire – Air Conditioning Compressor Noisy	Inspect for ground out conditions that can cause A/C compressor noise complaints.	Don't replace A/C compressor for excessive noise complaint without inspecting for ground outs.	03-01-38-012
1999-2004	All Cars and Trucks – Brake Warranty, Service and Procedures	Issue One: Refinish brake rotor. Issue Two: Measure for LRO	Issue One: Don't replace brake rotors. Issue Two: Don't measure for LRO	00-05-22-002D



## Truck Issues -- Fix It Right the First Time (new issues in **bold**)

Model Year(s)	Vehicle Line(s) / Condition	Do This	Don't Do This	Reference Information / Bulletin
2001-2003	<b>Fullsize Pickups – Injector Replacement for High Flow Rates</b>	<b>Use Bulletin 04-06-04-007A for injectors with high fuel return rates. Use Special Policy 04039 for 01-02 vehicles.</b>	<b>Don't replace 8 injectors except for high fuel return rates. Other injector failures are fix as failed.</b>	<b>Special Policy 04039</b>
2004-2005	<b>All Cars and Trucks – State-of-Charge Upon Delivery of New Vehicle</b>	<b>Check battery's state-of-charge per revised PDI procedure</b>	<b>Don't remove and replace battery.</b>	<b>02-06-03-009A</b>
2003-2005	<b>Avalanche, Suburban, Tahoe, Silverado, Yukon/XL, Sierra, Escalade – Snap/Popping Noise from Front of Vehicle</b>	<b>Slot left side mounting holes on front crossmember per bulletin.</b>	<b>Don't replace crossmember.</b>	<b>03-08-61-002B</b>
2002-2004	Fullsize and Midsize Pickups and Utilities	When submitting claims for reprogramming an electronic module, use correct labor operation that reflects module being programmed.	Do not use K5364, which is for reprogramming transmission control module (TCM), when reprogramming TCCM.	02-06-04-057D
2002-2004	Fullsize and Midsize Pickups and Utilities – Sleepy New Venture Gear Transfer Case Control Module	Verify sleepy module as primary cause, per bulletin. Reprogram TCCM with latest software released 3/11/04.	Don't replace encoder motor or transfer case. Replace module only if C0550 DTC shows as current or in history.	02-04-21-006D
2002-2003	Chevrolet Avalanche and Cadillac Escalade EXT – Cargo Covers and Cladding Faded or Stained	Thoroughly clean, dry and treat the components with "Armor-dillo." To order call (888)393-4722 or online at <a href="http://www.armor-dillo.net">www.armor-dillo.net</a> .	Don't replace cargo covers for this condition.	04-08-111-001
2002-2004	All Passenger Cars and Trucks – Air Conditioner Compressor Diagnosis	Follow SI and bulletin for diagnostic information before compressor replacement.	Don't replace the air conditioning compressor.	01-01-38-013A 03-01-38-019
2002-2004 (models with HomeLink™ option)	All TrailBlazers, All Envoys, Bravada, Rainier with HomeLink Universal Transmitter – Programming Diagnosis	Use J 41540 – GM Integrated HomeLink Tester. Follow SI and refer customers to Owner's Manual.	Don't replace HomeLink Transceiver without validating internal fault recognized by J 41540.	01-08-97-001B
2002-2004	All TrailBlazers, Envoy, Envoy XL, Bravada – Squeak/Rub/Scrub Type Noise in Steering Column	Lubricate and remove material, per bulletin.	Don't replace upper or lower intermediate shaft.	02-02-35-006A
2001-2004	Fullsize Pickups and Utilities – Servicing Wide Load Mirrors (RPO DPF)	Replace individual parts as needed.	Don't replace complete mirror assembly.	03-08-64-028

**Know-How  
Broadcasts  
for  
October**

**October 14, 2004**

10280.10D Emerging Issues

Time to be announced on

[www.gmtraining.com](http://www.gmtraining.com).

Click on: Resources, Service Know-How

**October 28, 2004**

10280.22D

Eastern Time

2005 Chevrolet Cobalt

9:00 AM

12:30 PM

3:00 PM



– Thanks to Tracy Timmerman