Some of the most common causes for air conditioning compressor replacement are noise, vibration and insufficient cooling concerns. But the root cause of customer concerns that lead to a compressor replacement might be a state of refrigerant charge issue or in another area or system of the vehicle.

For example, the A/C refrigerant quality and quantity — purity (air, foreign gases, etc.) or a high or low charge level — can be a major contributor to unnecessary compressor replacement. A 20% undercharge will cause noise and performance problems. A 20% undercharge on a Chevy Cobalt (system charge of 14 ounces) is a 3 ounce loss, which can happen if the hoses are emptied improperly in the refrigerant recycling/recharging equipment.

Properly using the refrigerant recycling/recharging equipment to recover and measure the weight of the A/C system refrigerant charge can help technicians make an accurate diagnosis of a charge level concern prior to any component replacement.

Before Compressor Replacement

Proper diagnosis and a thorough visual inspection should always be performed before any repairs are done. Here are some visual and measurable items that should be considered or checked before a compressor is replaced for noise, vibration or insufficient cooling concerns.

**Visual Inspection:**
- The compressor drive belt may be frayed, loose or misaligned.
- The A/C refrigerant lines may be grounding out on body, chassis or engine components. This may allow noise and vibration to be transmitted into the passenger compartment.
- The air flow through the condenser may be insufficient.
  - The condenser fins may be bent or filled with debris.
  - The space between the condenser and radiator may be filled with leaves or debris.
  - The cooling fans may be inoperative or not performing as designed.
  - The installation of aftermarket accessories may alter or restrict the air flow through the condenser.
- Inspect for missing or mispositioned air deflectors, baffles, seals and shrouds.
- The air flow through the evaporator core may be restricted.
  - The cabin filter may be plugged.
  - The evaporator core may be covered with debris.
  - The cowl air inlet leaf screen may be plugged.
- The capillary bulb on the thermostatic expansion valve (TXV) must be properly positioned so that the valve will provide proper refrigerant flow.

**Measurement Checks:**
- The compressor cycling switch may not be operating correctly. This may allow the evaporator core to freeze up or the compressor may not stay engaged long enough for proper system pressures to develop.
- The A/C system may be overcharged or undercharged with refrigerant. The A/C system charge weight can be measured with refrigerant recycling/recharging equipment after a refrigerant recovery is done.
- The A/C system may have an improper amount or incorrect type of refrigerant lubricant. Only OEM approved refrigerant lubricants should be used.
- A/C system sealers are not recommended. GM, for example, does not approve A/C system sealers for use in GM vehicles.
- The vehicle’s refrigerant may be contaminated or contain an excessive amount of air. The vehicle’s A/C system may have been charged with an unapproved refrigerant. The refrigerant identifier on the refrigerant recycling/recharging equipment should alert the technician to these conditions.
- The orifice tube or TXV may be restricted, plugged or inoperative.
- The desiccant bag in the accumulator may have failed, allowing debris to circulate in the A/C system.

*continued on page 3*
Service Seminars Deliver the Latest Technical Information

ACDelco continues to offer service seminars in addition to the service training courses. There are several seminars that ACDelco has identified that provide a solid technical foundation on the technical advancements of today’s cars and trucks.

There are also a number of other seminars that provide additional information on a variety of automotive technology, such as alternate fuels, hybrid vehicles, the Duramax diesel engine, and theft deterrent systems.

The seminars will be taught by ACDelco service managers and last approximately two to three hours each.

These seminars are designed to keep technicians up-to-date on the rapidly changing technology built into today’s vehicles as well as provide additional product knowledge, technical information and diagnostic tips on ACDelco’s top product lines. The seminars do not substitute for training courses.

Check with your local ACDelco distributor (DDG) for scheduled seminars in your area.

Highlighted seminars include:

Emerging HVAC Technology and Service Issues
- Presents current information on automotive air conditioning technology and related service methods, touching on environmental concerns and future refrigerant considerations
- Other topics include replacement parts survival, air conditioning and cooling system service items, issues and innovations, bulletins, and special tools

GM On-Board Diagnostics (OBD) II Service Seminar
- Focuses on OBD II regulations relevant to GM vehicles
- Covers misfire detection, catalytic converter monitoring, enhanced EVAP system diagnostics and comprehensive monitoring
- Other topics include hardware changes, terminology, GM’s new CAN system, Active Fuel Management technology and Wide-Range air/fuel sensors

Emissions System Diagnosis
- Helps technicians better understand emissions systems while improving their diagnostic skills
- Focuses on emissions control systems, examining vehicle emissions and government emissions standards for Tier 1, Tier 2 and Low Emissions Vehicles

Engine Performance and Drivability
- Looks at key items needed for precise engine performance that will lead to good driveability, helping technicians improve their drivability diagnostic skills
- Explains Variable Valve Timing, Active Fuel Management technology, modularized fuel systems and Compression Sense Ignition while including case studies to summarize key diagnostic strategies

Durastop Brakes Seminar
- Focuses on up-to-date service procedures to address customer concerns and reduce comebacks
- Covers important service tips to achieve quality results and customer satisfaction

Fuel System Service and Diagnostics
- Focuses on gasoline fuel system components with the main focus on electric fuel pumps
- Looks at various fuel delivery systems such as return, returnless (demand) and electronic returnless, along with port fuel, central multipoint, central sequential and multipoint flexible fuel injection
- Explains the different types of fuel pumps, including modular reservoir assemblies and service issues, fuel level sensors (including the latest ceramic card technology), fuel filters, and fuel pressure regulators, with an emphasis on current concerns and diagnostic techniques

– Thanks to Todd Dawn

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ACDelco 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, it cannot be assumed that the information applies to all vehicles or that all vehicles will have that condition.

All materials and programs described in this magazine are subject to change. Submission of materials implies the right to edit and publish. Inclusion in the publication is not necessarily an endorsement of the individual or the company.

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Cool Considerations for Air Conditioning Service – continued from page 1

- The A/C system charge weight may have been changed. A check for service bulletins applicable to the vehicle being worked on should always be done.
- A check for diagnostic trouble codes in all the control modules on the vehicle should be done. Some trouble codes will disable compressor operation after they have set. They must be repaired and cleared before compressor operation is allowed.
- Verify that the engine is not operating with a low, unstable idle, and that the engine is operating within the compressor engagement parameters. For example; the engine may be overheating or it may be too cold for compressor engagement.

**Diagnostic Procedures**

The diagnostic procedures in the HVAC section of the Service Information should be performed as outlined to prevent misdiagnosis. The diagnostic system checks and A/C system performance tests in the Service Information are written for a specific model only. They are not generic charts. They follow a logical order with detailed instructions on how to perform each step.

When a thorough HVAC system diagnosis indicates that the compressor should be replaced, follow the procedure in the appropriate Service Information.

If the compressor has had a catastrophic internal failure, an inline filter may be required to capture the large amount of debris that may be circulating in the A/C system. In addition, flushing the A/C system and installing a compressor suction screen will provide extra protection for the replacement compressor.

The addition of fluorescent refrigerant leak dye to the A/C system is recommended if the vehicle does not have it installed already. Some vehicles have leak dye installed at the assembly plant and this will be indicated on the A/C charge label. If leak dye has been added during a previous repair and has been in the vehicle for more than three years, it is recommended that additional dye be added.

Finally, a leak check of the entire A/C system should be performed before the vehicle is returned to the customer.

- Thanks to Jim Resutek

### A/C Web-Based Training Course

One of ACDelco’s new blended training courses is the web-based course Introduction to Air Conditioning, course number S-AC07-01WBT. The web-based training (WBT) courses are available on-demand 24/7 on the ACDelco Learning Management System (LMS) website.

The course covers HVAC system diagnosis and service, including an overview of R-12 and R-134a refrigeration systems, recovery and evacuation procedures, charging, and leak testing. It also explains the principles of heat and refrigeration as well as describes the components and operation of the refrigeration system, heating and cooling system, air distribution system, and the various control systems.

To take a web-based course, click on the Training tab at acdelcotechconnect.com and log on to the ACDelco LMS. To search the LMS course catalog for available web-based training, from the menu select: Catalog/Catalog Search, and search for Course Number Contains W. Select the View link next to the course name, and then click on Launch Course to begin the course.

- Thanks to Todd Dawn

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**Air Conditioning Essentials**

Keep these basic tips in mind to ensure proper air conditioning service.

- Use PAG lubricant with R-134a or when retrofitting to R-134a.
- Use mineral oil with R-12.
- Lubricate O-rings and threads only with mineral oil (525 viscosity).
- Change the accumulator if over five years old, damaged, or the system is found to be contaminated with sealants.
- Keep PAG lubricant containers sealed. They absorb moisture quickly.
- Measure and replace the exact quantity of lubricant when replacing a compressor.
- If required, flush R-12 systems with R-12 and R-134a systems with R-134a.
- Install an in-line filter and suction screen if contamination is suspected. ACDelco has a universal in-line filter, Part Number 15-10413, that can be used with any size air conditioning line. A complete suction screen kit, Part Number 15-21184, also is available.
- Ensure less than 2% R-12 remains in the system when converting to R-134a.
- Use a full measure of PAG lubricant when converting the system from R-12 to R-134a.
- Evacuate the system of all air to eliminate oxidation of lubricating oil.
- Keep all foreign substances out of the system. Air over 3% can cause compressor noise and reliability problems.
- Use new O-rings or seal washers if a connection has been disconnected.
- Use only approved leak detection dyes.
- Accurately weigh charge — do not employ cans.
- Lubricating O-rings with PAG lubricant could corrode fittings.
- Leaving the air conditioning system open allows moisture in the components.
- Ester oils do not provide proper lubrication and can cause system failures.
- Use of R-11 or R-22 will damage the compressor and contaminate refrigerant.
- Mixing refrigerants will damage the compressor.
- Refrigerant blends are not approved by General Motors, and will void the warranty on system components.
- Refrigerant blends are not approved by General Motors, and will void the warranty on system components.

Refer to ACDelco Bulletin 05D-J-114 for additional air conditioning service information.

- Thanks to Todd Dawn
MAP Sensors

The MAP sensor is an important part of the modern engine control system. When asked, “What does MAP mean?” most technicians could correctly answer, “Manifold Absolute Pressure.”

The next question, though, would stump most.

What is absolute pressure?

In absolute measurement, the zero point (where the measuring device indicates zero) is an absolute zero pressure. That means no pressure, or in other words, a 100% vacuum.

If a pressure gauge indicates zero when no pressure is being measured, is this absolute zero?

No. Most pressure or vacuum gauges indicate zero pressure when not connected, or when there is no pressure or vacuum being measured. However, there actually is pressure — the atmospheric pressure that surrounds the earth.

Is that barometric pressure?

Yes, even though your pressure or vacuum gauge may indicate zero, the atmospheric or barometric pressure is always present. Conventional gauges always measure gauge pressure.

What is gauge pressure?

Gauge pressure has its zero point at the current barometric pressure. Everything above barometric pressure is called pressure and everything below barometric pressure is called vacuum.

An absolute pressure gauge is bulky and expensive. Laboratory-grade devices that measure absolute pressure cost over $1,000.

Explain atmospheric, or barometric, pressure.

The two terms are interchangeable. Atmospheric pressure at sea level on a standard day is approximately 14.7 pounds per square inch (psi), or 29.9 inches of mercury (HG), or 101 kilopascals (kPa), or 1 Bar.

These various standards differ only in the units of measure used to express them.

Does atmospheric pressure always stay the same?

No. Two factors can make the atmospheric pressure vary. First, at an altitude above sea level the atmospheric pressure goes down, because the density of the air goes down.

Second, weather or climate can change the atmospheric pressure — high pressure or low pressure days. This is why the standard sea level atmospheric pressure is listed as being on a standard day.

How does a conventional pressure or vacuum gauge act at various altitudes?

It acts the same at high altitude as at sea level, which is exactly the point we are getting to.

A conventional pressure gauge has no way to compensate for different altitudes or weather changes. It will indicate zero either at sea level or at the top of a mountain. However, the atmospheric pressure is certainly different at these two extremes.

Why is this atmospheric pressure measurement so important?

The air in the atmosphere contains oxygen. An engine burns a mixture of oxygen and fuel. For an engine to burn efficiently, it has to have just the right mixture of fuel and oxygen.

To determine the correct air/fuel mixture and the correct ignition timing, the PCM must know the atmospheric (BARO) pressure. If the PCM is to compensate for changes in altitude or weather, it must have an input signal that reflects these changes in atmospheric pressure.

The Manifold Absolute Pressure sensor does this?

Yes. And on engines that do not have a Mass Air Flow (MAF) sensor, the MAP sensor signal is also used by the PCM to calculate engine load — how hard the engine is working. This is called the speed-density method of calculating engine load for engines without MAF sensors. It is because of this engine load calculation for speed-density engines that the accuracy of the MAP sensor signal is so critical.

On OBD-II engines, the MAP sensor signal is also used for EGR diagnosis.

What are the normal ranges of the sensor’s output voltage?

The most common MAP sensor generates an output voltage between 0 and 5 volts, depending on the pressure being measured. It must be able to measure atmospheric pressure at the lowest elevations, which in some areas is slightly below sea level. The standard atmospheric pressure at sea level is about 101 kPa. In Death Valley, Utah, which is below sea level, the atmospheric pressure can be higher than 101 kPa. At the top of Pikes Peak in Colorado, which is more than 14,000 (4,267 m) feet above sea level, the BARO pressure is less than 65 kPa. So, the MAP sensor must have a measurement range of 105 kPa to about 15 kPa.

How does the MAP sensor measure pressure up from absolute zero?

Imagine two glass jars glued together at the open ends, with a flexible membrane sealed between them. Drill a hole into the bottom of each jar, and glue a tube into each hole. Now, connect a powerful vacuum pump to one of the tubes.

When the vacuum pump removes all of the atmospheric pressure from the jar, seal the tube to trap the vacuum in the jar. The flexible membrane will be pushed in toward the vacuum chamber jar by the atmospheric pressure in the open jar.

The vacuum jar has absolutely no pressure in it, so it becomes the absolute zero reference point.

Any pressure on the atmospheric side will push the flexible membrane in, but higher pressure will push it in further. Remember, high pressure in this case equals atmospheric pressure, about 101 kPa at sea level.

A conventional pressure or vacuum gauge is constructed to measure gauge pressure to keep the cost affordable.
Updating Your ACDelco Image

You’ve heard them all before. Image is everything. Perception is reality. What you see is what you get.

You know there is much more to your ACDelco TSS service center and the services it provides than just its physical appearance — technical expertise, top-notch customer service and quality ACDelco parts, for example — but sometimes customers base their decision about visiting a business simply by how it looks. Customers are drawn to professional-looking businesses, and a shop’s appearance is a reflection of the service provided. So does your shop have the look of success?

Professional Look

TSS service centers will find that ACDelco’s Image items can help deliver the professional look that brings in customers by aligning the exterior and interior appearance of the shop with ACDelco’s premium automotive parts brand image and its well-known ACDelco red, white and blue color scheme.

The program is expanding its image offerings in 2006, providing assistance with an increasing variety of exterior and interior options that are designed to reassure customers that they have made the right choice for professional automotive repairs. Helpful recommendations about items ranging from color schemes, sales counters, flooring and customer waiting areas to exterior signage and ACDelco accessories like clocks, banners and floor mats are all part of the program.

Customer Service

An uncomfortable, unkept waiting area is one of the top reasons for customer dissatisfaction. Customer waiting areas that look dated and worn don’t reflect a professional image.

A new look can help make customers more comfortable (both physically and mentally) about bringing their vehicle in for service. The professional environment helps customers associate the shop’s appearance to its quality service and the reliability of ACDelco parts.

Recognize the Signs

Recognizable, easy-to-read signs are a simple, yet important, part of a business’ image. ACDelco offers a wide selection of signage for TSS service centers.

Since ACDelco is one of the most well-known brands in the service parts industry, ACDelco signage tells potential customers that your shop installs quality automotive parts they can trust. Plus, the signage ties the shop into ACDelco’s nationally recognized name.

An ACDelco Image provides the professional and welcoming appearance customers are looking for when considering automotive service.

For more details about an ACDelco Image, contact your ACDelco Warehouse Distributor or local ACDelco sales representative.

– Thanks to Dan Carter

Extreme Makeover

Winners to be Showcased at ACDelco’s 2006 National Convention

ACDelco’s Extreme Makeover promotion will award a grand prize of up to $10,000 to 10 TSS service centers to be used toward its image enhancement through the ACDelco Image and Appearance Enhancement Program. The winning TSS service centers will be featured at ACDelco’s 2006 National Convention in Las Vegas in October.

One winner in each of ACDelco’s 10 U.S. Zone territories will be selected based on purchases of ACDelco products, sales growth and existing state of operations.

The grand prize package will be tailored to each winning shop’s specific requirements and may include exterior and interior painting of the facility, floor tile in ACDelco-approved colors, interior wall borders, account-specific counter and wall graphics, and other ACDelco-branded image elements.

In addition, five runners-up in each zone will qualify for ACDelco image packages valued at more than $500.

The Extreme Makeover promotion runs through April 30, 2006. Winners will be announced in May 2006.

MAP Sensors — continued from page 4

Now, attach a hose from the intake manifold of your engine to the open jar. Devise an electrical circuit to measure how far the membrane flexes, and you have the basic idea of how a MAP sensor works.

Would a reading as low as 15 kPa ever by measured?

The sensor is called a manifold absolute pressure sensor because its sensing element is connected to the intake manifold, either through a hose or a direct mount. When the engine is not running, the pressure inside the intake manifold is equal to atmospheric pressure, and the PCM will use this “engine not running” MAP signal as the BARO reading.

A running engine acts like a large vacuum pump. When the throttle is nearly shut, the pressure in the intake manifold is very low — as low as 15 kPa at a high-speed, closed-throttle deceleration. As the throttle is opened, the pressure inside the intake manifold increases because the atmospheric pressure outside the intake manifold is rushing in, limited only by the engine’s throttle blade opening.

The accompanying chart shows that low manifold pressure (engine idling) equals low MAP output voltage, and high pressure (engine at WOT or not running at all) equals high MAP output voltage.

What is the function of the three wires leading to the MAP sensor?

One of the wires provides a precise 5 volt power supply from the PCM. Another wire provides the ground circuit, grounded only through the PCM. The third is the signal wire, carrying the signal voltage generated by the MAP sensor to the PCM.

– Thanks to Jack Woodward
Spring Undercar Promotion Kicks Off Year-Long Series of ACDelco Promotions

It’s three seasonal promotions with big payoffs for racing fans. ACDelco’s Year-Long Undercar Promotion features three promotions — starting with the Spring Undercar Promotion. TSS service centers that participate in the promotions have a chance to enjoy some great racing action and get behind the wheel themselves. And the reward at the finish line of the year-long promotion is an opportunity to win a trip to the Richard Childress Racing Fantasy Camp.

The three seasonal promotions are:

**Spring Undercar Promotion** (March 1 – May 31): TSS service centers will compete to win a September 2006 trip to Richmond, Va., for a racing weekend at the Richmond International Speedway. One TSS account in each ACDelco Zone territory will win a trip based on purchases of all ACDelco products, with a focus on Undercar products.

**Summer DuraStop Brakes Promotion** (June 1 – August 31): TSS service centers will race to win a January 2007 trip to Phoenix, Ariz., to the Bob Bondurant School of High Performance Driving. One TSS account in each ACDelco Zone territory will win a trip based on sales of ACDelco DuraStop and original equipment (OE) brake products.

In conjunction with the promotion, ACDelco will offer consumers a “Brake Bucks” cash-back rebate for qualifying purchases of ACDelco DuraStop brake pads, shoes or loaded calipers that are installed at a service center from June 1 to July 31.

**Fall Shock & Strut Promotion** (September 1 – November 30): TSS service centers will battle for a February 2007 trip to Daytona Beach, Fla., for a racing weekend at the Daytona International Speedway. One TSS account in each ACDelco Zone territory will win a trip based on sales of ACDelco shocks and struts.

As an added incentive, service writers who sell qualifying ACDelco shocks and struts will be eligible for a rebate on every two shocks and struts sold from September 1 to October 31.

**The Winner’s Circle**

With each purchase of Undercar products — shocks, DuraStop brakes, OE brakes, steering products, and chassis products — during the Year-Long Undercar Promotion, TSS service centers will receive ACDelco Winner’s Circle game cards from participating ACDelco distributors.

The scratch-off game cards feature points that can be collected and redeemed for a variety of prizes, including a diamond pendant or earrings, roundtrip airfare, ACDelco Image items, a home theater system or other electronics, plus much more.

**Fantasy Camp Grand Prize**

At the conclusion of the Year-long Undercar Promotion, one winner in each of the 10 ACDelco Zone territories, based on points earned by the top performing TSS service centers during the nine month promotion (from March 1, 2006 to November 30, 2006), will be awarded the grand prize trip to the Richard Childress Racing Fantasy Camp in Charlotte, N.C., in May 2007.

In addition to attending the fantasy camp, winners of the grand prize also will spend a racing weekend at the local speedway to watch the races in an ACDelco-sponsored suite, meet Richard Childress and his racing team, tour the Richard Childress Racing facility, and enjoy dinner at Childress Vineyards.

For more information about ACDelco’s promotions throughout the year, contact your ACDelco distributor or visit acdelcotechconnect.com/promotions.

– Thanks to Malcolm Fordyce

**ACDelco Sports Report**

**NASCAR Busch Series Stock Car Racing**

Driver: Clint Bowyer
Car: #2 Chevy Monte Carlo, Richard Childress Racing

Clint Bowyer picked up where he left off last year in the NASCAR Busch Series. At the opening race of the 2006 season, the Hershey’s Kissables 300 at Daytona International Speedway, Bowyer and rookie Burney Lamar fought for second place on the last lap. Neither driver could catch winner Tony Stewart, but both escaped a pileup of at least 10 cars that took place behind the leaders. After a video review, Lamar was awarded second place and Bowyer third.

For the 2006 season, Bowyer is off to a good start with a top 5 finish in the first race.

**2006 Driver Standings Points**

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<th>Driver</th>
<th>Points</th>
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<td>Tony Stewart</td>
<td>185</td>
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<tr>
<td>2</td>
<td>Clint Bowyer</td>
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</table>

**NHRA POWERade Pro Stock Series Drag Racing**

Driver: Kurt Johnson
Car: Chevy Cobalt

If the start of the 2006 NHRA Pro Stock Series season looks familiar, it’s because of Greg Anderson. The three-time and reigning Pro Stock champion won the 2006 opening round at Auto Club Raceway in Pomona, Calif.

Johnson made it to the elimination rounds on Sunday but wasn’t able to go any farther against Mike Edwards.

Johnson hopes to get back into his winning ways as the early part of the 2006 season schedule picks up with the ACDelco NHRA Gatornationals at Gainesville Raceway in Gainesville, Fla., in March.

**2006 Driver Standings Points**

<table>
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<th>Points</th>
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</thead>
<tbody>
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<td>1</td>
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<tr>
<td>2</td>
<td>Kurt Johnson</td>
<td>23</td>
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**CITGO BASSMASTER Tournament Trail**

Angler: Jimmy Houston
Professional Angler Jimmy Houston is getting ready to cast off the 2006 CITGO Bassmaster Tournament Trail.

The 2006 CITGO Bassmaster Tour kicks off with the 2006 Elite Series, which features a new season format that runs from March to September with 11 stops scheduled in four sections around the country: The Southern, The Turn, The Northern Swing, and The Final Charge.

The tour gets started with the Battle on the Border — the first stop on The Southern Swing — at Lake Amistad in Del Rio, Texas, March 9-12.
The following technical tips provide repair information about specific conditions on a variety of vehicles. If you have a tough or unusual service repair, the TSS Technical Assistance Hot Line can help. Call 1-800-825-5886, prompt #2, to speak with a technical expert with the latest OEM information.

**Torque Converter Replacement**

GM Bulletin 01-07-30-010A provides information on how to determine whether a torque converter should be replaced. This information applies to all GM cars and trucks with an automatic transmission (except equipped with VTi).

**Do Not Replace**

The bulletin includes five conditions under which the torque converter SHOULD NOT be replaced.

These include:
- DTC P0742 (TCC stuck on)
- Fluid has an odor or discoloration
- Fine metal particles in the fluid (traces of metal flakes/gray color to fluid)
- High mileage
- Small amount of wear on the hub where the oil pump drive gear mates to the converter

**Replace**

In addition, the bulletin includes 13 conditions under which the torque converter SHOULD BE replaced.

These include:
- TCC shudder and/or no TCC apply
- Damaged oil pump assembly and other specified parts
- Metal chips/debris in the converter
- External leaks in specified weld areas
- Issues with the converter pilot
- Issues with the converter hub
- Contaminated transmission oil
- Excessive end play
- Metal chips/debris in the fluid filter but internal parts not worn or damaged
- Unbalanced converter
- Blue converter or dark circular ring between lugs
- Converter bearing noise in Drive or Reverse at idle but not in Neutral and Park
- Viscous clutch silicon in the lower pan (4T80-E ONLY)

The descriptions given here are highlights only. Refer to GM Bulletin 01-07-30-010A for complete details.

**Avoiding PCM Connector Damage**

Connectors on some Powertrain Control Modules (PCM) are retained by bolts, and others by assist levers, using slides.

The Service Information procedure for PCM removal includes this statement:

*Remove any debris from around the PCM connector surfaces before servicing the PCM.*

It’s important to observe this step on all PCMs to prevent contamination from getting into the PCM header when the connector seal is opened.

But, it’s especially important on PCMs that use assist levers for connector retention. The slides must be pushed or pulled to unlatch or latch the connectors. If there is a buildup of dirt in the slide throughs the assist lever may be broken when you attempt to move it.

In addition, when the harness is reconnected, be sure that the gaskets are installed correctly. The gaskets prevent contaminant intrusion into the PCM.

**Axle Vent Hose Fluid Leak**

2003-06 Chevrolet Silverado and Express; GMC Sierra and Savana; Hummer H2

An axle fluid leak may appear to be coming from the end of the axle vent hose. This condition most often occurs during hot ambient temperatures and/or while towing.

Installation of filter (p/n 5651632) will act as an accumulator and prevent fluid from being forced out the end of the vent tube.

Install the filter vertically in either direction approximately 10-15 cm (4-6 in.) from the end vent cap of the hose or where convenient. Retain the filter using the supplied hose clamps and secure the filter and hose to prevent damage.
Ball Joint Service Tips

When removing and installing the lower ball joint on 1994-1999 Dodge Durango four-wheel-drive models, there are several service issues to take into consideration.

Here are a few tips about servicing the lower ball joint.

Repair Procedure:
1. Remove the caliper from the knuckle before separating the ball joint locking tapers and removing the half-shaft from the hub bearing. The added weight of the caliper makes it difficult to hold the knuckle to remove the half-shaft.
2. When pressing the original ball joint out of the control arm, there is no need to chisel the rolled over upper edge upward or to attempt to break off the rolled over edge.
3. Set up a ball joint press and press the original ball joint out of the control arm. If you press on the center of the end cap, the rolled over portion of the lip will either straighten itself up or break off when you press out the ball joint.
4. After removing the original ball joint, check for a rust ridge inside the control arm. Clean the ball joint press-in area of the control arm.
5. Press in the new ball joint until the ball joint press “bottoms out,” indicating the ball joint is seated. When the ball joint appears to be seated, tap the control arm press-in area with a ball-peen hammer. Re-tighten the ball joint press to make sure the ball joint is fully seated.
6. Remove the press and top adapter and check that the replacement ball joints snap ring groove is above the control arm. If it is not, reinstall the press and fully seat the ball joint into the control arm until the snap ring groove is completely above the control arm.

– Thanks to Dennis Kissack

Silver Most Popular Automotive Color Again

Silver once again is the most popular automotive color around the world. According to the Dupont Automotive Color Popularity Report, for the sixth year silver has topped their survey of the top vehicle colors offered by the world’s automotive manufacturers, as chosen by consumers.

Silver — a color that includes many finishes, such as stainless steel, chrome, and platinum — remains the top color of choice because it symbolizes new technology, opulence and precious metal.

The top ten colors (by percentage) of 2005 in North America as listed in the Dupont report are:

1. Silver .....................18%
2. White ....................17%
3. Gray ......................15%
4. Blue ......................12%
5. Black .....................11%
6. Red ......................11%
7. Light Brown ........... 9%
8. Green .................... 4%
9. Yellow/Gold .......... 2%
10. Others .................. 1%

Color choices vary more when broken down by vehicle category. Silver, white, blue and black are most popular for luxury vehicles; however, top colors for intermediate vehicles are silver, gray, red and light brown. More colors, such as blue, white and red are seen on compact and sport models. White is the top choice of light truck and SUV buyers.

The North American market has the widest acceptance of color, while European, Asian and South American consumers favor more neutral shades.

Silver (29%), black (21%) and gray (16%) were the top three colors in Europe. In Asia, silver (30%) was the top choice followed by white (24%) and black (13%).

Gray saw the biggest jump in the survey, with more complex shades being introduced that are infused with red, blue and purple.

Automotive colors are influenced by a variety of popular trends, whether it’s the latest fashions in New York, home décor or consumer electronics.

In the coming years, Dupont expects to see the popularity of colors such as cool blue and green as well as light brown metallic to grow. Warmer reds crossed with orange will create some of the new colors to be seen soon.