

Volume 2016

TURBO DIESEL
Buyer's
Guide



*What you should know about the
2016 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



VOLUME 2016

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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.

Join Us Today!

An annual subscription to the Turbo Diesel Register is \$35.00 U.S. and \$45 Canadian/International.

Please complete this subscription form and enclose it in an envelope along with your check or money order payable to:

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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.

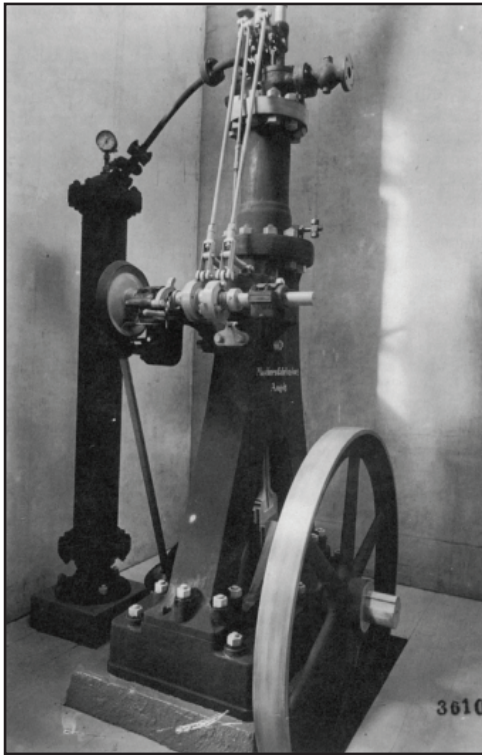
Adjudged practical only for heavy-duty, stationary, or marine power applications, diesels, when I first encountered them, weighed as much as 400 pounds per horsepower and ran at very slow speeds. Entering the industry some eight years after introduction of the diesel in this country, I undertook a personal 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

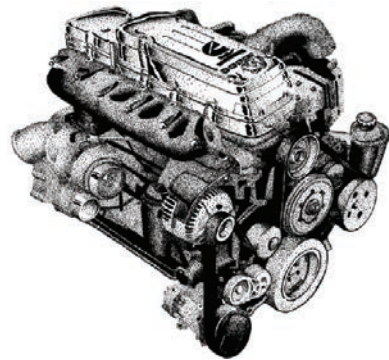
Serious damage to a gasoline engine can result if you attempt to run a high compression ratio with low octane fuel. Detonation or pinging is the ignition of the fuel due to the high temperature caused by a high compression ratio/high pressure developed by a given design. Premature ignition of the fuel, 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 “stoichiometric.” Stoichiometric describes the quantitative relationship between two or more substances, especially in processes involving physical or chemical change. With a gasoline engine there is a stoichiometric 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.

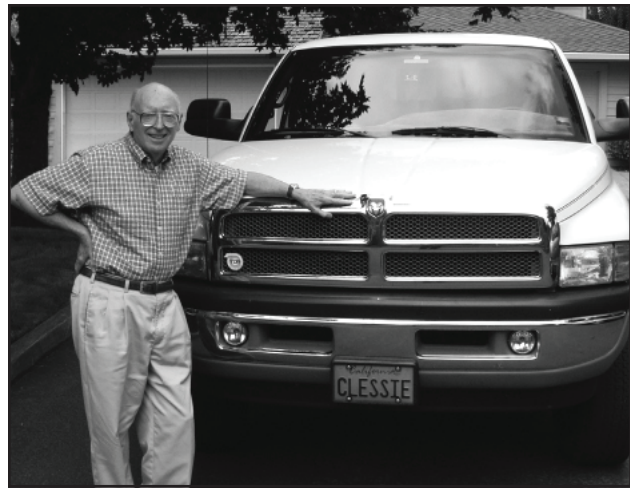
The Diesel Engine

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.

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

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

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.

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

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

$$\text{Diesel net yearly fuel savings} = \$1200$$

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.

CUMMINS 6.7-LITER FOURTH GENERATION POWER RATINGS

MODEL YEAR	HP@RPM	TORQUE @RPM	TRANSMISSION	COMMENTS
2010 6.7 Pickup	350@3000	610@1600	6 Manual	All States DOC/NAC/DPF
		650@1600	68RFE Automatic	
2010 3500 Cab/Chassis	305@2900	610@1600	6 Manual	All States
			Aisin Automatic	
2010 4500/5500 Cab/Chassis	305@2900	610@1600	6 Manual	All States
			Aisin Automatic	
2011 6.7 Pickup	350@3000	610@1400	Manual	All States DOC/NAC/DPF
		650@1600	68RFE Automatic	
2011.5 6.7 Pickup (HO)	350@3000	800@1600	68RFE Automatic	All States DOC/NAC/DPF
2011 Cab/Chassis	305@2900	610@1600	Manual	All States SCR System
			Aisin Automatic	
2012 6.7 Pickup	350@3000	610@1400	Manual	All States DOC/NAC/DPF
		800@1600	68RFE Automatic	
2012 Cab/Chassis	305@2900	610@1600	Manual	All States SCR System
			Aisin Automatic	
2013 6.7 Pickup	350@2800	660@1400	Manual	All States SCR System
	370@2800	800@1600	68RFE Automatic	
	385@2800 HO	850@1700	Aisin Automatic	
2013 Cab/Chassis	320@2800	650@1600	Manual	All States SCR System
	325@2400	750@1600	Aisin Automatic	
2014 6.7 Pickup	350@2800	660@1400	Manual	All States SCR System
	370@2800	800@1600	68RFE Automatic	
	385@2800 HO	850@1700	Aisin Automatic	
2014 Cab/Chassis	320@2800	650@1600	Manual	All States SCR System
	325@2400	750@1600	Aisin Automatic	
2015 6.7 Pickup	350@2800	660@1400	Manual	All States SCR System
	370@2800	800@1600	68RFE Automatic	
	385@2800 HO	865@1700	Aisin Automatic	
2015 Cab/Chassis	320@2800	650@1600	Manual	All States SCR System
	325@2400	750@1600	Aisin Automatic	
2016 6.7 Pickup	350@2800	660@1400	Manual	All States SCR System
	370@2800	800@1600	68RFE Automatic	
	385@2800 HO	900@1700	Aisin Automatic	
2016 Cab/Chassis	320@2800	650@1600	Manual	All States SCR System
	325@2400	750@1600	Aisin Automatic	

HOLSET HE351 VARIABLE GEOMETRY TURBINE

ISSUE 70 – TECHNICAL TOPICS

by Jacques Gordon

Why are there wires connected to my turbocharger?

by Jacques Gordon

Engines generate power by making gases expand in a confined space and then converting gas pressure into mechanical motion. In a given space, more gas expansion makes more power, and one way to increase gas expansion is to increase the amount of gas in the combustion chamber. This is done by forcing more air into the chamber than the engine can normally inhale at atmospheric pressure. Known as “supercharging” because the air charge is above (super) atmospheric pressure, the technique was initially used in the late 1800s on large stationary engines. Those superchargers were so big and heavy that they had to be driven by their own smaller engine. In November of 1905, Swiss engineer Alfred Büchi patented the exhaust gas turbine-driven supercharger, a forced-induction device that could theoretically be made small enough for mobile engines. Thus, the turbocharger was officially born: See TDR Issue 50, page 58, for a history lesson on turbochargers, as we acknowledged the 100 year anniversary of Büchi’s patent in that magazine.

Like so many other ideas that were first described in the earliest days of automotive technology, it took a while to develop the materials needed to turn theory into fact. For detailed information about the development of those metals and of the turbocharger itself, take a look at Kevin Cameron’s articles in TDR Issues 42, 47 and 50 that can be found at the TDR’s website listed as the “Cameron Collection”. Here we’ll just say that by the 1920s, nickel alloys became available that could withstand repeated heat cycles without becoming distorted. Engineers began designing precision turbines, and some of the first “production” turbochargers were built for large ship engines.

The first widespread use of turbochargers was on aircraft engines in the 1930s. Turbochargers are ideally suited for flight because they enable the engine to produce sea level power at higher altitudes where the air is thin. Near the end of piston aircraft engine development in the 1950s, even the biggest engines with huge mechanically-driven superchargers were fitted with two or even three exhaust-driven turbochargers for high-altitude flight. They are still used on small aircraft engines today.

Turbochargers are also well suited to Diesel engines. Unlike gasoline engines, Diesels make their power with low-rev torque rather than high-rpm horsepower. In a slow-turning engine, power output depends more on displacement, but as noted earlier, a turbocharger increases the engine’s specific power output, the amount of power it can make for a given displacement. A turbocharger also recovers

heat energy from the exhaust that would otherwise be wasted. Both of these qualities make a turbocharged Diesel engine more economical to operate, and Diesel engines are all about economy.

How They Work

Although there is a wide variety of types and sizes, turbochargers all have the same basic design and operating principles. A turbine wheel and a compressor wheel are attached to opposite ends of the same shaft. Engine exhaust flows through the turbine, spinning the shaft and turning the compressor. The compressor draws air in through the center, stuffs it into a carefully-shaped housing at the outer circumference of the wheel, and sends it to the intake manifold under pressure. In less technical terms, imagine a double-sided pinwheel. Air blowing through the wheel on one side causes the other wheel to turn too. Air moving one wheel causes the other wheel to move air. The flow volume and pressure generated by the compressor wheel are determined primarily by its rotational speed, but also by its size and the design of the compressor and the housings.

Turbochargers for modern Diesel engines are typically designed to flow 2.5 times the engine’s displacement at maximum turbine rpm. Turbine speeds have been climbing over the past several years, and today 140,000 rpm is not uncommon, reflecting the industry trend towards smaller turbochargers. Peak boost pressure depends on the application; 90 psi or more is possible, but for the average road-going engine, boost is usually limited to less than 20 psi.

Big industrial engines are operated in a very narrow speed/load range, so they have big turbos that move lots of air at relatively low turbine speeds. Road-going engines operate at varying speeds and loads, so they need a turbo that responds quickly to changes in load but can also spin fast enough to provide full boost at rated rpm. One way to accomplish this is with two different turbochargers operating in sequence, a smaller one for low-speed operation and a larger one for higher engine speeds. TDR performance enthusiast/writer Doug Leno has been experimenting with exactly that by adding a second turbocharger to his early-2004 5.9-liter engine. Technically called compound turbocharging (but often called ‘twins’), Leno learned that it’s an effective way to generate high boost pressures at every engine speed, providing the instantaneous throttle response we all love.

Another less complex solution is to use one fast-acting turbocharger and control its speed over a wide range to control boost pressure. But as we’ll soon see, this is easier said than done.

Turbine Speed

The way to control turbine speed is to control the exhaust gas flowing through it. For most applications, this can be easily accomplished with a “wastegate,” a valve on the turbine housing that allows some of the exhaust gas to bypass the turbine, “wasting” the exhaust gas energy. On the aircraft turbochargers mentioned earlier, the wastegate is operated by electronic engine controls using an actuator and a sensor that converts air pressure to a control signal. To avoid over-boosting at low altitudes, the wastegate is wide open and turbine speed is almost zero. As altitude increases and atmospheric pressure decreases, the wastegate gradually closes to send more exhaust energy to the turbine, spinning it faster to make more boost pressure.

On road engines that operate at varying speeds, the wastegate is used in a different manner, primarily to limit boost pressure according to engine speed and load. Boost is needed throughout the engine’s speed range, but most especially just above idle. As engine speed and intake manifold pressure increase, the pressure acts against a spring-loaded diaphragm. At a pre-set pressure, the diaphragm pushes a rod that opens the wastegate. It’s simple, reliable and easily applied to different engine/turbocharger combinations. Using electronic controls with sensors and actuators, the wastegate can also be operated by the Powertrain Control Module (PCM) to manage the boost over a wider speed range. But there are limits.

Even with electronic controls, a wastegate limits boost by controlling the volume of exhaust gas flowing through the turbine. This is okay for shaping the engine’s power curve, but today’s engines must also meet strict new emissions regulations. A different kind of boost control is needed. Could a variable-geometry turbocharger be the answer to the engineers’ desire to meet the new emissions regulations?



Up on a pedestal (and rightfully so), this Holset HE351 VGT is the key to managing intake air pressure for economy, power and emissions.

Emission Control

Diesel engines are now equipped with Exhaust Gas Recirculation (EGR), which is used to control Nitrogen

Oxide (NOx) emissions. In sunlight, NOx becomes ground-level ozone, aka smog. NOx is formed when nitrogen and oxygen combine chemically. Even though air is made up of 78 percent nitrogen and 21 percent oxygen, it’s a simple mixture of gasses, not a chemical compound. The molecules can only combine chemically when combustion (oxidation) takes place under pressure, such as in an engine.

NOx can be reduced by controlling peak temperature in the combustion chamber. It can also be reduced by making sure there’s no extra oxygen in the chamber after combustion. Since a Diesel combustion chamber contains a lot of excess oxygen (and we’re stuffing in even more with a turbocharger; see the sidebar to understand why), EGR flow in a Diesel must be much higher than in a gasoline engine to be effective at controlling NOx. TDR has covered the emissions story since our first issue back in 1993. The most recent coverage of emissions regulations is in Issue 49.

The exhaust gas for EGR is taken from the exhaust manifold before it reaches the turbocharger. To make sure the exhaust flows towards the intake manifold, pressure in the exhaust manifold must always be higher. This requires extremely precise control, because if too much exhaust gas is recirculated, there won’t be enough oxygen in the combustion chamber to burn all the fuel, and particulate emissions (soot) increase. It’s a fine balance.

To manage both manifold pressure and exhaust backpressure across the engine’s entire operating range, the Holset turbocharger on the Cummins 6.7-liter engine has a Variable Geometry Turbine (VGT). Instead of controlling exhaust gas *flow volume*, the VGT controls exhaust gas *pressure* in the turbine housing. At low engine speeds when exhaust flow is low, the flow from the turbine housing to the blades on the turbine wheel is restricted. This increases backpressure in the exhaust manifold, which increases the pressure of the exhaust gas striking the turbine blades. This makes the turbine spin faster at low exhaust flow. It’s the same principle as putting your thumb over a garden hose; flow may decrease a little but pressure increases a lot.

As engine speed increases, so does exhaust flow, so the restriction is opened to reduce backpressure in the exhaust manifold. By reading a turbine speed sensor and pressure sensors in both manifolds, the PCM can adjust the restriction quickly to control backpressure and boost at any speed or load. Some versions of the Holset VGT turbocharger also have a wastegate to limit maximum boost pressure.

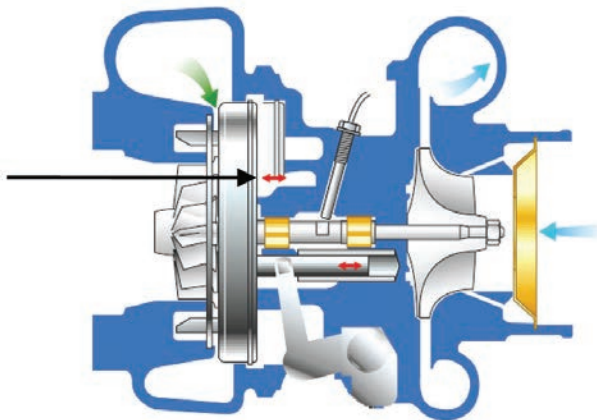
Simple and Direct

Compared to a wastegate, or even an electronically controlled wastegate, the VGT is a complex piece of machinery. The restriction device is in the collector ring of the exhaust turbine housing. That means there are moving parts in the hottest, dirtiest part of the turbocharger. Early models suffered soot-related seizure, proving that keeping things moving properly requires advanced materials, extremely precise engineering and sophisticated controls.

Precision is easier when the machine is simple: to that end the Holset VGT has only one moving part in the turbine's hot section. It is a high-temperature alloy sleeve with vanes at one end, and it moves axially, parallel to the turbine shaft. When the sleeve is fully retracted, exhaust gas flows freely from the exhaust collector through the turbine wheel. When fully extended, the vanes block off the exhaust flow. This creates exhaust back pressure (the exhaust cannot escape) and the turbo acts like an exhaust brake.

The sleeve is operated by an electronically-controlled brushless motor, so the sleeve position is infinitely variable. This provides the critical feature of the VGT turbocharger: infinite and continuous control at any engine speed/load. The motor and electronic controls are in a housing mounted on the center section of the turbocharger housing. To help deal with the heat, coolant is circulated through part of the motor/control housing, but truly advanced electronics are required to withstand that kind of heat and vibration. The following pictorial will, literally, show you how the HE351 VGT operates.

The Holset Variable Geometry Turbocharger



In this picture the vane is closed. Exhaust gas flow is restricted and, thus, the turbocharger is acting like an exhaust brake. Allow the vane to move to the right and the exhaust gas flow is "full-on" allowing the turbine (exhaust) blades of the turbocharger to spin faster and create more boost.



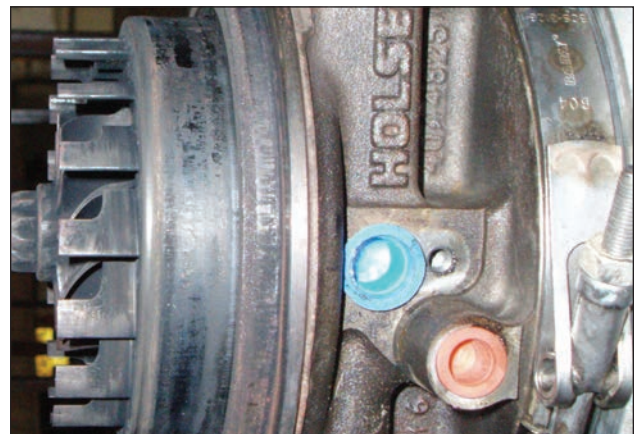
The motor is below this circuit board inside the motor housing. The visible gear engages a position sensor that sends information to the engine control computer. The electronics remain accurate over a 300-degree temperature range, but additional cooling is needed for this application.



The gear rack on the left connects to the linkage that moves the vane sleeve. The two holes to the right of the gear are coolant passages.



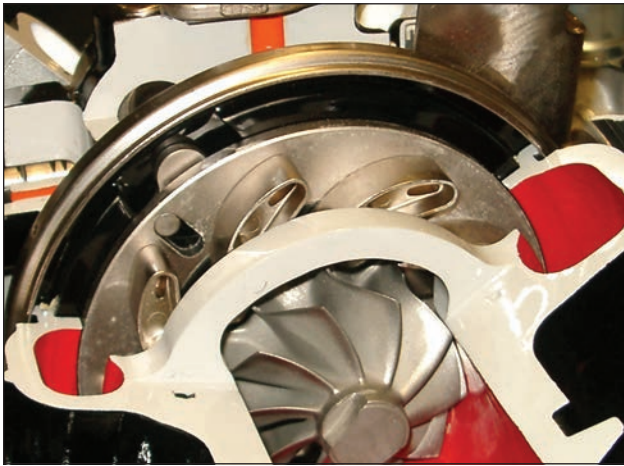
With the sleeve totally fully retracted, the vanes are open to exhaust flow. Exhaust flows freely and the pressure on the turbine blades builds intake air boost/pressure.



With the sleeve fully extended, the vanes are closed to exhaust flow. This creates exhaust gas back pressure (the exhaust cannot escape) and the turbo acts like an exhaust brake.

Other Methods Work Too

The Honeywell/Garrett turbo on the Ford PowerStroke engine is another example of a variable geometry turbocharger. Called the Variable Nozzle Turbine™ (VNT), it was introduced along with cooled EGR to help the 6.0-liter engine meet 2004 NOx emission standards. It operates on the same principal as the Holset VGT, but instead of moving axially, the vanes rotate like slats in a window blind to open and close the flow area. A pin in the center of each vane fits into the turbine housing, and each vane pivots around this pin. Behind the vanes is a plate with slots, and a pin on the end of each vane projects into a slot. When the plate rotates, it causes the vanes to pivot. The plate is rotated by a crank that's operated by a control piston and oil pressure.



On this Ford turbocharger, the vanes are pinned to the (white) turbine housing. When the plate behind the vanes rotates, the vanes pivot around the pins like slats in a window blind. Note the slot for the crank; the plate rotates only a few degrees.

In addition to controlling the exhaust gas energy acting on the turbine wheel, this system also controls backpressure in the exhaust manifold. With the right software, it can also be used as an exhaust brake.

As noted before, road-going engines work best with a small high-speed turbocharger that spools up quickly to generate boost anywhere above idle rpm. But the turbo also has to be big enough to provide boost at full load. The Honeywell Dual Boost turbocharger on Ford's new 6.7-liter Diesel engine has an interesting solution. In addition to the variable nozzle turbine, it also has what they call a single-sequential compressor. Two sets of compressor blades are cast back-to-back on the same shaft, and each set spins in its own inlet housing. The name is somewhat of a misnomer, because the air from both compressors is fed to the same outlet housing, effectively adding their volumes together at the same time rather than in sequence. Maximum boost pressure is about 30 psi at 150,000 rpm, which is not difficult to achieve with a single compressor wheel, but this double-sided compressor wheel has a much smaller diameter. A smaller compressor spins up quickly, so boost builds almost instantly when the driver presses the accelerator pedal.



The Dual Boost turbo has a set of blades on each side of the compressor wheel, each set spinning in its own inlet housing, but feeding air to the same outlet housing.



The upper and lower openings are both compressor inlets, the tube pointing to the right sends the output of both compressor wheels to the intercooler.

General Motors also began fitting the Garrett VNT™ Turbocharger to the 6.6-liter Duramax engine to meet emissions regulations in the 2004 model year. Compared with the Holset VGT, the Garrett VNT™ has more moving parts in the turbo's hot section. However the control system is much simpler; oil pressure moves a piston that operates the crank that rotates the vane positioning plate. Oil pressure on the piston is precisely controlled with a pulse-width-modulated solenoid valve. Although this valve is mounted directly on the housing, it's far more tolerant of extreme temperatures than the Holset's control motor and electronics, so no additional cooling is needed.

Living With a Turbocharged Engine

Proper lubrication is critical to so many parts of the engine, but nothing in the engine must survive as much heat or

move as fast as the turbocharger. Anything that impedes the flow of clean, cool and correct oil to that bearing will impact the service life of the turbocharger. Of course cool is a relative term, but if there's an oil temperature gauge in your truck, know that the turbocharger is the first thing to suffer if the temperature stays higher than normal for an extended period.

While oil has changed a lot in recent years, the definition of the correct oil hasn't really changed at all. There are good reasons to think one oil performs better than another, but there's only one oil that's been subjected to lab testing by the manufacturer, and that's the factory-fill, manufacturer-recommended oil. According to Cummins, the 6.7-liter Turbo Diesel engine requires low-ash oil because it is equipped with exhaust after-treatment equipment. The oil must meet CES 20081 standards and have a maximum of one percent by mass of sulfated ash. While this oil is specifically engineered to prevent damage to the catalytic converters, as we'll see in a moment, that's just as important to turbocharger life.

At high loads the turbocharger can get hot. Excess heat cooks the oil in the bearing housing to a hard carbon deposit that restricts oil passages. Holset recommends idling the engine for two or three minutes before shutdown to circulate coolant and oil through the bearing housing. Some owners idle longer because turbine housing temperature actually increases immediately after shutdown.

Holset also recommends allowing the engine to idle for one minute after a cold start, just to make sure of proper lubrication before asking the turbo to go to work.

Excess idling causes different problems. Holset says idling more than about 20 minutes can cause oil mist to leak past the shaft seals into the turbine and compressor housings. Although no real harm is done to the turbocharger, as load and temperatures increase, the oil will start to cook and cause blue smoke. On engines with EGR and a Diesel Particulate Filter (DPF), burning oil can clog the DPF, generating higher exhaust backpressure and therefore, higher EGR flow. This will send soot into the whole air intake system, resulting in a clogged turbocharger. Repairs can be expensive, and Chrysler has issued several service bulletins (11-001-09, 11-001-08, 11-002-08) that describe "desoot" procedures. On some models, the procedure can be done with the vehicle not moving, but others require driving the truck, and all require a scan tool to command the desoot process.

Fuel quality also has an influence on soot formation. While the problem should be all but eliminated since ultra low-sulfur fuel was mandated back in January 2007, some fleets that use off-road fuel (intended for construction equipment, etc) in their on-road trucks have traced failed turbochargers and clogged DPFs to misfueling.

The Future is Variable

Variable Geometry Turbochargers were originally developed for gasoline engines in the late 1980s. Again, the moving parts are in the hottest part of the turbocharger, so the advanced materials and precision engineering needed to keep things moving smoothly make VGTs expensive. But the ability to control boost and exhaust backpressure separately from engine speed and load is the only way to meet today's Diesel emissions standards, so it looks like their time has come. We can expect to see VGT turbochargers on a wider range of engines over the next decade, especially on small engines from Europe. There's even talk of using them on small gasoline engines too, but that market would (at least initially) be limited to high-priced models.

The Variable Geometry Turbine is the most significant advance in turbocharger technology in the past 100 years. It has added a whole new dimension to engine management strategy, and although it's been around for 20 years, for engineers and tuners who understand the possibilities, the fun is just getting started.

Jacques Gordon
TDR Writer

SIDEBAR

Fuel must be mixed with air to burn. If there is not enough air to burn all the fuel, that's called a rich mixture. In a lean mixture, there will be air left over after all the fuel burns. The perfect mixture, the one that produces the most power and the least amount of pollution, will have just enough air to burn all the fuel.

When fuel is injected into a Diesel combustion chamber, each droplet of fuel burns the moment it comes into physical contact with oxygen in the air. However, most of the air in that chamber is far away from the fuel injector, and each successive droplet of fuel will travel farther into the chamber before it finds oxygen. This creates local areas of rich air/fuel mixture, while the mixture in most of the combustion chamber is lean.

The chamber's shape, injector spray pattern, injection pressure and a few other factors all have an influence on air/fuel mixing, but a perfectly even mixture throughout the chamber has only been achieved in laboratory engines. To avoid making smoke instead of power, Diesel engines run lean.

While the air/fuel mixture in the chamber is uneven, the density of the air is the same everywhere in the chamber. If we increase that density by stuffing in more air with a turbocharger, there is more oxygen close to the injector, so we can burn more fuel and make more power.

Jacques Gordon
TDR Writer

CUMMINS ENGINE LUBE OIL QUESTIONS

ISSUE 84 – IDLE CLATTER

by Robert Patton

As we have mentioned, the 2013 and newer Heavy Duty 2500-5500 Cummins-powered trucks come from the factory with a fill of 5W-40 synthetic diesel rated engine oil (API CJ-4 specification). Oil additions and changes should be made using this lubricant or 15W-40 petroleum based oils. Your Owner's Manual clearly spells this out.

So, here is the obvious question: (Actually, it is close to a \$2 million, or more, dollar question. The math: 150,000 engines per year; three gallons of lube oil at a cost estimate of \$4/gallon premium for a synthetic oil $150,000 \times 3 \times \$4 = \$1,800,000$.) Why is the factory fill a 5W-40 synthetic?

Answer, Chrysler's cold start testing criteria dictates that 5W-40 be used. I wish I could tell you how Chrysler's test relates to the requirement at Ford, Chevy, Mercedes-Benz, BMW, Audi, etc., but I do not know. Let's simply enjoy the fact that your 2013-newer truck has the synthetic 5W-40 lube oil.

The next obvious question: do I have to continue with 5W-40 synthetic. The short answer, no. Documentation for this response is, again, found in your Owner's Manual. Quoting from the 2014 book:

"In ambient temperatures *above* 0°F, we recommend you use 15W-40 engine oil such as Mopar, Shell Rotella and Shell Rimula that meets Chrysler Materials Standard MS-10902 and the API CJ-4 engine oil category is required. Products meeting Cummins CES 20081 may also be used. The identification of these engine oils is typically located on the back of the oil container.

"In ambient temperatures *below* 0°F, we recommend you use 5W-40 *synthetic* engine oil such as Mopar, Shell Rotella and Shell Rimula that meets Chrysler Materials Standard MS-10902 and the API CJ-4 engine oil category is required."

For what it is worth, the 2012 and 2013 books had this extra little diddy: "Failure to use SAE 5W-40 synthetic engine oil in ambient temperatures below 0°F could result in severe engine damage."

This leads to question number three: What do I recommend on lube oils? For the answer to this I'm going to leave it to the experts and to you to do some research. TDR writer and oil guru John Martin did an article on the new CJ-4 lube oils in TDR Issue 77. One takeaway from Martin's article (and the editor's response, too) is to find a mineral-based 15W-40 that meets the CJ specification and then purchase and use the least expensive oil that you can find. Cheapskates! Change the oil based on your Owner's Manual/EVIC recommendation. For me, I'll stick with the 5W-40 synthetic, CJ specification oil.

Some owners have called wishing to know if the initial fill of engine oil should be run for a full oil change interval, or should it be changed early? Answer: Cummins recommends using the oil for a full oil change interval. The computer EVIC display will tell you when it is time for an oil change based on driving conditions.

Along with engine oil, use of the proper oil filter is essential. Your writer personally recommends the Fleetguard Stratapore oil filters for all model years of Cummins diesel engines. The complete story on lube filters is found in TDR Issue 71, pages 60-67. Fleetguard's Stratapore filter (LF16035) uses a synthetic filter media that is typically \$4-5 higher than the Fleetguard LF3972 or Mopar M285 (same filter, different paint on the outer shell) filters that are paper cellulose media. These filters (Stratapore or standard-type) are available in the Geno's Garage catalog at competitive prices, and at any Cummins distributor. They really are superior in quality and filtration against other brands, thus helping to make your engine last longer.



Here is a photo from Issue 71 showing writer Jim Martin's two favorites – the Fleetguard and Wix filters that use StrataPore filter media.

LUBE OIL UPDATE

ISSUE 76 – TECHNICAL TOPICS

by Robert Patton and John Martin

A New Inquiry

Last October I received an e-mail from TDR member Desmond Rees:

I am looking for supplemental information following up John Martin's article from Issue 57 on engine oil. The August 2007 article is somewhat dated. With the switch to the new API requirements for EGR/DPF diesel engines, are there plans to revisit this topic regarding the best engine oils meeting the API CJ-4 requirement? John's article only looked at a handful of the CJ-4 oils and they ranked at the bottom of the pile when compared to the previous generation of oils. Thanks.

Desmond Rees

My response: Prior to Desmond's letter, there were no plans to revisit the topic. However, it has been five years and oils do change. I will purchase and test the CJ oils and John can comment on the data. We will see if John's previous conclusion holds: "If it meets a spec, it becomes a commodity. Low price can be the purchase criteria. Change the oil based on the Owner's Manual recommendations."

Thanks to Desmond for the letter.

Background Information

It seems like just yesterday that I met lube oil expert John Martin and we collaborated on a series of articles about lube oils.

Ouch! As Desmond reminded me, "yesterday" was Issue 54 of the TDR, which was published in December of 2006. The four-part series that we wrote took a year to complete.

The reason behind the year-long series of articles was the forthcoming change from lube oil category CI+4 (an industry specification that was implemented in 2002) to the new category CJ. The CJ formula of oil was developed for the lower diesel exhaust emissions engines that were being implemented starting 1/1/2007.

I wondered how the lube oil would change. John Martin was the guy to tell me. (More about John in just a minute.)

In a lengthy telephone conversation he shared his opinion about the forthcoming CJ lube oil specification. Bottom line: John felt that the CI+4 oils were some of the best to come out of the respective refineries. In his discussions with those in the oil business, he had formed the opinion that the new CJ oils would not necessarily be new-and-improved.

As I noted, the CJ formula was developed for the new lower emissions diesel engines. From John I understood that the CJ oil would not necessarily be new-and-improved. Without analysis of the lube oils, I asked John what were the proposed changes from the highly acclaimed CI+4 to the new CJ oils. His response: "Robert, this is a lengthy topic, but it is very important for the audience to understand what is happening in the oil business." So, I looked back to Issue 54 and made a couple of tweaks to its contents. The following is the updated text that gives you the insight that you need to understand the CI+4 to CJ change.

A Little Lube Oil History

Before we talk about what the additive industry and the oil companies have done to meet the EPA's latest directive, we need a brief lube oil history lesson. Years ago diesels were operated on refined crude oils containing virtually no additive chemistry. As power density increased oil companies found they needed to add specific chemical compounds to the oil to provide performance attributes that crude oils couldn't deliver. The additive industry was born.

Traditionally, each new diesel engine oil specification was issued because available oils couldn't provide the lube oil performance needed. For example, API CE was issued to create oils which solved an oil consumption problem in Cummins NTC-400 engines. For fifty years each new diesel engine oil specification meant a better performing diesel engine oil was available—all the way from API CD to API CI+4.

Today diesel engine oils look like the example shown in figure 1. From 20 to 30% of modern diesel engine oil is additives designed to improve performance in key areas. These additives are carefully engineered mixtures of compounds formulated to pass the various diesel engine tests which define a new lube oil specification like the CI+4 or the new CJ.

Typical Diesel Oil Composition



Base Oils:	69-80%
Performance Package	15-20%
Viscosity Modifier:	5-10%
Pour Point Depressant	0-1%

Pour point depressants are used to keep the oil fluid at very low temperatures. (They inhibit wax crystal formation.) Viscosity modifiers are used to make the oil thin out less as it is heated. This makes an oil which we call "Multigrade" and it simply means the multigrade oil acts like a thinner oil at low temperatures and a thicker oil at high temperatures. Multigrade diesel engine oils were a key part of the solution to the excessive oil consumption problem addressed by API formulation CE.

The performance additive package (see figure 2) is a mixture of 8-12 specialty chemicals, each of which is intended to impart specific properties to the oil's performance. The important thing to remember here is that most additive chemicals (particularly detergents) deplete or wear out in service. This is one of the reasons why the oil must be changed. Life was good.

Typical Diesel Oil Performance Package	
<ul style="list-style-type: none"> • Detergents Neutralize Combustion Acids Minimize Wear Inhibit Rust Formation Oxidation Inhibitor 	<ul style="list-style-type: none"> • Oxidation Inhibitors Retard Oil Decomposition Slow Deposit Formation
<ul style="list-style-type: none"> • Dispersants Prevent Agglomeration of Soot Particles Suspend Contaminants in Oil 	<ul style="list-style-type: none"> • Anti-Wear Agents Create Sacrificial Film Between Metal Parts Minimize Valve Train Wear • Foam Inhibitors Prevent Oil Foaming

What Did the EPA Do To Us/Why Do We Need CJ-4 Oils?

First, let's discuss why this new oil was developed. The EPA tightened their exhaust emissions thumbscrew on diesel engines starting January 1, 2007, to reduce particulate matter (PM) and oxides of Nitrogen (NO_x) emissions even further. To meet those requirements most diesel engine manufacturers resorted to the use of diesel particulate filters (DPFs). A DPF differs from the catalytic converters we have used for years on gasoline engines in that a DPF actually filters the *entire* diesel exhaust stream.

On the surface you wouldn't think this would be a big deal—Europeans have been using DPFs for years. The difference is that Europeans don't accumulate mileage like Americans and they will tolerate much more frequent service intervals. Our EPA has decreed that the new DPFs must go 150,000 miles before needing removal for cleaning. This means the soot collected in the DPF must be burned off in the exhaust system frequently if trap life is to exceed 150,000 miles without removal and cleaning.

Now, don't take me wrong—I'm for a cleaner environment like everyone else is. The problem with the EPA is that they just decree which emissions will be reduced without once considering the cost, the technology needed or its effect on your operation. They refer to that as "Technology Forcing Legislation." In the case of diesel engine oils, the EPA forced the adoption of a low-sulfate ash, phosphorus, and sulfur (low SAPS) oil whose technology hasn't yet been proven extensively in the field.

I don't have to tell you that diesel exhaust is relatively dirty. It consists of lots of soot (That's what turns your oil black!) and unburned residues from both the fuel and the oil. Sulfur in the fuel can significantly hamper DPF performance. That's why the ultra low sulfur diesel (ULSD) fuel was implemented 1/1/2007. Phosphorus and sulfur in the lube oil can shorten DPF cleaning intervals considerably. Phosphorus (P) can "glaze over" and plug the tiny holes in the DPF, making the openings effectively smaller and quicker to plug. Sulfur (S) can "mask" the DPF, making it temporarily less effective. Sulfated Ash (SA) in the lube is thought to build up deposits on the DPF over time. These deposits that originate from diesel fuel and lube oil then make the DPF effectively smaller and quicker to plug.

What does this mean to you?

Low P means the Feds placed a limit on the amount of Zincdithiophosphate (ZDP) additive which can be utilized. ZDP is the most effective oxidation inhibitor and anti-wear agent currently available. Additive manufacturers are now forced to use more expensive and less effective ashless oxidation inhibitors and anti-wear agents.

Low S means the new oils can't rely on some of the least expensive Sulfur-based oxidation inhibitors used in the past. And, once again, many of the new ashless oxidation inhibitors haven't been thoroughly field proven in heavily loaded trucks. Low S also means more highly refined base oils, which is a positive thing. Average base oil quality is now significantly improved.

Low SA (less than 1 percent weight) effectively places a limit on the amount of detergent which can be used in these oils. But diesels love detergents. In over 25 years of inspecting various diesel engines in the field, I've yet to see one which didn't perform better on oils with higher levels of detergency.

So, What Oil Should I use?

If you have a diesel engine equipped with a DPF, you should probably use API CJ-4 oils. You really don't have a choice unless you want to clean your particulate trap more frequently. Pay particular attention to oil change intervals.

I know that the major oil marketers are telling their customers that CJ-4 oils are backward compatible (you can use them in pre-2007 engines), and that is somewhat true. But if you use less detergent in an oil, your oil change interval should be shortened accordingly. Oil marketers don't care if you have to change your oil more frequently—in fact, they love it! Remember oil companies are really in the business of moving as much base oil as possible. They love short oil change intervals.

In closing, remember to change your oil as frequently as possible, so we all can generate some more profits for those poor oil companies.

John R. Martin
TDR Writer

More About the Previous Series of Articles

Way back in Issue 54 I asked John how we might test the CI-4 oils and the new CJs. His response: “That’s easy: You spend the \$25 for a complete oil sample evaluation. Be sure the test includes total base number (TBN) and viscosity—and send me the results. Don’t tell me what is what. Let’s see if there is an obvious difference and let’s see who makes the best lube oil(s). Who knows what we will find. Will purchasing a lube oil be as easy as purchasing a commodity? You know, as long as it meets a specification then it is ‘good,’ therefore you can shop for your lube oil based on price.”

Answers to these questions gave me the basis for an excellent article. So, the oil analysis kits were purchased, \$25 x 22 kits (\$550) and I went on a shopping spree for oil, \$15 x 22 oils (\$330). A cool \$880, just so John and Robert would know about lube oils.

Earlier I stated that John was the oil expert. Prior to retirement he was an engineer at Lubrizol, one of the companies that makes and sells the additive packages to the oil manufacturers. And, at John’s stage in life, he was/is not beholden to anyone in the industry.

So, what conclusions could one draw from the year-long Martin and Patton examination of 22 different diesel lube oils? I’ve talked to many TDR members about the series of articles and each one has shared with me their own unique conclusion. Didn’t we all read the same article?

I have often stated that, “changing a person’s opinion about lube oils is like trying to change their opinion about religion. It is not going to happen.” My take-away from the year long, \$880 expenditure (oops... perhaps John Martin has brainwashed me) is as follows:

Back in 1999, it took a series of oil analyses samples before I was comfortable changing my 3,000 mile change-the-lube-oil/guy-on-TV mentality. Then again, it took a series of 22 oil samples to change my mentality concerning lube oil by brand name versus lube oil as a commodity.

I’m on the same page as John Martin; if it meets the specification you can purchase oil like a commodity. Change the oil based on the Owner’s Manual recommendations.

LUBE OILS – VERSION 2012

Questions for 2012

So, the long answer to Desmond Rees has thus far taken 2.5 pages! However, I felt the background data was necessary before we just jumped into “Lube Oils—Version 2012.” The following are the questions I wanted John to help me answer:

Q1 Could I find the good stuff, an old CI-4 specification oil?

Q3 Who has the best “John Martin” oil for 2012?

Q2 How would the CJ-4 oils blended today compare with the same oil that we sampled back in the summer of 2007?

Q4 What has changed in the world of John Martin in these past five years?

The Oil Analysis for 2012

As mentioned, back in 2007 we tested 22 different brands of lube oils: everything from Amsoil to Walmart; Caterpillar to John Deere; Red Line to Liqui Moly. The prices ranged from low of Walmart’s Super Tech at \$7.68 per gallon to the high of Red Line Diesel Synthetic at \$35 per gallon. If you want the complete list of CI-4 plus and CJ-4 oils that were tested you’ll want to look back at Issue 58, pages 52 and 53.

Why 22 oils back then and only 10 oils for 2012? Remember my comment about lube oils, religion and the change of opinion? Well, my opinion has been changed! How so? A look back at Issue 56 gives you some insight into my mindset prior to the testing of the 22 lube oils. Here is the recap:

“When new lube oil is analyzed you can get a good idea of the quality of the additive package that, as learned from Martin’s experience, makes up 20–25% of the lube oil blend. Maintaining viscosity at higher temperatures, maintaining high alkalinity (total base number); and protecting against wear with the right blend of molybdenum, zinc, phosphorus and boron are important lube oil attributes. Readings for calcium are a way to measure dispersion detergency.

“In the blind-sampling-from-the-bottle done by Trailer Life magazine in January 2005, I was greatly disappointed to see that Walmart Super Tech 15W40 diesel oil stood toe-to-toe with other very respected brand names.

“Why disappointment? First, consider what John Martin said, ‘Consequently there is less and less difference between engine oil that barely passes the API certification test and one that is designed to pass by a significant margin. Therefore, oils meeting a given performance spec are approaching commodity status.’

“Second, I am not a big fan of Walmart. I could go into a long tirade, but I will refrain.

“Third, for all of my vehicle ownership years (let’s see, that is about 37 years) had I been duped? Had I fallen for the marketing hype? I did not want to believe that lube oil is just a commodity. Yet the Trailer Life grid did not lie.”

What story did the forthcoming TDR grid tell?

*Had I fallen for the marketing hype?
I did not want to believe that
lube oil is just a commodity*

The previous 22 brand oil test did give me an education. For 2012 I did not feel the need to test every lube oil in the marketplace. As a matter of fact, I only went to two places for the various oils, Autozone (where each oil was priced at \$17.99) and Walmart. The following is the blind sampling data:

Sample Description	Viscosity @ 100°	TBN	Calcium	Magnesium	Phosphorus	Zinc	Boron	Molybdenum
1	14.1	8.84	1050	777	975	1110	82	0
2	15.5	8.17	2183	9	1053	1152	3	1
3	15.1	8.69	1135	783	1020	1172	0	40
4	14.7	9.27	1299	837	941	1069	64	48
5	16.5	8.19	1412	395	1084	1250	503	89
6	15.5	9.15	1171	970	1088	1202	0	43
7	15.0	9.03	2209	10	1039	1156	35	0
8	15.1	9.09	2305	10	1077	1169	58	0
9	15.5	8.7	1134	787	1017	1169	0	40
10	14.3	9.22	770	1119	994	1171	60	58

Product Identification Chart			
Item	Product	Viscosity	Price
1	Mobil 1 (Syn)	5W40	\$26.33
2	Motorcraft	15W40	20.99
3	Walmart	15W40	10.97
4	Mobil Delvac	15W40	17.99
5	Chevron Delo	15W40	17.99
6	Valvoline	15W40	17.99
7	Shell Rotella	15W40	17.99
8	Castrol Tecton	15W40	17.99
9	Warren	15W40	14.99
10	Shell Rotella (Syn)	5W40	27.99

And now, the answers for Lube Oils – Version 2012:

A1) I could not find any CI-4 lube oil.

A2) I'll turn this answer over to John Martin. John's response:

Robert and TDR audience, remember my often-used statement, "Diesels Love Detergents"? It appears from the oil analysis data that Samples 4, 5, 6, 7, 8, and 10 all have total base numbers (TBN) in excess of 9, which suggests to me that these oil marketers are trying to provide as much TBN as possible given the 1.0% weight sulfated ash limitation imposed by the API CJ-4 specification. They are doing this to satisfy those fleets whose oil change intervals are based on TBN depletion.

Samples 2 and 5 have the least amount of detergency of the oils tested. Sample 5 uses either a borated detergent or a boron-containing oxidation inhibitor. Borated detergents are thought by some to be more effective than traditional detergents. It is also possible that data in the last two columns for sample 5 has been transposed. (*Editor's note: the 503 and 89 numbers are as printed by the lab.*)

My field test experience has taught me that calcium (Ca) detergents are more effective than magnesium (Mg) detergents, so, to answer question 2, "Who has the best oil for 2012?" I think oils 7 and 8 would be the best of the oils you surveyed. Oils 4, 6, and 10 also have high TBN values for CJ-4 oils, but they depend heavily on magnesium detergents, so I don't think they would yield diesel performance as good as oils 7 and 8.

Oils 1, 4, 5, 7, 8, and 10 all contain boron, but I'm certain that the additive chemistry in sample 5 is different than the others (or the last two columns of data for sample 5 have been transposed). Boron oxidation inhibitors are evidently being utilized to improve the high temperature performance of these CJ-4 oils.

Now, if you allow me to look at the number-to-product identification report I can tell you that oil 5 has been completely reformulated, and I know why. Chevron Delo 400 is the most widely used oil in big trucking fleets. When CJ-4 came about, fleet operators told Chevron they preferred the old CI-4 oil, particularly when they found out that Chevron was going to ask more money for their CJ-4 oil. Neither Chevron nor the fleets would budge off their positions, and big marketers like Chevron only want one oil in their distribution systems. Chevron went back to the drawing board, reformulated, and retested until they could pass the API CI-4 tests with a CJ-4 oil. Then they dropped both earlier oils out of their systems and offered only the new, improved CJ-4 oil. I wonder if the big fleets paid them more money for the new oil?

Mobil and Shell also supply a lot of oil to truckers. If you compare sample 1 (a consumer oil, Mobil 1 synthetic) with sample 4 ((Mobil Delvac) you can see that Mobil added more detergency to oil 4 (Ca and Mg) to give their big fleets increased TBN and keep them happy. Fleets wouldn't use the Mobil oil in Sample 1. The Shell samples (7 and 10) are also very interesting. Shell is using different additive chemistry in their 15W40 (Rotella mineral, sample 7) than in their 5W40 (Rotella synthetic, sample 10). I'm guessing that the big fleets are mostly purchasing oil 7. I do not know why the chemistry is so different in oil 10, other than perhaps another additive supplier was able to pass the tests, allowing Shell to get the credentials they desired.

So, once again, my picks are oils 7 and 8. If you religiously adhere to your manufacturer's recommended oil change intervals, oil 3 would be the best performer on a cost per mile basis. Oils 1, 2, and 10 offer the highest cost per mile, so I would avoid them altogether.

A3) Now, let's compare the 2007 oils to the 2012 oils. I asked Robert to save you from going back to Issue 58 and present a comparison chart for you.

The CJ-4 Lube Oils Tested in Issue 58 were:

Shell Rotella T	15W40
Castrol Tecton	15W40
Chevron Delo 400 LE	15W40
Cummins/Valvoline Premium Blue	15W40

The following chart gives you the “Then and Now” candidates:

Price	Description	Viscosity @ 100°	TBN	Calcium	Magnesium	Phosphorus	Zinc	Boron	Molybdenum
\$10.96	Shell Rotella T	15.7	8.77	2488	8	1108	1147	37	2
17.99	Same 2012	15.0	9.03	2209	10	1039	1156	35	0
10.80	Castrol Tecton	14.7	7.74	2011	6	876	1035	0	0
17.99	Same 2012	15.1	9.09	2305	10	1077	1169	58	0
12.99	Chevron Delo 400 LE	15.7	7.82	1593	416	1156	1268	83	570
17.99	Same 2012	16.5	8.19	1412	395	1084	1250	503	89
9.98	Cummins/Valvoline	15.6	8.42	1109	827	994	1041	0	41
17.99	Same 2012	15.5	9.15	1171	970	1088	1202	0	43

Now, to compare the 2012 results to the 2007 table, it appears that Shell has dropped their ZDP content by 10% in oil 7. Before interpreting data from this type of analysis remember that repeatability of these numbers is no better than 10%. Looking at the data in that light, two things could have happened in the last five years. Either the ZDP level could have been dropped 10% to enable Shell’s additive supplier to put more detergent in the oil to increase TBN levels, or the data is on the outer edge of the repeatability limits. When comparing today’s Shell oils, it looks to me like Shell may be using a different ZDP than they did in 2007.

But, audience, did you notice from your 2007 to 2012 comparative data that all of the oils cost more in 2012? Whether or not the oil marketer changed his initial CJ-4 formulation, he has managed to use the new credentials as a vehicle to raise the selling price of their oils significantly. As I said before, I don’t know if oil marketers are getting more for their CJ-4 oils at major fleets, but they are certainly getting more from retail consumers. **(Editor’s note: I looked back to November 2007 and a barrel of crude oil was \$88, today it is \$106.)** You and I get to pay for everything!

A4) What has changed in John Martin’s world in the last five years?

For one thing, I spend much more time researching alternate fuels than diesel lube oils these days. Everyone wants to just jump into the future, be green and reduce our dependence on foreign sources of crude oil without even considering what these moves will do to the poor people who design the vehicles and systems that will have to make that happen.

For example, the public is finally beginning to discover that corn-based ethanol containing fuels (one of the worst jokes of the modern era) are actually worse than gasoline regarding greenhouse gas (GHG) emissions. It has taken the do-gooders billions of our tax dollars to discover what they’ve been told long ago by

fuels researchers. The California Air Resources Board (CARB), a bastion of the most radical environmentalists in the world, has actually had their low carbon fuel standard (LCFS) overturned by a Federal judge.

Secondly, remember how the do-gooders tell us we should all be driving the Toyota Prius (Pious)? The latest GHG emissions research has shown that power plants are responsible for more GHG emissions than transportation vehicles. Where did the do-gooders think that electricity was coming from? Was it magic? Left-wing environmentalists never let facts get in the way of a good story. These are the same radicals who are currently stalling the Keystone pipeline project which could bring much needed crude oil from the North to refineries on the Gulf Coast. After the OPEC countries, China, and Hugo Chavez purchase all that valuable Canadian crude, we will decide to build the pipeline. Our environmentalists are getting to the point where they are very destructive. (My political rant is over. Don’t send the editor hate mail.)

Our next new diesel lube oil spec (currently called PC-11) will occur sometime around 2015. The Federal government recently decreed that diesel trucks must provide significantly better fuel economy by 2016. The Engine Manufacturers Association (EMA) has already asked the lube oil industry for some improved fuel economy (FE) oils by 2015 so they can be field tested prior to production. Since the major fuel economy differences are observed by lowering oil viscosity, expect to see some very thin (5W30, 5W20) diesel oils in 2015. Very thin oils probably won’t work well in current engines. (More about that in future TDR magazines?) This, too, won’t be as easy as the EPA activists think it will be, but, as long as your tax money will hold out, they will be asking you to finance this research.

John Martin
TDR Writer

ADD OIL HERE/PC-11 AND CK-4 UPDATE

ISSUE 83 – TDREVIEW

ADD OIL HERE by Robert Patton

Every now and then you'll stumble across an automotive writer that clicks with you. (See *Motojournalism Connection*, pages 4-7.) You find that their stories convey what you would say if you had their literary talent. Some of my favorite writers: the TDR's very own Greg Whale (all things automotive, Whale's "been there, done that"); Kevin Cameron (Kevin can make a nut and bolt into a fascinating story) and Mark Barnes (Mark's writings have reinforced that I'm not the only one that enjoys the solitude of a workshop); Peter Egan from *Road & Track* and *Cycle World* (Egan's writings can make a trip to the 7-11 store into an adventure); and Peter DeLorenzo from *Autoextremist.com* (his automotive rants/insights challenge the norm).

A quick story about Greg, Kevin, and Mark.

Back in the early days of the TDR (think 1994 for Greg Whale, 1996 for Kevin Cameron, 1998 for Mark Barnes) I was on the lookout for writers that could bring their insight to our new member/club organization. To reach these writers, I sent a request to their respective editors asking if I could contact them. As I have come to learn, automotive and freelance writing is not the glamor job you might envision, and the editors were willing to grant me access to these talented writers. After all, the TDR did not compete with the titles that Greg, Kevin or Mark were writing for. So, now you know the TDR writer story.

Oops, I'm a little off track.

I have here before me a story from *Cycle World* written by Egan that reminded me of the oil change woes that many of us have encountered with the 2013-and newer Turbo Diesel trucks. However, unlike the TDR's Donnelly, Roberts, Redmond or Langan that give you the steps to perform the task, Egan tells the oil change story of the average Joe, complete with a handful of mistakes.

Here are just a few excerpts from the story that will help me transition into a humorous story that was told to me by our very own Greg Whale.

Egan's original article in *Cycle World* was titled "Zen and the Art of the Oil Change." He starts the story with a long introduction and then a question from a *CW* reader:

"These days, a lot of younger, less experienced riders come up to me and say, 'Mr. Egan, you have an almost legendary reputation for being able to change the oil and filter on your motorcycles without spilling more than about 30 percent of the oil onto the garage floor or your own clothing. How the heck do you do it?'"

Next Egan gives the audience the step-by-step process that he used to tell this tale:

"Step 1: Place a 'suitable container' under the sump or oil reservoir—which, in the Buell's case, is in the hollow swingarm above the end of the muffler—and remove the plug. A stream of scalding hot oil will run down over the rear of the muffler and cascade into the pan, like Niagara Falls in a nightmare. Some will run down to the far end of the muffler and onto the floor. Or trickle warmly down your forearm and into your sleeve.

"Step 2: While oil is dripping from the drain hole and muffler, remove the small chin fairing and place another pan under the oil filter. Remove the filter with a web-type tool and stand back as oil from the engine and filter run over the front of the muffler and into the pan. Much of the oil will follow the bottom of the muffler and run onto the floor. Expect some to drip off the filter wrench onto your blue jeans. Accidentally drop the slippery, hot filter into the pan for a nice splash effect.

"Step 3: Carefully fill the new filter with oil, spilling hardly any at all, then screw it into the engine and put the drain plug back in. Here's where you give the drain pan an accidental kick so that a small tidal wave of oil flops onto the floor. Then refill the reservoir using a funnel with too small an opening so that it overflows immediately and burps oil onto the swingarm. Before putting the chin spoiler back on, use massive amounts of contact cleaner/degreaser to clean up the muffler and floor, along with ecologically friendly piles of oil-soaked paper towels.

"Step 4: Carry the main oil drain pan across the workshop and dump it down a large funnel into a disgustingly filthy, oil-streaked, red-plastic five-gallon gas can with the words 'DRAIN OIL' scrawled across it so people don't accidentally drink from it.

"Step 5: Check to make sure this can isn't already almost full. Otherwise, about two quarts of dirty drain oil will well up around the sides of the funnel and run onto the floor, as mine did. Expect some oil to run down the back side of the pouring spout on the drain pan and drip onto your running shoes.

"Step 6: Mop up the oil spill with more paper towels and wring them out over your drain pan. Clean the whole area with half a spray can of contact cleaner, but don't breathe any of the fumes. When everything is cleaned up, start the bike and check it for oil leaks. Mine was fine; not a sign of a drip.

“Step 7: Wipe your tools carefully, put them away and then go into the house. Throw all your clothes—including the running shoes—into the washer and then take a shower. Put on clean clothes and return to the workshop to have a beer and ponder the evening’s work. Now, you’re done.

Peter Egan
Cycle World



A “Zen” moment as the editor-dude changes the oil in his EcoDiesel. (Like it’s big brother, it holds almost three gallons.) The unattended drain bucket almost overflowed.

As mentioned, I wish I could tell a story like that. The best I can do is to add a footnote to his yarn. From TDR’s Greg Whale: “Dear Mr. Egan, please add steps 3a and 3b.

“3a: As you are pouring fresh oil into the engine make a note that the fresh oil (\$8/quart) is leaking from the location of the oil drain plug. Oops, it’s not leaking, it is pouring. STOP ADDING FRESH OIL!

“3b: Rush to install the oil drain plug.”

Now, in fairness to the folks at Cycle World and to Peter Egan, I have to give credit where the credit is due. You can find all of Egan’s books from his Cycle World days and from his Road & Track editorials by doing a quick search at Google for your favorite place to shop for books or go directly to Amazon.com.

The “Zen” quotes came from Egan’s book “Leanings 3: On the Road and in the Garage with Cycle World’s Peter Egan.

While you have your computer fired-up, take a few minutes to log onto www.cycleworld.com and start a new subscription! You’ll not be disappointed.

Enjoy Mr. Egan’s writing. Buy one (or all) of his books. Subscribe to Cycle World. I’m hopeful my endorsements prompt you to make a purchase. Again, some great reading material, you won’t be disappointed!

Robert Patton
TDR Staff

While we’re on the subject of lube oil...

The Motojournalism thing, combined with excerpts from Mr. Egan and Greg Whale tie-in give you a humorous look at the mundane oil change(s) that we all have to endure. I can only imagine those of you guilty of Steps 3a and 3b, myself included.

Now, let’s move on to the serious look at oil in the news, the new lube oil specifications that will be introduced in December. In the update that follows, our oil-guru, John Martin, tells us about the new CK-4 and FA-4 oils.

Robert Patton
TDR Staff

PC-11 UPDATE

or

You’re Getting Something Besides Red Socks for Christmas

by John Martin

If you readers will recall, I thoroughly discussed the upcoming new engine lube oil performance category, PC-11, in October of last year, TDR Issue 89. I mentioned that the API (American Petroleum Institute), the ASTM (American Society for Testing of Materials) and the SAE (Society of Automotive Engineers) were feverishly working to develop two new diesel engine oil performance categories as requested by the EMA (Engine Manufacturers Association) to improve diesel engine fuel economy. This is part of our nation’s greenhouse gas (GHG) reduction effort.

Well, folks, on December 1, 2016, it’s finally going to become a reality. This will be a major change for the diesel engine oil market for several reasons.

First, there will be two new performance categories, API CK-4 (PC-11A) for existing diesel engines and API FA-4 (PC-11B) for new/post 2017 engine designs which will tolerate lower viscosity oils. (Viscosity is still the most important parameter influencing both fuel economy and horsepower.)

API CK-4 is no big deal, other than the cost and time it takes to develop a new diesel engine oil. Current estimates are that it costs over one million dollars to develop a new oil even if it passes all the required laboratory tests the first time out. And that doesn’t count the time and money it takes to field test the new product in a variety of engines in different types of service. In this day and age, you need at least two to three years of field testing to feel comfortable about the performance of any new diesel engine oil.

Now, the new FA-4 oil is creating quite a stir for several reasons. Oil marketers get very nervous when someone suggests putting an FA-4 oil in an older engine design with looser engine clearances, yet having to spend millions of dollars to develop a product to be used on only 2017 and later engine designs doesn’t fully justify the tremendous expenditures involved.

So both end users and oil marketers will want to see how many other engines the FA-4 oils can safely be used in to maximize their investment. In the end it will probably be up to each engine manufacturer to determine which of their engines can tolerate FA-4 oils without sacrificing engine service life. Big Oil will want you to put this oil in everything to simplify logistics, but most end users will want to make sure FA-4 oils don't void their warranties. It's a shame oil marketers didn't better educate the end users ahead of time so they could make more intelligent selections.

Due to the extremely high costs associated with developing and marketing two completely new oils, many oil marketers are taking a closer look at product line simplification. ConocoPhillips, for example, currently markets four diesel engine oils under its brand umbrella, Conoco, Kendall, Phillips, and 76 Lubricants. To minimize developmental and marketing costs, they have decided to drop the Conoco and 76 Lubricants brands from their diesel engine oil lineup.

I'm sure other oil marketers are either reducing product lines or having a brand represent only one of the new oils. For example, Shell, which has both their Rimula and Rotella brands, also owns Pennzoil and Quaker State. Will they eliminate some oils from this complicated lineup? I predict that both Rimula and Quaker State won't offer the full range of FA-4 products to minimize expenditures.

It's going to be fun with a lot of to-ing and fro-ing. Take the time to carefully read the API label on the container (see examples). Note that the FA-4 label will be shaded to make it stand out a little. API CJ-4 oils will continue to be produced and marketed for at least a year before that performance category is obsolete. The CK-4 oils shouldn't pose any problems for you.

Who knows, once there is product available (both CK-4 and FA-4), I might have the TDR guy go on a spending spree so we can check the composition of all these new-fangled oils and see what is really best for your truck.

John Martin
TDR Writer

FACTORY DATA ON THE 2015 HEAVY-DUTY TRUCKS

ISSUE 86 – BLOWIN' IN THE WIND

by Robert Patton

RAM FOR 2015

by Robert Patton

How closely have you been following the game of payload this; towing that; horsepower the other that the pickup truck OEMs have been playing?

Kinda yes. (See the stories that preceded this collection of data.)

Kinda no. (I am a Ram Turbo Diesel guy and the ratings one-upmanship is too difficult to follow.)

How about some factual data? How about a write-up that compares the trucks?

Well, we've got both for you. First is a press release from the folks at Ram announcing the 2015 Ram and giving you their data for their new trucks.



2015 RAM 3500 Heavy Duty Laramie Edition

Next is a story that is presented in "TDReview" where I summarize two articles from www.pickuptrucks.com where the Ram 3500 Turbo Diesel was tested against the Ford and GM products. In the one article that tested 3500 diesel trucks, Ram wins the subjective, a close second overall. Then, our "TDReview" gives you another reference to www.pickuptrucks.com where the Ram 2500 truck (gasoline engine) was tested against the comparable gasoline-powered Ford and GM products (Ram wins both categories.)

So, whether you are thinking about new/used Fourth Generation truck (some great close-out sales out there), looking ahead to 2015, or just wanting to keep up with what is new, here is some data worthy of your review.

First up, let's look at a late August press release data from the folks at Ram that tells you about the 2015 Ram Turbo Diesel.

A TRIFECTA OF CLAIMS: BEST-IN-CLASS POWER; TOWING CAPACITY; AND PAYLOAD CAPACITY (Ram Press Release Data)

Highlights for 2015

- New Cummins 6.7-liter calibration adds 15ft-lbs of torque, edging out even Class 4 pickup competitors to a best-in-class 865ft-lbs
- 2015 Ram 3500 crushes the competition with up to 30,000 pounds of towing capacity, beating the closest competitor by nearly 1.5 tons (SAE J2807 test criteria)
- 2015 Ram 2500 holds best-in-class 17,970 pounds of towing capacity (SAE J2807 test criteria)
- New best-in-class payload of 7,390 pounds (Ram 3500)
- Ram maintains credibility and customer confidence as the only automaker to align with the SAE J2807 towing standard for its entire pickup truck line
- Best-in-class Gross Combined Weight Rating (GCWR) of 37,900
- The first 2015 Ram Heavy Duty trucks begin rolling off the factory line during the last week in August
- Unsurpassed powertrain warranty – five years/100,000 miles

Ram takes heavy-duty towing and hauling seriously. With the late August start of 2015 model year for Ram 2500 and 3500 Heavy Duty production, the truck world's "King of the Hill" further adds to its most-capable claims.

Ram 3500 models will offer increased torque ratings of 865ft-lbs and an increased payload of 7,390 pounds, while maintaining a class leading maximum tow rating of 30,000 pounds.

Powertrain

For model year 2015, the Cummins Turbo Diesel is available in three versions. The first version is paired with Ram's segment-exclusive six-speed manual transmission. This combination delivers 350hp at 2,800rpm and 660ft-lbs of torque at 1,400rpm.

The second option matches the Cummins to the 68RFE six-speed automatic transmission. This combination is 370hp at 2,800rpm with 800ft-lbs of torque at 1,600rpm.

The third option is the High-Output Turbo Diesel for Ram 3500 paired with the Aisin six-speed automatic transmission (AS69RC). In addition to 385hp at 2,800rpm, the engine generates best-in-class torque of 865ft-lbs at 1,700rpm.

Frame

Ram Heavy Duty trucks feature frames built with high-strength 50,000psi steel, including eight separate cross-members, hydroformed main rails and fully boxed rear rails for optimal strength. Center frame rail sections are roll-formed, an efficient means for maintaining consistent strength in less complex longitudinal sections. In the rear portion of the frame, the structure includes fully boxed rear rails and a factory-installed rear axle cross-member with provisions for fifth-wheel and gooseneck hitches. Standard electronic stability control (ESC) on single and dual-rear-wheel equipped trucks, and body-to-frame hydro-mounts provide improved ride quality.

Suspension

Ram2500: Heavy Duty trucks generally have suspension equipped for constant, heavy payloads. This leads to a harsher ride when unloaded. Ram innovation leads again. The Ram 2500 takes lessons learned from the Ram 1500 with a segment-exclusive five-link coil rear suspension system. Loaded or unloaded, the 5-link coil system provides best-in-class ride and handling. The five-link coil design incorporates support at all major points of force. Additionally, the Ram 2500 offers a rear air suspension system for automatic load leveling and greater versatility.



2500 Ram rear coil suspension.

To understand how the coil-type rear suspension helps the ride, consider that the conventional leaf spring suspensions struggle to combat axle wrap by using staggered shock absorbers (one mounted on the front of the axle tube and one mounted on the rear of the axle tube). The design of the five-link coil system functionally resists unwanted axle rotation. Leaf spring configurations also lack lateral support, forcing the leaf ends and shackles to hold against lateral loads—a task they're not particularly good at and one reason competitive leaf-sprung rear suspensions shudder on rough surfaces.

Ram 3500: The Ram 3500 continues to feature the rear Hotchkiss leaf spring system, but offers a supplemental air suspension system (late model year availability). By adding supplemental air bags to the rear suspension, Ram engineers will be able to soften the leaf springs, allowing for more unloaded suspension movement—even with a best-in-class 30,000-pound trailer tow rating.

In the front, the Ram Heavy Duty line features an advanced three-link front suspension to ensure roll stiffness. Greater roll stiffness, also known as body roll, is an important characteristic in taller vehicles and especially trucks with heavy payloads. Roll stiffness is measured by the amount the truck's body tips side-to-side, independently of the wheels, during cornering.



3500 Ram front three link suspension.

Additional Features

Ram Heavy Duty customers can enjoy the convenience of an exclusive cargo camera, power folding mirrors and a combination, power rear-sliding window with defrost. Also, central locking includes the RamBox cargo management system and tailgate power locks, creating a convenient solution for locking all exterior doors and storage with one push of a button. Auto rain-sensing wipers and SmartBeam headlamps also are available, adding to a truckload of content offered in Ram Heavy Duty.

The 2015 Ram Heavy Duty is backed with an unsurpassed five-year/100,000-mile Powertrain Limited Warranty. The powertrain-limited warranty covers the cost of all parts and labor needed to repair a covered powertrain component—engine, transmission and drive system. Coverage also includes free towing to the nearest Ram Truck dealer, if necessary. The warranty is also transferable, allowing customers who sell their truck during the warranty period to pass the coverage on to the new owner. The standard five-year/36,000-mile Basic Limited Warranty provides bumper-to-bumper coverage for the Ram Heavy Duty, from the body to the electrical system.

Now turn the page to read our “TDReview” column where the folks at pickuptrucks.com test the 2104 Ram against Ford and GM products.

WHAT IS NEW FOR 2013 EMPHASIS ON THE CUMMINS ENGINE

ISSUE 80 – TDREVIEW

by Robert Patton

No doubt you read the exciting news in our Issue 78 and 79 magazines about the new horsepower ratings for the 2013 pickup and cab and chassis trucks. A quick refresher:

	MANUAL		AUTOMATIC	
	Old	New	Old	New
2500 pickup	350/610	350/660	350/800	370/800 (68RFE)
3500 pickup (SRW or DRW)	350/610	350/660	350/800	370/800 (68RFE) 385/850 (Aisin)
3500/4500/5500 Cab and Chassis	305/610	320/650	305/610	325/750

From the article you noted the obvious: the horsepower and torque ratings for the new 2013 trucks vary based on model (2500 versus 3500 consumer pickup) and type of chassis. Within those categories the rating then varies based on the type of transmission that is offered. The 2500 is only offered with automatic 68RFE. The 3500 (SRW or DRW) automatic can be either the 68RFE or the Aisin AS69RC. The cab and chassis automatic is also the Aisin AS69RC. The manual transmission for all trucks is the existing G56.

Also, from the article I noted that fuel mileage should improve by as much as 10%. As you might expect, we were inundated with questions about the cost and the amount of DEF that would enter into the 10% miles per gallon improvement.

To answer the question for TDR members, I did some research back to Issue 75, page 68.

In that article, there was the comparison of the Ford, GMC and Ram by an unbiased magazine group led by Pickuptruck.com. We lost miserably by 1mpg towing with a load. Ford showed 9.5mpg versus the Ram at 8.5. For their 2000 mile trip, the fuel for the Ram was \$99 more than the Ford. However, the Ford used an estimated 6 gallons of DEF (6x\$3=\$18). If we assume, as mentioned in the Ram literature, that the Ram will get 10% better mileage... well, let's go ahead and figure that the Ram can equal the Ford at 9.5mpg.

I think you see where this is going: For a 2000 mile trip the new 2013 will save you (\$99-\$18=\$81) \$81 over the 2012 engine in my fictitious example.

So, in really round numbers, the advantage to using the DEF is about 8%.

What Does This Mean to You? Changes to Exhaust Emissions

While we clearly understand the race between the manufacturers for higher power levels and improved fuel economy, my story did not do a good job of explaining the emissions reason(s) that the engine was changed.

In Issue 74 I wrote a lengthy article that talked about the emissions puzzle and the forthcoming government regulations that are being phased in for over-the-road tractors. No longer do the regulations apply to the emissions of particulate matter (PM) or oxides of nitrogen (NO_x) which were "big two" of diesel exhaust. These two emissions are at such low levels that they are difficult to measure. Now the standard to be met is a carbon dioxide (CO₂) standard. (Essentially fuel economy—the less CO₂ the better the fuel economy.) This standard is set by the EPA or by NHTSA.

At the conclusion of the article, I was mistaken when I commented, "Regardless, our truck will move to fuel economy standards for vehicles over 8500 GVWR that will be administered by EPA or NHTSA. The trucks no longer fall under the car and light truck standards as administered by CAFE guidelines."

The consumer 2500/3500 pickup trucks stay under the CAFE guidelines and are still in "Tier 2, Bin 5." To try and explain what Tier 2, Bin 5 means is futile. At Ram and Cummins there is an engineer guy in the corner that has charts and graphs to deal with the complexity of Tier 2, Bin 5.

However, do realize that that engineer is charged with trying to give you an engine with less CO₂ emissions. Remember, less CO₂ = better fuel economy.

The same engineer guy has the same assignment for the cab and chassis trucks to meet the fuel consumption standards for the "big rig" type vehicles.

Now, what does all this gobbledey gook mean to you and why was the engine changed for 2013? Turn to page 60 to find out!

TIER 2, BIN 5

THE ENGINEER IN THE CORNER WITH CHARTS AND GRAPHS

I mentioned that it is futile to try and understand the meaning of “Tier 2, Bin5,” and introduced the fictional “engineer in the corner with charts and graphs.” A quote from an article about the EPA’s quirky emissions and fuel economy rules from the periodical Automotive News will give you an idea of what I am talking about.

From 10/15/2012 Automotive News, “CAFE Guide: A Map Through the MPG Maze:

“The federal government has a screaming deal for automakers that have struggled to find a market for electric vehicles: Two for the price of one.

“In the 2017 through 2019 model years, regulators will count each EV produced as two when calculating whether automakers are meeting new fuel-economy standards for light vehicles.

“The standards have a simple-sounding goal: Cut fuel consumption and emissions. But the rules—at 1994 pages and more than half a million words are anything but straightforward filled with little-known peculiarities and fine print added to help get automakers on board.

“Each automaker’s vehicle fleet ultimately will have to average at least 54.5mpg. However, the 54.5mpg figure is based on strict federal testing criteria, with real-world fuel economy expected to be around 40mpg.

“Automakers have a myriad of ways to earn credits, such as using certain air-conditioning technologies to reduce emissions and building large numbers of hybrid trucks. Credits accumulated for overachieving can be shuffled, traded or sold.

“One key provision: A company that falls short one year can make up the difference with credits obtained as many as five years earlier.

“Among other loopholes that automakers might use to their benefit:

- Automakers that sell fewer than 50,000 vehicles annually in the United States are granted two additional years to begin meeting the standards.

- Some versions of a particular nameplate will be held to a higher standard than others. The two-wheel-drive Escape, for example, qualifies as a passenger car. But the four-wheel-drive Escape is considered a light truck and therefore has a lower emissions and fuel-economy target.
- So-called off-cycle credits account for benefits that may not be fully measured in testing. Credit can be earned for features such as active grille shutters, engine stop-start and solar panels.
- As mentioned, EVs count double from the 2017 through 2019 model years, after which the multiplier declines annually. Plug-in hybrids, such as the Chevrolet Volt, count as 1.6 vehicles each at first.

THE CHART AND GRAPH ENGINEER – PART 2

In my research to write the “10 Back” column (page 8) I ran across a previous article that attempts to explain the “Tier 2, Bin5” rules. If you’ll suffer through this brief explanation, I think you’ll see why we should leave this task to the Chart and Graph engineer. In the TDR Issue 38 article, I spoke of research at www.dieseln.net to try and make automotive and light-duty emissions comparisons. The results were confusing and led me to a defeatist comment, “Forget the numbers (Tier 2 regulations), they will make you crazy.” I resigned to leave it to a professional.

From January 2003, Automotive News’ Harry Stoffer succinctly describes the Tier 2 rules. “Automakers, demonstrating their commitment to the environment, generally supported Tier 2 rules when they were adopted by the Clinton administration in late 1999. The rules combine cars and light trucks, as well as gasoline, diesel and other fuels, into the same regulatory framework. A series of compliance categories, called bins, were created.

“Automakers will be free to certify some dirtier vehicles to higher bins as long as they also certify cleaner vehicles to lower bins and reach the overall standard for average fleet emissions.”

Got it? Tier 2, Bin 5 – whatever that means.

What Does This Mean to You? Changes to Exhaust Emissions (Continued)

What do the exhaust emissions mean to you? Three things come to mind:

First, the obvious: the engineers will continue to refine the engine to give you better fuel economy (oops, lower CO₂ emissions).

Second: the engine(s) will continue to be refined as there are on-board-diagnostics requirements for advanced monitoring of the emissions controls.

Third: the up-the-ante, neverending race for horsepower and torque bragging rights between Ram, Ford and General Motors will continue. Can you believe some of the numbers and tow ratings that are available?

Let's Do a Recap

As a recap, here is a list of the big changes to the engine that we have seen in the past:

1/1/91 – The engine gets a charge air aftercooler added to the intake air system.

1/1/94 – The '94 engine uses a mechanical Bosch P7100 fuel pump rather than the mechanical Bosch VE fuel pump. A catalytic converter is added to address particulate matter.

1/1/98 – The engine uses the electronic Bosch VP44 fuel pump and the cylinder head is now a 24-valve design.

2003 model year – The high pressure, common rail (HPCR) fuel system is introduced one year early in the new-for-2003 Third Generation truck

1/1/04 – A catalytic converter is added to the exhaust to meet the 2004 standards.

1/1/07 – The 6.7-liter engine is introduced to the marketplace and meets the 1/1/07 emissions as well as the forthcoming 2010 emissions guidelines. Exhaust aftertreatment now includes exhaust gas recirculation, a NO_x catalyst, a diesel oxidation catalyst and a diesel particulate filter. The cab and chassis trucks are not required to have the NO_x catalyst.

1/1/10 – The cab and chassis trucks add selective catalyst reduction (SCR), which is a fancy term for urea injection, to control NO_x.

Now, unlike those big hardware changes that we've seen in the past, I'm thinking that future changes to the engine will be more like refinements. If I am wrong in this assessment, in several years you'll see me "eat crow" in our "Backfire" section of the magazine.

Death of the Manual Transmission?

No doubt that subtitle caught your attention. And, since I've introduced the subject, I'd like to stop and ask, "Why do you think that competitors Ford and General Motors no longer offer a manual gearbox option?"

Well? The answer may not be what you think.

The obvious: People are lazy and don't like to shift. Besides, dear TDR members, we all know you can't shift and text at the same time.

The obvious: Bigger power numbers mean bigger clutches and bigger gearboxes—perhaps bigger warranty expenses too, as clutch abuse is not a warranty item but often is taken care of *once* for customer goodwill.

The not so obvious: To certify a power rating takes lots of engineering time and lots of testing expense. More ratings, more expenses.

The really not so obvious: The certification process and the ratings numbers are different for the consumer 2500/3500 pickup trucks than they are for the cab and chassis 3500/4500/5500. And, although this is buried in the "really not so obvious" paragraph, this may be the real reason for the death of the manual transmission.

How so?

To see the correlation you have to understand how the government does the emissions (or miles per gallon) testing on your Turbo Diesel truck and/or automobile. The consumer pickups are strapped to a chassis dynamometer and run through their paces. Imagine that there is an emissions "window of variance" that follows the engine's power curve. Likewise, the engine has a torque range that is best suited for a good fuel economy number. To keep the engine at its best performance, you want the predictability of an automatic gearbox with as many speeds as possible to keep the engine within the emissions/mileage variance.

And, although the testing of the cab and chassis trucks is done on an engine dynamometer, a similar window of variance for emissions and fuel economy exist.

Now, if we leave the testing up to "Marvin the manual shifter dude," well, I think you see the problem. Marvin doesn't have access to the same load, speed and shift algorithms that the software engineer of the engine/automatic transmission combination has at his computer. Yes, the engine/powertrain's electronic control unit (ECU) is more predictable and smarter than Marvin the manual shifter dude. Also, consider that the ECU can be programmed for all kinds of power-to-load scenarios and gearbox choices that give you six to eight forward speeds and I think you see why manual gearboxes are becoming less common in *any* type of vehicle.

Back to the Story – What is New for 2013?

For the 2013 consumer pickups and 2013 cab and chassis engines there are lots of parts that are new. The folks at Cummins' Columbus MidRange Engine Plant (CMEP) allowed me to photograph the new hardware and took the time to explain "What this means to you" on each part that we examined. The following items were changed on the 2013 engine:



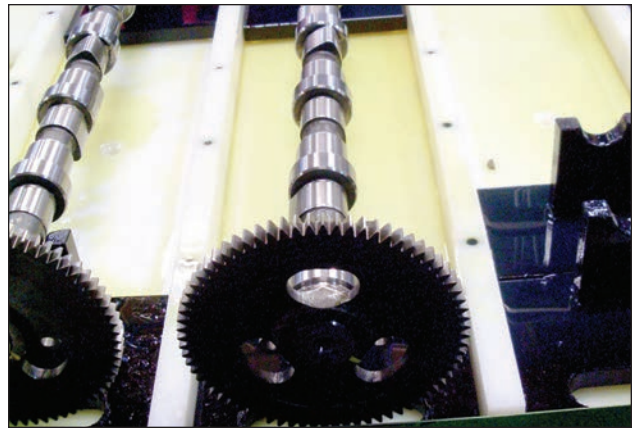
In 2012 a bedplate was added to the engine to increase block strength and reduce noise. This is a picture of the redesigned part used in the 2013 engine.



The new payload and towing ratings for the 2013 Ram necessitated changes to the truck's frame. Redesign of the engine oil pan was required to clear the suspension and frame. The oil pickup tube was also redesigned.



With new horsepower ratings come new torsional vibrations that have to be absorbed. This is the new vibration damper.



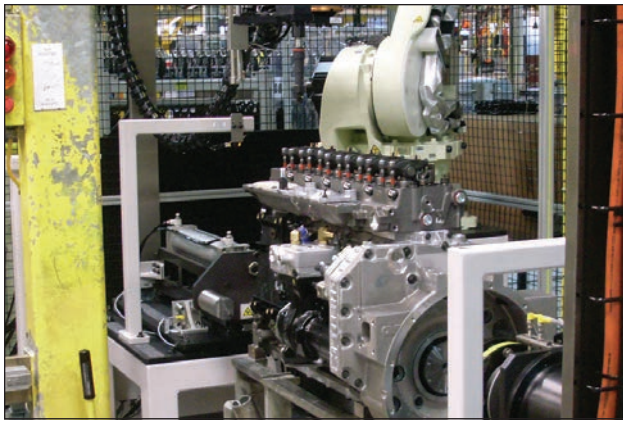
With the cab and chassis engine there was a change the camshaft's intake duration and lift. Power ratings and fuel economy necessitated the changes. The cam for the consumer pickup trucks remains the same. On the assembly line they do a photo scan to ensure the correct cam is used in an engine. This is the end of the cam showing the drive gear already installed.



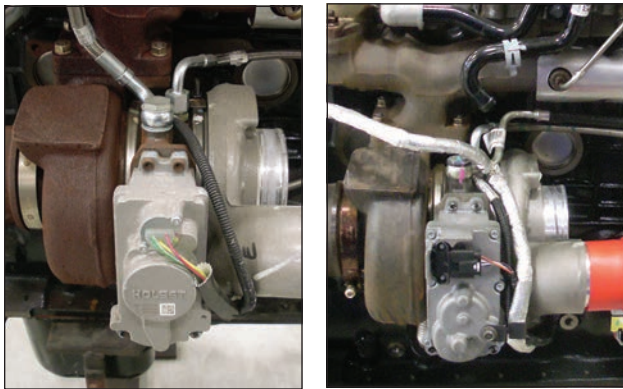
For the first time in Ram truck applications the pistons are coated in the skirt area to eliminate the chances of high/over temperature scuffing. The coating also eliminates cold start-up piston slap noise. Finally the piston bowl was redesigned for emissions concerns.



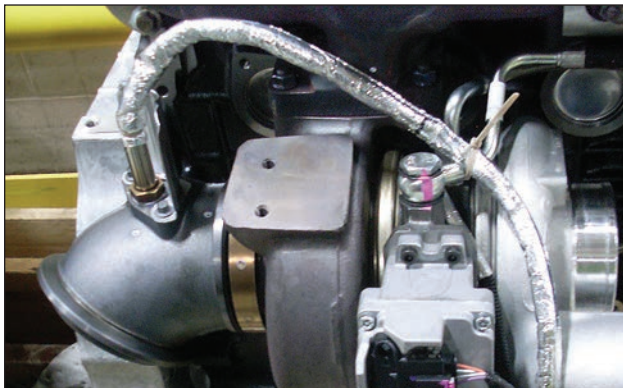
Higher horsepower and more heat call for better piston cooling. This is a picture of the piston cooling nozzle that sprays engine oil onto the underside of the piston to keep piston temperatures in check.



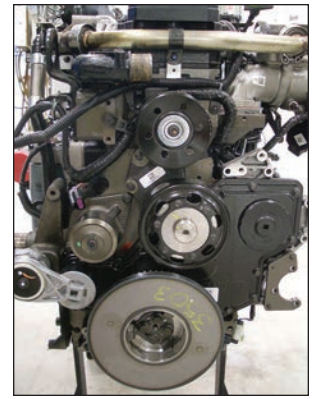
For the 2013 consumer pickup trucks, the cylinder head was revised. Here is a picture of a machine that automatically sets the valve lash of the intake and exhaust valves.



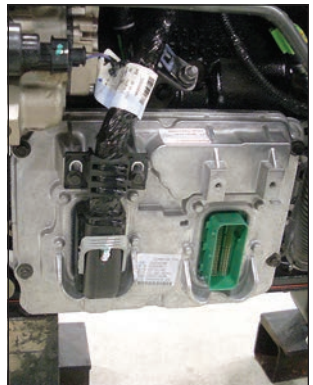
The old turbocharger is on the left, the new is on the right. The new turbocharger is enhanced with the addition of a feature that controls the exhaust braking to maintain a set vehicle speed when descending a grade.



With the advent of SCR technology there is no longer a NO_x catalyst in the exhaust aftertreatment. Therefore, the NO_x sensor has been moved to the turbocharger downpipe.



Higher horsepower, more heat, more cooling is necessary. The old engine is on the left, new on the right. Study the photographs carefully and you should see that the water pump and fan drive pulleys are slightly smaller so that they spin faster to provide better cooling.



Old ECU on the left, new ECU on the right. New software, new coding and two 96 wire (versus the previous two 76 wire) connector affirms that there is more data to process and control the engine.



In the previous engine there were individual noise isolators attached to the fuel injection lines (left picture). Now there is a rubber isolation boot that covers the injection lines (right).

As is the case with many model year or generational changes, there are lots of other knick-knack parts and sensors that are changed. For example, when you open the hood on the 2013 you'll notice that the plastic "bat wing" that surrounded the top valve cover portion of the engine has been replaced with a rubber noise isolation

cover. (Oops...late breaking news: I think I'm correct, the rubber cover has been changed back to the batwing.) There are sensors that have been moved, coolant tubes rerouted, brackets changed, etc. However, for the most part, the folks at CMEP tell me that I have covered the highlights.

Finally, saving the best for last, there is word from Cummins' subsidiary company Fleetguard that the fuel filter has changed for 2013. If you will recall from the Issue 78 magazine, the folks at Ram added a "first line of defense" see-through fuel filter to the trucks frame rail.

Now the news from Fleetguard: they have changed the filter element inside the primary fuel filter that is located on the engine. The new part number is: Fleetguard FS53000, Mopar 68157291AA. The trade name for the new fuel filter media is Fleetguard "NanoNet." This filter will fit '10-'13 pickups and '11-'13 chassis cab.

The new NanoNet fuel filter is a direct replacement for the existing Fleetguard FS43255 and Mopar 68065608AA. It has yet to be determined whether these old numbers will be superseded. Again, the new part numbers should be FS53000/68157291AA. I cannot imagine that customers would choose the old/less efficient filter...a supercession sounds logical to me.

Given that the NanoNet is a two-stage filter designed to trap smaller particles than the existing filters, there will likely be a price premium for this new media. I do not yet have the details. Also, yet to be determined, are the price and availability of the NanoNet for the '07.5-'09 pickup trucks ('07-'10 for chassis cab).

At this time the part numbers that have been pre-assigned for the older trucks:

Fleetguard	Mopar	
FS53001	68157287AA	(filter and shell)
FS53002	68157288AA	(filter only)

A final note about the NanoNet filter as a "better mousetrap." I took some time to read the Fleetguard literature on the filter (bulletin LT36228NA). The Fleetguard folks use a different testing process and they shy away from the "micron rating" terminology that is frequently used in the business. Regardless, word on the street has it that the old filter was a "5 micron" unit and this is a "5 micron outer with a 3 micron inner" two stage design. I understand how confusing all the marketing hype can be and I'll trust the factory-guys on this one.

Okay folks, is that enough detail for you? Again, my thanks to the folks at CMEP for helping me with the photographs and I look forward to hearing stories from our audience about the new 2013 truck and engine.

Robert Patton
TDR Staff

Sidebar

HOW ABOUT THE OIL CHANGE INTERVAL?

In the previous magazines I have mentioned that the oil change interval on the new 2013 can be as long as 15,000 miles. How is it that this differs so much from the '07.5-'12 6.7-liter engines? TDR writer Joe Donnelly answered that question in his write-up on diesel exhaust fluid (DEF) that was in Issue 79, page 74.

Since this important piece of information was buried in an article on DEF, I'm confident that a lot of folks may have missed reading about the revision to the oil change interval. So, here are some data from our last magazine that you may have missed. Quoting from Joe Donnelly:

"If you closely read Issue 78 (specifically page 52, the 6.7-Liter Engine Introduction) you learned that the 6.7 engine met the 2010 exhaust emissions three years early. This was a marketing tool for Ram and Cummins and to accomplish this task the truck was one of the first vehicles to use NO_x adsorber aftertreatment technology.

"The NO_x adsorber technology did require the use of ultra low sulfur diesel (ULSD) fuel. And, again as we learned in Issue 78, at the time the EPA was getting pressure to relax the ULSD requirement. Having a vehicle that needed ULSD gave the EPA reason to stand firm on their January 2007 implementation date.

"How does an NO_x adsorber differ from the use of SCR and the associated DEF fluid? An NO_x adsorber acts as molecular sponge. Once it is full, the injection of diesel fuel into the exhaust stream (think post-ignition injection) is used to purge the system.

"As the 2013 engines adopt the SCR technology, the DEF fluid is the clean-up agent. The injection of DEF is well downstream of the combustion cylinders. Since diesel fuel is no longer used in the aftertreatment of NO_x, there will be an associated reduction in the lubrication oil dilution caused by fuel leaking past the piston rings from spraying diesel fuel into the cylinders so that it would go out the exhaust unburned to bake the catalyst (regeneration cycle). Thus, oil change intervals will increase, up to 15,000 miles, for additional maintenance cost savings."

As a footnote to Joe's update on the oil change interval, I asked the folks at CMEP about the initial oil fill for the 2013 Turbo Diesel engines. As has been for as long the engines have been in production, the oil is the Cummins "Premium Blue" formulation that is made by Valvoline. The factory fill for the consumer 2500/3500 pickups in now the 5W40 Premium Blue synthetic oil. The 3500/4500/5500 trucks still use the 15W40 Premium Blue mineral oil.

Okay, folks, is that enough detail for you? My thanks to the folks at Cummins' Columbus MidRange Engine Plant (CMEP) for helping me with the photographs.

Robert Patton
TDR Staff

RAM WINS

ISSUE 83 – TDREVIEW

by Robert Patton

With the kickoff of the 2014 model year last fall, the Ram folks were in the news in magazines, performance comparisons, shows and exhibits. There were several feature articles that caught my attention. The biggest news for the Ram/Cummins Turbo Diesel faithful was the www.pickuptrucks.com (PUTC) “King of Beast” comparison. Good news for the Ram faithful, Ram wins!

Next up, a comparison by Canadian automotive journalist for the crown of “Truck King.” Ram trucks win three-of-three categories.

Finally, at the Texas State Fair the Texas Auto Truck Writers name the Ram 1500 EcoDiesel the “2013 Truck of Texas.”

Summaries of these press events start with PUTC’s “King of Beast.”

KING OF BEAST

In my recent travels, I had the good fortune to meet Automotive journalist Mark Williams of [pickuptrucks.com](http://www.pickuptrucks.com), and Kent Sundling of mrtruck.com. More from Williams and Sundling in a minute.

These two names may sound familiar to you. They were part of the team that did a 2500 truck comparison in the Fall of 2010, “Diesel Shootout” (covered in Issue 71, page 56); and a 3500 truck comparison back in September of 2011, “Hurt Locker” (covered in our Issue 75, pages 66-68).

So what is new from writer Williams and tester Sundling? While Ram did not fare so well in the two previous www.pickuptrucks.com tests, I have good news for you. Back in early October, Mark Williams told me to be on the lookout for their “King of Beasts” shootout. It was released to the public on October 21, 2013.

Unlike the “Diesel Shootout” and “Hurt Locker” tests, this time around there were only two contenders: The Ram 3500, 2013 model, with its newly released 30,000-pound tow rating; and the closest competitor, a Ford F-450 Super Duty, 2013 model, with a maximum tow rating of 24,700 pounds.

Using the same methodical procedure used in the other www.pickuptrucks.com (PUTC) evaluations, the staff chose the Davis Dam/SAE testing route and scored the “King of Beast” trucks in acceleration, braking, fuel economy and comfort.

Behind the Scenes

Just before the test was published at PUTC I had the chance to talk with Kent Sundling at a press event. I told

Kent that I wanted to do a summary of “King of Beast” for the TDR audience and asked if he could provide us with some behind-the-scenes commentary. Kent’s response, “You bet! I think your readers would enjoy a look at how we went about our testing of the two vehicles.”

I gave Kent our magazine deadline and went ahead writing my summary of the PUTC article. You’ll find Kent’s comments interspersed in the summary and italicized for clarity.

The following are Kent’s thoughts prior to the test:

I was skeptical when Ram announced the 2013 3500 dually could tow 30,000 pounds, a GCWR almost ½ of a Class 8 Peterbilt. However, after the “King of Beasts” shootout, I’m a believer. As you know, we closely matched the 2013 Ford F-450 Power Stroke diesel to the 2013 Ram. Both have a gross vehicle weight rating of 14,000 pounds. For weight rating they both are Class 3 trucks, but Ford likes to call the F-450 a class 4. Since all the truck manufacturers, except Toyota, have ignored the SAE Standard J-2807 for pickup truck weight carrying and towing, the only way to know what a new truck is capable of is a road test towing top capacity trailers through mountain grades. And that’s what we did. These trucks towing heavily loaded trailers felt surprisingly similar. They took turns winning the test we threw at them. But, in the end, one was a clear winner slowing down and safely handling 14 tons in the rearview mirror.

The stats: The 2013 Ford F-450 was a crew cab, long bed, 4x4 with a 4.30 rear axle ratio. It had a maximum towing capacity of 24,700 pounds. The 2013 Ram 3500 was a crew cab, long bed 4x4 with a 4.10, rear axle ratio. It had a maximum towing capacity of 28,800 pounds. To be fair we loaded both Load Trail 32’ flatbed trailers with pallets of rock to Ford’s maximum 24,700 pounds.

Acceleration Test

The following quote from PUTC’s writer Mark Williams sets the stage for the evaluations.

“We wanted to find out: How well can these big trucks pull the heavy loads their manufacturers say they can pull, and how comfortable do they feel doing it? We started the acceleration portion of our test with level-ground runs to give us a baseline. Of course, what we really wanted to find out was how well these two pickups could pull driving up the two toughest, most punishing grades in the country—Davis Dam and the Eisenhower Pass.”

The following are Kent’s comments as they saddled-up to start the evaluation:

I ordered the trailers from Load-Trail to safely haul 30,000 pounds. These heavy duty goosenecks were painted in Kubota orange, which made them easy to see on the road in front or back. We picked electric-over-hydraulic disc trailer brakes on the dual tandem axles. This is as powerful as it gets in a gooseneck without air brakes. Stopping power is as important as torque and horsepower when were towing over 12 tons. Interstate-70 through Colorado has many run away ramps, but we never want to test drive one.

Our test started in my back yard where we loaded a 14,350 pound 1942 WWII Army Half-Track M2-A1 on one of the trailers. We used the restored half-track as ballast for 0-40 mph acceleration and 40 to 0 brake tests before we climbed the mountains. The total weight of the trailer: 22,620 pounds.



The 10-foot dovetail was hydraulic, making it easy to load the vintage half-track. We opted for complete trailer air suspension and I was glad we picked the air suspension axles as Highway 191 crossing Arizona to Utah had the trucks almost airborne. The trucks bounced dramatically more than the trailers.

The new 30,000 pound trailer capacity of the Ram 3500 has ignited another race—trailer manufacturers have to catch up with bigger trailers. A few companies were making large gooseneck trailers for the “Hot Shot” haulers. However, one of the reasons it’s hard to find gooseneck trailers with a GVWR over 26,000 pounds is the federal excise tax for trailers 26001 pounds and over. This IRS road tax is 12%. Ouch!

How did the Ram 3500 truck perform? Let’s start with a recap of the level ground test.

No load, 0-40mph test

Ford: 5.91 seconds
Ram: 7.0 seconds

No load, 1/4 mile test

Ford: 18.4 seconds at 78.3mph
Ram: 19.1 seconds at 77.6 mph

Gooseneck trailer (22,620 pounds), 0-40mph

Ford: 18.6 seconds
Ram: 18.9 seconds

Now the towing test, a run up the Davis Dam highway. A little background from PUTC’s Mark Williams: “We like to use the section of Arizona Highway 68—which heads East from Bullhead City, Arizona—because it provides us with a long stretch of two-lane highway that climbs more than 3,000 feet in elevation over a relatively short 10-mile stretch. At certain points, the grade is at least 6 percent.”



Ford – 12:28 and 12:17 minutes; maximum speed 56.3mph, slowest speed 45.5mph
Ram – 12:20 and 12:24 minutes; maximum speed 57.8mph, slowest speed 43.5mph

Another towing test was the Eisenhower Pass Run. The test route is Interstate 70, eastbound starting at Dillon, Colorado, and travelling for 7.2 miles from 9,000 to 11,000 feet at an average grade of 6%.

Ford – 11.44 minutes; maximum speed 53mph, slowest speed 31mph
Ram – 10:31 minutes; maximum speed 57mph, slowest speed 37mph

Conclusion: The PUTC writers did not do a summary after the acceleration tests. My summary: this is a darned close horse race. I’ve already mentioned that Ram was chosen as the winner. Read on to see how evenly matched these trucks are.

Braking Test

Let’s start with the unloaded 40mph-0 test.

Ford: 117 feet
Ram: 104.5 feet

Loaded vehicle (without the use of trailer brakes) 40mph-0 test

Ford: 165.5 feet
Ram: 148 feet

As a subset to the braking test, the PUTC writers tested the effectiveness of each truck's exhaust brake by setting the cruise control to 50mph on the 10-mile downhill descent to Davis Dam. How many times would the driver have to touch the brakes to keep the speed in the 50mph window?

Ford: 20 times and 18 times
Ram: 7 times and 12 times*

*The Ram did not downshift to third in the 12-times scenario.

Same test down the shorter (7.2 miles) Eisenhower Pass.

Ford: 18 times
Ram: 11 times

In the for-what-it-is-worth department the PUTC testers took an infrared thermometer and recorded the temperatures of the front rotors at the bottom of Davis Dam and Eisenhower Pass.

The readings:

Ford: 375° (Davis); 1105° (Eisenhower)
Ram: 262° (Davis); 740° (Eisenhower)

The PUTC braking test data and my brief summary do not begin to tell the story. Comments from Kent give you the details and it is this kind of detail that made Ram/Cummins the winner. Kent writes:

I've been complaining about Ford's diesel exhaust brake since it was introduced in 2011. There is no button to turn it on like Ram and GM have. Ford says it comes on automatically in Tow Mode. I can't tell when it comes on. Going down a steep grade, you can only grade shift so many times, then if there isn't enough RPM band left to downshift before hitting the rev limiter, it will upshift and make you go faster, leaving you only the brakes. I'll stop complaining. Bottom line: the Ford takes more braking going downhill, the brakes get hotter and you don't feel safe downhill in the mountains with a big trailer. I've seen the new 2015 Ford Super Duty at the Texas State Fair. It has a larger turbo and an exhaust brake button. Future tests might be interesting.

Exhaust brakes for diesel trucks towing trailers in the mountains are very important. Combine them with grade shifting from the transmission and the Rockies are less scary. I was very impressed with Ram's new Smart Brake exhaust brake. The Ram 3500's new Smart Brake offers two levels of exhaust brake aggressiveness: "Auto" is meant for all-around usage, while "On" provides maximum exhaust back pressure braking. We ran all of our exhaust brake testing runs in the "On" position.

As you saw in the data, during the first run, the Ram's Aisin transmission was quick to downshift all the way to 3rd gear, revving the engine on one particularly steep stretch to 3,500 rpm until the halfway point, then upshifting to 4th gear for the remainder of the run. Any time our speed exceeded 56 mph, we brought the speed back down to

45 mph by braking and then we let the truck go again. For that full 10-mile run we needed to touch the brakes on the Ram just seven times. On the next run, where the transmission never did kick down to 3rd gear, but instead only got down to 4th gear, we needed to touch the brakes 12 times.

The Ford F-450 was a different story. Without a dedicated separate exhaust brake activation button all you can do is turn on tow/haul. Unfortunately, it doesn't do as good a job of slowing the vehicle as the Ram's bigger, more aggressive exhaust brake. Down the Davis Dam section, we had to brake 20 times on the first run and 18 times on the second F-450 run.

And then there was the Ram 3500 "alone test" and the big trailer (28,800 pounds) facing Eisenhower-Dillon run. Ram 3500 only braked 10 times down the hill. I'll say it again "only braked 10 times." It was very controllable, towing almost 29k, the trailer brakes all worked. Grade shifting was perfect and the exhaust brake was the best in the business. Going down the 7 % grade, it felt comfortable and controlled. Braking 3 times coming out of the tunnel, then into the groove with the exhaust brake and grade shift controlling my speed. I was not thinking about runaway ramps, only getting to the next destination.

Oddly enough, the Ram 3500 with the larger load caused the front rotors to be 820° at the stop sign at the bottom on the Dillon off ramp.

Fuel Economy

When you keep fuel filling records over a 1500 mile test, your data is not suspect like it would be with a one tank fill-it-up. The towing results:

Ford: 7.95mpg
Ram: 8.08mpg

They tested the truck's on-board computer for accuracy by averaging the numbers seen between fill-ups. The Ford showed 8.5mpg, the Ram showed 8.2mpg. Give the closest-to-the-pin award to Ram.

Once again, it is nice to have some comments from our behind-the-scenes correspondent. Kent writes:

On our full-length trip, the Ram recorded the best tank average at 10.3 mpg (its worst was 7.5 mpg); the Ford's best was 9.6 mpg (its worst was 7.0 mpg).

Comfort

The reviewers praised Ram's ride quality and noted that the seats (Laramie trim) were more comfortable after a long day's ride.



Ram Laramie trim package.

Kent gives us some insight into the subjective category of “comfort”:

My only complaint with the Ram has to do with the thickness of the steering wheel. Does it have to be as thick as a baseball bat? We found that holding onto the wheel for extended periods was tiring and at times, a little clumsy. The Cummins diesel is louder in the cab of the Ram, or at least a more noticeable frequency than the F450.

I wish the Ford had the DEF gauge in the dash like Ram. Ford has an “OK” light, for what it’s worth. When towing, you use more DEF, and knowing how much is left before the next “100 miles to the next town” would be good. Glad to see both trucks had the DEF fill cap behind the fuel door. The Ram fuel tank could be larger; 32 gallons is not enough for the big trailer hauler.

And The Winner Is...

The PUTC writers did not use an elaborate system of points for this and/or points for that. Looking back, the Ford won many of the performance tests. In the end it was a subjective evaluation. The staff at PUTC decided that, “the Ram also had higher top speeds up the steepest grades, handled the heavy loads with more control, and kept the drivers more comfortable and less stressed. With all that said, we finally say congratulations to the 2013 Ram 3500 HD, our winner and last beast standing in this bloody two-truck battle.”

Should you want to read the full story go to www.pickuptrucks.com and click on the category “Special Reports.”

For now, my thanks to PUTC for allowing us to use summary bits and pieces from their test.

Robert Patton and Kent Sundling
TDR Staff TDR Writer

FINAL COMMENTS/MAXIMUM LOAD

A final comment from Kent about the PUTC “King of Beast” test: After the side-by-side comparisons were completed, writers Williams and Sundling did some additional testing on the Ram. Kent gives us the story:



Extra loading for author Sundling’s adventure.

The last day of our adventure, the Ram HD was alone. We loaded up another 3,804 pounds onto the trailer to the maximum trailer weight, over 28,800 pounds. Although we did not get an exact time, our unofficial time keeper had the finishing time for the Eisenhower Pass run was in the high 13-minute range. Top speed at its top maximum GCWR number was 48mph. It held 30mph for most of the uphill run; right near the top, the speed dropped to 28mph. It seldom hit 3000rpm, and would shift down at 2800rpm. Impressive run, I passed many semi-trucks. I had all day, so I checked temps relative to towing; Coolant temp peaked at 222°; transmission peaked at 188°; and engine oil peaked at 228°.

With this bigger load, the Ram bounced more going up the mountain pass.

I was skeptical about Ram’s 30,000 pound trailer claim, but now I’m comfortable that the truck is competent. I’m impressed; we passed semi-trucks on the way up and on the way down mountain passes. I now believe Ram’s towing ratings are realistic, with good trailer brakes this is the new towing standard to beat.

Robert Patton and Kent Sundling
TDR Staff TDR Writer

CANADIAN TRUCK KING

I'm going to tip my hat to writer Mark Williams of PUTC fame. He did a succinct summary of the Canadian Truck King comparison. Mark's evaluation: "The Truck King Challenge fielded 16 competitors for the event: Eight trucks in the over \$45,000 category; five pickups in the under \$45,000; and three pickups in the heavy-duty category.

"The multi-test event took place in Kawartha Lakes (light-duty trucks) and London, Ontario (heavy-duty trucks), with an expert panel of five judges making real-world truck evaluations that focused on work capability, fuel consumption and features. The testing included towing an 8,000-pound trailer, carrying 1,800 pounds of payload and subjecting the vehicles to some light off-roading. This was the seventh year of the competition.

- **Under \$45,000:** Chevy Silverado 1500 (5.3-liter V-8); Ford F-150 (3.7-liter V-6); GMC Sierra 1500 (5.3-liter V-8); Ram 1500 (3.6-liter V-6); Toyota Tacoma (4.0-liter V-6). Winner: Ram
- **Over \$45,000:** Chevy Silverado High Country (6.2-liter V-8); Ford F-150 (5.0-liter V-8); Ford F-150 (3.5-liter EcoBoost); GMC Sierra 1500 Denali (6.2-liter V-8); Ram 1500 (3.0-liter V-6 EcoDiesel); Ram 1500 (5.7-liter V-8); Toyota Tundra (5.7-liter V-8). Winner: Ram 1500 EcoDiesel
- **Heavy-Duty:** Ford F-350 (6.7-liter); GMC Sierra 2500 HD (6.6-liter); Ram 2500 (6.7-liter). Winner: Ram 2500"

Wow, some tough competition! With all the vehicles in the mix, I guess I'm surprised to see that a Ram truck won all three categories.

TEXAS AUTO WRITERS

Finally, each year the auto writers of Texas gather at the State Fair and evaluate both automobiles and pickup trucks. Elsewhere in the TDR (BITW, page 38), you can read about how important the Texas marketplace is to the pickup truck manufacturers.

With the state of Texas accounting for one of every six trucks sold in the US, it is a big deal to be named the "Truck of Texas." Again, Ram wins, with the 2014 Ram 1500 EcoDiesel taking the honors.



Robert Patton
TDR Staff

PRINT THE BAD – PRINT THE GOOD

As I mentioned in the opening paragraphs, the TDR gave credit where it was due (hats off to the PUTC staff) and I cited them as the source and presented data from two previous truck comparisons that they had done—the "Diesel Shootout" (Issue 71) and the "Hurt Locker" (Issue 75). In those comparisons we essentially printed the bad, as the Ram Turbo Diesel was not...well, it was not.

With this recent PUTC evaluation there is redemption for the Ram/Cummins rank-and-file and a cause for celebration by the loyal fan base that is the TDR membership. Yes, it is refreshing to print the good.

So, let's not just stop with PUTC's Mark Williams' and Kent Sundling's comments. As they were complimentary, so were the folks at The Truth About Cars (TTAC) web site (www.truthaboutcars.com).

The TTAC review was forwarded to me by a friend. Since I had not yet visited their web site, I took a minute to check it out.

In my search for the Ram 3500 evaluation I was captivated by some of their editorial content. After reading the entire article on Porsche and the Porsche brand, titled "Cayenne won't help ya, Cayenne won't do you no good," dated November 27, by their editor Jack Baruth, I was convinced that these folks had a no-holds-barred attitude in their evaluation of products.

Enough rambling and suspense. What did TTAC have to say about the Ram 3500? The following are some quotes from author Alex Dykes' review:

"Ram was the first to market with an exhaust brake in 3/4 and 1 ton trucks and they continue to lead with one of the best on the market. This system shouldn't be confused with the "Jake Brakes" found in Cummins' big-rig engines: the system Cummins employs here is sometimes called a "potato brake" because it operates by closing the vanes of the variable geometry turbo charger to increase back pressure and thereby increasing engine braking. This type of engine brake is rated in horsepower for some reason, and the 6.7L diesel now brakes to the tune of 225 ponies which has a big impact on brake pad life if you tow in mountainous terrain.

"When it comes to pickup trucks, especially heavy-duty trucks, shoppers are extremely brand conscious and extremely brand loyal. Think about it, how many people do you know that rotate around pickup brands with every purchase? As a result, it would be easy to say the Ram 3500 is a great truck for Ram loyalists and the other trucks are all lovely too. However, the 2014 Ram might be the first truck since 1994 to sway hearts and minds. Not only does the Ram deliver the best interior and infotainment system in the segment, but it also delivers 30,000lbs of bragging rights, a stellar Cummins engine and a rear air suspension that is nothing short of revolutionary for the heavy-duty pickup market. If you're looking at an F-350 or eagerly waiting that new Silverado 3500, swallow your pride and give the Ram a test drive. You'll thank me later."

MORE GOOD NEWS

Motor Trend Names Ram 1500 EcoDiesel as 2014 Truck of the Year

This news comes to us from an early December press release from the folks at Ram. The following are excerpts from their press release:

Motor Trend has selected the Ram 1500 EcoDiesel as its 2014 Truck of the Year.

The announcement was made at the Chrysler's Warren Truck Assembly Plant in Michigan, the birthplace of Ram Trucks.

Nine Truck of the Year contenders were put through an extensive battery of testing designed to evaluate virtually every aspect of each vehicle. In addition to the 2014 Ram 1500 EcoDiesel, the judges examined other all-new or significantly updated trucks the industry produced this year: the Chevrolet Silverado, GMC Sierra, Ram Heavy Duty, and Toyota Tundra pickups; and the Ford Transit Connect, Mercedes-Benz Sprinter, Nissan NV200, and Ram ProMaster vans.

With the votes cast, the Ram 1500 clearly emerged as Motor Trend's 2014 Truck of the year. The judges were particularly impressed with the performance of the Ram 1500's all-new EcoDiesel V-6 engine as well as its eight-speed TorqueFlite transmission, a combination that boasts a towing capacity of up to 9,200 pounds. Further, Motor Trend's Real MPG testing supported what the team learned in Uvalde: None of the gas-powered half-ton trucks in this year's competition—be they V-6 or V-8, 4x2 or 4x4—could match the EcoDiesel's mileage. After delivering observed fuel economy of 15mpg under extreme testing at Continental's proving grounds, the EcoDiesel continued to impress during the Real MPG test loop, returning the following frugal stats: 19/26/21mpg city/highway/combined for the Laramie Longhorn Crew Cab 4x4 with a 3.92 rear axle and an even more notable 18/28/22 for the Lone Star Crew Cab 4x2 with a 3.55 rear axle.



The Ram's optional air suspension system also scored high marks in Engineering Excellence, as it delivered a compliant ride and commendable handling no matter the

terrain. In terms of design, the Ram 1500 impressed with its style, packaging, and interior ergonomics: notably, the Laramie Longhorn's luxury aesthetics and real wood trim.



The breadth of the lineup was another compelling factor. Whether outfitted as a basic workhorse or optioned up to a near-luxury hauler, the Ram 1500 provides all of the capability needed in a truck.

"For 2014 we had a large and highly competitive field of contenders for Motor Trend's Truck of the Year," said Edward Loh, Editor-in-Chief of Motor Trend. "At the end of the day, though, the Ram 1500 quickly rose to the top. Not only did it withstand our rigorous testing, it thoroughly impressed our judges with its vast array of standard and optional equipment, and, most notable, its fuel-efficient, segment-exclusive EcoDiesel V-6. With 420ft-lb of torque and up to 28 'Real MPG' highway, the EcoDiesel is a true game-changer. In fact, it helped make Ram 1500 the Motor Trend 2014 Truck of the Year—and the only consecutive winner in the history of the award."

Robert Patton
TDR Staff

RAM WINS, AGAIN

ISSUE 86 – TDREVIEW

by Robert Patton

In the words of 70's country music singer Jerry Reed,
"When you're hot, you're hot

(When you're not, you're not)

Members, the folks at Ram and Cummins are sizzling hot!

The balance of this article will give you a summary report of recent testing data and journalistic reviews of model year 2014 Ram, Ford and GM pickup truck (1/2 ton to 5500 series) products. However, the real proof positive of the "sizzling hot" claim lies in the numbers. Here are some sales figures for the first eight months of 2014.

	2013	2014	Change
Ram	234,642	283,256	+20.7%
Ford	499,050	497,174	-1%
GM	450,501	462,503	+2.6%

Careful now, here is some longtime advice I can offer you: Figures don't lie, but liars often figure.

In the case of Ram's sales figures, my cynical play on words is presented only so that we slow down a minute and provide some context for the numbers. These numbers were for *all* pickup trucks. Vehicle sales numbers do not give me diesel-only data. We also have to remember that the Ford F-150 is in its last year before its 2015 redesign. Regardless, a 20.7% increase by the Ram folks is impressive. Take a hike, Mr. Cynic!



Previous Test Data – Ram Wins

All right! Knowing that we have sales data that we can rally around, let's do a quick review of truck testing in the past year that could have influenced buyers' decisions.

It has been only three issues ago (TDR 83, pages 48–53) that we did a five-page *summary* of articles where Ram trucks were the winners of some high-profile testing done by three different media groups. To save you from having to reach for your Issue 83 magazine, here is a quick review:

PickupTrucks.com — "King of Beast": Ram wins in a HD3500 versus a Ford F-450 shootout.

Canadian Truck King Challenge — Ram wins three of three categories: Under \$45,000 1500 Series Comparison, a Ram 1500 3.6-liter truck wins; Over \$45,000 1500 Series Comparison, a Ram 1500 EcoDiesel wins; and a Heavy Duty Shootout, a Ram 2500 Turbo Diesel wins.

Motor Trend — "2014 Pickup Truck of the Year": the Ram 1500 EcoDiesel wins their annual truck award.

Did the accolades from the media bolster Ram's 2014 sales figures? The numbers certainly do indicate "yes."

I have an admission. The cynical Editor and the pragmatic industry expert Whale have both been put in their place when they would dismiss the test results in assuming that "figures don't lie but liar's figure", the rule I suggested earlier. So, enough of their attempt to ruin the party! The Ram folks are hot! Let's celebrate with Ram and Cummins with some more good news for 2014 and 2015.

New Test Data – Ram Wins (Sort Of), Ram Wins (Without a Doubt)

With all of this rambling on about Ram's good fortune, have you yet bothered to hunt up the TDR Issue 83 to check out the data?

"No, Mister Editor, that is your job: you find #83 and give us the summary."

You got me.

In the previous paragraphs I gave you the big category awards that Ram/Cummins received, as reported in the Issue 85, five-page *summary* article. So, what further data do you need?

Answer: Context, context, context, and a segue for the introduction of guest writer, Mr. Kent Sundling. All right, here goes:

Back in Issue 83 we had a review from the staff at PickupTrucks.com titled, "King of Beast." The "Beast" article was a follow-up to two other diesel truck shootouts that they had done: the fall of 2011's "Hurt Locker" (see Issue 75 for coverage), and fall of 2010's "Diesel Shootout" (see Issue 71 for coverage). One reason for providing this history is that I want to give a tip-of-the-hat to PickupTruck.com's (PUTC) Senior Editor Mark Williams for consistency in testing and reviews. You see, the prior PUTC evaluations have all been done using the SAE standard J2607 testing methods.

Additionally, I want to draw your attention to these oldie-but-goodie TDR magazine issues. You see, not everyone is a new truck buyer; there are lots of folks that will look at, or have already purchased, a used Fourth Generation truck. Check out info in the old issue and compare it to the new. While we may not have always been the winner of the previous comparisons, the earlier Fourth Generation trucks still have a lot to offer the Ram faithful.

Okay, this brings us to PUTC's Fall of 2014 comparisons (and the focus of this summary): "The 2014 Ultimate HD (3500) Challenge" and "The 2014 Ultimate Three-Quarter Ton Challenge."

The 3500 Challenge included comparably equipped 3500 crew cab, diesel-powered, automatic, 4x4, 3.73 ratio, dually trucks. The Three-Quarter Challenge included comparably equipped 2500 crew-cab, gasoline-powered, automatic, 4x4, 4.10 ratio (3.73 for the Ford) trucks.

From the title you already know the outcome: Ram wins (sort of) the Ultimate HD 3500 Challenge, and Ram wins (without a doubt) the Ultimate Three-Quarter Challenge. Now for the fun part, Mr. Editor gets to pick out the highlights.

Before I attempt my highlight/summary notes, one should, again, give credit to the PUTC test staff. Pulling data and reading from the entire 130+ page internet report makes one realize the time and expense that it takes to do this kind of test. Now, consider that they have done four different evaluations (dating back to 2010), and you begin to see the major undertaking the PUTC data represents. Impressive! The full reports are at www.pickuptrucks.com.

The Specifications:

	2015 Ford F-350 4x4	2015 GMC 3500 HD 4x4	2014 Ram 3500 HD 4x4
Cab	Crew Cab	Crew Cab	Crew Cab
Trim	King Ranch	SLT	Laramie Limited
Price	\$67,885	\$65,520	\$69,870
Engine	6.7 PowerStroke V-8	6.6 Duramax V-8	6.7 Cummins I-6
HP @ RPM	440@2,800	397@3,000	385@2,800
Torque @ RPM	860@1,600	765@1,600	850@1,700
Transmission	Ford 6R140 6-speed	Allison 1000 6-speed	Aisin AS69RC 6-speed
Axles	3.73	3.73	3.73
GVWR	14,000	13,025	14,000
Scale Weight	8,700	8,440	8,740
GCWR	31,900	30,500	32,000
Fuel Tank	37.5	36	32

	2015 Chevrolet 2500 HD 4x4	2015 Ford F-250 4x4	2014 Ram 2500 HD 4x4
Cab	Crew Cab	Crew Cab	Crew Cab
Trim	LT, Z71	XLT	SLT Big Horn
Price	\$49,545	\$47,690	\$49,755
Engine	6.0-liter V-8	6.2-liter V-8	6.4-liter V-8
HP @ RPM	360@5,400	385@5,500	410@5,600
Torque @ RPM	380@4,200	405@4,500	429@4,000
Transmission	6L90 six-speed	6R140 six-speed	66RFE six-speed
Axles	4.10:1	3.73:1	4.10:1
GVWR	9,500	10,000	10,000
Scale Weight	6,740	7,120	7,000
GCWR	20,500	19,000	22,500
Fuel Tank	36	35	31

Background Information

PUTC's Mark Williams gives you some background data:

Based on reader feedback from previous Challenges, we broke this Ultimate HD Challenge into two separate sets of test, each taking a full week to execute. The first focused on closed-course track and fuel economy data, and the second centered on real-world towing up some of the toughest grades in the country. In order to participate in this Challenge, each manufacturer had to agree to provide the exact same trucks for each portion of the test. So the six trucks we tested in Michigan during Week 1 would have to be shipped two weeks later to Las Vegas for the towing portion of the Challenge. All agreed. Week 1 consisted of testing at Milan Dragway, GM's Milford Proving Grounds, and fuel-economy lops near Detroit. Week 2 had us hitting the road for towing tests at Davis Dam in Arizona and the Eisenhower pass in Colorado.

The Specifications:

Ram Turbo Diesel faithful, this is not a category where we find ourselves in the "winner's circle" (literally, the testing was conducted at a 1/4 mile drag strip). For the 2500 test, one would assume the Ram 6.4-liter Hemi with a 4.10 gear would be strong, and it was the winner. The data:

		3500HD	2500HD
Ram	Empty	17.3	16.8
	Loaded	24.3	18.2
Ford	Empty	16.3	17.2
	Loaded	23.5	18.5
GM	Empty	16.2	17.0
	Loaded	24.2	18.8

Fuel Mileage:

For the mpg test all six vehicles travelled the same Ann Arbor, Michigan, test loop of 150 miles. The load on the 3500 trucks was a 16,000 pound trailer with a 64 square-foot windscreen; the 2500 trucks had 2,480 pounds of payload.

		3500HD	2500HD
Ram	Empty	16.31	14.03
	Loaded	7.23	13.65
Ford	Empty	16.12	15.10
	Loaded	6.92	13.70
GM	Empty	16.12	14.81
	Loaded	7.76	14.09

Braking (60-0mph):

The braking test was done at GM's proving grounds. On level pavement the trucks accelerated and braked empty and then did the same exercise with the payload used in the acceleration test: the 3500 trucks were pulling the 16,000 pound trailer; the 2500 trucks had the 2,480 pound payload.

		3500HD	2500HD
Ram	Empty	148.3	155.0
	Trailer Brake 5	249	161.0 (payload)
	Unplugged	312	
Ford	Empty	156.4	147.8
	Trailer Brake 5	285	153.2 (payload)
	Unplugged	335	
GM	Empty	145.9	146.4
	Trailer Brake 5	281	150.1 (payload)
	Unplugged	326	

Performance/Davis Dam Acceleration:

The Davis Dam data for the 3500 truck is based on a test pulling right at 21,000 pounds up the 10.8-mile stretch of Highway 68 from Bullhead City, Arizona, to Union Pass Summit, a 3000 foot elevation change, with a 5% grade. The Davis Dam data for the 2500 truck is based on a test using a 2400 pound payload and accelerating up a 1/2 mile section of the roadway where the average incline is close to 7% grade.

		3500HD	2500HD
Ram	Minutes	12.48	Seconds 46.35
	Top Speed	59.9	Top Speed 79.38
Ford	Minutes	11.32	Seconds 47.42
	Top Speed	64.1	Top Speed 76.46
GM	Minutes	12.25	Seconds 53.19
	Top Speed	60.5	Top Speed 77.74

Performance/Eisenhower Pass:

Quoting from the PUTC staff:

We don't think there is any more extreme test for a pickup truck to have to endure than taking it where the air is thin and the roads are steep, and that's what the Eisenhower Pass grade is all about. We tested on a 7.2-mile stretch of Interstate Highway 70 in Colorado, from the valley exit at Dillon to the entrance at the summit of the Eisenhower and Johnson tunnels. This stretch climbs more than 2,000 feet and is the worry of every eastbound big-rig trucker.

This stretch of the I-70 is famous for its hair-raising emergency runaway truck ramps (there were three on our test stretch) and for the punishingly steep hill climbs that bring trucks' cooling systems to their knees as engine temperatures reach redlines they've never seen before.

The 3500HD trucks pulled a 21,000 pound trailer up the pass.

The 2500HD trucks pulled a trailer based on 90% of GCWR: 22K for Ram, 20K for GM, 19K for Ford. This disparity (and the Ram would hold the shift out of 1st gear until 4500rpm) resulted in Ram's being miserably behind the Ford in the time taken to go up the hill. Also note the Ram's 90% figure correlates to the load of 3000 more pounds than the Ford.

		3500HD	2500HD
Ram	Minutes	9.21	12.23
	Top MPH	62.6	66.5
Ford	Minutes	9.03	9.40
	Top MPH	65.3	65.4
GM	Minutes	9.03	10.05
	Top MPH	66.6	62.2

Exhaust Brake/Brakes:

The PUTC team completed the brake testing after each of the uphill timed runs and employed the same procedures as in the past. At the top of the Davis Dam grade, right at the Union Pass summit sign, they started the brake test by slowing the truck and trailer to 55mph, with each truck in Tow/Haul and with the exhaust brake button on. The range they allowed before a brake or an acceleration touch was allowed was between 50 and 60mph. If the vehicle speed fell to 50mph, they would throttle to 55mph; if vehicle speed went above 60mph, they would slow back down to 55mph.

They kept track of acceleration touches needed as well as braking events, and they scored each "touch" the same. The winner was the truck that needed the least number of touches (accels or brakes) to maintain the stipulated speed.

		3500HD	
Ram	Minutes	12.48	Accel 3
	Speed	59.9	Decel 3
Ford	Minutes	11.32	Accel 1
	Speed	64.1	Decel 6
GM	Minutes	12.25	Accel 1
	Speed	60.5	Decel 8

And the Winner Is...

PUTC's Summary for the 3500HD – Ram Wins (Sort Of)

The following is the summary from the PUTC staff concerning the 3500HD competition:

Of the 19 empirical tests that we conducted—which included everything from quarter-mile times at a drag strip to how much each one-ton squatted with its gooseneck weight—eight of them were won by the 2015 GMC Sierra 3500 HD and seven were won by the 2015 Ford F-350. In fact, when looking at the point totals for the quantitative section, the Ford and GMC were virtually tied, with a statistical

difference between them of 0.3 percent. The 2014 Ram 3500 HD won just four events because the majority of the tests rewarded off-the-line speed and quickness, something the Ram/Cummins has always struggled with.

However, in the qualitative scoring section from our judges, the Ram had the most points, finishing in first or second place with each expert and winning the section by 40 points over the GMC (Editor's note: Ram wins, sort of). However, in the end, the GMC is our winner with the highest combined point total in one of our most comprehensive competitions to date, beating both of its competitors by a solid margin.

The overall point totals:

	Empirical	Judges	Total
GM	1792	1500	3292
Ram	1681	1540	3221
Ford	1786	1410	3196

PUTC's Summary for the 2500HD – Ram Wins (Without a Doubt)

The following is the summary from the PUTC staff concerning the 2500HD competition:

Interestingly, of the 16 empirical tests we conducted, the 2014 Ram 2500 won the most events with 10; the 2015 Chevrolet Silverado 2500 won three and the 2015 Ford F-250 won three. However, the Ram did not collect the most points in the empirical section. That happened because we allocate points equally in each event based on the percentage difference from the winning time, speed or distance. In several cases the winning and second-place scores were separated only by fractions, so many scores were very close. The Ford F-250 finished ahead in data points by a very small number, winning just three of 16 events but placing very close to the winner in many others.

Where the Ram 2500 did much better than either of the other two competitors was in our qualitative scoring, impressing each judge enough to get a unanimous first-place finish.

The overall point totals:

	Empirical	Judges	Total
Ram	1553	1515	3068
GM	1539	1445	2984
Ford	1560	1395	2955

CONCLUSION

Ram Wins (Sort Of) and Ram Wins (Without a Doubt) — That's the takeaway from this summary of the exhaustive test by PUTC. I'm hopeful you found it illuminating and helpful.

I know from the letters and emails that came in after our PUTC summary in Issue 83 that you readers really enjoyed the behind-the-scenes commentary from PUTC tester Kent Sundling. So, when I noticed Kent's name in these latest tests, I called to see if he would provide another report.

Where else would you get this kind of insight? —the kind of insight Kent provides TDR readers in the following report on the two 2014 HD Challenges!



2014 Ram 2500 Hemi

BEHIND THE SCENES WITH KENT SUNDLING

By Kent Sundling

It's always a privilege to be part of PickupTrucks.com truck shootouts. This go-round it was the "Ultimate 2014 HD Truck Challenge." My favorite part is towing trailers cross-country. So much data gets collected from the drivers and test equipment that I don't know how anyone could beat this much truck comparison information.

This is the longest truck contest I've participated in, or even heard of. Two weeks adjusting seats, mirrors, steering wheels, and of course Sirius radio. Behind the scenes of this comparison, the ordeal was even more intense, with cameras everywhere, photographers standing on Jeeps and hanging out windows, and us guys wheeling three big trailers through city traffic and around small cars (oops, that's a blind spot), it was stressful fun.

All three trucks had 3.73 axle ratios. We know the Ram HD 3500 with 4.10 axle has a higher trailer capacity, but we wanted this to be as close to an apples to apples comparison as possible. The 3.73 axle ratio is the only one GM has ever used with the Duramax diesel in a 3500.

Load Trail provided the Pro Max flatbed gooseneck trailers rated at 30,000 pounds. For trailer cargo our Ram Turbo Diesel pulled a 2500 with a 6.4-liter Hemi with ballast (water tanks) in the truck's bed.

I like to daydream when I'm cruising cross country, but on this kind of contest I had to register all the senses of how the trucks sounded, felt, and handled. So, let me give you my "full attention" review of the Ram.

Ram 3500 HD Review

The Ram Laramie Limited 3500 HD is as good as it gets for a high-end luxury cruiser. Like a kid declaring "shotgun," during the test I would call it "my office." The Ram interior has lots of soft touch, and big knobs for finding controls fast. Ram has the easiest console controls; the analog cluster was very good, with a dial for the DEF level. The Ram's big crew cab, with its rear floor storage and folding flat rear load floor, made hauling our equipment an easy task. You could say it was the crowd favorite, too.

Remember now, this was a test of both a 2500 and a 3500, so you'll want to read through my notes on the 2500 truck, too. (And you'll relish the commentary on it, for it was our particular winner.) The 2500 HD Ram has great visibility all around; the 3500 HD dually has great front visibility. The 2500 Ram with the new 6.4-liter Hemi impressed me. Its Multi-Displacement System (MDS) can give an unloaded truck good fuel mileage while tooling across the Plains, and you can still benefit from a 4.10 axle ratio for towing when you need it. The new 2500 HD five-link rear coil springs was my favorite ride of the six trucks for not spilling my truck-stop coffee. Really, the ride is that good.

As you log the miles, trailer towing visibility (I mentioned the oops/blind spot earlier) really means a lot to the driver. While the Ram didn't have the largest mirror glass area, it did have the farthest reach for mirrors, great for these 8.5-foot-wide trailers. Power fold mirrors for 2015 will make them even better. The Ram has an industry-only push button start; you don't have to bob your head to find the ignition switch. This feature will get copied.

Ram has improved the ride on the 3500 dually beyond the hydraulic cab mounts that were new in 2010, with their new three-link front suspension. The specification sheets and Ram guys tell me "no, there isn't," but something is different at the rear axle. The Hotchkiss leaf stack looks the same, but it seems to ride softer. I wish we could have had the new air assist rear suspension. In the last big contest we had in 2011, "Hurt Locker," the Ram dually bounced so badly on some sections of pavement through Moab to I-70 that I needed back support. This year the Ram 3500 was totally improved on the same road.

The Cummins Turbo Diesel has that distinctive sound that makes you feel like a big rig driver. Even the exhaust brake sounds more like that of a Peterbilt. Where the GMC and Ford sound more like gasoline engines, you won't mistake the Cummins diesel.

When we started in Detroit with the 16,000 pound test trailers, we used the factory Ram gooseneck balls in both the Ram and the Ford. A bit later Ford brought us a gooseneck ball. They both fit the under-bed hitch. I like the Ram ball better, as the latch is at the base of

the ball, whereas the Ford has a plastic clip on top of the “greasy ball” for unlatching the ball. For backing up to the gooseneck trailers, the Ram was better. With the high mount stop lamp and its backup camera, you could hit the target by yourself.

Earlier I told you that I laid claim to the Ram by calling it “my office.” Here is another observation that the TDR members will like: the Ram 3500 seems to perform better with bigger loads, it just lumbers along like a big rig. With the highest GCWR of the dually diesels we tested, the Ram HD 3500 was rated at 29,880 pounds.

The Ram won the brake tests with trailers. Ram and GMC had their Class 5, receiver inlets tucked out of the way. The Ford receiver looked like it did 20 years ago.

What’s to Complain About?

The Cummins diesel with Aisin transmission is the most expensive diesel/transmission combination. I remember when Dodge/Ram Turbo Diesel trucks were the best value/cost.

When we did the test at Davis Dam in Arizona, the trucks were tested using the SAE J2807 standards. I’m glad to see Ram test their whole truck line to that standard for 2015. SAE J2807 is a fair and true test of the entire vehicle.

The Ram integrated brake control is good, but in the last two major truck contests with PickupTrucks.com, there has been a problem with it. Last year it was with electric-over-hydraulic on gooseneck trailers. This year, after checking the trailer brakes at our starting point in Las Vegas, I couldn’t get around the first corner before the dash read out “trailer disconnected.” At the first truck stop I checked all the connections and got things working by switching the trailer plug from in the bed to the bumper. Then, almost to Arizona, the readout flashed “trailer disconnected” again. I checked all connections again. The dash readout showed 0 gain and defaulted to “light trailer electric brakes” from heavy trailer electric brakes. Then, limping along to a convenience store in Arizona for a sandwich at midnight, I backed up 30 feet to get out of the truck (truck stop coffee needed) and, voila, the trailer brakes all worked again. There were no more brake problems to the end of the trip in Denver.

The Ram’s “smart” exhaust brake was great on 5% grades or lower. It seemed to learn the way you applied brakes. Full setting was needed for 6% and higher grades to benefit. Running downhill with the Ram 3500 towing almost 21,000 pounds, out of the Eisenhower tunnel at 11,000 feet down 7 miles to Dillon, Colorado, did take some brake touches, five to be exact; GM zero and Ford one. This was a big difference from the previous test when Ford would take 20 touches.

In Michigan, Ram’s rain-sensitive wipers were the slowest in hard rain. Ram is the only one in the class without a telescoping steering wheel. The Ram 3500 has the largest rear fenders and the worst visibility. However, it looks

really good and it really helps to have the farthest-reach towing mirrors in the market.

I’m not sure why Ram has the smallest fuel tank at 32 gallons. We’ve been told it’s because of the new DEF tank, but how does Ford have a 38 gallon fuel tank and GM a 36 gallon tank with DEF? In our contest, Ram used twice as much DEF as Ford and GMC. I did like the DEF fill cap in the fuel door; it’s easier to fill up at the fuel island, much easier than GM’s DEF tank under the hood.

With the diesels, all three brands have their own acceleration characteristics. Ford is the fastest off the line, GM has the best midrange, and Ram chugs along like a locomotive forging ahead at a steady speed.

Conclusion

I really hope the readers find these truck contests to be usefully informative. From the data we collect, you can use what’s important to you to pick your own winner. When you test drive a new truck, dealerships don’t often allow you to hook up to a trailer. This is why all my reviews involve trailers. The data shows how close these trucks are, and this was the closest I can remember in a true race for power. If you didn’t use the time sheets and computers to count the numbers, you wouldn’t know who the winner was. The judge’s-opinion-part of this comparison gave you our considered assessments, which you may or may not agree with. None of us knew how the other guy voted until after we sent in our ballots and they were totaled up.

Kent Sundling
TDR Writer



2013 RAM REVIEW

ISSUE 81 – HAVE RAM, WILL TRAVEL

by Joe Donnelly

Editor's note: Joe starts his article for Issue 81 with a brief introduction and then he goes into a "technical comparison" of a new truck to his '04 Turbo Diesel.

Don't be fooled by the technical comparison wording— Joe is shopping for a new truck. In fairness to Joe and those that are also looking at a new vehicle, you can read and follow the analytical process that he uses. For a guy like me, who simply goes back to my long-time dealer and says "let's make a deal," then drives a new truck off the lot, it seems to be an arduous process.

So, follow along with Joe and you'll see how an engineering-type of guy pours over the data and convinces himself that new is better.

Finally, the analytical Joe versus the emotional editor-guy Robert ties directly to the article that we have in this issue by Mark Barnes titled "Define Best." So, turn to page 66 and read about the focus on facts or the focus on feelings. And the next time you are in the market for a truck, give some thought as to where you fall in the truck purchasing process. Now, back to the article that should be titled "Joe Buys a New Truck."

INTRODUCTION

For the "Ten Back" theme of this issue, I performed a technical comparison of the 2004 I bought in October 2003 to today's 2013-2014. For background, see Issue 78, page 42, and Issue 80, page 58. Back then I focused on the 3500 series, 4x4, Quad Cab (the crew version was not yet available) with single rear wheels. As I will discuss, for 2013 I spent most of the time researching the same style 3500 series, because the 2500 is not available with the Aisin automatic transmission.

First, here is a summary of the basic features for each model of the 2013 model year 3500 single rear wheel Crew Cab series:

Tradesman Features Include:

- 18-Inch Styled Steel Wheels
- Standard Quad Halogen Headlamps
- Black Grille, Front and Rear Bumpers
- Black Door Handles and Mirrors
- Standard 17,000-lb Class V Trailer Tow Hitch Receiver w/ 4- and 7-pin Wire Harness
- Available Fifth-Wheel/Gooseneck provision
- Locking Tailgate w/ Torsion Bar

SLT Includes Everything on Tradesman, Plus:

- 18-Inch Chrome-Clad Wheels
- Body-Color/Chrome Door Handles
- Power Door Locks
- Bright Bumpers and Grille
- SiriusXM Satellite Radio
- Cloth 40/20/40 Split Bench Front Seat
- Chrome Accent Shift Knob
- Remote Keyless Entry
- Traveler/Mini Trip Computer

Big Horn Includes Everything on SLT, Plus:

- 18-Inch Polished Aluminum Wheels
- Chrome Grille w/ Chrome Insert
- Fog Lamps
- Leather-Wrapped Steering Wheel w/ Radio Controls
- Uconnect Voice Command w/ Bluetooth Connectivity
- 60/40 Split Folding Backseat
- Remote Start+
- Uconnect 5.0 (RA2) System w/ 5-Inch Touchscreen

Laramie Includes Everything on Big Horn, Plus:

- Dual-Zone Automatic Temperature Control
- Heated and Ventilated Front Seats
- Leather-Trimmed Seats
- Driver Preference Memory Control
- Passenger Memory Seats w/ 6-Way Power
- Heated Steering Wheel
- Woodgrain Instrument Panel
- Uconnect 8.4A (RA3) System w/ 8.4-Inch Touchscreen

Laramie Longhorn Includes Everything on Laramie, Plus:

- Mopar® Bright Sill Guards
- Accent Color Running Boards
- Spray-In Bedliner
- Full Screen Navigation w/ 3-D City Models and Landmarks Digital Terrain Modeling
- HD Radio
- SiriusXM Travel Link+
- Leather Premium Seats
- Uconnect 8.4AN (RA4) System w/ 8.4-Inch Touchscreen

Pricewise (again looking to compare a new truck to my existing '04, 3500, Quad Cab, 4x4), you can begin with a stripped down 3500 Tradesman Crew Cab, 4x4, with only the Cummins and the standard six-speed, G56 manual transmission at a basic list price of \$48,285 with destination charge and \$500 rebate. You can escalate features and price all the way to the fully loaded Laramie Longhorn with the Cummins and Aisin options added, for \$64,255. Many other options are available, of course. For me, the important powertrain and heavy duty options,

besides the Cummins and Aisin, include the fifth-wheel/gooseneck towing prep group, spray-in bedliner, 4.10 axle ratio, cold weather group (engine block heater and front grill cover), and snow plow prep group (220 amp alternator and transfer case skid plate). At May Madness, I learned that the larger 8" touch screen system would allow gauges, etc. to be displayed. This option on the SLT model costs about \$970, and on the mid-priced Big Horn which comes with the smaller 5" touch screen, it costs \$505. It is not available with the Tradesman series.

If you go to www.ramtrucks.com and "build" your selection with options, you will find that single-cab Rams are limited in availability, as are Cummins power with 4.10 differential ratio and the Aisin transmission.

Dimensions

All Rams compared here are Crew Cab models with four-wheel drive and single rear wheels. Five inches is added to First Generation lengths for a rear bumper; bumpers are included in measurements I found for later Rams.

Dimensions

Generation	Cab	Bed	Wheelbase	Overall length	Height	Turning Circle 4x4 SRW	Brake dia. " ft, rear
First	Club	8'	149"	234"	69.8"		12.8, 12
Second	Club/Quad	6'	139"	224"	77.2"	45.2'	12.5, 13-drum
		8'	155"	244"	77.1"	51.6'	
Third	Quad	6'	140.5"	228"	79.0"	39.3'	13.9, 13.9
		8'	160.5"	250"	78.9"	50.6'	
2013	Crew	6'	149.5"	237"	79.8"	44.5'	14.17, 14.09
		8'	169.5"	259"	79.6"	49.8'	

Several things can be immediately noticed. The new long bed Crew Cab is nine inches longer than the 2004 Quad Cab that I am replacing. In turn, the 2004 is six inches longer than the 1997 Club Cab I had before it. That is a growth of fifteen inches in length since the Club Cab era, mostly due to increased rear seat leg room. However, your garage may not be as happy to have a truck that much longer! The 2013-14 will be about 10" longer than a 2004 with the same bed type. If you can move from a long bed to a short bed truck this time, you will end up with a Ram that is seven inches shorter than a 1997 long bed, Club Cab. Otherwise, your garage needs to be longer inside than 21'7" or 22 feet to give a little room on each end.

The growth in height is not much, only about an inch since the 2004, but 2.5" since 1997. Most garages have a nominal 7-foot high door or better, although in many cases, 1-4" of that height aren't available. You may have to stay with stock height tires and suspension if you garage your Ram! That inch seems to correspond to the taller 18" tires used on the new 3500 versus the 17" tires used on the 2004 and on new 2500s.

I found my long bed, Quad Cab 2004 to have a really long turning circle. From the turn lane, I needed about three traffic lanes going the opposite way to make a U-turn. That 50.6 foot diameter has been trimmed slightly with the new Rams, but the overhang can still cause an issue. Again, if you go from a long bed to a short bed, you will benefit from the smaller size; in this case, the diameter of the turning circle will be six feet shorter. For me, that will make a big difference in maneuverability in the city.

Weights

Axle capacities (GAWR) of 3500s are significantly higher than the 2500s. The front is 6000 pounds versus 5500 for the 2500, and rear capacity is 7000 pounds for the 3500, versus 6200 for the 2500. I don't expect to overload either end, but the extra front capacity is worthwhile for those who plan to attach a heavy aftermarket front bumper and winch. In the past, it was all too easy to exceed the weight capacity of the front end of the Turbo Diesel by adding 300 to 500 pounds to the very front, where it has extra leverage against the front suspension. It is noteworthy that GAWR and GVWR (gross vehicle weight rating) numbers are higher for today's 3500 single rear wheel (SRW) Ram than First Generation dual rear wheel trucks (they had 6900 pound rear GAWR).

The new, higher capacity 3500 SRW axles come with larger ring gears (11.8" vs. 11.5" rear; specification not available at this time for the front axle). This would reduce ground clearance a bit at the center section, except that looking at the "fine print" you see that the Ram 3500 SRW comes with 275-70R18 tires rather than the 265-70R17 that the 2004 had. The new 18" tires for the 3500 are rated for 3640 pound load and have a design diameter of 33.2" instead of 31.8" for the 17" tires that are still used on 2500s with their lower GVWR.

Weight Ratings

Generation Cab	Bed Length	Front GAWR	Front weight	Rear GAWR	Rear weight	Empty weight	GVWR
Second (\$) Club, Quad	82"	4850	3985	6200	2275	6260	8800
	102.2"						
Third-2500 Quad	75.9"	5200	4350*	6000	2740	6980*	9000
	97.9"		4550*		2770	7310*	
Third-3500 Quad	75.9"	5200	4290*	6150	2820	7110*	9900
	97.9"		4490*		2790	7290*	
2013-2500 Crew	76.3"	5500	4660**	6200	2830	7490**	10,000
	98.3"		4810**		2860	7670**	
2013-3500 Crew	76.3"	6000	4820^	7000	2910@	7730#	11,700
	98.3"		4940^		2920@	7860#	12,300

Weights rounded off slightly and are in pounds.

- \$ actual weights estimated; long wheelbase, Club Cab numbers used here.
- # with Aisin; about 110 pounds less with G56, 160 pounds less with 68RFE
- ^ with Aisin; about 95 pounds less with G56, 135 pounds less with 68RFE
- @ with Aisin; about 30 pounds less with G56 or 68RFE.
- ** with G56; about 60 pounds less with 68RFE automatic.
- * with NV5600; about 220 pounds less with automatic.

Towing Capacity

The new 2013 Ram has numerous changes to strengthen it and make it suitable for heavier towing than ever before. For example, the brakes are larger, the engine is more powerful, and the transmission is matched in strength. Alternator capacity has increased from 120 amps in 1995, to 160 amps in 2003 (with snow plow package) to 220 amps in 2013 (with snow plow package).

The 2013 frame for the 3500 is made of stronger, consistently alloyed, tested, and heat treated steel with a 50,000 psi (50KSI) rating, versus the older (and typical for pickups) 36,000 psi steel (ordinary mild steel). This high strength steel should not be welded by the average aftermarket hitch installer. If you ever plan on a fifth-wheel or gooseneck hitch, order the prep package which lists for \$400. It consists of a very strong cross-member that facilitates the installation of a hitch. Compatible hitches for this new mounting system should be widely available by the time you read this article. Don't have your local trailer dealer install your old fifth wheel hitch! I have seen too many dangerous, poor installations of hitches—bad welds, some bolted only to the bed, etc. The rear portion of the frame is now fully boxed, giving better support to the trailer hitch system.

Tow Ratings

The values below are some of the maximums that I noted. Actual maximum values depend on the particular configuration of differential gearing, actual truck weight, transmission type, etc. The tremendous strengthening of the Ram and increases in power and capacity to its powertrain are reflected in the doubling of gross combined weight rating (GCWR) from 1995 to 2013, along with the maximum trailer weight increasing by roughly half again, or even two and a half times as much as in 1995.

Generation	Cab	GVWR	Max. GCWR	Max. trailer wt.
Second-2500	Club, Quad	8800	18,000	11,900
Second-3500	Club, Quad	11,000	18,000	11,500
Third-2500	Quad	9000	20,000	12,950
Third-3500	Quad	9900	23,000	16,500
	Quad	12,000	23,000	15,650
2013-2500	Crew	10,000	25,000	17,230
2013-3500	Crew 6'	11,700	25,000	17,320
	Crew 8'	12,300	25,000	17,000
		14,000	37,500	29,130

Fuel Capacity

According to some (not all) brochures and specification documents, the fuel tank in the new Ram has a capacity of 31 gallons (32 for long beds), a reduction of three gallons from the 2004 Ram.

I am using the 98 gallon Transfer Flow tank in my 2004 long bed, which is 25" front-to-rear in the bed. The front lip of the bed is 1.5" and I placed the tank slightly back to use the mounting holes that the previous 74 gallon tank required. Thus, I had overall usage of 30" of the floor. The 2013-4 short bed is 21.6" shorter and the lip is 2" instead of 1.5" front-to rear, but I will install the tank closer to the front of the bed. I plan to get a 75 gallon tank that is Transfer Flow's largest for a short bed pickup; it is 18" front-to-rear. When installed, it should take up about 20.6" of bed space, measured at the floor. Therefore, the usable bed length will be 21.6" - 9.6" = 12" shorter than my 2004 Ram's setup. This is not as big a loss of bed space as it first appeared, when considering a short bed instead of a long bed for my new truck.

The new Ram will be at least 13" shorter overall, even if I get longer aftermarket bumpers for it. Those who might put their new Rams into a garage may need to consider overall length. The new trucks have a longer cab with more rear seat room, but the additional overall length of about nine inches has to be considered. I am happy to have a larger cab and feel it is a good trade-off to get the short bed with the smaller aftermarket fuel tank.

Fuel Filtration

In the editor's review of the 2013 truck (Issue 78, page 44) and the Cummins engine (Issue 80, page 63) he made a big to-do about improved fuel filtration.

From the pre-production picture in Issue 78 we noted that Ram was adding a frame-mounted fuel/water separator as a primary catch all item. The following is a picture of the production version (Mopar 68197867AA) that was relocated in back of the fuel tank/just in front of the spare tire and under the bed of the truck.



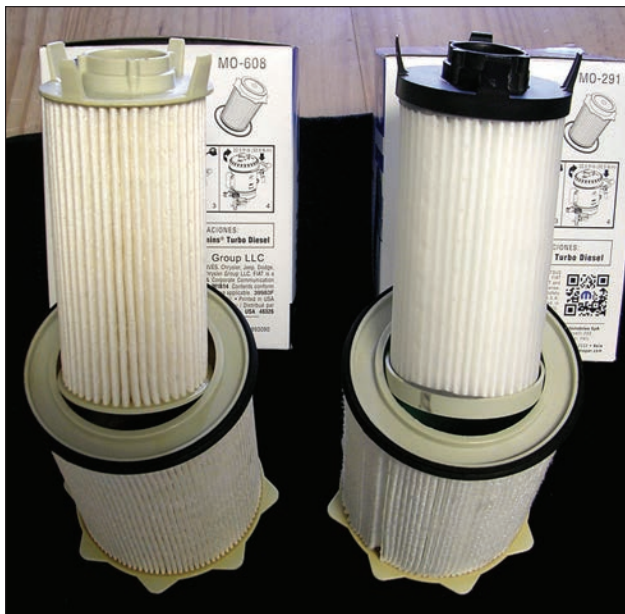
The new under-bed fuel filter.

Next up, the improvements to the secondary, on-the-engine fuel filter. Here is the verbage from the editor's Issue 80 report:

“Now the news from Fleetguard: they have changed the filter element inside the primary fuel filter that is located on the engine. The new part number is: Fleetguard FS53000, Mopar 68157291AA. The trade name for the new fuel filter media is Fleetguard “NanoNet.” This filter will fit ’10-’13 pickups and ’11-’13 chassis cab.

The new NanoNet fuel filter is a direct replacement for the existing Fleetguard FS43255 and Mopar 68065608AA. It has yet to be determined whether these old numbers will be superseded. Again, the new part numbers should be FS53000/68157291AA. I cannot imagine that customers would choose the old/less efficient filter...a supercession sounds logical to me.”

The word-on-the-street about the NanoNet’s “micron” rating: the old “608” part number was 5 micron; the new “291” part number is 3 micron. From the photo you can clearly see that both are a filter-in-a-filter design. With close inspection of the photo you can see a nylon screen around the inner filter of the “291” NanoNet.



Old “608” filter on the left and the new “291” filter on the right.

Finally, the fuel tank’s venting system prevents dirt and water from entering the tank; a warning light tells when the high-capacity sump requires draining. However, I do not agree with Ram’s approach to fitting the DEF and fuel inlets in the small, existing fuel recess. They ended up with no fuel cap, only a flapper valve. I’d rather have a real cap to keep dirt out of the system.



Open fuel door, showing DEF and diesel fuel inlets.

Transmissions

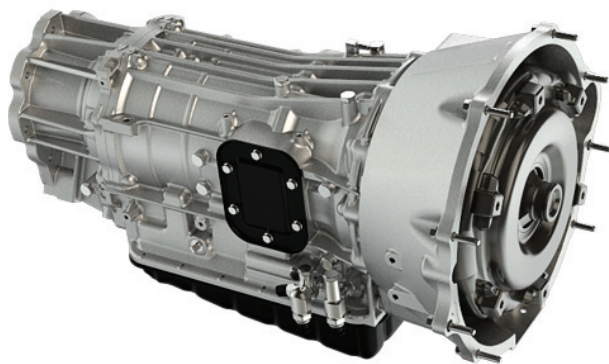
Manual transmissions represent one topic that I have studied over the past ten years! Most recently, manual transmissions for our Turbo Diesels were summarized in Issue 75, page 92.

While the five-speed NV4500 shifted well, it does not have enough rated torque capacity for today’s Cummins engines. The NV5600 was a good transmission, with a few weaknesses, but is obsolete and parts availability is limited. It was replaced by the G56, which has several significant limitations, largely because of its two piece aluminum case, coupled with the factory fill of ATF instead of gear lube. The dual mass flywheel also is subject to failure. My conclusion was that the G56 would be a weak point and not my choice for an expensive new truck that would be used for towing.

I preferred manual transmissions in the past for my Turbo Diesels because earlier automatics gave little to no engine braking if the converter was not locked up. Lock-up at low speeds on mountain trails was problematic. The transmissions themselves had reliability issues, especially with power increases. Higher horsepower engines were offered with manual transmissions (175hp versus 160hp in 1994-1995, and 215hp versus 180hp in 1996-1998. In 1998.5-2002, manual transmission Turbo Diesels had 235 and 245hp, while automatics had 215hp).

Today the situation is reversed. The Aisin and 68RFE automatics are strong, and lock-up can be achieved for engine braking. Also, did I forget to mention that an exhaust brake is included, for further capability on the mountain trails! As summarized above, the G56 is problematic and of limited torque capacity, necessitating a lower power and torque rating for engines equipped with it (350hp, 660 ft-lb). In contrast, the upgraded and improved Chrysler-manufactured automatic, the 68RFE, comes with an engine power rating of 370hp and 800 ft-lb. Ram now offers the excellent Aisin automatic with engine power of 385hp, 850 ft-lb. I remember fifteen years ago when that much power was the subject of mystery and fable! Ram does use “torque management” to protect the

automatic transmission while shifting, etc. whereas they cannot do that with a manual transmission. Thus, Ram has to cut the torque of the engine under all conditions. The strongest transmission is from Aisin (pronounced eye-sin) Seiki, a Japanese manufacturer of transmissions, as well as other automotive components that was founded in 1949. This transmission weighs over 400 pounds, and the Ram incorporating it weighs about 50 pounds more than one with a G56, and 160 pounds more than one with a 68RFE transmission. At May Madness, Harald Harks of BD told us the shafts are about twice as big as those in the 68RFE. While acknowledging the higher price of the Aisin option, because Ram has to buy the transmission instead of making it in-house, Stan Gozzi said, "It doesn't break." I contrasted those features with the assessments of the 68RFE as "adequate" and "improved" and decided that the Aisin was the best choice.



Aisin automatic transmission.

The Aisin option is restricted to the Ram 3500 series, so I dropped the 10,000 GVWR single rear wheel 2500 Crew Cab from my consideration. The short bed 3500 has a GVWR of 11,700, which is more than enough for my uses.

Transmission and differential ratios

Those of us who have owned Turbo Diesels for years tend to jump into differential gearing based on our experience with past models. These days we have to remember that the transmission ratios play more of a role than in the past. Both the Aisin and the 68RFE have double overdrive ratios. Unless you want sixth gear to be essentially unusable, pick a steeper differential ratio, even for economy, than you did in the past.

Ram is trying to improve fuel mileage every way they can for the average buyer. They have added a front axle disconnect (advertised as good for about 1 mpg improvement), synthetic Valvoline/Cummins engine oil, and selective catalyst reduction (SCR) with diesel exhaust fluid (DEF) for emissions control. The SCR is said to improve fuel mileage up to 10% compared to the older system that used the engine injectors to send fuel into the exhaust stream. The Aisin is supposed to be 1% more efficient than the 68RFE. They are reducing engine rpm with the standard 3.42 ratio, but on a diesel, that may not be the best approach.

While the engine can propel the Ram, particularly unloaded, at 1500rpm, the vibrations resulting from only three power strokes per revolution will hammer everything. It is far better to run at least 1700rpm, and I much prefer to drive with at least 1800rpm. I have the heavy duty hub in my South Bend clutch for the NV5600. I can hear the vibrations in the clutch hub at less than about 1600rpm.

Now look at tabulations of gear ratios and how the new combinations affect my typical driving (cruising, without a heavy load or trailer) at 1800rpm (61mph in 6th), highway cruising with or without a trailer at 2200rpm (74mph in 6th), and 2500rpm (towing in 5th, 62mph) with the NV5600 and 3.73 differential ratio. Because of the steep second overdrive ratio (.63) of the automatics, a 4.32 differential ratio would give the same overall gearing as the NV5600 with a 3.73. A 3.94 ratio with the 47 and 48 series automatics would compare to the final drive ratio of the NV5600 with 3.73. By final drive ratio, I mean the combination of drivetrain components that result in a particular engine rpm. The drivetrain combination will include transmission ratio, differential ratio, and tire diameter.

As of the date this was written, the 2014 was not available yet. The ST, SLT, and Big Horn 2013 can be ordered with the Cummins/Aisin/4.10 package. The 3.73 ratio is not available, and neither 3.73 nor 4.10 is available with Laramie or Laramie Longhorn packages. Thus, anyone wanting Cummins/Aisin 4.10 must order ST, SLT, or Big Horn. My preferences include 4.10 ratio, the 8.4" screen U-connect system and forged aluminum wheels, putting the SLT and Big Horn packages close in price. The Big Horn also can be ordered with protective side moldings. For me, the Tradesman package would not be suitable because it is not available with the 4.10 ratio, the 8.4" screen U-connect, or forged aluminum wheels.

Transmission Ratios

Gear	NV5600	47RH, 48RE	2005-7 G56	2007.5-up G56	NV4500	68RFE	Aisin AS69RC
1	5.63	2.45	6.29	5.94	5.61	3.23	3.75
2	3.38	1.45	3.48	3.28	3.04	1.84	2.00
3	2.04	1	2.10	1.98	1.67	1.41	1.34
4	1.39	0.69	1.38	1.31	1	1	1
5	1		1	1	0.73	0.82	0.77
6	0.73		0.79	0.74		0.63	0.63

Engine RPM changes with transmission and differential ratios for 17" wheels:

Trans/Rear	74 mph in 6th	61 mph in 6th	62 mph in 1:1 gear
NV5600/3.73	2200 rpm	1800 rpm	2500 rpm
Late G56/3.42	2046 rpm	1674 rpm	2292 rpm
68RFE/4.10	2090 rpm	1710 rpm	2375 rpm
68RFE/3.73	1899 rpm	1553 rpm	2158 rpm
68RFE/3.42	1738 rpm	1424 rpm	1975 rpm

The Aisin and the 68RFE have the same overdrive ratio so the same results will be achieved. The 68RFE is shown above because the 2013 Ram 2500 has 17" wheels and the Aisin is not available with it.

Now we come to another adjustment of the final drive ratios. The new tires (275-70R18) for the 3500 with its heavier rated axles are rated for 3640 pounds load, and have 33.2" design diameter, on 18" wheels. This situation contrasts with 3195 pounds load rating and 31.8" diameter for the 17" wheels and tires (265-70R17) previously used, and still used on the 2500 series with their lower GVWR of 10,000 pounds. The 18" wheels have correspondingly higher load ratings as well. This larger diameter restores or even increases the ground clearance at the "pumpkin" of the differential, but brings us to the need for adjusting the overall gear ratio calculations once again.

Therefore we will multiply the rpm calculations for the G56 and the Aisin/68RFE to apply to the 2013 model year 3500 by 31.8/33.2 and the adjusted table reads as follows:

Engine RPM changes with transmission and differential ratios and 18" tires, versus NV5600/3.73 with 17" tires:

Trans/Rear	74 mph in 6th	61 mph in 6th	62 mph in 1:1 gear
NV5600/3.73	2200 rpm	1800 rpm	2500 rpm
Late G56/3.42	1960 rpm	1603 rpm	2195 rpm
Aisin/4.10	2002 rpm	1638 rpm	2275 rpm
Aisin/3.73	1819 rpm	1487 rpm	2067 rpm
Aisin/3.42	1665 rpm	1364 rpm	1892 rpm

Thus, with the automatic transmission and 4.10 gears, the new 3500 will give about 200rpm less when cruising at 74mph than my old NV5600/3.73 combination. I wouldn't want to use a numerically lower ratio (like 3.73 or worse, 3.42) with a Cummins diesel powered Ram 3500 and either automatic transmission. With my old combination of NV5600/3.73, I would have the same final drive ratio with the Aisin and 4.51 ratio. With the Aisin/4.10, the final drive ratio is like the NV5600 with a 3.39 ratio. In summary, if you want low rpm and high fuel mileage with the NV5600 or G56, Ram offering the 3.42 ratio, and on some models making it mandatory, is sensible. However, transmissions like the 68RFE and Aisin with double

overdrive gears will give highway rpm ranges low enough to bring in vibration issues, in my opinion. (Remember, I have not owned and experienced the combination directly).

I feel the 4.10 ratio with these automatics is close to ideal for good mileage and avoiding vibration problems from too low rpm ranges, sometimes called "lugging the engine." In fact, I would want to downshift to fifth gear for the 61 mph "cruising" scenario above. In fifth, engine rpm would be 2002rpm.

Editor's note: Here is another example of a difference of opinion between the editor and staff. My opinion—if it pulls the load and the truck is not struggling, leave it in high gear. My trucks have always had low numerical differentials. Also, TDR member, remember I live in the small rolling hills of North Georgia and only tow 12,000 pounds.

NEW FEATURES OF THE 2013 RAM

Changes made to the 2013 model year Turbo Diesel Ram are described in detail on the TDR webpage. When you go to this page, you will also see links to many other related topics on the 2013 Ram. The summary of some new features can be found here:

<http://www.turbodieselregister.com/articlelive/articles/301/1/INTRODUCING-THE-NEW-2013-RAM-HEAVY-DUTY-TRUCKS/Page1.html>

I will go over some of these features here to emphasize those which I feel are some of the more significant technical changes making this model year very important to us.

- New Aisin AS69RC six-speed automatic transmission mated to higher output diesel and offering enhanced power take-off (PTO) capability.
- The Ram Active Air intake system is triggered by new monitoring capabilities added to the engine controller. When the exclusive intake system senses extreme heat, it draws cooler air from the front of the vehicle—a function that also engages at high altitudes for superior throttle response in low oxygen environments. When conditions are wet from snow, ice or water-fording, the system pulls air from an underhood inlet, clear from snow packing and water.
- Ram reduces operating costs via new selective catalytic reduction (SCR) and diesel exhaust after-treatment to deliver 15,000-mile oil-change interval and contributes to a 10 percent fuel-economy gain.
- "Smart" exhaust brake gives a smoother transition to braking.
- Front-axle disconnect works with new transfer cases to boost fuel economy by up to 1mpg.

For 2013, all Ram Heavy Duty diesels benefit from an all-new cooling system: a high-efficiency fan, dual radiators, dual transmission coolers and low-slung charge air cooler.



2013 6.7-liter Cummins Turbo Diesel cooling system.

The new DEF system applied on the Heavy Duty brings the following features and benefits:

- An electric heater in the DEF tank to ensure the fluid is available in a liquid state regardless of climate. The result is a less complex system for enhanced durability. Competitive designs have used a network of glycol-circulated cooling/heating lines.
- A new passively cooled DEF injector that does not require engine coolant to control its temperature, which reduces the complexity of the system.
- Exhaust system refinements to improve the utilization of DEF for NOx reduction and to reduce the risk of side effects from DEF crystalline build-up.
- Exhaust system design improvements allows DEF to be used more efficiently and creates a system that requires less energy from the engine to reach target exhaust temperatures for optimal emissions conversion.
- Emissions system strategy revisions to reduce soot output from the engine and improve fuel economy, all while meeting the legislative requirements. Combined with a 10 percent improvement in fuel economy due in part to the engines' high-pressure common-rail fuel system, SCR promises a net reduction in Ram Heavy Duty operating costs.

More Changes

The Cummins engine uses a high-output viscous vibration damper [see Issue 80, page 61], and the rear driveshaft's new center bearing design incorporates mechanically trapped isolators, and a redesigned U-joint reduces launch vibration. The Ram Heavy Duty's front driveshafts and U-joints are sized larger to align with the truck's new Gross Vehicle Weight Rating (GVWR) and Gross Combination Weight Rating (GCWR). The 2013 Ram 3500 has a higher GCWR, with an 11.8-inch rear axle, a 4-pinion carrier, and a cooling-fin equipped aluminum differential cover.

Two new Borg-Warner part-time transfer cases are used: the BW 44-46 is an electric shifting part-time transfer case with 2WD, 4WD High, 4WD Low and Neutral. The BW 44-47 is a manual shifting transfer case with 2WD, 4WD High, 4WD Low and Neutral. Both options feature a low-range ratio of 2.64 and locking differential from front to rear.



BorgWarner 44-46 electric-shift transfer case.

The Cummins diesels have better cold-start performance and refinement, due to innovations such as the "smart" exhaust brake. Enabled by Cummins' sliding-nozzle turbine design, this setup electronically manages exhaust braking for smoother downhill driving, regardless of vehicle load. The brake allows the speed to drop to any previously selected cruise control speed. (Assuming you've not touched the brake pedal.) Cummins' variable-geometry turbocharger also affords more effortless operation at high altitudes, greater management of EGR flow rates and improved control over exhaust temperatures to accommodate de-sooting.

Uconnect system, gauge cluster, and audio

The next-generation Uconnect system uses Sprint as its wireless partner, and depends on the fast Powernet architecture. Powernet allows up to 40 individual modules; each module (e.g., stability control) can activate other systems (e.g., anti-lock brakes).

A new VSIM can communicate between aftermarket modules and Chassis Cab control modules. The VSIM up-fitter interface has 72 inputs and outputs, including lighting controls, door position, and power take-off (PTO) use. It is a secure gateway to electrical systems and data bus architecture to enable safe, secure plug-and-play connectivity.

A 3.5-inch vehicle information center screen is now standard on Tradesman and SLT, displaying vehicle operating functions on the gauge cluster. A 5-inch screen is standard on Big Horn. A thin-film transistor (TFT), fully customizable 8.4-inch multi-view display is now available on SLT and Big Horn, and standard on Laramie.



The 8.4" touch-screen is to the right of the steering wheel and shifter, above the console.



Close-up of the 8.4" touch-screen shows how it is nicely integrated into the dash compared to some other manufacturers.

Conclusion

Alright, that was my evaluation of the 2013 Ram. Did I mention that I was in the market to purchase one of these trucks?

No?

Perhaps the editor made mention of my purchase intentions. Regardless, as I look back over the material covered in my article, Greg Whale's article on pages 62–65 and the editor's two previous write-ups on the truck (Issue 78) and the engine (Issue 80), I think we have covered the vehicle in detail that you'll not find from any other source. Combine our thoughts with the daily updates from your fellow TDR members at our website's discussion forums and you realize we are a great resource for all things Turbo Diesel.

Thanks for reading my column. Good luck in your search for a new truck.

Joe Donnelly
TDR Writer

OVERVIEW OF 2013 RAM HEAVY DUTY 3500 FEATURES

ISSUE 82 – HAVE RAM, WILL TRAVEL

by Joe Donnelly

THEME FOR 82

The editor has proposed the theme for this issue to be that TDR is the best resource for accurate, unbiased information. In fact, this is our goal consistently. Where we include personal preferences or biases, we present them as such, not as fact. The assessment I was given to evaluate the 2013 Ram 3500s attempts to give objective rationale for selecting options or models, along with plus and minus features. It has not been possible to be 100% accurate because I am approaching a moving target.

For example, Ram put in their features list on www.ramtrucks.com for SLT and higher models that they have a fold-flat load floor. The window stickers and actual trucks do not have this feature. Instead, there are latched high-strength covers over the rear seat storage areas. Initially it also appeared that you must order the fifth-wheel/gooseneck prep package if you anticipated using such trailers. In actuality, that is the case only for 2500s in 2013, and supposedly all 2014s will have the crossmember for the gooseneck hitch, and the frame pockets or boxes for the fifth-wheel inserts. No doubt the aftermarket will step forward with complete hitch packages so the factory prep package won't be required. B&W already has a gooseneck hitch that requires the crossmember, but not the prep package inserts. As a third example, I assumed that the bedrails were similar to those on my 2004 Turbo Diesel. As our Editor pointed out to me, they are not. The rails now have a series of slots and holes stamped into them, so the factory plastic covers are pretty much unavoidable. In turn, that makes it less an issue whether you get the factory bedliner or an aftermarket one—in either case, you won't be getting the “over-the-rails” spray liner option.

In other situations, it is hard to get enough objective information to make the best decision. Only experience with things like the 7” upgraded instrument cluster and the 8.4” Uconnect system will enable you to make a personal decision; there simply isn't enough detail in the information about them that I found. After using those two systems, I like them and feel that either is worth having.

Even with these limitations, we TDR writers continue to work at giving you more and better information than is available elsewhere, without duplicating a lot of the effort we are making for you. Our goal is to help you make the best decision for yourself, not merely to present one approach that a writer happened to take (for whatever reason of his/her own). I hope we are succeeding for you.

OVERVIEW OF 2013 HD FEATURES – PART TWO

In the previous issue of the TDR I did a six page write-up comparing the new 2013 Turbo Diesel truck to my '04

Turbo Diesel. The editor was not fooled by this “technical comparison,” I purchased a new truck. Nevertheless, let's continue to review the 2013 in detail—detail you'll only find in an article written by an enthusiast for an enthusiast.

Our magazine has provided some summaries of the technical advances for the 2013 Heavy Duty Rams. In Issue 78, Robert Patton introduced the new Rams with discussions on the selective catalyst reduction (SCR) approach that uses diesel exhaust fluid (DEF) to give us fuel mileage improvements. Another strategy that brings improved mileage to the 4x4 Rams is the axle disconnect system. It also has new transfer cases and stronger frame, suspension changes, etc. Details about the changes to the Cummins engine were described in Issue 80, pages 58-63. Since then, three events have added information and provided clarifications. Some technical features and a detailed “walk-around” tour were presented at May Madness 2013. Additional engine information was given to us by Cummins and Ram personnel at the Cummins Midrange Engine Plant tour in June, 2013. See the “Chapter News” discussion of this tour. Third, I have had many discussions with these factory personnel, read literature available on www.ramtrucks.com and on www.rambodybuilder.com and inspected about a dozen 3500 model 2013 Rams.



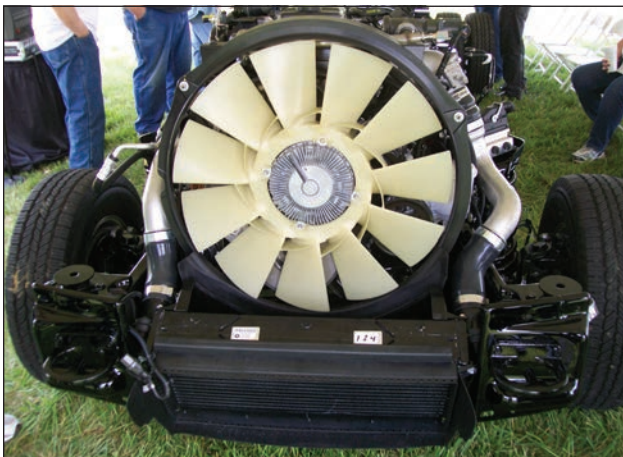
The editor finds a photo of a 2014 Ram and reminds Joe that the new model is now on the market.

The 2013 3500 is tremendously better than the 2012 in strength of components, brakes, and towing capacity. Since 2004.5 Cummins and Dodge/Ram have struggled to keep the engines from getting worse from emissions mandated changes. Finally, with the 2013 I think they now have an integrated approach that works well. Remember in 1973-4 when we all wanted to pull off the EGR hose and richen the carburetor of gas powered cars? You would never consider doing that sort of thing today with the power, mileage, and smoothness of today's integrated packages on gasoline-powered vehicles. I think that Cummins has gotten there with their diesels.

Presentations at May Madness

We received an excellent overview of the technical features and improvements that Ram has incorporated into the 2013 Ram from Stan Gozzi of Chrysler, and from Stuart Miller of the Chrysler Academy, at May Madness 2013. Here is a summary of some of what he presented, with some elaboration from Ram product literature. Some of this information has also been presented in the TDR magazine and on the website, but will be touched on again here for completeness. Additionally, Jamie Standing, the Ram Powertrain Integration Manager, provided clarification and further details.

- A few of the topics that particularly interested me were:
- Brake assist to hold the truck while engaging the transmission
- Power Net electrical architecture facilitates diagnosis
- Tire pressure monitoring at all wheels separately
- More efficient intercooler, radiators (two of them), and eleven blade fan
- Electronic stability control--the computer senses a skid and can apply braking to any combination of wheels, just enough to help the driver regain control
- Advanced air bag system to protect from all directions with just the amount of deployment needed
- Computerized sensing of panic stop—When the driver releases the accelerator pedal very quickly, the computer readies the brakes by moving the pads to the rotors without actually applying brakes before the driver does. This saves about 16 feet of braking distance from 70 mph to 0.
- Braking support for rainy conditions—The computer periodically brushes the pads against the rotors to dry the brakes
- Smart exhaust brake with a full mode to slow the truck/trailer fully, and a lighter application mode to maintain the set speed



Eleven blade fan and low-mounted intercooler.

The front axle continues as before with a 9.25" ring gear diameter and high pinion for driving on the drive side of the gears. However, the housing and axle tubes are stronger for the new 3500's weight rating of 6000 pounds. The differential cover has a larger bolt circle and clearance to the steering and track bar is less, due in part to the beefier components now used to support the higher weight and towing ratings. Thus, your old Mag Hytec front cover won't work. The Dana 60 used until 2002 had a conventional low mounted pinion and in front axle applications that resulted in the coast side of the gears being used in "drive" or forward motion. This setup resulted in about a 20% loss in strength. Thus, the smaller ring gear of the American axle ends up being quite comparable in strength.



Front axle disconnect is to the left of the suspension arm pivot and under the brake hose.

The rear axle is upgraded from 11.5" diameter to 11.8" for 385 HP/Aisin applications. It has the same cover bolt pattern as previous years. A Ram Box cargo management system is available. It includes boxes in the bed sides and a bed divider system.

The Borg Warner transfer case is new for 2013, and its features include:

- 2-Speed in 4WD
- Electrical or mechanical shift available
- Three Operating Modes: 2WD, 4 high-lock, 4 low-lock
- Neutral position for flat-towing the truck
- Flanged front output
- Flanged or slip yoke rear output

Upgrades made to the Cummins High Output / Aisin AS69RC-specific transfer case included case changes to strengthen the case as well as input shaft and bearing strength increases for the higher torque.

There is a new stiffener brace at the top of the engine block plate adapter. The automatic transmissions are easily differentiated by their oil pans; the 68RFE has cross and lengthwise ribs while the Aisin has lengthwise ribs and a drain plug towards the rear.

In previous magazines, we've discussed the fifth-wheel and gooseneck trailer hitch preparation package that is available for \$400. On a 2500, the frame pockets are present only if this package is specified. On the 3500 frame, the pockets are already welded on the side rails. There also is a new cross-member designed to accept a factory gooseneck ball mount that is part of the prep package. The package includes an electrical 7-blade connector in the bed at the left rear, and holes punched in the bed (with plastic caps) for the fifth-wheel and gooseneck mounts. One of the four fifth-wheel hitch frame mounts and the gooseneck mount are shown in the photo. The factory under-bumper receiver hitch has been upgraded to Class V with 1700 pound tongue weight and 17,000 pound trailer weight ratings.



Frame showing welded pockets on the top of the rail for fifth-wheel hitch mounts, and the cross member that the gooseneck hitch mount bolts to, on the underside of the member.



One fifth-wheel mount pocket in the bed at the lower left, and the gooseneck ball mount in the upper right.

What Should I Do?

In Issue 79, pages 65-66, John Holmes described the two extremes for selecting a new Turbo Diesel. Back in August

2010, Robert Patton started with a stripped down, base ST model and bought a lot of aftermarket upgrades to make it what he wanted and to “personalize” the truck. This represents one approach. Intermediate models/trim levels include the SLT, and Big Horn (labeled Lone Star for Texas sales). The Laramie is a higher end trim level. At the high end extreme, John bought the top-of-the-line Laramie Longhorn model with even more options added to those it had as standard features. Who was right? What should be my approach, and why?

To answer this question let's look at features and options on the 2013 Turbo Diesels. I will discuss my preferences which is between the low line ST (Tradesman) and the mid trim level Big Horn. But a similar analysis could be performed between any two models, such as Big Horn and Laramie. I think the key is to determine which features you definitely need, which ones you really want, and which ones are nice but you want to carefully balance their costs versus desirability. I'll try to do that in the analysis that follows. Note that I am only considering the 2013 model year, 3500, four wheel drive, Crew Cab. Other models can have different features, options, and costs.

Features of the Uconnect Systems

You can download the 2013 Owner's Manual, the Diesel Supplement, and the U-connect Owner's Manual from the ramtrucks website. After a two page introduction in the Owner's Manual to help the owner identify which Uconnect system is on a particular truck, ten pages are devoted to the Uconnect 3.0 system. Uconnect 5.0 takes 22 pages, and Uconnect 8.4A takes 122 pages (that's right, 122!) and Uconnect 8.4AN with Navigation takes 117 pages. Thus, we get a quick overview of the number of features and their complexity. But the underlying question is this: What features do you want? Some of them take “subscriptions” costing money annually. For example, if you have a cell phone that is much more than just a phone, such as the Droid that I have, you already have navigation. The big 8.4” screen of Uconnect may be easier to see than a small cell phone screen while driving, but you aren't supposed to do that while driving anyway! You may or may not care about hooking Uconnect up to your cell phone. With more states adopting anti-cell phone laws for drivers, pairing the phone with a hands-off Uconnect system may be wise.

I seldom use the radio and don't know if I want to pay for Sirius satellite radio (after the initial one-year subscription that is included with the factory packages that offer the feature). What is all the other “stuff” on the Uconnect systems, and will I use it?

Editor's note: Since Joe's veering into a discussion about the truck's entertainment system, I had an opportunity to pause for reflection.

I guess I am showing my age. The pause for reflection was taken over by the Joni Mitchell song from 1970, “Big Yellow Taxi.” that happened to be on the radio.

*Don't it always seem to go
That you don't know what you've got
Till it's gone
They paved paradise
And put up a parking lot*

I made a correlation: I enjoy the simple pleasure and entertainment of driving the truck.

Now, back to the new millennium. You can take the same lyrics and twist them 180 degrees as a segue to talk about new features.

*Don't it always seem to go
That you don't know what you've got
Till you've got it?*

Yes, often we do need time to adopt new technology.

Now, back to Joe's analysis of the Chrysler Uconnect system.

Uconnect 3.0 is standard on the base-line ST (Tradesman) model, and on the first upgrade model, the SLT. It gives you an AM/FM radio. The radio has familiar knobs and buttons to choose the stations you program into it. You get a year's subscription to Sirius satellite radio if you buy the "Popular Equipment Group" for your ST. That group also includes cloth seats, carpet, remote keyless entry, etc. Uconnect 3.0 switches to Media mode to play music from a USB stick, an iPod, bluetooth, etc. If you buy the CD player (\$195), it will play them too. A clock is included.



Uconnect 3.0, HVAC knobs underneath the screen, electric transfer case switch to the left of the knobs, and ignition switch to the left of that, just right of the steering wheel.

Uconnect 5.0 is optional on the ST and SLT. The Big Horn and Lone Star packages include it. Where optional, the system costs about \$500-650. What do you get? The radio has a volume button, but now you use soft keys on the screen to select stations you have programmed into the system. You also get a compass to tell what direction your Ram is going, and a clock. The Uconnect system can connect to your cell phone, and you can use voice commands and Bluetooth. This feature facilitates "hands-free" telephone calling. The 5.0 system connects to media also. It accepts voice commands for the radio, media inputs, and Bluetooth streaming.



Uconnect 5.0

Uconnect 5.0 on the ST costs \$660 and includes:

- AM/FM radio.
- Media Hub with audio jack and USB port for music control and USB charging capability.
- SD Card Input for Music (according to ramtrucks.com but not in the owner's manual).
- Uconnect Voice Command w/Bluetooth, which includes Uconnect Phone Hands Free Calling, Voice Prompts, Voice Commands for Radio Functions and Bluetooth Streaming Audio.
- 5.0-Inch Touch Screen Display.
- GPS Antenna Input
- Media Hub (USB, Aux)
- Rearview Mirror with Microphone
- Overhead Console
- Remote USB Port - Charge Only
- SiriusXM Satellite Radio with One-Year subscription

On the SLT, the Uconnect 5.0 option costs only \$465 because it does not include the last three items. Those three items come standard on SLT and above. Uconnect 5.0 allows you to change EVIC and HVAC settings. Uconnect 3.0 and 5.0 have three HVAC knobs in the panel below. Uconnect 8.4 equipped Rams have a single knob and buttons for HVAC control, as well as touch screen controls on the screen. Confused?

Uconnect 8.4 is available in two versions, A and AN with the latter including Navigation (maps and directions). They include the features of the lower level Uconnect systems, and add traffic and weather, and SD card media interface. The 8.4A system is "navigation ready" meaning that you can buy that feature later. The 8.4A system costs about \$500 on Big Horn. It is included with Laramie and Laramie Longhorn models. The 8.4AN costs another \$500 on models up through Laramie, and is included with the Longhorn. The "Favorites" feature allows you to access user defined menus for artists or individual songs on Sirius radio that are currently playing. Similarly, you can access games that are being played on Sirius radio. You can also access heating and cooling settings through the 8.4. The Uconnect 8.4 communicates with EVIC and can adjust settings in it, HVAC (heating, ventilating, air conditioning), the clock, etc.



Uconnect 8.4

You will get six speakers, or nine if a Laramie. Be aware, however, that those extra speakers have to go “somewhere.” Ram decided to put them under the rear seat, so you lose the storage space that would otherwise be there.



Premium stereo speakers under the rear seat of a Laramie.

The above list is a brief overview, summarizing almost 300 owner’s manual sized pages of text. I concluded that any of the systems will work for me, in the same mindset as I had with my previous Turbo Diesels, unless in the future I want to pair my cell phone to the Ram. With the ST, the Uconnect 5.0 option package has more music inputs (in case you want to use a memory stick, etc.) and the seemingly unrelated benefit of adding an overhead console with map lights. The higher level Uconnects allow the owner to access “new worlds” of information and settings that are available in EVIC. (See the EVIC section below).

Optional Equipment

Here I will discuss the various trim levels (models) of the 3500, single rear wheel, 4x4, Crew Cab Turbo Diesel.

If the “build” feature on the ramtrucks website is accurate, only the ST truck can be ordered with Park View using the rear view mirror to present the image. Higher level models require the 5.0 or 8.4 Uconnect as the display screen for this useful option. It shows the direction the truck will go in reverse with green, yellow, and red lines. Park View allows you to see an image of the rear surroundings of your vehicle whenever the shift lever is put into Reverse. The camera is in the tailgate latch escutcheon. Park View is standard on Laramie. On the SLT, Park View requires either Uconnect 5.0, Uconnect 8.4, or the center high mount stop light camera.



Park View screen

You can get a camera in the center high mounted stop light (CHMSL) area to help with connecting a fifth-wheel or gooseneck trailer. That CHMSL camera displays in the rear view mirror, and is available on SLT and above. It also requires Uconnect 5.0. If you want both Park View and the CHMSL camera, you need to order Uconnect 8.4 and Park View. This somewhat confusing situation results from the need to display views from two cameras and how the software allows such displays.

Another option to help with backing up the Ram is Park Sense, which uses sound waves to determine if there are obstacles in the way of backing the truck. It provides visual and audible indications of the distance between the rear fascia and a detected obstacle when backing up, e.g. during a parking maneuver. It can be ordered in SLT and higher models.

Fog lights are optional on SLT and included in higher trim levels (models). The fold-flat load floor under the rear seat is standard on Big Horn and above trim levels.

The fifth-wheel/gooseneck preparation package includes the cast inserts in the frame pockets and cross member, punched holes in the bed with plastic caps, and a 7-blade wiring connector in the bed on the left rear.

The factory bedliner seems to be well done, but does not wrap over the bed rails. The bed rails have factory-installed plastic caps.

The snow plow preparation package includes a 220-amp alternator and transfer case skidplate.

The cold weather group includes a grill cover system and an engine block heater cord.

If you plan to “upfit” a complex package, such as ambulances have, or Power Take Off accessories, the Vehicle System Interface Module, or Electronic Monitoring Module, order code XXS will provide electrical connections to various signals on the CAN BUS. You can also order auxiliary switches on the dash, under the radio. These options are described at [rambodybuilder](#).

If you like a real lever to activate the four wheel drive feature of the transfer case, it is available, but only on the low trim level ST. It includes a floor mounted mini-console with trays and cup holders. The dash-mounted electrical switch for the transfer case (below and to the left of the radio) is a \$245 option on ST and included with higher level models.



ST interior with cloth covered split bench seat and manual transfer case shifter.

Also note that the ST has a large open storage bin above the glove box. Higher level models have a second glove box there. It appears that a glove box could be purchased from a Mopar Parts Department and inserted pretty easily. Issue 74, page 49, has all the details. Parts needed:

- Door – 1NM86DX9AA
- Bin – 1RF25DX9AA
- Striker – 68050731AA
- Screws – 6505628AA x4

An adjustable trailer brake controller is optional on ST (\$230) and standard on higher models. It is located below the radio, at the left of the bank of switches. The tow/haul mode switch is in the center of the bank.



Knob for electric shift transfer case, HVAC knobs to the right of it. The switch panel is below, with the trailer brake controller at the left, and the Tow/Haul mode switch in the center.

Seating and Comfort

The ST (Tradesman) model has an option called “Popular Equipment Group.” It replaces the standard vinyl covered seats and rubber floor covering:

- Cloth 40 / 20 / 40 Split Bench Seat
- Front Armrest with Cup Holders
- Rear Folding Seat
- Floor Covering – Carpet
- Front and Rear Floor Mats
- Remote Keyless Entry with All-Secure
- SiriusXM Satellite Radio with 1 Year Radio Subscription

The 7” multi-view display upgrade instrument panel allows the simultaneous display of multiple gauges and features in the EVIC (see the Electronic Vehicle Information Center section below). It is included with the “Luxury Group” on SLT and Big Horn models, and standard in the Laramie. It is not available on the ST, which has a standard instrument cluster with EVIC display in the center. You can watch transmission temperature (automatic transmissions) and boost, but not exhaust gas temperature (EGT). An aftermarket product such as the inexpensive Edge Insight (it plugs into the diagnostic port so installation is very easy) is another approach to viewing temperatures, EGT, boost, etc. simultaneously.



ST steering wheel and standard instrument cluster, with EVIC display screen in the center of the cluster.



Premium 7" multi-view instrument cluster.

In the SLT, the Luxury Group costs \$665 and includes:

- Comfort Group: Heated Front Seats and Heated Steering Wheel
- 7-Inch Multiview Display in Instrument Cluster. This instrument cluster features easy-to-read gauges that are electroluminescent for glare-free nighttime driving visibility.
- Glove Box Lamp
- Leather-Wrapped Steering Wheel
- Overhead Console with Universal Garage Door Opener
- Rear Dome Lamp with On / Off Switch
- Auto-Dimming Rearview Mirror with Microphone
- Steering Wheel Mounted Audio Controls
- A power driver's seat with upgraded cloth is a \$1000 option package on SLT models. It includes:
 - 115-Volt Auxiliary Power Outlet
 - 40 / 20 / 40 Split Bench Seat
 - Folding Flat Load Floor Storage
 - Front Armrest with Cup Holders
 - Front Center Seat Cushion Storage
 - Power 10-Way Driver Seat
 - Power Lumbar Adjust
 - Rear 60 / 40 Split Folding Seat
 - Remote USB Port – Charge Only

In the Big Horn, the Luxury Group and Uconnect 8.4 must be ordered together. The leather wrapped steering wheel is standard on Big Horn and above, so is not in the Luxury Group.

The premium (power adjustments and upgraded cloth) seat is included with Big Horn. It is available in 40-20-40 bench or bucket styles, the latter with a full console. Laramie comes with power driver's and passenger's seats. Laramie Longhorn has highly upgraded leather seating, and a wood insert in the steering wheel. For me, manually operated seats are fine. I have had no trouble getting an adjustment I like, and any time I try to work under the dash of a Ram with power seats, I end up bumping the adjustment buttons and have to start over to get the seat

where I want it. The power seat has better lumbar support, with some darker colored upholstery panels than the ST seats have.



Laramie interior, with cream colored leather bucket seats and leather-wrapped steering wheel.

Some buyers and passengers appreciate the leather seats and dual-zone air conditioning temperature control of the Laramie and Laramie Longhorn models. Of course, those higher trim levels have nicer appointments and more equipment as standard rather than optional.

An overhead console provides nicely located map lights. It is available on ST in the Uconnect 5.0 package, and is standard on SLT and above. An upgraded console is in the Luxury Package option on SLT and Big Horn, and standard on Laramie. The upgraded console includes a programmable garage door opener. The ST has a single dome light in the center of the headliner, just behind the front seat. Rams with the overhead console have a dome light at the back of the cab.

A polyurethane covered steering wheel comes on the ST. Leather covered wheels are standard or optional (luxury package) on higher models. Heated steering wheel and seats are in the luxury package (or comfort package) on SLT and Big Horn, standard on Laramie. A power sunroof is optional on SLT and higher models.

While searching an inventory of Rams out here in the west, I found that most come from the factory with the gray interior, except for Laramies which are usually brown with a few having black interiors. ST level Rams are available only in gray. White is the most popular exterior color, with black, silver, and gray following. The SLT and Big Horn models have brown and cream interiors with cloth seats as a no-cost option.

The ST comes with black bumpers and grille, and argent painted wheels. For \$695 you can upgrade to chrome. Higher level Rams have chrome bumpers and grilles, with different grille inserts for different models. Fog lamps are included with Big Horn and above models. A trip mileage computer comes on SLT and above.



Black grille and front bumper on an ST model.

The ST comes with argent painted wheels. Chrome clad wheels are in the \$695 chrome group. The SLT comes standard with the chrome-clad wheels. Big Horn and higher models have forged aluminum wheels.

The Sentry Key theft-deterrent comes on all Turbo Diesels. Note that it does not use a conventional metal “key” but rather has a plastic end or tongue that plugs into the instrument panel. Remote keyless entry is optional (Popular Equipment Group) on ST, standard on SLT and above.

Decisions, Decisions!

Without any further debate, I plan to get these features and options:

- 3500, Crew Cab, 4x4, with a six-foot bed. This length fits the garage comfortably, can be turned around easily, and has enough bed capacity for me (I think!)
- Cummins with Aisin transmission
- Fifth wheel and gooseneck prep package (just in case I ever need to tow those trailers)
- Park View back up camera (for hooking up a trailer and because my wife insists)
- Wheel-to-wheel side steps (my wife has spoken, again)
- Snow plow prep group (220 amp alternator in case I get a winch, and transfer case skid plate)
- White or Copperhead exterior paint. I thought about other colors, but white is coolest in the desert sun, looks good even dusty or ten years old, and is easy to match if repairs are needed. On the other hand, copper is attractive and is the color Oldsmobile painted my favorite engine (the 400 cubic inch for 4-4-2s in the 1960s). Copper is new for 2013 and the preliminary press release for the 2014 model does not show it. Timberline is a nice darker green but would be even hotter in the desert sun, and costs \$450 whereas white and copper are no-cost colors.
- Trailer brake control – whether an option or standard on the model I choose
- Remote keyless entry – optional or standard depending on model
- Cloth seats – cooler in the Southwest desert heat

My Analysis and a Discussion

In 1997, an ST-equipped truck was a stripped down model, without power windows, cruise control, tilt steering wheel, air conditioning, front air dam under the bumper, or trailer towing mirrors (let alone power and heated mirrors!). It did not have a limited slip differential, or electronic stability control (back then all you could get was four-wheel antilock brakes, as an option). There was no such thing as a locking tailgate. Advanced variable intensity air bags with side curtain bags were not created or available. There was a basic, high force airbag in the hub of the steering wheel. The 2013 base-level ST Turbo Diesel has all these features. If you are thinking that you could not tolerate a “stripped-down” model, well, there isn’t such a Ram anymore! Even the low-level trim package (ST) has a lot of features and some color/shading contrast. On the other end of the scale, a high trim level 2013 Laramie Longhorn model is far, far, more feature-laden and luxurious than the 1997 Laramie. So many features that are available now were unheard of sixteen years ago when I ordered my 1997 Turbo Diesel.

Editor’s note: Again the Joni Mitchell song with the revised lyrics comes to mind:

***Don’t it always seem to go
That you don’t know what you’ve got
Till you’ve got it?***

As Joe reminds us, in the 17 years that have passed since his ‘97 truck, the creature comforts, performance, and safety features have found their way into the truck as standard equipment.

How does this influence the way in which you look at the price tag of a new truck or automobile?

I’m not sure about you, but I’ll keep this idea in mind the next time I have a conversation with my wife about a new vehicle.

My Personal Choices

I have an interest in the brown/cream interior that is used in the SLT and Big Horn, a leather steering wheel, aluminum wheels, and the 7” instrument cluster. On the other hand, easy to clean plain gray door panels, dark seat belts, and all matching shades-of-gray interior have an attraction as well. I like the manual transfer case lever with mini-console on the ST. Painted bumpers make it easier to weld in reinforcements (if I go that route instead of an aftermarket front bumper). I am not sure I would ever use Bluetooth, but the capability might be nice (\$660 on the ST model). However, to get all those things, the realistic package would be the Big Horn with some options, for a total list price of about \$4500 more than the ST with the options that I want and can be ordered with that lower trim level of Ram. The limited information I have found on the Uconnect systems does not give me a clear direction, although getting the highest level (8.4) ensures that I would have everything I want later.

I still haven't decided between white and copper paint. It is one of many decisions to be made between "what I like" and "what is most practical."

My wife prefers the Big Horn, or at least some of its features. She likes the premium cloth power seats with lumbar support and the brown/cream interior. She wants the 8.4 Uconnect to give the bigger Park View display. She insists on Park View, automatic transmission, and the side steps. She also likes the "his-and-hers" dual glove boxes, and wants the map lights. She wants a nice truck, not just utilitarian.

Thus, my personal decision is between two packages, both Ram 3500, Crew Cab, 4x4, short bed with Cummins 385hp High Output engine and Aisin transmission. Both would have these options: Park View, fifth-wheel/gooseneck hitch prep package, wheel-to-wheel side steps, and snow plow prep group. In addition to those options, the trailer brake controller, cloth seats, Sirius radio, remote keyless entry, Uconnect 5.0, overhead console, and rear folding seat are options I would choose on the ST model. These latter features are standard on Big Horn. The manually shifted transfer case is available only on the ST. The brown/cream interior, Uconnect 8.4, forged aluminum wheels, and 7" instrument cluster are not available on the ST but I might order them on the Big Horn.

The two choices, then, are:

1. ST model with the above options (as available on that model) and Uconnect 5.0.
2. Big Horn model with the upgraded brown/cream interior, Uconnect 8.4, and the Luxury Group (mostly for the 7" multi-view instrument cluster) in addition to the above-listed features and options.

It could help to justify buying the Big Horn if we look at what that \$4500 difference buys. The Uconnect 8.4 and the Luxury Group account for \$940 of that amount. Chrome bumpers, grille surround, and wheels cost \$695, and aluminum wheels another \$300. The Big Horn includes the 60-40 split rear seat, the power driver's seat with lumbar support, and premium cloth. These items all together account for about \$3000. The Big Horn also has a power sliding rear window, electric shift transfer case, upgraded interior door panels and other trim, fog lamps, chrome accent trim on door handles, shifter, interior, and mirrors. While it is hard to set "usefulness" values to the trim, door panel enhancements, etc. they do make the truck more attractive.

AFTERMARKET ACCESSORIES

Going back ten years, I made a list of some accessories and toys that are (or once were) installed on my 2004 Turbo Diesel. Next, I went through the list and picked some of those items for discussion of "Then versus Now."

Reunel Bumpers

My highly polished, stainless steel Reunel bumpers are light for their strength, have excellent, maintenance-free appearance, serve as stout winch mounts, and have saved my Turbo Diesel from severe damage in accidents. They tie the frame rails together, keeping it from being twisted even in a corner-of-the-truck impact. The rear bumper/trailer hitch setup from Reunel is extremely strong and eminently useful for towing.

I will probably get higher strength aftermarket bumpers for my new truck soon after buying it.

Warn 16.5ti and XD9000 Winches

These winches are relatively compact and light weight yet strong, reliable, and very capable. Even owners who don't plan to use winches frequently can benefit from the peace of mind that the truck can be recovered from the ditch, etc. without relying on help from someone else. Along with the winches, auxiliary equipment such as straps, shackles, and chains are worth carrying under the back seat or in your in-bed tool box. See TDR 47, page 14, and TDR 51, page 28 for extensive discussions of winches, Reunel bumpers, and related equipment.

Today, I still see substantial value to aftermarket winch-mount bumpers not only for protection of the truck but as solid winch mounts. The winch for the 2013 model will have to be a new design in order to protect and yet provide air flow to the low-mounted intercooler.

BD Exhaust Manifold, Air Box, Compound Turbos

In TDR 60, page 94, I noted that I had used at least eight aftermarket single turbochargers on my '97 Turbo Diesel, and four on my '04. I was also unhappy with the accessibility of the turbo on the Third Generation '04 Turbo Diesel for replacement purposes. While a twin or compound turbocharger setup is much more complex, the accessibility of components and the ease of disassembly favor the BD Twins significantly. The great reliability of the compound turbocharger setup gives me considerable peace of mind since I often drive for hundreds of miles where a breakdown would be very inconvenient, cell phone coverage is non-existent, and help is unavailable.

Where are we today? We can get 385hp from the factory and the turbocharger mated to it is under factory warranty. The factory type paper air filter works very well, and the new Ram Active Air pulls air from under the hood or from the front of the truck, as needed. If we are satisfied with that power level, we can leave the engine and the turbocharger alone, at least until something more wonderful comes along.

Dynomite Diesel Performance (DDP) Injectors

I am currently running a set of DDP Stage 1 injectors (50hp) on the '04 Turbo Diesel for a combination of power and mileage. I am very happy with them.

Today with 385hp from the factory, can we leave the engine alone?

South Bend Con-Fe Clutch

I have been running this clutch in my '04 Turbo Diesel since 2003, when the truck was almost new. It is meeting and exceeding all my expectations for longevity, torque capacity, and user friendliness.

Today we have the choice of a somewhat lower horsepower engine (350hp) with the aluminum-cased G56 manual transmission, or at the other end of the scale, the 385hp engine with the massive and very strong Aisin transmission. I wanted a manual transmission ten years ago for engine braking going down mountain trails, higher strength and durability of the NV5600 transmission, avoiding torque converter lockup issues, and good control of gearing. Today the automatic transmission with advanced computerized controls, coupled with the integral smart exhaust brake, does what I need.

Mag Hytec Differential Covers

These covers are the gold standard for Turbo Diesel owners. They fit perfectly, make it easy to check lube level and to change lube, look good, and add lube capacity. The front cover has a ramp at the bottom to help the differential to run up over an unseen big rock instead of merely crushing the cover.

Today, with the "Max Tow" package, Ram offers an aluminum rear cover, but it does not look as substantial, nor does it appear to add lubricant capacity.



11.8" (300 mm) ring-gear American Axle differential with finned aluminum cover, for the Cummins/Aisin/dually application.

Transfer Flow Fuel Tanks

When I want a reliable measurement of the amount of diesel fuel in my fuel tanks on my '04, I simply look at the TRAX II readout on my dash. Otherwise, I forget all about these excellent, trouble-free fuel tanks. They never leak, the associated electrical and electronic components work perfectly, and so they basically get no further attention. However, I would not want to be without them or their reliability. I live in the West and travel long distances without fuel stations along the route. Furthermore, the price of fuel often varies 25 cents or more per gallon from one location to another, so I want to get enough fuel for the trip where it is cheaper.

Today, the stock fuel tank has only a 31 or 32 gallon capacity, making a Transfer Flow system even more important than before when the stock capacity was 34 or 35 gallons.

FASS 220 Lift Pump, Filters

I find the three micron fuel filter to be essential with the HPCR fuel system. The pump is just loud enough so that I know it is running when I am starting the engine, but is non-intrusive when driving. The high flow capacity is necessary for those high horsepower dyno runs. Today, 3 micron filtration is available from the factory but the reliability and capacity of the stock lift pump are not. Capacity should be plenty for the factory-rated horsepower. I don't trust any electrical lift pump, and one in the tank is not easy to change. I don't have any answer. Maybe I'll look at what Editor Patton did with his dual fuel transfer pump, accessory project "Fool Pump Retrofit" that he detailed in Issue 76, pages 16-21.

Optima Batteries

Put them in before your stock batteries fail or leak acid all over your fenders and under the hood onto the sensors and wiring harnesses.

Today, gel mat or other non-liquid batteries are still a great idea. Acid inevitably leaks from conventional batteries, corroding whatever it can.

Boost; Exhaust Gas Temperature; Transmission Temperature; Supply Pump Fuel Pressure; and Rail Pressure Gauges

Today, the Engine Control Module monitors almost everything we want to see, but won't let us look at everything (such as EGT). The Edge Insight provides us with a view of those things by simply plugging into the diagnostic port at the bottom of the dash. However, if I want EGT, I'll still have to add a probe.

Line-X Bed Liner

This bed liner has been good and reliable for the rather light use I give it. The Rhino liner I had in my '97 Turbo Diesel was also good. Next time I will probably consider whatever similar brands are available, price, and quality of preparation and application by the local franchisers.

Engine Performance

The 370hp 800 ft-lb engine gave 332hp, 765 ft-lb at the wheels, on the H&S dynamometer:

http://www.youtube.com/watch?v=Nb_amlQa1zQ

H&S Performance
4160 S. River Road
St. George, UT 84790
888-628-1730
435-628-1730

I feel the new Cummins engine will perform as advertised. The 385hp High Output version that I plan to get should give around 345hp or so, pretty close to what we used to take older engines up to—and this will be factory with a warranty! Just like I want and hope for, finally a Ram that is ready as delivered, with no aftermarket performance stuff needed. Reports on the TDR forum indicate the mpg is close to what my '04 gets, so the new emissions recipe is working for us. I expect this will be another “pinnacle” year, like the 215hp 12-valve and the '03 305hp. The former gave 207-215 on the dyno, and the 305 gave 280. Cummins and Dodge knew the 12-valve engines were a little stronger at the flywheel than advertised, but customers were happy so they continued producing them that way.

Editor's note: In the preceding paragraphs where Joe has mentioned the engine's horsepower and the new-for-2013 Aisin automatic transmission. I'm reading between the lines—Joe is saying that “stock is ‘gooder’.”

Did you read the same thing? (Well, not necessarily with my goofy made-up word “gooder.”)

Now, all that's left in Joe's decision making process is what differential ratio he should choose.

In his Issue 81 write-up (page 89) he compared the engine RPM changes that he could expect in an old truck versus new truck chart. Here is the data:

Engine RPM changes with transmission and differential ratios and 18” tires, versus his existing truck with the NV5600/3.73 with 17” tires:

Trans/Rear	74 mph in 6th	74 mph in 5th	61 mph in 6th	62 mph in 1:1
NV5600/3.73	2200 rpm	3014 rpm	1800 rpm	2500 rpm
Late G56/3.42	1960 rpm	2649 rpm	1603 rpm	2195 rpm
68RFE/4.10	2002 rpm	2606 rpm	1638 rpm	2275 rpm
68RFE/3.73	1819 rpm	2368 rpm	1487 rpm	2067 rpm
68RFE/3.42	1665 rpm	2167 rpm	1364 rpm	1892 rpm
Aisin/4.10	2002 rpm	2447 rpm	1638 rpm	2275 rpm
Aisin/3.73	1819 rpm	2223 rpm	1487 rpm	2067 rpm
Aisin/3.42	1665 rpm	2035 rpm	1364 rpm	1892 rpm

Rereading Joe's Issue 81 article, my impression is that Joe would stick with a 4.10 ratio differential. I opined that the 3.42 would be best for me.

The final drive ratio decision for every owner is different and, often times, made by what happens to be in stock at the dealership.

I will mention that Cummins and Ram personnel did presentations at the CMEP open house event (coverage on page 111-115) that would lead me in the direction of the 3.42 ratio.

Here is what Joe noted in his summary of the presentation. Joe writes:

The “rest of the story” is that lower rpm is acceptable under light loads on level ground. When in tow/haul mode, in fifth gear, the rpm will be higher, which you would want when towing. However, the new engine has good torque and fuel efficiency from 1200 rpm to 2000 rpm, according to Jamie Standridge, the Ram Powertrain Integration Manager. These situations suggest that 3.42 is a good ratio for Rams that will be used solo a good percentage of the time, or in tow/haul mode when towing medium weight trailers. In fact, when towing a heavy trailer and locked into tow/haul mode, fifth gear with the 3.42 ratio may be the best for interstate highway speeds.

The engine rpm at 74 mph will be 2035 with the Aisin and 2167 with the 68RFE. With the 17” tires, again the 3.42 ratio works well with the automatics because rpm is low for economy under light loads. Running solo at 74 mph, 1665rpm in sixth gear is acceptable under light load and will give enhanced fuel economy. Under heavier loads, use tow/haul or manually downshift to fifth and then the rpm will be 2035 (Aisin) or 2167 (68RFE).

The 4.10 ratio in tow/haul mode, with a locked torque converter and in fifth gear, will give 2606 rpm with the 68RFE, and 2447 rpm with the Aisin. These numbers are just a bit high (but acceptable) for the 68RFE but about right with the Aisin for the Cummins 6.7 liter engine under heavy load. Thus, the 3.42 gears works well for any Ram not trying to approach the 37,000 pound GCWR advertised for a dually 3500 with the Max Tow package (4.10 ratio, dual transmission coolers, finned aluminum rear differential cover). The DEF emissions strategy and the front axle disconnect are two other significant contributors to help Ram give us considerably better fuel mileage in the 2013 model Turbo Diesels.

**Joe Donnelly
TDR Writer**

LIFE WITH THE 2013-UP EMISSIONS SYSTEM

ISSUE 91 – HAVE RAM, WILL TRAVEL

INTRODUCTION

During a presentation by Cummins at the 2013 Cummins Midrange Engine Plant, we were told that with the new emissions strategy, the exhaust from a Ram Turbo Diesel is cleaner than urban air. We were told that Tenneco makes the emissions system/exhaust system.

So, does it work and is it reliable and “transparent” to the user? In the case of my 2013 Turbo Diesel, I can say, after 40,000 miles, that it seems to work and is completely reliable. I did discuss in Issues 88 and 89 that there was a recall to switch two exhaust gas temperature connectors in the wiring harness. I noted no issues before or after, and it seems that usage of diesel exhaust fluid has been less afterwards. Drivability has been perfect, and the tailpipe is still clean and almost free of soot. Because I have the Edge Insight (Issue 85, page 78), I am able to see when the regeneration process occurs, by watching the “DPF Status,” EGT2 and EGT3 monitoring gauges. There have been only a few brief regenerations, with those EGT probes registering a bit over 1000° where otherwise they show up to 800°. Without the Insight, I would not have known a regeneration was occurring, and, as I noted, the time involved was pretty short, a few minutes each time. I am very pleasantly surprised that the truck has behaved so well and that the computers, sensors, probes, and modules have been completely trouble free. While it is distressing to look at the complex attachments to the 2013 engine compared to the simplicity of my old '97 12-valve, I have to admit that the engine has needed no attention from me beyond changing oil and fuel filters.



Ram Turbo Diesel tailpipe after 40,000 miles.

The oil change is a little more difficult than it was on the 1997 (Issue 84, page 90), while the engine-mounted fuel filter change is far easier on the 2013 (Issue 86, page 106) than on the 12-valve. Ash production is minimized by use

of the proper engine oil, along with engine characteristics that minimize oil entering the combustion chamber. As John Martin has said in the TDR magazine (Issue 76, page 52), oils today are almost a commodity—just make sure they meet manufacturer’s specifications.

The only attention I have paid to the emissions system is to add diesel exhaust fluid (DEF) as needed. DEF is made from highly purified water because low grade water with dissolved metal ions can contaminate and deactivate the catalyst of the selective catalytic reduction (SCR) emissions system. It is worthwhile to point out once again that the lifespan for DEF is temperature dependent. This is more of a concern in the desert southwest, of course, where daytime temperatures can reach or exceed 110°, and pavement temperatures can be even higher.

DEF LIFETIME

According to Chrysler TSB 25-005-14:

Temperature	Estimated Useful Life
50°F	36 Months
77°F	18 Months
86°F	12 Months
95°F	6 Months
104°F	2 Months

THE CUMMINS STRATEGY

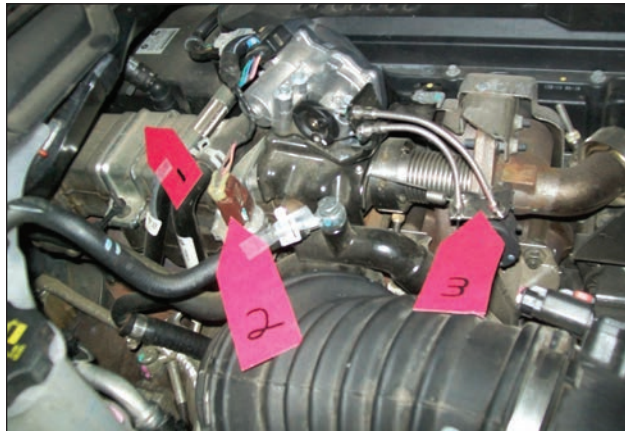
The emissions reduction strategy employed in the 2013-up Cummins Turbo Diesels includes two major approaches: internal, in-cylinder emissions controls; and external, exhaust aftertreatment components.

Engine Controls

Emissions controls begin with engine parameters such as piston bowl shape; airflow characteristics (swirl or tumble) of the intake air entering the cylinder; injection rail pressure, timing, and quantities of each fuel pulse during the overall injection event; and engine control module (ECM) control of fueling versus boost pressure from the turbocharger. Atomization of the fuel is critical and is influenced by such things as rail pressure, injector nozzle hole placement and number, and air pressure and turbulence in the cylinder.

Exhaust gas recirculation (EGR) was applied to the Cummins B engine in 1996 in California; but that primitive system was “hot,” meaning that the exhaust gas was not cooled before being sent into the air intake horn. Today, the exhaust gas is cooled in a chamber with engine coolant circulating around the exhaust gas. The EGR system is designed to reduce nitrogen oxides (NO_x) in the exhaust stream. High combustion temperatures form these nitrogen

oxides, and the peak combustion temperature is reduced by introducing “inert” gas, meaning exhaust gas into the air intake. As a note, do not remove the stamped steel plug on the end of the 6.7L EGR valve to inspect or clean the valve. You won’t be able to adequately reseal the port. The EGR cooler incorporates a cooler bypass valve to maintain a desired EGR gas temperature with a cold engine, and to aid in engine warm-up. The cross-over tube has a temperature sensor to measure the temperature of the EGR gas flowing after the gas has exited the EGR cooler. EGR cooler failures are often caused by improper coolant filling procedures—allowing an air pocket to form in the cooler, which causes it to overheat and crack. A stuck EGR cooler bypass valve can also cause the cooler to crack.



Arrow #1, EGR cooler. Arrow #2, exhaust pressure module. Arrow #3, EGR cooler bypass valve.



Arrow #1 EGR flow control valve. Arrow #2, EGR temperature sensor. Arrow #3, intake air throttle valve with the controller shown to the right of Arrow 2.

Another device, this one at the air intake, is the airflow control valve. The Edge Insight calls it the Intake Air Throttle and the Insight can monitor its position, from open (100) to closed (0). The valve is attached to the air intake horn and the position of the valve is controlled by the ECM. The purpose of the throttle or airflow control valve is to help regulate EGR flow by creating a pressure differential between the exhaust system and the boosted intake air system. The valve position depends on the blended quantity of exhaust gas needed in the engine for the exhaust gas NO_x to remain at the target level.

The engine has a closed crank case ventilation (CCV) system with these features:

- Blow-by gases from the crankcase are forced through the block to the cylinder head
- The gases are then forced into the CCV filter where the impactor nozzles and the filter separate oil from the gas
- The oil droplets flows through the drains to the breather cover and back to the oil pan
- Crankcase pressure is monitored by two sensors
- Blow-by gases then pass through the crankcase depression regulator (CDR) valve
- After passing through the CDR valve, the gases exit to the breather tube, then to the turbocharger air inlet
- The CDR valve is a safety device on the inside of the engine top cover that regulates crankcase pressure. In the event of excessive vacuum in the fresh air inlet due to a restricted air filter, the CDR valve closes, preventing vacuum from building up in the crankcase. The CDR valve also acts as a one-way check valve that stops oil from being drawn into the turbocharger. Engine oil greatly increases the soot load in the exhaust, and a failing turbocharger that sends oil to the exhaust system will damage the emissions traps. Also, a plugged air filter will cause excessive soot load in the DPF.



Crankcase pressure sensors.

The CDR valve gives our engines a big advantage over the approach some other manufacturers used (and maybe still do?) which sent the crankcase air with oil in it through the intercooler and into the turbocharger. Oil on the intercooler tube surfaces insulates them from transferring heat efficiently, especially if the oil cokes onto the tubes, which can occur if they are hot from high temperature turbocharged intake air passing through them.

The variable geometry turbocharger (VGT) is key to producing high horsepower with low exhaust emissions. It has a patented one-piece sliding nozzle that moves continuously to vary the effective size of the turbine (exhaust) housing and thus the amount of air (boost level) delivered to the engine. From our experience with earlier Turbo Diesels, we know that the small turbine housings

such as the 12sq.cm. used from '94-'02 was good for producing boost quickly and lowering smoke levels, but was restrictive at high power and high boost levels. Many of us changed that waste-gated housing to the 16sq. cm. housing and realized a power gain from the lower restriction and better balance of the exhaust and intake sides of the turbo system. However, the downside was that the engine tended to produce more soot as it built boost. Ideally, the turbo would vary the size of the turbine housing, depending on the amount of boost needed and the amount of exhaust restriction that would produce the ideal power level. Today's VGT system basically accomplishes that goal. I have watched the "VGT Position" on the Edge Insight and can tell that the ECM is doing a good job of optimizing the position of the sliding nozzle for soot minimization without killing power under load.

The 2013-up model year Cummins VGT actuator is flash programmable. It features an electronically controlled actuator that is replaceable separately. This system provides an exhaust brake with smooth engagement via the gear-train controlled sliding nozzle. The ECM based controller allows the exhaust brake to have "smart" modes—full on, or partial and variable to maintain the set road speed downhill. The VGT actuator is water cooled, with coolant flowing through a passage in the bearing housing. Water cooling adds to the reliability and durability of the turbocharger. The turbo is equipped with a speed sensor, which is used by the ECM for diagnostic purposes. There is also an exhaust pressure sensor, upstream of the turbocharger, at the end of a stainless steel tube fitted to a port on the exhaust manifold. This exhaust pressure sensor is used by the ECM to control emissions and EGT valve operation.



Arrow #1, turbocharger speed sensor under the foil cover for the wiring harness. Arrow #2, pressurized oil inlet to the turbocharger center housing. Arrow #3, coolant line. Arrow #4, VGT controller.



Arrow #1, exhaust gas pressure tube and fitting in the exhaust manifold. Arrow #2, electronic sensor for pressure readings.

The automatic transmission has been programmed to downshift more aggressively when the exhaust brake is enabled, and when tow/haul mode is activated. The exhaust brake feature can also be used to reduce engine warm-up time when the following parameters are met:

- Vehicle speed is less than 5mph
- Exhaust brake switch is on
- Coolant temperature is below 180°
- Ambient temperature is below 60°

Exhaust Aftertreatment

Diesel emission requirements have become far more stringent over the past 10 years—reductions of 98% since 2004 levels. Cummins has become the industry leader in producing engines with better power levels than ever, while meeting these extremely low allowable emissions levels. Integral to the emissions recipe for meeting these stringent requirements is a suite of aftertreatment systems. Visually, the aftertreatment components appear to be two large cylinders, one after the other, underneath the truck. The first cylinder contains the diesel oxidation catalyst (DOC) and the diesel particulate filter (DPF), with temperature and pressure sensors attached. The second cylinder contains the selective catalytic reduction (SCR) system, which is where the DEF is introduced to convert the nitrogen oxides to nitrogen. The amount of DEF needed has been greatly reduced because EGR is used to moderate combustion temperatures and hence the amount of NO_x that is produced in the engine.

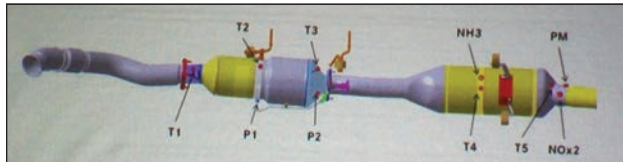
The aftertreatment processes include:

- Hydrocarbons and trace carbon monoxide are reduced with the diesel oxidation catalyst. This process also produces heat and combustion by-products that support the regeneration of the DPF.
- Particulate matter is a mixture of solids including soot, ash, metallic abrasion particles, sulfates, and silicates. The diesel particulate filter removes these contaminants

from the exhaust stream. Additional heat to burn off particulate matter into gases and ash is used with diesel fuel that the engine injectors inject post-combustion on the exhaust stroke. Eventually the DPF will be filled with ash, depending on engine duty cycles.

- Nitrogen oxides are reduced with selective catalytic reduction and urea (DEF) injection.

The temperature and pressure sensors in the exhaust system are shown schematically below.



Schematic of the after-treatment system with temperature sensors T1-T5, and DPF differential pressure sensors P1 and P2.

Exhaust Temperature Sensors

The diesel exhaust temperature sensors are thermistors and change resistance based on the temperature being measured. The powertrain control module (PCM) provides a 5 volt reference voltage to the sensor. The PCM monitors the change in signal voltage and converts this to a temperature value.

For 2013-up there are five exhaust temperature sensors:

- Exhaust Temperature Sensor (T1) is located in the front exhaust pipe. It is close to the diesel oxidation catalyst and a couple feet from the turbocharger, but I have been using it to measure EGT to know when the exhaust temperature is low enough to shut down the engine safely.
- Exhaust Temperature Sensor (T2) is located at the rear of the diesel oxygen catalyst (DOC).
- Exhaust Temperature Sensor (T3) is located at the rear of the diesel particulate filter (DPF). [photo 11, arrow #2]
- Exhaust Temperature Sensor (T4) is located in the center of the selective reduction catalyst (SCR), near the ammonia sensor.
- Exhaust Temperature Sensor (T5) is located at the rear of the SCR.



Arrow #1, EGT1 sensor in the exhaust pipe before the DOC/DPF housing



12. Pressure sensors before and after the DPF, with electronic module above them (in the photo, partially hidden behind the driveshaft universal joint).

Passive regeneration occurs when the system generates enough heat based on the engine duty cycle. If not enough heat is present and regeneration is needed, active regeneration is used. This is the mode that injects fuel into the exhaust stream by means of fuel injection into the cylinders during the exhaust stroke. There is also a manual regeneration mode that can be accessed using the Wi-Tech diagnostic tool.

The DEF tank has a dosing control module on top. The tank also includes a DEF pump, level sensors, heater, and a temperature sensor inside the tank. The dosing valve at the SCR housing is shown in the last photo on the previous page (arrow #1).



13. Dosing control module on top of the DEF tank.

The Wi-Tech scan tool has extensive diagnostic tests to make repairs of the relatively complex emissions system more straightforward. It can access data from sensors and modules, such as:

- Ammonia sensor for the SCR catalytic bed
- NO_x going into the exhaust stream
- NO_x in the exhaust stream after SCR
- Boost pressure
- Calculated engine load
- Charge air temperature, before and after the aftercooler
- Coolant temperature
- Crankcase pressure
- Desired VGT position, and actual position
- EGR flow
- EGR orifice temperature
- EGR valve position
- Engine speed
- Estimated soot load based on pressure differential [photo 90-12]
- Exhaust gas temperatures 1-5
- Exhaust pressure
- Mass airflow
- DPF operating state

Joe Donnelly
TDR Writer

WELCOME LITTLE BROTHER - A RAM 1500 ECODIESEL REVIEW

ISSUE 85 - YOUR STORY

by Robert Patton

Let's Order a New Truck

I just took delivery of a 2014 Ram 1500 EcoDiesel from my local dealer, Troncalli Ram, Cumming, Georgia. It was ordered in mid-March. Now I can take logging on to www.ramtrucks.com/vots to check the truck's order status out of my daily routine. As an aside, the truck spent more time in shipment (10 days) than it did in any other queue. (Logistically speaking, the Frame/Paint/Trim is only a two day process.) The vehicle order tracking (VOTS) is kinda hokey, but perhaps it is better than no information at all.

Hindsight has 20/20 vision. My truck order went extremely smooth. As mentioned, the order was placed on 3/14 and the truck was delivered five weeks later on 4/18. From what I observed on different "where is my truck" threads at internet forum web sites, I can only say I was very fortunate. The truck wasn't held up in some post-production inspection queue, nor did it suffer from railway to tractor/trailer delays. Atlanta, Georgia, is a major railway hub.

It has been quite some time since I ordered a vehicle from a factory. The two other times were a 2003 Turbo Diesel and a 1983 Buick Regal. Back in the day, the order-from-the-factory was something my dad enjoyed doing, so I guess I got the order-it gene from him.

Actually, not so much. If you'll recall, in last issue's editorial I talked tongue-in-cheek about the death wish/car count (DWCC). My DWCC number was .77. I average owning a different vehicle every nine months. Don't be too impressed; most are \$500 clunkers. The expensive cars/trucks hang around for a while. The point of this rambling: Aside from Turbo Diesels that have to be purchased for TDR story content, I rarely purchase new. I'll take a three/four year old vehicle with a little bit of remaining warranty, and a lot of initial depreciation, over the new-kid-in-town vehicle any day.

Enough rambling, Little Brother has arrived.

About the Truck

Being the frugal type (or, some would say, cheap), mine is a 1500 Tradesman. If you'll recall, my 2010 Turbo Diesel was also a Tradesman (then called an ST) and it was purchased off the dealer's lot with a steep discount. Considering it was in stock from March 2010 until August 2010 and we were in the midst of a bad recession, the steep discount was understandable. There weren't any steep discounts on this 2014 EcoDiesel. Officially it was on the dealer's lot for only four hours.



Here it is sitting on the dealer's back lot.

There were several quirks in my "how cheap can I be" order. First, I wanted air suspension with two-wheel drive and a 6'4" box. For some unexplainable reason, you can't get the air suspension in this combination. You can get it with a smaller 5'-7" box or you can get it if you go four-wheel drive and the 6'-4" box.

There were other quirks in the option pricing. The one that immediately caught my attention was the disparity in the price of the diesel engine option. Here were the numbers:

- With a 4x2, 5'7" box, the diesel option was \$4000
- With a 4x2, 6'4" box, the diesel option was \$2850
- With a 4x4, 6'4" box, the diesel option was \$2350

Okay, go explain the above logic. Bottom line, I wanted the air suspension and I wanted a 6'4" box, so I had to order a four-wheel drive truck. All quirks considered, the four-wheel drive version was \$3000 more than a comparable two-wheel drive truck.

Also, for this new-kid-in-town EcoDiesel I went all out. I ordered the Popular Equipment Group, \$645, which gave me carpet on the floor (along with several other items) instead of the rubber floor liner.

My efforts at frugality: a sticker price (destination included) of \$42,750.

Ouch. For comparison, my good 'ole 2010 two-wheel drive, 2500 truck had a sticker of \$40,820.

However, this comparison has a key flaw—how much more would the good 'ole 2010 truck have been were it four-wheel drive? In today's numbers (base price to base price) the difference is about \$3000. So, \$40,820 + \$3000 = \$43,820.

What do all these numbers mean? How about that today's 1500 is comparable in price to a "new" 2010, 2500 truck? How about it was an interesting exercise for me to do (I made it as apples-to-apples as I could), and it helped me justify the sticker shock of the 1500.

Moral of the story: I have no doubt you'll do the same analysis should you consider any kind of new or used vehicle in the future.

(I recall that TDR writer Dr. Mark Barnes wrote about the mental struggles with three kinds of financial analyses. I went to our web site and reread his article "The Fever," from Issue 48 that is found in his book What Makes us Tick?, page 42-43. Also, check our Barnes' "Tricks of the Trade," from Issue 78, pages 92-93 in his book, What Makes us Tick?)

Good luck in your endeavors. And, remember this little ditty: figures don't lie, but liars figure.

Yes, I Purchased a Tradesman Truck

You just read about the order process. Did it put you to sleep?

The real point of the above is that all of us do some kind of analysis to justify the purchase of a big ticket item.

Here is another analysis that I did. I asked the dealer, "Change the base vehicle from 'Tradesman' to 'Laramie Longhorn' and let's see what the base price difference would be?"

The answer: the base price went from \$35,800 to \$49,600.

Wow, I can purchase a lot of accessories for the difference in price of approximately \$14,000. Later in the story we will see how quickly I can spend the savings. (Sounds kinda like your wife's logic.) Up front I'll spend \$1500 to upgrade my wheels and tires to 20" and another \$1400 to get some Laramie leather seats from a used truck.

The difference is now \$11,100. How much more will I spend in pursuit of Laramie features?

Do I need the following:

- | | |
|--------------------------|-----------------------------------|
| Remote start | Heated steering wheel |
| Park view | LED interior lighting |
| Park sense | Uconnect 8 with 8.4" touch screen |
| Power pedals with memory | Amplified speakers and subwoofer |
| Security alarm | Two tone paint |
| Floor console | Chrome bumpers |
| Longhorn accents | Halogen headlamps |
| Leather steering wheel | Dual exhaust |
| Navigation | Premium tail lamps |
| Heated rear seats | |

Over time, let's see how this comparison works out.

Initial Fuel Mileage

As tempting as it was to take the truck directly from the dealer's lot and install the new 20" SRT-type wheels and tires, I postponed the installation. I filled the truck to the top of the tank, drove 3 miles to the expressway and made a 240 mile trip to Charlotte, North Carolina, with the speed set at 75 mph. (Cruise control speed and total miles were verified with GPS.) Upon arrival in Charlotte I filled the truck. Miles per gallon: 23.85.

I putzed around Charlotte for the weekend. I filled up and made the return trip to Atlanta. The cruise was set/verified at 75mph. I went 242 miles using 9.9 gallons: 24.4mpg.

What does the 24.16mpg number tell us? At this early point, I'm afraid not much. The Atlanta to Charlotte to Atlanta route is rolling hills with no real total elevation change. There was traffic, there was a bit of wind. The truck is not yet broken in. Time will tell. Quick math, a 10% improvement would get the truck to 26mpg territory. Now we are talkin'!

Change the Gear Ratio

With a baseline mpg reading done I could now install the new wheels and tires. So, how does it look?



BEFORE



AFTER

The black 20" wheels and tires make a huge difference.

I feel I got a great deal on the 20" SRT-style wheels with Cooper 275 x 60 x 20 tires at www.performanceplus.com.

The diameter of the 20" tires is 33," a difference of 1.3" from the OEM tires which were 31.7." Effectively, I have changed the rear end ratio by 4% from 3.55 to 3.41. Should this 4% be a concern?

Indeed it should. Well, kinda. Not really.

Choose one of the above; all of the answers are correct. Here is the story.

A Long Conversation on Gearing, SAE J2807 and Tow Ratings

In several previous issues we have talked about the Society of Automotive Engineers towing and hauling testing known as SAE J2807. I'll save you from digging up the previous magazines; here is a quick refresher from last issue:

Quoting from Automotive News author Larry Vellequette:

The towing standard, called SAE J2807, tests vehicles under load in three categories: climbing, acceleration and launching.

The tests are pass-fail, and the load weight is up to the manufacturer. If a pickup passes all three tests with, say, a 10,000-pound load, the truck gets a 10,000-pound rating.

In the launch test, a pickup with a loaded trailer is put on a steep 12 percent grade—a rise of 12 feet over 100 feet of road. That's the equivalent of a 220-foot ascent in a half mile.

To pass the launch test, the pickup must travel up hill at least 16 feet from a standstill five times within five minutes, then do the same in reverse in another five minutes.

To pass the acceleration test, the vehicle and loaded trailer have 12 seconds to reach 30mph and 30 seconds to reach 60mph on level ground. The vehicle also must accelerate from 40mph to 60mph in less than 18 seconds on level ground.

Finally, the climbing test requires the vehicle and loaded trailer to ascend 3,000 feet over an 11.4-mile stretch without dropping below 40mph and with the air conditioning at maximum.

Now, we all remember the formula for horsepower: $HP = (\text{torque} \times \text{rpm})/5252$

How do you *make* more horsepower? Rev the engine higher.

Common sense (as well as the ratings that Ram can publish) tells us that the 3.92 will zing the engine higher and help tremendously in those J2807 acceleration tests. So, the higher numeric number = higher tow rating.

Gear it with a lower numeric number, in my case the order blank gave me a 3.55, and you get a lower tow rating.

Effectively change the gear ratio by adding bigger tires and I'm sure the truck would continue to drop in its tow rating.



Yes, total diameter of the tire changes the overall gear ratio. Even though the 20" wheel/tire combo is in the background, you can still see that it is taller than the stock wheel/tire combo.

So, what is the bottom line? There is a GCWR "number" that is associated with the truck. I'm not at all concerned by my truck's lower number. I know how to downshift and, from my old days as a product support representative at a Cummins distributor, I'm all-too-familiar with the "gear fast/run slow" theories of fuel economy. Unlike its Heavy Duty brothers and some of the available super-tow packages, my truck has the same brakes, same frame, same cooling system, etc., as the 1500 truck with the 3.92 differential. However, it isn't "rated" to tow as much on paper.

Pay Attention Heavy Duty Readers!

Concurrent with the changes to my truck's overall gear ratio by going to the larger tire size, there was an abundance of discussion at the TDR's web site when a TDR member asked, "What gear should I get in my new Heavy Duty truck I'm going to order?" The question was posted in the April timeframe.

For your entertainment I would encourage you to find the discussion thread at our web site.

However, from the preceding J2807 discussion I've given you some insight about how the tow "number" is determined. Keeping in mind the big rig motto for fuel economy "gear fast/run slow" and the choice of how to order a truck or how to evaluate the merits of the 4.10 versus a 3.something-or-other ratio becomes as subjective as the load that has to be transported.

Again, I vote to gear fast/run slow, downshift as necessary.

ACCESSORIES FOR LITTLE BROTHER

Okay guys and gals, we're all on the same team. How do I begin this story on accessories for a 2014 Ram 1500 EcoDiesel while keeping it relevant to the established Heavy Duty crowd?

Perhaps let's start with the definition of insanity: Doing the same thing over and over again, all the while expecting a different result.

So, you can call me insane—for this 2014 upfit I'll use the same accessories (over and over again) on this truck that I have used on the past three Heavy Duty Ram/Cummins trucks that I've owned. I won't go back to old truck number two, a '99 2500 (fiberglass side steps, anyone?), or number one, a '96 3500 (a wood-grain dash kit, anyone?), for much has changed in the past 20 years.

Or, has it?

If I go back to truck number three (a '03 2500) I find an established pattern of accessories that are as current today as they were 11 years ago.

Here are some examples of those tried-and-true accessories:

- AMP Research rear bumper bed step
- AMP Research fold-under side steps
- Finger Touch oil drain plug
- Mag Hytec differential cover
- Quick grill release kit
- Condenser guard
- Block heater bumper plug
- FASS fuel pump/fuel filter
- MBRP exhaust tip
- Cabin filter kit
- Agri-Cover roll-up tonneau cover
- GateGlide II tailgate up/down assist
- Mopar splash guards
- Covercraft seat covers
- Edge Insight CTS with back-up camera
- UltiMat dash cover
- Painless Wiring fuse block
- Rostra seat heater kit

And, I would list my favorite accessory, the Geno's Garage center console cup holder, but the factory guys at Ram incorporated this idea into the front seat center section effective with the 2013 year model truck.

Likewise, with Ram's recent (July 2013) release of the 1500 Black Express truck and the 2500/3500 series Black Package (April 2014) it is fun to say that the styling of my 2010 truck, Mr. Schwarz, was also incorporated by the factory folks. Notice I wrote "fun to say." I'd like to think the 'ole Geno's cup holder and Mr. Schwarz were influential in decisions made in Auburn Hills, but it is highly unlikely that is the case. ("Pssssss," the sound of my ego deflating.)

Let's Get Started

Now, with a list of the above parts at \$2800 to be added to a truck that has a sticker price of \$42,750 and a set of 20" wheels and tires that cost \$1500 and a set of "Laramie" leather front seats from an eBay auction (another \$1400) and... Well, perhaps this is insanity. Should I expect a different result?

You've already read about the first change to the truck, the addition of 20" wheels and tires, "Change the Gear Ratio." With the immediate improvement in the look of the truck, I was motivated to continue my efforts to improve the truck's appearance.

That's right, off came the bumpers.



I am really good at tearing things up.

I could take you through the step-by-step process, but the procedure is pretty simple. Under the hood you have an abundance of plastic air-flow shrouding that has to be removed before you can get to the front bumper. Lots of 10mm bolts and plastic push-tab pins, half of which will not be reused, were removed and set-aside. Then it is a straightforward job to unbolt the 18mm nuts and remove the bumper. The rear bumper has six 18mm nuts/bolts that hold it in place.

With both bumpers removed it was decision time. Do I have the Tradesman-trim, black bumpers painted professionally, or do I use the Line-X/Rhino-type bed liner spray and coat the bumpers with a textured finish?

As I did on my '07.5 and '10 Rams, I took the inexpensive route and went with the bed liner spray. I also like the way the textured surface washes and scuffs so that the bumpers are easily retouched. In the past I had used a product called U-POL that was purchased at the auto body and paint store. This time I used a product that was less expensive and I had UPS deliver it to my doorstep. I ordered the "Rock It" bed liner kit made by SEM Products. Summit Racing has the tintable kit for a little over \$100; the U-POL price had risen to almost \$150.

How do you like the bumpers?



With the new wheel/tires and the bumpers reinstalled the profile of the truck is starting to improve. (Notice, no chrome!)

The truck has air suspension and it is set in the entry/exit (lowest) height.

The bumpers and front grill were complete and I had some Rock It left over. I mentioned that the textured surface is easy to wash, so I got busy with the masking tape and lined-off the rocker panels just below the bottom trim line. I textured this area on my '10 truck and I don't have to worry about paint chips or scratches to rocker panels. The tintable liner blends with the existing paint.

If you elect to try a SEM or U-POL bed liner spray, let me issue a word of caution: This stuff will stick on anything and it is next to impossible to remove. Latex gloves, clothing that you don't care about and goggles to protect those expensive glasses that you wear: all are requirements for using the bed liner products. Also, cover the area of overspray with cardboard, unless you want colored or black spackles on your concrete.

Last, but not least, I like the fact that Ram spends an extra dollar or two to give us an underhood mat. However, to an old guy that can't see in the dark, the black mat absorbs light. You can sense where this is leading: yes, I removed the mat and gave the underside of the hood a coat of Rock It. Now, the white-on-white doesn't show up too well in a picture, so below is my 2010 Ram's black hood with a coat of silver/grey Rock It to brighten-up the engine compartment.



The silver/grey Rock It brightens the underhood compartment of my 2010 "Mr. Schwarz" Turbo Diesel.

DOUBLE CUP-CUPHOLDER

On the truck's next visit to the Editor's customization shop, what else could I do?

Earlier I mentioned that effective with 2013 trucks the Ram folks have incorporated the exclusive Geno's Garage cupholder into the center section of the fold down front seat. Their execution of the idea is spot-on, it is a very nice, three position, cupholder.

However (and you knew a "however" statement was coming), can their holder be improved?

Yes! Introducing the Ram Double Cup-Cupholder.



BEFORE



AFTER

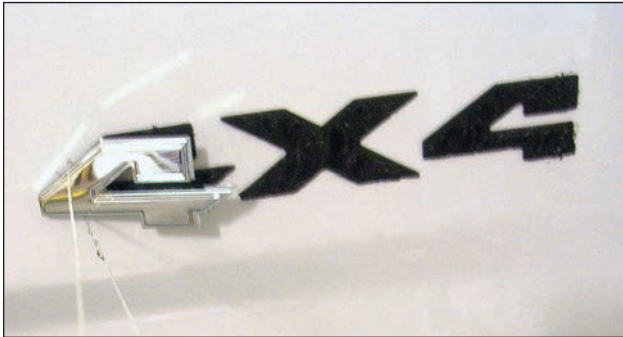
Now, before you blast the idea for being over-the-top, I want you to think about all of the cups and mugs; pencils and pens; cell phones and iPods; loose change and wallets; garage door and gate openers; glasses and sunglasses; tire pressure gauges; and flashlights that you have bumping around in your truck. Where better to keep these items than at your fingertips? Remember, folks, it is a truck and trucks get used. The Double Cup-Cupholder is a great accessory for all kinds of storage.

I really think the idea has merit. I took our first '94-'97 holder and cut the backside off. I trimmed the contour to fit the inner edge of the existing console. Some more trim here and there; four holes for some self tapping Phillips head screws and it was ready for testing. After using the Double Cup-Cupholder for a week you can forget about having to reach down to the floorboard/center hump to find your stuff, it is right at your fingertips. We have the Double Cup-Cupholder available exclusively at Geno's Garage.

Emblem Removal

Next up, remove the emblems.

When I removed the badges from the '10 truck, I forgot about the good 'ole fishing line trick. Back in 2010 I used a heat gun and it warped one of the badges. This go-round I parked the truck in the sun and later in the afternoon I "sawed" through the double-stick tape with some nylon fishing line. The magic eraser from the auto body and paint store was chucked into the drill and the sticky goo was removed from the door panels and the tailgate.



Off come the emblems.



The magic eraser is a great tool for removing sticky goo, old pinstriping or those dealer decals that are often found on the tailgate.



The editor has transformed his Tradesman-trim truck into a Sport-trim truck. Insanity?

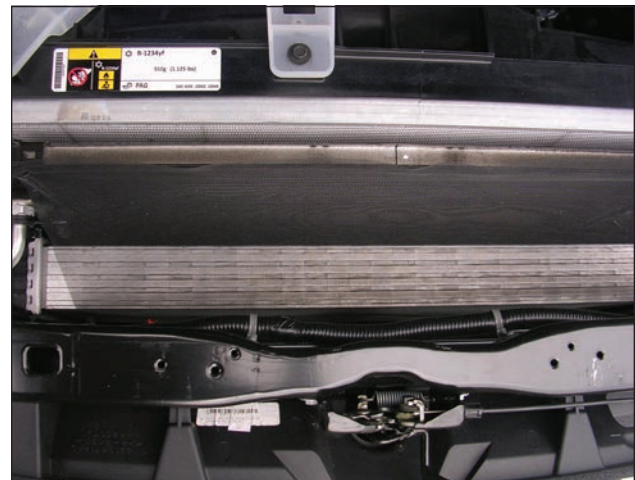
Quick Release and Condenser Guard

One of the many reasons we purchased the 1500 truck was to develop and/or modify parts that the Geno's folks sell, and introduce these parts to a new marketplace.

I'm thinking a Cummins shift knob for a manual transmission (not available with a 1500 EcoDiesel) doesn't have a home on this new truck. However, I was hopeful that the 1500 audience could enjoy the benefits of the Geno's Garage Quick Grill Release Kit and the Condenser Guard parts that are so successful with the Heavy Duty trucks.

With great anticipation, I opened the hood to find 3.0-liters of engine in a V-6 configuration versus 6.7-liters of engine in an inline-6. The engine is way back from the front and there is a lot of area under the air shroud for the radiator.

With my handy V-claw trim tool I removed the six plastic fasteners that held the top shroud in place. Next, the grill was removed. (Remove four 10mm bolts that are in the vertical position on top, pull horizontally outward and four tab pins pop out of their holes.) With the grill removed, I came to two quick realizations. First, the radiator and other cooling heat exchangers are way, way back in the engine compartment. These coolers are so far back that they don't need a condenser guard. I did cut some nylon window screen and tie-wrapped it over the outermost heat exchangers to keep bugs and small grit from the fins.



Nylon screen mesh added to keep out bugs and grit.

Second, unlike the Heavy Duty trucks, where the metal bumper is directly below the grill, the 1500s have a flexible plastic fascia over a plastic support panel that is stair-stepped above the actual bumper. Is the plastic support panel sturdy enough to stand on? How do you stand on the plastic fascia without scratching it with shoe grime?

Oh, well, so much for the great functionality of the quick grill release kit for a 1500 truck. Since I already had everything apart (and lots of bugged-up plastic push-pin fasteners) I used the pins and tethers and made a 1500 kit anyway.

With the grill removed it is impressive to note the ducting Ram has used to direct the air to the coolers. These photos will show what I mean.



Post Script: Should you want a quick grill release kit, we added two more 1/4" detent-type, clevis pins to the kit that the Geno's folks sell for the Heavy Duty trucks. For underhood servicing it is nice to have the grill out of the way. (However, I'm still not sure about putting a lot of weight on the plastic fascia above the bumper.)

Mudflaps

What is the big deal about mudflaps?

In this case it is beneficial to have multiple parts in hand to compare and then formulate a quick bottom line.

For Fourth Generation mudflaps *without* fender flares, the Husky liners and Mopar liners are the same length. The Huskys are \$13 cheaper and they ship with 3M clear tape to protect the paint.

If you get the truck with fender flares, the Mopar mudflaps are heavy duty rubber and are 1.5" longer than the Husky plastic flaps. So, for the serious off-road types, the Mopars are worth the extra price.

Geez, that's about all the print that mudflaps warrant.

Access LiteRider Tonneau Cover

I have used this brand of cover since truck number two. Each year when I go to the SEMA show or each month when the Truck Times arrives in the mailbox, I make note to see if there is a better mouse trap in the crowded bed cover marketplace. I've found none better.

On my first truck in 1996, I tried the Roll-N-Lock, garage door-type cover. Cool concept, it was fun to show off the push-to-retract feature. However, over time (kinda like a garage door) the push to retract didn't cooperate so well. Also, over time I grew to regret the loss of header space that was taken up by the big box needed for the retractable cover. Over time it was bothersome that there was no flexibility when the cargo was "just one-inch" too high.

Throughout the years I've seen all of the panel type fold-ables, lift-ables, and other brand rollup-ables. For me, the Access LiteRider product still represents the best value in the marketplace. There is no real loss in header space; the cover rolls up to open/rolls back to close in a matter of seconds; the cover is flexible enough to go over slight cargo irregularities; and the cover latches securely when down. The only drawback: security-wise its thick vinyl cover is no match for a thief with a knife.



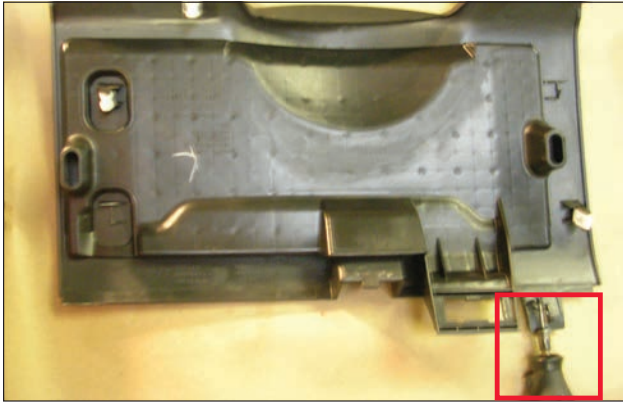
The Access Cover is a five-star item. Installation takes about 30 minutes. Should you have an interest in this cover the Geno's Garage folks documented the installation with a video that you can find at <http://www.youtube.com/watch?v=3-4UwOvCBaM>.

Painless Wiring

Long ago TDR writer Scott Dalgleish introduced this product to the TDR audience. His comment, "This is the building block for the addition of electrical accessories in a professional manner," still holds true for me. And, with the complexity of today's electronics and switches that tie into interior control modules rather than direct circuits, the need (should I say requirement?) for a separate electrical system for your add-on goodies is paramount.

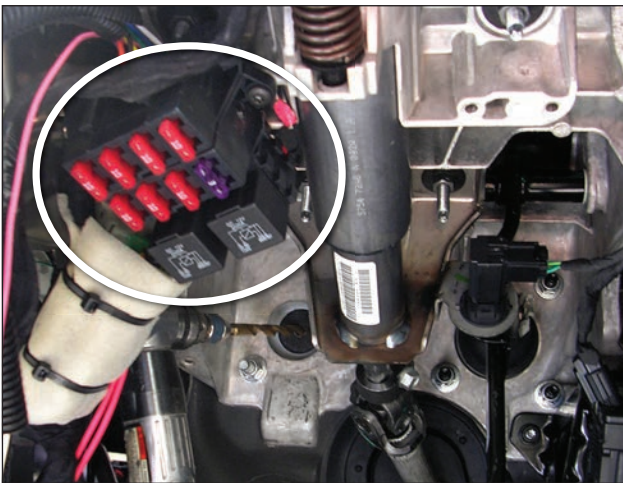
All right, we've established a need for this accessory, now where do you locate it? I went back to Issue 72 to review my installation in my 2010 truck behind the knee bolster panel. To remove the knee bolster panel, start underneath

and remove the two Phillips head screws at the bottom of the panel. Now the only thing holding the panel in place are some plastic expansion clips. As you might imagine, I removed several of these clips to make future removal easier. To remove, pull the panel down at the top and horizontally out at the bottom.



The knee bolster panel has been removed and the Dremel tool will soon be cutting the tab where the Phillips head screws were located.

With the knee bolster out of the way there is plenty of room to add a Painless Wiring accessory fuse panel.



Seat Replacement

As you already know, I purchased a Tradesman truck and I had the bright idea to replace the driver's seat as I had done with my 2010 Mr. Schwarz truck. Sorry, gang, the factory's Tradesman, a non-adjustable, "embossed cloth," diesel gray-colored seat is not the hot ticket.

While my memory is not the best, I recall that the seat swap on my 2010 Mr. Schwarz truck was not easy. Short story: The entire seat is easily removed from the truck, two 15mm bolts in the front, two 18mm bolts in the rear. However, the seat is riveted onto its sliding frame and you can't easily grind off the rivet heads to remove the seat. Issue 76, page 50, has the details. I was determined not to repeat the "saws-all between the seams to cut the rivets" lesson.

The five weeks between ordering the truck and its delivery (yes, five weeks, I was very fortunate) gave me time to think about seat replacement, eBay presented an interesting option.

I think you can see where this is going. Log onto eBay motors and do a search in the parts and accessories category for "Ram 1500 front seats." It didn't take me long to find a front set of Laramie Longhorn, black leather seats. Power settings, lumbar, seat heat, seat cooling, memory settings, side curtain airbags: These seats had it all. I was hooked.

Maybe, I was hooked.

With today's electronics, how would I make all of the accessories work? Seat movement? Seat memory? I know the seat's heat and cooling are switched at the truck's center control area. How would the wiring interface work? The airbags... well, my truck's seat has the airbag modules, maybe this would be plug-n-go?

Unfortunately (fortunately), it isn't 1994 when most of your controls were hard-wired to a simple switch. Today we have wiring to the body control module (BCM) and the BCMs are configured/programmed at the factory. As an example, the Geno's folks could not help a customer "upgrade" his mirrors. He purchased a replacement set that had the puddle lamps. The new ones plug right in, but the lamps did not operate. A check of the wiring loom to the mirrors indicated it should be okay, but no success. The seat swap could be complicated.

Perhaps I paid too much for the seats, but remember, I've got 14K as the difference between the Tradesman and the Laramie Longhorn trim package. The seats were \$1400. They arrived as advertised, brand new, take-out seats from a railcar accident. As advertised, the side curtain air bag modules had been removed.

Time to go to work. Just how much of the seat's controls would plug-n-go? The factory seat was quickly removed and wiring connections unplugged. I loosely installed the new seat. I made a note that my seat had 5 pins; the new seat's harness has 12 pins. I made a note that the new seat has another harness with 20 pins and there is no wiring for this harness from my truck. I plugged the new seat in. For fun I hit the fore/aft, up/down, tilt/tilt controls on the new seat.

Nothing. This could be complicated

As I suspected, I would have to supply +12volts directly to the new seat's harness. I identified the +12volt seat wire and provided a +12 volt ignition off/always hot wire to the seat. The controls worked! The lumbar inflation worked!

Now it was time to sort out the seat's other features. Long story, short version:

- Investigation of the new seat-to-truck wiring harness revealed that the side curtain air bags were plug-n-go. This was confirmed when the air bag module was

pulled out of the factory “embossed cloth” seat and installed into the Laramie Longhorn seat. The “check air bag system” note turned off.

- I direct-wired power to the seat’s cooling fan. I installed an on/off switch. My switch was located on the seat’s side panel.
- The new seat’s memory settings buttons do not work. Oh, well, 4 out of 6 features, not bad!

Moral of the story: Be adventurous. I love the Laramie Longhorn seats.



The Laramie seats transform the interior.

Seat Surgery – Seat Heat

It seems like yesterday that I was fiddling around with seats from a Fourth Generation truck, removing the outside seat covers only to discover those pesky hog clips hold the very top of the seat covers in place. However, last go-round I was intent on adding seat heat with both element pads on the back, no element on the bottom. This time I have a different plan.

Experience has proven that using both elements to cover the back really did not accomplish much. For me it is lower back heat that makes the drive comfortable. Only one element is needed for this and the pesky hog clips that are located 5/8 of the way up the seat cover can be avoided.

For those that are extremely frugal and use only one heat element per seat, you can purchase only one kit. Do some creative wiring for element number two, and you’ve saved some money.

Enough of the penny-pinching lesson. What is the story?

You read about the addition of the Laramie Longhorn seats to the truck. I could not figure out how to make the seat’s factory seat heating elements operate, so I added seat heating the old fashioned way: New elements under the factory seat covers and manual controls on the side of the seat.

In addition to the removal of the factory seat cover for seat heat, it was necessary to remove the seat’s back cover to get access to the area where the seat’s side cushion air bag is located. Electrically, the air bag was a plug-n-go item, the air bag module is held on the side of the seat with two 8mm nuts.



Time to transplant the air bag module.
(New Laramie seat is on the left.)

Yes, now that I have all of the hook-ups sorted out, I really like the Laramie Longhorn seats.

AMP Research Steps

Elsewhere I’ve warned you: time after time I tend to upfit a truck with accessories that are tried and true. Such is the story with my third use of AMP Research retractable cabin steps.

Now, if you consider that the three trucks prior to my discovery of the AMP steps were also power-down, power-up steps, then you could say I am six-for-six in the use of retractable steps. My first three trucks used a small 18” wide step (an 18” surface is really all you need), the Kodiak “Sidewinder.” Unfortunately Kodiak went out of business in the mid-2000s. The steps (one for driver, one for passenger) could be done by the average shadetree mechanic and the price was about \$750 for the pair. Geno’s Garage guy, Brandon Parks, still has a set of Kodiak steps on his 2003 truck.

So much for the Kodiak story, let’s move on to the AMP steps. Rather than bore you with the how-to story, I thought I could find a chapter-and-verse in an old TDR magazine where one of our writers had taken you through the AMP step installation. The first mention of the AMP steps was back in August 2005, Issue 49, where writer Jerry Nielson talked about the steps. Jerry commented:

“While attending a SEMA show last year (November 2004) an innovative product caught my eye. Upon closer inspection, I realized I might have found the gem of the show. This product is a retractable step for the Ram truck. The step is unique in that it runs the entire length of the cab (both doors). But, perhaps the best feature is that it is *completely hidden* when not in use.

“I have had these steps for over two months. The eight-inch drop makes entry and exit from my four-wheel drive truck exceptionally easy. Front and rear seat passengers no longer have to struggle to get ‘up’ into the truck. And, the wow-factor when the door is opened and the step descends is remarkable. The actuation time after the door

starts to open is less than one second and it takes less than one second to retract. I've gotten the steps muddy and I've power washed them at the car wash. I've even shot a direct stream of high pressure water directly on the motor without a problem.

"We've all heard it said that 'you get what you pay for.' The AMP Research steps are \$1250 for the kit. This investment will give pause to those that are prone to making quick, emotional decisions. However, were someone to offer me my money back, I would decline. The steps are worth your due consideration."

Two years later, Jerry gave the AMP steps another favorable review. People were still impressed with the wow-factor as the opened door signals the step to go up or down. He mentioned that his 92 year old mother also liked the steps. That's important!

Next up, after Jerry's discovery of the AMP steps, I installed the steps on my '07.5 Mega Cab, Long Box truck. However, no long and boring how-to story, just a two year follow-up on my part: "These steps have been recommended by many TDR writers. I've used them for almost two years and they continue to be functional and flawless in quality and operation."

Now, the subjective: who has the best step/running board?; What is the best look? What is the best value/price? You can tell I've come to the conclusion the AMP step is the winner. Yet, since the first mention of these steps nine years ago, I can't believe that we've not bored you with a how-to story.

All right, "How to install an AMP Power Step."

Seriously, I'm not going to do that to you. You've already suffered through my lengthy sales pitch: Even though they are an expensive item, the wow-factor and the quality of the product make the steps worthy of your consideration. I will give you some highlights and lessons learned from installing these on both a Third and Fourth Generation truck.

First up: although AMP gives the installation a 4 out of 4 for the skill level required to install the steps, I have to disagree. I don't do engine rebuilds, I can't fabricate or weld. However, I can swap parts, and the installation is not complicated by time consuming "drill here, cut this, twist that" instructions. And, since AMP steps are a Mopar Accessory item, the majority of holes needed for the attachment of the steps to the truck's cabin were already drilled.

The exception to the pre-drilled factory holes: four 1/8" holes that you have to drill to allow a pop-rievet to go into place. The rivet holds a reinforcement plate behind a cut-out in the shell of the cabin. Truthfully speaking, fishing the reinforcement plate through the cut-out and cinching the expandable rivet nuts into place was the most difficult part of the installation.

Really, aside from lining up and fishing the reinforcement plates (there are four of them), the installation is very much by the book. And, credit to the AMP folks, their instruction book is straightforward and clear.

Now, truthfully speaking, who follows instructions anyway?

I mentioned that the AMP instructions are well written. However, I did uncover some lessons learned the hard way: Tips on installing the reinforcement plate; tips on relocating the emergency brake cable; tips on wiring; tips on step adjustment for opening and closing the steps. I had checked the internet and YouTube for installation videos. Yes, I'm old-school, you should be able to read instructions and get 'er done. But, pictures are often worth 1000 words. To that end, I could not find an AMP/YouTube video, so I did a video for the Geno's Garage folks that show you all of the above. Should you have an interest in these steps, check it out at <http://www.youtube.com/watch?v=t1gslY2lrpY>.



GateGlide II

Okay, I'm spoiled. In one of those rare incidents, I forgot that I had yet to add a GateGlide to the new truck and went to open the tailgate. Even though Ram trucks now have a torsion bar to help close the gate, the bar does nothing to slow the gate's drop.

Wham.

There are two products that you can use to control the downward wham-problem: the EZdown, a shock absorber that just controls the down movement; or the GateGlide, which is a shock absorber to control the down and a spring assist to help you go back up.

Again, I'm spoiled. Before wham number two occurred, I installed the GateGlide. With the GG and Ram's torsion bar the tailgate is wife-friendly in its up and down opening.



No more “wham” with the GateGlide II.

Fourth Generation Cabin Filter Kit

The sales write-up for the cabin filter kit reads as follows: The installation of the filter to the interior air box required the use of a hot butter knife (box cutter heated with a torch). Cut out the opening shown in the included instructions, slip the carbon filter into the slot, and close it off with a Mopar air box door. The door fits perfectly as it is used on other Dodge vehicles.

Sounds simple, albeit a little dangerous as you go back and forth heating the blade of the box cutter. Don't drop the knife. Wear some leather gloves to protect your hands.

On second thought, I got out my trusty Dremel tool and cut the plastic HVAC box.

I really like this little modification. I don't understand why it was not put on the truck from the factory. Replacement filter elements are readily available at NAPA auto parts stores.



You have to cut where shown to install the cabin filter.

CONCLUSION AND A CHALLENGE FOR THE RAM HD TYPES

Wow, looking back to the start of this story in early April I see that I've been busy adding lots of personal touches to my truck. Jokingly, I asked you to judge if I was insane. Save those cards and letters, we all have to do what is necessary to make the truck perform its assigned task.

I've enjoyed the upfit process. As mentioned, save the insanity letters, but do send us your analysis of aftermarket items that you may have added to your truck.

Now, a question for you: Imagine you are the editor, how do you blend-in this new 1500 EcoDiesel with an audience that is 99% Ram/Cummins Heavy Duty?

Just like you, I've read some of the internet gibberish where there is a strong difference of opinion between the 1500 and the Heavy Duty crowd. Thankfully, the examples of bias were not at the TDR's site; you guys continue to be civil and respectful in your discussions. To the point: TDR members are proving to be helpful watching out for “little brother.”

Thanks, TDR members. Now, back to the question. With the cabins and truck beds being the same, that commonality immediately transfers over to your HD Ram. Likewise, you read about differential ratios, big tires, the SAE J2807 test and the corresponding tow ratings that Ram can publish. Do you really need a 4.10 differential? Also, you'll be entertained and enlightened as I take a look (next issue) at the super-special “Euro L” lube oil that is called for in the EcoDiesel's Owner's manual. Is it really that special?

I hope the faithful TDR Heavy Duty audience will follow the adventures of Little Brother. There is a lot we all can learn!

**Robert Patton
TDR Staff**

NOTES:

FIRST IMPRESSIONS - RAM 1500 ECODIESEL

ISSUE 86 - 1500/3.0 VM

by Scott Gress

A Perfectly Competent Medium Duty Tow Rig



The dark cherry red Ram Laramie EcoDiesel at the dealer while the paperwork is getting signed.

Bottom line, for me it's terrific. It rides like a large sedan, it's peaceful and quiet and in the upper trims, luxurious. If you can live with the cargo capacity and towing limitations, you should get one.

Ram broke new ground this year bringing the first modern diesel engine to the ½ ton truck market and it's been selling faster than Ram can build them. The two-wheel drive truck is EPA rated at 23 city, 28 hwy versus 15/22 for the Hemi. As diesel owners know, however, a diesel engine really shines in its ability to efficiently handle higher loads. I have found that better fuel mileage in mixed use is nice, but I bought the truck for its towing mpg. What remained to be seen is if the little 3.0-liter Turbo Diesel was enough engine that the 1500 didn't struggle when pulling its rated capacity.

The Ram 1500 is cargo capacity limited. This is inescapable. With a dozen mouse clicks one can option themselves into a fully loaded truck that has the cargo capacity of your kid's Big Wheel.

The Truck: My truck is a Laramie, Crew Cab, two-wheel drive. Options: conventional spring suspension, 3.55 rear end, Airlift 1000 airbags at 35psi. Cargo capacity 1276 pounds, towing capacity 7800 pounds. The Laramie had the desirable leather trim seats and fender flares, yet retained enough cargo capacity that it could be a reasonable tow vehicle.

The Load versus Capacity of the Truck. My trailer is a 7400 pound, 24' enclosed car-hauler, with a weight distribution hitch set darn tight. The couple hundred pounds of gear and large cooler of beer in the bed reduced the towing capacity to 7600 pounds. This put the truck within a single well-fed American of its maximum towing capacity, a number that didn't change when Ram recently announced that all their 2015 trucks are rated per the SAE J2807 towing capacity standard.

Leaving the beer cooler home was considered.

Some risks have to be borne.

The Pulls. Three road trips totaling 1600 miles, over flat and rolling terrain. The cruise control was set at 64mph and the speed was allowed to drop when pulling up hills. In order to get accurate mpg numbers, there was no drafting behind other rigs.

MPG. The average for the 1600 miles of towing was 14.3mpg. At the end of the 1600 miles, I increased the speed to 70mph for 100 miles to see how the engine would react to the increased load. The average mpg for that 100 miles, which was almost entirely flat, was 10mpg. I lost a third or more of my mpg in order to gain only 6mph. **(Editor's note: Heavy Duty guys feel free to embellish: "I get the 10mpg number at the same 70mph with a larger load.")**



Before with 1 in sag (top) and After with 3 in. sag (bottom).

MPG Comparison. I've towed the same trailer on the same route at the same speed for years. The previous tow vehicle was a pre-emissions controls 2000 Ford F-250 Powerstroke diesel that got 13-13.5mpg. A buddy with a 2011 Ram 2500 Cummins tows the same rig/route/speed and he gets 13mpg. The EcoDiesel did a little better with the speed at 64mph than the big diesels, but it did not do better when pushed harder at 70mph. The small engine is efficient, but push it too hard and you get outside of its comfort zone.

When pulling the trailer up freeway on-ramps or heading up hills on surface streets, I never felt like I was wanting for power. If I routinely towed over some serious mountains, maybe I'd feel differently.

Based on my towing the same rig with gas engines, I would expect 8mpg out of the Ram 1500 Hemi and less than 9mpg with Ford's EcoBoost.

Inside the Cabin. Ram worked hard to make the passenger compartment an oasis of peace and quiet. From inside the truck it's hard to hear the engine. The engine might have been laboring and wheezing, but if it was doing so, it was being really quiet about it. The 80s tunes on Satellite radio were nice, though. Having never owned a diesel truck quiet enough that I was tempted to turn on a radio, this was a new experience. I never really knew how much I'd grown to hate the endless roar of my old tow vehicle's engine until I finally had peace and quiet.



Ram accepted risk to bring the first diesel engine into the modern 1/2 ton market. One of their design criteria was certainly to "civilize" the diesel truck engine so that it would be in stark contrast to the clattering beasts of 15-20 years ago that Prius types seem to envision as current truth. The mild mannered and inoffensive EcoDiesel is going to win new fans outside of us brutish louts that have appreciated diesel trucks for years. I see this happening when I talk up the truck to my wife's sensitive friends.

Observed Temperatures. Peak coolant temperature was 222°. Peak oil temp 242°. Peak transmission 179°. Ambient temps ranged from 75-95°.

Although a coolant temperature of 222° seems a bit hot, this is because I was used to lower temperatures. The 222° number is less alarming if one watches the analog gauge instead of obsessing over the additional information available on the gauge cluster's digital EVIC display. On the analog gauge 222° puts the needle at dead center. There is an unconfirmed report that the coolant thermostat does not fully open until 228°.

During my 100 miles at 70mph test the coolant temp increased to 228° and the analog gauge went slightly beyond center.

The coolant system has a large heat load. Not only is the turbo water-cooled, but the oil and transmission coolers are just small heat exchangers that add their heat-load to the engine coolant.

At 242° the temperature of the oil was acceptable. Those with aircooled engines would call it barely warmed up.



Turbo and Exhaust Gas Temperature. For most of my roadtrips, the turbo rarely went over 10-14psi of boost and EGT's peaks were usually 1000-1100°. The EGT's dropped very rapidly when off boost. A scenario where one would pull off the freeway for fuel and need to idle for a minute to drop EGTs seemed unlikely. During the 100 mile test at 70mph, the boost peaks spent most of their time at 14-16psi. I failed to note EGTs during the test.

Transmission. All good. The ZF transmission has become ubiquitous. In various guises it can be found in a broad range of cars and trucks, some being significantly more powerful than the Ram, and including a \$400K Rolls Royce. The eight gears allow the truck to easily keep the engine at an efficient rpm for the load. The transmission shifts smoothly and, since you can barely hear the drivetrain, you won't notice the gear changes unless you're watching for them.

In Tow/Haul mode, the transmission behaves as one would expect, staying in gears longer in order to reduce gear hunting. In Tow/Haul mode the truck would pick a lower gear on the flats and maintain about 2300rpm at 64mph. The software seemed cleverly done. The transmission was good at being in the most efficient gear for the load. The transmission was a little less clever pulling the trailer with Tow/Haul off. This resulted in a few more gear changes.

Chassis and Suspension. I had never asked a 1/2 ton truck to pull a load so close to its rated maximum, so I did not know what handling issues to expect. As mentioned, for the last several years I've been doing my monthly road trips in a stiffly sprung, ponderous beast of a 2000 Ford F-250 diesel. At first the Ram 1500 truck seemed a little flighty and nervous in comparison. Each time a semi passed me I tried to feel if I was being pushed around a little more, or, I asked myself, "was it just my imagination?" Was I being moved around because the trailer weighed more than I did? Was the truck wiggly because the rear shocks couldn't damp the combined spring rate of the springs and airbags?

I thought at first that the Ram 1500, towing a load at its capacity and with a large sail area, seemed a little flighty and nervous compared to the heavier and more tightly sprung F-250. As I got used to the different handling though, I decided that what I was really feeling was precision and feedback. I was used to towing the trailer behind a ferry boat, that no matter how much money I spent on its suspension and steering, still had a 1" dead spot in the center of its steering. Now I was towing in a truck that handled like a sedan. I could feel every force on the truck, and the truck happily executed tiny unconscious driver inputs. The handling characteristics I was feeling weren't "nervous" but "sure."

The Ram 1500 was telling me what was happening and doing precisely what I told it to do. I was used to having my kidneys pounded by freeway expansion cracks while the lumbering beast constantly wandered to and fro. I'd simply have to find a way to get used to this new world of a comfortable, quiet tow vehicle with precise handling characteristics. You ever notice that if you spend too much time smiling your cheeks ache?

Cargo and Towing capacity. The Ram 1500's cargo and towing capacity are challenged and there's no getting around it. In the top trim Laramie Limited there's so little spare cargo capacity that one might have to choose between your dog and your girl. (And the girl might not understand.) It is a light duty truck. If you have heavy duty truck needs, \$10K more will get you a similarly equipped Ram 2500. It won't get nearly the daily driver mpg and the ride won't be as nice, but it will happily pull twice my trailer's 7400 pounds up a steep grade.

Ram says that the 3.92 ratio differential will give the light duty truck 1000 pounds more towing capacity, but you'll take a hit in mpg. There are not many EcoDiesels on dealer lots and likely none of them are 3.92s. The 3.92 is about 10% shorter than my 3.55. Even though I'd certainly prefer an extra 1000 pounds of rated towing capacity, I did not go for the shorter differential. I figured that my truck had eight gears to pick from to find an rpm that it liked. I was going to enjoy the mpg advantage of the taller differential until the day came that I tried to pull my trailer up a hill so steep that first gear wasn't quite low enough. (**Editor's note: We covered the gear fast/run slow story and how it relates to tow ratings in our previous TDR magazine, Issue 85, page 40.**)

Extra Capacity. I've long bought into the common wisdom that one should always have plenty more truck than the towing/hauling job calls for. I imagined that it was a significant safety issue, and I suppose, a form of lawyer repellent. If, forbid, something bad happened one day, and I was a couple hundred pounds over rated capacity, I imagined that the lawyers would descend upon me like locusts and pick my bones clean. But maybe towing/hauling at near the capacity of the truck isn't quite the big deal I thought it was.



With a 24', 7400 pound trailer, 800 pounds of tongue weight and 200 pounds in the bed, the airbags keep the truck level.

The 2015 Ram trucks have tow ratings based on the SAE J2807 standard. My 2014 rating didn't change, so clearly Ram has been using the standard unofficially for a while. Much of J2807 is about launching and accelerating up hills. The Hemi 1500 has a tow rating 2000 pounds greater than the EcoDiesel, so the tow rating difference isn't about safety issues like brakes and handling, it's about the engine. Therefore towing with the EcoDiesel at its capacity is just as safe and responsible as towing with the Hemi well short of its capacity. If my truck isn't as capable as the Hemi launching up a 12% grade, I can live with that, knowing I get almost double the mpg of the Hemi when I tow. Besides, there probably isn't a 12% grade within a 1000 miles of Savannah, Georgia.

If I was 100 pounds over the truck's towing capacity when the hypothetical accident occurred, the idea of the lawyers spending their afternoons picking up roadside debris and carefully weighing it, brings a smile to my face. All that ice that was in the beer chest is long gone, guys.

The Airlift 1000 Airbags. With so much weight on the rear axles, this accessory was a must do. The airbags were inexpensive and easy to install. Without the airbags the trailer caused 3" of rear sag and 1" of front lift for a total delta of 4". That was a recipe for much derision from my peers. Even my wife (a fancy lawyer inclined to skirts and Italian heels) inquired, "Ah, is it supposed to look like that?" It was that bad.

Fastening on the weight distribution bars nice and tight only barely helped with the rear end sag. With 1000 pounds more than usual pressing on the rear axle, the weight distribution hitch moving 160 pounds rear to front wasn't going to make a dramatic difference.

The rear suspension was almost bottomed out onto the bump stops. Routinely banging off of the bump stops at freeway speeds would have made for a very exciting trip.

With 35psi in the airbags it reduced the total suspension change to an unnoticeable amount. The airbags were a big win, and best of all, they were cheap and easy.



Airlift 1000 airbag, a must do for serious loads in the bed. \$90 and a one hour install.

The Ram 1500 EcoDiesel as a Daily Driver. The truck is often my commuter vehicle. The old F-250 got around 12mpg around town, a little better on the freeway, and it punished me the whole way. The EcoDiesel gets almost 24mpg around town and when I have to take the kids across the state to a soccer tournament, I can get 30mpg if I feel like keeping it below 70mph. And, I am in perfect comfort. It was a genuinely astounding upgrade.

Final Thoughts. I wanted the ride comfort, handling, peace and quiet, luxurious and sophisticated interior, and price of a 1/2 ton truck. But I didn't want the 8mpg that a gasoline V8 would have delivered for the 8000 miles I tow each year. I wanted the towing mpg that only a diesel could give me. I wanted outstanding mpg when not loaded/driving around town. I wanted outstanding mpg when travelling on the interstate. I wanted the best of both worlds, a nice 1/2 ton truck with a diesel engine. I think this was a big win.

Scott Gress
TDR Writer

ECODIESEL LUBE OIL

ISSUE 86 – TECHNICAL TOPICS

by Robert Patton and John Martin

Last issue I mentioned that my 2014 Ram 1500 EcoDiesel truck was ordered just after the Ram folks opened the door for business in March. So, like a kid at Christmas time, I had to wait. With a deposit at the dealership, I was committed to the time it would take the complex manufacturing system to build the truck. Again, I was very fortunate. Five weeks to the day and my truck was on the road.

The interim five weeks gave me time (too much time?) to plan for ownership. I downloaded the EcoDiesel Owner's Manual (www.ramtrucks.com) to check out the routine maintenance parts that the truck would need.

Based on previous questions that members had about lube oil for the 2014 Ram/Cummins engine (TDR 84, page 67), the first section that I went to for the EcoDiesel was "Maintaining Your Vehicle/Engine Oil." And, the recommendation:

Only use ACEA C3 SAE 5W-30 Synthetic Low Ash engine oil meeting Chrysler material standard MS-11106 or Pennzoil Ultra Euro L full synthetic 5W-30 motor oil, which is recommended for all operating temperatures. This engine oil improves low temperature starting and vehicle fuel economy.

Great, I had a feeling I would not be able to bop into Wally World and purchase some MS-11106/Euro L diesel motor oil.

I went shopping. I was correct. There are various Pennzoil "Ultra" oils in different viscosities (all were "Energy Conserving," passenger car motor oils), but no "Euro L" ACEA C3 oils.

Time to investigate. Besides the Pennzoil "Ultra Euro L," which other oil(s) meet Chrysler MS-11106?

Let me save you some time. I was only able to find one other lube oil that met Chrysler MS-11106, Mobil 1 "ESP Formula 5W-30." (Mobil notes that "ESP" means exhaust system protection.) The Mobil 1 folks have a much better web site than Pennzoil. Data from the Mobil 1 web site tells us about their ESP Formula and, thus, what is special about Chrysler MS-11106. Quoting from Mobil's web site:

"Mobil 1 ESP Formula 5W-30 is made with a proprietary blend of leading edge components formulated to be fully compatible with the latest diesel particulate filters (DPFs) and gasoline catalytic converters (CATs). (Editor's note, blah, blah, blah.) Mobil 1 ESP Formula 5W-30 has been designed to help deliver outstanding performance and protection in conjunction with fuel economy benefits. Key features and potential benefits include:

Features	Advantages and Potential Benefits
Low Ash Content	Helps to reduce particulate build up in diesel particulate filters
Low Sulphur and Phosphorous content	Helps to reduce poisoning of gasoline catalytic converters
Active cleaning agents	Helps to reduce deposits and sludge build up to enable long and clean engine life
Outstanding thermal and oxidation stability	Helps to reduce oil aging, allowing extended drain interval protection
Low oil consumption	Less hydrocarbon pollution
Enhanced frictional properties	Aids fuel economy
Excellent low temperature capabilities	Quick cold weather starting and ultra fast protection. Helps to extend engine life.

Further, while tooling around at Mobil's web site, I found a break-out chart showing all of their oils and the oils' properties. In an effort to find one that might be at Wally World or the local Pep-Zone store, I noted their Mobil 1 "Extended Performance" 5W-30 had a nominal Phosphorus level (PPM) of 800 and Zinc level of 900 which matched their ESP oil. Also, I printed the product data sheet for the Extended Performance oil and compared it to the ESP. It looks comparable to me. But, wait, their "Extended Performance" is a passenger car motor oil (PCMO), not a diesel oil. Put this oil back on the shelf. More on diesel oils and PCMOs later.

Dang, I'm not a lube oil engineer; I'm just trying to...

What am I trying to do?

I know, I don't want to be *told* what product has to be used on the truck. Granted, there are two choices, but at \$9.06 for the Pennzoil and \$11.95 for the Mobil ESP, well you can understand my quest for options, even if the price of the quest will outweigh the price of several oil changes.

Did I mention that, thus far, I've only found one source for the oil filter, Mopar 68229402 at \$49.95. Now, you can really sense my building frustration.

What Ya Gonna Do?

Okay, it has been established that I do not want to be told what to do. This is nothing new, I've spent lots of money testing oils and we published the results of "who has the best diesel lube oil" back in our Issue 76 magazine. Lets put some dollars and cents to this project. It is also time to call in the expert, our lube oil guru, John Martin, to help with the article.

First, the dollars and cents. Being the frugal type, I noted that the EcoDiesel engine holds 10.5 quarts, so let's call it 11. I went to my local Ram dealer and purchased the Pennzoil that is recommended for the truck:

Oil: Pennzoil Euro L 11 × \$9.20	\$101.20
Filter: Mopar 68229402	<u>49.95</u>
	\$151.15

And, you thought an oil and filter change for the HD Cummins engine was expensive. (Just wait until you price the Mopar 8/9 speed ZF transmission fluid, 68218925SS at \$43.25/quart.)

With the lube oil in hand, I went shopping for the factory recommended alternative. The Mobil 1 ESP oil was \$11.99 at O'Reilly Auto Parts. It had to be special ordered, you won't find it on their shelf.

Next, I went shopping for some alternative oils. I kept in mind the 5W (low temperature) viscosity recommendation. I settled on two inexpensive US diesel-spec motor oils, samples 4 and 5. Sample 4 was a 10W product, (the Shell Rotella T5 partial synthetic); and a 5W product (the Shell Rotella T6 full synthetic). Go ahead, call me cheap.

John Martin did some shopping. He went in search of some European diesel-spec motor oils of the 5W variety. He found samples 6 and 7, two oils that met a Daimler Benz/European C5 criteria. Neither of us could find any other oils that met the ACEA C3 or Chrysler MS11106. Here are the results.

Table 1

	Viscosity	Brand	Specification	\$/Quart
1	5W 30	Factory fill	EURO C3	0
2	5W 30	Pennzoil Ultra	EURO C3	\$9.30
3	5W 30	Mobil ESP	EURO C3	\$11.95
4	10W 30	Shell Rotella	API DIESEL CJ	\$5.00
5	5W 40	Shell Rotella	API DIESEL CJ	\$5.00
6	5W 40	Mobil ESP	DB 229.5 EURO C5	\$9.59
7	5W 40	Pennzoil Ultra	DB 229.5 EURO C5	\$8.99

From the shopping spree you can see where this is going. I had already purchased several Fleetguard CC2543 oil analysis kits. The oils were sent for evaluation and the following table shows the results:

Table 2

Sample #	Viscosity @ 100°	TBN	Magnesium	Calcium	Phosphorous	Zinc	Boron	Molybdenum
1	12.8	4.89	4	1909	668	805	0	0
2	11.8	5.03	8	1426	536	648	68	0
3	11.9	4.42	3	1090	719	843	229	87
4	11.7	7.94	7	2381	1015	1207	19	0
5	14.0	8.87	1179	850	1046	1249	66	61
6	13.0	7.23	713	1040	682	789	206	85
7	13.4	9.44	12	2635	832	1011	67	0

Great, table 1 represents about \$70 in lube oils and table 2 represents \$175 in lube oil analysis kits. Add in the cost to run around town shopping and I'm into this project for \$250. Now, I don't know diddly about lube oils, so I'll turn this article over to the TDR's John Martin.

Robert Patton
TDR Staff

VM MOTORI LUBE OIL RECOMMENDATIONS

by John Martin

Our fearless editor, Robert, opened a real can of worms when he purchased a new Ram pickup powered by the VM Motori V6 diesel engine. The factory Owner's Manual only has one oil listed (Pennzoil) and Robert was able to find only one other oil that met the Chrysler MS-11106 specification. What's a shadetree, elcheapo mechanic to do?

Isn't it great that Chrysler has dictated a lube performance category the oil has to meet? Robert, a guy who changes his own oil, immediately went looking for some MS-11106 oil in the recommended SAE 5W30 grade. Several parts stores and Wally World, had none in stock. A few stores offered to special order it for him.

These oils are very hard to find in stores. However, most stores have a plethora of SAE 5W30 grade oils on their shelves. Beware, don't use passenger car motor oils (PCMOs) in diesel engines for at least two reasons.

First, and the most obvious, diesels need higher levels of detergents and dispersants to handle higher combustion temperatures and soot loading of the oil.

Second, and the reason Editor Patton has his underwear all wadded-up, all passenger car oils that say "energy conserving" (EC oils) contain friction modifiers to improve fuel economy. Many diesel engines can't tolerate friction modified oils. (Think "more slicker.")

As an example of this energy conserving/more-slickeryness think back to the late 1990s. The guys and gals with motorcycles were all up in arms because they

would change their oil and shortly thereafter, the clutch would slip. Disclosure statement: this was happening to those bikes where the engine and wet clutches of the transmission share the same lube oil sump. The problem, the automotive oil specifications had changed and the oils were now branded with the American Petroleum Institute stamp of "Energy Conserving." No longer could our two-wheeled buddies bop into Wally World for a can of oil and they are paying a higher price for what used to be the standard product offering. Geez, that's an obvious rip-off.

Here's another friction modifier story for you. Molybdenum disulfide is a useful solid friction modifier, but the sulfur in the compound causes deterioration of yellow metal (brass, copper) parts. Diesels often use yellow metal bushings in their engines. Additionally, passenger car motor oils (PCMO) often use glycerol monooleate (GMO) or calcium oleate friction modifiers to reduce the coefficient of friction of oils, but they can produce side effects such as slow lockup of wet clutches (the motorcycle example) or sliding of roller cam followers. A sliding roller cam follower soon causes a catastrophic failure! There are other good reasons, but just take my word for it, don't use PCMOs in your diesel engine.

Robert took a sample of the oil in his pickup (labeled "Sample 1"), and he purchased several 5W30 oils. He sent these oils in for analysis and then sent the results to me to interpret. The oil identifications and performance categories are shown in Table 1. The analytical data is shown in Table 2.

The results are very interesting. Robert's Factory Fill oil and the Pennzoil Ultra Euro oils (samples 1 and 2) have very low total base numbers (TBN) for diesel oils. Likewise the Mobil 1 ESP oil (sample 3). This means less detergent than optimum which should translate into shorter oil change intervals. These are light duty Diesel oils. They also have low levels of phosphorous and zinc (ZDP) which indicates the amount of extreme pressure (EP) and antioxidant protection. All this is done supposedly to optimize catalytic converter and particulate filter life. The Shell Rotella T5 partial synthetic (Item 4, SAE 10W30 grade) and Shell Rotella T6 full synthetic (Item 5, SAE 5W40 grade) had detergent, dispersant, phosphorus, and zinc levels like I would expect from a heavy-duty diesel engine oil.

So Sherlock Martin got to work. I was able to locate a Mobil 1 ESP 5W40 oil (sample 6) and a Pennzoil Ultra Euro 5W40 oil (sample 7) in two different parts stores that had Daimler-Benz sheet 229.5 claims on their containers. This meant they were genuine heavy duty diesel engine oils. Mercedes doesn't screw around with low-quality oils, and they often recommend them by brand name.

Robert looked at the performance claims on his Pennzoil Ultra Euro 5W30 (samples 1 and 2) and the Mobil 1 ESP (sample 3) and found that they both claimed ACEA C-3 performance. ACEA (Association des Constructeurs Européens) is a European trade association much like our API, but in Europe more power rests with the

vehicle manufacturer than with the oil company. The C-3 performance category is relatively new, and it emphasizes catalyst protection and fuel economy over engine durability.

Comparing the C-3 oil test requirements (samples 1, 2, 3) to the Daimler-Benz Sheet 229.5 test requirements (samples 6, 7), I determined that the Sheet 229.5 spec oils offer better oxidative stability, but most other oil performance parameters were roughly equivalent between the two specifications. Evidently Fiat chose to emphasize catalyst durability at the expense of total engine and/or oil life. Or, perhaps, Fiat figured if they utilized lower sulfated ash (SA) oils with reduced phosphorus levels, they could build vehicles with smaller catalytic converters and particulate traps that would still make it through the warranty period without plugging. This would actually be a significant cost savings for Fiat since less platinum and/or palladium would be needed, and these materials currently cost more than gold.

I also noticed something interesting about the two Shell Rotella oils. Comparing boron, calcium, magnesium, and molybdenum values shows these oils contain chemical packages from different additive manufacturers. This doesn't surprise me at all. Big oil companies often ask two or more additive manufacturers for their recommendations and supporting test results to meet that performance category. If both suppliers can meet the performance criteria, they award the contract to the lowest bidder. So, if your father had good luck with one brand of oil, you need to remember that the formulation has probably changed several times since your dad's day.

Another interesting observation is that the Pennzoil Ultra Euro oils utilize base stocks made from natural gas. This is a relatively new technique which produces very high quality (like a synthetic) low sulfur base stocks. As long as natural gas prices remain depressed this technique makes good economic sense to those companies heavily invested in natural gas as Shell is. (Shell also owns both Quaker State and Pennzoil.)

What Should You Do

Okay, so what are you readers supposed to do for oil if you own one of the new VM Motori V6 engines? As I mentioned, if you go to any oil marketer's shelves, you will see a plethora of SAE 5W30 oils, but all of them Robert and I found were passenger car engine oils. Remember, SAE 5W30 is only a viscosity grade, not a performance specification. Stay away from PCMOs!

Robert and I only sampled four heavy duty diesel oils of lower viscosity (to improve fuel economy) than the typical SAE 15W40 grade. No doubt there are many, many more lower viscosity-type diesel oils on the market, we only tested four of them to see how they would match up to the European ACEA C-3 category. As you know, these oils were samples 4, 5, 6, and 7.

These oils would protect your VM diesel very adequately, although your fuel economy might be 1-2% less than with the recommended 5W30 grade oils. I'm betting you, like most truck operators I know, can't even repeatedly measure the fuel economy difference between these oils.

Catalytic converter and particulate trap life might be slightly adversely affected, but all of the field test data I've seen suggests that the differences are too slight to measure. I call this "environmental politics." Our environmental do gooders just want to force their theories on us in the form of regulations—don't bother them with facts or data!

So, if absolutely maintaining warranty coverage without question is your biggest concern, take your Ram pickup to the dealer to have the oil changed, or order the Pennzoil Ultra Euro or Mobil 1 ESP in the 5W30 grade if you change your own oil. Choose the one that costs you less.

If you're not inclined to do either of the above, buy one of the four diesel oils listed in our test for your truck. The Mobil and Pennzoil 5W40 grade oils (samples 6 and 7) would be the least risky oils as regards warranty coverage, because they are modern European diesel engine oils. If your dealer gives you any crap, have him contact me for a little Lube Oil 101 education about what diesel engine oil specs really mean.

However, I feel the best oils for your engine's ultimate durability would be the two Shell products (samples 4 and 5). I prefer the 10W30 version because I know and like the additive chemistry utilized. The 5W40 full synthetic would also do a good job of protecting your diesel engine's durability. However, catalytic converter and/or particulate trap might be shorted a little.

Now, if you'll pull out your TDR 76, pages 52-56, you can see where Editor Patton sampled another 5W-type oil (a Mobil1 synthetic diesel oil). In the Issue 76 article I didn't really care for its make-up.

- Viscosity – 14.1
- TBN – 8.84
- Magnesium – 777
- Calcium – 1050
- Phosphorous – 975
- Zinc- 1110
- Boron – 82
- Molybdenum – 0

My comment: "This Mobil product looks like a consumer-type diesel oil. Big truck fleets wouldn't use this product." At the time, the price per quart was about \$6.50. However, it fits right in with the Euro-specification stuff (samples 1, 2, 3) that we've uncovered for this article.

Looking further at Issue 76's oils (2.5 years ago) and this test, the only oil in both tests that had a 5W-type viscosity characteristic was the Sample 5/Shell Rotella 5W40 synthetic. For the record the Shell formula has not really changed.

	THEN	NOW
Viscosity	14.3	14.0
TBN	9.22	8.87
Magnesium	1119	1179
Calcium	770	850
Phosphorus	994	1046
Zinc	1171	1249
Boron	60	66
Molybdenum	58	61

Now, let's get back to the VM Motori diesel engine and my closing statements. This is my big concern, please don't use just *any* SAE 5W30 engine oils, because you saw them all over the parts house or Wally World's shelves. (Again, a rather intimidating array of choices for any lube purchaser, including me.) Most likely they'll say "for gasoline engines" on the front of the container. *Please* don't use gasoline engine oils in your diesel engines. (I promise an update on PCMOs and diesel-specific oils in the next issue.)

**John Martin
TDR Writer**

P.S. I don't want to think about this VM Motori engine and the lube oil that will go into it five-or-so years from now. You know how the scenario plays out: truck's out of warranty and has had three different owners. Billy Bob pulls into Lousy Larry's Lube Oil Emporium. Larry gives the engine a \$19.95 oil change.

Well...I guess new and fresh oil is better than no oil? Geez.



Confused yet?

ECODIESEL LUBE OIL - PART II

ISSUE 87 – BACKFIRE

by Robert Patton

Let's start this issue's Backfire with a follow-up letter about our article on lube oil for the Ram 1500 EcoDiesel.

THE ECODIESEL LUBE OIL

In last issue's discussion of lube oils for the 1500 EcoDiesel you stated, "I'm not a lube oil engineer." Well, I'm no lube oil engineer either, but I did find an Amsoil product that meets ACEA C3 criteria in a 5W-40 European Car Formula for that Italian diesel in the Ram 1500 truck. It is a "Mid-SAPS" (sulfated ash, phosphorus and sulfur) synthetic oil and retails for about \$11 per quart.

Amsoil actually makes three different products especially for European cars and diesel vehicles.

Just saying...

Dave Mitchell
Pine, Colorado

Dave, it is good to hear that Amsoil has ACEA C3 products. However, at \$11 per quart the price does not help the "Freddie Frugal" that is in search of a low cost alternative. Nor does it help "Confusion Charlie" that is bewildered at all of the 5W30 motor oils on the shelf at WalMart/WallyWorld. ("Hey, it doesn't say 'diesel' but it's got a nice yellow bottle like that Pennzoil does.") So, we're going to go back to John Martin for another round of "EcoDiesel Lube Oil 101."

ECODIESEL LUBE OIL – ROUND TWO

by TDR Writer John Martin

As a part of last issue's article titled "Lube Oil for Your EcoDiesel" the editor had purchased some 5W30 passenger car motor oils (PCMOs) to add to his group of diesel oils that were sent out for lube oil analysis. One of these PCMOs was very close in performance to the factory-recommended Pennzoil Ultra/Euro C3 5W30 oil. The oil was the WallyWorld "SuperTech" product and he was able to purchase it for \$4.75/quart. What does "close in performance" mean? Here is the oil sample chart from last issue. (Expanded to add the SuperTech #8.)

Table 1

	Viscosity	Brand	Specification	\$/Quart
1	5W 30	Factory fill	EURO C3	0
2	5W 30	Pennzoil Ultra	EURO C3	\$9.30
3	5W 30	Mobil ESP	EURO C3	\$11.95
4	10W 30	Shell Rotella	API DIESEL CJ	\$5.00
5	5W 40	Shell Rotella	API DIESEL CJ	\$5.00
6	5W 40	Mobil ESP	DB 229.5 EURO C5	\$9.59
7	5W 40	Pennzoil Ultra	DB 229.5 EURO C5	\$8.99
8	5W 30	SuperTech	Automobile SN	\$4.75

Table 2

Sample #	Viscosity @ 100°C	TBN	Magnesium	Calcium	Phosphorous	Zinc	Boron	Molybdenum
1	12.8	4.89	4	1909	668	805	0	0
2	11.8	5.03	8	1426	536	648	68	0
3	11.9	4.42	3	1090	719	843	229	87
4	11.7	7.94	7	2381	1015	1207	19	0
5	14.0	8.87	1179	850	1046	1249	66	61
6	13.0	7.23	713	1040	682	789	206	85
7	13.4	9.44	12	2635	832	1011	67	0
8	11.2	6.76	8	2387	711	851	194	0

Look at the results for oil #8. Compare the numbers to the factory fill #1, and the two other EURO C3 lubes #2 and #3. I think you can understand his obsession with the oil: it is cheap, it is easy to find, he can use it in his car, and it is one less thing to worry about. There is only one problem, and it is a big one: the SuperTech is a PCMO.

I strongly cautioned against using PCMOs in your diesel truck and said I would explain the differences between PCMOs and diesel engine oils (DEO) in this issue.

One of engine oil's primary jobs is to protect the engine from the harmful by-products of combustion. Very clean-burning fuels such as hydrogen, propane, and natural gas generate the least harmful by-products. Ethanol/methanol fuels generate a lot of sulfuric acid due to the hydrogen and water released by combustion combining with sulfur and SO₄ in the system.

Gasoline and diesel fuels are some of the dirtier fuels used for internal combustion. Gasoline is lighter than diesel; therefore, it contains fewer heavy ends, and it burns more completely than diesel fuel. Very little carbon (soot) is created, except in direct injection engines.

Diesel fuel, on the other hand, is very dense and viscous, and combustion is less complete than it is with gasoline. That's why some of us old-timers refer to diesels as "oil burners." Complete combustion of diesel fuel takes a finite amount of time. CO and HC emissions are reduced if combustion initiation is delayed by delaying the onset of fuel injection, allowing combustion to continue out into the exhaust system. This is one of the tricks manufacturers use to reduce gaseous exhaust emissions.

In short, diesels create more soot than they have to (and get poorer fuel economy) all because of environmental activists. (There are those nasty words again!) The oil ring scrapes the by-products of combustion down into the sump, and the oil is forced to deal with it. Heavy soot loading of oils in modern engines has forced oil formulators to create new and more effective detergents and dispersants.

To properly handle soot, it should be kept in suspension in small enough particles (less than 1 micron) so that it can't create abrasive wear in engine components. Both ash-less dispersants and ash-containing detergents bind with soot particles while they are small to keep them away from each other, thereby preventing agglomeration. (How about that oil chemistry word?)

Detergents do a better job of handling soot and soot-related wear, but they tend to build deposits on particulate traps due to ash formation, forcing the traps to be re-generated more often. Dispersants do the same job without the formation of deleterious ash deposits, so we've seen a recent trend to increased use of dispersants at the expense of detergents. But dispersants aren't as oxidatively stable as detergents; that's why I'm not particularly fond of them. Just remember, "Diesels Love Detergents." I just need to remember that we're not building oils for engines anymore; now we're building oils for environmental activists!

The modern low-ash diesel engine oil contains roughly twice as much detergent and dispersant as PCMOs. Detergent content is quantified by looking at Ca, Mg, and sulfated ash content. His #8 oil "holds its own" in these categories. Unfortunately, it is difficult to measure total dispersant content by typical lab oil analysis. So dispersant content is an unknown in the analysis. Maybe there is something right about lube oil additives being snake-oil?

If you use PCMOs in diesels you would expect to plate out more black, sooty deposits on components throughout the engine and increase engine component wear rates. We once field tested a PCMO which had been uprated 25% so it would actually pass the CD dynamometer engine performance tests (a common practice at that time in South America). The reference oil was an average CD level diesel engine oil. Wear rates in the PCMO oiled engines were double what they were in the engines using the diesel engine oil. I rest my case; don't do it!

TWO OTHER TOPICS TO COVER...

PC-11 Is Late

I also need to mention that PC-11 is behind schedule. As I wrote in TDR Issue 84, pages 40-43, PC-11 was scheduled to be commercialized January 1, 2016, but politics between the oil industry and the engine manufacturers have slowed the pace considerably. This always happens with a new specification.

The necessary laboratory engine dynamometer tests (a total of nine) have now all been defined. Seven of these tests are carried over from the previous API CJ-4 performance specification. In addition, there will be new tests for Caterpillar Oil Aeration and Mack T-13 Bearing Corrosion, Oxidation (thermal stability), and Nitration.

Test stands for the new criteria are currently being installed at several laboratories to begin matrix testing. These tests are conducted to be certain that every test stand evaluates the series of reference oils exactly as all the other test stands do so that oils can be developed properly anywhere in the country. All this testing and subsequent data analysis take considerable time and money. (Current estimates are five-million dollars.) Since this testing, like all testing, obeys Murphy's Laws, I'm betting that PC-11 or API CK-4 (or whatever the new category will be called) won't commercialize until the spring of 2017. Plans are still to have two categories: one for the new, lower viscosity oils and one for use in older engines which will require more viscous oils. Biodiesel fuel usage has still not been addressed.

Diesel Versus Gasoline Pricing

I also need to mention a phenomenon I've observed around here lately. Gasoline prices continue to drop while diesel fuel prices either remain steady or increase. This happens when fuel marketers simply can't sell enough gasoline. Refineries are like large water spigots which spew out a predefined product mix every day. Quantities are so huge that no fuel refiner can store very much of his daily production.

Refineries in the US were constructed many years ago to optimize gasoline production, and diesel/gasoline production ratios are not very adjustable. So currently fuel marketers have gasoline coming out of their ears, hence the low prices. Several (8-12) refinery upgrade projects have been in the approval process for years, but environmental activists have stalled them as much as possible, because they think Big Oil is evil. Sounds like the Keystone XL pipeline, doesn't it?

What bothers me is that gasoline in Nixa, Missouri, currently sells for \$2.54 per gallon, while diesel fuel sells for \$3.65 per gallon. That's roughly a 33% difference. Since diesels usually get approximately 25% better fuel economy, it makes diesels less fuel efficient on a dollars/mile basis. I wonder if this pricing is hurting the sales of diesel-fueled passenger cars and light trucks. I can only hope that US refineries can be updated to optimize diesel fuel production.

John Martin
TDR Writer

LUBE OIL MATTERS

ISSUE 94 – 1500/3.0 VM

On pages 34-55 our TDRResource feature gives you a listing of the Technical Service Bulletins issued thus far in 2016. Buried in those 21 pages is TSB 18-078-16, revision A. As written, it was/is a rapid response bulletin that instructs the dealer to change the lube oil on EcoDiesel trucks in inventory to a 5W40 oil. The bulletin's main thrust appears to be a Flash Enhancement to change a fan calibration, transmission calibration and oil change algorithm.

I'll save you some time looking for the bulletin. Here is the summary from page 47:

TSB# 18-078-16 **MODEL** '16
REV A
7/27/16

SUBJECT/DESCRIPTION

Engine Oil Viscosity Upgrade And Flash Enhancements

This bulletin applies to vehicles built on or before June 30, 2016 and equipped with a 3.0-liter diesel engine.

The following powertrain system improvements/enhancements are also included in this software release:

- Fan calibration.
- Transmission calibration.
- Revised oil change algorithm.

This bulletin involves reprogramming the Powertrain Control Module (PCM) and the Transmission Control Module (TCM). For vehicles in dealer inventory it also involves changing the engine oil with new 5W40 engine oil and applying a sticker to the engine oil filler cap. An addendum card will need to be added in the owner's manual.

At first glance this looks like great news for the EcoDiesel audience. The previously specified 5W30 oil/MS-11106 with its European 3 specification forced you to pay about \$10 per quart/\$110 per oil change. The 18-078-16 bulletin mentions and recommends the Shell 5W40 Rotella T synthetic oil that is priced at approximately \$5 per quart.

Great news, really?

However, inquiring minds asked further questions about reasons for the specification's change in viscosity. I called TDR lube oil guru, John Martin, and John gives us the following response:

John Martin's Lube Oil Rant

Wow, it is a strange that you ask. The Chrysler TSB is coincidental with a suggestion by the North American Council for fleet Efficiency (NACFE) recently suggested that *all* truck operators should start using the PC-11 (FA-4) low viscosity, energy conserving, lube oils when it comes out in December.

This is a bad idea.

Now, you TDR folks have read my articles on the forthcoming lube oil changes (Issue 84, pages 40-43). Briefly the FA-4 oils are to be used in 2017 and newer engines, *where* approved. The FA-4 oils are low viscosity to promote fuel economy. Again the NACFE wants to promote this feature. And, if you did turn back to the Issue 84 article, you'll recall that the Engine Manufacturer Association (EMA) asked the lube oil industry to help them meet the fuel econ-omy standards by developing the FA-4 oil. But you *should not*, as the NACFE might suggest, use FA-4 oils in the older engines. Two-plus-two does not equal four.

If you'll remember, I am a member of the Transportation Maintenance Council (TMC), an organization for the big-rig truck fleets, as well as one of the pioneers back in the old days of the Shell fuel economy challenge.

The TMC folks have asked NACFE to rescind the recommendation. As I was witness at the meeting, the word "nim-rod" was often used to describe the NACFE idea.

Now, while I have piqued your interest by calling folks names (political satire unintended), I want to repeat something I wrote in Issue 84 that will explain the fuel economy/viscosity give and take.

"The initial change which will be made to diesel oils to improve fuel economy is to lower the viscosity. When engines are properly lubricated, a hydrodynamic film exists between engine components. Larger engine component clearances (primarily crankshaft bearing clearances) require higher viscosity oils to maintain hydrodynamic lubrication. Racers build engines with extremely tight clearances in order to reap the horsepower benefits of pumping low viscosity oils, but diesel engine builders have just recently started to research reduced bearing clearances. Since most (83%) North American diesel oil is SAE 15W-40, preliminary effort has been focused on reducing oil viscosity to improve fuel economy in these engines."

Later, in Issue 84, the Editor pulled out a 14-year old article by Kevin Cameron that explained the same thing. Quoting from Kevin in Issue 84 (which was really quoting from Issue 28):

“When Detroit and other auto-makers faced ever-tightening fuel consumption standards, they essentially had to tread in Junior Johnson’s footsteps to the same solution. Today, all automakers are using this or a related process to reduce journal asperity height so that lower-viscosity oils can be reliably used.”

Might I suggest a reread of the entire Cameron Issue 84 material?

So, now let’s talk about Chrysler’s TSB 18-078-16 and the “Engine Oil Viscosity Upgrade.”

While the “upgrade” TSB has nothing to do with the upcoming FA-4 category, it does—in no uncertain terms—spell out a change to a higher viscosity.

As you may have concluded by now, the switch from SAE 5W-30 to SAE 5W-40 produces one key effect—higher oil pressure at engine operating temperatures (200°F). EcoDiesel owners, I would make the change to 5W-40 in short order.

John Martin
TDR Writer

TECHNICAL SERVICE BULLETINS FOR 2016

ISSUE 94 – TDRESOURCE

Hello TDR Members:

Well, it is that time of year again, time to dust-off the credit card and go shopping at Chrysler's TechAuthority website to do the TDR's annual summary of technical service bulletins that have been released for our trucks during the past year.

"So, Mister Editor, how was your search for data this year?"

Good and not-so-good.

Good

Let me start my review with the positive.

- Service bulletins and recalls: the data is there and you can search on your VIN to find only the bulletins that are applicable to your truck—even if it is a 1993 truck!
- Service information: Hidden in this "file folder" is an electronic copy of the factory service manual (FSM). If you had the patience, a printer, and 1000+ pages of paper, you could print the entire book for your truck.
- Ditto specifications for the truck. I was *very* surprised to see that the 2014 EcoDiesel specifications call for the 5W40 synthetic engine oil that meets the CJ-4 specification (see page 47 for the discussion). My TechAuthority search was done on 8/15 and the TSB talking about the change (TSB 18-078-16) was dated 7/27/16. Talk about up to date!
- Wiring diagrams: I mentioned the FSM is buried in the "service information" folder. The truck's wiring diagrams are also found in a folder, "wiring diagrams."
- Owner's Manuals: Just as in the above discussion about service information, one could load the printer with paper and print the entire contents. As an aside, the EcoDiesel lube oil was also updated to the CJ-4 specification in the OM section of TechAuthority. Impressive.
- Parts books: Yes, you can pretend you are the counter person at your local dealership, you have complete access to the parts book for your truck.

Not-So-Good

If you've never used the TechAuthority web site, well, even the purchase of a subscription can be awkward. Again, my wife can tell you that I do a very good job of internet purchasing, but the hidden-in-the-corner "Log In" icon and the complicated check out process are sometimes frustrating.

Also, this year as in year's past I was armed with a handful of VINs and I used those vehicle numbers to access the bulletins that were released in 2016. Remind me next year, this is not the efficient way to search for data. The tried-and-true VIN search only uncovered about 14 TSBs. Wow, the truck is solid, not much to be updated or corrected at the dealer/owner level?

I don't know if this is a new feature, but on the front home page is a tab "What's New in Service Bulletins/Recalls." So, your do-it-the-hard-way editor clicked on this tab.

Oops, the Chrysler folks *have* been busy. The printed index was 36 pages in length and about 400+ in number. As I sifted through these I came across 55 that related to our trucks. So much for my thought of "not much to be updated."

Next Year

As you read, the above discussion about the tab "What's New in Service Bulletins/Recalls" changed the way in which I did my search for data. The "What's New" is so much more efficient.

This will prompt a change in the quarter of the year that our annual review takes place. I will move the review to early December rather than the early September date that we've used for the previous 20+ years. So, look for next year's summary to be in Issue 99.

Strange Billing

Again this year the credit card statement came and there was a strange entry: "SOI*SBS KENOSHA 888-371-8300 WI." I pull out Issue 90 and verified that this was the same third party billing as occurred last year. Perhaps next year the strange entry will not surprise me.

HOW TO TACKLE THIS PROJECT

Tackle? It is football season, right?

You know, I've been doing this recap for 23 years and long-time members know the value of TechAuthority, the TSB summaries that we do and your previous TDR magazines that have the updates (just subtract 4: Issue 90, 86, 82, 78, etc.).

As I went about the task of summarizing the TSBs for 2016, I went back to Issue 90 to review the ground that we had previously covered.

Issue 90 was pretty darned good at providing and recapping the basics. Here is the outline that was used in Issue 90:

- Introduction: This year's TSBs
- Meaning of truck codes
- TechAuthority stumbles
- Coverage of 2015 calendar year only
- Why you may wish to reference past TDR magazines
- TechAuthority – Impressive and powerful tool
- TechAuthority gives you access to Service Manuals too
- Annual TSB review
- Recall Notices
- Did you know

If you are new to the TDR, I would encourage you to pull out your Issue 90 (or download it from our website) and pay attention to the topic "Why you may wish to reference past TDR magazines." I spent two pages reviewing the fact that TSB listings *issued during the past year* does not give you a complete picture for a particular truck model year (read older truck).

In order to get the information for an older truck (specifically your truck) you have two clear options, good and better:

Good: Carefully read this issue's summary pages, look at the older TDRs and our web site, and read the TSB summaries.

Better: Purchase a one-day or three-day subscription to TechAuthority and search for TSBs, recalls and service data using your VIN.

For easy reference there is only one of the subjects that needs to be repeated in this magazine, "Meaning of Truck Codes." Here is the updated table:

Throughout our summary pages you'll see model codes listed for the various Ram trucks. The following is a chart of the model code meanings.

Series	'10	'11	'12	'13	'14	'15	'16
1500 Pickup					DS	DS	DS
2500 Pickup	DJ	DJ	DJ	DJ	DJ	DJ	DJ
3500 Pickup	D2	D2	D2	D2	D2	D2	D2
3500 C/C	DC	DD	DD	DD	DD	DD	DD
4500 C/C	DM	DP	DP	DP	DP	DP	DP
5500 C/C	DM	DP	DP	DP	DP	DP	DP

With the reference table reprinted, I will note that Issue 90's topics "Why you may wish to reference past TDR magazines"; "TechAuthority a powerful tool"; and "Did you know" *could* have been repeated. But, I'm going to save the space and ask that you look in Issue 90 for those details.

HERE WE GO – PRESENTING THE 2016 TSBs

In an effort to organize the TSBs for the magazine, we're going to use the same index system categories as those used by Chrysler. 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	25 Emissions Control
	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.

If you need a complete copy of the bulletin, you can contact your dealer with this Issue 94 in hand; or armed with your truck's vehicle identification number (VIN) and a credit card you can log on to www.techauthority.com and, for \$35, you can view/print all of the TSBs that apply specifically to your vehicle. The \$35 buys you three consecutive days of access.

Final note: Scattered throughout the bulletin summaries are some of my comments in bold text. Hey the TDR is supposed to enter-tain, right?

CATEGORY 8

ELECTRICAL...continued

TSB#	MODEL	SUBJECT/DESCRIPTION
08-0444-16 4/20/16	'16 DS/DJ/ D2/DD/DP	<p><i>Radio Frequency Hub Module (RFHM) Enhancement—Flash Update</i></p> <p>This bulletin applies to vehicles built on or before April 6, 2016 and equipped with one of the following sales codes:</p> <ul style="list-style-type: none"> • (GXD) Remote Proximity Keyless Entry. • (GXM) Remote Keyless Entry With All Secure. • (GX4) Keyless Go. <p>Customers may describe the instrument cluster is illuminating by itself after the ignition has been off for an extended period of time (10 minutes or more).</p> <p>The repair procedure involves a flash update to the radio frequency hub module software.</p>
08-046-16 4/22/16	'14-'16 D2/DJ	<p><i>Air Suspension Control Module (ASCM) System Enhancements—Flash Update</i></p> <p>This bulletin applies to vehicles built on or before April 10, 2016 equipped with Cummins Diesel Engine and Auto Level Rear Air Suspension (sales code SEB).</p> <ul style="list-style-type: none"> • A customer may describe the following: • Cluster stays awake after ignition is turned off for 10 minutes or more. <p>False message “Battery Voltage Low – Start Engine to Change Ride Height” which appears in the Electronic Vehicle Information Center (EVIC). This condition may happen when the vehicle is first started and trying to move the suspension from trailer ride height to normal ride height.</p> <p>The repair procedure involves an update to the ASCM software.</p>
08-050-16 4/22/16	'16 DJ/D2/DD/DP	<p><i>Headlamps May Be Out Of Adjustment Or Alignment.</i></p> <p>This bulletin applies to vehicles built on or before March 14, 2016 without Auto Level Rear Air Suspension (sales codes SEB).</p> <p>The customer may describe that the headlamps are out of alignment or oncoming vehicles are flashing their bright lights at them.</p> <p>This bulletin involves adjusting the headlamps to specified alignment.</p>
08-051-16 4/23/16	'15-'16 DS	<p><i>Air Suspension Control Module (ASCM)—Flash Update</i></p> <p>This bulletin applies to vehicles built on or after December 4, 2014 and on or before February 22, 2016 equipped with Air Suspension, 4-Corner (sales code SER).</p> <p>Customers may experience no ride height change with the vehicle in really cold conditions and in addition they may also have a Malfunction Indicator Lamp (MIL) illumination. Upon further investigation the technician may find that several Diagnostic Trouble Codes have been set.</p> <p>In addition, the customer may notice that the vehicle does not change ride heights when selected in cold weather.</p> <p>The repair procedure involves a flash update to the air suspension control module.</p>
08-053-16 REV B 5/19/16	'15 DS/DJ/ D2/DD/DP	<p><i>RA3/RA4 Radio Software Enhancements—Flash Update</i></p> <p>This bulletin applies to vehicles equipped with one of the following radios:</p> <ul style="list-style-type: none"> • UConnect 8.4A (sales code RA3). • UConnect 8.4AN (sales code RA4). <p>The customer may experience one or more of a lengthy list of problems.</p> <p>The repair procedure involves a software update to the radio. This software update is only compatible with the 2015 model year vehicles listed above. Attempting to flash a 2013-2014 model year vehicle with this software will result in a loss of some radio/navigation functions. Should this occur, reinstalling the correct software for the radio will correct the condition.</p>

CATEGORY 8**ELECTRICAL...continued**

TSB#	MODEL	SUBJECT/DESCRIPTION
08-054-16 4/29/16	'13-'14 DS/DD/ DJ/DP/D2	<p><i>RA3 RA4 Radio Enhancements—Flash Update</i></p> <p>This bulletin applies to vehicles equipped with one of the following radios:</p> <ul style="list-style-type: none"> • UConnect 8.4A (sales code RA3) • UConnect 8.4AN (sales code RA4) <p>A customer may experience one or more of a lengthy list of problems.</p> <p>The repair procedure involves inspecting and updating the radio software.</p>
08-057-16 5/3/16	'16 DS/DJ/ DD/DP/D2	<p><i>RA3 RA RA4 Radio Enhancements—Flash Update</i></p> <p>This bulletin applies to vehicles built on or before April 2, 2016 equipped with UConnect 8.4 (sales code RA3) or UConnect 8.4AN (sales code RA4).</p> <p>This bulletin involves inspecting and, if required, updating the radio software.</p>
08-072-16 7/8/16	'15 DS/DJ/D2	<p><i>RG3, RG4, RJ3, RJ4 Radio Enhancements—Flash Update</i></p> <p>This bulletin applies to vehicles built on or before July 21, 2015 and equipped with one of the following radios:</p> <ul style="list-style-type: none"> • UConnect 8.4 (sales code RG3) • UConnect 8.4 AN (sales code RG4) • UConnect 8.4 (sales code RJ3) • UConnect 8.4N (sales code RJ4) <p>Customers may experience one or more of a listing of various problems.</p> <p>The repair procedure involves updating the radio software.</p>

CATEGORY 9**ENGINE**

TSB#	MODEL	SUBJECT/DESCRIPTION
09-006-15 REV A 11/13/15	'14 DS	<p><i>Intermittent Engine Shudder While Driving</i></p> <p>This bulletin applies to vehicles equipped with the 3.0-liter V6 Turbo Diesel engine.</p> <p>Customers may experience a slight engine shudder while driving. They may state that the condition feels and sounds like driving over rumble strips. It may also be perceived as an internal transmission issue or engine misfire. No Diagnostic Trouble Codes (DTCs) will set as a result of this condition.</p> <p>The root cause of the engine shudder has been found to be due to excess carbon build-up on the exhaust valve stems and will typically happen on vehicles driven mostly in light load conditions. As a result, new cylinder heads have been released that are equipped with newly designed valve stem seals. These newly designed seals are designed to help prevent excessive carbon from building up on the valve stems.</p> <p>Although it may be hard to reproduce, engine shudder resulting from these excess carbon deposits, will typically only happen under the following driving conditions:</p> <ul style="list-style-type: none"> • Steady speeds between 50 and 70mph • Engine speed between 1600-2000rpm • Present during engine warm up to operating temperature after a cold soak. • Only present for a few seconds at a time and often during a 6-7 upshift. • Light load acceleration or while driving up a slight grade. • Symptoms will go away either by aggressively applying the accelerator pedal or going into a zero throttle deceleration. <p>The repair involves replacing the engine cylinder heads.</p>

TSB#	MODEL	SUBJECT/DESCRIPTION
18-015-15 2/28/15	'14-'15 DS	<p data-bbox="496 233 1393 260"><i>Malfunction Indicator Lamp (MIL) Illumination And/Or Intermittent No Crank/No Start</i></p> <p data-bbox="496 262 1518 348">This bulletin applies to vehicles equipped with a 3.0-liter diesel engine and engine block heater. Customers may experience a MIL illumination when ambient temperatures fall below 32°F. Upon further inspection, a technician may find the following Diagnostic Trouble Codes (DTCs).</p> <ul data-bbox="561 350 1146 407" style="list-style-type: none"> <li data-bbox="561 350 1073 378">• P0299 – Turbocharger Underboost Condition <li data-bbox="561 380 1146 407">• U1424 – Implausible Engine Torque Signal Received <p data-bbox="496 422 1518 508">In addition, a customer vehicle may come in with a no crank/no start. This may have occurred after the vehicle has been driven for an extended period of time in extremely low ambient and then allowed to sit overnight. Further diagnosis may indicate a possible inoperative starter.</p> <p data-bbox="496 522 1518 661">A possible cause of these concerns may be attributed to internal icing of the Charge Air Cooler (CAC) system and intake manifold. Icing will occur because warm, moist air from the turbocharger is being rapidly cooled and the moisture is then condensed into liquid by the CAC. The liquid is then distributed into the rest of the intake system, which is operating at ambient temperature, where it will then freeze.</p> <p data-bbox="496 676 1518 821">Vehicles that are driven for extended periods of time are susceptible to higher amounts of ice buildup within the intake manifold. Once the vehicle is turned off and allowed to sit, the ice formation in the intake will begin to melt due to the elevated underhood temperatures. The moisture will then run down the intake runners and accumulate in the combustion chamber through an open intake valve, causing the engine to hydro-lock.</p> <p data-bbox="496 835 1518 947">To help prevent icing in the CAC system when the vehicle is operated in low ambient temperatures, it is highly recommended that the vehicle have winter front cover installed. This raises the CAC outlet temperatures above freezing which will help reduce condensation build up.</p> <p data-bbox="496 961 1518 1016">This bulletin involves inspecting the Charge Air Cooler (CAC) system for excessive water and/or ice and drying the CAC components if needed. It also involves installing a winter front cover.</p>
18-064-15 9/24/15	'14 DS	<p data-bbox="496 1066 1146 1094"><i>P20EE SCR NOX Catalyst Efficiency Below Threshold Bank 1</i></p> <p data-bbox="496 1096 1243 1123">This bulletin applies to vehicle equipped with a 3.0-liter Diesel Engine.</p> <p data-bbox="496 1138 1518 1224">Customers may experience a Malfunction Indicator Lamp (MIL) illumination. Upon further investigation, the technician may find Diagnostic Trouble Code (DTC) P20EE SCR NOX Catalyst Efficiency Below Threshold Bank 1 set in the Powertrain Control Module (PCM) memory.</p> <p data-bbox="496 1239 1518 1293">The proper repair procedure involves replacing the Selective Catalyst Reduction (SCR) Catalyst assembly.</p> <p data-bbox="496 1308 1518 1394"><i>Editor's note: A new category, "Vehicle Performance," and a new series of pages. I counted the bulletins and there are 15, of which 9 are flash updates to the powertrain or engine control module. Geez.</i></p>

TSB# MODEL

18-017-16 '14 DS
2/17/16

SUBJECT/DESCRIPTION

3.0-Liter Powertrain Diagnostic And System Enhancements—Flash Update
This bulletin applies to vehicles equipped with a 3.0-liter Diesel Engine.

Customers may experience an intermittent engine shudder, bucking under hard acceleration, or vibration. In addition other customers may experience a Malfunction Indicator Lamp (MIL) illumination upon which the technician may find one or more of the following DTCs have been set:

P1296	P249C	P20C2	P24A4	P24D1	P1288	P1289
P2463	U0422	U3017	P26AB	P24AF	P2196	P1E0C
P2237	P1297	P0420	P204F	P20E9	P2002	P2299
P241D	P016A	P2459	P0133	P2084	P0171	P0426
P0045	P0087	P009A	P0128	P0234	P05F8	P050E
P200A	P200B	P202E	P2080	P20BA	P20BE	P225C
P225D	P2453	P24C2	P24F2	P2564	P2565	U029D
U029E						

Upon further investigation a technician may find the following Diagnostic Trouble Code (DTC) set in the TCM memory:

U1424-00

The following enhancements are also included in this software update:

- Enhancements to improve A/C compressor relay duty cycle operation to prevent ignition off battery draw.
- Powertrain system improvements to enable EGR cleaning routine.
- DTC P0171-00 System Too Lean (Bank 1) has now changed to P026C-00 Fuel Injection Quantity Lower Than Expected.
- DTC P0172-00 System Too Rich (Bank 1) has now changed to P026D-00 fuel Injection Quantity Higher Than Expected.

This bulletin involves reprogramming the Powertrain Control Module (PCM) with the latest available software. It also involves replacement of the Oxygen (O2) Sensor and cleaning or replacement of the Exhaust Gas Temperature (EGT) Sensor if necessary depending on Diagnostic Trouble Codes (DTCs) that may have set.

18-018-16 '15 DS
2/17/16

3.0-Liter Powertrain Diagnostic and System Enhancements—Flash Update
This bulletin applies to vehicles equipped with a 3.0-liter Diesel Engine.

Customers may experience bucking under hard acceleration. In addition, other customers may experience a Malfunction Indicator Lamp (MIL) illumination. Upon further investigation a technician may find one or more of the following Diagnostic Trouble Codes (DTCs) set in the PCM memory.

P1296	P249C	P20C2	P24A4	P24D1	P1288	P1289
P2463	U0422	U3017	P2196	P1E0C	P2237	P1297
P0420	P24AF	P26AB	P204F	P20E9	P2002	P2299
P208B	P016A					

Upon further investigation a technician may find the following Diagnostic Trouble Code (DTC) set in the TCM memory:

U1424-00

The following enhancements are also included in this software update:

- Enhancements to improve A/C compressor relay duty cycle operation to prevent ignition off battery draw.
- Powertrain system improvements to enable EGR cleaning routine.
- DTC P0171-00 System Too Lean (Bank 1) has now changed to P026C-00 Fuel Injection Quantity Lower Than Expected.
- DTC P0172-00 System Too Rich (Bank 1) has now changed to P026D-00 fuel Injection Quantity Higher Than Expected.

This bulletin involves reprogramming the Powertrain Control Module (PCM) with the latest available software.

TSB# **MODEL**
 18-022-16 '13 DD/DP
 3/4/16

SUBJECT/DESCRIPTION

6.7-Liter Diagnostic And System Improvements—Flash Update

This bulletin applies to vehicles equipped with a 6.7-liter Cummins engine. Several software improvements are available for the engine. These improvements are separated into categories

These DTCs have been changed from a one trip fault to a two trip fault:

- P0201-P0206 – Fuel Injector X Circuit/Open
- P049D – EGR Control Position Exceeded Learning Limit

This DTC has been changed from a two trip fault to a one trip fault:

- U12A4 – Lost Communication With Ammonia Sensor

Improvements to prevent or reduce unnecessary Malfunction Indicator Lamp (MIL) illumination for:

P1C55	P205E	U110E	P20E8	P2281	U3017	U1421
P0128	P0087	P0544	P2002	P061A	P0234	P026A
P0299	P0544	P0562	P20EE	P2201	P24A5	P2459
P249E						

Other updates:

- SCR Efficiency scan tool test improvement.
- Various Urea system calibration changes, cold weather system improvements and dosing heater thaw times.
- Various additional wiTECH data and system test additions or improvements.
- Cruise control system improvements.
- System enhancements to starter lockout feature.
- Fuel Filter Minder system calibration enhancements.
- Exhaust brake switch operation improvements.
- Charging system improvements for dual alternator applications.
- Erroneous “Service Exhaust System – see dealer” message setting with the ignition in the “Run” position, engine not running.
- Remove MIL for DTC; P1C70 – SCR Error Detected – Engine Disabled.
- Wait To Start (WTS) bulb check timing improvements (1 second).
- Set PTO maximum speed to 2,000rpm.
- Allow Mobile PTO operation in neutral.
- Frozen CAC Diagnostic Improvement.
- WiTECH – Reset fix (PTO request on Pickup).
- WiTECH – Road Governor Speed Upper Limit adjustment
- SCR Performance Test Fix.

There will be a choice between two calibrations. One for a 3-sensor configuration that utilizes an ammonia sensor and one for 2-sensor configuration for vehicles that have had the ammonia sensor removed. Be sure to select the correct software based on the configuration.

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

TSB#**MODEL****SUBJECT/DESCRIPTION**

18-027-16

'16 DJ/D2

REV C

6/2/16

6.7-Liter Diagnostic And System Improvements—Flash Update

This bulletin applies to vehicles built on or before April 7, 2016 equipped with a 6.7-liter Cummins Diesel engine.

The following Diagnostic Trouble Codes (DTCs) have been changed from a one trip fault to a two trip fault:

- P0421 – Catalyst 1 Efficiency Below Threshold Bank 1
- P2280 – Air Flow Restriction/Leak Between Air Cleaner and MAF
- P203C – (Diesel Exhaust Fluid) Reductant Level Sensor Circuit Low
- P208D – (Diesel Exhaust Fluid) Reductant pump Control Circuit High

Customers may experience a Malfunction Indicator Lamp (MIL) illumination. Upon further investigation a technician may find the following DTCs set in the PCM memory.

- P0128 – Thermostat Rationality Improvements
- P2281 – Air Leak Between MAF and Throttle Body
- P218F – Reductant No Flow Detected
- P0218 – Transmission High Temperature Operation Activated (68RFE Only)
- P0868 – Line Pressure Low, MIL Action (68RFE Only)
- U110E – Lost Ambient Temperature Message
- P205E – (Diesel Exhaust Fluid) Reductant Tank Temperature Sensor Circuit Intermittent

In addition to addressing the above DTCs, the following powertrain system improvements/enhancements are also included in this software release:

- Engine Noise Improvements.
- Engine Hesitation Improvement.
- Improved Engine Fuel Economy.
- Reduction in engine noise during regeneration at idle.
- 68RFE Transmission Overall Shift Quality Improvements.
- Test results fix for partial range misfire (68RFE Only).
- Ambient Air Temperature Improvements.
- Stationary Desoot with wiTECH Fix.
- OBD Misfire Monitoring Improvement (68RFE Only).

This bulletin involves reprogramming the Engine Control Module/Powertrain Control Module (ECM/PCM) with the latest available software.

TSB#	MODEL	SUBJECT/DESCRIPTION														
18-028-16 3/19/16	'14 DD/DP	<p><i>6.7-Liter Diagnostic And System Improvements—Flash Update</i></p> <p>This bulletin applies to vehicles built equipped with a 6.7-liter Cummins Diesel engine.</p> <p>Several software improvements are available for vehicles equipped with a Cummins Turbo Diesel. Improvements to prevent or reduce Malfunction Indicator Lamp (MIL) illumination when no defect is present for:</p> <table border="0"> <tr> <td>P1C55</td> <td>P205E</td> <td>P20E8</td> <td>U110E</td> <td>U3017</td> <td>P0087</td> <td>P0544</td> </tr> <tr> <td>P2281</td> <td>P0128</td> <td>U1421</td> <td>P202E</td> <td>P20EE</td> <td>P2002</td> <td>P0604</td> </tr> </table> <p>These faults have been changed from a one trip fault to a two trip fault: P0201-P0206 P049D</p> <p>Other updates:</p> <ul style="list-style-type: none"> • Selective Catalytic Reduction (SCR) efficiency scan tool test improvement. • Urea system calibration changes. • Fuel filter minder calibration changes. • Cruise control system improvements. • Improvements in exhaust brake switch operation. • Charging system improvements for dual alternator applications. • Various wiTECH data and system test additions and improvements. • OBD template changed for P2453. • Dual fuel tank component update. • Inducement timer reset (Feature enable in wiTECH). • PTO denied status message update. • PTO horn request sent to Body Control Unit (BCU). • Wait To Start (WTS) bulb check timing improvements (1 second). • Frozen Charge Air Cooler (CAC) diagnostic improvement. <p>There will be a choice between 2 calibrations. One for vehicles that utilize an ammonia sensor and one for vehicles that have had the ammonia sensor removed. Be sure to select the correct software based on vehicle configuration.</p> <p>This bulletin involves selectively erasing and reprogramming the Engine Control Module (ECM) with new software.</p>	P1C55	P205E	P20E8	U110E	U3017	P0087	P0544	P2281	P0128	U1421	P202E	P20EE	P2002	P0604
P1C55	P205E	P20E8	U110E	U3017	P0087	P0544										
P2281	P0128	U1421	P202E	P20EE	P2002	P0604										

18-036-16 4/1/16	'15 DD/DP	<p><i>6.7-Liter Diagnostic And System Improvements—Flash Update</i></p> <p>This bulletin applies to vehicles built equipped with a 6.7-liter Cummins diesel engine. Several software improvements are available for vehicles equipped with a Cummins Turbo Diesel.</p> <p>Improvements to prevent or reduce Malfunction Indicator Lamp (MIL) illumination when no defect is present for the following Diagnostic Trouble Codes (DTCs):</p> <table border="0"> <tr> <td>P1C55</td> <td>P218F</td> <td>P242F</td> <td>U110E</td> <td>P205E</td> <td>P20E8</td> <td>U3017</td> </tr> <tr> <td>U1421</td> <td>P2281</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table> <p>Other software improvements:</p> <ul style="list-style-type: none"> • Ambient Air Temperature improvements. • Operational Improvement for Dual Alternators. • SCR Efficiency scan tool test improvement. • Fuel Filter Minder calibration changes. • WITECH Fuel Pressure Override and Fuel System Run Up test improvements. • EGR system improvement to help prevent freeze up. • Diesel Exhaust Fluid (DEF) system enhancement during stationary regeneration. <p>This bulletin involves reprogramming the Engine Control Module (ECM) with the latest available software.</p>	P1C55	P218F	P242F	U110E	P205E	P20E8	U3017	U1421	P2281					
P1C55	P218F	P242F	U110E	P205E	P20E8	U3017										
U1421	P2281															

TSB#	MODEL	SUBJECT/DESCRIPTION
18-037-16 REV A 4/23/16	'15 DJ/D2	<p><i>6.7-Liter Diagnostic And System Improvements—Flash Update</i> This bulletin applies to vehicles equipped with a 6.7-liter Cummins Diesel engine.</p> <p>Customers may experience a Malfunction Indicator Lamp (MIL) illumination. Upon further investigation a technician may find one or more of the following Diagnostic Trouble Codes (DTCs) set in the PCM memory:</p> <p style="text-align: center;">P218F P242F P205E U110E P20E8 P2281 P1477 U1421 P026B</p> <p>In addition to addressing the above DTCs, the following powertrain system improvements/enhancements are also included in this software release:</p> <ul style="list-style-type: none"> • NOx sensor calibration improvements (sales code DG7). • Enhanced software for a No crank/No start issue – U0100 (sales code DG7). • Ambient Air Temperature (AAT) improvements. • 68RFE Transmission overall shift quality improvements. • SCR Efficiency scan tool test improvement. • Charging system improvements for single alternator applications (changes the cutout threshold from 600 to 500rpm). • Diesel Exhaust Fluid (DEF) system calibration improvement during Stationary Regeneration. • Cold idle speed stability improvement. • Charging system improvements for dual alternator applications. • Torque increase to 865 ft-lbs (D2 vehicles with the Aisin transmission sales code DF2 only). • Fuel Filter Minder calibration changes. • WiTECH Fuel Pressure Override and Fuel System Run Up test improvements. <p>This bulletin involves reprogramming the Engine Control Module/Powertrain Control Module (ECM/PCM) with the latest available software.</p>
18-038-16 4/1/16	'13-'15 DD/DP	<p><i>P20EE SCR NOX Catalyst Efficiency Below Threshold Bank 1</i> This bulletin applies to vehicles equipped with a 6.7-liter diesel engine.</p> <p>Customers may experience a Malfunction Indicator Lamp (MIL) illumination. Upon further investigation the technician may find Diagnostic Trouble Code (DTC) P20EE SCR NOX Catalyst Efficiency Below Threshold Bank 1 set in the Powertrain Control Module (PCM) memory.</p> <p>This bulletin involve verifying the proper operation of the Diesel Exhaust Fluid (DEF) system and, if necessary, replacing the Selective Catalyst Reduction (SCR) Catalyst assembly.</p>
18-039-16 4/2/16	'16 DD/DP	<p><i>6.7-Liter Diagnostic And System Improvements—Flash Update</i> This bulletin applies to vehicles built on or before January 1, 2016.</p> <p>These DTCs have been changed from a one trip fault to a two trip fault: P2280 – Air Flow Restriction/Leak Between Air Cleaner and MAF P203C – (Diesel Exhaust Fluid) Reductant Level Sensor Circuit Low P208D – (Diesel Exhaust Fluid) Reductant Pump Control Circuit High</p> <p>Customers may experience a Malfunction Indicator Lamp (MIL) illumination. Upon further investigation a technician may find the following Diagnostic Trouble Codes (DTCs) set in the PCM memory:</p> <p style="text-align: center;">P1C55 P207F P218F U110E</p> <p>In addition to addressing the above DTCs, the following powertrain system improvements/enhancements are also included in this software release.</p> <ul style="list-style-type: none"> • Ambient Air Temperature Improvements. • Stationary de-soot with wiTECH fix. <p>This bulletin involves reprogramming the Engine Control Module/Powertrain Control Module (ECM/PCM) with the latest available software.</p>

TSB#

MODEL

SUBJECT/DESCRIPTION

18-054-16 '14 DJ/D2
5/7/16

6.7-Liter Diagnostic and System Improvements—Flash Update

This bulletin applies to vehicles equipped with a 6.7-liter Cummins Engine.

Customers may experience a Malfunction Indicator Lamp (MIL) illumination. Upon further investigation a technician may find one or more of the following Diagnostic Trouble Codes (DTCs) set in the PCM memory:

P218F	P242F	P2281	P205E	U110E	P20E8	P1477
U3017	P0087	P0544	P0128	P214D	P24A5	P040B
U1421	P0420	P026B	P04DB	P1C55	P202E	P20EE
P2002	P0604	P1451				

In addition to the above symptoms, the following software improvements are also included in this update.

The following DTCs have been changed from a one trip fault to a two trip fault:

- P0201-P0206 – Fuel Injector X Circuit Open Fault Codes
- P049D – EGR Control Position Exceeding Learning Limit.
- P226C – Turbocharger Boost Control “A” Slow Response.

The following DTC has been changed from a two trip fault to one trip fault:

- U1A24 – Lost Communication With Ammonia Sensor

Other software enhancements included:

- NOx sensor calibration improvements.
- Cap Urea Dosing at Low Temps.
- Ambient Air Temperature (AAT) improvements.
- SCR efficiency scan tool test improvement.
- 68RFE transmission shift quality improvements for low speed first to neutral and neutral to first (garage shifts).
- Charging system improvements for single alternator applications (changes the cutout threshold from 600 to 500rpm).
- Diesel Exhaust Fluid (DEF) system calibration improvement during stationary regeneration.
- Cold idle speed stability improvement.
- Fuel Filter Minder calibration improvement to save current mileage count during module reflash.
- Diagnostic improvement for DTC P20E8 – (Diesel Exhaust Fluid) Reductant Pressure Too Low. Increases pump prime attempts to eliminate false failures.
- Cruise control system improvements.
- Improvements in exhaust brake switch operation.
- Charging system improvements for dual alternator applications.
- Cold Idle Stability improvements.
- Charge Air Cooler (CAC) leak detection software improvements.
- Various wiTECH data and system test additions or improvements.
- 68RFE transmission shift quality improvements.
- Dosing thaw calibration improvement.
- IM OBD II readiness – DTC P2002 improvements help Particulate Matter (PM) filter monitor group to be set to ready more often.
- Grid heater inhibit operation correction.
- Add engine run time to fuel filter minder.
- Dual alternator wiTECH improvements.
- Inducement timer reset procedure improvement.
- DEF refill detection calibration improvement.

If a customer describes the symptom/condition or if the technician finds any of the DTCs listed, perform the Repair Procedure: reprogramming the ECM/PCM with the latest software update.

TSB#

MODEL

SUBJECT/DESCRIPTION

18-078-16
REV A
7/27/16

'16

Engine Oil Viscosity Upgrade And Flash Enhancements

This bulletin applies to vehicles built on or before June 30, 2016 and equipped with a 3.0-liter diesel engine.

The following powertrain system improvements/enhancements are also included in this software release:

- Fan calibration.
- Transmission calibration.
- Revised oil change algorithm.

This bulletin involves reprogramming the Powertrain Control Module (PCM) and the Transmission Control Module (TCM). For vehicles in dealer inventory it also involves changing the engine oil with new 5W40 engine oil and applying a sticker to the engine oil filler cap. An addendum card will need to be added in the owner's manual.

18-091-16
7/26/16

'13 DJ/D2

Powertrain Diagnostic And System Improvements—Flash Update

This bulletin applies to vehicles equipped with a 6.7-liter Cummins Turbo Diesel engine.

Customers may experience a Malfunction Indicator Lamp (MIL) illumination. Upon further investigation the technician may find that the following Diagnostic Trouble Codes (DTCs) have been set. Several software improvements are available for the following conditions.

The following DTC has been changed from a two trip fault to a one trip fault:

U1A24 – Lost Communication With Ammonia Sensor

Prevent or reduce MIL illumination when no defect is present for the following DTCs. These faults have been changed from a one trip fault to a two trip fault:

P0201	P0202	P0203	P0204	P0205	P0206	P049D
P0711	P0712	P0713	P0714	P0740	P0869	P0933
P0934	P0935	P1775	P1776	U0100	U0002	

Improvements to prevent or reduce MIL illumination when no defect is present for:

P2281	P218F	P242F	P20E8	P202E	P209F	P218F
P205E	U110E	P2281	U3017	P1477	P20EE	P026B
P0128	P0087	U1421	P026A	P04DB	P0544	P0562
P0604	P1451	P2201	P24A5	P2459	P249E	

Other updates also include:

- Ambient Air Temperature (AAT) improvements.
- NOx sensor calibration improvements.
- Cap urea dosing at low temps.
- SCR efficiency scan tool test improvement.
- Transmission updates.
- Alternator Dropout Threshold Set to 500rpm.
- Warm Up Combustion Stability Improvement.
- Urea Dosing during Stationary Regen.
- Various Urea system calibration changes and cold weather system improvements and dosing heater thaw times.
- Various additional wiTECH data and system test additions or improvements.
- 68RFE Transmission shift quality improvements.
- Cruise control system improvements.
- System enhancements to starter lockout feature.
- Erroneous "Service Exhaust System – see dealer" message setting with the ignition in the "Run" position, engine not running.
- IM OBD II readiness – DTC P2002 improvements help Particulate Matter (PM) filter monitor group to be set to ready more often.

TSB

18-091-16

continued

- Add engine run time to fuel filter minder.
- Remove MIL for DTC; P1C70 – SCR Error Detected – Engine Disabled.
- Frozen CAC Diagnostic Improvement.
- WiTECH – Reset fix (PTO request on Pickup).
- WiTECH – Road governor speed upper limit adjustment.
- SCR Performance test fix.
- DEF refill detection calibration change.
- Grid heater inhibit operation correction.
- P0544 – Exhaust Gas Temperature Sensor Circuit – Bank 1 Sensor 1 – Does not clear correctly.
- Fuel filter minder distance trigger correction.
- Fuel system test improvements.
- Exhaust brake switch improvement.
- Cold idle stability improvement.
- Add ability to reset soot load after DPF replacement.
- Correct condition – Cruise control does not cancel at key off.

This bulletin involves reprogramming the Powertrain Control Module (PCM) with the latest available software.

CATEGORY 19**STEERING****TSB#****MODEL****SUBJECT/DESCRIPTION**19-001-16
8/16/16

'16 DS

Electric Power Steering Gear With Low Assist

This bulletin applies to vehicles built between March 22, 2016 and April 9, 2016.

The customer may notice a low assist or excessive steering effort at lower speeds or parking lot maneuvers.

This bulletin involves replacing the electric power steering gear assembly.

CATEGORY 21**TRANSMISSION AND TRANSFER CASE****TSB#****MODEL****SUBJECT/DESCRIPTION**21-004-16
1/8/16

'16 DD/DP/D2

Transmission Shift And Drivability Enhancements—Flash Update

This bulletin applies to vehicles built on or before December 23, 2015 equipped with a 6.7-liter diesel engine and a 6-speed Aisin automatic transmission.

Some customers may experience one or more of the following conditions.

A harsh 1-2 upshift.

Excessive gear shifting.

This bulletin involves reprogramming the Transmission Control Module (TCM) with the latest available software.

TSB#	MODEL	SUBJECT/DESCRIPTION
21-017-16 REV A 7/30/16	'16 DS	<p data-bbox="495 233 1179 260"><i>Transmission Shift And Drivability Enhancements—Flash Update</i></p> <p data-bbox="495 262 1515 317">This bulletin applies to vehicles built on or before June 24, 2016 equipped with a 3.0-liter Turbo Diesel engine and an 8-speed automatic transmission.</p> <p data-bbox="495 333 1515 417">Customers may experience a Malfunction Indicator Lamp (MIL) illumination. Upon further investigation, a technician may find the following Diagnostic Trouble Code (DTC) stored in the TCM memory:</p> <p data-bbox="540 434 878 459">P0731 – Gear Ratio Error in 1st.</p> <p data-bbox="495 476 1192 501">The following enhancements are included in the software update:</p> <ul data-bbox="561 506 1503 903" style="list-style-type: none"> • 2-1 coast down improvement • 3-2 coast down improvement. • Improvement to 5-3 downshift with pedal to improve 5-3-2 shift. • 6-5 coast down improvement. • 2-3 upshift with less than a 30% pedal improvement. • Clutch C adaption stability improvement (improves shift quality for new transmissions on gear shifts that use Clutch C) • Garage shift to D improvements. • Rolling garage shift improvements. • Implementation of End Of Line (EOL) adaption to improve shift quality on brand new transmission. • Improved 7th gear upshift timing. • Downhill engine braking improvements. <p data-bbox="495 919 1515 972">This bulletin involves reprogramming the Transmission Control Module (TCM with the latest available software.</p>
21-025-16 7/6/16	'13-'16 D2	<p data-bbox="495 1026 1292 1054"><i>Transmission Torque Converter Replacement After Drone Noise Verification</i></p> <p data-bbox="495 1056 1515 1110">This bulletin applies to vehicles built on or before April 13, 2016 equipped with a Cummins Turbo Diesel Engine and Aisin AS69RC HD transmission.</p> <p data-bbox="495 1127 1515 1239">The customer may describe a “heavy droning noise” coming from the vehicle at an engine speed range of 1,800rpm to 2,000rpm with mid to deep throttle applied. If the customer describes the symptom/condition listed above, test drive the vehicle and verify the noise. If the drone noise is verified, normal torque converter replacement should be performed.</p>
21-027-16 7/30/16	'16 D2/DD/DP	<p data-bbox="495 1293 1281 1320"><i>Transmission Torque Converter Replacement Due to Dislodged Snap Ring</i></p> <p data-bbox="495 1323 1515 1377">This bulletin applies to vehicles built between March 29, 2016 and April 11, 2016 equipped with a Cummins Turbo Diesel Engine and Aisin AS69AR HD transmission.</p> <p data-bbox="495 1394 1515 1478">Customers may experience a Malfunction Indicator Lamp (MIL) illumination. Upon further investigation the technician may find the following Diagnostic Trouble Code (DTC) set in the Transmission Control Module (TCM) memory:</p> <p data-bbox="540 1495 1276 1520">P2757 – TCC Pressure Control Solenoid Control Circuit Performance</p> <p data-bbox="495 1537 1515 1587">This bulletin involves replacing the torque converter after verifying that an internal snap ring has dislodged.</p>

CATEGORY 23		BODY
TSB#	MODEL	SUBJECT/DESCRIPTION
23-001-16 REV E 5/26/16	'15-'16 D2/DD/ DP/DS/DJ	<i>Center Console Lid Binding</i> This bulletin applies to vehicles built between early-April 2015 and early-October 2015 equipped with a Floor Console. This bulletin involves adding a rubber bumper to the console lid to prevent the lid from binding.
23-004-16 REV A 2/11/16	'15-'16 DS	<i>Tailgate Contacting Pickup Box Panel When Closing</i> This bulletin applies to vehicles built between February 14, 2015 and October 28, 2015. The customer may describe the tailgate making contact with the passenger side outer box panel. This bulletin involves adjusting the passenger side out box flange.
23-006-16 REV A 2/17/16	'16 DS	<i>Right Front Door Outer Belt Molding Too High</i> This bulletin applies to vehicles built between January 14, 2016 and January 20, 2016. The customer may describe that the outer belt molding is sitting too high on the door. This bulletin involves inspecting and if necessary, repairing the right front outer belt molding height.
23-007-16 2/17/16	'16 DS	<i>Water Entering Passenger Side Floor Area</i> This bulletin applies to DS vehicles built on or after December 13, 2015 and January 15, 2016. The customer may experience wet carpet in the right front footwell. This condition may be due to an insufficient adhesive bead between the aperture and cowl side. This bulletin involves applying sealant between the aperture and cowl to repair a water leak.
23-011-16 3/5/16	'16 DS/D2/DJ	<i>Sunroof Water Leak</i> This bulletin applies to vehicles built on or before December 8, 2015 equipped with Power Sunroof. An insufficient urethane bead around the metal bracket results in water leaking into the vehicle at one or both of the front corners of the sunroof. The repair procedure involves replacing the sunroof glass to repair a water leak from the sunroof.
23-033-15 8/22/15	'14-'15 DJ	<i>Rattle/Clunking/Popping Noise While Driving Vehicle On Uneven Roads</i> This bulletin applies to vehicles built on or before April 18, 2015. The customer may describe a rattle/clunking noise or popping that can be heard and felt in the floor under the front passenger or driver side when the vehicle is driven on uneven roads, especially from a higher level to a lower level. Noise may be more audible at cold temperature. This bulletin involves replacing the frame to body cushion isolators located under the right and left cab A-pillars.
23-037-15 19/14/15	All	<i>Windshield Wiper Blade/Element Maintenance</i> This is an "information-only" bulletin. Windshield wiper blades/elements are frequently replaced unnecessarily. Because of the environmental conditions vehicles can be operated in, a film can build up on both the windshield and the windshield wiper elements that will cause poor cleaning/streaking of the windshield, and in some instances, a chattering condition as the wiper blades travel across the windshield. Replacement of the wiper blades/elements is normally not required to correct the streaking issue. A simple normal maintenance cleaning of the wiper blades/elements and windshield is all that is required. Editor's Note: There it is, the 2016 version of windshield wiper blade cleaning, TSB 23-037-15. Got it.

TSB#	MODEL	SUBJECT/DESCRIPTION
25-001-16 6/7/16	'13-'16 DD/ DJ/D2/DP	<p data-bbox="496 233 1117 260"><i>Diagnosing A Urea Module That Is Exposed To Diesel Fuel</i></p> <p data-bbox="496 262 1463 319">This is an "information only" bulletin that discusses what will happen to the rubber material used in the urea pump when it is mistakenly exposed to diesel fuel.</p> <p data-bbox="496 333 1503 443">This unit is sometimes referred to as the Selective Catalyst Reductant (SCR) module or the Adblue Delivery Module (ADM). Units exposed to hydrocarbons have a particular failure mode, the rubber unit is crinkled and in some cases the metal heater protrudes through the rubber membrane.</p> <p data-bbox="496 459 1490 546">The rubber material used in this unit is designed to withstand Diesel Exhaust Fluid (DEF) only. Exposure to fluids that contain hydrocarbons (i.e. diesel fuel) will damage the unit beyond repair. Units returned that exhibit this failure mode will have warranty claims that are rejected.</p> <p data-bbox="496 560 1484 646">Units that exhibit this failure mode should be considered customer abuse and should not be covered under warranty. Use the Hydrosopic test paper (P/N 223-44-863) available through MoparEssentialTools.com to confirm exposure.</p>
25-003-14 9/6/14	'13-'15 DJ/ D2/DD/DP	<p data-bbox="496 695 1117 722"><i>Information: P207F P1C70 And SCR Inducement Strategy</i></p> <p data-bbox="496 724 1479 810">A vehicle may come in with a Malfunction Indicator Lamp (MIL) illuminated. Upon inspection the technician may find the following Diagnostic Trouble Codes (DTCs) set in the Powertrain Control Module (PCM).</p> <ul style="list-style-type: none"> <li data-bbox="545 814 976 842">P207F – Reductant Quality Performance <li data-bbox="545 844 1052 871">P1C70 – SCR Error Detected – Engine Disabled <p data-bbox="496 886 1484 1085">These codes are set when the system detects inadequate DEF quality due to diluted, degraded, or contaminated fluid. As a result, the system will enter what is commonly called "Inducement Strategy." This is indicated by a message "5 MPH Max Speed in XXX Miles, Service DEF System, See Dealer" which will incrementally count down. Once the mileage countdown has expired, the EVIC will display "5 MPH Max Speed on Restart, Long Idle, or Refuel, Service DEF, See Dealer" followed by "5 MPH Max Speed, Service DEF System, See Dealer."</p> <p data-bbox="496 1100 1495 1270">In order to repair the vehicle, normal diagnostics should be performed for the DTC P207F and the root cause of the inadequate DEF quality corrected per published service information. However, once repaired and the codes have been cleared, the technician may find that DTC P1C70 will remain set and the EVIC message still displayed. To properly clear out the inducement message and reset the system the PCM should be flashed, using wiTECH, with the current most up to date calibration.</p>

RECALLS ISSUED LATE 2015/TO-DATE 2016

SAFETY RECALL R36/NHTSA 15V-459 STEERING WHEEL WIRING

Date: September 2015

Models/Production:

'12-'14 DS 1500
'12-'14 DJ 2500
'12-'14 D2 3500
'12-'14 DD 3500 Cab Chassis
'12-'14 DP 4500/5500 Cab Chassis

This recall applies only to the above vehicles equipped with an Electronic Vehicle Information Center (EVIC) (sales code LAZ) built through October 7, 2014.

Subject: The steering wheel wire harness on about 1,060,000 of the above vehicles may become chaffed by the driver airbag module retainer spring ends. A chaffed steering wheel wire harness could cause an electrical short and/or an inadvertent driver airbag deployment. Inadvertent driver airbag deployment, during certain driving conditions, may increase the risk of a crash and/or vehicle occupant injury.

Repair: The steering wheel wire harness will be inspected, and if needed, repaired. The steering wheel wire harness will be rerouted and secured to prevent wire chaffing and protective caps will be installed onto the airbag retainer spring ends.

SAFETY RECALL R40/NHTSA 15V-461 RADIO SECURITY VULNERABILITY

Date: September 2015

Models/Production:

'13-'15 DS 1500
'13-'15 DJ 2500
'13-'15 D2 3500
'13-'15 DD 3500 Cab Chassis
'13-'15 DP 4500/5500 Cab Chassis

This recall applies to the above vehicles equipped with a Uconnect 8.4" screen radio built through July 23, 2015.

Subject: The radios on about 1,410,000 of the above vehicles have certain software security vulnerabilities which could allow unauthorized third-party access to some networked vehicle control systems. Exploitation of the software security vulnerabilities could lead to exposing the driver, the vehicle occupants or any other individual or vehicle with proximity to the affected vehicle to a potential risk of injury.

Repair: The radio software must be updated to remove the security vulnerability condition.

SAFETY RECALL R23/NHTSA 15V-460 REPROGRAM OCCUPANT RESTRAINT CONTROL MODULE

Date: August 2015

Models/Production:

'13-'15 DS 1500

This recall applies to the above vehicles built at the Warren Assembly Plant through January 26, 2015.

'13-'15 DS 1500
'13-'15 DJ 2500
'13-'15 D2 3500

This recall applies to the above vehicles built at the Saltillo Assembly Plant through December 8, 2014.

Subject: Occupant Restraint Control (ORC) module software on about 667,000 of the above vehicles may contain side impact calibrations that are overly sensitive. Inadvertent Side Airbag Inflatable Curtain (SABIC). Seat airbag, and/or seatbelt pretensioner deployment during certain driving conditions may increase the risk of a crash and/or vehicle occupant injury.

Repair: The ORC module must be reprogrammed with new software.

SAFETY RECALL R47/NHTSA 15V-534 SIDE AIRBAG INFLATABLE CURTAIN

Date: September 2015

Models/Production:

'14-'15 DS 1500 Quad Cab

This recall applies only to the above vehicles built through August 8, 2015.

Subject: The right and left Side Airbag Inflatable Curtains (SABIC) on about 188,000 of the above vehicles may not deploy as intended. An improperly deployed SABIC, during certain crash events, could allow additional injuries to rear seat occupants.

Repair: A foil patch will be installed on each side of the headliner and the right and left Side Airbag Inflatable Curtains will be inspected for proper orientation. In a small number of cases, one or both of the Side Airbag Inflatable Curtains may need to be replaced.

**SAFETY RECALL R43/NHTSA 15V-517
BATTERY WIRE HARNESS**

Date: October 2015

Models/Production:
'14 DS 1500 Series

This recall applies only to the above vehicles equipped with a 3.0-liter diesel engine and 4x2 drivetrain built at the Warren Assembly Plant from August 8, 2013 through June 13, 2014.

'13-'15 DS 1500 Series

This recall applies only to the above vehicles equipped with a 3.0-liter diesel engine and 4x2 drivetrain built at the Saltillo Assembly Plant.

Subject: The battery (B+) wire harness on about 1,650 of the above vehicles may have been routed against the right engine mount frame bracket. Continuous battery wire harness contact with the right engine mount frame bracket could cause the battery wire harness sheathing to wear and create a highly resistive short circuit. A highly resistive short circuit could cause the vehicle to stall and/or an underhood electrical fire.

Repair: The battery wire harness must be inspected for a rub through of the wire harness. Trucks found with a damaged battery wire harness must have the battery wire harness replaced.

**SAFETY RECALL R46/NHTSA 15V-541
FRONT SUSPENSION TRACK BAR FRAME BRACKET**

Date: February 2016

Models/Production:
'13-'14 D2 3500
'14 DD 3500 Cab Chassis
'14 DJ 2500

This recall applies only to the above vehicles built from October 9, 2012, through July 29, 2014.

Subject: The front suspension track bar frame bracket on about 149,500 of the above vehicles may have been improperly welded to the frame rail during the manufacturing process. The front suspension track bar frame bracket welds may break and allow the front suspension track bar frame bracket to separate from the frame rail. A separated front suspension track bar frame bracket will cause diminished steering response and could cause a crash without warning.

Repair: The front suspension track bar frame bracket welds must be inspected. Vehicles found with cracked and/or separated welds must have the track bar frame brackets reviewed to determine if they should be repaired, replaced or no action is required before the reinforcement package is installed.

**SAFETY RECALL R32/NHTSA 16V-301
FRONT HALFSHAFTS**

Date: July 2016

Models/Production:
'16 DS 1500

This recall applies only to the above vehicles equipped with four wheel drive built from February 19, 2016, through March 1, 2016.

Subject: The front halfshafts on about 90 of the above vehicles may not have been heat treated properly during the manufacturing process. An improperly heat treated halfshaft could fracture without warning. A fractured halfshaft could damage underbody components and cause a crash without warning.

Repair: Both front halfshafts must be replaced.

**EMISSIONS RECALL R369
SELECTIVE CATALYTIC REDUCTION CATALYST**

Date: July 2016

Models/Production:
'14 DS 1500 Series

This recall applies only to the above vehicles equipped with a 3.0-liter diesel engine.

Subject: The Selective Catalytic Reduction (SCR) catalyst on about 11,400 of the above vehicles is experiencing washcoat degradation, which may lead to the exceedance of exhaust emission standards.

Repair: The SCR catalyst must be replaced.

**SAFETY RECALL R48/NHTSA 16V-495
TRANSFER CASE REAR OUTPUT SHAFT**

Date: August 2016

Models/Production:
'16 DD 3500 Cab Chassis
'16 DP 4500/5500 Cab Chassis

This recall applies to the above vehicles equipped with a Transfer Case – Manual Shift or Electronic Shift and 6-Speed Automatic Transmission or 6-Speed Manual Transmission built from July 24, 2015, through January 7, 2016.

Subject: The transfer case rear output shaft on about 650 of the above vehicles could fracture while driving. A fractured rear output shaft will result in a loss of motive power and a loss of "Park" functionality when the vehicle is operated in two-wheel drive mode. The loss of "Park" functionality could cause unintended vehicle movement. This could cause a crash and/or strike bystanders near the vehicle.

Also, 144.5" wheelbase trucks equipped with a one-piece rear propeller shaft may experience propeller shaft separation if the transfer case rear output shaft fractures. This could cause a crash without warning while driving.

Repair: The transfer case must be replaced on all involved vehicles.



2016 RAM 1500 SPECIFICATIONS

2016 Ram 1500 SPECIFICATIONS

Specifications are based on the latest product information available at the time of publication.
All dimensions are in inches (millimeters) unless otherwise noted.
All dimensions measured at curb weight with standard tires and wheels.

GENERAL INFORMATION

Vehicle Type	Regular Cab, Quad Cab, and Crew Cab, 2WD, 4WD
Assembly Plant	Regular Cab: Saltillo Truck Assembly, Saltillo, Mexico Quad Cab: Warren Truck Assembly Plant, Warren, Michigan Crew Cab: Warren Truck Assembly Plant, Warren, Michigan and Saltillo Truck Assembly, Saltillo, Mexico
EPA Vehicle Class	Standard Pickup

BODY/CHASSIS

Layout	2WD — Longitudinal, front engine 4WD — Longitudinal, front engine, transfer case
Construction	2WD — Ladder-type frame, steel cab, double-wall steel pickup box 4WD — Ladder-type frame, steel cab, double-wall steel pickup box

ENGINE: 3.6-LITER PENTASTAR V-6

Type and Description	60-degree V-type, liquid-cooled
Displacement	220 cu. in. (3,604 cu. cm)
Bore x Stroke	3.78 x 3.27 (96.0 x 83.0)
Valve System	Chain-driven DOHC, 24 valves and hydraulic end-pivot roller rockers
Fuel Injection	Sequential, multiport, electronic, returnless
Construction	Aluminum deep-skirt block, aluminum alloy heads
Compression Ratio	10.2:1
Power	305 hp (224 kW) at 6,400 rpm
Torque	269 lb.-ft. (364 N•m) at 4,175 rpm
Max. Engine Speed	6,400 rpm (electronically limited)
Fuel Requirement	Unleaded regular, 87 octane (R+M)/2, E85-compatible
Oil Capacity	6.0 quarts (5.7 liters)
Coolant Capacity	14.0 quarts (13.25 liters)
Emission Controls	Dual three-way catalytic converters, heated oxygen sensors
EPA Fuel Economy mpg (city/hwy)	18/25



2016 RAM 1500 SPECIFICATIONS

ENGINE: 3.0-LITER ECODIESEL V-6

Type and Description	60-degree V-type, liquid-cooled
Displacement	182 cu. in. (2988 cu. cm)
Bore x Stroke	3.27 x 3.60 (83 x 92)
Valve System	Chain-driven DOHC, 24 valves
Fuel Injection	Common-rail, 2000 bar, Solenoid Injectors
Construction	Cast-iron block, aluminum alloy heads
Compression Ratio	16.5:1
Power	240 hp (179 kW) at 3,600 rpm
Torque	420 lb.-ft. (569 N•m) at 2,000 rpm
Max. Engine Speed	4,800 rpm (electronically limited)
Fuel Requirement	Ultra Low-sulfur diesel
Oil Capacity	10.5 quarts (10 liters)
Coolant Capacity	12 quarts (11.4 liters)
Emission Controls	Cooled EGR, oxidation catalyst, diesel particulate filter, SCR w/urea injection
EPA Fuel Economy mpg (city/hwy)	21/29

ENGINE: 5.7-LITER HEMI® V-8

Type and Description	90-degree V-8, liquid-cooled
Displacement	345 cu. in. (5,654 cu. cm)
Bore x Stroke	3.92 x 3.58 (99.5 x 90.9)
Valve System	Variable-cam timing, pushrod-operated overhead valves, 16 valves, hydraulic lifters with roller followers
Fuel Injection	Sequential, multiport, electronic, returnless
Construction	Deep-skirt cast-iron block with cross-bolted main bearing caps, aluminum alloy heads with hemispherical combustion chambers
Compression Ratio	10.5:1
Power	395 hp (291 kW) @ 5,600 rpm
Torque	410 lb.-ft. (556 N•m) @ 3,950 rpm
Max. Engine Speed	5,800 rpm
Fuel Requirement	Unleaded mid-grade, 89 octane (R+M)/2 — recommended Unleaded regular, 87 octane (R+M)/2 — acceptable
Oil Capacity	7.0 quarts (6.6 liters)
Coolant Capacity	14.0 quarts (13.33 liters)
Emission Controls	Three-way catalytic converters, heated oxygen sensors and internal engine features



2016 RAM 1500 SPECIFICATIONS

TRANSMISSION: ZF TORQUEFLITE 8HP70 EIGHT-SPEED AUTOMATIC

Availability	Standard with 3.0-liter EcoDiesel V-6 and select 5.7-liter HEMI V-8 equipped trucks
Description	Adaptive electronic control, automatic or ERS manual control. Five clutch-pack design with only two open clutches in any gear. Torque converter lock with turbine torsional damper for low lock-up speeds in 1st through 8th gear
Gear Ratios	
1st	4.71
2nd	3.14
3rd	2.10
4th	1.67
5th	1.29
6th	1.00
7th	0.84
8th	0.67
Reverse	3.30
Axle Gear Ratios	3.21 (excluding 3.0-liter EcoDiesel V-6), 3.55 (excluding 5.7-liter HEMI V-8), 3.92

TRANSFER CASE: BW 44-45 PART-TII

Availability	3.6-liter Pentastar V-6 4x4, and 5.7-liter HEMI V-8 4x4
Shift Mechanism	Electric
Available Speeds	Two-speed
Operating Modes	2WD High; 4WD High, Locked; Neutral; 4WD Low, Locked
Low-range Ratio	2.64
Center Differential Type	None

TRANSFER CASE: BW 44-44 ON-DEM

Availability	3.0-liter EcoDiesel V-6 4x4, and 5.7-liter HEMI V-8 4x4
Shift Mechanism	Electric
Available Speeds	Two-speed
Operating Modes	2WD High; 4WD Auto; 4WD High, Locked; Neutral; 4WD Low, Locked
Low-range Ratio	2.64
Center Differential Type	None



2016 RAM 1500 SPECIFICATIONS

TRANSMISSION: ZF TORQUEFLITE 8HP70 EIGHT-SPEED AUTOMATIC

Availability	Standard with 3.0-liter EcoDiesel V-6 and select 5.7-liter HEMI V-8 equipped trucks
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Gear Ratios	
1st	4.71
2nd	3.14
3rd	2.10
4th	1.67
5th	1.29
6th	1.00
7th	0.84
8th	0.67
Reverse	3.30
Axle Gear Ratios	3.21 (excluding 3.0-liter EcoDiesel V-6), 3.55 (excluding 5.7-liter HEMI V-8), 3.92

TRANSFER CASE: BW 44-45 PART-TII

Availability	3.6-liter Pentastar V-6 4x4, and 5.7-liter HEMI V-8 4x4
Shift Mechanism	Electric
Available Speeds	Two-speed
Operating Modes	2WD High; 4WD High, Locked; Neutral; 4WD Low, Locked
Low-range Ratio	2.64
Center Differential Type	None

TRANSFER CASE: BW 44-44 ON-DEM

Availability	3.0-liter EcoDiesel V-6 4x4, and 5.7-liter HEMI V-8 4x4
Shift Mechanism	Electric
Available Speeds	Two-speed
Operating Modes	2WD High; 4WD Auto; 4WD High, Locked; Neutral; 4WD Low, Locked
Low-range Ratio	2.64
Center Differential Type	None



2016 RAM 1500 SPECIFICATIONS

AXLES

Front	ZF 215 mm
Rear	C235 mm (available limited slip)
Available Ratios	3.21, 3.55, 3.92

ELECTRICAL SYSTEM

Architecture	Powernet
Alternator	160-amp, 180-amp, 220-amp (Stop-start system and Special Services Package) 230-amp (3.0-liter EcoDiesel V-6)
Battery	Group 65, low-maintenance 730 CCA (Stop-start features 800 CCA absorbed glass mat)

SUSPENSION

Front	Upper and lower "A" arms, coil springs, twin-tube shock absorbers, stabilizer bar. Optional air suspension replaces twin-tube shock absorbers and coil springs. Rebel features Bilstein monotube shocks with air suspension
Rear	Five-link with track bar, coil springs, stabilizer bar, twin-tube shock absorbers, solid axle. Optional air suspension replaces twin-tube shock absorbers and coil springs. Rebel features Bilstein monotube shocks with air suspension

BRAKES

Front	
Size and Type	13.2 x 1.1 (336 x 28) vented disc with 2.13 (54) two-piston pin-slider caliper and anti-lock braking system (ABS)
Swept Area	292 sq. in. (1,884 sq. cm)
Rear	
Size and Type	13.8 x 0.87 (352 x 22) disc with 2.13 (54) single-piston pin-slider caliper and ABS
Swept Area	274 sq. in. (1,768 sq. cm)
Power-assist	Dual-rate, tandem diaphragm vacuum

AIR BAGS

Regular Cab	6
Quad Cab	6
Crew Cab	6



2016 RAM 1500 SPECIFICATIONS

STEERING

Power-assist

Regular Cab	2WD	2WD	4WD	4WD
Box Length	6-ft. 4-in.	8-ft.	6-ft. 4-in.	8-ft.
Wheelbase (nominal)	120.5 (3,061)	140.5 (3,569.2)	120.5 (3,061)	140.5 (3,569.2)
Overall Steering Ratio	19.1:1	17.9:1	19.1:1	17.9:1
Steering Wheel Turns (lock-to-lock)	3.5	3.3	3.5	3.3
Turning Diameter – 17-in. Tire - ft. (m)	39.5 (12.0)	45.1 (13.7)	39.8 (12.1)	45.4 (13.8)
Turning Diameter – 20-in. Tire - ft. (m)	39.3 (12.0)	44.9 (13.7)	39.8 (12.1)	45.5 (13.9)
Turning Diameter – 17-in. Outdoorsman □ Tire – ft. (m)	N/A	N/A	39.4 (12.0)	45.0 (13.7)

Quad Cab	2WD	4WD
Box Length	6-ft. 4-in.	6-ft. 4-in.
Wheelbase (nominal)	140.5 (3,569.2)	140.5 (3,569.2)
Overall Steering Ratio	17.9:1	17.9:1
Steering Wheel Turns (lock-to-lock)	3.3	3.3
Turning Diameter – 17-in. Tire - ft. (m)	45.1 (13.7)	45.4 (13.8)
Turning Diameter – 20-in. Tire - ft. (m)	44.9 (13.7)	45.5 (13.9)
Turning Diameter – 17-in. Outdoorsman Tire – ft. (m)	44.8 (13.7)	45.0 (13.7)

Crew Cab	2WD	2WD	4WD	4WD
Box Length	5-ft. 7-in.	6-ft. 4-in.	5-ft. 7-in.	6-ft. 4-in.
Wheelbase (nominal)	140.5 (3,061)	149.5 (3,569.2)	140.5 (3,569.2)	149.5 (3,569.2)
Overall Steering Ratio	19.1:1	17.9:1	19.1:1	17.9:1
Steering Wheel Turns (lock-to-lock)	3.5	3.3	3.5	3.3
Turning Diameter – 17-in. Tire - ft. (m)	39.5 (12.0)	45.1 (13.7)	39.8 (12.1)	45.4 (13.8)
Turning Diameter – 20-in. Tire - ft. (m)	39.3 (12.0)	44.9 (13.7)	39.8 (12.1)	45.5 (13.9)
Turning Diameter – 17-in. Outdoorsman Tire – ft. (m)	N/A	N/A	39.4 (12.0)	45.0 (13.7)



2016 RAM 1500 SPECIFICATIONS

DIMENSIONS AND CAPACITIES

Cargo Box

Nominal Box Size	5-ft. 7-in. (Crew)	6-ft. 4-in. (Regular, Quad, or Crew)	8-ft. (Regular)
SAE volume, cu. ft. (cu m)	50.3 (1.4)	57.5 (1.6)	74.7 (2.1)
Length at Floor, Tailgate Closed	67.4 (1,712.4)	76.3 (1,938.5)	98.3 (2,496.5)
Cargo Width	66.4 (1,686.9)	66.4 (1,686.9)	66.4 (1,686.9)
Distance Between Wheelhouses	51 (1,295.4)	51 (1,295.4)	51 (1,295.4)
Depth	20.0 (508.6)	20.1 (511.1)	20.2 (513.0)
Tailgate Opening Width in. – (mm)	60.4 (1,535.3)	60.4 (1,535.3)	60.4 (1,535.3)

Regular Cab Pickup

Model – Tire Size	2WD –265/70R17		4WD –265/70R17	
	6-ft. 4-in.	8-ft.	6-ft. 4-in.	8-ft.
Box Length				
Wheelbase (nominal)	120.5 (3,061.2)	140.5 (3,569.2)	120.5 (3,062.5)	140.5 (3,570.2)
Track, Front	68.0 (1,728.2)	68.0 (1,728.2)	68.2 (1,732.3)	68.2 (1,732.3)
Track, Rear	67.5 (1,714.7)	67.5 (1,714.7)	67.5 (1,714.7)	67.5 (1,714.7)
Overall Length	209.0 (5,308.5)	231.0 (5,866.5)	209.0 (5,308.5)	231.0 (5,866.5)
Overall Width	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)
Overall Height	74.6 (1,894.2)	74.4 (1,889.2)	75.2 (1,910.4)	75.0 (1,906.2)

Ground Clearance

Front Axle	9.0 (229.3)	9.0 (229.2)	9.2 (232.6)	9.2 (232.7)
Rear Axle	8.7 (221.2)	8.7 (221.5)	8.6 (219.2)	8.6 (219.5)
Open Tailgate to Ground	34.8 (883.4)	34.6 (878.3)	35.0 (889.6)	34.9 (885.3)
Pickup Body Height	20.1 (511.1)	20.2 (513.0)	20.1 (511.1)	20.2 (513.0)
Approach Angle (degrees)	15.6	15.7	17.7	17.8
Departure Angle (degrees)	25.2	24.1	25.6	24.4
Ramp Breakover Angle (degrees)	21.5	19.2	22.9	20.5
Fuel-Tank Capacity	26-gal. (98-liter) (standard)	32-gal. (121-liter) (standard)	26-gal. (98-liter) (standard)	32-gal. (121-liter) (standard)



2016 RAM 1500 SPECIFICATIONS

Quad Cab 6-ft. 4-in. Box Pickup

Model – Tire Size	2WD –265/70R17	4WD –265/70R17
Wheelbase (nominal)	140.5 (3,569.2)	140.5 (3,570.2)
Track, Front	68.0 (1,728.2)	68.2 (1,732.3)
Track, Rear	67.5 (1,714.7)	67.5 (1,714.7)
Overall Length	229.0 (5,816.5)	229.0 (5,816.5)
Overall Width	79.4 (2,017.4)	79.4 (2,017.4)
Overall Height	77.2 (1,960.2)	77.7 (1,974.8)
Ground Clearance		
Front Axle	9.0 (229.2)	9.2 (232.7)
Rear Axle	8.7 (221.5)	8.6 (219.5)
Open tailgate to ground	34.6 (878.3)	34.9 (885.3)
Pickup Body Height	20.1 (511.1)	20.1 (511.1)
Approach Angle (degrees)	15.7	17.8
Departure Angle (degrees)	25.1	25.4
Ramp Breakover Angle (degrees)	19.2	20.5
Fuel-Tank Capacity	26-gal. (98-liter) (standard) 32-gal. (121-liter) (optional)	26-gal. (98-liter) (standard) 32-gal. (121-liter) (optional)

Model – Tire Size	2WD –265/70R17		4WD –265/70R17	
	6-ft. 4-in.	8-ft.	6-ft. 4-in.	8-ft.
Box Length				
Ground Clearance				
Front Axle	9.8 (248.5)	9.8 (248.5)	9.8 (248.5)	9.8 (248.5)
Rear Axle	9.3 (235.0)	9.3 (235.0)	9.3 (235.0)	9.3 (235.0)
Open Tailgate to Ground	33.4 (847.2)	34.9 (885.7)	35.6 (904.1)	36.9 (936.7)
Pickup Body Height	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)
Approach Angle (degrees)	16.6	20.9	22.9	24.0
Departure Angle (degrees)	19.4	21.3	22.2	23.6
Ramp Breakover Angle without Skid Plate	17.1	20.6	22.5	24.2
Ramp Breakover Angle with Skid Plate	13.8	17.0	18.7	20.3
Ground Clearance without Skid Plate	7.4(187.2)	9.4 (239.8)	10.6 (269.5)	11.4 (290.8)
Ground Clearance with Skid Plate	6.7(169.3)	8.8 (222.8)	9.9 (252.8)	10.8 (273.7)



2016 RAM 1500 SPECIFICATIONS

Fuel-Tank Capacity	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)
	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)

Crew Cab Pickup

Model – Tire Size	2WD –265/70R17		4WD –265/70R17	
	<i>5-ft. 7-in.</i>	<i>6-ft. 4-in.</i>	<i>5-ft. 7-in.</i>	<i>6-ft. 4-in.</i>
Box Length				
Wheelbase (nominal)	140.5 (3,569.2)	149.4 (3,795.3)	140.5 (3,570.2)	149.4 (3,795.2)
Track, Front	68.0 (1,728.2)	68.0 (1,728.2)	68.2 (1,732.3)	68.2 (1,732.3)
Track, Rear	67.5 (1,714.7)	67.5 (1,714.7)	67.5 (1,714.7)	67.5 (1,714.7)
Overall Length	229.0 (5,816.5)	237.9 (6,042.6)	229.0 (5,816.5)	237.9 (6,042.6)
Overall Width	79.4 (2,017.4)	79.4 (2,016.6)	79.4 (2,017.4)	79.4 (2,016.6)
Overall Height	76.9 (1,953.8)	76.8 (1,950.6)	77.5 (1,967.9)	77.4 (1,965.1)

Ground Clearance

Front Axle	9.0 (229.2)	9.1 (231.1)	9.2 (232.7)	9.2 (235.2)
Rear Axle	8.7 (221.5)	8.7 (220.5)	8.6 (219.5)	8.6 (218.3)
Open Tailgate to Ground	34.6 (878.3)	34.4 (874.0)	34.9 (885.3)	34.7 (880.8)
Pickup Body Height	20.0 (508.6)	20.1 (511.1)	20.0 (508.6)	20.1 (511.1)
Approach Angle (degrees)	15.7	16.0	17.8	18.0
Departure Angle (degrees)	25.1	24.9	24.7	25.2
Ramp Breakover Angle (degrees)	19.2	18.5	20.5	19.7
Fuel-Tank Capacity	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)
	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)

Crew Cab Pickup – Outdoorsman

Model – Tire Size	2WD –275/60R20		4WD –275/60R20	
	<i>5-ft. 7-in.</i>	<i>6-ft. 4-in.</i>	<i>5-ft. 7-in.</i>	<i>6-ft. 4-in.</i>
Box Length				
Wheelbase (nominal)	140.5 (3,569.4)	149.4 (3,795.8)	140.7 (3,573.5)	149.6 (3,799.6)
Track, Front	68.6 (1,742.2)	68.6 (1,742.2)	68.6 (1,743.2)	68.6 (1,743.2)
Track, Rear	68.0 (1,727.4)	68.0 (1,727.4)	68.0 (1,727.4)	68.0 (1,727.4)
Overall Length	229.0 (5,816.5)	237.9 (6,042.6)	229.0 (5,816.5)	237.9 (6,042.6)
Overall Width	79.4 (2,017.4)	79.4 (2,016.6)	79.4 (2,017.4)	79.4 (2,016.6)
Overall Height	77.6 (1,972.3)	77.5 (1,968.1)	78.5 (1,994.1)	78.4 (1,991.7)



2016 RAM 1500 SPECIFICATIONS

Ground Clearance				
Front Axle	9.6 (244.8)	9.6 (243.6)	9.8 (248.6)	9.8 (248.0)
Rear Axle	9.3 (237.0)	9.3 (235.0)	9.2 (233.2)	9.2 (233.1)
Open Tailgate to Ground	34.9 (887.7)	34.8 (883.9)	35.6 (903.5)	35.5 (902.3)
Pickup Body Height	20.0 (508.6)	20.1 (511.1)	20.0 (508.6)	20.1 (511.1)
Approach Angle (degrees)	21.3	21.0	23.9	22.9
Departure Angle (degrees)	21.4	21.2	22.1	22.1
Ramp Breakover Angle (degrees)	20.9	19.9	18.8	17.6
Ground Clearance without Skid Plate	10.3 (261.5)	10.3 (261.0)	NA	NA
Ground Clearance with Skid Plate	NA	NA	9.9 (252.2)	9.9 (251.6)
Fuel-Tank Capacity	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)
	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)

Crew Cab 5ft. 7in. Box Pickup - Air Suspension 4x2 and 4x4

<i>Tire Size</i>	<i>265/70R17</i>			
Suspension Mode	Entry / Exit	Normal Ride Height	Off Road 1	Off Road 2
Wheelbase (nominal)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)
Track, Front	68.0 (1,728.2)	68.0 (1,728.2)	68.0 (1,728.2)	68.0 (1,728.2)
Track, Rear	67.5 (1,714.7)	67.5 (1,714.7)	67.5 (1,714.7)	67.5 (1,714.7)
Overall Length	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)
Overall Width	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)
Overall Height	74.9 (1,902.1)	77.0 (1,955.1)	77.9 (1,979.2)	79.0 (2,006.1)
Ground Clearance				
Front Axle	9.1 (232.3)	9.1 (232.3)	9.1 (232.3)	9.1 (232.3)
Rear Axle	8.7 (220.0)	8.7 (220.0)	8.7 (220.0)	8.7 (220.0)
Open Tailgate to Ground	32.8 (832.8)	34.3 (871.2)	35.0 (889.6)	36.3 (922.2)
Pickup Body Height	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)
Approach Angle (degrees)	13.8	18.3	20.9	22.5
Departure Angle (degrees)	23.0	24.8	25.6	27.1



RAM

2016 RAM 1500 SPECIFICATIONS

Ramp Breakover Angle (degrees)	15.9	19.4	21.4	23.0
Ground Clearance without Skid Plate	6.7 (171.0)	8.8 (223.5)	10.0 (254)	10.8 (274.3)
Ground Clearance with Skid Plate	6.0 (153.1)	8.1 (205.7)	9.3 (236.2)	10.1 (256.5)
Fuel-Tank Capacity	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)
	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)

Crew Cab 5ft. 7in. Box Pickup - Air Suspension 4x2 and 4x4

<i>Tire Size</i>	<i>275/60R20</i>			
Suspension Mode	Entry / Exit	Normal Ride Height	Off Road 1	Off Road 2
Wheelbase (nominal)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)
Track, Front	68.6 (1,742.2)	68.6 (1,742.2)	68.6 (1,742.2)	68.6 (1,742.2)
Track, Rear	68.0 (1,727.4)	68.0 (1,727.4)	68.0 (1,727.4)	68.0 (1,727.4)
Overall Length	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)
Overall Width	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)
Overall Height	75.5 (1,917.4)	77.6 (1,970.4)	78.5 (1,994.5)	79.6 (2,021.4)
Ground Clearance				
Front Axle	9.8 (248.5)	9.8 (248.5)	9.8 (248.5)	9.8 (248.5)
Rear Axle	9.3 (235.0)	9.3 (235.0)	9.3 (235.0)	9.3 (235.0)
Open Tailgate to Ground	33.4 (847.2)	34.9 (885.7)	35.6 (904.1)	36.9 (936.7)
Pickup Body Height	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)
Approach Angle (degrees)	15.2	19.8	22.4	23.9
Departure Angle (degrees)	23.7	25.5	26.4	27.8
Ramp Breakover Angle (degrees)	17.1	20.6	22.5	24.2
Ground Clearance without Skid Plate	7.4(187.2)	9.4 (239.8)	10.6 (269.5)	11.4 (290.8)
Ground Clearance with Skid Plate	6.7(169.3)	8.8 (222.8)	9.9 (252.8)	10.8 (273.7)
Fuel-Tank Capacity	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)
	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)



2016 RAM 1500 SPECIFICATIONS

Crew Cab 5ft. 7in. Box Pickup - Air Suspension 4x2 and 4x4 Outdoorsman

Tire Size		265/70R17		
Suspension Mode	Entry / Exit	Normal Ride Height	Off Road 1	Off Road 2
Wheelbase (nominal)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)
Track, Front	68.0 (1,728.2)	68.0 (1,728.2)	68.0 (1,728.2)	68.0 (1,728.2)
Track, Rear	67.5 (1,714.7)	67.5 (1,714.7)	67.5 (1,714.7)	67.5 (1,714.7)
Overall Length	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)
Overall Width	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)
Overall Height	74.9 (1,902.1)	77.0 (1,955.1)	77.9 (1,979.2)	79.0 (2,006.1)
Ground Clearance				
Front Axle	9.1 (232.3)	9.1 (232.3)	9.1 (232.3)	9.1 (232.3)
Rear Axle	8.7 (220.0)	8.7 (220.0)	8.7 (220.0)	8.7 (220.0)
Open Tailgate to Ground	32.8 (832.8)	34.3 (871.2)	35.0 (889.6)	36.3 (922.2)
Pickup Body Height	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)
Approach Angle (degrees)	15.2	19.7	21.8	22.9
Departure Angle (degrees)	18.7	20.6	21.4	22.9
Ramp Breakover Angle without Skid Plate	15.9	19.4	21.4	23.0
Ramp Breakover Angle with Skid Plate	12.7	15.9	17.6	19.2
Ground Clearance without Skid Plate	6.7 (171.0)	8.8 (223.5)	10.0 (254)	10.8 (274.3)
Ground Clearance with Skid Plate	6.0 (153.1)	8.1 (205.7)	9.3 (236.2)	10.1 (256.5)
Fuel-Tank Capacity	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)
	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)



2016 RAM 1500 SPECIFICATIONS

Crew Cab 5ft. 7in. Box Pickup - Air Suspension 4x2 and 4x4 Outdoorsman

Tire Size		275/60R20		
Suspension Mode	Entry / Exit	Normal Ride Height	Off Road 1	Off Road 2
Wheelbase (nominal)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)
Track, Front	68.6 (1,742.2)	68.6 (1,742.2)	68.6 (1,742.2)	68.6 (1,742.2)
Track, Rear	68.0 (1,727.4)	68.0 (1,727.4)	68.0 (1,727.4)	68.0 (1,727.4)
Overall Length	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)
Overall Width	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)
Overall Height	75.5 (1,917.4)	77.6 (1,970.4)	78.5 (1,994.5)	79.6 (2,021.4)
Ground Clearance				
Front Axle	9.8 (248.5)	9.8 (248.5)	9.8 (248.5)	9.8 (248.5)
Rear Axle	9.3 (235.0)	9.3 (235.0)	9.3 (235.0)	9.3 (235.0)
Open Tailgate to Ground	33.4 (847.2)	34.9 (885.7)	35.6 (904.1)	36.9 (936.7)
Pickup Body Height	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)
Approach Angle (degrees)	16.6	20.9	22.9	24.0
Departure Angle (degrees)	19.4	21.3	22.2	23.6
Ramp Breakover Angle without Skid Plate	17.1	20.6	22.5	24.2
Ramp Breakover Angle with Skid Plate	13.8	17.0	18.7	20.3
Ground Clearance without Skid Plate	7.4(187.2)	9.4 (239.8)	10.6 (269.5)	11.4 (290.8)
Ground Clearance with Skid Plate	6.7(169.3)	8.8 (222.8)	9.9 (252.8)	10.8 (273.7)
Fuel-Tank Capacity	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)
	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)



2016 RAM 1500 SPECIFICATIONS

Crew Cab 6ft. 4in. Box Pickup - Air Suspension 4x2 and 4x4

Tire Size	265/70R17			
Suspension Mode	Entry / Exit	Normal Ride Height	Off Road 1	Off Road 2
Wheelbase (nominal)	149.5 (3,798.0)	149.5 (3,798.0)	149.5 (3,798.0)	149.5 (3,798.0)
Track, Front	68.0 (1,728.2)	68.0 (1,728.2)	68.0 (1,728.2)	68.0 (1,728.2)
Track, Rear	67.5 (1,714.7)	67.5 (1,714.7)	67.5 (1,714.7)	67.5 (1,714.7)
Overall Length	237.9 (6,042.6)	237.9 (6,042.6)	237.9 (6,042.6)	237.9 (6,042.6)
Overall Width	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)
Overall Height	74.7 (1,897.7)	76.8 (1,950.7)	77.8 (1,975.2)	78.8 (2,001.7)
Ground Clearance				
Front Axle	9.1 (231.6)	9.1 (231.6)	9.1 (231.6)	9.1 (231.6)
Rear Axle	8.6 (217.7)	8.6 (217.7)	8.6 (217.7)	8.6 (217.7)
Open Tailgate to Ground	32.6 (827.9)	34.1 (866.6)	34.8 (885.2)	36.1 (917.6)
Pickup Body Height	20.1 (511.1)	20.1 (511.1)	20.1 (511.1)	20.1 (511.1)
Approach Angle (degrees)	13.8	18.3	20.9	22.5
Departure Angle (degrees)	22.8	24.6	25.5	26.9
Ramp Breakover Angle (degrees)	15.3	18.7	20.5	22.2
Ground Clearance without Skid Plate	6.7 (170.0)	8.8 (222.7)	9.9 (252.4)	10.8 (273.7)
Ground Clearance with Skid Plate	6.0 (152.3)	8.1 (205.4)	9.3 (235.4)	10.1 (256.4)
Fuel-Tank Capacity	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)
	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)

**RAM****2016 RAM 1500
SPECIFICATIONS****Crew Cab 6ft. 4in. Box Pickup - Air Suspension 4x2 and 4x4**

Tire Size	275/60R20			
Suspension Mode	Entry / Exit	Normal Ride Height	Off Road 1	Off Road 2
Wheelbase (nominal)	149.5 (3,798.0)	149.5 (3,798.0)	149.5 (3,798.0)	149.5 (3,798.0)
Track, Front	68.6 (1,742.2)	68.6 (1,742.2)	68.6 (1,742.2)	68.6 (1,742.2)
Track, Rear	68.0 (1,727.4)	68.0 (1,727.4)	68.0 (1,727.4)	68.0 (1,727.4)
Overall Length	237.9 (6,042.6)	237.9 (6,042.6)	237.9 (6,042.6)	237.9 (6,042.6)
Overall Width	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)
Overall Height	75.4 (1,914.5)	77.5 (1,967.5)	78.4 (1,991.9)	79.5 (2,018.5)
Ground Clearance				
Front Axle	9.8 (247.9)	9.8 (247.9)	9.8 (247.9)	9.8 (247.9)
Rear Axle	9.2 (234.7)	9.2 (234.7)	9.2 (234.7)	9.2 (234.7)
Open Tailgate to Ground	32.3 (819.5)	34.8 (883.9)	35.5 (902.5)	36.8 (934.9)
Pickup Body Height	20.1 (511.1)	20.1 (511.1)	20.1 (511.1)	20.1 (511.1)
Approach Angle (degrees)	15.5	19.7	22.3	23.9
Departure Angle (degrees)	22.5	25.5	26.4	27.8
Ramp Breakover Angle (degrees)	16.4	19.8	21.7	23.3
Ground Clearance without Skid Plate	7.3 (185.8)	9.4 (239.0)	10.6 (268.7)	11.4 (290.0)
Ground Clearance with Skid Plate	6.6 (168.8)	8.7 (221.7)	9.9 (251.7)	10.7 (272.7)
Fuel-Tank Capacity	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)
	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)



2016 RAM 1500 SPECIFICATIONS

Crew Cab 6ft. 4in. Box Pickup - Air Suspension 4x2 and 4x4 Outdoorsman

Tire Size		265/70R17			
Suspension Mode	Entry / Exit	Normal Ride Height	Off Road 1	Off Road 2	
Wheelbase (nominal)	149.5 (3,798.0)	149.5 (3,798.0)	149.5 (3,798.0)	149.5 (3,798.0)	
Track, Front	68.0 (1,728.2)	68.0 (1,728.2)	68.0 (1,728.2)	68.0 (1,728.2)	
Track, Rear	67.5 (1,714.7)	67.5 (1,714.7)	67.5 (1,714.7)	67.5 (1,714.7)	
Overall Length	237.9 (6,042.6)	237.9 (6,042.6)	237.9 (6,042.6)	237.9 (6,042.6)	
Overall Width	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)	
Overall Height	74.7 (1,897.7)	76.8 (1,950.7)	77.8 (1,975.2)	78.8 (2,001.7)	
Ground Clearance					
Front Axle	9.1 (231.6)	9.1 (231.6)	9.1 (231.6)	9.1 (231.6)	
Rear Axle	8.6 (217.7)	8.6 (217.7)	8.6 (217.7)	8.6 (217.7)	
Open Tailgate to Ground	32.6 (827.9)	34.1 (866.6)	34.8 (885.2)	36.1 (917.6)	
Pickup Body Height	20.1 (511.1)	20.1 (511.1)	20.1 (511.1)	20.1 (511.1)	
Approach Angle (degrees)	15.3	19.7	21.8	22.9	
Departure Angle (degrees)	18.6	20.4	21.3	22.7	
Ramp Breakover Angle without Skid Plate	15.3	18.7	20.5	22.2	
Ramp Breakover Angle with Skid Plate	12.0	15.0	16.6	18.2	
Ground Clearance without Skid Plate	6.7 (170.0)	8.8 (222.7)	9.9 (252.4)	10.8 (273.7)	
Ground Clearance with Skid Plate	6.0 (152.3)	8.1 (205.4)	9.3 (235.4)	10.1 (256.4)	
Fuel-Tank Capacity	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	
	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	



2016 RAM 1500 SPECIFICATIONS

Crew Cab 6ft. 4in. Box Pickup - Air Suspension 4x2 and 4x4 Outdoorsman

Tire Size		275/60R20		
Suspension Mode	Entry / Exit	Normal Ride Height	Off Road 1	Off Road 2
Wheelbase (nominal)	149.5 (3,798.0)	149.5 (3,798.0)	149.5 (3,798.0)	149.5 (3,798.0)
Track, Front	68.6 (1,742.2)	68.6 (1,742.2)	68.6 (1,742.2)	68.6 (1,742.2)
Track, Rear	68.0 (1,727.4)	68.0 (1,727.4)	68.0 (1,727.4)	68.0 (1,727.4)
Overall Length	237.9 (6,042.6)	237.9 (6,042.6)	237.9 (6,042.6)	237.9 (6,042.6)
Overall Width	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)
Overall Height	75.4 (1,914.5)	77.5 (1,967.5)	78.4 (1,991.9)	79.5 (2,018.5)
Ground Clearance				
Front Axle	9.8 (247.9)	9.8 (247.9)	9.8 (247.9)	9.8 (247.9)
Rear Axle	9.2 (234.7)	9.2 (234.7)	9.2 (234.7)	9.2 (234.7)
Open Tailgate to Ground	32.3 (819.5)	34.8 (883.9)	35.5 (902.5)	36.8 (934.9)
Pickup Body Height	20.1 (511.1)	20.1 (511.1)	20.1 (511.1)	20.1 (511.1)
Approach Angle (degrees)	16.6	20.9	22.9	24.0
Departure Angle (degrees)	19.4	21.3	22.1	23.6
Ramp Breakover Angle without Skid Plate	16.4	19.8	21.7	23.3
Ramp Breakover Angle with Skid Plate	13.0	16.0	17.7	19.2
Ground Clearance without Skid Plate	7.3 (185.8)	9.4 (239.0)	10.6 (268.7)	11.4 (290.0)
Ground Clearance with Skid Plate	6.6 (168.8)	8.7 (221.7)	9.9 (251.7)	10.7 (272.7)
Fuel-Tank Capacity	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)
	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)



2016 RAM 1500 SPECIFICATIONS

ACCOMMODATIONS

<i>Model</i>	<i>Regular Cab</i>	<i>Quad Cab</i>	<i>Crew Cab</i>
Seating Capacity, F/R	3/0 or 2/0	3/3 or 2/3	3/3 or 2/3
Front			
Head Room	39.9 (1,013.5)	41.0 (1,041.4)	41.0 (1,041.4)
Legroom	41.0 (1,041.4)	41.0 (1,041.4)	41.0 (1,041.4)
Shoulder Room	66.0 (1,676.4)	66.0 (1,676.4)	66.0 (1,676.4)
Hip Room	62.9 (1,598.7)	63.2 (1,605.3)	63.2 (1,605.3)
Seat Travel	9.0 (230.0)	9.0 (230.0)	9.0 (230.0)
Recliner Range (degrees)	85 (38 RWD, 47 FWD)	56 (38 RWD 18 FWD)	56 (38 RWD, 18 FWD)
Rear			
Head Room	N/A	39.7 (1,008.4)	39.9 (1,013.5)
Legroom	N/A	34.7 (880.9)	40.3 (1,023.3)
Shoulder Room	N/A	65.7 (1,668.8)	65.7 (1,668.8)
Hip Room	N/A	62.9 (1,598.3)	63.2 (1,605.3)
Interior Volume			
Front – cu. ft. (cu m)	62.5 (1.8)	64.2 (1.8)	64.2 (1.8)
Rear – cu. ft. (cu m)	N/A	52.4 (1.5)	61.1 (1.7)

Quad Cab 6ft. 4in. Box Pickup – Outdoorsman

<i>Model – Tire Size</i>	<i>2WD –275/60R20</i>	<i>4WD –275/60R20</i>
Wheelbase (nominal)	140.5 (3,569.4)	140.7 (3,573.5)
Track, Front	68.6 (1,742.2)	68.6 (1,743.2)
Track, Rear	68.0 (1,727.4)	68.0 (1,727.4)
Overall Length	229.0 (5,816.5)	229.0 (5,816.5)
Overall Width	79.4 (2,017.4)	79.4 (2,017.4)
Overall Height	77.9 (1,979.4)	78.8 (2,001.6)
Ground Clearance		
Front Axle	9.6 (244.8)	9.8 (248.6)
Rear Axle	9.3 (237.0)	9.2 (233.2)
Open tailgate to ground	(887.7)	(903.5)
Pickup Body Height	20.1 (511.1)	20.1 (511.1)
Approach Angle (degrees)	21.3	23.9
Departure Angle, (degrees)	21.4	22.1
Ramp Breakover Angle (degrees)	20.9	18.8



2016 RAM 1500 SPECIFICATIONS

Ground Clearance without Skid Plate	10.3 (261.5)	NA
Ground Clearance with Skid Plate	NA	9.9 (252.2)
Fuel-Tank Capacity	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)
	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)

Quad Cab 6ft. 4in. Box Pickup - Air Suspension 4x2 and 4x4

<i>Tire Size</i>		<i>265/70R17</i>		
Suspension Mode	Entry / Exit	Normal Ride Height	Off Road 1	Off Road 2
Wheelbase (nominal)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)
Track, Front	68.0 (1,728.2)	68.0 (1,728.2)	68.0 (1,728.2)	68.0 (1,728.2)
Track, Rear	67.5 (1,714.7)	67.5 (1,714.7)	67.5 (1,714.7)	67.5 (1,714.7)
Overall Length	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)
Overall Width	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)
Overall Height	75.2 (1,909.0)	77.2 (1,962.0)	78.2 (1,986.6)	79.2 (2,013.0)
Ground Clearance				
Front Axle	9.1 (232.3)	9.1 (232.3)	9.1 (232.3)	9.1 (232.3)
Rear Axle	8.7 (220.0)	8.7 (220.0)	8.7 (220.0)	8.7 (220.0)
Open Tailgate to Ground	32.8 (832.8)	34.3 (871.2)	35.0 (889.6)	36.3 (922.2)
Pickup Body Height	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)
Approach Angle (degrees)	13.8	18.3	20.9	22.5
Departure Angle (degrees)	23.0	24.8	25.6	27.1
Ramp Breakover Angle (degrees)	15.9	19.4	21.4	23.0
Ground Clearance without Skid Plate	6.7 (171.0)	8.8 (223.5)	10.0 (254)	10.8 (274.3)
Ground Clearance with Skid Plate	6.0 (153.1)	8.1 (205.7)	9.3 (236.2)	10.1 (256.5)
Fuel-Tank Capacity	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)
	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)



2016 RAM 1500 SPECIFICATIONS

Quad Cab 6ft. 4in. Box Pickup - Air Suspension 4x2 and 4x4

Tire Size		275/60R20		
Suspension Mode	Entry / Exit	Normal Ride Height	Off Road 1	Off Road 2
Wheelbase (nominal)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)
Track, Front	68.6 (1,742.2)	68.6 (1,742.2)	68.6 (1,742.2)	68.6 (1,742.2)
Track, Rear	68.0 (1,727.4)	68.0 (1,727.4)	68.0 (1,727.4)	68.0 (1,727.4)
Overall Length	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)
Overall Width	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)
Overall Height	75.8 (1,924.4)	77.8 (1,977.4)	78.8 (2,002.0)	79.9 (2,028.4)
Ground Clearance				
Front Axle	9.8 (248.5)	9.8 (248.5)	9.8 (248.5)	9.8 (248.5)
Rear Axle	9.3 (235.0)	9.3 (235.0)	9.3 (235.0)	9.3 (235.0)
Open Tailgate to Ground	33.4 (847.2)	34.9 (885.7)	35.6 (904.1)	36.9 (936.7)
Pickup Body Height	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)
Approach Angle (degrees)	15.2	19.8	22.4	23.9
Departure Angle (degrees)	23.7	25.5	26.4	27.8
Ramp Breakover Angle (degrees)	17.1	20.6	22.5	24.2
Ground Clearance without Skid Plate	7.4(187.2)	9.4 (239.8)	10.6 (269.5)	11.4 (290.8)
Ground Clearance with Skid Plate	6.7(169.3)	8.8 (222.8)	9.9 (252.8)	10.8 (273.7)
Fuel-Tank Capacity	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)
	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)



2016 RAM 1500 SPECIFICATIONS

Quad Cab 6ft. 4in. Box Pickup - Air Suspension 4x2 and 4x4 Outdoorsman

Tire Size		265/70R17		
Suspension Mode	Entry / Exit	Normal Ride Height	Off Road 1	Off Road 2
Wheelbase (nominal)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)
Track, Front	68.0 (1,728.2)	68.0 (1,728.2)	68.0 (1,728.2)	68.0 (1,728.2)
Track, Rear	67.5 (1,714.7)	67.5 (1,714.7)	67.5 (1,714.7)	67.5 (1,714.7)
Overall Length	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)
Overall Width	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)
Overall Height	75.2 (1,909.0)	77.2 (1,962.0)	78.2 (1,986.6)	79.2 (2,013.0)
Ground Clearance				
Front Axle	9.1 (232.3)	9.1 (232.3)	9.1 (232.3)	9.1 (232.3)
Rear Axle	8.7 (220.0)	8.7 (220.0)	8.7 (220.0)	8.7 (220.0)
Open Tailgate to Ground	32.8 (832.8)	34.3 (871.2)	35.0 (889.6)	36.3 (922.2)
Pickup Body Height	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)
Approach Angle (degrees)	15.2	19.7	21.8	22.9
Departure Angle (degrees)	18.7	20.6	21.4	22.9
Ramp Breakover Angle without Skid Plate	15.9	19.4	21.4	23.0
Ramp Breakover Angle, with Skid Plate	12.7	15.9	17.6	19.2
Ground Clearance without Skid Plate	6.7 (171.0)	8.8 (223.5)	10.0 (254)	10.8 (274.3)
Ground Clearance with Skid Plate	6.0 (153.1)	8.1 (205.7)	9.3 (236.2)	10.1 (256.5)
Fuel-Tank Capacity	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)	26-gal. (98-liter) (standard)
	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)	32-gal. (121-liter) (optional)



2016 RAM 1500 SPECIFICATIONS

Quad Cab 6ft. 4in. Box Pickup - Air Suspension 4x2 and 4x4 Outdoorsman

<i>Tire Size</i>		<i>275/60R20</i>		
Suspension Mode	Entry / Exit	Normal Ride Height	Off Road 1	Off Road 2
Wheelbase (nominal)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)
Track, Front	68.6 (1,742.2)	68.6 (1,742.2)	68.6 (1,742.2)	68.6 (1,742.2)
Track, Rear	68.0 (1,727.4)	68.0 (1,727.4)	68.0 (1,727.4)	68.0 (1,727.4)
Overall Length	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)
Overall Width	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)	79.4 (2,017.4)
Overall Height	75.8 (1,924.4)	77.8 (1,977.4)	78.8 (2,002.0)	79.9 (2,028.4)

Crew Cab 5ft. 7in. Box Pickup - Air Suspension 4x2 and 4x4 Rebel

<i>Tire Size</i>		<i>285/70R17</i>		
Suspension Mode	Entry / Exit	Normal Ride Height	Off Road	
Wheelbase (nominal)	140.5 (3,569.4)	140.5 (3,569.4)	140.5 (3,569.4)	
Track, Front	68.6 (1,743.2)	68.6 (1,743.2)	68.6 (1,743.2)	
Track, Rear	68.0 (1,727.4)	68.0 (1,727.4)	68.0 (1,727.4)	
Overall Length	229.0 (5,816.5)	229.0 (5,816.5)	229.0 (5,816.5)	
Overall Width	81.5 (2,070.8)	81.5 (2,070.8)	81.5 (2,070.8)	
Overall Height	75.3 (1,913.7)	78.1 (1,984.6)	79.1 (2,010.2)	
Ground Clearance				
Front Axle	9.3 (237.3)	9.3 (237.3)	9.3 (237.3)	
Rear Axle	8.8 (223.6)	8.8 (223.6)	8.8 (223.6)	
Lift In Height	32.9 (835.3)	35.4 (899.1)	36.4 (924.7)	
Pickup Box Height	20.0 (508.6)	20.0 (508.6)	20.0 (508.6)	
Approach Angle, degrees	18.7	23.8	25.3	
Departure Angle, degrees	18.9	21.9	23.0	
Ramp Breakover Angle without Skid Plate, degrees	17.7	23.6	25.4	
Ramp Breakover Angle with Skid Plate, degrees	13.0	18.0	19.6	
Ground Clearance without Skid Plate	6.9 (175.5)	10.0 (253.5)	11.0 (279.1)	
Ground Clearance with Skid Plate	6.2 (157.8)	9.3 (236.3)	10.3 (261.9)	
Fuel-Tank Capacity	26-gal. (98-liter) (Standard)	26-gal. (98-liter) (Standard)	26-gal. (98-liter) (Standard)	
	32-gal. (121-liter) (Optional)	32-gal. (121-liter) (Optional)	32-gal. (121-liter) (Optional)	



RAM

2016 RAM 1500 SPECIFICATIONS

Cargo Box

Nominal Box Size	5 ft. 7 in.
SAE volume, cu. ft. (cu. m.)	50.3 (1.4)
Length at Floor, Tailgate Closed	67.4 (1,712.4)
Cargo Width	66.4 (1,686.9)
Distance Between Wheelhouses	51 (1,295.4)
Depth	20.0 (508.6)
Tailgate Opening Width in.	60.4 (1,535.3)

ACCOMMODATIONS

<i>Model</i>	<i>Crew Cab</i>
Seating Capacity, F/R	2/3

Front

Head Room	41.0 (1,040.5)
Legroom	40.9 (1,039.6)
Shoulder Room	65.9 (1,674.9)
Hip Room	62.9 (1,598.1)
Seat Travel	9.0 (230.0)
Recliner Range, degrees	56° (38 RWD, 18 FWD)

Rear

Head Room	39.9 (1,013.5)
Legroom	40.2 (1,022.3)
Shoulder Room	65.7 (1,670)
Hip Room	62.7 (1,592.7)

Interior Volume

Front – cu. ft. (cu m)	64.0 (1.8)
Rear – cu. ft. (cu m)	61.0 (1.7)





2016 RAM 2500 HEAVY DUTY SPECIFICATIONS

2016 Ram 2500 Heavy Duty SPECIFICATIONS

*Specifications are based on the latest product information available at the time of publication.
All dimensions are in inches (millimeters) unless otherwise noted.
All dimensions measured at curb weight with standard tires and wheels.*

GENERAL INFORMATION

Vehicle Type	Regular Cab, Crew Cab and Mega Cab, 2WD, 4WD
Assembly Plants	Saltillo Truck Assembly Plant, Coahuila, Mexico
EPA Vehicle Class	Standard Pickup

BODY/CHASSIS

Model	2WD	4WD
Layout	Longitudinal, front engine	Longitudinal, front engine, transfer case
Construction	Ladder-type frame, steel cab, double-wall steel pickup box	Ladder-type frame, steel cab, double-wall steel pickup box

ENGINE: 5.7-LITER HEMI® V-8

Type and Description	Eight-cylinder, 90-degree V-8, liquid-cooled with variable-valve timing (VVT)
Displacement	345 cu. in. (5,654 cu. cm)
Bore x Stroke	3.92 x 3.58 (99.5 x 90.9)
Valve System	Pushrod-operated overhead valves, 16 valves, hydraulic lifters with roller followers
Fuel Injection	Sequential, multiport, electronic, returnless
Construction	Deep-skirt cast-iron block with cross-bolted main bearing caps, aluminum alloy heads with hemispherical combustion chambers
Compression Ratio	10.5:1
Power	383 bhp (286 kW) @ 5,600 rpm
Torque	400 lb.-ft. (542 N•m) @ 4,000 rpm
Max. Engine Speed	5,800 rpm
Fuel Requirement	Unleaded mid-grade, 89 octane (R+M)/2 — recommended Unleaded regular, 87 octane (R+M)/2 — acceptable Compressed Natural Gas — optional
Oil Capacity	7.0 quarts (6.6 liters)
Coolant Capacity	18.3 quarts (17.30 liters)
Emission Control	Three-way catalytic converters, heated oxygen sensors, internal engine features and knock sensors



2016 RAM 2500 HEAVY DUTY SPECIFICATIONS

TRANSMISSION: G56 — MANUAL SIX-SPEED OVERDRIVE

Availability	6.7-liter diesel
Description	Synchronized in all gears
Gear Ratios	
1st	5.94
2nd	3.28
3rd	1.98
4th	1.31
5th	1.0
6th	0.74
Reverse	5.42
Axle ratios	3.42

TRANSMISSION: 66RFE — AUTOMATIC SIX-SPEED

Availability	5.7-liter HEMI V-8 and 6.4-liter HEMI V-8
Description	Three planetary gear sets, one overrunning clutch, full electronic control, electronically controlled converter clutch
Gear Ratios	
1st	3.23
2nd	1.84
3rd	1.41
4th	1.00
5th	0.82
6th	0.63
Reverse	4.44
Axle ratios	3.73 and 4.10

TRANSMISSION: 68RFE — AUTOMATIC SIX-SPEED

Availability	6.7-liter diesel
Description	Three planetary gear-sets, one overrunning clutch, full electronic control, electronically controlled converter clutch
Gear Ratios	
1st	3.23
2nd	1.84
3rd	1.41
4th	1.0



2016 RAM 2500 HEAVY DUTY SPECIFICATIONS

TRANSMISSION: G56 — MANUAL SIX-SPEED OVERDRIVE

Availability	6.7-liter diesel
Description	Synchronized in all gears
Gear Ratios	
1st	5.94
2nd	3.28
3rd	1.98
4th	1.31
5th	1.0
6th	0.74
Reverse	5.42
Axle ratios	3.42

TRANSMISSION: 66RFE — AUTOMATIC SIX-SPEED

Availability	5.7-liter HEMI V-8 and 6.4-liter HEMI V-8
Description	Three planetary gear sets, one overrunning clutch, full electronic control, electronically controlled converter clutch
Gear Ratios	
1st	3.23
2nd	1.84
3rd	1.41
4th	1.00
5th	0.82
6th	0.63
Reverse	4.44
Axle ratios	3.73 and 4.10

TRANSMISSION: 68RFE — AUTOMATIC SIX-SPEED

Availability	6.7-liter diesel
Description	Three planetary gear-sets, one overrunning clutch, full electronic control, electronically controlled converter clutch
Gear Ratios	
1st	3.23
2nd	1.84
3rd	1.41
4th	1.0



2016 RAM 2500 HEAVY DUTY SPECIFICATIONS

5th	0.82
6th	0.63
Reverse	4.44
Axle ratios	3.42

TRANSFER CASES: BW 44-46, BW 44-47

Availability	Optional on 6.7-liter diesel, 6.4-liter HEMI V-8 and 5.7-liter HEMI V-8
Type	Part-time – BW 44-47 manual shift and BW 44-46 electric shift
Operating Modes	2WD; 4WD High; Neutral; 4WD Low
Low-range Ratio	2.64
Center Differential	None

AXLES

Front (4x4)	AAM 9.25-inch beam front axle with center disconnect
Rear	AAM 11.5-inch beam rear axle

ELECTRICAL SYSTEM

Alternator	
Rating	160-amp standard with 5.7-liter HEMI V-8
Rating	180-amp included with 6.4-liter HEMI V-8 and 6.7-liter diesel, optional on 5.7-liter HEMI V-8
Rating	Dual (220 and 160) optional on 6.4-liter HEMI V-8
Rating	Dual 220-amp optional on 6.7-liter diesel
Battery	
Description	Group 65, maintenance-free, 730 CCA on 5.7-liter HEMI V-8 and 6.4-liter HEMI V-8
	Dual Group 65, maintenance-free, 730 CCA on 6.7-liter diesel

SUSPENSION

<i>Model</i>	<i>2WD</i>	<i>4WD</i>
Front	Three-link with track bar, coil springs, stabilizer bar, solid axle	Three-link with track bar, coil springs, stabilizer bar, solid axle
Rear	Five-link with track bar, coil springs, stabilizer bar, solid axle	Five-link with track bar, coil springs, stabilizer bar, solid axle (optional air bags)



2016 RAM 2500 HEAVY DUTY SPECIFICATIONS

BRAKES

Front

Size and Type	Rotors 14.17 x 1.54. (359.9 x 39.1) disc with twin-piston pin-slider caliper and ABS
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Rear

Size and Type	Rotors 14.09 x 1.34 (357.9 x 34.0) disc with twin-piston pin-slider caliper and ABS
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Power-assist type	Dual-rate, tandem diaphragm vacuum (gas)
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Hydro-boost (diesel)

AIR BAGS

Regular Cab	6
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Crew Cab	6
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Mega Cab	6
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STEERING

Power-assist	Hydraulic assist
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Regular Cab Pickup

<i>Model</i>	<i>2WD</i>	<i>4WD</i>
Box Length	8-ft.	8-ft.
Wheelbase (nominal)	140.5 (3,568.7)	140.0 (3,556.0)
Turning Diameter – ft. (m) ^(a)	45.1 (13.72)	41.6 (12.68)

Crew Cab[®] Pickup

<i>Model</i>	<i>2WD</i>	<i>2WD</i>	<i>4WD</i>	<i>4WD</i>
Box Length	6-ft., 4-in.	8-ft.	6-ft., 4-in.	8-ft.
Wheelbase (nominal)	149.4 (3,794.8)	169.4 (4,302.8)	148.9 (3,782.1)	168.9 (4,290.1)
Turning Diameter – ft. (m) ^(a)	47.5 (14.48)	53.2 (16.22)	43.9 (13.38)	49.2 (15.0)

Mega Cab Pickup

<i>Model</i>	<i>2WD</i>	<i>4WD</i>
Box Length	6-ft., 4-in.	6-ft., 4-in.
Wheelbase (nominal)	160.5 (4,076.7)	160.0 (4,064.0)
Turning Diameter – ft. (m) ^(a)	50.67 (15.44)	46.86 (14.28)

(a) Turning diameter is measured at the outside of the tires at curb height. Turning diameters and steering wheel turns, lock-to-lock may differ with optional tires and wheels.



2016 RAM 2500 HEAVY DUTY SPECIFICATIONS

Nominal Box Size	6-ft., 4-in. (Regular, Crew or Mega)	8-ft. (Regular, Crew)
SAE volume, cu. ft. (cu. m)	57.5 (1.6)	74.7 (2.1)
Length at Floor, Tailgate Closed	76.3 (1,938.5)	98.3 (2,496.5)
Cargo Width	66.4 (1,686.9)	66.4 (1,686.9)
Distance Between Wheelhouses	51 (1,295.4)	51 (1,295.4)
Depth	20.1 (511.1)	20.2 (513.0)
Tailgate Opening Width	60.4 (1,535.3)	60.4 (1,535.3)

REGULAR CAB 140.5" WB 8-FT. BOX SRW	4x2	4x4
Wheelbase	140.5 (3,568.7)	140.5 (3,568.7)
Track Width – Front	68.6 (1,742.4)	68.3 (1,734.8)
Track Width – Rear	68.2 (1,732.3)	68.2 (1,732.3)
Overall Length	231.0 (5,867.4)	231.0 (5,867.4)
Overall Width @ SgRP Front	78.9 (2,004.1)	78.9 (2,004.1)
Overall Height	73.3 (1,861.8)	75.7 (1,922.8)
Suspension or Axle to Ground – Front	7.6 (193.0)	7.5 (190.5)
Suspension or Axle to Ground – Rear	7.4 (188.0)	7.4 (188.0)
Approach Angle (degrees)	13.2	23.0
Ramp Breakover Angle (degrees)	16.5	16.9
Departure Angle (degrees)	18.1	21.6

CREW CAB 149.5" WB 6-FT. 4-IN. BOX SRW	4x2	4x4
Wheelbase	149.5 (3,797.3)	149.5 (3,797.3)
Track Width – Front	68.6 (1,742.4)	68.3 (1,734.8)
Track Width – Rear	68.2 (1,732.3)	68.2 (1,732.3)
Overall Length	237.4 (6,029.9)	237.4 (6,029.9)
Overall Width @ SgRP Front	79.1 (2,009.1)	79.1 (2,009.1)
Overall Height	73.7 (1,871.9)	77.7 (1,973.6)
Suspension or Axle to Ground – Front	7.1 (180.3)	7.4 (188.0)
Suspension or Axle to Ground – Rear	7.3 (185.4)	7.1 (180.3)
Approach Angle (degrees)	13.4	21.8
Ramp Breakover Angle (degrees)	15.1	18.2
Departure Angle (degrees)	18.8	22.3



2016 RAM 2500 HEAVY DUTY SPECIFICATIONS

CREW CAB 169.5" WB 8-FT. BOX SRW	4x2	4x4
Wheelbase	169.4 (4,302.7)	168.9 (4,290.1)
Track Width – Front	68.6 (1,742.4)	68.3 (1,734.8)
Track Width – Rear	68.2 (1,732.3)	68.2 (1,732.3)
Overall Length	259.4 (6,588.8)	259.4 (6,588.8)
Overall Width @ SgRP Front	79.1 (2,009.1)	79.1 (2,009.1)
Overall Height	73.5 (1,866.9)	77.6 (1,971)
Suspension or Axle to Ground – Front	7.1 (180.3)	7.3 (185.4)
Suspension or Axle to Ground – Rear	7.3 (185.4)	7.2 (182.9)
Approach Angle (degrees)	13.4	21.7
Ramp Breakover Angle (degrees)	14.1	16.5
Departure Angle (degrees)	18.0	21.4

MEGA CAB 160.5" WB 6-FT. 4-IN. BOX SRW	4x2	4x4
Wheelbase	160.5 (4,076.7)	160.0 (4,064)
Track Width – Front	68.6 (1,742.4)	68.3 (1,734.8)
Track Width – Rear	68.2 (1,732.3)	68.2 (1,732.3)
Overall Length	248.4 (6,309.4)	248.4 (6,309.4)
Overall Width @ SgRP Front	79.1 (2,009.1)	79.1 (2,009.1)
Overall Height	74.1 (1,882.1)	78.3 (1,988.8)
Suspension or Axle to Ground – Front	7.8 (198.1)	8.1 (205.7)
Suspension or Axle to Ground – Rear	7.8 (198.1)	7.7 (195.6)
Approach Angle (degrees)	14.0	23.9
Ramp Breakover Angle (degrees)	15.8	18.3
Departure Angle (degrees)	19.1	23.0

ACCOMMODATIONS

Model	Regular Cab	Crew Cab	Mega Cab
Seating Capacity, F/R	3/0 or 2/0	3/3 or 2/3	3/3 or 2/3
Front			
Headroom	39.9 (1,013.5)	41.0 (1,040.5)	41.0 (1,040.5)
Legroom	41 (1,041.4)	41 (1,041.4)	41 (1,041.4)
Shoulder Room	66 (1,676.4)	66 (1,676.4)	66 (1,676.4)
Hip Room	62.9 (1,598.7)	63.2 (1,605.3)	63.2 (1,605.3)
Seat Travel	9.0 (230.0)	9.0 (230.0)	9.0 (230.0)



2016 RAM 2500 HEAVY DUTY SPECIFICATIONS

Recliner Range (degrees)	85 (38 RWD, 47 FWD)	56 (38 RWD, 18 FWD)	56 (38 RWD, 18 FWD)
Rear			
Headroom	N/A	39.9 (1,013.5)	40.3 (1,023.6)
Legroom	N/A	40.3 (1,023.6)	43.3 (1,099.5)
Shoulder Room	N/A	65.7 (1,668.8)	65.7 (1,668.8)
Hip Room	N/A	63.2 (1,605.3)	63.2 (1,605.3)
Interior Volume			
Front – cu. ft. (cu. m)	62.5 (1.8)	64.2 (1.8)	64.2 (1.8)
Rear – cu. ft. (cu. m)	N/A	61.1 (1.7)	66.3 (1.9)





2016 RAM 3500 HEAVY DUTY SPECIFICATIONS

2016 Ram 3500 Heavy Duty SPECIFICATIONS

*Specifications are based on the latest product information available at the time of publication.
All dimensions are in inches (millimeters) unless otherwise noted.
All dimensions measured at curb weight with standard tires and wheels.*

GENERAL INFORMATION

Vehicle Type	Regular Cab, Crew Cab and Mega Cab, 2WD, 4WD
Assembly Plants	Saltillo Truck Assembly Plant, Coahuila, Mexico
EPA Vehicle Class	Standard Pickup

BODY AND CHASSIS

Model	2WD	4WD
Layout	Longitudinal, front engine	Longitudinal, front engine, transfer case
Construction	Ladder-type frame, steel cab, double-wall steel pickup box	Ladder-type frame, steel cab, double-wall steel pickup box

ENGINE: 5.7-LITER HEMI® V-8

Type and Description	Eight-cylinder, 90-degree V-8, liquid-cooled with variable-valve timing (VVT)
Displacement	345 cu. in. (5,654 cu. cm)
Bore x Stroke	3.92 x 3.58 (99.5 x 90.9)
Valve System	Pushrod-operated overhead valves, 16 valves, hydraulic lifters with roller followers
Fuel Injection	Sequential, multiport, electronic, returnless
Construction	Deep-skirt cast-iron block with cross-bolted main bearing caps, aluminum alloy heads with hemispherical combustion chambers
Compression Ratio	10.5:1
Power	383 bhp (286 kW) @ 5,600 rpm
Torque	400 lb.-ft. (542 N•m) @ 4,000 rpm
Max. Engine Speed	5,800 rpm
Fuel Requirement	Unleaded mid-grade, 89 octane (R+M)/2 — recommended Unleaded regular, 87 octane (R+M)/2 — acceptable
Oil Capacity	7.0 quarts (6.6 liters)
Coolant Capacity	18.3 quarts (17.3 liters)
Emission Control	Three-way catalytic converters, heated oxygen sensors, internal engine features and knock sensors



2016 RAM 3500 HEAVY DUTY SPECIFICATIONS

ENGINE: 6.4-LITER HEMI® V-8

Type and Description	Eight-cylinder, 90-degree V-type, liquid-cooled, with variable-valve timing (VVT)
Displacement	392 cu. in. (6,417 cu. cm)
Bore x Stroke	4.09 x 3.72 (103.9 x 94.6)
Valve System	VVT, push-rod operated overhead valves (16, two per cylinder), eight de-activating and eight hydraulic lifters all with roller followers
Fuel Injection	Sequential, multiport, electronic, returnless
Construction	Deep-skirt cast-iron block with cross-bolted main bearing caps, 356 aluminum cylinder heads with hemispherical combustion chambers
Compression Ratio	10.0:1
Power	410 hp (306 kW) @ 5,600 rpm (all configurations except Mega Cab) Mega Cab — 370 hp (276 kW) @ 4,600 rpm
Torque	429 lb.-ft. (582 N•m) at 4,000 rpm
Maximum Engine Speed	5,800 rpm limited
Fuel Requirement	Unleaded regular, 87 octane (R+M)/2
Oil Capacity	7.0 quarts (6.6 liters)
Coolant Capacity	16.6 quarts (15.75 liters)
Emission Control	Three-way catalytic converters, heated oxygen sensors, cooled electronic EGR and individual cylinder fuel control

ENGINE: 6.7-LITER CUMMINS TURBO DIESEL I-6 (three versions)

Type and Description	Six-cylinder, inline, liquid-cooled, turbocharged, intercooled
Displacement	408 cu. in. (6,690 cu. cm)
Bore x Stroke	4.21 x 4.88 (107 x 124)
Valve System	OHV, 24 valves, solid lifters
Fuel Injection	Electronic high-pressure common rail
Construction	Cast-iron block and head
Compression Ratio	16.2:1
Power	350 bhp (261 kW) @ 2,800 rpm (G56 manual transmission)
Torque	660 lb.-ft. (881 N•m) @ 1,500 rpm
Power	370 bhp (276 kW) @ 2,800 rpm (68RFE automatic transmission)
Torque	800 lb.-ft. (1,084 N•m) @ 1,600 rpm
Power	385 bhp (287 kW) @ 2,800 rpm (AS69RC automatic transmission)
Torque	900 lb.-ft. (1,220 N•m) @ 1,700 rpm (3500 only)
Maximum High-idle Engine Speed	3,200 rpm
Fuel Requirement	Ultra low-sulfur diesel
Oil Capacity	12.0 quarts (11.3 liters) with filter



2016 RAM 3500 HEAVY DUTY SPECIFICATIONS

Coolant Capacity	23.8 quarts (22.50 liters)
Emission Controls	Selective Catalytic Reduction (SCR)

TRANSMISSION: G56 — MANUAL SIX-SPEED OVERDRIVE

Availability	6.7-liter diesel
Description	Synchronized in all gears
Gear Ratios	
1st	5.94
2nd	3.28
3rd	1.98
4th	1.31
5th	1.0
6th	0.74
Reverse	5.42
Axle ratios	3.42, 3.73 (DRW only)

TRANSMISSION: 66RFE — AUTOMATIC SIX-SPEED

Availability	5.7-liter HEMI V-8 and 6.4-liter HEMI V-8
Description	Three planetary gear sets, one overrunning clutch, full electronic control, electronically controlled converter clutch
Gear Ratios	
1st	3.23
2nd	1.84
3rd	1.41
4th	1.00
5th	0.82
6th	0.63
Reverse	4.44
Axle ratios	3.73, 4.10



2016 RAM 3500 HEAVY DUTY SPECIFICATIONS

TRANSMISSION: 68RFE — AUTOMATIC SIX-SPEED

Availability	6.7-liter diesel
Description	Three planetary gear-sets, one overrunning clutch, full electronic control, electronically controlled converter clutch
Gear Ratios	
1st	3.23
2nd	1.84
3rd	1.41
4th	1.0
5th	0.82
6th	0.63
Reverse	4.44
Axle Ratios	3.42, 3.73 (DRW only), 4.10 (DRW only)

TRANSMISSION: AS69RC — AUTOMATIC SIX-SPEED

Availability	6.7-liter diesel
Description	Three planetary gear-sets,, full electronic control, electronically controlled converter clutch
Gear Ratios	
1st	3.75
2nd	2.0
3rd	1.34
4th	1.0
5th	0.77
6th	0.63
Reverse	3.54
Axle ratios	3.42, 3.73 (DRW only), 4.10 (DRW only)

TRANSFER CASES: BW 44-46, BW 44-47

Availability	Optional on 6.7-liter diesel and 5.7-liter HEMI V-8 and 6.4-liter HEMI V-8
Type	Part-time — BW 44-47 manual shift and BW 44-46 electric shift
Operating Modes	2WD; 4WD High; Neutral; 4WD Low
Low-range Ratio	2.64
Center Differential	None



2016 RAM 3500 HEAVY DUTY SPECIFICATIONS

AXLES

Front	AAM 9.25-inch beam front axle with center disconnect
Rear	AAM 11.5-inch and 11.8-inch beam rear axles

ELECTRICAL SYSTEM

Alternator

Rating	160-amp standard with 5.7-liter HEMI V-8
Rating	180-amp included with 6.4-liter HEMI V-8 and 6.7-liter, optional on 5.7-liter HEMI V-8
Rating	Dual (220-amp and 160-amp) optional on 6.4-liter HEMI V-8
Rating	Dual 220-amp optional on 6.7-liter diesel

Battery

Description	Group 65, maintenance-free, 730 CCA on 5.7-liter HEMI V-8 and 6.4-liter HEMI V-8
	Dual Group 65, maintenance-free, 730 CCA on 6.7-liter diesel

SUSPENSION

<i>Model</i>	<i>2WD</i>	<i>4WD</i>
Front	Three-link with track bar, coil springs, stabilizer bar, solid axle	Three-link with track bar, coil springs, stabilizer bar, solid axle
Rear	Hotchkiss leaf spring, solid axle	Hotchkiss leaf spring, solid axle (optional supplemental air bags)

BRAKES

Front

Size and Type	Rotors 14.17 x 1.54 (359.9 x 39.1) disc with twin-piston pin-slider caliper and ABS
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Rear

Size and Type	Rotors 14.09 x 1.34 (357.9 x 34.0) disc with twin-piston pin-slider caliper and ABS
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Power-assist type	Dual-rate, tandem diaphragm vacuum (gas) Hydro-boost (diesel)
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AIR BAGS

Regular Cab	6
Crew Cab	6
Mega Cab	6



2016 RAM 3500 HEAVY DUTY SPECIFICATIONS

REGULAR CAB 140.5"WB 8-FT. BOX SRW	4x2	4x4
Wheelbase	140.5 (3,568.7)	140.5 (3,568.7)
Track Width – Front	67.7 (1,719.6)	67.7 (1,719.6)
Track Width – Rear	67.1 (1,704.3)	67.1 (1,704.3)
Overall Length	230.4 (5,852.2)	230.4 (5,852.2)
Overall Width @ SgRP Front	79.1 (2,009.1)	79.1 (2,009.1)
Overall Height	78.4 (1,991.4)	79.8 (2,026.9)
Suspension or Axle to Ground – Front	7.3 (185.4)	9.2 (233.7)
Suspension or Axle to Ground – Rear	8.6 (218.4)	8.6 (218.4)
Approach Angle (degrees)	20.9	25.1
Ramp Breakover Angle (degrees)	20.8	21.3
Departure Angle (degrees)	24.8	25.6

REGULAR CAB 140.5" WB 8-FT. BOX DRW	4x2	4x4
Wheelbase	140.0	140.5 (3,568.7)
Track Width – Front	68.6 (1,742.4)	69.5 (1,765.3)
Track Width – Rear	75.8 (1,925.3)	75.8 (1,925.3)
Overall Length	230.4 (5,852.2)	230.4 (5,852.2)
Overall Width @ SgRP Front	78.9 (2,004.1)	78.9 (2,004.1)
Overall Height	76.9 (1,953.3)	78.5 (1,993.9)
Suspension or Axle to Ground – Front	6.5 (165.1)	8.5 (215.9)
Suspension or Axle to Ground – Rear	7.9 (200.7)	7.9 (200.7)
Approach Angle (degrees)	19.1	23.6
Ramp Breakover Angle (degrees)	17.2	19.7
Departure Angle (degrees)	23.2	23.8

CREW CAB 149.5" WB 6-FT. 4-IN. BOX SRW	4x2	4x4
Wheelbase	149.5 (3,797.3)	149.5 (3,797.3)
Track Width – Front	67.7 (1,719.6)	67.7 (1,719.6)
Track Width – Rear	67.1 (1,704.3)	67.1 (1,704.3)
Overall Length	237.3 (6,027.4)	237.3 (6,027.4)
Overall Width @ SgRP Front	79.1 (2,009.1)	79.1 (2,009.1)
Overall Height	78.4 (1,991.4)	79.8 (2,026.9)
Suspension or Axle to Ground – Front	7.3 (185.4)	9.2 (233.7)
Suspension or Axle to Ground – Rear	8.6 (218.4)	8.6 (218.4)
Approach Angle (degrees)	20.9	25.1



2016 RAM 3500 HEAVY DUTY SPECIFICATIONS

Ramp Breakover Angle (degrees)	20.8	21.3
Departure Angle (degrees)	24.8	25.6
CREW CAB 169.5" WB 8-FT. BOX SRW		
	4x2	4x4
Wheelbase	168.9 (4,290.1)	169.3 (4,300.2)
Track Width – Front	67.7 (1,719.6)	67.7 (1,719.6)
Track Width – Rear	67.1 (1,704.3)	67.1 (1,704.3)
Overall Length	259.3 (6,586.2)	259.3 (6,586.2)
Overall Width @ SgRP Front	79.1 (2,009.1)	79.1 (2,009.1)
Overall Height	78.2 (1,986.3)	79.6 (2,021.8)
Suspension or Axle to Ground – Front	7.3 (185.4)	9.1 (231.1)
Suspension or Axle to Ground – Rear	8.6 (218.4)	8.6 (218.4)
Approach Angle (degrees)	21.0	25.1
Ramp Breakover Angle (degrees)	19.5	19.3
Departure Angle (degrees)	23.7	24.4
CREW CAB 169.5" WB 8-FT. BOX DRW		
	4x2	4x4
Wheelbase	168.9 (4,290.1)	169.3 (4,300.2)
Track Width – Front	68.6 (1,742.4)	69.5 (1,765.3)
Track Width – Rear	75.8 (1,925.3)	75.8 (1,925.3)
Overall Length	259.3 (6,586.2)	259.3 (6,586.2)
Overall Width @ SgRP Front	79.1 (2,009.1)	79.1 (2,009.1)
Overall Height	77.4 (1,966.0)	78.9 (2,004.1)
Suspension or Axle to Ground – Front	6.4 (162.6)	8.4 (213.4)
Suspension or Axle to Ground – Rear	7.9 (200.7)	7.9 (200.7)
Approach Angle (degrees)	19.2	23.6
Ramp Breakover Angle (degrees)	14.6	16.9
Departure Angle (degrees)	22.9	23.6



2016 RAM 3500 HEAVY DUTY SPECIFICATIONS

MEGA CAB 160.5" WB 6-FT. 4-IN. BOX SRW	4x2	4x4
Wheelbase	160.0 (4,064)	160.4 (4,074.2)
Track Width – Front	67.7 (1,719.6)	67.7 (1,719.6)
Track Width – Rear	67.1 (1,704.3)	67.1 (1,704.3)
Overall Length	248.4 (6,309.4)	248.4 (6,309.4)
Overall Width @ SgRP Front	79.1 (2,009.1)	79.1 (2,009.1)
Overall Height	78.3 (1,988.8)	79.7 (2,024.4)
Suspension or Axle to Ground – Front	7.3 (185.4)	9.1 (231.1)
Suspension or Axle to Ground – Rear	8.6 (218.4)	8.7 (221)
Approach Angle (degrees)	20.9	25.1
Ramp Breakover Angle (degrees)	20.1	20.1
Departure Angle (degrees)	24.7	25.5

MEGA CAB 160.5" WB 6-FT. 4-IN. BOX DRW	4x2	4x4
Wheelbase	160.0 (4,064)	160.4 (4,074.2)
Track Width – Front	68.6 (1,742.4)	69.5 (1,765.3)
Track Width – Rear	75.8 (1,925.3)	75.8 (1,925.3)
Overall Length	248.4 (6,309.4)	248.4 (6,309.4)
Overall Width @ SgRP Front	79.1 (2,009.1)	79.1 (2,009.1)
Overall Height	77.5 (1,968.5)	79.0 (2,006.6)
Suspension or Axle to Ground – Front	6.4 (162.6)	8.4 (213.4)
Suspension or Axle to Ground – Rear	7.9 (200.7)	7.8 (198.1)
Approach Angle (degrees)	19.1	23.6
Ramp Breakover Angle (degrees)	15.2	17.6
Departure Angle (degrees)	23.9	24.6



2016 RAM 3500 HEAVY DUTY SPECIFICATIONS

ACCOMMODATIONS

<i>Model</i>	<i>Regular Cab</i>	<i>Crew Cab</i>	<i>Mega Cab</i>
Seating Capacity, F/R	3/0 or 2/0	3/3 or 2/3	3/3 or 2/3
Front			
Headroom	39.9 (1,013.5)	41.0 (1,040.5)	41.0 (1,040.5)
Legroom	41 (1,041.4)	41 (1,041.4)	41 (1,041.4)
Shoulder Room	66 (1,676.4)	66 (1,676.4)	66 (1,676.4)
Hip Room	62.9 (1,598.7)	63.2 (1,605.3)	63.2 (1,605.3)
Seat Travel	9.0 (230.0)	9.0 (230.0)	9.0 (230.0)
Recliner Range (degrees)	85 (38 RWD, 47 FWD)	56 (38 RWD, 18 FWD)	56 (38 RWD, 18 FWD)
Rear			
Headroom	N/A	39.9 (1,013.5)	40.3 (1,023.6)
Legroom	N/A	40.3 (1,023.6)	43.3 (1,099.5)
Shoulder Room	N/A	65.7 (1,668.8)	65.7 (1,668.8)
Hip Room	N/A	63.2 (1,605.3)	63.2 (1,605.3)
Interior Volume			
Front – cu. ft. (cu. m)	62.5 (1.8)	64.2 (1.8)	64.2 (1.8)
Rear – cu. ft. (cu. m)	N/A	61.1 (1.7)	66.3 (1.9)





2016 RAM 4500 & 5500 CHASSIS CAB SPECIFICATIONS

2016 Ram 4500 & 5500 Chassis Cab SPECIFICATIONS

*Specifications are based on the latest product information available at the time of publication.
All dimensions are in inches (millimeters) unless otherwise noted.
All dimensions measured at curb weight with standard tires and wheels.*

GENERAL INFORMATION

Vehicle Type	Chassis Cab: Regular Cab and Crew Cab, 2WD, 4WD
Assembly Plant	Saltillo Truck Assembly Plant, Saltillo, Mexico
EPA Vehicle Class	Medium Heavy Duty
Introduction	2008 Model Year

ENGINE: 6.4-LITER HEMI® V-8

Availability	Standard
Type and Description	Eight-cylinder, 90-degree V-type, liquid-cooled, with variable-valve timing (VVT)
Displacement	392 cu. in. (6,417 cu. cm)
Bore x Stroke	4.09 x 3.72 (103.9 x 94.6)
Valve System	VVT, push-rod operated overhead valves (16, two per cylinder), eight de-activating and eight hydraulic lifters with all roller followers
Fuel Injection	Sequential, multiport, electronic, returnless
Construction	Deep-skirt cast-iron block with cross-bolted main bearing caps, 356 aluminum cylinder heads with hemispherical combustion chambers
Compression Ratio	10:1
Power (SAE gross)	366 hp (302 kW) @ 4,500 rpm
Torque (SAE gross)	429 lb.-ft. (582 N•m) at 4,500 rpm
Maximum Engine Speed	4,800 rpm limited with Aisin
Fuel Requirement	Unleaded regular, 87 octane (R+M)/2
Oil Capacity	7 quarts (6.6 liters)
Coolant Capacity	18.3 quarts (17.3 liters)
Emission Control	Three-way catalytic converters, heated oxygen sensors, cooled electronic EGR and individual cylinder fuel control

ENGINE: 6.7-LITER CUMMINS TURBO DIESEL I-6

Availability	Manual six-speed transmission
Type and Description	Six-cylinder, inline, liquid-cooled, turbocharged, intercooled
Displacement	408 cu. in. (6,690 cu. cm)



2016 RAM 4500 & 5500 CHASSIS CAB SPECIFICATIONS

Bore x Stroke	4.21 x 4.88 (107 x 124)
Valve System	OHV, 24 valves, solid lifters
Fuel Injection	Electronic high-pressure common rail
Construction	Cast-iron block and head
Compression Ratio	17.3:1
Power (SAE gross)	320 hp (239 kW) @ 2,800 rpm
Torque (SAE net)	650 lb.-ft. (881 N•m) @ 1,400 rpm
Maximum Engine Speed	3,200 rpm
Fuel Requirement	Ultra low-sulfur diesel
Oil Capacity	12.0 quarts (11.3 liters) with filter
Coolant Capacity	23.8 quarts (22.5 liters)
Emission Controls	Selective Catalytic Reduction (SCR)

ENGINE: 6.7-LITER HIGH OUTPUT CUMMINS TURBO DIESEL I-6

Availability	Optional with Aisin six-speed automatic
Type and Description	Six-cylinder, inline, liquid-cooled, turbocharged, intercooled
Displacement	408 cu. in. (6,690 cu. cm)
Bore x Stroke	4.21 x 4.88 (107 x 124)
Valve System	OHV, 24 valves, solid lifters
Fuel Injection	Electronic high-pressure common rail
Construction	Cast-iron block and head
Compression Ratio	17.3:1
Power (SAE gross)	325 hp (242 kW) @ 2,400 rpm
Torque (SAE gross)	750 lb.-ft. (1,017 N•m) @ 1,500 rpm
Maximum Engine Speed	3,200 rpm
Fuel Requirement	Ultra low-sulfur diesel
Oil Capacity	12.0 quarts (11.3 liters) with filter
Coolant Capacity	23.8 quarts (22.5 liters)
Emission Controls	Selective Catalytic Reduction (SCR)

TRANSMISSION: G56 — MANUAL SIX-SPEED OVERDRIVE

Availability	6.7-liter diesel
Description	Synchronized in all gears



2016 RAM 4500 & 5500 CHASSIS CAB SPECIFICATIONS

Gear Ratios	
1st	5.94
2nd	3.28
3rd	1.98
4th	1.31
5th	1.0
6th	0.74
Reverse	5.42
Axle ratios	4500: 4.10, 4.44
	5500: 4.10, 4.44
PTO	Left -or right-side with split shaft capability

TRANSMISSION: AS66RC — AUTOMATIC SIX-SPEED

Availability	6.4-liter HEMI V-8
Description	Three planetary gear-sets, one overrunning clutch, full electronic control, electronically controlled converter clutch
Gear Ratios	
1st	3.75
2nd	2.0
3rd	1.34
4th	1.0
5th	0.77
6th	0.63
Reverse	3.54
Axle ratios	4500: 4.44, 4.88
	5500: 4.88
PTO	Left- or right-side capability

TRANSMISSION: AS69RC — AUTOMATIC SIX-SPEED

Availability	6.7-liter diesel
Description	Three planetary gear-sets, one overrunning clutch, full electronic control, electronically controlled converter clutch
Gear Ratios	
1st	3.75
2nd	2.0
3rd	1.34



2016 RAM 4500 & 5500 CHASSIS CAB SPECIFICATIONS

4th	1.0
5th	0.77
6th	0.63
Reverse	3.54
Axle ratios	4500: 4.10, 4.44 5500: 4.10, 4.44 and 4.88
PTO	Left -or right-side with split shaft capability

TRANSFER CASES: BW 44-46, BW 44-47

Availability	Optional on 6.7-liter diesel and 6.4-liter HEMI V-8
Type	Part-time – BW 44-47 manual shift and BW 44-46 electric shift
Operating Modes	2WD; 4WD High; Neutral; 4WD Low
Low-range Ratio	2.64
Center Differential	None

AXLES

See feature availability chart

ELECTRICAL SYSTEM

See feature availability chart

SUSPENSION

Front	5-link suspension
Rear	Hotchkiss leaf spring suspension, solid axle

BRAKES

Front	
Size and Type	Rotors 15.3 x 1.5 (390 x 39) vented disc with 2-piston 2.6 (66) caliper
Rear	
Size and Type	Rotors 15.3 x 1.5 (390 x 39) vented disc with 2-piston 2.6 (66) caliper
Power-assist Type	Hydro-boost

AIR BAGS

Regular Cab	2
Crew Cab	2



2016 RAM 4500 & 5500 CHASSIS CAB SPECIFICATIONS

STEERING

Power-assist	Hydraulic assist
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DIMENSIONS AND CAPACITIES

Regular Cab 144.5-in. WB 60-in. CA DRW	4x2	4x4
Wheelbase	144.5 (3,670.3)	144.5 (3,670.3)
Turning Diameter – ft. (m) ^(a)	41.7 (12.7)	41.7 (12.7)
Track Width – Front	76.0 (1,930.4)	76.0 (1,930.4)
Track Width – Rear	73.6 (1,869.4)	73.6 (1,869.4)
Overall Length	234.3 (5,951.2)	234.3 (5,951.2)
Overall Width @ Single Ground Reference Point (SgRP) Front	78.9 (2,004.1)	78.9 (2,004.1)
Overall Height	80.1 (2,034.5)	80.1 (2,034.5)
Suspension or Axle to Ground – Front	10.3 (261.6)	8.7 (221)
Suspension or Axle to Ground – Rear	8.4 (213.4)	8.4 (213.4)
Approach Angle (degrees)	28.3	28.3
Ramp Breakover Angle (degrees)	23.7	23.7
Departure Angle (degrees)	31.1	31.1
Regular Cab 168.5-in. WB 84-in. CA DRW	4x2	4x4
Wheelbase	168.5 (4,279.9)	168.5 (4,279.9)
Turning Diameter – ft. (m) ^(a)	47.95 (14.6)	47.95 (14.6)
Track Width – Front	76.0 (1,930.4)	76.0 (1,930.4)
Track Width – Rear	73.6 (1,869.4)	73.6 (1,869.4)
Overall Length	258.3 (6,560.8)	258.3 (6,560.8)
Overall Width @ Single Ground Reference Point (SgRP) Front	78.9 (2,004.1)	78.9 (2,004.1)
Overall Height	80.0 (2,032)	80.0 (2,032)
Suspension or Axle to Ground – Front	10.3 (261.6)	8.7 (221)
Suspension or Axle to Ground – Rear	8.4 (213.4)	8.4 (213.4)
Approach Angle (degrees)	28.4	28.4
Ramp Breakover Angle (degrees)	20.8	20.8
Departure Angle (degrees)	31.0	31.0
Regular Cab 192.5-in. WB 108-in. CA DRW	4x2	4x4
Wheelbase	192.5 (4,889.5)	192.5 (4,889.5)
Turning Diameter – ft. (m) ^(a)	54.09 (16.5)	54.09 (16.5)
Track Width – Front	76.0 (1,930.4)	76.0 (1,930.4)



2016 RAM 4500 & 5500 CHASSIS CAB SPECIFICATIONS

Track Width – Rear	73.6 (1,869.4)	73.6 (1,869.4)
Overall Length	282.3 (7,170.4)	282.3 (7,170.4)
Overall Width @ Single Ground Reference Point (SgRP) Front	78.9 (2,004.1)	78.9 (2,004.1)
Overall Height	79.9 (2,029.5)	79.9 (2,029.5)
Suspension or Axle to Ground – Front	10.3 (261.6)	8.8 (223.5)
Suspension or Axle to Ground – Rear	8.4 (213.4)	8.4 (213.4)
Approach Angle (degrees)	28.5	28.5
Ramp Breakover Angle (degrees)	18.2	18.2
Departure Angle (degrees)	30.9	30.9

Regular Cab 204.5-in. WB 120-in. CA DRW	4x2	4x4
Wheelbase	204.5 (5,194.3)	204.5 (5,194.3)
Turning Diameter – ft. (m) ^(a)	57.2 (17.4)	57.2 (17.4)
Track Width – Front	76.0 (1,930.4)	76.0 (1,930.4)
Track Width – Rear	73.6 (1,869.4)	73.6 (1,869.4)
Overall Length	294.3 (7,475.2)	294.3 (7,475.2)
Overall Width @ Single Ground Reference Point (SgRP) Front	78.9 (2,004.1)	78.9 (2,004.1)
Overall Height	79.8 (2,026.9)	79.8 (2,026.9)
Suspension or Axle to Ground – Front	10.3 (261.6)	8.7 (221)
Suspension or Axle to Ground – Rear	8.4 (213.4)	8.4 (213.4)
Approach Angle (degrees)	28.6	28.6
Ramp Breakover Angle (degrees)	17.2	17.2
Departure Angle (degrees)	30.8	30.8

Crew Cab 173.4-in. WB 60-in. CA DRW	4x2	4x4
Wheelbase	173.4 (4,404.4)	173.4 (4,404.4)
Turning Diameter – ft. (m) ^(a)	49.2 (15)	49.2 (15)
Track Width – Front	76.0 (1,930.4)	76.0 (1,930.4)
Track Width – Rear	73.6 (1,869.4)	73.6 (1,869.4)
Overall Length	263.2 (6,685.3)	263.2 (6,685.3)
Overall Width @ Single Ground Reference Point (SgRP) Front	79.1 (2,009.1)	79.1 (2,009.1)
Overall Height	80.6 (2,047.2)	80.6 (2,047.2)
Suspension or Axle to Ground – Front	10.3 (261.6)	8.7 (221)
Suspension or Axle to Ground – Rear	8.4 (213.4)	8.4 (213.4)
Approach Angle (degrees)	28.5	28.5
Ramp Breakover Angle (degrees)	20.4	20.4



2016 RAM 4500 & 5500 CHASSIS CAB SPECIFICATIONS

Departure Angle (degrees)	31.0	31.0
Crew Cab 197.4-in. WB 84-in. CA DRW	4x2	4x4
Wheelbase	197.4 (5,014)	197.4 (5,014)
Turning Diameter – ft. (m) ^(a)	55.7 (17)	55.7 (17)
Track Width – Front	76.0 (1,930.4)	76.0 (1,930.4)
Track Width – Rear	73.6 (1,869.4)	73.6 (1,869.4)
Overall Length	287.2 (7,294.9)	287.2 (7,294.9)
Overall Width @ Single Ground Reference Point (SgRP) Front	79.1 (2,009.1)	79.1 (2,009.1)
Overall Height	80.5 (2,044.7)	80.5 (2,044.7)
Suspension or Axle to Ground – Front	10.3 (261.6)	8.7 (221)
Suspension or Axle to Ground – Rear	8.4 (213.4)	8.4 (213.4)
Approach Angle (degrees)	28.6	28.6
Ramp Breakover Angle (degrees)	17.8	17.8
Departure Angle (degrees)	30.8	30.8

(a) Turning diameter is measured at the outside of the tires at curb height. Turning diameters and steering wheel turns, lock-to-lock may differ with optional tires and wheels.



2016 RAM 4500 & 5500 CHASSIS CAB SPECIFICATIONS

<i>Model</i>	<i>Regular Cab</i>	<i>Crew Cab</i>
Seating Capacity, F/R	3/0 or 2/0	3/3 or 2/3
Front		
Headroom	39.9 (1,013.5)	41.0 (1,041.4)
Legroom	41 (1,041.4)	41 (1,041.4)
Shoulder Room	66 (1,676.4)	66 (1,676.4)
Hip Room	62.9 (1,598.7)	63.2 (1,605.3)
Seat Travel	9.0 (230.0)	9.0 (230.0)
Recliner Range (degrees)	85 (38 RWD, 47 FWD)	56 (38 RWD, 18 FWD)
Rear		
Headroom	N/A	39.9 (1,013.5)
Legroom	N/A	40.3 (1,023.3)
Shoulder Room	N/A	65.7 (1,668.8)
Hip Room	N/A	63.2 (1,605.3)
Interior Volume		
Front – cu. ft. (cu. m)	62.5 (1.8)	64.2 (1.8)
Rear – cu. ft. (cu. m)	N/A	61.1 (1.7)

