TURBO DIESEL

Buyer's Guide

Volume 2003-2009

What you should know about the
2003-2009 Ram Turbo Diesel truck.

A Publication of the ***Turbo Diesel Register***

Turbo Diesel Buyer's Guide

A WORD ABOUT THIS BUYER'S GUIDE

Recently my wife and I spent much time looking for a "new" used car. I fired up my computer, studied comments and users' experiences in forum-based websites, and downloaded archived articles from Car and Driver and Edmunds.com. There was a lot of miscellaneous and helpful information, free and for the taking. I figure this sort of web search is pretty typical for prospective vehicle purchasers today. As it turned out, we didn't make a purchase, but my experience in searching for a suitable used car made me more aware of issues of value and economy in owning a Turbo Diesel today.

As a writer it is tempting to tell the long story of "information being worth the price that you paid for it." I will refrain. Many thought-provoking articles on the state of the publishing business versus the free-for-all of the interweb (pun intended) have been written and my opinion is not likely to change anyone's point of view.

Back to the subject at hand—you are a prospective or new owner. You want more information. You want it now. You want it at no charge.

Since the late 90s we have compiled information on the Dodge/Cummins Turbo Diesel truck. Each year we update the book. We call the data the Turbo Diesel Buyers Guide, which you have successfully downloaded.

The price of this book has been discussed many times over. It is offered to you at no charge. Our hope is that its value will lead you to purchase a subscription to the Turbo Diesel Register magazine. Thanks for your consideration.

Robert Patton
TDR Editor

P.S. As I have pulled relevant data from old TDR magazines I've sometimes not been able to transfer the photograph(s). Yes, I could postpone the book until it was 100% complete, but, rather, it is published with omissions. Remember the quote "information being worth what you paid for it."? Good reading to ya!

VOLUME 2003-2009

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A WORD ABOUT THE TURBO DIESEL REGISTER

How did the Turbo Diesel Register get its start? First off, I'm an automotive enthusiast. An automotive enthusiast that was in search of a tow vehicle for my admittedly small collection of automobiles. As you can imagine, the search for the right tow vehicle took me in the direction of the Ram Turbo Diesel. My search was aided by the fact that my previous job was in the diesel engine profession as a Cummins distributor product support representative. Do I have a good knowledge of the Turbo Diesel engine? Well, maybe. I'll let you be the judge.

Back to the "story." As an automotive enthusiast, I am a member of a handful of car club/register type publications. In addition, I subscribe to just about every car and truck monthly publication in hopes that I can learn something more about my vehicles. The only vehicle I owned that didn't have its own club was the Turbo Diesel. The light goes on. Why not start a Turbo Diesel club? The light flickers. I know the immediate answer: not enough time, no money, and who would write the articles? Needless to say, the idea got put on the back burner. Another great idea, but…

Looking back, that was many long years ago. Prior to our first magazine (Fall '93) I took time to talk to other Turbo Diesel owners who wanted to know more about their truck and specifically the Cummins engine. At the time I knew the Turbo Diesel Register would work. I also knew it would be a lot of hard work with an up-front monetary investment and the commitment to publish the magazine.

Positive discussions with other club/register publishers and an unofficial "good luck" or two from the manufacturers, and well, I was still hesitant. Back to the all-important concerns: time, money and writing skills. Time? In the initial two-career-days it was nothing to stay up until 2:00 a.m. Money? What the heck, we took out a second mortgage. And writing skills? You've heard the saying, "if it is to be, it is up to me." Thus, we started the TDR way back in the summer of 1993.

Robert Patton
TDR Editor

PS. We hope you'll learn something from the following collection of tips and Ram technical data. Please realize this booklet is just the "tip of the iceberg." The TDR and its members provide a wealth of information. How to join? Please fill-out and mail the order form or register on-line at www.turbodieselregister.com.

WHY A DIESEL?

by Robert Patton

As the editor of a club news magazine (the *Turbo Diesel Register* for Dodge/Cummins owners), I am frequently asked, "Why is a diesel engine more fuel efficient than a gasoline engine of comparable displacement and horsepower?"

Let's see if I can provide a simple, no-nonsense answer. At the close of this article we'll do a quick diesel-payback example. Armed with a better understanding of why diesel provides a better payback on fuel consumption, you will be equipped to wring the most mileage from your tankful of diesel fuel.

How would you respond to, "Why is a diesel more fuel efficient?"

You may respond with one of the common clichés, such as, "It's the design of the diesel, it's built to be more efficient." How about, "The compression ratio is higher, there is more power?" Or, maybe a little more helpful, "The Btu content of diesel fuel is greater;" or perhaps, "It's in the injection system."

All of the above are correct, but the answers are pretty intuitively obvious.

When working with diesel powered generators, I encountered similar queries and responded with the same partial answers. I've seen the same "you didn't answer my question" body language from interested parties. It took being embarrassed in front of a large crowd before I vowed to get the complete answer.

Let's see if I can tie it all together and give you an answer you'll be able to use with your acquaintances. We will examine the diesel's design, compression ratios, fuel Btu's, and the fuel injection system to lead us to a concise answer, one that's easy to recall.

THE DIESEL'S DESIGN

"It's the design of the diesel; it's built to be more efficient."

The diesel engine was designed and patented in 1892 in Europe by Rudolf Diesel.[1] In the early part of the last century, Mr. Clessie Cummins, founder of Cummins Engine Company, refined the diesel design and developed engines to be used on-highway in the USA. Clessie's son, Clessie Lyle Cummins Jr., is a diesel historian. A passage from his book Diesel's Engine provides an historical perspective on Rudolf Diesel's early struggle to perfect his revolutionary engine and bring it to market.[2]

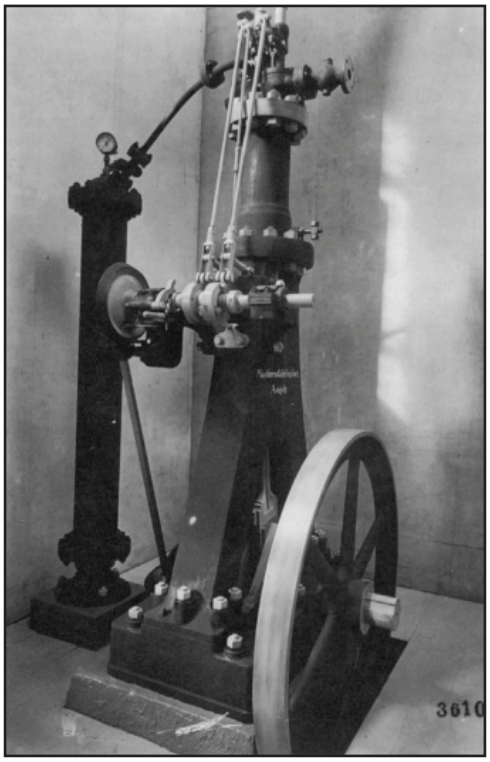
> After a ten-year search Rudolf Diesel was convinced he had found the way to design an engine with the highest thermal efficiency. He believed the most difficult days were over and transforming ideas into reality should prove a simpler task: License a qualified manufacturer to develop and build the engine under his guidance and then await the forthcoming royalty check. One company finally agreed to evaluate a test engine built to his design, but gave him no financial support. Because of this limited commitment he continued to promote his theories through the book based on his studies. Gift copies went to influential professors and companies deemed possible licensees. A few favorable academic endorsements resulted, but no new firms showed any interest. Meanwhile, when Diesel came to realize that his patented combustion process was unsuitable for a real engine he quietly substituted another. The path of his endeavors still failed to follow his optimistic, short range plan.

Diesel continued to seek the "highest thermal efficiency," or what he called a "heat engine," until his suicide in 1913. But the design principle is remarkably simple. From Mr. Clessie Cummins' book My Days With the Diesel,[3] I'll let the senior Mr. Cummins explain.

> As the term "heat engine" implies, the diesel differs in principle from the gasoline engine, in that [diesel] combustion is obtained by the heat created by compression of air in the cylinder. The diesel needs no electrical (spark) ignition system. Furthermore, it burns low-grade oil rather than the highly refined, more expensive fuels required by the gasoline engine.
>
> Adjudged practical only for heavy-duty, stationary, or marine power applications, diesels, when I first encountered them, weighed as much as 400 pounds per horsepower and ran at very slow speeds. Entering the industry some eight years after introduction of the diesel in this country, I undertook a personal campaign, with the crudest of experimental facilities, to reduce this pound-per-horsepower ratio, despite all textbook rules to the contrary. These efforts culminated in the invention of the high-speed, light-weight automotive diesel.
>
> For two decades, while struggling with the engine developments, I battled equally big odds to build a highly specialized business. Cummins Engine Company was incorporated in 1919, but it took the better part of eighteen years for our bookkeeper to need any black ink. Then success arrived with a rush, after the initially skeptical long distance truckers finally accepted our new engine.
>
> Today Cummins Inc., of Columbus, Indiana, is the world's largest independent producer of automotive diesel engines. It provides jobs for ten thousand persons, with sales of more than $250 million annually (the publish date of Clessie Cummins' book was 1967).

Note: 2005 sales were 9.92 billion.

Considering the level of technology in machined parts in the late 19th century, it is no wonder that Rudolf Diesel was unable to build his heat engine and prove its practicality. But in time, technology would catch up with the simplicity of Diesel's informing concept; and so the seemingly offhand answer that the design of the diesel is built to be more efficient is a true statement. Let's look further at the components that make the diesel different.



Diesel's first engine at the start of an 1893 test (photo courtesy of C. Lyle Cummins).

HIGHER COMPRESSION RATIO

"The compression ratio is higher, there is more power."

Technically speaking, the compression ratio of an engine is the comparison of the total volume of the cylinder at the bottom of the piston's stroke divided by the volume of the cylinder remaining at the top of the piston's stroke. Since we are familiar with gasoline engines, let's quickly discuss their compression ratios and a condition that spells disaster in a gasoline engine, detonation, or pinging.

The Gasoline Engine

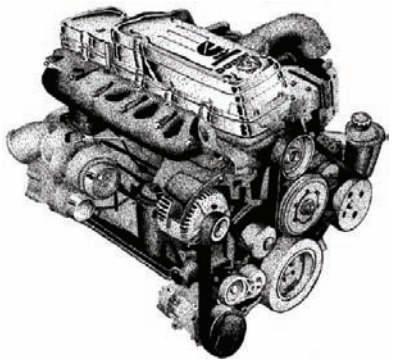
Serious damage to a gasoline engine can result if you attempt to run a high compression ratio with low octane fuel. Detonation or pinging is the ignition of the fuel due to the high temperature caused by a high compression ratio/high pressure developed by a given design. Premature ignition of the fuel, i.e., coming before the spark of the spark plug, results in rapid uncontrolled burning. When timed properly, the approximate maximum compression ratio for a gasoline engine in race trim is 14:1. Most non-racing low octane compression ratios used in automobiles and trucks are less than 9:1.

The Diesel Engine

Remember, the diesel is a "heat engine" using heat energy developed from the compression of air. High compression ratios (ratios range from 14:1 to 20:1) are possible since air only is compressed. The hot compressed air is sufficient to ignite the diesel fuel when it is finally injected near the top of the compression stroke. A high compression ratio equals a greater expansion of the gases following ignition and a higher percent of the fuel's energy is converted into power! The diesel compression ratio is higher, there is more power! However, I've provided yet another incomplete answer that is a true statement, but not the complete story.

Thus far we've covered the principle of diesel operation and the high compression ratios needed to make the heat for diesel engine combustion. The high compression ratio requires the designers to test and manufacture the block, heads, head bolts, crankshaft, connecting rods, rod bolts, pistons, piston pins, etc., with greater structural capacity. Diesel engines are heavy in comparison to their gasoline brothers. Take, for example, the B-Series engine used in the Dodge pickup. It is 970 pounds for the 359 cubic inch Turbo Diesel engine versus 540 pounds for the 360 cubic inch Dodge Magnum V-8 gasoline engine. With the greater structure and a diesel's need for air, the turbocharger (introduced in the 1950s) was a natural fit for diesel engines.

Looking back, the first engine designed by Clessie Cummins in the 1920s was a monster at 400 pounds per horsepower produced. The year model 2005, 325 horsepower Cummins Turbo Diesel pickup truck engine is 3 pounds per unit of horsepower. I'd say diesels have made some progress in 85 years.



The Cummins engine used in today's Dodge pickup.

FUEL BTU'S

"The BTU value of diesel is greater."

Quite true, the BTU, or British Thermal Unit, for diesel fuel is 130,000 per gallon, with a weight of 7.0 lbs./gallon. The value for gasoline is 117,000 BTUs at a weight of 6.3 lbs./gallon. If we go back to our basic physics rules for energy, you'll note the fuel in the tank has potential for work if it is injected into the cylinders and, when combined with the compressed heated air, ignited. The piston is forced downward, the crankshaft rotates, and the wheels turn. True as all this is, the BTU value is not the major contributing factor to the diesel's miles-per-gallon superiority. So, what is the key answer?

THE INJECTION SYSTEM

"It's in the injection system."

Rudolf Diesel designed the heat engine to use the injection of fuel at the last moment to ignite the compressed air. Understanding the heart of the diesel, the fuel pump, is the key to answering the fuel efficiency question.

The Gasoline Engine

A gasoline engine is what engineers call "stochiometric." Stochiometric describes the quantitative relationship between two or more substances, especially in processes involving physical or chemical change. With a gasoline engine there is a stochiometric equation of 14 parts of air to one part of fuel. Remember, always 14:1. Whether at idle or full throttle, the fuel and air are mixed outside the cylinders in a carburetor or injection manifold, and the mixture is introduced to the combustion chamber via the intake valve, 14:1, always.

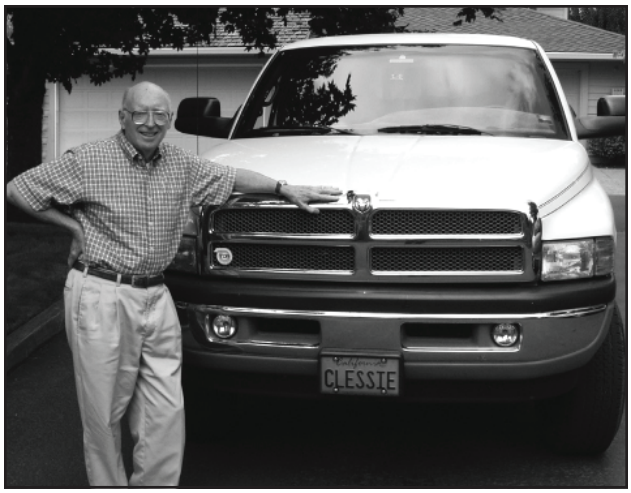
The Diesel Engine

Fuel and air in the diesel design are not premixed outside the cylinder. Air is taken into the cylinder through the intake valve and compressed to make heat. Diesel fuel is injected near the top of the piston's stroke in an amount or ratio corresponding to the load on the engine. At idle the air-to-fuel ratio can be as high as 85:1 or 100:1. At full load the diesel still boasts a miserly 25:1 or 30:1 ratio! It is in the injection system where we find the key to the diesel's fuel mileage superiority.

The Fuel Pump is the Key

The fuel pump used on early '90s vintage diesel pickup trucks typically was a rotary style fuel pump. Think of this pump as a mini automobile-spark-distributor. A rotary head sends fuel pulses through the high-pressure fuel lines to the injectors. The pressure opens the injector valve, and fuel is injected.

As exhaust emissions standards tightened in 1994, there was a need for higher fuel injection pressures and more timely delivery of fuel into the combustion chamber. Pickup truck leader, Ford, used an injection system developed by Caterpillar called HEUI (hydraulically-actuated, electronically controlled, unit injection). The Dodge/Cummins engine used a Bosch P7100 in-line fuel pump. Think of it as a mini in-line six cylinder engine, and it's easy to understand its principle of operation. Six plunger pumps actuated by the pump camshaft send fuel pulses through six high pressure fuel lines to the injectors. The pressure opens the injector valve, allowing fuel to pass into the combustion chamber. With the Bosch P7100 fuel pump the metering of the fuel (at idle, 85:1; or at full load, 25:1) is controlled by a fuel rack and gears that rotate a metering helix to allow fuel into the six plunger pumps.



C. Lyle Cummins Jr. poses in front of a '02 Dodge/Cummins Turbo Diesel pickup.

Future Considerations

Further exhaust emission legislation in 1998 and again in 2002 has forced the diesel engine manufacturers to introduce electronic fuel injection controls. Key legislation dates were 1988, 1994, 1998, and 2002. Thus the progression from simple mechanical (vintage 1988-1993) to more complex mechanical (vintage 1994-1997) followed by simple electronics (vintage 1998-2001) and now advanced electronics (2002 and newer) has been the norm that the diesel industry has followed. Stay tuned as the 2007 emissions legislation has brought another dramatic decrease in exhaust emissions for diesel engines in pickups and big-rigs.

1. We capitalize "Wankel" when referring to a rotary engine. When did we stop capitalizing the "D" in diesel?

2. I found Lyle Cummins' *Diesel's Engine* to be a complete history of Rudolf Diesel's engineering efforts. For information on how to order this book, please see this story's source table. I'll bet that if you request it, Mr. Cummins will autograph your copy! A must for your automotive library.

3. The senior Cummins' book, *My Days with the Diesel* is no longer in print (publication date, 1967). Lyle Cummins remembers his father in his recent book, *The Diesel Odyssey of Clessie Cummins.* Copies of the latter book are available. Again, please see the source table for complete information.

Sources:
Diesel's Engine (760 pages, $55) and *The Diesel Odyssey of Clessie Cummins* (400 pages, $37) are books written by diesel historian Clessie Lyle Cummins Jr. Published by Carnot Press. The books can be ordered at (503) 694-5353.

DIESEL VERSUS GASOLINE
DO THE MATH

My own experience has been with a 2002 Dodge 1500 with its 360 cubic inch (5.9 liter) gasoline engine and a 2003 Dodge 2500 with the 359 cubic inch (5.9 liter) Cummins diesel engine. Overall numbers in around-town driving equated to 13.5 mpg gasoline, 18.5 diesel.

In our example, let's figure that I travel 20,000 miles per year.

Gasoline usage: $\frac{20{,}000}{13.5} = 1{,}481$ gallons used

Diesel usage: $\frac{20{,}000}{18.5} = 1{,}081$ gallons used

It used to be that the price of diesel fuel was less than that of regular gasoline. Lately in my area that has not been the case. However, for comparison sake, let's assume the numbers are equal at $3 a gallon.

Gasoline expense: $\$3 \times 1{,}481 = \$4{,}443$

Diesel expense: $\$3 \times 1{,}081 = \$3{,}243$

Diesel net yearly fuel savings = $1200

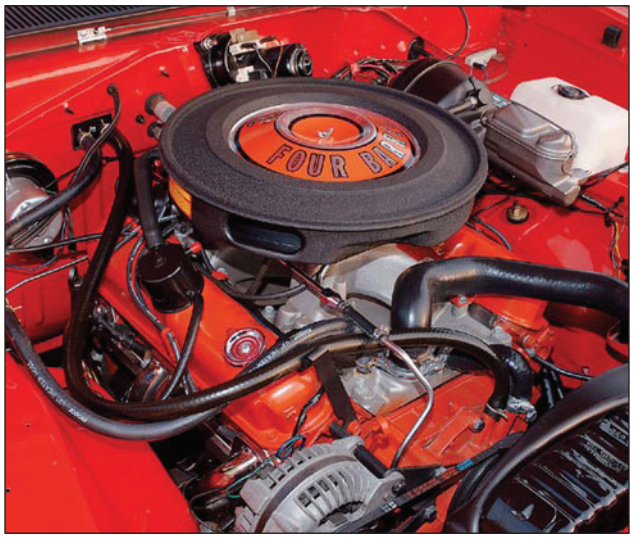
Estimated sticker price for the optional diesel engine – $7,000

Years (assuming 20K per year) and miles to payback – 5.8 years or 116,000 miles

If you subscribe to the adage, "Figures don't lie, but liars figure," you can easily make the previous example work for a shorter or longer payback period. In this short, down-n-dirty comparison we're not going to consider maintenance or resale values. And don't lose track of the obvious: as the diesel engine option in pickup trucks continues to price-creep upward, the payback is longer; however, as fuel prices rise, the payback is quicker.

To close the do-the-math example, remember that "your mileage may vary based on driving conditions." Don't ya love the clichés of automotive doubletalk?

Robert Patton
TDR Staff



The Chrysler 360 gasoline engine delivers around-town fuel mileage of 13.5 mpg.

The Cummins Turbo Diesel engine delivers around-town fuel mileage of 18.5 mpg.

CHARTING THE CHANGES – THIRD GENERATION

2003 TURBO DIESEL

What is New:

- All new body and cab interior layouts. It is called "Third Generation" by Turbo Diesel enthusiast.
- New full four-door cab option with forward hinged rear doors is still called the Quad Cab.
- New hydro-formed boxed frame for greater rigidity.
- New High Pressure, Common Rail diesel engine fuel injection system eliminates distributor-type fuel injection pump. New engine meets tighter emission control standards while offering more power.
- Driving axles are now supplied by American Axle in ratios of 3.73 and 4.10 to 1.
- The 4x2 models get new rack and pinion steering system, while 4x4 models retain recirculating ball system of previous models.
- All models use 17-inch wheels and tires.
- The 3500 model is available with either single or dual rear wheels.

Models Available:

- 2500HD as standard cab, quad cab (full size rear doors) short bed, long bed, 4x2 and 4x4.
- 3500HD is available in single rear wheel and dual rear wheel versions. Dual wheel version has higher weight and towing capacities. Dual wheel version is not offered with a short box.

Engine Ratings:

- 235 HP and 460 ft-lbs torque for 47RE automatic. The states of CA, ME, MA are only offered the 235 HP/460 ft.-lbs. engine.
- 250 HP and 460 ft-lbs torque for the 48RE automatic (introduced mid-year as an 03.5) and five-speed manual transmission.
- 305 HP and 555 ft-lbs torque high output (HO) engine with six-speed manual only.

Transmissions:

- Five-speed manual NV4500HD 5th overdrive only with standard engine.
- Six-speed manual NV5600HD 6th overdrive only with HO engine.
- In the first half of the 2003 model year the four-speed automatic 47RE 4th overdrive with locking converter only with standard engine.
- In January of 2003 Dodge released the 48RE automatic transmission 4th overdrive with locking converter

Maximum Tow Ratings:

- 2500 regular cab and quad cab, 4x2 and 4x4, five-speed, 250 hp engine:
  - 3.73 differential – 19,000 GCWR/18,000 GCWR for the states of CA, ME, MA.
  - 4.10 differential – 20,000 GCWR.
- 2500 regular cab and quad cab, 4x2 and 4x4, 47RE automatic transmission, 235 hp engine:
  - 3.73 differential – 18,000 GCWR/17,000 GCWR for the states of CA, ME, MA.
  - 4.10 differential – 20,000 GCWR/19,000 GCWR for the states of CA, ME, MA.
- 2500 regular cab and quad cab, 4x2 and 4x4, six-speed or 48RE automatic transmission. 3.73 or 4.10 differential, High Output/305 hp engine – 20,000 GCWR.
- 3500 Regular Cab and Quad Cab, 4x2 and 4x4, five-speed, 250 hp engine, single or dual rear wheels:
  - 3.73 differential – 19,000 GCWR/18,000 GCWR for the states of CA, ME, MA.
  - 4.10 differential – 21,000 GCWR/20,000 GCwr for the states of CA, ME, MA.
- 3500 single or dual wheels, Regular Cab and Quad Cab, 4x2 and 4x4, 47RE automatic transmission, 235 hp engine:
  - 3.73 differential – 18,000 GCWR/17,000 GCWR for the states of CA, ME, MA.
  - 4.10 differential – 20,000 GCWR/19,000 GCWR for the states of CA, ME, MA.
- 3500 regular cab and quad cab, 4x2 and 4x4, six-speed or 48RE transmission, High Output/ 305 hp engine:
  - 3.73 differential – 21,000 GCWR.
  - 4.10 differential – 23,000 GCWR.

Summary: Varies with model and options. Maximum tow rating is a 3500 series with standard cab, long bed, manual transmission, 4x2, 4.10 axle ratio = 23,000 GCWR.

Cab/Chassis Models:

Not ofered by the factory. However, commercial owners could order a "box delete" option.

Comments:

This all-new body and cab interior layout also features options not previously offered. American rear axle features a larger ring and pinion set for greater strength and durability. New body gets new exterior paint colors and new interior upholstery colors and options. Cummins badging is moved form front doors to front fender edges near bumper.

At mid-year the 47RE automatic transmission was discontinued. The 305 hp High Output engine was matched to a NV5600 six-speed manual transmission and a new 48RE automatic transmission.

2004 TURBO DIESEL
(also 2004.5 models)

What is New:

- See 2003 model for description of new body and frame.
- Minor trim and color changes.
- 2004 model engine ratings and transmission choices are different for California, Maine, Massachusetts, New York and Vermont. These states were given the 235 HP/460 ft-lbs engine only.
- At mid-year the 2004.5 engine with 325 HP and 600 ft-lbs torque is released. With it mid-year introduction this engine is now the only engine offered (50-state certified).
- Five-speed manual transmission is not offered in 2004.5 models with 325/600 engine.
- 2004.5 model is offered with uprated 48RE automatic transmission.
- 3500 Quad Cab, short bed now offered.
- 7/70 powertrain warranty, 7/100,000 Cummins engine warranty.

Models Available:

- 2500HD as standard cab, quad cab, short bed, long bed, 4x2 and 4x4.
- 3500HD same as above. The dual wheel 3500 is not offered with a short box.

Engine Ratings:

- The 2004 engine is 305 HP and 505 ft-lbs and is available with six-speed manual and 48RE automatic. The states of CA, ME, MA, NY, VT are only offered the 235 HP/460 ft-lbs engine for the first half of the year.
- The 2004.5 engine is 325 HP and 600 ft-lbs torque as standard with no optional engine. Offered only with six-speed manual or 48RE automatic. This 50 state engine was/is equipped with a catalytic converter.

Transmissions:

- Early 2004 models for California, Maine, Massachusetts, New York and Vermont: five-speed manual, NV4500HD 5th overdrive.
- All other states: six-speed manual, NV5600HD 6th overdrive.Four-speed automatic 48RE 4th overdrive with revised torque converter lockup clutch programming.

Differential Ratios Offered:

- 3.73 and 4.10 to 1

Maximum Tow Ratings:

- 2500 regular cab and quad cab, 4x2 and 4x4, 235 HP/460 ft-lbs torque engine in the states of California, Maine, Massachusetts, New York and Vermont:
  - five-speed, 3.73 differential – 18,000 GCWR
  - five-speed, 4.10 differential – 20,000 GCWR
  - 48RE automatic, 3.73 differential – 17,0000 GCWR
  - 48RE automatic, 4.10 differential – 19,000 GCWR
- All other states with the 305 HP/505 ft-lbs engine or the 2004.5 325 HP/600 ft-lbs engine (all states approved) were shown to have a 20,000 GCWR regardless of transmission or axle ratio.
- 3500 single or dual wheels, regular cab and quad cab, 4x2 and 4x4, 235 HP/460 ft-lbs torque engine in the states of California, Maine, Massachusetts, New York and Vermont:
  - five-speed, 3.73 differential – 18,000 GCWR
  - five-speed, 4.10 differential – 20,000 GCWR
  - 48RE automatic, 3.73 differential – 17,000 GCWR
  - 48RE automatic, 4.10 differential – 19,000 GCWR
- All other states with the 305 HP/505 ft-lbs engine or the 2004.5 325HP/600 ft-lbs engine (all-states approved), with either an automatic transmission or six-speed:
  - 3.73 differential – 21,000 GCWR
  - 4.10 differential – 23,000 GCWR

Summary: Varies by model and options. Maximum is quad cab or standard cab 4x2, six-speed manual, 4.10 axle ratio, 4x2 = 23,000 GCWR.

Cab Chassis Models:

Not offered by the factory. Howeve,r commercial owners could order a “box delete” option.

Comments:

The 2004 model year was an exciting one for Dodge/Cummins fans. At year end, the bragging rights to the most powerful diesel engine belonged to Ram owners with an engine certification of 325 HP/610 ft-lbs torque. It is interesting to watch as the horsepower race continues.

2005 TURBO DIESEL

What is New:

- Polished aluminum wheel replaces the painted aluminum sheel on 2500/3500 SRW models.
- Optional on the Quad Cab are a power sunroof and satellite radio.
- The Cummins 325/600 engine was voted one of the “10 Best Engines” by Ward’s

Models Available:

- 2500HD as standard cab, quad cab, short bed, long bed, 4x2 and 4x4.
- 3500HD same as above. The dual wheel 3500 is not offered with a short box.

Engine Ratings:

- For 2005 the only rating offered is 325 HP and 610 ft-lbs torque. The engine is 50-state approved.

Transmissions:

Throughout the 2005 model year the New Venture NV5600, six-speed manual was replaced by a Mercedes Benz designed G56 six-speed manual transmission. The reason for the change: New Venture Gear was a joint venture company between DaimlerChrysler and GM. In December of 2002 the partnership was disolved and New Venture was/is wholly owned by GM.

The ratios of the NV5600 versus the G56 are shown below:

	1	2	3	4	5	6	R
G56	6.29	3.48	2.10	1.38	1.0	.79	5.74
NV5600	5.63	3.38	2.04	1.39	1.0	.73	5.63

The automatic transmission remained the 48RE.

Differential Ratios Offered:

- 3.73 and 4.10 to 1

Maximum Tow Ratings:

In the 2005 Ram Truck brochure the factory simply lists payload and towing weights. With the previous GCWR numbers we've used, the reader knows that the maximum trailer weight plus weight of the truck equals the GCWR. Effectively, the heavier the truck is, the *less* the trailer can weigh to not exceed the GCWR.

The 2005 brochure does not list truck weight or the TDR would do-the-math inorder to present consistant data to you. The data we have is presented below:

2005 Payload and Towing Maximums

	Payload	Trailer Weight
2500		
Regular Cab 4x2	2740	13,600
Regular Cab 4x4	2340	13,200
Quad Cab 4x2	2520	13,350
Quad Cab 4x4	2230	13,100
3500		
Regular Cab 4x2	4910	16,250
Regular Cab 4x4	5200	15,850
Quad Cab 4x2	4550	16,300
Quad Cab 4x4	4840	15,950

Cab Chassis Models:

Not offered by the factory. However, commercial owners could order a "box delete" option.

2006 TURBO DIESEL

What is New:

In the fall of 2005, Dodge introduces the Mega Cab as a 2006 model. Although it has four doors, the current Quad Cab has always been seen by Dodge as an extended cab model.

As its entry into the crew cab marketplace, the Dodge Mega Cab boastfully features the following largest/best-in-class attributes:

- Largest, longest cab – 143.2 cubic feet, 111.1 inches long
- Largest interior cargo valume – 72.2 cubic feet
- Largest cargo volumne behind rear seat – 7.7 cubic feet
- Largest flat floor load area – 16.8 square feet
- Largest second-row leg room – 44.2 inches
- Largest rear-door opening – 34.5 inches wide, 35.5 inches tall
- Largest rear-door open angle – 85 degrees
- First-ever reclining rear seats – 22 to 37-degree seat-back angle

Going hand-in-hand with the Mega Cab introduction, Dodge redesigned the interior dash and seats. A minor facelift to the truck's headlights, bumper and grill were a part of the 2006 introduction.

In the spring of 2006 Dodge introduced the Chassis Cab truck for commercial markets. The truck started production in the summer months and was officially known as a 2007 model. The engine for the Chassis Cab was a new 6.7-liter Cummins Turbo Diesel.

This 6.7 liter engine will be used in the pickup trucks in 2007 as it was designed to meet the tighter 2007 emissions regulations.

Models Available:

- 2500HD as Standard Cab, Quad Cab, short bed, long bed, 4x2 and 4x4.
- 3500HD same as above. The dual wheel 3500 is not offered with a short box.
- The Mega Cab is offered only with a short box. With the dual rear wheel/3500 Mega Cab, Dodge had to introduce a short box option.

Chassis Cab Models:

Introduced in March of 2006 the Commercial Chassis Cab trucks are initially available as a 3500 series truck. The 3500 series truck is available in single or dual rear wheels (SRW/DRW). The truck is available in both regular cab and Quad Cab configurations. The Regular Cab can be purchased with a 60-inch cab-to-rear axle length or a 84-inch cab-to-axle. The Quad Cab can only be purchased with a 60-inch cab-to-rear axle length.

Engine Ratings:

Again, for 2006 the only engine offered is the 50-state approved, 325 HP and 610 ft-lbs torque Cummins Turbo Diesel.

- The Chassis Cab gets the 6.7 liter Cummins engine rated at 305 HP and 610 ft-lbs torque.

Transmissions:

- Consumer pickup models 2500 and 3500 – no changes from 2005
- Commercial Cab and Chassis 3500 – G56, six-speed manual transmission (same as consumer pickup), Aisin AS68RC, six-speed automatic transmission

The Aisin internal gear ratios are as follow:

	1	2	3	4	5	6
Aisin AS68RC	3.74	2.00	1.34	1.00	.77	.63

Differential Ratios Offered:

3.73 and 4.10 to 1

Both the 3.73 and 4.10 are offered in consumer pickup models 2500 and 3500.

In the Chassis Cab model 3500 both the 3.73 and 4.10 are available with the G56 manual transmission. The 4.10 is the only axle ratio offered with the Aisin AS68RC automatic transmission.

Maximum Towing Capacities:

With the single power offering of 325 HP/610 ft-lbs torque the GCWR towing capacities are simplified. The numbers below are for regular, Quad and Mega Cab trucks.

- 2500 Manual or Automatic transmission with a 3.73 differential – 20,000
- 2500 Automatic transmission, 4.10 differential – 20,000
- 3500 Automatic transmission, 3.73 differential – 21,000
- 3500 Automatic transmission, 4.10 differential – 23,000
- 3500 Manual transmission, 3.73 differential – 23,000

2007 TURBO DIESEL

What is New:

- Mid-year introduction (2007.5) of Cummins 6.7 liter engine in consumer pickup models 2500 and 3500. Mid-year introduction of a Chrysler-supplied 68RE, six-speed automatic transmission.
- Mid-year introduction (February 2007) of commercial Chassis Cab models 4500 and 5500. These trucks would officially be labeled as 2008 model year vehicles.

Models Available:

Same as 2006.

- 2500HD as standard cab, quad cab, short bed, long bed, 4x2 and 4x4.
- 3500HD same as above. The dual wheel 3500 is not offered with a short box.
- The Mega Cab is available in the 2500 or 3500 single rear wheels, or 3500 dual rear wheels. It is only offered with a short cargo box.

Chassis Cab Models:

The Commercial Chassis Cab trucks are initially available as a 3500 series truck. The 3500 series truck is available in single or dual rear wheels (SRW/DRW). The truck is available in both regular cab and Quad Cab configurations. The regular cab can be purchased with a 60-inch cab-to-rear axle length or a 84-inch cab-to-axle. The Quad Cab can only be purchased with a 60-inch cab-to-rear axle length.

Engine Ratings:

- For early '07 models, 325 HP and 610 ft-lbs for consumer pickup models 2500 and 3500. This is a carry-over of the Cummins 5.9 liter engine.
- The 2007.5 consumer pickup models 2500 and 3500 received the Cummins 6.7 liter engine rated at 350 HP and 650 ft-lbs torque with the automatic transmission, 350HP and 610 ft-lbs torque with the manual transmission.
- The engine was introduced in January 2007 to meet a more stringent set of diesel exhaust emissions standards. The engine and its exhaust aftertreatment components were praised by the press as the engine not only met the 2007 standards, it also met the upcomming 2010 emissions standards. The fact that no further changes would be necessary for 2010 gave Dodge and Cummins an advantage over competitive engines that would go through two sets of hardware changes.
- The 6.7-liter's introduction was not without its own set of problems. Multiple software calibrations were implemented to solve problems with soot. This engine, with its electronic controls, NOx filter, and particulate filter, does not lend itself to "hot rodding" as did the previous 5.9-liter engine.
- 305 HP and 610 ft-lbs for commercial Chassis Cab 3500 models using the Cummins 6.7 liter engine. The 4500 and 5500 trucks are introduced with the same engine and engine ratings as the 3500 Chassis Cab.

Transmissions:

- For early 2007 the consumer pickup models 2500 and 3500 used the existing G56, six-speed manual transmission and 48RE, four-speed manual transmission.
- With the mid-year (2007.5) introduction of the 6.7 liter engine the automatic transmission was revised to a Chrysler-supplied 68RFE, six-speed unit.

48RE versus 68RFE Gear Ratio Comparison

	1	2	3	4	5	6
'03.5 -'07, 48RE	2.45	1.45	1.0	.69		
'07.5+, 68RFE	3.23	1.84	1.41	1.00	.82	.63

- With the mid-year (2007.5) introduction of the 6.7 liter engine the manual transmission (the Mercedes Benz designed G56 six-speed unit) was revised. In order to raise the overall gear ratios in the manual transmission the redesign dropped a tooth on the input shaft. The resulting gear ratios are as follow:

G56 versus G56R Gear Ratio Comparison

	1	2	3	4	5	6
'05-'07, G56	6.26	3.48	2.10	1.38	1.00	.79
'07.5+, G56R	5.94	3.28	1.98	1.31	1.00	.74

- Commercial Cab Chassis – no changes from 2006:
  - G56R, six-speed manual transmission and Aisin
  - AS68RC, six-speed automatic transmission.

Differential Ratios Offered (Consumer 2500/3500 trucks):

- With the mid-year (known as '07.5) change to the Cummins 6.7-liter engine there was also a change in the differentials that were offered by Dodge. Starting mid-year:
  - 3.43 and 3.73 with the G56R manual transmission
  - 3.43, 3.73 and 4.10 with the 68RFE automatic transmission.

Differential Ratios Offered (Chassis Cab 3500):

In the Chassis Cab model 3500 both the 3.73 and 4.10 are available with the G56 manual transmission. The 4.10 is the only axle ratio offered with the Aisin AS68RC automatic transmission

Maximum Towing Capacities:

Again in 2007, with the single power offering of 325 HP/610 ft-lbs torque the GCWR towing capacities are simplified. The numbers below are for regular, Quad and Mega Cab trucks.

- 2500 Manual or Automatic transmission with a 3.73 differential – 20,000
- 2500 Automatic transmission, 4.10 differential – 20,000
- 3500 Automatic transmission, 3.73 differential – 21,000
- 3500 Automatic transmission, 4.10 differential – 23,000
- 3500 Manual transmission, 3.73 differential – 23,000

2008 TURBO DIESEL

What is New:

Introduced to the public in February 2007 at the Chicago Auto Show, the Chassis Cab models 4500 and 5500 were officially known as 2008 model trucks. These Chassis Cab trucks share the same powertrain as the 3500 truck that was introduced in March of 2006. For the 4500 and 5500 trucks the differentials are larger. The front axle is made by Magna, the rear axle is made by Dana.

Available gearing for the existing 3500 Chassis Cab:

- 3.73 and 4.10 with the manual transmission
- 4.10 with the automatic transmission

Available gearing for the 4500 Chassis Cab:

- 4.10 and 4.44 to 1 for the manual transmission
- 4.44 and 4.88 to 1 for the automatic transmission

Available gearing for the 5500 Chassis Cab:

- 4.44 and 4.88 to 1 for the manual transmission
- 4.88 to 1 for the automatic transmission

Models Available:

- Same as 2006 and 2007
- 2500 HD as standard cab, quad cab, with short bed or long bed in 4x2 and 4x4 configurations.
- 3500 HD same as above, although the dual wheel 3500 is not offered wiith a short box.
- The Mega Cab is available in the 2500 or 3500 single rear wheels, or 3500 dual rear whels. It is only offered with a short cargo box.

Chassis Cab Models:

- The 3500 is available in single or dual rear wheels
- The 4500 and 5500 are dual rear wheels.

All three Chassis Cabs are available with a regular cab or Quad Cab configuration.

With the 3500, the regular cab can be purchased with a 60-inch cab-to-rear axle length or a 84-inch cab-to-axle length with single or dual rear whels (SRW/DRW). The 3500 Quad Cab can only be purchased with the 60-inch cab-to-rear axle length with SRW or DRW.

The 4500 and 5500 trucks are only offered with dual rear wheels. These trucks allow regular cab or Quad Cab cabins to be used with the 60-inch or 84-inch cab-to-axle length.

Engine Ratings:

- Same as 2007.5
- For 2008 the engine ratings for the Cummins 6.7-liter engine in consumer pickup models 2500 and 3500 remained the same as they were when the 6.7-liter engine was introduced in January of 2007: 350 HP and 650 ft-lbs of torque with the automatic transmission and 350 HP and 610 ft-lbs of torque with the manual transmission.
- The engine ratings for the Cummins 6.7-liter engine in the Chassis Cab models 3500, 4500 and 5500 remained the same as they were when the engine was introduced in the first Chassis Cab 3500 model in March of 2006: 305 HP and 610 ft-lbs or torque.

Transmissions:

- Same as 2007.5
- In the consumer pickup models 2500 and 3500 the automatic and manual transmission are the same as those used in the '07.5 introduction of the Cummins 6.7-liter engine in January of 2007. The nomenclature for the automatic transmission is the 68RFE; the nomenclature for the manual transmission is G56R. The gear ratio comparison chart is found in the "2007 Turbo Diesel" write-up.
- Commercial Chasis Cab models 3500, 4500, 5500 get the revised G56R manual transmission. The Aisin AS-68RC six-speed automatic transmission is the same as the initial offering of the first Chassis Cab 3500 model in March of 2006.

Differential Ratios Offered (Consumer 2500/3500 trucks):

- Same as 2007.5.
- 3.43 and 3.73 with the G56R manual transmission
- 3.43, 3.73 and 4.10 with the 68RFE automatic transmission.

Differential Ratios Offered (Chassis Cab 3500/4500/5500):

In the Chassis Cab models both the 3.73 and 4.10 are available with the G56 manual transmission. The 4.10 is the only axle ratio offered with the Aisin AS68RC automatic transmission

Maximum Towing Capacities:

In the 2008 Ram Truck brochure the factory has gone back to the rating guidelines that they used in 2005 whereby they simply list the payload and towing weights. With previous GCWR numbers the reader knows the maximum trailer weight plus the weight of the truck equals the GCWR. Effectively, the heavier the truck is, the *less* the trailer can weigh in order to not exceed the GCWR.

The 2008 brochure does not list the truck weight or the TDR would do-the-math in order to present consistant data to you. The data we have from the 2008 brochure is presented below:

	Payload	Trailer Weight
2500		
Regular Cab 4x2	2,680	13,550
Regular Cab 4x4	2,270	13,100
Quad Cab 4x2	2,520	13,350
Quad Cab 4x4	2,070	12,900
Mega Cab 4x2	2,050	12,850
Mega Cab 4x4	1,520	12,350
3500 (DRW equipped/4.10 axle)		
Regular Cab 4x2	4,790	16,150
Regular Cab 4x4	5,120	16,750
Quad Cab 4x2	4,480	16,150
Quad Cab 4x4	4,780	16,750
Mega Cab 4x2	3,200	15,550
Mega Cab 4x4	2,770	16,100

2009 TURBO DIESEL

What is New:

Although the Dodge Ram 1500 model received a new body and interior, the Turbo Diesel 2500 and 3500 consumer pickups and 3500, 4500, 5500 Chassis Cab trucks saw only minor trim revisions in this carryover/transitional model year.

Models Available:

- Same as 2006, 2007, and 2008
- 2500 HD as standard cab, quad cab, with short bed or long bed in 4x2 and 4x4 configurations.
- 3500 HD same as above, although the dual wheel 3500 is not offered with a short box.
- The Mega Cab is available in the 2500 or 3500 single rear wheels, or 3500 dual rear wheels. It is only offered with a short cargo box.

Chassis Cab Models:

- Same as 2008.
- The 3500 is available in single or dual rear wheels
- The 4500 and 5500 are dual rear wheels.

All three Chassis Cabs are available with a regular cab or Quad Cab configuration.

With the 3500, the regular cab can be purchased with a 60-inch cab-to-rear axle length or a 84-inch cab-to-axle length with single or dual rear wheels (SRW/DRW). The 3500 Quad Cab can only be purchased with the 60-inch cab-to-rear axle length with SRW or DRW.

The 4500 and 5500 trucks are only offered with dual rear wheels. These trucks allow regular cab or Quad Cab cabins to be used with the 60-inch or 84-inch cab-to-axle length.

Engine Ratings:

- Same as 2007.5 and 2008.
- In consumer pickup models 2500 and 3500: 350 HP and 650 ft-lbs of torque with the automatic transmission and 350 HP and 610 ft-lbs of torque with the manual transmission.
- The engine ratings for the Cummins 6.7-liter engine in the Chassis Cab models 3500, 4500 and 5500 remained the same when the engine was introduced in 2006: 305 HP and 610 ft-lbs or torque.

Engine Changes for 2009:

Starting in '02, the heavy duty trucks' introduction has followed the Dodge Ram 1500 by one year. The model year 2009 heavy duty trucks are no exception, they continue with the same cab and chassis design. As you can expect there are only a few subtle changes to the engine. These changes are:

- Access port on the turbocharger's exhaust housing that allows for exhaust turbine cleaning as needed.
- Revised stamped steel alternator bracket.
- Revised coolant hoses and O-ring fittings for the plumbing that goes to cool the exhaust gas recirculation heat exchanger.
- Revised fuel filter assembly that features a dual filter with greater filter area to strip away water as well as a secondary fuel filter with a smaller 5-micron rating. (The current fuel filter is 7-micron). The new fuel filter was released for production in January and the part can be retrofitted to the '07.5 to early '09 engines. Service parts for these engines were released in July 2009.
- Revised water inlet housing.

Transmissions:

In the consumer pickup models 2500 and 3500 the automatic and manual transmission are the same as those used in the '07.5 and '08. The nomenclature for the automatic transmission is the 68RFE; the nomenclature for the manual transmission is G56R. The gear ratio comparison chart is found in the "2007 Turbo Diesel" write-up.

Commercial Chassis Cab models 3500, 4500, 5500 use the same G56R manual transmission and Aisin AS68RC six-speed automatic transmission.

Differential Ratios Offered (Consumer 2500/3500 trucks):

- Same as 2007.5 and 2008.
- 3.43 and 3.73 with the G56R manual transmission
- 3.43, 3.73 and 4.10 with the 68RFE automatic transmission.

Differential Ratios Offered (Chassis Cab 3500/4500/5500):

In the Chassis Cab models both the 3.73 and 4.10 are available with the G56 manual transmission. The 4.10 is the only axle ratio offered with the Aisin AS68RC automatic transmission

Maximum Towing Capacities:

No changes from the listing chart for 2008.

THIRD GENERATION POWER RATINGS

Model Year	HP@RPM	Torque@RPM	CPL	Transmission	Comments	Boost Specification
2003 5.9L HPCR	235@2700	460@1400	8216	47RE Auto	CARB - DOC	23
			8224	5 Manual	CARB - DOC	23
	250@2900	460@1400	2624	47RE Auto	EPA - Non-Catalyst	23
			8223	5 Manual	EPA - Non-Catalyst	23
	305@2900	555@1400	2998	6 Manual	EPA - Non-Catalyst	26
2003.5 5.9L HPCR	235@2700	460@1400	8410	47RE Auto	CARB - DOC	23
			8412	5 Manual	CARB - DOC	23
	250@2900	460@1400	8212	47RE Auto	EPA - Non-Catalyst	23
			8226	5 Manual	EPA - Non-Catalyst	23
	305@2900	555@1400	8228	6 Manual	EPA - Non-Catalyst	26
			8213	48RE Auto	EPA - Non-Catalyst	26
2004 5.9L HPCR	235@2700	420@1600	8412	48RE Auto	EPA - Non-Catalyst	23
			8412	6 Manual	CARB - DOC	23
	305@2900	555@1400	8213	48RE Auto	EPA - Non-Catalyst	26
			8228	6 Manual	CARB - DOC	26
2004.5 5.9L HPCR	325@2900	600@1600	8350	6 Manual	EPA - DOC	30
			8351		CARB - DOC	30
			8346	48RE Auto	EPA - DOC	30
			8347		CARB - DOC	30
2005 5.9L HPCR	325@2900	610@1600	8423	6 Manual	EPA - DOC	30
			8424		CARB - DOC	30
			8421	48RE Auto	EPA - DOC	30
			8422		CARB - DOC	30
2006 5.9L HPCR	325@2900	610@1600	8348	6 Manual	EPA - DOC	30
			8349		CARB - DOC	30
			8344	48RE Auto	EPA - DOC	30
			8345		CARB - DOC	30
2007 5.9L HPCR	325@2900	610@1600	1091	6 Manual	EPA - DOC	30
			1095		CARB - DOC	30
			1000	48RE Auto	EPA - DOC	30
			1083		CARB - DOC	30

THIRD GENERATION POWER RATINGS

Model Year	HP@RPM	Torque@RPM	CPL	Transmission	Comments	Boost Specification
2007.5 6.7L HPCR Pickup	350@3000	610@1600	8233	6 Manual	EPA - DOC/NAC/DPF	28*
			8234		CARB - DOC/NAC/DPF	28*
		650@1600	8230	68RE Auto	EPA - DOC/NAC/DPF	28*
			8231		CARB - DOC/NAC/DPF	28*
2007.5 6.7L HPCR Cab/Chassis	305@2900	610@1600	8232	6 Manual	EPA - DOC/NAC/DPF	26*
			1264		CARB - DOC/NAC/DPF	26*
			2885	Aisin Auto	EPA - DOC/NAC/DPF	26*
			1257		CARB - DOC/NAC/DPF	26*
2008 6.7L HPCR Pickup	350@3000	610@1600	1489	6 Manual	All States - DOC/NAC/DPF	28*
		650@1600	1490	68RFE Auto	All States - DOC/NAC/DPF	28*
2008 6.7L HPCR Cab/Chassis	305@2900	610@1600	8235	6 Manual	All States - DOC/DPF	26*
			2886	Aisin Auto	All States - DOC/DPF	26*
2009 6.7L HPCR Pickup	350@3000	610@1600	1489	6 Manual	All States - DOC/NAC/DPF	28*
		650@1600	1490	68RFE Auto	All States - DOC/NAC/DPF	28*
2009 6.7L HPCR 3500 Cab/Chassis	305@2900	610@1600	2780	6 Manual	All States - DOC/DPF	26*
			2775	Aisin Auto	All States - DOC/DPF	26*
2009 6.7L HPCR 4500/5500 Cab/Chassis	305@2900	610@1600	2779	6 Manual	All States - DOC/DPF	30
			2774		All States - DOC/DPF	30

DOC = diesel oxidation catalyst NAC = NO_X absorption catalyst DPF = diesel particulate filter SCR = selective catalyst reduction (urea)

*** The boost numbers for the '07.5 and newer 6.7-liter engine applications are approximate. There can be variance based on the amount of exhaust gas recirculation in the intake air, the intake through the opening and the variable geometry turbocharger's position.**

WHAT DOES EVERY TURBO DIESEL OWNER NEED TO KNOW

by Robert Patton

I am reminded daily that "the world is going digital." Perhaps so, but as the last of an older breed I enjoy sitting in the EZ chair and reading the newspaper and periodical magazines.

Always on the lookout for interesting ideas that serve as an inspiration to write, I noted an article in the American Motorcycle Association's American Motorcyclist titled, "What Does Every Motorcyclist Need to Know?"

Shazam! Change the title to "What Does Every Turbo Diesel Owner Need to Know?" and I've got the basis for a good article. So, here goes…

TDR Related Items

First things first—you've got the magazine in hand and I thank you for your subscription. Now that I have paid due tribute, this resource article is going to direct you to the TDR's web site (www.tdr1.com) because I'm guessing that you may not be aware of the wealth of information that is available to you.

Once at the TDR's main page, look to the left and notice the heading "MAGAZINE." Scroll down to "Technical FAQs" and print the file. Read the FAQs and you'll be on your way to shedding the title of "diesel newbie."

Do you want to impress your neighbor with your knowledge of year-by-year, model-by-model changes to the truck? Or, do you have a specific question about gear ratios or horsepower and torque ratings for a given year? Tab down to "Buyer's Guide" and the 150+ page (we're continuously adding to the Buyer's Guide) PDF file is available for you to download. This book is a real gem.

With an eye on the basics one has to realize that your truck's Owner's Manual holds a wealth of information. From remote key lock reprogramming (some models), to tire inflation pressures, to the fluid capacities... the standing joke among TDR staff members is that there would not be a need for the TDR if owners would consult their Owner's Manual.

Kidding aside, the Owner's Manual is an excellent resource book and it covers the lubricants and fluids needed in your truck. The catch: often the Owner's Manual only gives the Chrysler/Mopar specification or part number for a fluid. Should you want to source a generic fluid (read: less expensive), you will again find the TDR's Turbo Diesel Buyer's Guide to be a great resource. A quick thumb to the index shows the title "Liquids in Your Truck" and this article is helpful in your search for lower cost consumable items.

Lower cost is always an important matter. Go back to the Buyer's Guide index and note the title "Part Number Reference." This chart gives oil, fuel and air filter crossover numbers; belt and hose numbers; and other miscellaneous parts. Use the chart wisely and save some additional money.

If I've not yet convinced you that the TDR Buyer's Guide is an excellent resource, there is another chapter that is worthwhile to those looking for performance specifications. Take a look at "Your Truck and the Boost Treadmill" and you'll see what I mean. Other noteworthy chapters: Most Common Problems, Preventive Maintenance, Mechanics Tips, and Memorable TDR Articles.

Have you encountered a problem with your truck that you think may have been previously discussed? While you're at the TDR's web site, tab down to "Magazine Index" and you'll be able to print files and then search for the TDR magazine's chapter-and-verse coverage of a problem, a gadget or a gizmo. My thanks to Bob and Jeannette Vallier for providing this valuable resource for us.

Still plagued with a problem or have an unanswered question? If you've not yet activated your username and password at the TDR's web site, now is an excellent time to do so. Log on to the members' "Discussion Forums" and ask the helpful TDR membership.

Enough about the technical information found at the TDR's web site; what else does every Turbo Diesel owner need to know? For an in-depth look at the truck there is nothing better than a factory service manual. Back in the early 90s the book was one volume and maybe 500 pages. The latest service manual is not even offered in print, it is a $120 CD. The last print versions were 10 volumes and $450. An alternate source is the Haynes manuals at about 350 pages for $18. Both the factory manuals and Haynes books can be found at Geno's Garage (800) 755-1715 or www.genosgarsage.com.

Factory Technical Service Bulletins (TSBs)

For a quick look at TSBs you can look at page 54 of this magazine or go to the TDR's web site and tab down to "Dodge Technical Service Bulletins" and take a look through the archives. Alternately the 150+ page pdf file "Turbo Diesel Buyer's Guide" (that you previously printed?) has the same TSB summary.

Chrysler's TechAuthority – An Outstanding Resource

The TDR's list of technical service bulletins is provided as a service to the membership. We recognize and observe copyright, and our listing is only a summary of the TSB. If you need the entire text you can visit your dealer and discuss the referenced TSB number. Alternately, you can log onto Chrysler's TechAuthority website (www.techauthority.com) and you can purchase *all* of the TSBs that may apply to your truck based on your truck's vehicle identification number (VIN). This service is $20 and the information is invaluable.

More about TechAuthority: I spent several days putting together the TSB summary for this year. While I was at the TechAuthority web site using the VIN for my '07.5 Turbo diesel truck, I noted the tab "Service Info." I clicked onto it and I was amazed at the wealth of information that was available.

I could look up front end alignment specifications. I could review the flywheel runout specifications. I looked up the removal of upper and lower control arms. I looked up the removal of the drive shaft center bearing. I looked up the troublesome diagnostic trouble code (DTC) P0106 that randomly occurs on my truck.

Then it hit me: it appears that the entire service manual for my truck was/is available for my viewing for the $20 daily fee. To confirm my assumption I called Tech Authority and verified that the information that I was viewing was, in fact, from the factory service manual.

More accolades for TechAuthority: I mentioned the P0106 code that randomly occurs on my '07.5 truck. I was armed with several VINs, so I did some research to see how a '07 truck with the 5.9-liter engine might differ from my '07.5 truck with the 6.7-liter engine. I started with a search on my truck with the 6.7. Using "Service Info," I scrolled down to item "28 DTC Based Diagnostics," then scrolled down to "MODULE, Engine Control (ECM) 6.7L."

Next: Diagnostics and Testing

Next: P0106

I was amazed at the information on code P0106. There was a Theory of Operation; When Monitored; Possible Causes; and a Service Tree.

I did the same for the '07 truck with the 5.9-liter engine and there was much less information. So, for owners of the '07.5 and newer trucks with 6.7-liter engines, there is a world of information that awaits at the TechAuthority web site.

A side note to the 6.7-liter audience: As I reviewed the "Theory of Operation" for my P0106, the write up motivated me to look at other codes with a focus on whether the code has a derate-effect on the engine. For example, I found these two derate codes:

P0217 – Coolant Temperature Too High results in, "during this time the customer may experience an engine power derate."

P242F – Diesel Particulate Filter Restriction – Ash Accumulation results in, "If the vehicle's EVIC massage center notification is ignored, the engine will eventually derate and set a DTC and MIL lamp."

I searched for others, but these were the only two that I came across in my quick review. Elsewhere in this magazine (page 91, "Make It Go Away") you can read further my frustration with DTC codes and engine derate or damage implications.

The Boy Scouts

Other things you need to know? Were you a Boy Scout? It is always a good idea to be prepared. A "boonie box" of spare parts to carry around under the seat is a good idea. My spares: a fuel filter, belt, belt tensioner, hoses, thermostat and a small tool kit. By the way, a spare key hidden underneath the truck has saved me from inconvenience many times.

Summary

My review of the magazine, the TDR's web site and the TDR Turbo Diesel Buyer's Guide has convinced me that this membership group is your best resource. My sincere thanks to all of the members that have helped answer what every owner needs to know on the TDR's active web site message boards. Also, Chrysler's TechAuthority is an excellent web site location for information. And now, I'm at a loss for further recommendations. So, thumb-through the magazine to see what other TDR writers had to say about what every owner needs to know.

Robert Patton
TDR Staff

THIRD GENERATION PURCHASE CRITERIA

ISSUE 77 – TECHNICAL TOPICS

by Robert Patton

WISH I'D KNOWN THAT

TDR members are very good at holding on to their old magazines. Likewise they know that indexes of previous articles were published yearly until year 2009. These important archives were compiled by Bob and Jeannette Vallier. These valuable yearly indexes are found in Issues 65, 61, 57, 53, 49, (deduct 4), etc. Then in 2009, we implemented a digital search of TDR magazines back to Issue 40 at our web site.

So, a solid infrastructure exists for those who want to research a topic.

But, how about a resource for those folks who don't know what they don't know?

That's right, something for the "wish I'd known that" crowd.

Wait a minute, isn't that what the TDR's Turbo Diesel Buyer's Guide (TDBG) is all about? Yes, indeed, and there is so much detail (aka, TDR's solid infrastructure) in the TDBG – Oops, perhaps the detailed research is too daunting of a task for the prospective new owner who doesn't know what he doesn't know. How can we keep it simple?

Easy. I gave the "Wish I'd Known That" assignment to Joe Donnelly for the First Generation truck, Scott Dalgleish for the Second Generation truck and I took the Third Generation truck. I created an outline for each of us to follow and I completed the assignment first so they could see how the format should be turned into entertaining and educational text.

The Outline

Rather than reinvent the wheel, I used the established categories used by the Chrysler group for all of their Technical Service Bulletins. That numerical system is as follows:

2 Front Suspension
3 Axle/Driveline
5 Brakes
6 Clutch/Manual Transmission
7 Cooling
8 Electrical
9 Engine
11 Exhaust/Air Intake
13 Frame and bumpers
14 Fuel
16 Propeller Shafts and U-Joints
18 Vehicle Performance
19 Steering
21 Automatic Transmission
22 Wheels and tires
23 Body
24 Air Conditioning
25 Emissions Control
26 Miscellaneous

Within each of these categories I will present the most common "Wish I'd Known That" problems that have been encountered by the TDR audience. Then I'll give a brief write-up of the solution with a TDR reference location (perhaps within the TDBG, perhaps in the magazines) where the new or prospective owner can go for details as needed. Here goes…

General Information

Before I start my "Known That" story, I'll remind you of an inspection chart that TDR writer Andy Redmond uses for evaluation of any used vehicle. The detailed chart is found in Issue 70, page 121.

If you use this level of detail in your pre-purchase exercise(s), I have no doubt that the seller will be impressed with the thoroughness of your vehicle search. Andy's inspection list trumps my, "If the door jambs and truck seal (or tailgate lift area) are clean, I am a buyer" pre-purchase criteria.

Rather than bore you with the "do a Carfax Report; check the NADA and Kelly blue book values; check with your insurance agent for policy prices; loan values; etc.," I'm going to make the assumption that this truck purchase is not your first rodeo. If you need further information:

TDBG, "Buying a Used Truck"
TDR #70, page 120, "Pre-Owned Purchase"
TDR #73, page 96, "Let the Search Begin"
This issue, page 80, "The Search for a New Ram"

Likewise, the TDBG is a fantastic source for performance and miles-per-gallon enhancements; specifications; Technical Service Bulletins; yearly changes to the truck; evolution of the different Cummins engines; warranty considerations – wait, why not give you the table of contents because I can guarantee it will be referenced when I get into the "Known That" story detail. The TOC is on the next page.

That, my friends, was a heck of a long introduction. Those with an eye for the details will carefully examine the TDBG's "TSBs Issued During '03-'09," pages 182-205. These documents give the service network the proper repair technique for the most common Third Generation truck problems. Perhaps this article should have been simply republishing those 23 pages?

No, let's attempt the highlights and add additional commentary. Here goes: Now, for the data that you've been waiting for, "Wish I'd Known That – Third Generation, 2003-2009."

2 Front Suspension

For this concrete-cowboy who lives in Atlanta, Georgia, there is no need for a four-wheel drive truck. With the two Third Generation trucks that I have owned (one is still in the family) I can say that the only suspension maintenance required was to change the shock absorbers at 175,000 miles.

In consulting with my four-wheel drive buddies, they tell me that the Third Generation's suspension is greatly improved over that of the previous '94-'02 Second Generation truck. However, if you add big wheels and tires, raise the suspension and/or exceed the 100,000 milestone you will have to go underneath the truck and monitor the suspension components for wear. While this generation of truck is not as prone to the "death wobble," the aforementioned big tires/raised suspension/mileage will have the owner looking at beefing up the steering box stabilizer, track bar, track bar bushings and steering damper. Unfortunately, there is not a one-size-fits-all solution to suspension wear. There is a 10-page article in the TDBG that covers suspension inspection and alignment specifications, pages 235-245.

3 Axle/Driveline

One word: bulletproof. Certainly there have been individual problems, but when was the last time you read a TDR article about U-joints, drive shaft, transfer case or axle problems?

5 Brakes

Normal maintenance is required.

If you want a complete tutorial on brakes, brake pads, brake bias, etc., you'll want to review the four-part series written by brake expert, James Walker, in TDR Issues 40-44. Yes, this is the same James Walker that authored the book High-Performance Brake Systems. His words from Issues 40-44 still hold true today.

Issue 40: James explains that your brakes do not stop the vehicle. The traction available between the road and the tire's four contact patches are what stops the vehicle. With this bit of enlightenment, you can bet that Issue 40 is worth a reread as James covers "Braking Systems in Plain English." Discussion about everything from the brake pedal, master cylinder, brake calipers, brake rotors, brake pads, brake lines are in the Issue 40 text.

Issue 41: "Brake Pad Selection." Brake pad material is a compromise. Read all about it.

Issue 42: "Twenty-One Brake Questions." From how to break in brake pads to why the rotors warp, James answers your 21 questions.

Issue 43: "Brake Fluid." What is the difference between DOT 3, 4, 5 and 5.1? You'll know after you reread Issue 43.

Issue 44: "Brake Bias." Have you ever locked up the rear tires and have the back of the vehicle want to pass the front? Do you know more about brake bias than the factory engineer? Another James Walker article that is worthy of reread.

6 Clutch/Manual Transmission

Transmission Options: You know, the TDBG is an excellent reference guide—I had to refer to its section "Looking at the Changes," pages 14-19 to see what clutch/gearbox was used in the different '03-'09 Third Generation trucks. Here goes—

2003: NV4500 with standard 235 or 250hp engine
NV5600 with high output 305hp engine

2004: Early 2004 models in CA, ME, MA, NY and VT got the NV4500 gearbox with a 235hp engine. All other states got the NV5600 gearbox with a 305hp engine

2004.5: A mid-year introduction gave all states the 325hp engine and a NV5600 gearbox.

2005: As the 2005 model year progressed, the New Venture NV5600, six-speed manual was replaced by a Mercedes Benz designed G56 six-speed manual transmission. The reason for the change: New Venture Gear was a joint venture company between DaimlerChrysler and GM. In December of 2002 the partnership was dissolved and New Venture was/is wholly owned by GM.

So if you have a 2005 truck with a six-speed transmission, how do you tell—without crawling under the truck looking for signs of identification—if it is the NV5600 or the G56? Easy, the shift pattern for a NV gearbox has reverse up and to the right; the G56's pattern is over to the left and down. (Thanks, Peter Pyfer at South Bend Clutch.)

2006: The G56 Mercedes Benz is now the only manual transmission that is offered.

2007: Same

2007.5-2009: In early 2007 the internal ratios of the G56 transmission were revised. The new gearbox is given the name "G56R." The following is the comparison chart.

		1	2	3	4	5	6
'05-'07	**G56**	6.26	3.48	2.10	1.38	1.00	.79
'07.5-newer	**G56R**	5.94	3.28	1.98	1.31	1.00	.74

Clutch Discussion: All clutches are a compromise. For the most part, if you drive the truck as it was intended and do not increase the engine's performance, the clutches used in Third Generation trucks give the owner acceptable (and then some) life. So, in an effort to write an article for "Wish I'd Known That," there is not a beware-of-this statement that has to be addressed.

The clutch used with the NV4500 and NV5600 was mated to a single flywheel.

The clutch used with the G56 and G56R is mated to a dual mass flywheel.

If your truck has a clutch problem; if you want to learn more about clutch replacement options; if you need to learn more about the dual mass flywheel and flywheel options for your G56/G56R, here are the related articles in the TDR that will help you.

Issue	Page(s)	Title	Author
30	36-39	NV4500 Drivetrain Updates	Joe Donnelly
31	28-29	Manual Clutches for the NV5600	Joe Donnelly
38	140-141	Troubleshooting Short Clutch Life,	Peter Pyfer
55	58-59	Clutches 101	Jim Anderson
63	40-44	Covering the Basics	Gary Croyle
66	94-101	Turbo Diesel Clutch History	Joe Donnelly
67	78-79	Performance Clutches	Joe Donnelly
68	88-90	Dual Mass Conversion and the G56	Joe Donnelly
71	12-16	Dual Disc Clutch for the NV5600	Doug Leno
72	10-12	Dual Disc Clutch Update	Doug Leno

Gearbox Discussion: As I mentioned in the Clutch discussion, in writing for the "Wish I'd Known That" audience there is not a beware-of-this statement about gearboxes used in the Third Generation trucks that has to be addressed. And, just like the clutch discussion, the TDR's writers and members have "been there, done that" with the gearboxes. How so? Well, take a look at the reference material listing that I have provided below:

Issue	Page(s)	Title	Author
53	94-98	G56 and the Dual Mass Flywheel	Scott Dalgleish
53	98-101	G56 compared to NV5600	Scott Dalgeish
64	85-89	Rebuilding the NV5600	Joe Donnelly
67	84	Rebuilding the NV5600	Joe Donnelly
68	88	G56 Rebuild	Joe Donnelly
70	12	NV4500 Repair	Joe Donnelly
71	106-109	G56 Rebuild	Joe Donnelly
75	92-94	Manual Transmission Review	Joe Donnelly

Pay particular attention to Donnelly's Issue 75 article (pages 92-94) and the "Backfire" discussion on pages 106-107, as the text gives you some preventive maintenance and accessory tips:

To summarize, the articles recommend: G56 and NV5600 – The addition of transmission coolers, for cooling and for extra lubricant capacity, is a good idea. Likewise, do not "over-torque" the gearbox by leaving it in sixth gear/low rpm when you encounter steep terrain.

G56 – ATF+4 is the recommended lubricant. Donnelly and transmission vendors recommend over-filling the G56 by one quart and using a heavier fluid (Pennzoil Synchromesh as used in the NV5600 or a GL6-rated lubricant).

7 Cooling

Normal maintenance is required.

The TDBG has a summary of all of our antifreeze discussion on page 326.

And, for anyone who has had to change a water pump on any vehicle other than their Turbo Diesel, you have to give the Cummins engineers credit for the super-simple water pump design. Remove the accessory drive belt, remove two 10mm bolts that hold the water pump in place and you've got this project close to completion. Cooling system problems are few and far between.

8 Electrical

Normal maintenance to the alternator, starter, batteries, solenoids, etc., is required.

In this issue, you'll read about Chrysler's totally integrated power module (TIPM) that controls many of the truck's electrical functions. A replacement TIPM is expensive ($700) and now that these trucks have aged—and seen multiple owners with multiple trailers with who-knows-what wiring—we are seeing TIPM failures. The TIPM was not designed as a circuit breaker, and, if owners do not correct wiring problems, they find out how expensive it is to replace the TIPM if they use it as a circuit breaker. Ouch.

9 Engine

With all of the components that make up an engine, you would think that there would be a long list to discuss. However, aside from programming issues with the 6.7-liter engine (covered later in "Vehicle Performance"), the 5.9 and the 6.7 are rock solid! And, in fact, the '03-'07 5.9-liter engine is regarded by Turbo Diesel enthusiasts as the best of all. It is easy to maintain and service. The valve adjustment is every 100K miles. Hot rod parts are inexpensive and abundant and 400 horsepower is easy to attain. (Over 400 gets expensive as turbochargers need to be modified and other components have to be matched to the higher engine output.) Also, fuel mileage can be improved. All the particulars are in the TDBG starting on page 50 and again on page 96.

As I mentioned in "Axle/Driveline," there are always individual problems that occur, but when was the last time you read a TDR article about a bad turbocharger, water pump, oil cooler, oil pump, camshaft, valve train, etc.?

However, there is one area of the engine that is prone to wear. To meet emissions standards the engine uses a Bosch high pressure common rail (HPCR) fuel injection system. These injectors can fire as many as four times in a combustion event. Fuel filter maintenance (every 15,000 miles) and clean fuel are paramount to injector life. The average life span is 160-200,000 miles. Normally, if you need to replace one injector you'll need to replace all six—kind of like the purchase of replacement tires. Expect to pay $350-400 per injector or $2100-$2400.

TDR writer Joe Donnelly tried to capture everything you need to know about the HPCR injectors in his Issue 72 article "Injectors for HPCR Engines." The three page article starts on page 44. Any owner who wants to understand the principle of operation; wants to understand the importance of clean fuel; needs to replace an injector; has an engine stumble; wants to know about performance injectors; wants to know about alternate fuels; etc., you'll want to reread Joe's article. It is as relevant today as it was one year ago. Again, that is Issue 72, pages 44-57.

Performance upgrades for the 5.9-liter engine: Read all about it in the TDBG, pages 96-119, "So You Want Fuel Economy."

Performance upgrades for the 6.7-liter engine: Three words sum it up—don't do it. The TDBG, pages 72-77, "Performance, Warranty and You," gives you the reasons. Also, flip to page 56 and read "Section 18 – Vehicle Performance" for the reason(s) that I suggest you leave the 6.7-liter engine alone.

11 Exhaust/Air Intake

I just returned from a show where the proud Turbo Diesel owner told me about his '06 truck with the free flow exhaust, super monster filter and powder-coated intake air horn. He told me about the increased mileage (Really?) and the fact that he could hear the difference (No doubt!).

After we touched on several other topics—my favorite was the biodiesel junk—it was obvious that any challenge that I might present that opposed the justification for his modifications would be futile. So, I found a reason to excuse myself and walked away.

Don't get me wrong. In the quest for high horsepower, performance exhaust and intake systems have their place. Both work to lower and control exhaust gas temperatures and give a measure of better horsepower. However, with the exhaust system you sacrifice noise, with air intakes you may sacrifice air filtration.

So, for the guy who wants a dependable, reliable truck, my suggestion is to leave the exhaust and air intake alone.

This is especially true with the 6.7-liter engine. Our contacts at Dodge tell us that the new emissions laws require more sensors than ever before. The engine is very sensitive to intake air temperature and any change in the filter or airbox could lead to:

- The potential for too much hot underhood air which can cause a derate condition. This occurs most often in high altitude situations when the engine fan is engaged.
- Too much oxygen (O2) in the exhaust system. This can prevent the regeneration from coming on and foul the exhaust aftertreatment system.

For 5.9-liter owners the K&N filter debacle was covered in Issue 34, pages 105. Back in the Fall of 2001 Cummins tested the K&N for air flow and dirt flow. The result: Yes, they flow more air *and* more dirt. At the time the K&N was the number two selling item at the sister company Geno's Garage. As much as it could have hurt sales, the folks at Geno's pulled the item from the shelves and no longer ofer the K&N line of filters.

Finally, the air filter, cold air intake, and the performance you should expect from these types of modifications was covered in Issue 56 and 59. These articles are also conveniently found at the Geno's Garage web site under "Technical Information" and then the title "Understanding Air Intake Systems," or at the TDR's web site in the digital back issues area.

13 Frame and Bumpers

Back in 2003 Dodge introduced a new-and-improved hydroformed frame. This manufacturing technique results in a stiffer and stronger frame.

The folks at Dodge did not want a bunch of owners and aftermarket installers messing up this frame with Swiss cheese-type holes. They issued a technical service bulletin (TSB 13-001-03, 2/7/03) that set forth their guidelines. Since these trucks are now ten years old, I've no doubt that the second and third generation owners have ignored the TSB and the Swiss cheese holes have been drilled. The take away: beware of the overzealous frame driller. Aside from this watchword, the frame and bumpers are not problem areas.

14 Fuel

As mentioned in "Section 9 Engine Discussion," clean fuel is paramount to injector life. In this issue see pages 14 to 16 for more information on clean fuel (Chrysler TSB 14-004-11).

Biodiesel: With the cost of injectors at $2100-$2400 per set (and the other HPCR injection components aren't cheap either) I would steer clear of unknown biodiesel and not use anything greater than a B20 blend from a reputable supplier. Your Owner's Manual states that you should only use a B5 blend.

16 Propeller Shafts and U-Joints

Normal maintenance and inspection are required.

18 Vehicle Performance

For ease of reading I will break this topic into the two engines used in Third Generation trucks: the 5.9-liter and the 6.7-liter.

5.9-Liter Engine

Earlier I mentioned that the 5.9-liter from '03-'07 is regarded as the best of all engines found in our turbo Diesels. Leave it stock and it will last forever.

However, "leave it stock" is not a statement that the typical Turbo Diesel enthusiast can abide. So, what do owners do to this engine in their quest to improve on what was provided by the Cummins factory folks?

Boy, this is a lengthy topic. Exhaust and air intake have already been discussed in category 11. Programmers, turbochargers, camshafts, hot-rod injector—the TDR's writers have "been there, done that" and achieved some amazing results with horsepower *and* fuel economy. I'm not going into all of the details for this "Wish I'd Known That" article, but I will give you the chapter and verse so that you can do due diligence in your research—TDBG, pages 96-119, "So You Want Fuel Economy" with particular attention to pages 104 and 1115. Scott Dalgleish articles: Issues 50, 51, 52, 54, 59, and 61. Doug Leno articles: Issues 45, 47, 48, 49, 51, 53, and 57. Doug Leno article update: Issue 68, pages 50-57.

Now, while you are on your due-diligence quest for horsepower and economy you need to realize that, for the most part, *none* of the performance gains were done using aftermarket parts that meet any EPA or California Air Research Board (CARB) emissions standards or testing. You are reading between the lines correctly: Prior to 2007.5 (actually 2009, but it is a real long story*), the world of diesel performance aftermarket parts was like the wild, wild West—anything, everything and lots of black smoke.

*If you want the long story, you'll have to attend the Specialty Equipment Manufacturer's Association (SEMA) show each year and sit in on the diesel performance roundtable discussions. A summary of many years of my participation is found in the TDBG, "Performance Warranty and You," pages 72-77. Before you add any winky-twinky performance items to your truck, you need to understand the potential $25,000 fine you could face for violation of EPA code 203(a). Ouch!

6.7-Liter Engine

As mentioned, the vehicle performance section was broken into two categories. Now it is time to discuss the 6.7-liter engine from the ’07.5-’09 model years.

TDR members know that some of the odd model year designations (’91.5, ’98.5, ’07.5) coincide with the tightening of federal exhaust emissions rules. Such was the case with the 6.7-liter introduction as an ’07.5 model. And, if you recall from your reading in the TDR or from the TDBG, the 6.7-liter engine was a step ahead of the competition and the federal emissions standards as it was emissions compliant for the standards that would be in force in 2010. Detailed information about the hardware changes that coincided with the 6.7-liter introduction: TDBG pages 42-48, “The 6.7-Liter Engine Introduction.”

Yet, early to the market with the new technology does not always equate to seamless reliability. Notice I did not mention durability, as the hardware (block, cylinder head, turbo, EGR components, water pumps, fuel injection equipment, etc.) have not given owners undue problems. However, the software, i.e., programming of the engine to stay in-sync with the emissions control hardware (the diesel particulate filter, the EGR controls, the diesel oxidation catalyst and the nitrogen absorber catalyst), has caused owners their share of grief. Knowing that there are two sides to every story, the blame is not entirely that of Cummins and Dodge. Back in ’07.5 we still had folks purchasing diesel trucks without a need to really have a diesel. The 6.7-liter engine should not be used to drive around town and bring home groceries.

Time has proven that if you use the engine as intended and leave it stock, it will last forever. This statement is a repeat of my assessment of the ’03-’07 5.9-liter engine. However, unlike the 5.9 owner that could not resist modifying his engine, the 6.7-liter owner had better leave it stock.

For those that resisted the temptation to tinker, in the past four years the 6.7 owner was faced with multiple ECM flashes and updates. Often these updates were complicated by fraudulent owners that would pull their hot-rod programmer off the truck or reflash the ECM to stock. In March 2009, the Cummins folks—perhaps tired of this illegal game, and wanting tighter control of their ECM and/or influence by the EPA to stop owner tampering—embedded software to make sure only approved calibrations were downloaded, a secured ECM. If a non-approved flash was detected, a trouble code U1601 was set and the engine would not start.

Looking back to the TDR’s coverage of the secured ECM (Issue 67, page 34, “Spy Versus Spy: The 3/2009 Secured ECM”) I did some research to see how successful Cummins has been with their security attempt. Since there are aftermarket products available for Turbo Diesels made *after* 3/2009, one has to assume that the aftermarket folks found a way around the U1601 code and that engines do start with the aftermarket programmers. However, in typical Spy versus Spy fashion, I’ve no doubt that there are other counters (the number of downloads), timers or red flags in the ECM to tell the Dodge service technician that a reprogram has occurred.

If you value your warranty status, how many times do I have to say “Leave the engine stock.”

Here is what to look for if you play hot-rod guy with the 6.7 engine: First off, admit that you are a cowboy, a one-percenter, a member of the lone-wolf club. It is now *your* engine, and you are your own warranty station! Next, please read the TDBG article “Performance Warranty and You,” pages 72-77. Subsequently, the EPA and CARB have made enough threats to keep many in the aftermarket from playing in the 6.7-liter performance business. Likewise, another deterrent is the 2010 CARB emissions test that California residents have to pass in order to get a license tag.

Now, after all of the cautions that I have presented, I can only imagine that there will still be owners that want more performance from the 6.7-liter engine. In Issue 67, pages 31-34, I listed all of the modules/programmers that were available for the engine. In conclusion, I wonder to myself, “How many different ways can I say leave the engine stock.”

Finally, the TDR followed the trials and tribulations of a member that modified his 6.7-liter engine in a short article in Issue 72, page 32: “The Long Story, a Tale of Woe.”

Regardless of the cautions that I’ve issued, there will be the instance where a fault code/check engine light appears on your dash. How do you read the code and what does it mean? Is the code a nuisance or a serious call to action? Again, the intent is to keep this article brief: you can find all of the fault code answers in Issues 74, pages 84-85; Issue 66, pages 90-91; and the TDBG, pages 300-308.

19 Steering

In my review of the TSBs from ’03-’09 (TDBG, pages 189-212) I did not see anything out of the ordinary in the steering category.

21 Automatic Transmission

In my review of the TSBs from '03-'09 (TDBG, pages 182-205) I did not see anything out of the ordinary in the automatic transmission category.

Before you cry, "Foul, we know there are automatic transmission problems," let's try for a civil discussion on the topic.

First, let's discuss the time frame for changes to the automatic transmission. The first big change was January 1, 2003, for the change from the 47RE to the 48RE. There were no internal gear ratio changes.

The next change was January 1, 2007, for the change from the 48RE to the six-speed 68RFE. The new 68RFE went hand-in-hand with the '07.5 introduction of the 6.7-liter engine. The gear ratio comparison to the 48RE:

		1	2	3	4	5	6
'3.55-'07	**48RE**	2.45	1.45	1.0	.69		
'07.5-newer	**68RFE**	3.23	1.84	1.41	1.00	.82	.63

The complete "Ask the Engineer" story about the 68RFE is found in TDR Issue 58, pages 46-47.

Now, let's talk reliability, durability and all that stuff…

Okay, the '03 and '04 models have the same throttle position sensor (TPS) as the '98.5-'02 trucks. The TPS has been widely known to give folks problems. Do you need to do some research to find out the particulars? TDBG, "Vintage '94-'02 Lock/Unlock," page 23.

More reliability, durability and stuff: Perhaps you are under the impression that the Dodge automatic transmissions are substandard and are the weak link in an otherwise good drive line. How did this idea come to be?

First off, let's discuss the new 68RFE. It was introduced with the 6.7-liter engine in 2007.5. The initial power ratings for the engine was 350hp/650 torque. Not to be outdone by the competition, in February 2011 an engine rating of 350hp/800 torque was authorized for use with the 68RFE. (Notice, this rating was not released for manual transmissions—the clutch cannot take the torque.) Careful reading of the TDR magazine will reveal that the 68RFE is not being overpowered by the engine and the problems are few and far between.

I think the reason the 68RFE is doing well is two-fold: First, it is a good transmission. Second, owners of the 6.7 engine are not playing super hot rod/gonzo performance games with the engine and, therefore, not overpowering the torque converter lockup disc.

Now let's talk about the 48RE. This transmission has the same casting footprint as the previous 47RH/RE ('94-'03 vintage), the A618 ('89-'93 vintage) and the famous Chrysler 727 transmission that dates back to the 1960s. Matched to moderate horsepower and torque ratings, this transmission performed well, at least until 1994. Although engine ratings did not substantially increase in 1994, the factory used a plastic transmission line connector that, given time and heat cycles, was prone to leak fluid. If you ran the transmission low on fluid you would eventually overheat the transmission and end up with an expensive repair bill. Revised connectors were implemented in or about 1997. However, a damaged reputation was already established.

Add to this damaged reputation story the fact that Turbo Diesel owners were discovering all kinds of horsepower adders for their 12-valve and 24-valve engines, and the transmission's reputation was further dinged. The extra horsepower/torque could, and did, overpower the 47RH/RE's torque converter lockup disc. Once the disc slips the transmission has to be rebuilt.

That's the transmission story, and the bad reputation kind of disappears with the Third Generation trucks and the 48RE and 68RFE. I fully understand the 68RFE story. I suspect the reason we don't hear complaints from the '03-'07 crowd with the 48RFE is that they *know* that their engine horsepower/torque modification has to be matched with a modified automatic transmission torque converter lockup. They listened and learned from the '94-'02 owners.

23 Body

In my review of the TSBs from '03-'09 (TDBG, pages 182-205) I did not see anything out of the ordinary in the body category. However, since your Third Generation truck is up to nine years old I am betting that the paint could use a bit of rejuvenation. TDR writer Doug Leno did an excellent article on truck detailing in Issue 68, pages 58-65. To rid your truck of those nasty swirl marks and etching from acid rain, this article is worth a reread.

24 Heating and A/C

Two words: blend door. Two more words: It happens. Reference material for the repair: Issue 66, pages 12-17.

25 Emission Control

Nothing to report.

26 Miscellaneous

Nothing to report.

Conclusion

It is difficult for me to put aside my bias for the Dodge/Cummins Turbo Diesel truck. However, the Third Generation vehicle is far better than the trucks from GM or Ford from the same vintage of years. The Ford owners had various engine problems to deal with in those years and the Duramax engine from GM was yet to be proven.

If you already own a Third Generation truck, I hope you agree with my assessment of your vehicle and that the article has provided a solid review for details that you had long since forgotten. For the prospective "Known That" owner my hope is that the data provided gives you the confidence to purchase the truck. The truck is not without its faults, but we TDR members are here to provide you with an information resource that is unmatched anywhere else.

Robert Patton
TDR Staff

NOTES:

TECHNICAL SERVICE BULLETINS FOR 2003-2009

ISSUE 66 – TDRESOURCE

This combined section represents our review of Dodge Technical Service Bulletins (TSBs) issued to date (8/2009). Previously, Dodge vehicle TSBs were published in CD format and were available for purchase in July/August. As a service, we would purchase the TSB directory and then search through the CD to isolate only those bulletins relating to the Turbo Diesel truck.

The TSB directory is no longer available. However, the service that replaces it is an improvement. Armed with your truck's vehicle indentification number (VIN) and a credit card you can log on to www.techauthority.com and, for $20, you can view/print all of the TSBs that apply to your vehicle.

Using several VINs from years 2003 to 2009 we downloaded the TSBs and have summarized the subject, the description of the problem, and the corrective action. Should you need the entire text, you should consult your dealer or use the www.techauthority.com web site to purchase the bulletin(s) pertaining to your truck.

One final note: As mentioned, the TSBs that we've researched cover those issued from 2003 to date (8/2009). For clarity we have printed **in bold** the TSB number and the models of trucks to which the TSB applies. The bold print will help you distinguish the old lisitngs from the newer ones.

In an effort to consolidate the TSBs for the magazine, we're going to use the same index system categories as DaimlerChrysler. Below are the index categories.

2	Front Suspension	14	Fuel
3	Axle/Driveline	16	Propeller Shafts and U-Joints
5	Brakes	18	Vehicle Performance
6	Clutch	19	Steering
7	Cooling	21	Transmission
8	Electrical	22	Wheels & Tires
9	Engine	23	Body
11	Exhaust	24	Air Conditioning
13	Frame & Bumpers	26	Miscellaneous

A note concerning the TSBs and their use: The bulletins are intended to provide dealers with the latest repair information. Often the TSB is specific to the VIN. VIN data on the Chrysler service network helps the dealer in his service efforts. A TSB is not an implied warranty.

2009 TSBs

With the new service at www.techauthority.com we've gathered information on Dodge Technical Service Bulletins that have been released thus far in 2009. These 2009 TSBs are incorporated into our summary listing.

CATEGORY 2 FRONT SUSPENSION

TSB#	MODEL	SUBJECT/DESCRIPTION
02-003-08 6/20/08	'08 (DM) 4500/5500	*Front and/or rear shock absorber noise.* The customer may experience a clunking-like sound when traveling over small inputs (bumps and dips) in the road. This clunk-like sound is sometimes described as being similar to the sound that "loose lumber" may make when loose boards strike each other. This condition is more noticeable during cold ambient conditions below 40°F and at lower vehicle speeds when background noise is less. The sound may come from the front and/or rear shock absorbers. This condition is due to internal components within the vehicle shock absorber and the bulletin describes the replacement procedure.

CATEGORY 3 AXLE/DRIVELINE

TSB#	MODEL	SUBJECT/DESCRIPTION
03-003-04 6/15/04	'03 - '04 (DR)	*Launch shudder.* This bulletin involves adjusting the propeller shaft working angles and applies to vehicles equipped with a two-piece rear driveshaft. The problem is described as a drive line shudder or vibration while accelerating from a stop. The condition is most noticeable under heavy throttle acceleration and is usually present only at low speeds (below 25 mph). Vehicles equipped with a two-piece driveshaft are designed to minimize reaction forces that result from the universal joint transmitting torque at an angle. These forces cannot be eliminated entirely because of the necessity to compromise joint angle selection between curb and design loading conditions. U-joint angles change depending upon the amount of weight applied to the vehicle bed. Therefore U-joint angle readings may need to be taken with different vehicle loads in order to obtain a satisfactory compromise. The vehicle should be evaluated under the loaded condition that produces the objectionable disturbance. The repair procedure involves measurements at the transmission yoke, front propeller shaft, rear propeller shaft and rear axle. The working angles should be adjusted to provide the lowest angle possible for the output shaft to front propeller shaft, front propeller shaft to rear propeller shaft, and rear propeller shaft to axle pinion. The measurements will determine which direction to move the center bearing to optimize the angles. Install the appropriate bracket to obtain the minimum working angle, but still maintain at least ½ degree to ensure that there will be some movement in the U-joint bearings.
03-004-04 6/22/04	'03 - '04 (DR)	*Axle whine.* This bulletin applies to 4x2, 2500 series, 140.5 inch wheelbase vehicles equipped with diesel engine, sales code ETC/ETH, and an automatic transmission, sales code DG8. The problem is that some vehicles may exhibit rear axle whine at speeds between 35 and 70 mph. The repair procedure involves identification of the pinion flange and propeller shaft that the vehicle is equipped with. If a repair is necessary, the propeller shaft is replaced using the chart listing the appropriate part numbers.
03-003-06 10/20/06	'03-'07 (DR)	*Axle-fluid level.* This bulletin supersedes TSB 03-001-04, revision A dated 5/11/04. The axle fill holes on some 2004 Dodge Truck axles may be located considerably higher than the actual fluid level. Filling the axle until the fluid comes out of the fill hole will overfill the axle, which could cause fluid foaming. When checking fluid level or filling a rear axle with fluid, you must measure distance from the bottom of the fill hole to the actual fluid level. This can easily be accomplished using a pipe cleaner or piece of wire. Make a 90 degree bend in the wire two inches from the end. The wire can then be inserted into the axle fill hole and used as a dipstick. Measure the distance from the bend to the oil level. The fluid levels for the axles are shown in the table below. Ram Truck 2500/3500 Axle — Fluid Level (measured from the bottom of the fill hole) — Fluid Capacity 10.5 Rear Axle — 1 inch ± ¼ inch — 85 oz. SAE 75W-90 Synthetic 11.5 Rear Axle — ¼ inch ± ¼ inch — 122 oz. SAE 75W-90 Synthetic 9¼ Front Axle — ¼ inch ± ¼ inch — 76 oz. SAE 75W-90 Synthetic Note: The limited slip feature on 2500/3500 series Ram Trucks utilizes the Trac Rite locking feature which does not require Trac-Lok additives or friction modifiers.

CATEGORY 6 CLUTCH

TSB#	MODEL	SUBJECT/DESCRIPTION
06-001-03 5/16/03	'03 (BR)	*Rattle sound from transmission when idling.* This bulletin applies to vehicles equipped with a 5.9L Cummins high output Turbo Diesel (sales code ETH) and NV5600 six-speed manual transmission (sales code DEE) built on or before May 11, 2003. The vehicle operator may describe a rattling sound when idling in neutral with the clutch pedal released. The bulletin involves replacing the clutch disc with a revised part.
06-001-07 2/03/07	'07	*Clutch system may over-adjust causing difficulty engaging transmission gear.* This bulletin involves replacement of the clutch system flywheel, pressure plate, and disc. This bulletin applies to vehicles equipped with a 5.9 liter or 6.7 liter Cummins Turbo Diesel engine and the G56 manual transmission (sales code ETH, ETJ, and DEG respectively), and built on or before November 09, 2006. The customer may experience difficulty attempting to engage a manual transmission gear. This may be due to the self-adjusting mechanism in the clutch system. The self-adjusting clutch mechanism may over-adjust (forward adjust). This condition most often will occur within the first 1,000 miles of vehicle operation. The bulletin describes the proper repair technique to replace the flywheel, clutch plate, and clutch disc.

CATEGORY 8 ELECTRICAL

TSB#	MODEL	SUBJECT/DESCRIPTION
08-004-03 3/14/03	'02 - '03 (DR)	*Electro mechanical instrument cluster (MIC) erroneous indicator lamps.* Three conditions have been identified which may be caused by communication errors between the electro mechanical instrument cluster (MIC) and other electronic modules on the vehicle. 1. An intermittent false "Check Gauges" on diesel engine equipped vehicles. 2. An intermittent false chime and "Low Wash" indicator. 3. A "Trans Temp" indicator on a manual transmission equipped vehicle. This bulletin involves selectively erasing and reprogramming the MIC with new software.
08/007/03 4/4/03	'03 (DR)	*Alternator mounting bracket cracked.* This bulletin applies to vehicles equipped with a 5.9L 24-valve diesel engine (sales codes ETC, or ETH) and built on or before February 13, 2003, with engine serial numbers prior to 57013271. The problem is that the vehicle operator may experience an accessory drive belt squeal during normal driving conditions. This bulletin describes how to replace the alternator support bracket with a revised bracket.
08-019-03 6/20/03	'03 (DR)	*Lamp-out indicator with aftermarket pickup box installation.* This information-only bulletin discusses situations where an aftermarket utility box is installed after the removal of the original equipment pickup box. Under the circumstances the lamp-out indicator may illuminate. This is due to the use of aftermarket rear stop and turn signal lamps which use a dual filament bulb instead of separate circuits for the stop and turn indicator. The bulletin then describes the reprogramming procedure to reset the lamp-out indicator.

CATEGORY 8 ELECTRICAL

TSB#	MODEL	SUBJECT/DESCRIPTION
08-031-03 10/31/03	'03 (DR)	*PCM connector corroded—sets MIL light.* This bulletin applies to vehicles equipped with a 5.9 liter diesel engine and an automatic transmission. Water may enter the PCM connector causing corrosion of electrical terminals on the PCM. This condition can set diagnostic trouble codes and illuminate the MIL light. If diagnostic trouble codes are present or other diagnostics lead to PCM connector problems, inspect the PCM and the PCM wire harness connector. The repair procedure involves replacement of the wiring harness.
08-011-04 3/16/04	'04 (DR)	Poor radio sound quality with Infinity speakers. This bulletin applies to vehicles equipped with Infinity speakers, sales code RCK. Radios equipped with Infinity Speakers may exhibit a variety of symptoms due to reversed right front speaker wiring (polarity). Symptoms include: front door or speaker buzz, poor sound quality, lack of bass. The solution involves correcting speaker wiring polarity in the radio connector.
08-014-04 3/30/04	'04 (DR)	*Radio intermittent audio.* This bulletin applies to vehicles equipped with an AM/FM/cassette radio built prior to January 30, 2004 or AM/FM/CD radio built prior to January 30, 2004. Radios built after 1/30/04 will no longer have vent holes in the area the repair procedure covers. If the audio drops out when the vehicle is moved from a cold to a warm or humid environment, the reason is that condensation builds up across the audio amplifier circuitry, causing the amplifier to shut down. Typically, cycling the ignition switch off and on will restore the audio output. If the problem persists, the correct repair procedure is to apply tape over the row of slots on the left hand side of the radio's top cover.
08-014-05 2/17/05	'04 - '05 (DR)	*Mopar accessory remote starter inoperative due to hood switch.* This bulletin applies to vehicles equipped with a Mopar remote starter kit. The problem frequently occurs as one or more of the following: • When the transmitter is pressed twice for start, the vehicle horn will chirp once but the vehicle engine will not start. • When the transmitter is pressed twice for start, the vehicle horn will chirp twice, indicating a problem with the remote start system and the vehicle engine will not start. • When the transmitter is pressed twice for start, the vehicle will chirp once, the engine will start and then turn off. The technician may not be able to verify the symptom(s) because it may be an intermittent condition. The corrective action involves replacing the hood switch for the remote starting system.
08-024-05 5/4/05	'02 - '06 (DR)	*Radio communication equipment installation recommendations.* This information only bulletin gives the dealership technician some guidelines for the installation of two-way radio equipment.
08-058-05 10/29/05	'05 - '06 (DR)	*Revised radio antenna mast installation procedure.* This information only bulletin advises the proper tightening torque (30-32 in-lbs) for the radio antenna mast for various Chrysler group products.
08-014-06 3/16/06	'06 (DR)	*UConnect Hands Free module fails to respond due to module lock-up.* This bulletin supersedes service bulletin 08-049-05 dated September 1, 2005, and applies to vehicles equipped with UConnect Hands Free Communications (sales code RSP) that were built prior to October 2, 2005. If the UConnect Hands Free Communications system does not respond when system activation is attempted by the customer, the technical service bulletin gives the technician the proper repair technique to reset the hands-free module.

CATEGORY 8 ELECTRICAL

TSB#	MODEL	SUBJECT/DESCRIPTION
08-016-06 Rev. A 7/18/06	'06 - '07 (DR)	*Intermittent operation of electrical components due to ignition off draw (IOD) fuse not being fully seated.* This bulletin supersedes technical service bulletin 08-016-06, dated March 22, 2006. The ignition off draw (IOD) fuse is used to prevent battery discharge during shipping and long term storage of vehicles. If the fuse is not completely inserted, partial contact of the fuse terminals could occur. When the vehicle is prepped for customer delivery, ensure that the fuse is fully engaged. When the IOD fuse holder is depressed into the carrier, an initial distinct detent will be felt to overcome the "pre-hold position." On '06 and '07 DR vehicles the circuits fed by the IOD fuse are: Radio, EVIC, Wireless Control Module, Hands Free Module, Satellite Radio, Video Screen, CCN wake-up with ignition off, Underhood Lamp, and CCN Interior Lighting.
08-020-06 5/5/06	'04 (DR)	*Overhead console average fuel economy display.* This information-only bulletin discusses the calculation method used by the truck's average fuel economy display. On '06 vehicles, the calculation has been changed to use the last displayed average fuel economy as a starting point for the calculation after a reset. The average fuel economy will then be adjusted from that point. If the display read 21.6 mpg at the time the reset was activated, the new display will start at 21.6 mpg and would change from that point depending on the current fuel usage. This was done to eliminate the extreme variations caused by very high or low fuel usage at the time of the reset.
08-021-06 Rev. A 10/13/06 *Continued on next page.*	'06	*TIPM Flash: DTC's indicating short circuits in the wiring on the trailer or no engine crank with DTC P1277 – starter control circuit too low.* This bulletin supersedes technical service bulletin 08-021-06, dated May 10, 2006. This bulletin involves a discussion and reprogramming of the totally integrated power module (TIPM). This bulletin applies to vehicles built prior to April 03, 2006. The customer may experience any of the following TIPM diagnostic trouble codes (DTC's): B166B - Left Trailer Tow Lamp Control Circuit Low. Trailer harness left lamp circuit is shorted to ground. B166C - Left Trailer Tow Lamp Control Circuit High. Trailer harness left lamp circuit is shorted to battery voltage. B178C - Left Trailer Tow Lamp Control Circuit Over Current. Trailer harness left lamp circuit is intermittently grounding. B166F - Right Trailer Tow Lamp Control Circuit Low. Trailer harness right lamp circuit is shorted to ground. B1670 - Right Trailer Tow Lamp Control Circuit High. Trailer harness right lamp circuit is shorted to battery voltage. B166E - Right Trailer Tow Lamp Control Circuit Over Current. Trailer harness right lamp circuit is intermittently grounding. B1667 - Back Up Lamp Feed Low. Trailer harness back up circuit is shorted to ground. B2215 - Front Control Module Internal (TIPM). An internal fault code counter has exceeded its limit of 250 counts and one or more electrical outputs controlled by the TOPM have been disabled. P1277 - Starter Control Circuit 2 Low (TIPM). The output feed current to the starter solenoid has exceeded the upper current limit of 75 amps. This may result in a no-crank condition. DTC's B1667, B166B, B166E, B166F, B178C and B2215: These DTC's indicate that a (hard or intermittent) short circuit to ground exists in the wiring of one or more of the trailer electrical harness circuits. The TIPM retries the output on each ignition cycle or request (brake or turn signal activation) in an attempt to enable the output in case the fault is intermittent. The new TIPM software raises the TIPM circuit trigger point from 15 amps to 20 amps. DTC's B166C and B1670: These DTC's indicate that a short circuit to battery voltage (12 volts) exists in the wiring of one of the trailer electrical harness circuits.

08-021-06
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10/13/06

Continued from previous page.

DTC B2215 - Front Control Module (TIPM): This fault code occurs when the TIPM detects a short (to ground or to battery) on one of the trailer circuits more than 250 times. When B2215 is present with one of the above trailer circuit faults, the TIPM will turn off (disable) the respective faulty trailer circuit or circuits. This internal fault does not mean that the TIPM module is defective. The TIPM memory can be cleared, and this action will turn on a previously disabled trailer circuit. If possible, the fault in the circuit should be repaired first before clearing the TIPM memory. The dealer will need a scan tool to clear the TIPM memory.

DTC P1277 - Starter Control Circuit too Low (TIPM): The TIPM monitors the output current to the starter solenoid for over-current conditions. The DTC is set when the output current to starter solenoid exceeds 75 amps. On trucks equipped with a diesel engine, there may be times in cold climates when it is normal for the starter solenoid current to exceed 75 amps. The new TIPM software raises the TIPM current trigger point for DTC P1277 from 75 amps to 100 amps.

If any of the DTC's listed above are present, perform the repair procedure.

08-026-06
Rev. A
10/25/06

'06 (DR/DH/D1)

Overhead console temperature reading inaccurate or dome lamp turns off too soon.
This bulletin supersedes technical service bulletin 08-026-06, dated June 02, 2006.

This bulletin involves selectively erasing and reprogramming the cabin compartment node (CCN) with new software. This bulletin applies to vehicles built on or before May 30, 2006. The vehicle owner may notice that if a vehicle door is left open for longer than 20 seconds the illuminated interior (dome) lamps will turn off. Or the vehicle operator may report that the ambient temperature first displayed in the overhead console is not accurate (displays -40°C or -40°F), when the ignition switch is turned to the "On" position, then slowly updates to the outside ambient temperature as the vehicle is driven. If the vehicle operator describes or experiences the symptom/condition, perform the repair procedure which involves a reflash to the CCN.

08-044-06
10/07/06

'07 (DR)

Steering angle sensor over travel performance (DTC:C1240).
This bulletin involves the diagnosis and possible replacement of the steering angle sensor. This bulletin applies to vehicles equipped with the Electronic Stability Program (sales code BNB) and built prior to October 03, 2006. The customer may experience an illumination on the instrument cluster of the ABS (anti-Lock Brake System) and/or the ESP/BAS (Electronic Stability Program/Brake Assist System) warning lights. Investigation may reveal the presence of diagnostic trouble code (DTC) C1240 – Steering Angle Sensor Over Travel Performance.

If the diagnostic test procedure for DTC C1240 determines that the steering angle sensor is at fault, then perform the repair procedure.

08-046-06
10/25/06

'04-'07

Cell phone induced buzz or clicking-like sound in radio speakers.
This bulletin involves a discussion regarding cell phone generated signal interference with the vehicle radio system. A customer may experience a buzzing or clicking-like sound coming from the vehicle radio speaker(s). The sound may be heard when the radio is in AM or FM mode. The clicking-like sound may sound like Morse code.

This information-only bulletin points out that the construction of certain cell phones may generate frequencies that can interfere with the vehicle radio system. These frequencies may result in buzzing and/or clicking-like sounds in the vehicle radio. This condition can be easily corrected by instructing the customer to move their cell phone away from the immediate area around vehicle radio system (radio, radio amplifier, antenna, antenna lead). Do not replace any radio system component in an attempt to address this condition.

CATEGORY 8 ELECTRICAL

08-003-07 01/27/07	'07 (DR/DH/D1/DC)	*Remote start system – Diagnostic chart for antenna.* This bulletin involves a diagnostic chart that may be used to aid the technician with the diagnosis of the antenna on an originally equipped (factory installed) remote start system. This bulletin applies to vehicles with an original equipment remote start system (sales code XBM). The customer may notice that the signal range of the remote keyless entry system is reduced (less than 100 feet). This condition may be due to the RKE antenna. The diagnostic flow chart is provided as a diagnostic aid for dealer technicians.
08-015-07 06/06/07	'06-'07 (DR)	*Flash: Sunroof module, excessive ignition off draw, pop in radio with ignition off, dome lamp flickers and may not go off.* This bulletin involves selectively erasing and reprogramming the Sunroof Motor Module with new software.
08-018-07 06/23/07	'07 (DR/DH/D1/DC)	*Mopar remote start system – RKE – intermittent operation or alarm may sound.* This bulletin involves the installation of a Mopar remote start system service repair kit.
08-007-08 REV. A 7/4/08	'07-'08	*ngine does not crank or start due to electronic lockup of the remote key module.* This bulletin applies to vehicles built on or before May 05, 2008. The customer may experience a no engine crank and a no engine start condition. Also, the remote keyless entry system will not operate. This condition may be due to an electrostatic discharge from the ignition key into the wireless control module (WCM), causing the WCM to electronically lock up. This condition is corrected by the replacement of the WCM (also known as the Sentry Key Remote Entry Module).
08-028-08 9/18/08	'08 (DR/DH/DC/D1)	*Voice recognition screen lock-up on REN or REZ radio equipped with hands-free communications.* The customer may experience one of the following conditions: a) A "lock up" condition of the radio screen when the voice recognition (VR) button is pressed b) When the VR button is pressed, the radio display changes to the phone screen and there is a lack of the "Ready" audio prompt. If the above symptom/condition is experienced, the HFM is replaced. This bulletin applies to radios built before 11/6/07.
08-035-08 11/21/08	'07-'09 (DH/D1)	*Proper testing tools for oxygen sensor terminals.* This bulletin describes the use of proper test probes to test the oxygen (O2) sensor connector terminals equipped with the new TP2 style sensor. The recommended tool for these testing procedures is the Miller Tool #6801.

CATEGORY 9 ENGINE

TSB#	MODEL	SUBJECT/DESCRIPTION
09-004-06 03/31/06	'03-'06 (DR)	*Accessory drive belt chirp at shutdown.* This bulletin applies to vehicles with diesel engine sales code ETH. A chirping sound may be heard coming from the accessory drive belt when the engine is shut down. If a customer indicates that the condition is present, the bulletin directs the technician to install an overrunning clutch pulley on the generator.
09-002-09 REV. A 6/13/09	'07-'09 (DH/D1)	*MIL illumination due to DTC P2262 - Revised diagnosis and repair procedures.* This bulletin applies to vehicle equipped with a Cummins 6.7-liter engine (sales code ETJ). The bulletin supersedes technical service bulletin 09-002-09 dated 5/2/09. This bulletin discusses revised diagnostic and repair procedures for DTC P2262 - Turbocharger Boost Pressure Not Detected - Mechanical. Recent PCM calibration updates have improved the robustness to this DTC through updated diagnostic strategies. As a result, many events which have no adverse affects on drivability, emissions, or reliability will no longer set the P2262 fault. As a result of recent PCM calibration updates, the proper repair for some P2262 faults is merely to update the calibration, while others will require cleaning or replacing the turbocharger. Scan Tool software includes a P2262 diagnosis test for this purpose. The new P2262 diagnosis test must be used prior to performing any of the following: • Clearing codes • Updating the PCM • Beginning the turbocharger repair. Based on the outcome of the P2262 diagnosis test, the Scan Tool will provide one of the following as the proper direction for the appropriate repair. Service info and complete the repair as directed: • Update PCM flash calibration to the latest calibration. No repair required to the turbocharger. • Clean the turbocharger. • Update PCM flash calibration to the latest calibration and clean the turbocharger. • Replace the turbocharger. • Update PCM flash calibration to the latest calibration and replace the turbocharger.

CATEGORY 11 FRAME/BUMPER

TSB#	MODEL	SUBJECT/DESCRIPTION
11-002-07 9/25/07	07-'08 (DH/D1) 2500/3500	*Inspection and test procedures for the 6.7-liter diesel particulate filter (DPF).* This bulletin applies to vehicle equipped with a Cummins 6.7-liter engines (sales code ETF). The customer may experience a malfunction indicator lamp (MIL) illumination, warning chime, and an overhead electronic vehicle information center (EVIC) message that states "Catalyst Full Service Required." Investigation may reveal that the MIL illumination is due to one or more of the following diagnostic trouble codes (DTCs): P1451 – Diesel Particulate Filter System Performance. P2463 – Diesel Particulate Filter – Soot Accumulation. P242F – Diesel Particulate Filter Restriction – Ash Accumulation. The balance of the 10-page bulletin describes the inspection, test, repair, or replacement of the DPF based on the severity of the accumulation in the DPF.

CATEGORY 11 FRAME/BUMPER

TSB#	MODEL	SUBJECT/DESCRIPTION
11-001-08 5/21/08	'07-'08 (DH/D1) 2500/3500	*Cleaning the turbocharger on the Cummins 6.7-liter engine.* This 17-page bulletin describes the process of cleaning the turbocharger using Cummins Engine Update Kit 10138-UPD to address excess soot accumulation. The procedure cleans the internal components on the exhaust side of the turbocharger. The bulletin goes hand-in-hand with TSBs 11-005-08 and 11-002-07 for detailed turbocharger, engine and exhaust aftertreatment system repair procedures.
11-002-08 5/21/08	'07-'08 (DH/D1) 2500/3500	*Inspections and test for the turbocharger on the Cummins 6.7-liter engine.* The customer may experience a malfunction indicator lamp (MIL) illumination due to diagnostic trouble code (DTC): P2262 – Turbocharger Boost Pressure Not Detected – Mechanical. If further codes of P1451, P2463 or P242F are present, the technician is referred to the repair procedure listed in TSB 11-002-07. If the codes are not present, the repair and cleaning procedures in this 8-page bulletin and TSB 11-001-08 are to be performed.
11-001-09 7/23/09	'07-'09 (DH/D1)	*Diesel Particulate Filter: Diagnosis and repair of DTC's P1451, P200C, P242F or black smoke from exhaust.* This bulletin applies to vehicles equipped with a Cummins 6.7-liter engine (sales code ETJ). The customer may experience a malfunction indicator lamp (MIL) illumination, warning chime and an overhead electronic vehicle information center (EVIC) message regarding the aftertreatment system and/or black smoke from the exhaust and/or a no start condition. Further investigation by the technician may reveal that the MIL illumination and/or EVIC message is due to one or more of the following diagnostic trouble codes (DTC''s): P1451 - Diesel Particulate Filter - System Performance P242F - Diesel Particulate Filter Restriction - Ash Accumulation P200C - Diesel Particulate Filter Over Temperature - Bank 1. This bulletin provides revised diagnostic and repair procedures for DTC's P1451, P200C, P242F, black smoke from the exhaust, or a no start condition due to a nonfunctional or plugged diesel particulate filter (DPF).
11-002-09 8/5/09	'07-'09 (D1/DH)	*Diesel particulate filter Stationary DeSoot.* This bulletin applies to D1/DH vehicles equipped with a 6.7-liter Cummins diesel engine (sales code ETJ). Mobile DeSoot still applies to DC/DM vehicles equipped with the 6.7-liter Cummins diesel engine (sales code ETJ). Stationary DeSoot has replaced Mobile DeSoot as the repair for Diagnostic Trouble Codes P1451 and P2463. This bulletin provides the procedure to perform Stationary DeSoot. This new procedure allows running the DeSoot in a secured area with the vehicle unattended. Stationary DeSoot can only be performed when the diesel particulate filter has exceeded a specified soot threshold. The Diagnostic Scan Tool will not allow the procedure to operate unless the threshold has been exceeded. If the vehicle does not have an active P1451, the soot in the Diesel Particulate Filter is at a normal level and a scan tool initiated DeSoot is not needed.

CATEGORY 13 FRAME/BUMPER

TSB#	MODEL	SUBJECT/DESCRIPTION
13-001-03 2/7/03	'03 (DR)	*Frame alterations.* This bulletin is to support the 2003 Body Builder's Guide and presents guidelines that must be followed during modifications or alterations to any 2003 Dodge Ram pickup frame. The following general industry standard procedures are recommended for proper installation of special bodies and/or equipment on the Ram pickup frame, such as fifth-wheel hitches, snow plows, etc. Failure to follow these recommendations could result in damage to the basic vehicle and possible injury to occupants. The information-only bulletin gives the guidelines for welding and drilling of holes into the frame.

CATEGORY 14 FUEL

TSB#	MODEL	SUBJECT/DESCRIPTION
14-004-05	'03 - '05 (DR)	*Electronic fuel control (EFC) actuator available for service* This bulletin deals specifically with an engine surge at idle condition. The diagnostic procedures are the same as those listed in TSB 14-003-05. The bulletin describes the repair procedure for replacement of the electronic fuel control actuator.
14-003-06 Rev. A 10/27/06	'03 - '07 (DR/DH/D1/DC)	*Cummins diesel diagnostics.* This bulletin applies to vehicles with the 5.9 liter engine, sales code ETH or ETC. • Revised diagnostic procedures are available for the following conditions: • Engine cranks for a long time or will not start • White smoke and/or misfire after starting when the engine temperature is below 150° F • Engine surges at idle • Engine sounds The 12-page bulletin gives the service technician a set of revised diagnostic procedures for the fuel system. Each condition is discussed and possible causes are established. Step-by-step instructions help the technician identify and repair the problem.
14-005-06 07/27/06	'07 (DH/D1/DC)	*5.9-liter and 6/7-liter Cummins diesel engines - correct low and ultra-low sulfur highway diesel fuel use.* This bulletin involves a discussion regarding the correct diesel fuel to use for either the 5.9-liter or the 6.7-liter Cummins diesel engine (sales code ETH and ETJ respectively). Dodge Ram trucks equipped with the 6.7L Cummins Turbo-Diesel engine are required by Federal law to be fueled with ultra-low sulfur diesel fuel (model year '07.5). Early production 2007 Dodge Ram trucks equipped with the 5.9 Cummins Turbo Diesel engine are allowed by Federal law to be fueled with low sulfur diesel fuel, and are encouraged to fuel with ultra-low sulfur diesel fuel. The new ultra-low sulfur highway diesel fuel enables vehicles equipped with the advanced emissions control devices to achieve more stringent U/S EPA vehicle emissions standards.
14-007-06 Rev. A 09/02/06 *Continued on next page.*	'06-'07 (DH/D1/DC)	*Fuel and fuel filtering requirements for Cummins 5.9-liter and 6.7-liter engines.* This bulletin supersedes technical service bulletin 14-007-06, dated August 25, 2006. This information-only bulletin involves a discussion regarding fuel system requirements. The bulletin applies to vehicles equipped with a 5.9-liter High Output or a 6.7-liter Cummins Turbo Diesel engine (sales codes ETH or ETJ respectively) that were built on or after March 07, 2006. Bulletin highlights follow: For the diesel engine system to operate at its peak performance a high level of fuel quality must be maintained. Emission control and fuel delivery systems have advanced significantly. Care must be taken to ensure that the fuel that is delivered to the engine fuel injection system is of the highest quality possible and free of contaminants. Significant components to fuel quality are: the initial quality of the fuel (as dispensed from the service station fuel pump or bulk storage), on-vehicle fuel storage, and the on-vehicle fuel filtering of the diesel fuel prior to the fuel injection process. Use good quality diesel fuel from a reputable supplier. It is recommended that purchase of diesel fuel be made from a service station that is known to dispense a high volume of highway diesel fuel. Ultra low sulfur highway diesel fuel is required for use in Dodge Ram trucks equipped with a 6.7-liter diesel engine. A maximum blend of 5% biodiesel (B5) is acceptable as long as the biodiesel mixture meets ASTM specification D-975, D-975-grade S-15, and ASTM D6751. A biodiesel fuel blend that is higher than 5% is not acceptable without additional fuel processing because these higher percentage biodiesel blends contain excess amounts of moisture which exceed the water stripping capability of the on-engine final fuel filter. Should a higher percentage biodiesel fuel be used, an auxiliary water stripping filter will be required.

CATEGORY 14 FUEL

14-007-06 Rev. A 09/02/06	\	A maximum blend of 20% biodiesel (B20) can be used by government, military, and commercial fleets who equip their vehicle(s) with an optional water separator, and adhere to the guidelines in the *Department of Defense specification A-A-59693.*
Continued from previous page.		Fuel conditioners (additives) are not recommended and should not be required if you buy good quality fuel and follow cold weather advice supplied in the Owner's Manual.

CATEGORY 18 VEHICLE PERFORMANCE

TSB#	MODEL	SUBJECT/DESCRIPTION
18-015-03 4/4/03	'03 (DR)	*Powertrain control module (PCM) shift quality improvements.* This bulletin applies to vehicles equipped with a 5.9L standard output Cummins diesel engine (sales code ETC) and a 47RE transmission(sales code DGP) built before December 31, 2002. The vehicle operator may find that the vehicle will not shift out of third gear at throttle between 50% and 90% until 70 mph. The repair involves selectively erasing and reprogramming the powertrain control module (PCM) with new software.
18-027-03 7/4/03	'03 (DR)	*No throttle response, lack of power while towing and diagnostic trouble codes P2638/P0700.* This bulletin applies to vehicles equipped with a Cummins diesel engine (sales code ETC or ETH) built on or before July 25, 2003. The vehicle may exhibit: • No throttle response if the engine is started with the Accelerator Pedal Position Sensor (APPS) in an off-idle position (pedal depressed) and the transmission is shifted into drive or reverse while the APPS remains in an off-idle position (pedal depressed), causing the engine to remain at idle. • Lack of power while towing or hauling a heavy load with the transmission in overdrive—vehicles equipped with 47RE transmission. The repair involves selectively erasing and reprogramming the Cummins CM845 engine control module (ECM) with new software.
18-030-03 8/29/03	'98.5 - '02 (BE/BR) '03 - '04 (DR)	*Generic Cummins engine control module (ECM) procedure.* This bulletin applies to Ram trucks equipped with the 5.9L Cummins 24-valve diesel engine (sales code ETC or ETH). Mopar is phasing out pre-programmed Cummins Diesel engine control modules (ECM). New modules will no longer be pre-programmed when received from Mopar. Replacement of future ECM's will require programming utilizing the DRBIII and TechCONNECT.
18-003-04 2/3/04	'03 - '04 (DR)	*Poor A/C performance, slow fuel gauge response, and diagnostic trouble codes PO341 and P1757.* This bulletin applies to vehicles equipped with a Cummins Turbo Diesel engine (sales code ETC or ETH) with an engine serial number 57130284 or earlier and the engine date of manufacture on or before December 10, 2003. The owner of the vehicle may describe slow fuel gauge response after adding fuel. On California emission equipped vehicles, the problem is rapid A/C clutch cycling and poor A/C performance until coolant temperature reaches 170°. The repair involves erasing and reprogramming the Cummins ECM with new software.
18-004-04 2/3/04	'04 (DR)	*Poor cab heat and/or slow engine warm-up in cold ambient temperatures.* This bulletin applies to DR vehicles equipped with a Cummins Turbo Diesel engine (sales code ETC or ETH) and an automatic transmission, with an engine serial number 57130284 or earlier and the engine date of manufacture on or before December 10, 2003. The vehicle operator may describe poor cab heat and/or slow engine warm-up in cold ambient temperatures. A new feature has been added that allows the vehicle operator to use the speed control switches to increase the engine speed up to 1500 rpm in order to improve cab heat. The feature must be enabled using the DRBIII. If the vehicle operator would like to have the feature enabled, perform the repair procedure which involves erasing and reprogramming the Cummins ECM with new software.

CATEGORY 18 VEHICLE PERFORMANCE

18-007-04 2/24/04	'04 (DR)	*White smoke, engine stumble/misfire, or flat spot in engine performance.* This bulletin applies to vehicles equipped with a Cummins Turbo Diesel engine (sales code ETH) with an engine serial number 57130285 through and including 57149668 and the engine date of manufacture 12/10/2003 through and including 2/2/2004. The vehicle operator may describe: • White smoke during no-load engine acceleration between 2800 and 3000 rpm. • Engine stumble/misfire or flat spot during moderate accelerations between 1500 and 2500 rpm. May be accompanied by white smoke. • During cold ambient temperatures (30° or below) white smoke and/or engine stumble when engine is started after an extended cold soak. • During cold ambient temperatures (30° or below) white smoke when restarting engine that has not yet reached normal operating temperature. If the vehicle operator describes or the technician experiences the problem, perform the repair procedure which involves erasing and reprogramming the Cummins ECM with new software.
18-033-04 8/20/04	'98.5 - '02 (BR) '03 - '05 (DR)	*Cummins engine control module (ECM) procedure.* Mopar is phasing out pre-programmed Cummins diesel engine control modules (ECM). New modules will no longer be pre-programmed when received from Mopar. Replacement of future ECM's will require programming at the dealership. This bulletin describes the programming procedure.
18-041-05 12/20/05	'06	*Flash: engine performance/white smoke.* This bulletin applies to Ram trucks equipped with the 5.9L Cummins 24-valve diesel engine (sales code ETH) built on or after June 9, 2005, through and including November 8, 2005. This bulletin involves programming the PCM (Cummins) with new software. The software is designed to reduce white smoke and improve engine performance after a cold start at ambient temperatures below 60°F and to improve oil pressure gauge operation.
18-001-06 Rev. A 7/12/06	'06 - '07 (DR, DH, D1) '07 (DC)	*StarSCAN StarMOBILE abort recovery procedures.* This information-only bulletin supersedes technical service bulletin 18-001-06, dated January 11, 2006, and provides guidelines to minimize flash reprogramming problems and recovery procedure information for failed flash attempts.
18-003-06 Rev. A 09/27/06	'05 - '06 (DH, D1)	*Flash: long crank when starting and/or transmission shift and battery charging enhancements.* This bulletin applies to Ram trucks equipped with the 5.9L Cummins 24-valve diesel engine (sales code ETH) built on or after January 01, 2005. The vehicle operator may experience extended engine crank time in cold ambient temperatures on vehicles equipped with manual transmissions. This flash also provides the following enhancements: • Improved start times for manual transmission vehicles • Improved automatic transmission shifting • Engine fan is activated if the coolant temperature sensor fails • Enhanced battery charging This bulletin involves flash reprogramming the PCM (Cummins) with the software.
18-005-06 Rev. B 05/31/06 *Continued on next page.*	'06 (DH/D1)	*Flash: DTC correction, turbocharger protection, and clutch durability improvement.* This bulletin supersedes technical service bulletin 18-005-06 Rev. A, dated April 26, 2006. This bulletin applies to Ram trucks equipped with the 5.9L Cummins 24-valve diesel engine (sales code ETH) built on or after June 9, 2005, through and including May 31, 2006. The PCM software has been revised to address the following issues: • A MIL may illuminate due to one or more of the following diagnostic trouble codes: P0071 – Inlet Air Temperature Sensor Rationality P0111 – Intake Air Temperature (IAT) Sensor Rationality P0514 – Battery Temperature Sensor Rationality P0191 – Fuel Pressure Rationality • Turbocharger durability improvement: Implemented an engine speed limitation when cold, to protect the turbocharger bearings.

Continued from previous page.

- Clutch durability improvement: Implemented a minimum engine speed limitation when launching vehicle from a stop, to protect the clutch.

This bulletin involves selectively erasing and reprogramming the PCM (Cummins) with new software.

18-022-07
03/14/07

'03 - '05 (DR)

Flash: 5.9L Turbo-Diesel engine system enhancements

This bulletin applies to vehicles equipped with a 5.9L Turbo Diesel engine (sales codes ETC and ETH respectively). The bulletin supersedes 18-022-06 dated 07/13/06. The following enhancements are included with this software update:

- Improved engine cooling (radiator fan activation) and prevention of possible engine overheat. When coolant temperature faults are present, the radiator fan is enabled (turned on) during vehicle operation.
- Correction to oil pressure reading when engine is operating at higher engine temperatures above 195°F.
- Improvement to the Temperature Sensor Rationality Test to prevent possible false test failures and their following related diagnostic trouble codes:
  DTC P0071 – Inlet Air Temperature Sensor Rationality
  DTC P0111 – Intake Air Temperature (IAT) Sensor Rationality
  DTC P0514 – Battery Temperature Sensor Rationality.
- Additional water-in-fuel (WIF) warning added to indicate that the operator has had a WIF (DTC P2269) and has continued to operate the vehicle in excess of 500 miles without draining the water from the fuel filter. The following is the new WIF DTC that has been added:
  DTC P0169 – WIF Too Long Error
- Improvement to the fuel pressure rationality test to prevent false test failures and the related DTC 0191.

This bulletin involves selectively erasing and reprogramming the engine control module with new software.

18-038-06
12/05/06

'07 (DC)

Flash: DTC P0471 – Exhaust pressure sensor rationality on Cummins 6.7-liter Turbo Diesel.

This bulletin applies to vehicles equipped with a 6.7-liter engine (sales code ETJ) built on or before October 05, 2006. The vehicle operator may experience a malfunction indicator lamp (MIL) illumination due to diagnostic trouble code (DTC) P0471: exhaust pressure sensor rationality. This bulletin involves selectively erasing and reprogramming the engine control module (ECM-Cummins) with new software.

18-001-07
01/06/07

'06 - '07 (DH/D1)

Flash: check gauges lamp illuminates for alternator charging with DTC P2502, P2503, or P2509

This bulletin applies to vehicles equipped with a 5.9-liter engine (sales code ETH) built on or before November 29, 2006. The customer may experience the illumination of the "Check Gauges" lamp on the instrument panel cluster. Inspection of the gauges may reveal that the battery charging gauge may read in the 11-volt range rather than in the 14-volt range. There may not be a Check Engine/Malfunction Indicator Lamp (MIL) illumination.

Further diagnosis may reveal the following diagnostic trouble codes (DTC's) have been set:

P2502 – Charging System Error – Diesel
P2503 – Charging System Output Low – Diesel
P2509 – Powerdown Data Lost Error – Diesel

This bulletin involves selectively erasing and reprogramming the powertrain control module (Cummins PCM) with new software.

18-009-07
Rev. B
07/13/07

'07 (DC)

Ram truck 3500 Cab and Chassis – Excessive soot accumulation in exhaust, PCM may not reprogram, and other engine system enhancements.

This bulletin applies to Ram truck 3500 Cab and Chassis vehicles equipped with 6.7-liter Cummins Turbo Diesel engine (sales code ETJ). This bulletin supersedes technical service bulletin 18-009-07 Rev. A, dated May 16, 2007.

The vehicle operator and/or technician may experience one or more of the following conditions:

- The technician may not be able to reprogram (flash) the PCM with new application software.
- After extensive idling of the vehicle engine or if an intake air leak is present, the vehicle operator may experience a MIL illumination and/or an electronic vehicle information center (EVIC) message alert due to one or more of the following DTC's:
  P1451 – Diesel Particulate Filter System Performance.
  P2463 – Diesel Particulate filter – Soot Accumulation
  P242F – Diesel Particulate Filter Restriction – Ash Accumulation.
- The vehicle operator may experience a MIL illumination due to one of the following DTC's:
  P0101 – Manifold Absolute Pressure Sensor Performance.
  P0106 – Boost Pressure Sensor Rationality.
  P0191 – Fuel Rail Pressure Sensor Circuit Performance.
- Improved Water-In-Fuel (WIF) alert. To improve awareness that water has been detected in the fuel system, the vehicle operator will be alerted to a five (5) chime alert versus a single (1) chime alert.

This bulletin involves selectively erasing and reprogramming the powertrain control module (PCM) with "bootloader" software and application software.

18-030-07
04/26/07

'04 - '07
(DR/DH/D1/DC)

Engine off-idle speed limit feature to protect turbocharger when vehicle is not moving.

This bulletin applies to vehicles equipped with a 5.9-liter or a 6.7-liter Cummins Turbo Diesel engine (sales codes: ETC, ETH, or ETJ). This bulletin involves a discussion regarding an engine control feature that limits engine off-idle speeds when the vehicle is not moving.

Dependent upon engine coolant temperature, the engine control module (ECM) will temporarily limit the maximum engine speed when the vehicle is not moving. For automatic transmission equipped vehicles the maximum engine speed is temporarily delayed when the vehicle speed is less than one mph, and when the transmission selector is in either the neutral or park position. For manual transmission equipped vehicles, the maximum engine speed is temporarily delayed when the vehicle speed is less than one mph. This ECM feature is used to protect the engine turbocharger.

This delay in maximum engine and turbocharger shaft speed allows for sufficient oil lubrication to the turbocharger shaft bearings which is important for long term turbocharger durability.

The maximum engine speed for the 5.9-liter engine is temporarily limited to 1,600 RPM when the above conditions are met. The 6.7-liter engine speed is temporarily limited to 1,200 RPM when the above conditions are met. The length of time that the maximum engine speed is temporarily limited is dependent upon engine coolant temperature. For example, the delay can be up to 45 seconds at 35° or 7 seconds at 70°.

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Rev. B
06/28/07

Continued on next page.

'07 (DH/D1)

Ram truck 2500 and 3500 – Excessive soot accumulation in exhaust, PCM may not reprogram, OBD readiness status and other engine system enhancements.

This bulletin applies to Ram truck 2500 and 3500 vehicles equipped with 6.7-liter Cummins Turbo Diesel engine (sales code ETJ) built on or before June 11, 2007. This bulletin supersedes technical service bulletin 18-033-07 Rev. A, dated June 12, 2007.

The vehicle operator and/or technician may experience one or more of the following conditions and/or enhancements:

- The technician may not be able to reprogram (flash) the PCM with new application software.
- The vehicle may fail an emission inspection maintenance (I/M) test because two or more on-aboard diagnostic (OBD) monitors report that they are not ready for testing. This condition may cause the customer vehicle to fail an emissions I/M test. The following is a list of OBD Monitors that may report as not ready for testing:

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a. Non-Methane Hydrocarbon (NMHC) Catalyst Monitor.
b. Nitrogen Oxide (NOx) Absorber Monitor.
c. Exhaust Gas Temperature Sensor Monitor.
d. Electrical Charging System Monitor.
e. EGR System Monitor.
f. Oxygen Sensor Monitor.

- After extensive idling of the vehicle engine or if an intake air leak is present, the vehicle operator may experience a MIL illumination and/or an electronic vehicle information center (EVIC) message alert due to one or more of the following DTCs:

  P1451 – Diesel Particulate Filter System performance
  P2463 – Diesel Particulate Filter – Soot Accumulation
  P242F – Diesel Particulate Filter Restriction – Ash Accumulation.

- The vehicle operator may experience a MIL illumination due to one of the following DTC's:

  P0106 – Manifold Absolute Pressure Sensor Performance.
  P242B – Exhaust Gas Temperature Sensor Circuit Performance – Bank 1 Sensor 3
  P245A – EGR Cooler Bypass Control Circuit – Open

- An intermittent rough engine idle and/or white smoke following initial engine start.
- A throttle tip-in stumble at engine speeds of 1,300 to 2,100 rpm.
- An engine hesitation at altitude of 5,000 feet between engine speeds of 1,200 to 1,600 rpm.
- A turbocharger "chuff-like" sound during rapid deceleration.

This bulletin involves selectively erasing and reprogramming the Powertrain Control Module (PCM) with "bootloader" software and application software.

In October of '07 this TSB (and the number of fault codes addressed by the reprogramming of the ECM) was superseded by a recall (Recall G30) of all 6.7-liter engines built to that date. The TSB 18-033-07 was left in the magazine to give 6.7-liter owners data to see what the Recall G30 scope of work entailed.

Then in December of '08 the G30 recall and the TSB 18-013-08 that described the proper repair technique were updated again by TSB 18-013-08A.

18-037-07
Rev. A
07-20-07

'07 (DH/D1)

68RFE Transmission – DTC P0868 low line pressure.

This bulletin applies to vehicles equipped with a 68RFE automatic transmission (sale code DG7) built on or before April 30, 2007. The customer may experience a malfunction indicator lamp (MIL) illumination due to diagnostic trouble code (DTC) P0868-Low Line Pressure. This condition may be due to the transmission control module (TCM) software or to a hardware circuit in the TCM.

This bulletin involves checking the transmission control module (TCM) to determine that it is in proper working order and then selectively erasing and reprogramming the TCM with new software.

18-013-08
3/13/08

'07 - '08

Engine system and exhaust aftertreatment system enhancements.

This bulletin applies to vehicles equipped with a Cummins 6.7-liter engine (sales code ETJ) built on or before February 14, 2008. This bulletin discusses the G30 recall and the many drivability issues that are addressed and covered in the G30 recall software update.

18-013-08
REV. A
12/4/08

'07-'09 (DH/D1)

Continued on next page.

Engine system and exhaust aftertreatment system enhancements.

This bulletin applies to vehicles equipped with a Cummins 6.7-liter engine (sale code ETJ) built on or before November 27, 2008. This bulletin supersedes technical service bulletin 18-013-08, dated March 13, 2008. This bulletin involves verifying that Emission Recall G30 - Replace Oxygen Sensor Module and Reprogram ECM has been performed. If not, perform Recall G30 first, then verify the software level, and if necessary, selectively erasing and reprogramming the Engine Control Module (ECM) with new software. Additionally, verify the software level, and if necessary, selectively erasing and reprogramming the Cab Compartment Node (CCN) module with new software. With this latest ECM software release listed in this Service Bulletin, the following symptoms have been completely addressed.

18-013-08
REV. A
12/4/08

Continued from previous page.

- One of the following driveability conditions:
  a. An intermittent rough engine idle and/or white smoke following initial engine start.
  b. A throttle tip-in stumble at engine speeds of 1,300 to 2,100 rpm.
  c. An engine hesitation at altitude of 5,000 feet between engine speeds of 1,200 to 1,600 rpm.
  d. A turbocharger "chuff-like" sound during rapid deceleration.

- The vehicle may fail an Emission Inspection Maintenance (I/M) Test because two or more On-Board Diagnostic (OBD) monitors report that they are not ready for testing. This condition may cause the customer vehicle to not pass an Emissions I/M test. The following is a list of OBD Monitors that may report as not ready for testing:
  a. Non-Methane Hydrocarbon (NMHC) Catalyst Monitor.
  b. Nitrogen Oxide (NOx) Absorber Monitor.
  c. Exhaust Gas Temperature Sensor Monitor.
  d. Electrical Charging System Monitor.
  e. EGR System Monitor.
  f. Oxygen Sensor Monitor.

- Malfunction Indicator Lamp (MIL) due to one or more of the following Diagnostic Trouble Codes (DTC's):
  a. P0101 - Mass Air Flow (MAF) Sensor Rationality
  b. P0128 - Thermostat Rationality
  c. U1421 - Implausible Ignition Key Off Time Received.

The latest ECM software includes a new extended idle feature to accommodate the extended idle times present in some duty cycles. This feature may help to reduce the accumulation of soot in the exhaust aftertreatment system when the engine is idling for an extended period of time.

A number of improvements have been made to the engine diagnostics. Performing this Service Bulletin completely will enable these diagnostic improvements.

To determine if the vehicle has the latest software, compare the software level to the following notes:

- If the vehicle in question is a 2007 model year vehicle, then compare the current ECM software level part number to one of the following part numbers (or with a higher suffix):
  55350430AZ (or higher) = DH 2500 6.7L Manual Transmission 50 State
  55350435AZ (or higher) = DH 2500 6.7L Automatic Transmission 50 State
  55351430AZ (or higher) = D1 3500 6.7L Manual Transmission 50 State
  55351435AZ (or higher) = D1 3500 6.7L Automatic Transmission 50 State
- If the vehicle in question is a 2008 model year vehicle, then compare the current ECM software level part number to one of the following part numbers (or with a higher suffix):
  62350430AR (or higher) = DH 2500 6.7L Manual Transmission 50 State
  62350435AR (or higher) = DH 2500 6.7L Automatic Transmission 50 State
  62351430AR (or higher) = D1 3500 6.7L Manual Transmission 50 State
  62351435AR (or higher) = D1 3500 6.7L Automatic Transmission 50 State
- If the vehicle in question is a 2009 model year vehicle, then compare the current ECM software level part number to one of the following part numbers (or with a higher suffix):
  72350430AF (or higher) = DH 2500 6.7L Manual Transmission 50 State
  72350435AF (or higher) = DH 2500 6.7L Automatic Transmission 50 State
  72351430AF (or higher) = D1 3500 6.7L Manual Transmission 50 State
  72351435AF (or higher) = D1 3500 6.7L Automatic Transmission 50 State
- Determine if the current CCN module level software part number is one of the following (or with a higher suffix):
  05172187AG (or higher) = 2007 DH (2500) or 2007 D1 (3500)
  05172334AG (or higher) = 2008 DH (2500) or 2008 D1 (3500)
  05172529AG (or higher) = 2009 DH (2500) or 2009 D1 (3500)

CATEGORY 18 VEHICLE PERFORMANCE

18-035-08
9/13/08

'07-'08 (DH/D1)

MIL illumination due to P2000, P2A00 and/or P2A01.

The customer may experience MIL illumination. Further investigation by the technician may find one or more of the following DTC(s) present:

P2000 - NOx Absorber Efficiency Below Threshold - Bank 1.
P2A00 - O2 Sensor 1/1 Circuit Performance.
P2A01 - O2 Sensor 1/2 Circuit Performance.

This bulletin involves verifying all TSBs related to high sooting issues have been properly addressed, replacing both Oxygen (O2) Sensors, and wrapping the exhaust pipe in the area of the FRONT O2 sensor.

18-001-09
1/21/09

'07-'09 (DC/DM)
(3500/4500/5500
Cab Chassis)

Engine systems and exhaust aftertreatment systems enhancements.

This bulletin applies to vehicles equipped with a Cummins 6.7-liter engine (sales code ETJ) built on or before January 13, 2009. This bulletin supersedes technical service bulletin 18-009-07 Rev. B, dated July 13, 2007.

This bulletin involves verifying that the latest software has been installed on 2007 MY vehicles. Selectively erasing and reprogramming the Engine Control Module (ECM). Selectively erasing and reprogramming the Cab Compartment Node (CCN).

The latest PCM software will address the erroneous MIL illumination of the following faults:

P0191 - Fuel Rail Pressure Sensor Circuit Performance
P0128 - Thermostat Rationality
P0106 - Manifold Absolute Pressure Sensor Performance
P0524 - Engine Oil Pressure Too Low
P061A - ETC Level 2 Torque performance
P0607 - ECU Internal Performance

The latest PCM software will include the following operational and diagnostic improvements: Improve engine cooling capability and prevention of over temp condition (P0217 - Coolant Temperature Too High) when operating with snow plow. New feature that allows for customer selectable remote PTO speed (if equipped). The latest ECM software includes a new extended idle feature to accommodate the extended idle times present in some duty cycles. This feature may help to reduce the accumulation of soot in the exhaust aftertreatment system when the engine is idling for an extended period of time.

To determine if the vehicle has the latest software, compare the following notes:

- If the vehicle in question is a 2007 model year vehicle, then compare the current PCM software level part number to one of the following part numbers (or with a higher suffix):
  52300430AX (or higher) = DC 3500 6.7L Manual Transmission 50 State
  55300434AX (or higher) = DC 3500 6.7L Automatic Transmission 50 State
- If the vehicle in question is a 2008 model year vehicle, then compare the current PCM software level part number to one of the following part numbers (or with a higher suffix):
  61300430AK (or higher) = DC 3500 6.7L Manual Transmission 50 State
  61300434AK (or higher) = DC 3500 6.7L Automatic Transmission 50 State
  61301430AK (or higher) = DM 4500/5500 6.7L Manual Transmission 50 State
  61301434AK (or higher) = DM 4500/5500 6.7L Automatic Transmission 50 State
- If the vehicle in question is a 2009 model year vehicle, then compare the current PCM software level part number to one of the following part numbers (or with a higher suffix):
  71300430AH (or higher) = DC 3500 6.7L Manual Transmission 50 State
  71300434AH (or higher) = DC 3500 6.7L Automatic Transmission 50 State
  71301430AH (or higher) = DM 4500/5500 6.7L Manual Transmission 50 State
  71301434AH (or higher) = DM 4500/5500 6.7L Automatic Transmission 50 State
- Determine if the current CCN module level software part number is one of the following (or with a higher suffix):
  05172187AH (or higher) = 2007 DC (3500) / DM (3500/4500)
  05172334AG (or higher) = 2008 DC (3500) / DM (3500/4500)
  05172529AG (or higher) = 2009 DC (3500) / DM (3500/4500)

CATEGORY 18 VEHICLE PERFORMANCE

18-024-09 8/6/09 — ‘07-’09 (D1/DH)

MIL illumination and stationary DeSoot and other enhancements.

This bulletin applies to D1/DH vehicles equipped with a 6.7-liter Cummins engine (sales code ETJ) built before May 5, 2009. The customer may experience:

- An erroneous MIL illumination for P2262 - Turbocharger Boost Pressure Not Detected - Mechanical.
- Improved diagnostics for P2299 - Brake Pedal Position/Accelerator Pedal position Incompatible.
- An erroneous MIL illumination for P0402 - Exhaust Gas Recirculation (EGR) Flow Excessive Detected.
- An erroneous MIL illumination for P040B - EFR Temperature Sensor 1 Circuit Performance.
- An erroneous MIL illumination for P0405 - EFR Position Sensor Circuit Low.

This bulletin involves selectively erasing and reprogramming the Engine Control Module (ECM) with new software.

CATEGORY 19 STEERING

TSB#	MODEL	SUBJECT/DESCRIPTION
19-005-03 8/29/03	‘94 - ‘02 (BR/BE) ‘02 - ‘04 (DR)	*Power steering fluid usage.* The factory fill power steering fluid for most 2004 model year Chrysler Group vehicles is ATF+4 (part number 05013457AA/S9602) and it provides superior performance at both low and high temperatures. Refer to the table to identify factory fill and the approved service power steering fluid by year and model. From the table, it is noted that the ’94 to ’02 truck uses part number 04883077/MS5931. MS9602 should not be mixed or used as a “topping off” fluid on systems requiring MS5931.
19-008-03 11/28/03	‘03 (DR)	*Vibration in steering column.* A vibration may be felt in the steering wheel and/or the accelerator pedal on diesel engine vehicles with the engine operating between 2000 and 2200 rpm. The vibration may be more pronounced with the A/C compressor on. Operate the engine between 2000 and 2200 rpm. If the vibration is present, perform the repair procedure which involves installing a power steering hose containing a vibration damper.
19-010-04 11/29/04	‘04 - ‘05 (DR)	*Power steering fluid contamination.* This information-only bulletin discusses the use of supplements to the power steering fluid. Do not use fluids or supplements that contain Teflon as they will cause a restriction at the filter in the power steering system. The power steering fluid used in Chrysler Group vehicles is an engineered product. The addition of any unapproved fluids or supplements can interfere with the proper function of the fluid and cause damage to the steering system. To ensure the performance and durability of Chrysler Group steering systems, use only Mopar Power Steering Fluid +4, ATF+4 automatic transmission fluid, or equivalent (MS-9602), in the power steering system.
19-003-05 5/3/05	‘03 - ‘05 (DR)	*In and out movement in steering column.* This bulletin applies to vehicles built after December 1, 2003. If there is a small amount of movement in the steering column when pulling the steering wheel toward you while seated in the driver’s seat, the TSB outlines the proper repair procedure which involves the installation of a steering retainer kit to the steering column.
19-008-05 Rev. A 11/2/05	‘02 - ‘06 (DR)	*Revised power steering system bleeding procedures.* This bulletin supersedes service bulletin 19-008-05, dated October 26, 2005. The bulletin discussed that Mopar Power Steering fluid +4 or ATF+4 (MS-9602) is to be used in the power steering system of DR vehicles. No other power steering or automatic transmission fluid is to be used in these systems. Damage may result to the power steering pump and system if the incorrect fluid is used. Do not overfill the power steering reservoir. If the air is not purged from the power steering system correctly, pump failure could result.

CATEGORY 21 TRANSMISSION

TSB#	MODEL	SUBJECT/DESCRIPTION
21-023-05 11/11/05	'06	*Out of park sense alarm.* This information only bulletin applies to vehicles equipped with a 5.9L Turbo Diesel engine (sales code ETH). This information only bulletin discusses an alarm for "out of park" transmission setting. Vehicles with a diesel engine and an automatic transmission are equipped with an alarm that warns the customer, upon exiting the vehicle, that the transmission is not in the "Park" position. This feauture will only be functional under the following conditions: • engine running • foot off the brake pedal • driver's seat belt unbuckled • driver's door open. When this feature is triggered the horn will sound and the high beams and turn signal lamps will flash. This feature is standard equipment and cannot be disabled.
21-006-06 3/11/06	'05 - '06	*Transmission jumps out of reverse.* This bulletin applies to vehicles equipped with Cummins Turbo Diesel engines, sales code ETH and G56 manual transmissions sales code DEG. A customer may experience the transmission jumping out of reverse. If the customer indicates that the condition is present, perform the repair procedure which involves replacing the reverse synchronizer.
21-010-06 4/14/06	All	*Automatic transmission fluid usage ATF+4 (Type MS9602).* This bulletin supersedes technical service bulletin 21-004-04, dated March 16, 2004. ATF+4, type 9602, is being used as factory fill for Chrysler Group automatic transmissions. ATF+4 is recommended for all vehicles equipped with Chrysler Group automatic transmissions except for those noted: AW-4 transmissions, Sprinter transmissions, Crossfire transmissions, MK/PM vehicles equipped with Continuously Variable Transmission (CVT). ATF+4 is backward compatible with ATF+3, ATF+2, and ATF+. Additionally, ATF+4 can be used to top off vehicles that used ATF+3, ATF+2, or ATF+. Benefits: • Better anti-wear properties • Improved rust/corrosion prevention • Controls oxidation • Eliminates deposits • Controls friction • Retains anti-foaming properties • Superior properties for low temperature operation. Mopar ATF+4 has exceptional durability. However, the red dye used in ATF+4 is not permanent; as the fluid ages it may become darker or appear brown in color. ATF+4 also has a unique odor that may change with age. With ATF+4 fluid, color and odor are no longer indicators of fluid condition and do not necessarily support a fluid change.
21-003-07 02/09/07		*Automatic transmission diagnostic tear down procedure.* This bulletin provides a procedure to determine repair versus replacement of an automatic transmission assembly. Follow the proper repair procedure based on the transmission type. This procedure is to be used after the transmission has been removed from the vehicle. This bulletin supersedes technical service bulletin 21-008-06, dated 04/08/06. This bulletin supersedes technical service bulletin 21-021-08, dated 09/17/08.
21-006-07 03/20/07 *Continued on next page.*	'05 (DH)	*Flash: New 48RE feature that allows normal shift schedule with full disable of 4th gear overdrive.* This bulletin applies to vehicles equipped with a 5.9-liter Cummins Turbo Diesel engine and a 48RE automatic transmission (sales codes ETH and DG8 respectively). A new 48RE transmission feature is added that will allow normal shift schedule with full disable of 4th gear (overdrive gear), when the customer selects the Over-Drive (O/D) switch.

21-006-07
03/20/07

Continued from previous page.

Prior to the implementation of this new transmission feature, the use of the O/D switch changed the automatic transmission shift schedule from a "normal" shift schedule to a tow/haul mode shift schedule, and allowed 4th gear (overdrive gear) engagement.

This new transmission feature will not change the transmission shift schedule, but will allow full 4th gear overdrive disable (lock out). With this new feature the customer will have the "normal" shift schedule with NO overdrive (4th gear).

This bulletin involves selectively erasing and reprogramming the Cummins Engine Control Module (ECM) with new software.

21-009-07
5/24/07

'04 - '07

48RE Transmission – 1-2 shift hunt at light throttle.

The customer may experience a 1-2 shift transmission hunt during light throttle application. This condition may be due to a governor pressure solenoid valve. This bulletin involves the replacement of the governor pressure solenoid valve in the transmission valve body.

21-014-07

All

Automatic transmission fluid usage ATF+4 (Type MS9602).

This bulletin supersedes technical service bulletin 21-010-06, dated 4/16/06. ATF+4, type 9602, is being used as factory fill for Chrysler Group automatic transmissions. ATF+4 is recommended for all vehicles equipped with Chrysler Group automatic transmissions except for those noted: Sprinter transmissions, Crossfire transmissions, MK/PM vehicles equipped with Continuously Variable Transmission (CVT), all vehicles equipped with a A568RC transmission (sales code DG3), all vehicles with a Getrag MP56 (sales code DG5), and Grand Cherokees with the diesel engine option. ATF+4 is backward compatible with ATF+3, ATF+2, and ATF+. Additionally, ATF+4 can be used to top off vehicles that used ATF+3, ATF+2, or ATF+. Benefits:

- Better anti-wear properties
- Improved rust/corrosion prevention
- Controls oxidation
- Eliminates deposits
- Controls friction
- Retains anti-foaming properties
- Superior properties for low temperature operation.

Mopar ATF+4 has exceptional durability. However, the red dye used in ATF+4 is not permanent; as the fluid ages, it may become darker or appear brown in color. ATF+4 also has a unique odor that may change with age. With ATF+4 fluid, color and odor are no longer indicators of fluid condition and do not necessarily support a fluid change.

21-019-07
11/14/07

'07 - '08 (DH/D1)
2500/3500

68RFE transmission – harsh coast downshift and/or harsh 2-3 upshift.

This bulletin applies to vehicles equipped with a 68RFE automatic transmission (sale code DG7) built on or before November 6, 2007. The customer may experience a harsh downshift from the transmission when coming to a stop. When a vehicle stop is initiated from 4th gear (around 25mph), the harsh downshift condition will usually occur as the vehicle decelerates to a speed of about 10mph. If the transmission is in 2nd, 3rd, 5th, or 6th gear when the stop is initiated, the condition will not be present. This may cause the condition to appear to be intermittent to the customer. Because the harsh downshift may occur below 10mph, the customer may believe that they are experiencing a harsh 2-1 downshift.

Some customers may also experience a harsh 2-3 upshift during normal acceleration. This symptom is less common than the harsh coast downshift.

This bulletin involves selectively erasing and reprogramming the transmission control module (TCM) with new software.

21-021-08
9/17/08

'95-'02 (BR/BE)
'07-'09 (D1/DC)
'02-'09 (DR/DH)

Automatic transmission diagnostic tear down procedure.

This bulletin provides a procedure to determine repair versus replacement of an automatic transmission assembly. Follow the proper repair procedure based on the transmission type. This procedure is to be used after the transmission has been removed from the vehicle.

CATEGORY 22 WHEELS AND TIRES

TSB#	MODEL	SUBJECT/DESCRIPTION
22-001-05 12/1/05	'00 - '01 (BR/BE) '02 - '06 (DR)	*Chrome wheel care.* This information-only bulletin discusses chrome wheel care. Chrome wheels should be cleaned regularly with mild soap and water or Mopar Car Wash Concentrate to maintain their luster and prevent corrosion. Wash them with the same soap solution as the body of the vehicle. Care must be taken in the selection of tire and wheel cleaning chemicals and equipment to prevent damage to wheels. Any of the "Do Not Use" items listed below can damage or stain wheels and wheel trim. Wheel cleaners that contain hydrofluoric acid, biflouride compounds, sulfuric acid, or phosphoric acid. • Any abrasive type cleaner. • Any abrasive cleaning pad (such as steel wool) or abrasive brush. • Any oven cleaner. • A car wash that has carbide tipped wheel-cleaning brushes.
22-005-06 10/07/06	'03 - '07 (DR/DH/D1/DC)	*Front end shimmy on 4x4 vehicles when traveling over rough surfaces in the road.* This bulletin applies to four wheel drive (4x4) 2500 and 3500 model vehicles. The customer may experience a self sustaining vibration (shimmy) felt in the front end of the vehicle after striking a bump or pothole. This bulletin involves verifying the condition of the vehicle front suspension and steering components, and adjusting the front tire pressure. If the customer experiences the above condition, perform the repair procedure which includes a steering damper, tie rods and end links.
22-002-07 Rev. A 7/12/07	'08 (DH) 2500	*Tire pressure monitor system (TPMS) "Light Load" reset switch and tire rotation caution.* This information-only bulletin provides information for new vehicle preparation, setting tire pressures, rotating tires and setting the light load switch on vehicles with the tire pressure monitoring system installed.

CATEGORY 23 BODY

TSB#	MODEL	SUBJECT/DESCRIPTION
23-018-03 6/13/03	'03 (DR)	*Instrument panel whistle.* A whistling sound may be present coming from the front of the instrument panel near the bottom of the windshield when the heater A/C blower is on. This may be caused by air escaping through the holes in the center of the rivets that attach the VIN plate to the instrument panel. This can be mis-diagnosed as a windshield air leak. If necessary, remove the instrument panel top cover and apply a small drop of clear glass sealer to the center of each of the rivets to seal the rivet holes.
23-016-03 6/13/03	'03 (DR)	*Buzzing or vibrating sound coming from the front of the vehicle.* The description of the problem is a buzzing or vibrating sound coming from the front of the vehicle at highway speeds. Open the hood and inspect the ID plate located on the radiator support. The ID plate should be attached with four rivets. If there are only two rivets securing the ID plate, the ID plate may be vibrating against the radiator support. The repair involves securing the ID plate with additional rivets.
23-025-03 10/24/03	'03 (DR)	*Scratched aftermarket window tint film.* Customers who have installed aftermarket window tint film see scratches on the film on the windows from contact with the door inner belt weather strip. Some vehicles may have been built with the weather strip not having a coating of soft protective flocking on the surface that contacts the window. The repair involves installing a revised door inner belt weather strip.

CATEGORY 23 BODY

TSB#	MODEL	SUBJECT/DESCRIPTION
23-001-04 1/13/04	'03 (DR)	*Bug deflector wind whistle.* Some vehicles equipped with a factory installed hood mounted bug deflector may exhibit a whistling sound coming from the front of the vehicle. The repair procedure involves installing foam tape to the bug deflector.
23-003-04 1/27/04	'02 - '04 (DR)	*Water leak at grab handle.* Water may enter the vehicle through the secondary door seal retainer or the roof seam, onto the headliner and run down the "A" pillar, coming out at the grab handle. The repair involves sealing holes in the roof panel.
23-004-04	'04 (DR)	*Cup holder binds or sticks.* If the cup holder binds, will not open, or only opens partially, the instrument panel trim should be adjusted to provide clearance for the cup holder.
23-011-04	'03 - '04 (DR)	*Bug deflector loose/rattling.* This bulletin applies to vehicles equipped with a factory installed bug deflector, sales code MXB. The bug deflector or air dam located on the front of the hood may become loose and rattle. The deflector could become dislodged in an automatic car wash. The repair involves replacing the bug deflector fasteners.
23-029-04 8/2/04	'04 (DR)	*Binding front power window.* This bulletin applies to vehicles equipped with trailer tow mirrors, sales code GPD or GPG. Vehicle owners may experience the power window on the front door binding or slow to operate. The corrective action involves lubricating the window channel and installing a spacer under the outside mirror.
23-005-05 1/31/05	'03 - '04 (DR)	*Improved secondary door seal.* Mud or dirt may accumulate on the rocker panel, causing customers to complain that their clothing gets dirty when they enter or exit the vehicle. This bulletin involves installing a new lower secondary door seal.
23-022-05 4/2/05	'05 - '06 (DR)	*Low gloss interior trim.* This information-only bulletin discusses that all Chrysler, Dodge, and Jeep vehicles are designed with a low gloss interior trim. This low gloss finish maintains pleasing aesthetics, and minimizes glare of the instrument panel into the windshield. This low gloss finish should not be altered with a medium or high gloss interior treatment solution such as MOPAR Protector's or other Armor All-like products. Instead, MOPAR Satin Select (part number 05174395AA) which has been specifically developed to remove minor surface contamination and maintain the low gloss appearance, should be used for interior trim treatment.
23-049-05 10/12/05	'04 - '05 (DR)	*Drip rail door seal torn.* The drip rail or secondary door seal may become torn from contact with the lower "A" pillar of the front door. The repair involves replacing the secondary door seal with an improved seal.
23-009-06 2/14/06	'04 - '05	*Water leak at roof mounted marker lamps.* Water leaks may be present coming from the roof mounted marker lamps. New marker lamps have been released which contain base gaskets. These marker lamps should be used in all cases where water leaks are present at the marker lamps. These lamps will have to be replaced in sets of five due to appearance differences. If water leak tests reveal that water leaks are present at the marker lamps, perform the repair procedure.

CATEGORY 23 BODY

23-014-06 3/8/06	All Chrysler Group Vehicles	*Windshield wiper blade maintenance.* Windshield wiper blades/elements are frequently replaced unnecessarily. If the wipe pattern appears to be streaky or if there is chatter and no damage to the wiper blades/elements is obvious, the following steps should be performed: • Use a soft cloth or sponge and squeegee and a solution of 50/50 alcohol and water, to wash the windshield. • Raise the wiper blades off the glass and clean the wiper blade elements with a solution of 50/50 alcohol and water and a soft cloth, paper towel or sponge. • Return the wiper blades to their normal operating position. If the wipe pattern is still objectionable, repeat several times. If the wipe pattern is still objectionable, replace the wiper blades/elements.
23-018-06 5/5/06	'06 (DR)	*Speaker buzz.* Customers may experience a buzzing sound coming from the door area when the radio is on. This bulletin involves adding insulating tape to the inner door and door trim panel.
23-004-07 01/26/07	'04 - '07 (DR)	*Transit film removal.* This information only bulletin provides a transit film removal procedure.
23-021-06 Rev. A 08/09/06	'07 (DR)	*YES Essentials stain, odor, and static resistant fabric care.* This bulletin applies to vehicles equipped with YES Essentials stain, odor, and static resistant fabric (sales code XGW). YES Essentials fabric is an easy-care material that repels and releases soil to maintain the like-new appearance. Spills remain on the surface of the fabric to allow for easy clean up and to prevent stains and odors. The material is antimicrobial and static resistant. YES Essentials fabric may be cleaned in the following manner: • Remove as much of the stain as possible by blotting with a clean, dry towel. • Blot any remaining stain with a clean, damp towel. • For tough stains, apply Mopar Total clean, p/m 04897840AA, or a mild soap solution to a clean damp cloth and remove the stain. Use a fresh, damp towel to remove the soap residue. • For grease stains, apply Mopar Multi-purpose Cleaner, p/n 05127532AA, to a clean, damp cloth and remove the stain. Use a fresh, damp towel to remove the soap residue. • Do NOT use any solvents or fabric protectants on Yes Essentials fabric.
23-047-06 10/21/06	'06 - '07 (DR/DH/D1)	*Cracked windshield.* Windshield cracks caused by an impact from a foreign object (i.e. stone) are often difficult to identify. The following assessment should be used to verify the presence of an impact chip on the crack.
23-010-07 3/24/07	'06 - '07 (DR/DH/D1) 1500/2500/3500	*Water leak due to small void in backlite sealer.* The customer may experience the presence of water on or under the rear area floor carpet. This condition is likely due to water leaking past a small void in the adhesive used to retain the backlite glass to the body panel. It is recommended that a flowable sealer be applied to seal a small void in the backlite adhesive.
23-011-07 3/30/07	'06 - '07 (DR/DH/D1) 1500/2500/3500	*Glass keeper loose on back power sliding window.* The customer may notice that the glass keeper on the rear backlite has separated from the glass. The bulletin gives directions for the proper repair procedure.

CATEGORY 23 BODY

23-013-07 04/13/07	'02 - '07 (DR/DH/D1/DC)	*Trailer Towing Mirror – New mirror glass locking tab, new removal procedure.* This bulletin applies to vehicles equipped with trailer tow mirrors (sales codes GPD or GPG) built after April 16, 2007, and for any vehicle where service replacement of the mirror glass is required. The trailer towing mirror assembly has a replaceable mirror glass. As part of the replaceable mirror glass, a locking tab has been added to the plastic backing on the mirror glass. This change has been made to vehicles built after April 16, 2007. This change is also being incorporated in service replacement of mirror glass. This bulletin involves a discussion regarding new removal procedure when replacing the mirror glass on a trailer tow mirror.
23-028-07 Rev.A 7/20/07	'06 - '07 (DR/DH/D1) 1500/2500/3500	*Buzz-like sound from front door speaker area when radio is on.* The sound in question will come from the interior door trim panel, in the area where the radio speaker is mounted. This condition may be misdiagnosed as a bad radio speaker. The actual cause is typically the interface between the door trim panel sound insulation and the door water shield. The repair procedure involves the addition of sound insulation to the door panel.
23-035-07 08/08/07	'06 - '08 (DC/DM/DR/DH/D1)	*Exterior Lamp – lens fogging.* Some customers may report that vehicle exterior lamp assemblies are fogged with a light layer of condensation on the inside of the lenses. This may be reported after the lamps have been turned on and brought up to operating temperature, turned off, and then rapidly cooled by cold water (such as rain, or the water from a car wash). Lens fogging can also occur under certain atmospheric conditions after a vehicle has been parked outside overnight (i.e., a warm humid day followed by clear cool night). This will usually clear as atmospheric conditions change to allow the condensation to change back into a vapor. Turning the lamps on will usually accelerate this process. A lamp that has a large number of water droplets visible on most internal surfaces indicates a problem with the lamp sealing that has allowed water to enter the lamp. In this instance, the customer is likely to report that moisture in the lamp is always present and never disappears. A lamp that exhibits internal moisture permanently should be replaced. This bulletin supersedes technical service bulletin 23-041-06, dated September 27, 2006.
23-017-08 5/10/08	'08 (DR/DH/D1) 1500/2500/3500	*Tailgate retaining cables appear to be of unequal lengths.* This bulletin applies to vehicles built on or before May 7, 2008. One of the two side tailgate check cables may not be properly tensioned. This condition may cause the appearance that the tailgate cables are of unequal lengths. The repair procedure involves setting the loose/longer in appearance cable firmly into its seat.
23-046-07 10/30/07	06 - '08 (DR/D1/DC/DH)	*Repair of etched paint.* This bulletin involves evaluating the paint condition on all horizontal panels for etching. If the problem exists, the bulletin describes the proper repair procedure using sanding/buffing techniques or spot paint refinishing.

CATEGORY 23 HEATING & A/C

TSB#	MODEL	SUBJECT/DESCRIPTION
24-003-03 5/23/03	'90 - '04 All Chrysler group products	*A/C system additives.* The use of A/C system sealers may result in damage to A/C refrigerant recovery/evacuation/recharging equipment and/or A/C system components. Many federal, state/provincial and local regulations prohibit the recharge of A/C systems with known leaks. DaimlerChrysler recommends the detection of A/C system leaks through the use of approved leak detectors available through Pentastar Service Equipment (PSE) and fluorescent leak detection dyes available through Mopar Parts. Vehicles found with A/C system sealers should be treated as contaminated, and replacement of the entire A/C refrigerant system is recommended.
24-004-03 6/13/03	'03 (DR)	*Defrost/door inoperative.* The defrost door may break at the pivot shaft, causing inadequate travel. The system may not completely close, causing a lack of air discharge out of the floor vents and full discharge from the defrost outlet. This may be caused by a broken actuator stop on the heater A/C (HVAC) housing. The bulletin describes the repair procedure for replacing the defrost door and the lower half of the heater/AC housing.
24-021-05 12/16/05	'06 (DR)	*Mega Cab – lack of air flow from rear seat heat duct.* This bulletin applies to 2006 Ram Truck Mega Cab built between 8/29/2005 and 8/31/2005. The rear seat actuator rod could become disconnected from the actuator lever, causing the rear seat heater door to become inoperative. This bulletin involves replacing the rear seat heat duct actuator lever.
24-006-06 8/9/06	'02 - '07 (DR)	*A/C cooling coil odor.* This bulletin involves inspecting for leaves and other foreign material, cleaning, and treating the cooling coil and housing. Some vehicle operators may experience a musty odor from the A/C system, primarily at start up in hot and humid climates. This odor may be the result of microbial growth on the cooling coil. During normal A/C system operation, condensation, bacteria and fungi growth begins and odor results. If the operator describes, or the technician experiences, a musty odor when operating the A/C system, perform the appropriate repair procedure based on the vehicle model.

RECALLS

The following are summaries of recall notices and satisfaction notifications that apply to various model year trucks. We have organized the information based on the bulletins' release date. As is the practice with a recall, owners of record should have been notified directly by Chrysler. However, things do slip through the cracks, so we are printing reminders for you.

CUSTOMER SATISFACTION NOTIFICATON NO. C42 POWERTRAIN CONTROL MODULE CONNECTORS

Date: February 2004
Models: '03 (DR)

This notification applies only to trucks equipped with a 5.9-liter Cummins diesel engine (sales code ETC or ETH) and an automatic transmission (sales code DGP or DG8) built through July 9, 2003. The Powertrain Control Module (PCM) electrical connectors on about 70,000 of the above trucks may allow water to enter into the connectors. Water and the resulting corrosion in a PCM connector can cause the speed control and/or transmission overdrive function to become inoperative.

Repair: The three electrical connectors on the PCM must be removed and inspected for corrosion. If no corrosion is found, the connectors must be sealed by installing rubber O-rings onto the harness connectors.

If corrosion is found in the connector, the transmission wiring harness and PCM must be replaced.

CUSTOMER SATISFACTION NOTIFICATON NO. C44 TRANSMISSION COOLER LINE

Date: February 2004
Models: '03-'04 (DR)

This notification applies only to trucks equipped with a 5.9-liter Cummins diesel engine (sales code ETC or ETH) and an automatic transmission (sales code DG8 or DGP) built through November 24, 2003. The transmission cooler line on about 97,000 of the above vehicles can transmit high pressure pulses when the vehicle is operated at heavy loads. These pulses may cause the engine-mounted transmission cooler to crack and leak fluid which could result in significant transmission damage.

Repair: The transmission cooler line must be replaced on all involved vehicles. In addition, the engine-mounted transmission cooler must be inspected and replaced if necessary.

CUSTOMER SATISFACTION NOTIFICATION E10 FRONT SUSPENSION COIL SPRINGS

Date: July 2005
Models: '05 (DH) Dodge Ram 3500 4x2 Pickup Truck

This notification applies only to the above vehicles built through May 27, 2005. Incorrect front coil springs may have been installed on about 8,100 of the above trucks' front suspension. This may cause the front suspension to bottom out prematurely, which can reduce ride quality.

Repair: Both front suspension coil springs must be replaced.

SAFETY RECALL E17 OUT-OF-PARK ALARM SYSTEM

Date: March 2006
Models: '03 – '04 (DR); '05 (DH)

This recall applies only to the vehicles equipped with a 5.9-liter diesel engine (6 or C in the eighth VIN Position) and an automatic transmission (sales code DGP or DG8). In certain circumstances when a driver has not placed the shifter lever fully into the "Park" position and leaves the engine running, the vehicle may unexpectedly move rearward after seeming to be stable. Unintended rearward movement of a vehicle could injure those in and/or near the vehicle.

Repair: An Out-of-Park alarm system must be installed on the vehicle. The alarm system will beep the horn and flash the headlamps and the shift indicator if a driver tries to exit a running vehicle without fully placing the shifter into the "Park" position.

CUSTOMER SATISFACTION NOTIFICATION F19 ROLL-OVER VALVE VENT HOSES

Date: June 2006
Models: '06 (DH) Dodge Ram 2500 Pickup and Cab-Chassis
'06 (D1) Dodge Ram 3500 Pickup and Cab-Chassis

This notification applies only to the above vehicles equipped with a 5.9-liter diesel engine (C in the eighth VIN position) built through February 1, 2006. The roll-over valves on about 69,300 of the vehicles may allow water to enter into the fuel tank. Excessive water in the fuel can damage the injection pump and/or injectors if the engine is off for an extended period of time.

Repair: A vent hose must be installed at each tank roll-over valve (ROV). The fuel system must be inspected for excessive water content. If excessive water is found, the water must be removed and the fuel filter must be replaced.

SAFETY RECALL F05 ANTILOCK BRAKE SYSTEM CONTROL MODULE

Date: July 2006
Models: '06 (D1) Dodge Ram Pickup (3500 Series)
'06 (DH) Dodge Ram Pickup (1500 Mega Cab and 2500 Series)

This recall applies only to the above vehicles equipped with a four-wheel Antilock Brake System (sales code BGK or BRT) built from September 12, 2005 through December 11, 2005.

The Antilock Brake System (ABS) control module on about 37,900 of the above vehicles may cause the rear brakes to lock up during certain braking conditions. This could result in a loss of vehicle control and cause a crash without warning.

Repair: The ABS control module must be replaced and initialized with the StarSCAN tool.

EMISSIONS RECALL G30
REPLACE OXYGEN SENSOR MODULE
AND REPROGRAM ECM

Date: October 2007
Models: '07 – '08 (DH/D1) Dodge Ram 2500/3500
Pickup Truck

This notification applies only to the above vehicles equipped with a 6.7-liter diesel engine built through August 20, 2007. The on-board diagnostic (OBD) system on about 74,000 of the above vehicles may not detect a failed oxygen sensor or illuminate the malfunction indicator light (MIL) as required. In addition, the OBD system may cause these trucks to fail an inspection maintenance test and may not store mileage as required for certain transmission faults.

Repair: The oxygen sensor module must be replaced and the engine control module (ECM) must be reprogrammed (flashed). The new software will also improve vehicle drivability and reduce the potential for exhaust soot accumulation in the vehicle's particulate filter. The recalibration of the ECM updates and supersedes TSB 18-033-07 Revision B, dated 6/28/07.

EMISSIONS RECALL H31
VECI LABEL

Date: October 2008
Models: '08 (D1) Dodge Ram 3500 Truck Cab
and Chassis

An incorrect Vehicle Emission Control Information (VECI) label was inadvertently installed on about 60 of the above vehicles. The original VECI label does not include the required information for vehicles built without a pickup box.

Repair: A new VECI label must be installed over the vehicle's original VECI label.

SAFETY RECALL H34
DASH SILENCER PAD

Date: January 2009
Models: '07 – '08 (DH, D1, DC, DM)

The dash silencer pad on about 110,000 vehicles, built with a Cummins 6.7-liter diesel engine through 11/5/07, may sag and contact the exhaust gas recirculation (EGR) cooler. This may cause the dash silencer to locally overheat and cause an underhood fire without warning.

Repair: All vehicles must have a dash silencer pad support bracket installed.

SAFETY RECALL H46
MOPAR STEERING LINKAGE

Date: May 2009

Models: '03 – '04 (DR) 2500/3500, 4x4
'05 (DH) 2500/3500, 4x4
'06 – '09 (DH) 2500/3500 or 1500 Mega Cab 4x4
'06 – '09 (D1) 3500, 4x4
'07 – '09 (DC) 3500, Cab Chassis

This recall only applies to vehicles that had certain Mopar service parts steering components installed.

During a prior service appointment, a Mopar service parts steering linkage was installed on about 13,900 of the above vehicles. The drag link inner joint may fracture under certain driving conditions. This could result in a loss of steering control and cause a crash without warning.

Also, the steering damper bracket at the tie rod tube may loosen. This could allow the bracket to slide on the tube and may cause increased vehicle turning radius.

Repair: The steering linkage must be inspected and some steering linkage components may need to be replaced.

SAFETY RECALL H36
STEERING DRAG LINK INNER JOINT
AND DAMPER BRACKET

Date: May 2009
Models: '08 – '09 (DH/D1) 2500/3500 or 1500 Mega Cab
(4x4 only)
'08 – '09 (DC) 3500 series Cab Chassis

This recall applies only to the above vehicles built from February 19, 2008 through October 30, 2008.

The steering drag link inner joint on about 32,700 of the above vehicles may fracture under certain driving conditions. This could result in a loss of steering control and cause a crash without warning.

Also the steering damper bracket at the tie rod tube may loosen. This could allow the bracket to slide on the tube and may cause increased vehicle turning radius.

Repair: The drag link inner joint must be replaced and the steering damper bracket must be inspected and replaced, if required.

NOTES:

ENGINE EVOLUTION – EMISSIONS

ISSUE 72 – TECHNICAL TOPICS

by Robert Patton

EPA, NOx, PM, SCR, EGR, DPF, NAC, VGT, ULSD, HPCR, HCCI, NMHC, ACERT, TITT: Can you pick the abbreviation that is non-diesel, non-emissions related? It's easy, TITT as in "throw in the towel." The balance of the abbreviations serves to bewilder your diligent scribe. However, with a new round of diesel exhaust emission legislation less than two years away and with ultra low sulfur diesel fuel (abbreviation: ULSD), due in the summer of '06, it is appropriate that we understand what the abbreviations will mean to the diesel enthusiast.

As TDR subscribers know, emission legislation dates are the driving force in the changes to the Cummins engine hardware. To make a boring story into a relevant topic, the subject matter has to address "what does it mean to me?" The best way to answer this question is to crank-up the way-back machine to Issue 40 and look at the progression of the ever-tightening emissions standards.

After we review the material which answers the question, "what does it mean to me?" material, I'll attempt to tie the big picture together with a look at those annoying abbreviations and what is on the horizon for 2006 and 2007.

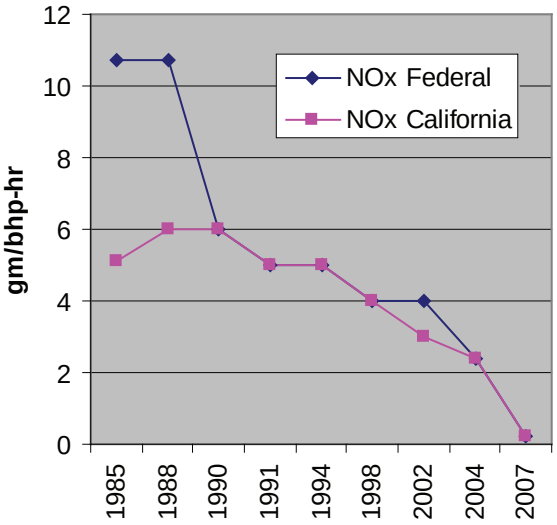
Boring Stuff?

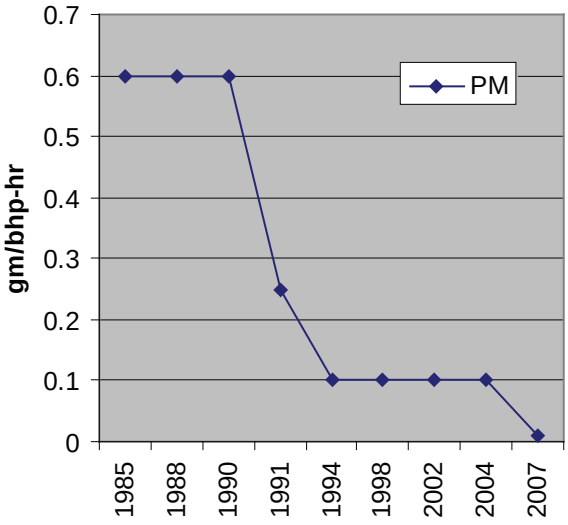
While it might be tempting to skip through this subtitle, I'll ask for your concentrated efforts as we simplify (oversimplify?) the two emissions components that concern the diesel engineer: oxides of nitrogen (NOx) and particulate matter (PM). The following paragraphs may provide us a more informed understanding of these two emissions components.

Oxides of Nitrogen (NOx)

- One of the primary regulated pollutants from diesel engines.
- Reacts with hydrocarbons in the presence of sunlight to form ozone.
- Formed by reaction between nitrogen and oxygen in the combustion chamber.
- NOx formation increases with higher combustion temperature and cylinder pressures.
- Methods of reduction include lower intake manifold temperature, lower in-cylinder temperature, retarded fuel injection and combustion optimization. Any in-cylinder approach to NOx reduction involves lowering the temperature and limiting the time of the combustion event.
- Potential impacts can be higher fuel consumption and requirement of a more complex cooling system.

Note the sharp, ten-fold drop in emissions from year 2004 to 2007. I recall that one of the first TDR magazines stated that emissions were the driving force behind changes to the diesel engine. The 2007 emissions targets nail home that statement. Certainly ultra-low sulfur fuel will help, but the engineering it will take to meet the targets is difficult to imagine.





Particulate Matter (PM)

- Often visible as black smoke.
- Formed when insufficient air or low combustion temperature prohibits complete combustion of the free carbon.
- Primarily partially burned fuel and lube oil.
- Methods of control include oil consumption reduction, catalytic converters, combustion system development and higher fuel injection pressures.

To oversimplify, think back to last winter and the many fireside evenings you enjoyed. As you built the fire, there was inefficient combustion, characterized by black smoke and not much heat generation. Thirty minutes into the exercise you were sitting back in the easy chair, with a raging fire, no more black smoke, a beautiful yellow and blue flame, and lots of heat.

Now, refer back to the NOx and PM bullet statements and reflect on the following: the design engineers could control particulates (PM) by raising the combustion efficiency (temperatures and pressures). But, raising temperatures and pressures causes the formation of oxides of nitrogen (NOx) to go out of the emissions box. Likewise, efficiency and heat of combustion can be sacrificed to meet the NOx legislation, but the particulates go out of the emissions box. How does the engineer get the teeter-totter level?

As an interesting sidenote, NOx not only is formed in internal combustion engines, it is the result of elevating the temperature of air—made up of 79% Nitrogen and 21% Oxygen—high enough for the reaction to occur. One of the most significant sources of NOx formation in nature is lightning.

The reaction that forms NOx is also time related; the longer the temperature remains elevated, the greater the level of NOx formation.

In the diesel engine, NOx formation can be correlated to engine performance; the higher the rate of formation, the more efficient the engine. As most are aware, the impact of reducing NOx emissions is increased fuel consumption, which is the result of reduced efficiency.

For a good demonstration of the principle, consider that in-cylinder temperatures are much higher on two-stroke engines because fuel is provided on every stroke. Also, consider the lack of oil control that contributes to too many particulate emissions. These factors made it impossible for two-stroke engines to meet emission targets and maintain fuel consumption and other performance targets. The 1988 on-highway emissions regulations were the final blow to the two-stroke diesel in trucking applications. Two-stroke diesels are now only produced for off-highway and generator set markets.

The method of attack in reducing NOx formation in the diesel engine is basically twofold: a) reduce the in-cylinder temperature and/or, b) reduce the time for the reaction to occur. Control of the temperature within the cylinder is managed in part by reduced intake manifold temperature (an intercooler/charge air cooler). Although not used on our Cummins diesel engines, exhaust gas recirculation (EGR) is another method used to control the in-cylinder temperature and, in turn, NOx formation. Recirculated exhaust gas is oxygen-depleted and the inert gas acts to buffer the combustion event thus lowering the in-cylinder temperature. Reduced reaction time is controlled largely by retardation of the injector timing. Also note the '03-'05 Turbo Diesel engine with its high-pressure, common-rail (HPCR) fuel injection system gives a pilot shot of fuel prior to, and post of the larger injection event. The pilot shots of fuel help control the temperature and reduce NOx formation. Pilot injection also has greatly reduced the noise level that is associated with diesel combustion.

As you review the NOx and PM bullets, you can understand the balancing act the engineer has to perform. Now, add to the emissions teeter-totter the need for the engineer to deliver to the market place an engine that can maintain or show an increase in fuel economy. Further, competition dictates higher performance from the engine. Quite a job for the engineering community.

THE LOOK AHEAD

Back to the Basics

For easy understanding and efficient recall, let's start with a glossary of terms that will be used in this article.

EPA: Environmental Protection Agency, the governmental department that is responsible for governing diesel exhaust emissions.

NOx: oxides of nitrogen, a key pollutant that reacts with hydrocarbons in the presence of sunlight to form ozone.

PM: particulate matter, another key diesel pollutant that is primarily soot and other combustion byproducts that form urban smog.

SCR: selective catalytic reduction, an aftertreatment technology that uses a chemical reductant (urea) that is injected into the exhaust stream where it transforms into ammonia and reacts with NOx on a catalyst, converting the NOx to nitrogen and water vapor.

EGR: exhaust gas recirculation, a technology that diverts a small percentage of the oxygen depleted, inert exhaust gas back into the cylinder to help lower the combustion temperatures, thus reducing NOx.

DPF: diesel particulate filter, also known as a particulate trap. DPFs will be used to capture particles of soot in a semi-porous medium as they flow through the exhaust system. DPFs are available in passive or active configurations. Active DPFs use a control system to actively promote regeneration events.

NAC: NOx absorber catalyst, a catalyst that releases NOx for a conversion to nitrogen gas and water vapor.

VGT: variable geometry turbo, turbochargers that constantly adjust the amount of airflow into the combustion chamber, optimizing performance and efficiency. In essence, the turbine casing varies from a small to a large cross section.

ULSD: ultra low sulfur diesel, this fuel is scheduled to be available in September 2006. Over the years the sulfur in diesel fuel has all but been removed. The standards: prior to 1994 – 5000 ppm; 1994 – 500 ppm; 2006 – 15 ppm. It is interesting to note that the European standard is 50 ppm which was enacted in 2004. With ULSD in September 2006 the United States will have the world's strictest standard.

HPCR: high-pressure, common-rail, this is the type of fuel system that is currently produced for our Dodge/Cummins pickup trucks.

HCCI: homogeneous charge compression ignition, a method of in-cylinder NOx reduction. Think of HCCI as "massive EGR."

NMHC: non-methane hydrocarbons, these are primarily unburned fuel in the exhaust stream and are not a substantial part of the diesel emissions problem. In 2002 the EPA added the NMHC number to the NOx number for a total standard of 2.5-g/bhp-hr (NOx + NMHC).

ACERT: advanced combustion emission reduction technology, the abbreviation for Caterpillar's emission control system.

The 2007 EPA Emissions Rules

Looking ahead to 2007-2010, the emissions requirements will change dramatically for diesel pickup trucks. Both NOx and PM are reduced by 90% from 2004 levels. Specifically, NOx must be reduced to 0.2 grams/brake horsepower-hour by 2010, while the particulate standard is reduced to 0.01 g/bhp-hr PM beginning in 2007.

The EPA has allowed for NOx phase-in from 2007 through 2009. During this time, 50% of the engines produced must meet the 0.2 g/bhp-hr NOx standard, while 50% may continue to meet the current 2.5 g/bhp-hr NOx + NMHC standard.

Most engine manufacturers will use the NOx phase-in provisions along with averaging to certify engines to a NOx value roughly halfway between the 2004 number and the final 2010 NOx level. This calculates to approximately 1.2 g/bhp-hr NOx.

The PM level is not phased in, and thus all engine production is required to be at 0.01 g/bhp-hr PM beginning January 2007.

In addition to the lower NOx and PM levels, crankcase gases will be included in the emissions measurements. This requirement will drive closed crankcase systems for 2007 or ultra-low emissions from open systems. Open systems allow crankcase gases to be vented into the atmosphere through a breather tube. Closed systems reroute crankcase ventilation gases from the breather tube back into the engine intake airflow to be used for combustion.

Likely there will be further EPA regulations which will require advanced onboard diagnostics, which will lead to additional sensors to monitor the effectiveness of emissions systems on the engine.

Ultra-Low Sulfur Fuel

In addition to new exhaust emissions standards and in support of the new exhaust emissions, the EPA is lowering the limit for diesel fuel sulfur from 500 parts per million (ppm) to 15 ppm. The new fuel standard will be phased in beginning September 1, 2006 (80% participation) through September 1, 2010 (100% participation). It is expected that 15-ppm fuel will be widely available. On a volume basis, over 95% of highway diesel fuel produced in 2006 is projected to meet the 15-ppm sulfur standard. On a facility basis, over 90% of refineries and importers have stated that they plan to produce some15-ppm diesel fuel. It is projected that the additional cost of the new fuel will be less than 5¢/gallon.

Ultra-low sulfur fuel (ULSD) has several beneficial effects. It inherently produces less PM from combustion, so it is a PM control strategy for all in-use equipment. And, just like unleaded gasoline in the early '70s, ULSD enables NOx absorber catalyst (NAC) technology to be highly effective and reduces the production of sulfuric acid.

In 1994 there were widespread problems associated with the introduction of low sulfur diesel. The desulphurization process that removes the sulfur plays havoc with the aromatic composition of the fuel. The change in composition caused shrinking, cracking and oxidation of rubber compounds, specifically fuel pump o-rings, and fuel leakage was the result. Manufacturers scrambled to switch the composition of their fuel pump seals.

Many tried to link the fuel pump leakage problem to the lower lubricity of '94s low sulfur fuel. However, a fuel lubricity specification was never adopted by the American Society of Testing and Materials (ASTM). For 2007 the ASTM has set fuel lubricity standards and these are set to take effect in early 2006.

Cooled EGR to Reduce NOx

Cooled EGR is an effective NOx control. The EGR system takes a measured quantity of exhaust gas, passes it through a cooler before mixing it with the incoming air charge to the cylinder. The EGR adds heat capacity and reduces oxygen concentration in the combustion chamber by diluting the incoming ambient air. During combustion, EGR has the effect of reducing flame temperatures, which in turn reduces NOx production since NOx is proportional to flame temperature.

In order to control both NOx and particulate emissions accurately, the amount of recirculated exhaust gas and air has to be precisely metered into the engine under all operating conditions. This has driven the use of advanced variable geometry turbochargers (VGT) that continuously vary the quantity of air delivered to the engine.

Aftertreatment Solutions to Reduce NOx

While cooled EGR is an in-cylinder technology that can reduce NOx, there are several aftertreatment solutions which can achieve reduced NOx levels by treating the exhaust gases after they leave the engine. These include selective catalytic reduction (SCR), NOx adsorbers and lean-NOx catalysts.

SCR systems use a chemical reductant, in this case urea, which converts to ammonia in the exhaust stream and reacts with NOx over a catalyst to form harmless nitrogen gas and water. Urea is a benign substance that is generally made from natural gas and widely used in industry and agriculture.

The SCR-urea catalyst is a more mature technology. The first SCR applications have been implemented in Europe and Japan. And, while the EPA has not said no to SCR, the world's diesel manufacturers have an understanding of the problems associated with SCR in the US—specifically distribution at fueling locations, additional tanks and plumbing on trucks and controls to ensure the operator refills the SCR tanks. Nevertheless, the European diesel manufacturers as well as Detroit Diesel are intent on using SCR technology for the North American market in 2007.

For several reasons Cummins has chosen SCR for its engine in Europe: the NOx limits in Europe are a bit more lenient; relative to the cost of diesel fuel, the urea price is low; and there is a supporting urea distribution infrastructure.

For the North American market Cummins will continue with cooled EGR and work with original equipment manufacturers to select the appropriate NOx aftertreatment.

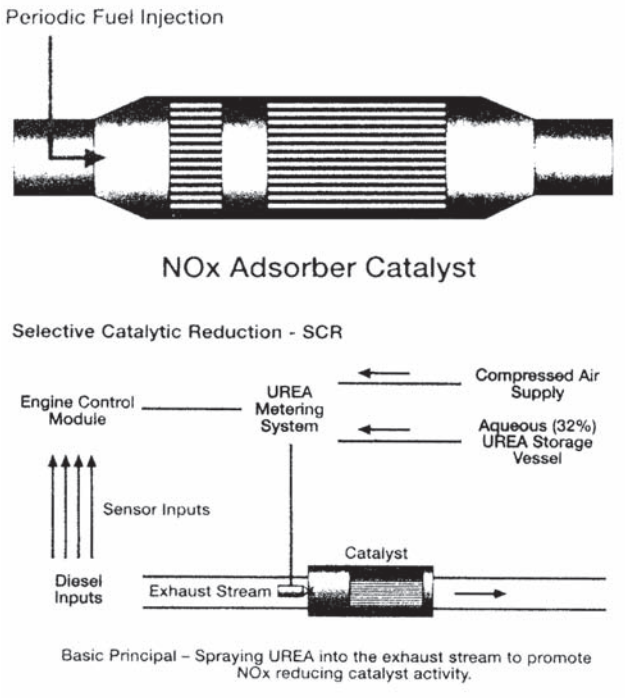
Caterpillar will continue with their ACERT combustion technology and the appropriate NOx aftertreatment. In a November '04 issue of Transportation Topics, William Morris, chief engineer for on-highway engines at Caterpillar responded, "the selective catalytic reduction process 'was at the bottom of the list for 2010 solutions.' Morris said Caterpillar was more interested in modifying its existing emission control system called ACERT and that Caterpillar was doing something similar in 2007 with new designs for 'pistons, rings and liners' to improve the combustion that takes place in the cylinder."

NOx Adsorber Catalyst to Reduce NOx

The NOx adsorber catalyst (NAC) is a technology developed in the late 1990s. The NAC uses a combination of base metal oxide and precious metal coatings to effect control of NOx. The base metal component (for example, barium oxide) reacts with NOx to form barium nitrate—effectively storing the NOx on the surface of the catalyst. When the available storage sites are occupied, the catalyst is operated briefly under rich exhaust gas conditions (the air-to-fuel ratio is adjusted to eliminate oxygen in the exhaust). This releases the NOx and allows it to be converted to nitrogen gas and water vapor. Just like unleaded fuel in the early 70s, ULSD enables NAC technology to be implemented.

The elimination of all excess oxygen in the exhaust gas for a short period of time can be accomplished by operating the engine in a rich mode. This is done by injecting fuel directly into the exhaust stream ahead of the adsorber to consume the remaining oxygen in the exhaust. Either way, the engine and catalyst must be controlled as a system to determine exactly when regeneration is needed, and to control the exhaust parameters during regeneration itself.

NOx adsorbers are expected to appear first in light-duty applications.



PM Reduction

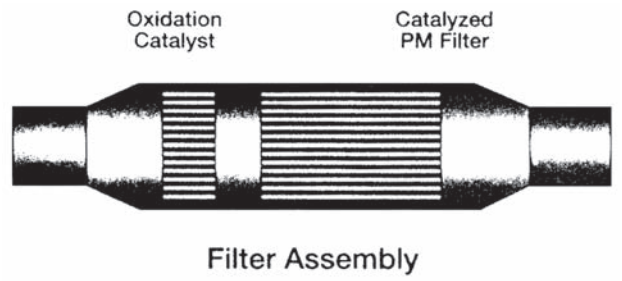
Previous reductions in particulate matter emissions have been achieved through engine combustion improvements and oxidation catalysts, the stringent 2007 particulate standards (90% lower than current-day standards) will require very effective particulate aftertreatment.

The active diesel particulate filter (DPF) is the only current technical option for meeting the 2007 PM emissions standards. It is expected that all engine manufacturers will use this technology.

Filtration of exhaust gas to remove soot particles is accomplished using porous ceramic media generally made of cordierite or silicon carbide. A typical filter consists of an array of small channels that the exhaust gas flows through.

Adjacent channels are plugged at opposite ends, forcing the exhaust gas to flow through the porous wall, capturing the soot particles on the surface and inside pores of the media. Soot accumulates in the filter, and when sufficient heat is present a regeneration event occurs, oxidizing the soot and cleaning the filter.

There are several methods to control or raise the exhaust temperature to manage the regeneration event in the DPF. The most promising methods for an active integrated system for 2007 are management of the engine combustion process in combination with an additional oxidation catalyst. This will allow regeneration to take place under low-ambient/low-load conditions when exhaust temperatures are low, as well as during normal operation.



Filter Assembly

As oil is consumed and particulate matter is burned off through regeneration they become ash and collect in the filter. The ash must be cleaned from the filter or plugging will occur. Maintenance may be required on diesel particulate filters.

Cummins is currently working with oil manufacturers on the development of low-ash oils and to determine how different oil additive components may behave with regard to filter plugging. If maintenance of the diesel particulate filter is required, it is anticipated that it will be at relatively high-mileage intervals of 185,000-250,000miles.

2007 Lubricating Oil

New specifications are being developed for lubrication oil compatible with the low-emissions engines for 2007-2010. The primary focus will be to make the oils compatible with aftertreatment devices. For 2007, the immediate requirement is to reduce ash in order to enable extended maintenance intervals on the diesel particulate filter while maintaining the important lubricity capability of the lubricant.

And the Bottom Line?

Yours truly is not an accomplished prognosticator. I am often reminded that we incorrectly predicted that the post 1/1/04 Turbo Diesel would have EGR. While the Ford and General Motors diesels were saddled with EDR, the engineers at Cummins were diligent with their in-cylinder development and avoided adding the recirculated exhaust gas plumbing and controls to the engine.

With my qualifications duly noted, as we look toward the future I will stick with factual data and quotations from other periodicals.

- ULSD is currently legislated to be available in September of '06. The problems associated with the introduction of low sulfur diesel fuel in 1994 have not been forgotten and the fuel vendors and the ASTM have standards in place to avert problems.

- Particulate control: according to Diesel Progress, November 2004: "Major manufacturers such as Caterpillar, Cummins, Detroit Diesel and International Truck and Engine have adopted diesel particulate filters as the preferred strategy/technology for PM reduction, but there is no consensus on NOx control technologies. The two most practical and cost-effective approaches to lower NOx emissions from diesel trucks are in-cylinder techniques such as a high rate of EGR and exhaust system technologies such as urea-SCR, which is being adopted in the European Union staring in 2005."

- Further, Diesel Progress, December 2004 notes: "Diesel particulate filter can be considered a relatively mature technology. At least in light-duty vehicles, DPFs have been used in high-volume applications in diesel passenger cars in Europe, with over 850,000 systems sold since 2000. In the US, several heavy-duty engine manufacturers have been testing their 2007 truck prototypes and expressed confidence in the DPF technology."

- Confident that PM can be addressed with DPFs? Let's continue to address NOx. Consider this excerpt from Successful Dealer, March 2004: "According to technology chief John Wall, Cummins already has laboratory engines that can achieve a 1g level for NOx emissions and he is confident of being able to manufacture production engines that will meet the 1.2g "averaging" level without exhaust aftertreatment.

  > "Furthermore, Wall zsaid highly-advanced combustion research techniques that actually use windows on the combustion process, and the complex modeling they can now do, allow him to predict that fuel consumption will not take a hit next time. It may even improve in some applications. Conclusion: For Cummins the refinement of the EGR process currently in place is the right emissions strategy for North America.
  >
  > "In Europe, Wall says it is likely Cummins will use the alternative selective catalytic-reduction (SCR) technology. The requirements for Euro 5 are less stringent on PM and the big differential between the cost of fuel between European countries and the United States (their cost per gallon is four or five times ours) means SCR is the more economical solution.
  >
  > "The economics are simply not there for the US. However, he did not rule out some SCR for 2010 to clean up the NOx from 1.2g down to the 0.2g levels."

- Specifically, how about NOx control on our light-duty pickup diesel. Scowering through the trade publication Transportation Topics—Equipment and Maintenance Update, March 2004, I found another interview with Cummins' John Wall. "John Wall, vice president and chief technical officer for engine manufacturer Cummins, said NAC adsorbers would likely go into lighter applications first because 'they have a lot of precious metals in them and they get more expensive as you scale them up to heavy-duty applications.'"

To conclude: your light-duty Cummins engine will require some form of exhaust aftertreatment. The allowable NOx phase-in between years '07 to '10 make prediction difficult and complex. Therefore I will refrain from bold statements laden with abbreviations like, "expect an EGR and VGT-equipped engine with a DPF and later a NAC.

Time will tell. I will keep a watchful eye toward press information and an open ear when in conversation with others.

The Right Technology

As a postscript to our crystal ball look into the future I found an article in the 1/3/05 Transportation Topics magazine that give further insight into the use of SCR to control NOx emissions. As was mentioned several times in the article, the EPA would not take a stand on the technology the manufacturers should use. However, there was pressure against the SCR concept. How so? Consider the following from TT: "SCR can reduce levels of NOx by mixing urea, an ammonia-based solution, into the exhaust stream ahead of the catalytic converter. SCR would allow the combustion process to operate in a more traditional way, proponents have argued.

"Detroit Diesel Corporation, a subsidiary of Freightliner, plus the powertrain units of Mack Trucks and Volvo Trucks North America had been considering SCR for 2007 engines. "They finally dropped the option in the face of EPA's concern over the engine makers' ability to ensure SCR's use when a truck was operating, plus the lack of a distribution infrastructure for the mixture."

If we read between the lines it looks like the use of SCR has not been abandoned, rather pushed back. See if you come to the same conclusion as we again quote from TT, "Diesel manufacturers have put the selective catalytic reduction aftertreatment process on hold, but the manufacturers said SCR would still be an option for 2010, when emission standards were set to change again."

Final Conclusion

Again, I'll remind you that I am not adept at predicting the future. However, we've provided a paint-by-numbers guide for the 2007 emissions picture; it's up to you to fill in the colors. Will your picture match the one that Cummins and Dodge are painting? We've got about one year before the 2007 model year truck is introduced. Get busy with your brush.

Credits: Much of the technical information (abbreviation definitions and emissions solutions) was gleaned from Cummins bulletin number 4103666, "2007 Emissions: Choosing the Right Technology." Copies of this bulletin can be sourced at your Cummins distributor or by calling 800-DIESELS.

ENGINE EVOLUTION – HARDWARE
2004.5 TECHNICAL FEATURES
ISSUE 43 – TECHNICAL TOPICS
by Joe Donnelly

backfire ('bak-"flr) n. **1.** An explosion of prematurely ignited fuel or unburned exhaust. 2. To produce an unwanted result.

The new Cummins 325/600 high pressure, common rail (HPCR) engine was introduced to Dodge dealerships on 12/1 and to the automotive press on 12/11. Aside from the industry-leading power ratings, the engine should make the headlines in that it is 50-state certified without using exhaust gas recirculation (EGR). I had speculated and presented with authority (Issue 39, page 24 and 97, as examples) that the 2004.5 engine would have EGR. I'm thankful for the words "almost" and "speculation" that give wiggle room. In other text (Issue 40, page 64) I used the question technique, "Will Dodge owners rush out to pre-buy 2004 trucks with non-EGR Cummins engines or will they hold out for a post 1/1/2004 Turbo Diesel with a possible 50-state certification?"

Let's take a look at backfire definition two: to produce an unwanted result. I was wrong about EGR for the 2004.5 Cummins, HPCR, 325/600 engine. EGR is not required. I'm hopeful that the TDR's speculation about EGR did not cause unwanted results.

It seems that the majority of diesels in the marketplace have an EGR system. How did Cummins accomplish a non-EGR engine for the Turbo Diesel? TDR writer, Joe Donnelly, was on hand at the press introduction and files the following report.

325 and 600!
Technical Features and a Test Drive of the 2004.5 Turbo Diesel: 325 Horsepower and 600 ft-lb of Torque
By Joe Donnelly

Lots of folks have been waiting for the 2004.5 release of the High Output engine. Many rumors were circulated, and it turned out that several important features and benefits would be realized.

- First, and most important to the sales and hence the viability of the Cummins/Dodge partnership, the horsepower and torque were brought up enough to beat the competition.

- Second, at last there is a modern, competitive version available in the states that have tougher emissions laws: California, Maine, Massachusetts, New York, and Vermont. Formerly, these states were restricted to a 235 horsepower engine with a catalytic converter for emissions control.

- Third, we are now assured that Cummins will be a major player in the future diesel pickup truck engine marketplace. We know they will be able to continue to supply emissions-legal, high horsepower engines to Dodge for the next several years. Those of us who are waiting another year or so to purchase a new Ram will be able to buy a state-of-the-art package.

- The modest cost increase of the new engine, Cummins and Dodge raising the power rating of the new engine, and very positive results of a test drive combine to assure us that Cummins has mastered the emissions hurdle imposed by the EPA.

I was lucky enough to have an opportunity to drive one of these Rams at its introduction in mid-December. Test drives included solo and towing modes. In the solo mode, a Ram equipped with an automatic transmission (48RE) was loaded with 5500 pounds of payload and an extra passenger. The Ford and Chevrolet pickups were also automatics and were loaded with 5000 pounds each. In the towing comparison, each truck had a Bobcat loader on a gooseneck trailer hitched to it. The trailers were 13,000 pounds each. Each truck was the extended cab version and was equipped with the six-speed transmission and 3.73 gearing. The Dodge was equipped with the new 2004.5 emissions legal engine, while the other two were off-the-showroom 2004 models.

Even though I had already bought a 2004 Turbo Diesel I hoped it would fare well in the competition. I already knew that the mighty Cummins was the only engine for long term power and durability (even if the competition could produce something with five more horsepower or 10 more foot-pounds of torque). I was happy with the Third Generation Dodge as an excellent truck platform. Having bought a 2004 about two months previous, no one needed to convince me! On the other hand, more knowledge about the competition serves two purposes: I could give better advice, and in the past, the competition has spurred Dodge on to giving us more. It was long ago that we marveled at the first generation, non-intercooled, 160 horsepower engine!

Two press releases are reproduced here, one from Dodge, and one from Cummins:

Dodge Dominates

Dodge, the brand that revolutionized the diesel pickup market when it launched the state-of-the-art 1989 Dodge Ram, Cummins Turbo Diesel, announced today the 2004.5 Dodge Ram Heavy Duty Cummins "600" with a class-dominating 600 lb.-ft. of torque at 1,600 rpm and 325 horsepower at 2,900 rpm. Equipped with the new Cummins "600," the Dodge Ram Heavy Duty takes its position at the head of the heavy-duty pickup segment.

> "The Dodge Ram dominates in every category," said Darryl Jackson, Vice President, Dodge Marketing, Chrysler Group. "With the new Ram Heavy Duty Cummins '600,' the Ram family of trucks now includes the strongest heavy-duty pickup available, the fastest production pickup with the 150 mph Dodge Ram SRT-10, and the most powerful, mass-produced light-duty pickup, the HEMI-powered Dodge Ram 1500. This is an exciting time for Dodge."

In addition to the most torque ever available in a production heavy-duty pickup, the Dodge Ram Heavy Duty Cummins "600" boasts best-in-class towing capability of 16,400 lbs. (a 3,000 pound advantage over the Ford F-350 PowerStroke), a payload of 5,020 pounds and a best-in-class Gross Combined Weight Rating (GCWR) and Gross Vehicle Weight Rating (GVWR) of 23,000 pounds and 12,000 pounds, respectively. Additionally, the new Cummins "600" generates its peak torque of 600 lb.-ft. at 1,600 rpm, earlier than either Ford's PowerStroke or Chevrolet's Duramax diesels. The new Cummins "600" delivers an 80 lb.-ft. torque and 25 horsepower advantage over Chevrolet Duramax and is priced just $135 more than the previous Cummins High Output Turbo Diesel. The Standard Output Cummins Turbo Diesel is dropped from the Ram Heavy Duty line-up.

> "The Ram Heavy Duty has the most sophisticated chassis in the segment, the biggest brakes, excellent handling and class-exclusive safety features such as side curtain air bags," said Eric Ridenour, Executive Vice President Product Development. "It is only fitting that it now has the most powerful diesel engine. This is also the quietest Ram diesel ever and the first High Output Cummins Turbo Diesel that meets 50-state emissions requirements."

Do More, Get the Job Done

The names Dodge Ram and Cummins are synonymous with power, durability and quality. All are characteristics that made the Dodge Ram Heavy Duty Motor Trend's 2003 Truck of the Year and merited a best-in-class rating for the Cummins-powered Dodge Ram Heavy Duty in the J.D. Powers 2003 Initial Quality Survey, surpassing both Ford PowerStroke and Chevrolet Duramax.

With real-world customers in mind, the re-designed 5.9-liter Cummins "600" powerplant not only meets 50-state emissions requirements, but was designed to be even tougher with premium exhaust valves and seats, high-strength exhaust manifolds, gallery cooled pistons and an oil bath turbo system.

Built for high-mileage customers who need the most capability available, the new Cummins "600" delivers best-in-class oil change intervals of 15,000 miles (versus 7,500 for the competition) and is the only heavy-duty diesel pickup pre-equipped for an exhaust brake. The Ram Heavy Duty Cummins "600" is also capable of zero-throttle launches, enabling smooth drive-offs under load with the six-speed manual transmission. An automatic transmission is also available with the new Cummins "600."

"Our goal during the development of the Cummins '600' was to make meaningful changes, not just chase numbers," said Frank Klegon, Vice President, Truck Product Team. "The Ram Heavy Duty Cummins '600' delivers more torque and power where our customer needs it, under a full load and heading up a steep grade. We designed the Ram Heavy Duty Cummins '600' for the severe use customer, and for them, torque is everything. Dodge is also the only heavy-duty pickup manufacturer confident enough in our product to offer a seven year, 100,000 mile powertrain warranty."

And now from Cummins:

Frank Kelgon, Dodge Vice President, Truck Product Team, giving us a talk on the 2004.5 Ram. A cut-away engine is also in the tent.

Cummins Inc. announced today that its next-generation turbo diesel engine will be supplying the power to the 2004.5 model year Dodge Ram Heavy Duty pickup, launching in January 2004.

The re-engineered Cummins 5.9-liter diesel engine builds on the power and quality of the 2003 model year engine that helped make the Dodge Ram Motor Trend magazine's "Truck of the Year." The Cummins engine for the Dodge Ram also merited a best-in-class rating in the J.D. Power 2003 Initial Quality Survey.

"We are excited to supply this engine for the new Dodge Ram," said Joe Loughrey, Cummins President – Engine Business. "We have built upon the proven performance and reliability of our previous engine, and engineered the new Cummins turbo diesel to provide more power and torque with reduced noise, while meeting tougher emissions standards. We think our customers will love the new Dodge/Cummins package."

The launch of the 2004.5 Dodge Ram is the latest collaboration between the two companies, which have been partners since 1988 when Dodge first offered the Cummins engine option. Earlier this year, Cummins celebrated production of the one-millionth Dodge Ram engine, which is made at the Company's Walesboro, IN, facility.

In October the Company announced the extension of its agreement as the exclusive supplier of diesel engines for the Dodge Ram. The agreement also includes consideration of Cummins as a supplier for the diesel engine after treatment system, which would be provided by Fleetguard, a wholly-owned Cummins business unit.

Market Data

First, let's summarize some product features and marketing data for the Turbo Diesel Ram:

Dodge expects that the new 2004.5 Heavy Duty Ram will meet and beat the competition for the title of most powerful heavy duty pickup. The new Cummins "600" is rated 325 horsepower, 600 foot-pounds of torque. It meets emissions requirements for all fifty states. For forty-five states, the increase is 20 horsepower and 45 ft-lb of torque over the previous 2003-2004 model HO engine. For California, Maine, Massachusetts, New York, and Vermont, the increase is a tremendous 90 horsepower and 140 ft-lb torque, because these five states were formerly restricted to the standard output Cummins engine with 235 horsepower, 460 ft-lb torque, and a catalytic converter (3" exhaust head pipe and converter inlet). Furthermore, the peak torque is lower at 1600 rpm than the competition, and is designed for improved towing capability at moderate rpm. The previous five-state 235 horsepower engine required oil changes at every 3,750 miles (Schedule B) or 7,500 miles (Schedule A) while the 250 horsepower and 305 horsepower engines sold in the other 45 states needed oil changes at 7,500 miles (Schedule B) or 15,000 miles (Schedule A). Soot levels in the new engine are so low that oil change intervals are driven not by soot but by oxidation and acid numbers.

Ram payloads are now up to a maximum of 5,220 pounds, with a gross vehicle weight rating (GVWR) of 12,200 pounds (with proper equipment). Gross combined weight ratings are as much as to 23,000 pounds, with a trailer weight of up to 16,400 pounds.

Surveys of the percentage of pickups remaining on the road for the past twenty years have shown the Ram to be the longest lasting pickup on the market. Ram has the largest brakes, and largest standard wheels and tires in the heavy-duty pickup truck segment.

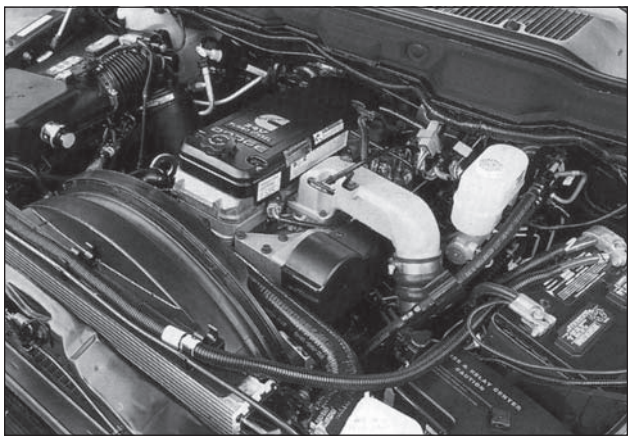
The Ram comes with either the iron-case New Venture 5600 six-speed manual transmission or the Chrysler 48RE four-speed automatic transmission. Both transmissions include overdrive. The 48RE also includes a "Tow-Haul" button on the shift lever. This feature locks out overdrive and locks the torque converter clutch. If you engage Tow-Haul at speeds above 50 mph, the transmission will shift or stay in third gear and the converter will lock. If you shift the transmission manually to second gear when you slow down to below 50 mph, the transmission will shift down to second gear with locked torque converter.

Sales of the Ram are up 13% for the year. Ram 2500 and 3500 models account for a third of overall Ram sales. Currently, the Ram holds 28.4% of the heavy duty diesel market. Ram holds the J.D. Powers 2003 Initial Quality Survey best-in-class rating. About 73% of the Heavy Duty Rams are Cummins powered, and about 70% of the Heavy Duty Rams are four wheel drive.

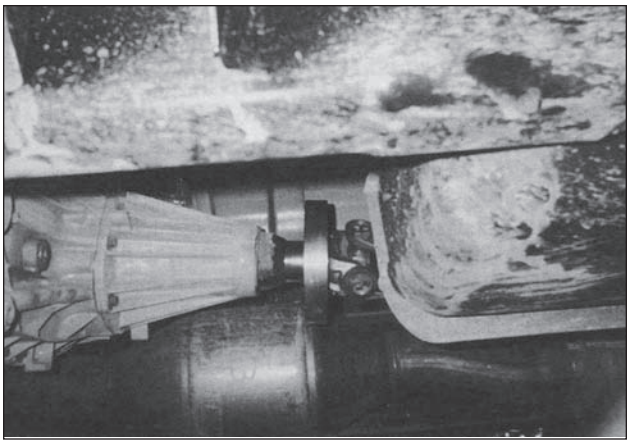
2004.5 Component Changes

Now, let's take a look at the changes made to the 2004.5 Ram to accommodate the new Cummins "600" engine.

The engine fan shroud is now engine mounted, with soft plastic seals to the radiator assembly. Mounting the shroud onto the engine allowed a tighter clearance to the fan blades for improved forced air flow and cooling. The area in front of the air cleaner box is shrouded with an air blocker so that hot air off the radiator and from recirculation inside the engine compartment cannot pass to the air cleaner. Dodge claims an improvement of 30 to 40 degrees in inlet air temperature. The fan clutch calibration is different, to reduce fan roar and to improve cooling. The turbocharger air intake system has been refined with a new "resonator," or air baffle. A hood insulator has been installed (absent in the past few years of Rams). With a new design catalytic converter the exhaust system is now a full four inches in diameter throughout. The truck is configured to be compatible with the use of an exhaust brake, even with the 48RE automatic transmission. The intercooler is new, with higher flow. The end plates and hose connections are plastic.



This picture is the 2004.5 engine compartment. Note the engine-mounted fan shroud and the blocker panel to the left and in front of the air cleaner box.



Underneath view showing the catalytic converter just beyond the transfer case.

Both Dodge and Cummins spent considerable time controlling noise, vibration, and harshness (NVH). The result is a truck platform with the best manners ever (as we will discuss later in this article), far better than the competition.

2004.5 Engine Changes

Further, let's discuss the changes made to the Cummins engine, focusing on the changes made from the former 305 horsepower product in order to produce the new 325 horsepower engine that meets emissions requirements for all fifty states.

The primary means to control emissions on the new engine are inside the combustion chamber. Exhaust gas recirculation (EGR) is not used. This change represents a major advance from the interim approach, with use of EGR, taken in 2002 to meet federal EPA emissions regulations for the medium-duty truck market with the B-engine. The engine system becomes significantly simpler. Fifty-eight new part numbers have been required to implement EGR as a part of the emissions strategy. Only seven new emissions part numbers are needed for the new approach used on the 325/600 engine. A diesel oxidation catalyst (catalytic converter) is employed. The pilot injection/primary injection strategy has changed significantly. Formerly, a small pilot injection was followed by the larger injection event; at higher loads and above 2000 rpm, a single injection event would be used. In the new engine, two or three events are used. The pilot injection is larger, and when under power a post-event is added. These events are part of the emissions and power strategy, as well as a means to noise reduction. The engine control module now contains 550 kilobytes of code for engine control, while the previous 305 horsepower HO engine used only 350 kilobytes.

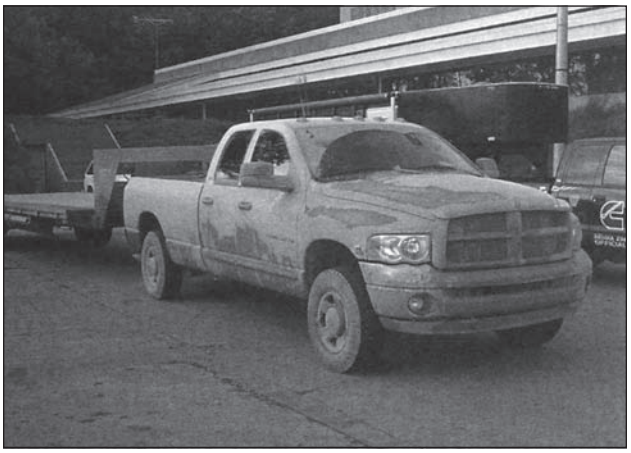
The Cummins noise control strategy includes carry-over of the straight-cut gears from the previous HO. The Bosch CP3 high pressure fuel pump is quieter than the former VP44 and P7100 injection pumps, which suffered noise-producing torque-reversals. Rubber isolators have been added to the valve cover hold-down bolts. Overall, the engine is a little quieter, with less rattle and a deeper tone.

The new cylinder head has revised ports with less swirl. High-cobalt stellite valve seats are used with high strength inconel valves. The forged steel connecting rods with cracked-cap technology are carried over from the 305 horsepower engine. These rods pass exactly the same strength and durability tests as the former, machined cap rods, while providing more rigidity than the former units. The exhaust manifold material and shape has been slightly revised for durability, and multi-layer gaskets are used between the manifold and head. The piston bowls are slightly more open. The cooling passages for the piston rings are carried over from the 305 horsepower HO engine.

Other testing involved the equivalent of five million miles of driving.

The turbocharger remains an HY-35, but with a new, large compressor wheel and housing for increased air flow. The wastegate has an electronic controller to better match boost pressure to engine needs for optimized emissions control. The turbo shaft bearings have small oil reservoirs under them to improve oiling on cold start- up. The oil drain tube is flexible steel, replacing the former system of two rigid steel tubes connected by a hose with two worm-drive clamps. This oil drain and the new exhaust gaskets were developed as a result of their successful use in heavy duty engines.

Engine testing included 22,000 hours on the dynamometer, much of it at full power. For example, a standard Cummins engine test involves running the engine at full power for one thousand hours straight. Other testing involved the equivalent of five million miles of driving. Two such tests were the Lap of America and the Lap of Indiana. The former test is a run of 50,000 highway miles with the truck loaded to its gross combined weight rating. The latter test is a run of 100,000 miles at 4,300 miles per week, at slow speeds with the vehicle loaded to its gross combined weight rating.



Lap of Indiana testing.

Driving the Diesels, Towing 13,000 Pounds

For common comparison, each truck was an extended cab, dually,

long bed with six-speed manual transmission and 3.73 axle ratio. The three trailers were identical, each with a Bobcat loader chained down to it. Each truck had a properly functioning electric trailer brake controller. All three trucks were near new. The Dodge/Cummins and the Ford PowerStroke met 2004.5 emission specs while the Chevrolet Duramax will need a catalytic converter to met the January 2004 EPA emissions specifications. The Ram and its competitors were driven over the same course, downhill and up again, through turns and stops, and through a radar speed trap to show us the maximum speed that the vehicle and trailer could achieve on a fairly steep hill. Part of the test was a standing start test in low and in second gear, uphill on a moderate grade.

This picture shows the three trucks set up for the towing test. Each loaded trailer weighs 13,000 pounds and is mounted to the truck with a gooseneck hitch.

The Ram handled solidly and felt very safe at 45-50 mph going downhill. The exhaust brake engaged quietly and could hardly be heard at an idle or on the road. It did give just the right amount of braking effort for this load and a rather steep hill. The Ram service brakes were excellent and gave me tremendous confidence. The Other testing ride was smooth and tight; the steering felt stable, like full weight was still on the front wheels. I easily started the rig in first gear and even in second from a stop, going uphill. I did not have to touch the accelerator pedal, or smoke the clutch. At the radar unit, the rig was going 45 mph uphill at full power in fourth gear.

The Ram handled solidly and felt very safe at 45-50 mph going downhill.

The Ford had a rather jarring ride, and handling felt "on the edge" in the curves. Every bump in the road caused bouncing and jumping. The driver needed to have a strong stomach and back. The truck constantly reminded me that it was heavy duty and I was not! The brakes were not good, just okay. The rig was difficult to start from a stop going uphill. Even in first gear, I had to slip the clutch quite a bit and carefully modulate the accelerator pedal. Otherwise, the engine stalled, regardless of the care I took. The ZF aluminum cased transmission was louder than the Dodge NV5600. I was especially unhappy with the difficult, notchy shift from first to second. Almost all of the momentum gained in the low gear was lost in the time it took to shift. The rig achieved 41 mph at the radar unit. I gained several other impressions about the Ford that I want to relate.

The Ford had a rather jarring ride, and handling felt "on the edge" in the curves.

The ignition key release button is difficult to operate, especially if you are not in the seat and just reaching across from outside the truck. The idle is rattly, and transitions to quiet just off idle. However, under load and release, a "machine gun" rattle comes back, like pouring BB's onto a steel dish. The transmission/gear train is noticeably louder than the Ram's. The shifter is too close to the driver and the seat in first gear. Overall, the shifter moves too much going through its pattern. Ford/Navistar needs both a catalytic converter and exhaust gas recirculation to meet the easier 2004.5 emission standards. An especially troubling problem occurs if you give the engine some accelerator pedal at a stop in neutral. First the engine goes to 2000 rpm, or greater. Then without any driver input, it runs away clear to the red-line rpm (4000). From pulling the trailer, it seemed that there was no advantage to the last 500 rpm going to the 4000 rpm red line. The power curve was moderately good, but more peaky than the Ram. In other words, the Ford needed to get up in rpm much more than the Ram to pull the load.

The Chevrolet Duramax is not for a truck enthusiast.

The Chevrolet Duramax is not for a truck enthusiast. Even in first gear, it was difficult to start the rig going uphill on the modest grade without stalling. Second gear starts were completely out of the question. Handling was definitely "on the edge" going through downhill curves, and the brakes were not even close to confidence- inspiring. The best I could get through the radar unit was 33 mph. The engine and drivetrain emitted a variety of unhappy noises, growls and whines, with lots of fan noise. As the radar showed, power was poor. The redline was about 3000 rpm, and you had to be near there to get any power.

Driving the Diesels, loaded with 5000 pounds in the bed.

These trucks were extended cab, dual wheel, one-tons with automatic transmissions. The route consisted of a downhill section followed by a twisty narrow uphill road. The Ram was tight, controlled, and felt like the load was not at all severe. Handling was very good. No creaking or groaning on turns was experienced. Power going through the curves was good, and a good speed could easily be maintained with minimal experience.

The Ford handled noticeably less well, and emitted some creaking on making a turn where the rear suspension had to flex sideways. The engine gave a loud and distracting whine/howl on acceleration. Handling and braking were fair. The truck is suited to those who feel high brand-loyalty to Ford and gratefully accept whatever Ford is willing to give them. Many of them have no experience with the Third Generation Dodge Ram, so they don't know any better.

Once again, the Chevrolet was generic and did not inspire any confidence in the power, handling, or braking departments. It creaked and groaned in the side-flex curve, and made a lot of noise when the driver begged for power. Perhaps the low power was a blessing, because hitting the brake pedal seemed to be only a mild suggestion to the truck that it needed to slow down. Actually, my main concern was not whether the brakes worked—they did a fair job—but the pedal went almost to the floor even pushing on it at a stop. Using the clutch was not easy, because a large box is bolted to the floor just above and to the left of the clutch pedal. I hit it several times with my foot and was unable to depress the clutch pedal fully when that happened. The handling was rather sloppy and the suspension seemed soft, particularly with the weight in the bed.

In distinct contrast to the competitors, the Ram was rather quiet, with a deep hum or growl on acceleration. There was no creaking or groaning, and the load did not seem to upset the truck's tight and solid manners in accelerating, stopping, or negotiating curves. Oh, just to slap the competition a bit, the Dodge had an extra passenger and an extra 500 pound slab in the bed. Dodge's homework spent on the 48RE was apparent in the better manners exhibited by the transmission in shifting and in transferring power through the torque converter.

Concluding Driving Impressions of the Cummins 325/600 Turbo Diesel

Beforehand, I was concerned about drivability. The concerns were groundless. I remembered the 1970s when emissions controls caused the gasoline powered engines to hesitate, have flat spots in the power curves, have much lower power, run roughly, etc. Driving the new Ram, you would never know that it meets the most stringent emissions regulations ever written. Smoothness, lack of extraneous noises, power, and drivability are inherent characteristics of this engine. Even meeting tougher specifications than the competition, sthe engine's performance is far superior. The Cummins starts, runs, and pulls like a textbook example of what a diesel engine should be. In my opinion, the others act like children's drawings of illustrations in that textbook.

The Ram has come up to a very high level of performance and quality as well. The other brands should now be ashamed of their poor brakes. Such brakes were the standard ten years ago, but need not be tolerated any more in a new truck. The Dodge rides like it is a half-ton with a rally suspension. The others ride and handle like an old truck is expected to ride. The Ford is like an old three-quarter ton, and the Chevy rides like an old half-ton.

Folks, I expected the comparisons to be close, and hoped the Ram would shade the competition—maybe with some buyer preferences to help. As it turned out for me, I see no need to say much about personal preferences regarding placement of controls, shape of the instrument panel, exterior styling, or fit and finish. I happen to be very happy with my 2004 Turbo Diesel in those respects, but I never got to those considerations in these tests. Fundamentals and objective measurements were all that were needed for me to formulate my opinions, and overrode the "kinder and gentler" issues for making a purchasing decision. I feel that the Ford was well below the Dodge Ram, even on the most simplistic, objective considerations. For me, the Chevrolet was not even in the running. A Chevy buyer would seem to be someone who hates to drive a truck and expects the experience to be unpleasant. Chevy does not disappoint or surprise such a buyer, in my opinion. I found the Ford platform to be somewhat primitive in comparison to the Ram in capabilities and in noise-vibration-harshness. The Chevy engine was very disappointing. The Ford 6.0 liter Power Stroke engine was a distinct second in power and smoothness. It needed a lot more rpm to perform, and was peaky in power. Shifting gears took you out of the power band too quickly. It was noisy, and the noise came and went disconcertingly. The tentative connection between the accelerator pedal and the engine's response/rpm did not inspire confidence when letting out the clutch.

Joe Donnelly
TDR Writer
TDR Issue 43

A view of the tent where the talks were given and four parked Rams.

ENGINE PERFORMANCE EVALUATIONS

ISSUE 47 – TECHNICAL TOPICS

by Bill Stockard and Robert Patton

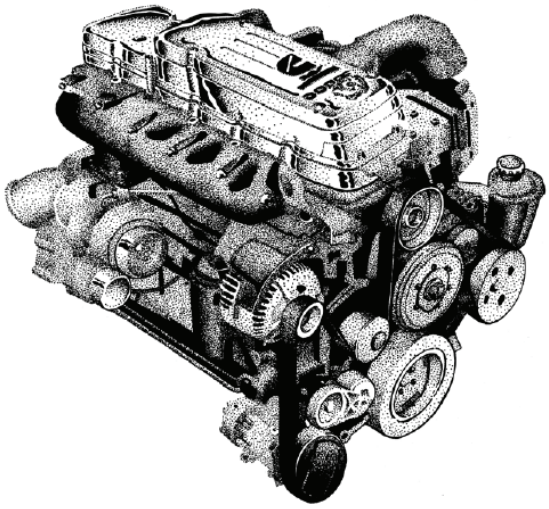
As the model year 2005 Turbo Diesel is being introduced (and, as of this printing, is a full five-months into production), I reflected back three years to the unveiling of the Third Generation 2500/3500 truck at the Chicago Auto Show in February of 2002.

The look back in time, combined with a trip to Cummins' home town of Columbus, Indiana, provided an idea for an updated TDR article on the Cummins high-pressure, common-rail (HPCR) engine.

As I prepared for the trip to Columbus, several thoughts came to mind. To organize my review, I jotted down the topics I wanted to cover. An article updating the HPCR should include the following topics.

- Emissions: past, present, future
- Ratings: past, present, future
- Engine Hardware: past, present, future
- Engine Software: past, present, future
- Product Launch: past, present, future

With my topic outline in hand I journeyed to Cummins to get for our TDR readers this exciting "2005 Cummins Engine Update."



The new legend – the Cummins HPCR Engine.

EMISSIONS: PAST, PRESENT, FUTURE

Any in-depth article on diesel engines has to include a discussion of exhaust emissions. In model year 2002 the Third Generation Dodge Ram 1500 truck was introduced with gasoline engine power. Diesel customers had to wait for the 2003 truck model year. At the time there was much speculation about the reason the 2500/3500 series trucks were not introduced at the same time. Was there a dramatic difference in the body vis-à-vis Ford and their 150 truck offering being totally different than their 250/350 trucks? Was the hold-up due to upcoming diesel emissions legislation and the need to give Cummins more time to finalize their HPCR engine? Or, was the delay of the 2500/3500 simply an instance of the staggered-launch marketing tactic that is frequently used by manufacturers? The speculation is over and the answer is "a finalized HPCR engine and staggered-launch marketing."

Moving back on topic, the 2003 Cummins HPCR engine was introduced prior to the impending and tighter 1/1/2004 exhaust emissions standards.

Looking back to Issue 40 we find a comprehensive article that summarizes exhaust emissions over a 22 year period—1985 to 2007. In the article we took time to describe the hardware changes required byl emissions legislation that was enacted in '88, '91, '94, '98, '04 and soon to be '07.

Emissions — past, present, future: if you care to read the details, please refer to your Issue 40 magazine. The next issue of the magazine will have a detailed "Technical Topics" discussion of the pending '07 regulations.

RATINGS: PAST, PRESENT, FUTURE

Publishing the past and present ratings for your Turbo Diesel is as easy as making a chart. The horsepower and torque numbers make good copy, but you'll note from the chart that there are two additional columns, "CPL and Comments."

The comments column is self explanatory.

CPL is a Cummins abbreviation that stands for "control parts list." The CPL provides a comprehensive breakdown of performance hardware, i.e. pistons, turbo, camshaft, injectors, and fuel pump that were used in the engine build. The CPL number along with the Cummins engine serial number will help your Cummins parts professional should you need engine hardware.

Model Year	HP@RPM	Torque@RPM	CPL	Transmission	Comments
'89-'91 Non-intercooled	160@2500	400@1600	804	Auto and Manual	One CPL for both transmissions over a three year production run.
'91.5-'93 Intercooled	160@2500	400@1600	1351	Auto and Manual	21mm turbo housing
			1579		18mm turbo housing and LDA
'94-'95	160@2500	400@1600	1815	Auto	No catalyst CPL (pre 1/1/94)
			1549		Catalyst equipped
			1959		Catalyst equipped
			1968		Catalyst equipped
	175@2500	420@1600	1816	Manual	No catalyst CPL (pre 1/1/94)
			1550		Catalyst equipped
'96-'98	180@2500	420@1600	2022	Auto	Initial '96 production
			2174		Timing change
			1863	Auto and Manual	CARB w/EGR
			2308		CARB timing change
	215@2600	440@1600	2023	Manual	Initial '96 production
			2175		Timing change
'98.5 ISB	215@2700	420@1600	2098, 2513	Auto	EPA certification
			2280, 2515		CARB certification
	235@2700	460@1600	2024, 2512	Manual	EPA certification
			2279,2514		CARB certification
'99 ISB	215@2700	420@1600	2617	Auto	EPA certification
			2619		CARB certification
	235@2700	460@1600	2616	Manual	EPA certification
			2618		CARB certification
'00 ISB	215@2700	420@1600	2660	Auto	EPA certification
			2661		CARB certification
	235@2700	460@1600	2662	Manual	EPA certification
			2663		CARB certification
'01 ISB	235@2700	460@1600	2865, 2902	Auto	EPA certification
			2866, 2903		CARB certification
			2496, 2904	5 Spd. Manual	EPA certification
			2497, 2905		CARB certification
	245@2700	505@1600	2415, 2906	6 Spd. Manual	EPA certification
			2495, 2907		CARB certification
'02 ISB	235@2700	460@1600	8030	Auto	EPA certification
			8031		CARB certification
			8032	5 Spd. Manual	EPA certification
			8033		CARB certification
	245@2700	505@1600	8034	6 Spd. Manual	EPA certification
			8035		CARB certification
'03 HPCR	235@2700	460@1400	8216	47RE Auto	CARB certification
			8224	5 Manual	CARB certification
	250@2900	460@1400	2624	47RE Auto	EPA certification
			8223	5 Manual	EPA certification
	305@2900	555@1400	2998	6 Manual	EPA certification

Model Year	HP@RPM	Torque@RPM	CPL	Transmission	Comments
'03.5 HPCR	235@2700	460@1400	8410	47RE Auto	CARB certification
			8412	5 Manual	CARB certification
	250@2900	460@1400	8212	47RE Auto	EPA certification
			8226	5 Manual	EPA certification
	305@2900	555@1400	8228	6 Manual	EPA certification
			8213	48RE Auto	EPA certification - 2003.5 model
'04 HPCR	235@2700	420@1600	8412	48RE Auto	EPA certification
			8412	6 Manual	CARB certification
	305@2900	555@1400	8213	48RE Auto	EPA certification
			8228	6 Manual	CARB certification
'04.5 HPCR	325@2900	600@1600	8350	6 Manual	EPA certification
			8351		CARB certification
			8346	48RE Auto	EPA certification
			8347		CARB certification
'05 HPCR	325@2900	610@1600	8423	6 Manual	EPA certification
			8424		CARB certification
			8421	48RE Auto	EPA certification
			8422		CARB certification

Editor's Note: This article was written in 2005. The ratings that follow in this table were sourced from our most recent/late model Buyer's Guides.

'06 HPCR	325@2900	610@1600	8348	6 Manual	EPA certification
			8349		CARB certification
			8344	48RE Auto	EPA certification
			8345		CARB certification
'07 HPCR	325@2900	610@1600	1091	6 Manual	EPA certification
			1095		CARB certification
			1000	48RE Auto	EPA certification
			1083		CARB certification
'07.5 HPCR	350@3000	610@1600	8233	6 Manual	EPA certification
			8234		CARB certification
		650@1600	8230	68RE Auto	EPA certification
			8231		CARB certification
'08 HPCR	350@3000	610@1600	1489	6 Manual	All States
		650@1600	1490	68RFE Auto	All States
'09 HPCR	350@3000	610@1600	1489	6 Manual	All States
		650@1600	1490	68RFE Auto	All States

ENGINE HARDWARE: PAST, PRESENT, FUTURE

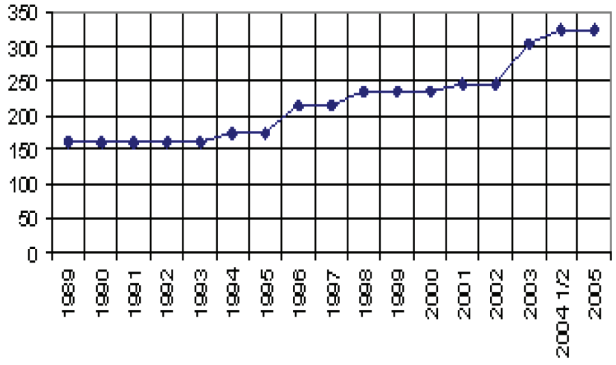
While I was writing the piece on the previous sub-topic and reviewing the material on exhaust emissions printed in Issue 40, I noted that the HPCR engine was also covered there in great detail.

I faced a dilemma. Should I reprint the engine information from Issue 40 or simply direct the reader back to its pages? I could not overlook the fact that TDR has added many new members in the past two years. My decision—for the benefit of both longtime and new readers—was to reprint the timely information on engine hardware from Issue 40, but to omit the dismal numbers in Issue 40's recitation of exhaust emissions regulations.

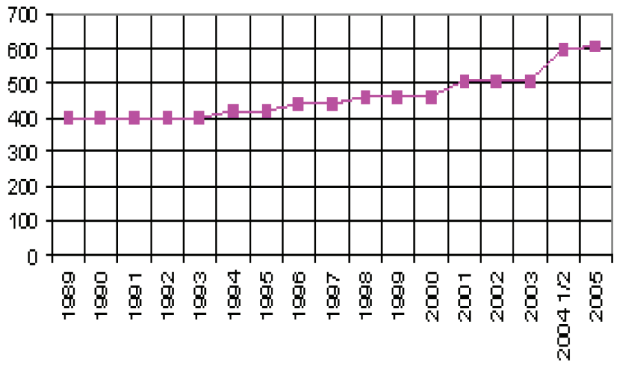
What appears immediately below incorporates the engine information from Issue 40 with text from Issue 43 on the '04.5 engine and recent information on changes in '05 HPCR engine hardware.

The '03–'05 HPCR Cummins Engine

First things first. The emission numbers: for 2004 the Federal NOx changed from 4 to 2.4. The 2.4 number is actually a combination of NOx and non-methyl hydrocarbons. California pulled up the NOx standard and implemented a 3.0 number effective in late 2002. The California number parallels the Federal NOx of 2.4 that was forced on the six Consent Decree manufacturers (Cat, Mack, Detroit Diesel, Volvo, Navistar and Cummins) as they were required to meet the 2004 standard early. Their effective implementation date was 10/2002. The Dodge pickup engine was exempt from the 10/2002 early implementation (Issue 32, page 85). The particulate number of 0.1 stayed the same for 2004.



Horsepower Changes



Torque Changes

As you can note from the graph, horsepower has been steadily increased over the years beginning with 160 horsepower and 400 ft-lbs of torque in 1989 to the 325 horsepower and 610 ft-lbs of torque with the 2005 engine. The 2005 engine is matched up to the NV5600 six-speed manual transmission or the 48RE automatic transmission.

In early 2004 the California engine was rated at 235 horsepower and 460 torque. This engine was matched to the NV5600 six-speed manual transmission or the 48RE automatic transmission. Other states got the high-output 305/555 engine with the NV5600 or 48RE transmissions. As a mid-year release ('04.5) Dodge and Cummins made the 325/600 engine the standard for all 50-states.

In 2003 the standard engine was rated at 250 horsepower and 460 torque. This engine was matched to the NV4500 five-speed manual transmission or the 47 RE automatic transmission. The high-output 305/555 engine was matched to the NV5600 six-speed transmission or the 48RE automatic transmission.

In 2003 trucks sold in California were available with a 235 hp/460 torque (CARB) version of the engine. This lower rating was necessary because of a tighter oxides of nitrogen standard (three grams per brake horsepower hour) and was achieved through the use of an oxidation catalyst (similar to the one used on all 12-valve engines from '94 to early '98), engine control module programming, and smaller injectors.

I faced a dilemma. Should I reprint the engine information from Issue 40 or simply direct the reader back to its pages? I could not overlook the fact that TDR has added many new members in the past two years.

As an aside, we often receive a phone call complaing that "My new '05 truck (or 2001, or 1998—pick your model year) just doesn't get the same fuel economy as my old, trusty '91 truck. What gives?" There are legitimate complaints that need mechanical attention, but the obvious answer to the smaller discrepancies lies in the progression of power. The new 2005 engine is rated 165 horsepower greater than the initial '89 through '93 engines. Torque on the engine is 210 ft-lbs greater. The '98 24-valve engine boasted 55 horsepower and 20 ft-lbs torque (automatic) or a 75 horsepower and 60 lb-ft torque (five-speed) increase. If you use the additional power, should the fuel economy stay the same?

Back to the subject at hand, the HPCR engine. The HPCR engine was another evolutionary step in the 5.9 liter, B-series platform that was introduced back in 1983. However, two-thirds of the HPCR engine is new or redesigned. The lion's share of the new hardware had to do with the fuel injection system. The engine uses a HPCR fuel system from Bosch. Although new to us here in the United States, Cummins has used the HPCR fuel system in Europe since 2001. This track history helped eliminate product concerns that owners might have had.

Parts Carryovers

Let's start the analysis by listing the carryover parts from the previous 5.9 liter engine. Purists will be pleased that the engine's bottom-end hardware, the crankshaft, connecting rod and bearing assemblies, are the same as the previous, proven, 24-valve engine. Other carryover parts include:

- Head bolts
- Water pump
- Oil pump
- Camshaft
- Valve train
- Critical fasteners (head, rod and flywheel bolts)

New Designs

As we have noted, the biggest change to the engine in 2003 was the use of the Bosch HPCR fuel system. The system has rail pressure of 23,200 psi (1600 bar) on the high output engine. The change in the fuel system netted a reduction of 8-10 db of noise. Additionally, the ability to better control injection timing and pilot injection provides an extended rpm peak torque band over previous engines (200 rpm lower and higher). The lift/supply pump is located on the side of the motor right next to the fuel filter and is an all-new design supplied by Federal-Mogul.

Instead of an injection pump (previous VP44 electronic for 24-valve engines, or P7100 and VE mechanical pumps for 12-valve engines) that sequences high-pressure fuel to injectors at the proper time, the new fuel pump supplies a common rail with high-pressure fuel, which is, in turn, fed to the individual injectors. The injectors deliver the pressurized fuel to the cylinders as the result of a signal from the engine control module, not as a result of a pulse of high pressure from the pump.

All in all, the HPCR fuel system brought the following attributes to the engine:

- Gear-driven fuel pump delivers high pressure fuel supply to a common rail
- Fuel delivery through electronically controlled unit injectors
- Multiple injection events (pilot, main, post injection)
- Higher injection pressures—up to 1600 Bar
- Timing, pressure and quantity less dependent on engine speed

As a result the owner can expect:

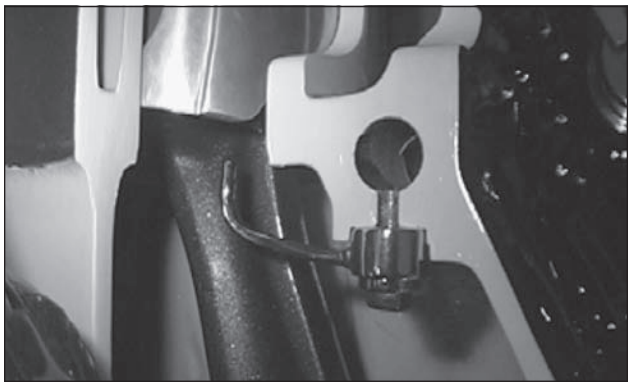
- Cleaner combustion
- Improved power and engine response
- Improved cold start capability
- Lower noise
- Lower vibration and harshness

Of course, the new fuel system drives changes throughout the engine. The cylinder head maintains a four-valve per cylinder design. However, the new cylinder head has induction hardened valve seats, on both intake and exhaust, to handle the higher temperatures and pressures.

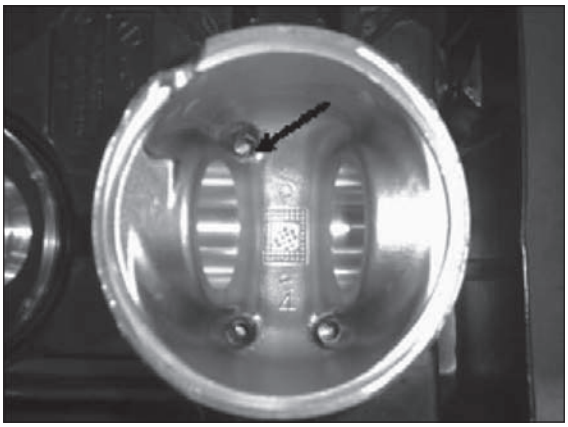
The change to the HPCR fuel system drove several changes to the engine block. The block now incorporates sculpted side walls to stiffen the block. This change was necessary as the stiffer block is needed to help withstand the higher peak cylinder pressures needed for emissions control and power requirements. Additionally, it aids in noise reduction by absorbing noise. An engine's bedplate was also designed and added to the engine for less noise and greater durability.

The '03 and '04 standard-output engines continued to use saddle jets located in the upper main bearing saddles to spray the connecting rods and the pistons.

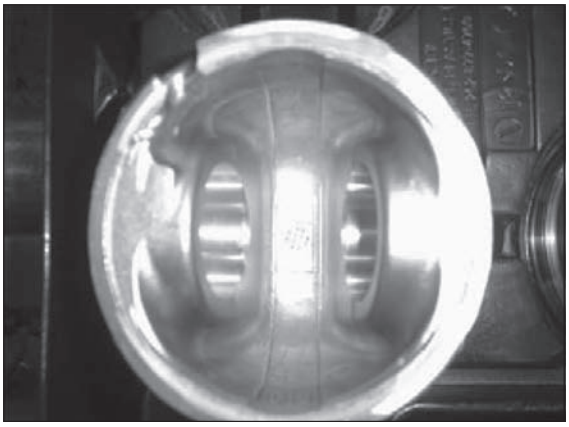
The 2005 and previous 305 horsepower High Output engines use a system that includes a component called a "J-jet" for each piston. The J-jet nozzle is bolted to the block and directs a stream of oil to the underside of the piston. The 2005 and previous HO pistons have a passageway to direct the flow of oil through the piston head to cool it. The 2005 and previous HO engines also have an exhaust manifold that is capable of higher exhaust temperatures.



The J-jet piston cooling nozzle.



Underside of the HO piston. Note the passageway for oil to flow through the piston.



Underside of the standard piston.

Cummins has taken measures to reduce the amount of dead space in the combustion chamber. The head gasket is now measured and matched (graded) based on block height and cylinder head thickness. During assembly a machine measures piston protrusion and, based on the measurement, a thick or thin headgasket is chosen for assembly. Get the picture that meeting emissions standards is serious business?

Further, the HPCR fuel system necessitated changes to the engine's front gear train. New high contact-ratio spur gears result in quieter operation.

The turbo on all versions of the engine is an HY35 with a 9cm2 exhaust housing. This turbo has been redesigned from previous HY35's. Exhaust exits the turbo at 3.5" and flows to a 3.5" muffler inlet. The exhaust is now a full 4" system from the muffler to the tail as opposed to the previous 3" system. The turbo has an intake silencer to eliminate high frequency, blade pass noise. There is closer tolerance control of the turbo's critical components.

Specifications for turbocharger boost pressure are numbers that TDR members carefully watch. An engine that achieves its specified number is an engine that will deliver its advertised horsepower numbers. The wide open throttle boost specifications: '03 and '04 standard engine, 22-24 psi; 2005 and previous HO engines, 25-26 psi.

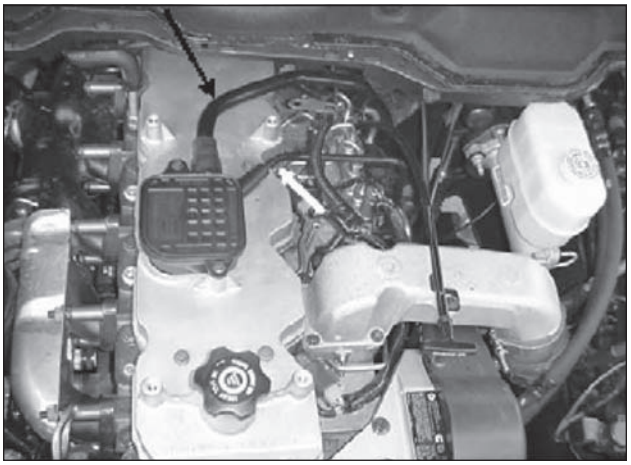
Other Changes

Besides changes to the engine, let's take a look at some of the hardware codifications.

In the area of accessory drive components, you will also notice that the power steering pump is now driven by the accessory drive belt instead of by a gear. The vacuum pump, which was previously combined with the power steering pump, is no longer used; however, it is available as a Mopar Accessory for trucks using an exhaust brake.

The radiator cooling fan used with the Cummins HPCR engine is quite a bit different than the fan used with previous engines. The fan still uses a viscous drive; now, however, the drive is actuated electronically by the engine control module. The controller looks at inputs from coolant, air intake, and transmission temperature sensors and the A/C status and then sends a pulse width modulated signal to the solenoid in the fan drive. The solenoid controls the viscous fluid to match fan speed with vehicle operating conditions.

The crankcase vent system has been a point of contention for many Turbo Diesel owners. To virtually eliminate the driveway-drip problem Cummins and Fleetguard have redesigned the crankcase vent system. Thankfully the crankcase vent (read: low pressure vaporized oil) is not routed to the engine's air intake system [like the new 6.0 liter Power Stroke (Issue 39, page 96). The vent goes from the engine to an oil separator box on top of the valve cover and then is vented to atmosphere.



The 2003 crankcase vent system. The white arrow| shows the inlet from the crankcase to the filter assembly. The black arrow points to the outlet hose that vents to atmosphere.

2004.5 and '05 Engine Changes

Further, let's discuss the changes made to the Cummins engine, focusing on the necessary changes made to the former 305 horsepower product in order to produce the new 325 horsepower engine that meets emissions requirements for all fifty states.

The primary means to control emissions on the new engine are inside the combustion chamber. Exhaust gas recirculation (EGR) is not used. This change represents a major advance from the interim approach, with use of EGR, taken in 2002 to meet federal EPA emissions regulations for the medium-duty truck market with the B-engine. The engine system becomes significantly simpler. Fifty-eight new part numbers were required to implement EGR as a part of the emissions strategy on the other versions of the B-series engine that Cummins sells to other customers. Only seven new emissions part numbers were needed for the new approach used on the Dodge 325/600-610 engine. Starting 1/1/2004 a diesel oxidation catalyst (catalytic converter) was employed. The pilot injection/primary injection strategy has changed significantly. Formerly, a small pilot injection was followed by the larger injection event; at higher loads and above 2000 rpm, a single injection event would be used. In the new engine, two or three events are used. The pilot injection is larger, and when under power, a post-event is added. These events are part of the emissions and power strategy, as well as a means to noise reduction. The engine control module now contains 550 kilobytes of code for engine control, while the previous 305 horsepower HO engine used only 350 kilobytes.

The Cummins noise control strategy includes carry-over of the straight-cut gears from the previous HO engine.

A new cylinder head has revised ports with less swirl. High-cobalt stellite valve seats are used with high strength inconel valves. The forged steel connecting rods with cracked-cap technology are carried over from the 305 horsepower engine. These rods pass exactly the same strength and durability tests as the former, machined cap rods, while providing more rigidity than the former units. The exhaust manifold material and shape has been slightly revised for durability, and multi-layer gaskets are used between the manifold and head. The piston bowls are slightly more open. The cooling passages for the piston rings are carried over from the 305 horsepower HO engine.

For the '04.5 and '05 325/600-610 engines the turbocharger remains an HY-35, but with a new, larger compressor wheel and housing for increased air flow. The wastegate has an electronic controller to better match boost pressure to engine needs for optimized emissions control. The turbo shaft bearings have small oil reservoirs under them to improve oiling on cold start-up. The oil drain tube is flexible steel, replacing the former system of two rigid steel tubes connected by a hose with two worm-drive clamps. This oil drain and the new exhaust gaskets were developed as a result of their successful use in heavy duty engines.

2004.5–'05 Component Changes

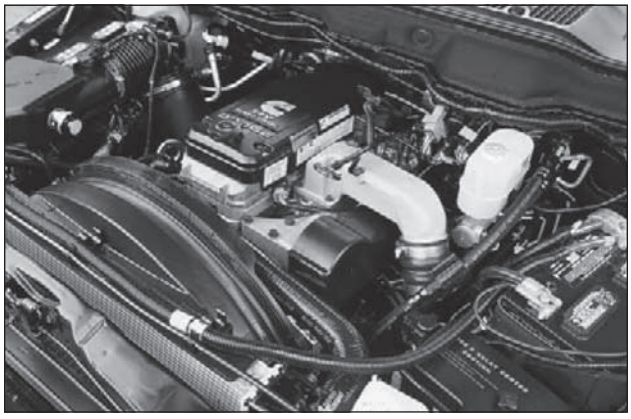
The engine fan shroud is now engine mounted, with soft plastic seals to the radiator assembly. Mounting the shroud onto the engine allowed a tighter clearance to the fan blades for improved forced air flow and cooling. The area in front of the air cleaner box is shrouded with an air blocker so that hot air from the radiator and from recirculation inside the engine compartment cannot pass to the air cleaner. Dodge claims an improvement of 30 to 40 degrees in inlet air temperature. The fan clutch calibration is different, to reduce fan roar and to improve cooling. The turbocharger air intake system has been refined with a new "resonator," or air baffle. A hood insulator has been installed (absent in the past few years of Rams). With a new design catalytic converter, the exhaust system is now a full four inches in diameter throughout. With a manual transmission, the truck is configured to be compatible with the use of an exhaust brake. The intercooler is new, with higher flow.

New for 2005, the lift/supply fuel pump design has been changed. The previous electronic lift/supply fuel pump was located next to the fuel filter assembly. The pump has been relocated to the fuel tank where it pushes fuel to the engine rather than pulling fuel from the fuel tank.

For those trucks equipped with the 48RE automatic transmission there are subtle changes in other components. A pedal position sensor has replaced the throttle position sensor and the cruise control vacuum actuator has been removed, having been replaced as an integrated function of the ECM. There were additional changes to ECM programming to give the transmission a more aggressive lock-up schedule and to enhance the shift schedule.

Finally, for 2005 the intake air grid heater now uses a gasket that is electronically conductive. The conductive gasket allowed Cummins to eliminate the grid heater's ground strap.

Engine hardware—past, present, future: The proof of the HPCR's solid engine design will be shown in the heading covering the engine's product launch. Likely you noted that the changes to the engine in the past two years have been incremental. There are no anticipated changes for the '06 product.



CATEGORY 18 VEHICLE PERFORMANCE

TSB#	MODEL	SUBJECT/DESCRIPTION
18-037-04 9/27/04	'04.5 - '05 (DR)	*Fuel economy improvement, white smoke on start up, accuracy of fuel mileage in overhead console display.* This bulletin applies to DR vehicles equipped with a 5.9L Cummins Turbo Diesel engine (sales code ETH), with an engine serial number 57130285 through and including 57246361; and the engine date of manufacture 12/10/2003 through and including 8/17/2004. The bulletin gives the dealership specific information for erasing and reprogramming the Cummins ECM with new software. The following enhancements are included with this software: • Improved fuel economy—A new ECM calibration has been developed which should provide customers an average fuel economy improvement of approximately 1 mpg. • Reduces white exhaust smoke on cold start at temperatures below 50°. • Improves accuracy of the fuel economy calculation in the overhead console display.

ENGINE SOFTWARE: PAST, PRESENT, FUTURE

With TDR Issues 46 and 42 in hand, I carefully looked at the "TDResource" column for Dodge technical service bulletins (TSBs) that would address programming or software changes to the engine control module (ECM). There was only one bulletin (found in Issue 46) and that TSB has been updated with the following TSB 18-037-04.

The single TSB that has been issued for the sales code "ETH" engines is indicative of a smooth product launch by Cummins. Point of clarification: ETH sales code applies to those engines that are known as high output. The engines that have a horsepower rating of 325 ('04.5 engines and early '05 models) are a part of the TSB's coverage.

PRODUCT LAUNCH: PAST, PRESENT, FUTURE

The last topic to be covered is perhaps the most important. It was mentioned in the Engine Hardware section that Cummins had used the HPCR fuel system on its B-series engine in Europe two years prior to the introduction of the Turbo Diesel engine in our pickup. One has to assume that the two year head start was helpful. Regardless, the data from Cummins on the product launch on the HPCR engine is overwhelmingly positive.

The data that I had a chance to inspect showed cost per engine and the frequency of repairs. Similar to the graphs we have published that debunked diesel fuel, price gouging conspiracies (cost of diesel fuel goes hand-in-hand with the price of crude oil—Issue 45, page 64) the frequency of repairs and the cost per engine graphs closely parallel one another.

To put the HPCR engine's successful product launch into perspective, I was able to average some numbers relating to the repairs. I think we can all agree that the '94-'98, 12-valve engines with the mechanical fuel system are renowned for their record of reliability.

If you compare the HPCR to the old '94-'98 12-valve engine you should note that, not only the average number, but the high and low numbers are all less than half of the numbers posted by the 12-valve engine.

Phenomenal! Certainly the HPCR engine in the Third Generation truck is worthy of your trust. The question that now comes to mind is, "how good is the Dodge chassis and driveline in the Third Generation trim?" My observations using the number (or lack thereof) of technical service bulletins (TSBs) and owner correspondence is that Dodge is also enjoying a smooth product launch with the truck.

Product launch—past, present, future: The past and present engine numbers have been presented. The trend for the HPCR engine started at the high of 3.6 and has trended downward to a steady number that is less than 2. Looking to the future, Cummins is well-pleased with the performance of the engine and they look to move the repair rate numbers even lower.

The analysis of the frequency of repair serves as an endorsement for HPCR owners and those that are considering a Turbo Diesel purchase. Knowing that TDR members are well revered for their knowledge of all things automotive, share the good news with your friends and sell 'em a Dodge Truck with confidence inspired by a smooth product launch.

Conclusion

In this update on the Cummins High Pressure Common Rail engine, we have borrowed extensively from Issues 40 and 43 for technical information available at the launch of the HPCR. Such a review and update not only brings new readers up to speed, it provides all of us with the comprehensive information and a perspective that inspires all of us with pride and confidence in today's foremost diesel-engines pickup truck.

Robert Patton
TDR Staff