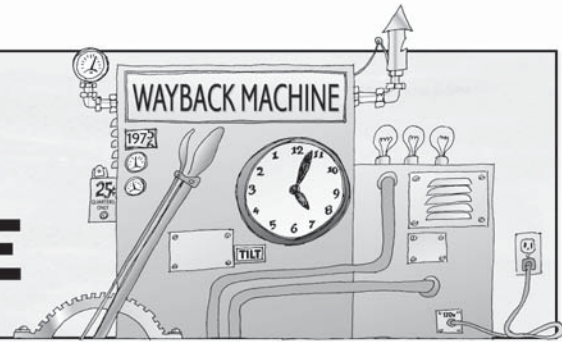


# THE WAY WE WERE



*It has been duly noted that the TDR has reprinted material from previous magazines. Realizing when this practice is appropriate is a difficult task—darned if you do, darned if you don't.*

*From time to time we will crank up the “way-back machine” and repeat material that is relevant. For this issue I went back to early 2000, Issue 27, and found an article that will help members understand their truck's towing capabilities. In other words, there are reasons the 2003 trucks are rated to tow more than your old '89. However, even with the new higher output ratings, there are still complaints of low power. Perhaps member expectations should be calibrated? Read on!*

## HORSEPOWER CALCULATION

Hi folks. I'm going to give you some excerpts from a letter to our technical advisor Jim Anderson. Perhaps it was not meant for review by the editor. We've located this in the TDRResource heading of the magazine as we used a Cummins factory resource (computer program) to analyze and set realistic expectations for the driving scenario. I will withhold the name of the TDR member. I'm confident the writer has had the opportunity to read several TDR magazines, as the title of his correspondence gives him away. Below are the key comments:

### I am Not My Own Warranty

*We have a '98 3500, Turbo Diesel, quad cab with automatic transmission. It currently has 24,000 miles, 90% while towing. We pull a 35' Cardinal fifth-wheel trailer. The combined weight of our rig is 20,750 lbs.*

*I maintain my service warranty by using Dodge dealers when servicing the truck's oil and fuel systems. I have brought the TDR magazine with me pointing out the various upgrades from TST, BD and other vendors. No Dodge dealer would install these upgrades, because of their view of the warranty process. As our travel continued and we encountered the mountains of the Northwest, the truck's pulling performance declined. I had to shift down to second gear to climb hills. When cresting a hill the truck speed would go down to 30/35 mph, the engine temperature rising to 200 degrees.*

*I have become convinced at this point that the truck needs an upgrade to increase hp and torque.*

*While waiting for the service I talked to the service manager (at an unnamed Dodge dealership) about my power problem. I related my experience to date with Dodge dealers overall blind view in this area. He said the dealership can install a “stage two upgrade” that would increase my hp to 270/300 and the torque to*

*600 ft lbs. This upgrade would be warranted! After picking my chin up off the floor I asked what was included in the upgrade. (Editors note: My chin is on the floor as the owner believes this . . .)*

*The dealership completed the upgrade, tested it, and turned it over to me. I am more than satisfied.*

*My conclusion is that this dealership knows the Dodge truck and they have the expertise to handle service and upgrades, all within the parameters of the existing warranty.*

### Gottahav MoPower Everywhere, USA

Editor's comments: As noted, Mr. MoPower has had the opportunity to read previous TDR magazines. With his combined vehicle weight of 20,750 pounds he voided his warranty consideration the moment he rolled over the curb. Reference, Issue 26, page 35: “Your warranty will not cover the cost of repairing damage or conditions caused by any of the following: misuse—overloading.”

Shall we talk further about his performance upgrade? The answer to the right-of-warranty consideration question . . . no, no, no, a thousand times, no. Even though his performance upgrade was done at a Dodge dealership, the customer is his own warranty station. Do not expect that any of the other 2,684 Dodge dealerships would cover a power-related driveline or engine problem.

Just because the “stage two upgrade” was installed at a Dodge dealership does not make it right. Upon reading this commentary, I'm confident our DaimlerChrysler friends in Detroit will also have their chins on the floor. Their next move will be to the telephone to correct the situation.

Obviously, we've not been clear in our previous sermons? I had to go no further back than Issue 26 to find a detailed four-page exposé on warranty/aftermarket enhancements. We've also noted that “when it involves ‘power upgrades’ Dodge and Cummins agencies play it by-the-book and do not venture outside the factory/EPA-approved fuel pump and performance standards.” This TDR member found the dealership that is the exception to the rule.

Rest assured, the dealership will not be the exception for much longer.

## THE WAY WE WERE . . . . Continued

### LOW POWER/SPEED ANALYSIS/REALISTIC EXPECTATIONS

I'd like to use the previous letter from Mr. MoPower as an example to further investigate the performance of the Turbo Diesel and set some realistic expectations. Mr. MoPower noted that prior to the performance upgrade he had to use second gear to climb hills and that "When cresting the hill the truck speed would go down to 30/35 mph." Is second gear operation (remember, Mr. MoPower's rig was an automatic) at 30/35 mph realistic?

Further, let's outline the typical situation that can start an adversarial customer/dealership relationship. The scenario:

While traveling, Sammy Stocktruck meets Gottahav MoPower at the travel park. Stocktruck and MoPower have occasion to discuss their trucks and each has an opportunity to drive the other's vehicle. Impressed with MoPower's vehicle, Stocktruck asks, "How did you get so much power?" Mr. MoPower pulls a fast one on Stocktruck and responds, "Heck I added this intake box and changed the muffler but that's all I've done to my truck." Mr. Stocktruck is bewildered.

Upon returning to his home base, Mr. Stocktruck schedules his truck into the Dodge dealership to diagnose a low power complaint. I'll resist the temptation to ad-lib the owner/service manager/mechanic discussions concerning the service visit. I will conclude that the owner feels he has been given the run-around and the service manager is frustrated by his inability to correct the situation.

Run-around? Inability? Perhaps we should analyze the situation.

In previous TDR magazines we've used mathematics to calculate engine horsepower. We've also used mathematics to help with tire size/miles-per-hour/engine rpm calculations. How might we use the numbers to explain Mr. Stocktruck's low power complaint scenario and Mr. MoPower's (prior to his performance upgrade) 30/35 crest-of-the-hill concern?

First let's remove the blinders and look outside the world of the Turbo Diesel. I recently read a Monaco Motorcoach factory newsletter. Their commentary caught my eye:

"You may be surprised to learn about how much horsepower it takes to move your coach down the road, even a flat one. You may be further surprised at just how much more power (spell that fuel) it takes to drive 75 mph, as opposed to 55 or 60 mph.

"An average Monaco coach towing a car requires 91 horsepower to travel down the road at 54.8 mph. Driving 59.0 mph requires 109 horsepower. To add just 2 mph and drive 61 mph takes 118 horsepower. Add 10 mph to that, and to cruise at 71, takes 172 horsepower. To drive fast, 75 mph takes 197 horsepower.

"Let's address 'non-flat' ground for a moment. Same coach going up a mild 3% grade. 54.8 mph takes 278 horsepower. A 5% grade will require 500 horsepower to blast over at 65 mph. For you deep thinkers, factor in a 5 mph tailwind. For you really deep thinkers, consider this information and then tell me what your fuel economy should be."

Although the Monaco article looked at fuel economy, I wondered, "How did the author derive the horsepower numbers?" Could I do the same for a Turbo Diesel pulling a trailer? Surprisingly, the answer was yes!



VMS Trucking  
Regional Haul

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Vehicle Config : 4X2 (6 whls)	GCW : 20000 lb	Tires : (650 Rev/mi)
Make/Model : Dodge	Width : 8.00 ft	Steer - 265/75R16 Radial Rib
Body Type : Pick-up	Height : 10.00 ft	Drive - 265/75R16 Radial Rib
Application : On Highway	Aero : 10 %	
Engine - Cummins ISB 185	2600 Gov.	Accessory HP at 2600 RPM:
CPL 8136 FR-91050 02 EPA & CARB		Cooling Fan = 0.00
420 lb-ft at 1600 RPM (128 HP)		Power Steering = 1.00
		Air Cond = 3.00
		Alt/Gen( 45A @ 14V) = 1.69
		PTO or other = 0.00
		Total = 5.69
Drivetrain - Transmission = Generic 6 spd		Ratio = 3.730
Drive Axles = Generic 23000lb		
Driver Type - Governed Speed Shift		

**THE WAY WE WERE . . . Continued**

Power Requirements Table - By Road Speed

**GEAR 6**

Engine	HP		HP required for each percent grade							
	RPM	Avail	MPH	-1%	0%	1%	2%	3%	5%	7%
970	70	24	2	15	28	41	54	81	107	147
1051	79	26	2	17	31	45	59	88	117	159
1131	88	28	3	19	34	49	65	95	126	172
1212	97	30	4	21	37	54	70	103	136	185
1293	103	32	5	23	40	58	76	111	146	199
1374	110	34	7	25	44	63	81	119	156	212
1455	116	36	8	28	48	68	87	127	166	226
1536	123	38	10	31	52	73	94	135	177	240
1616	129	40	12	34	56	78	100	144	188	254
1697	135	42	14	37	60	83	107	153	199	268
1778	142	44	17	41	65	89	113	162	210	283
1859	148	46	19	45	70	95	121	171	222	297
1940	155	48	22	49	75	102	128	181	233	312
2020	161	50	26	53	81	108	136	191	245	328
2101	168	52	29	58	86	115	144	201	258	343
2182	174	54	33	63	92	122	152	211	270	359
2263	181	56	37	68	99	130	160	222	283	376
2344	184	58	42	74	105	137	169	233	297	392
2425	184	60	46	79	112	145	178	244	310	409
2505	183	62	52	86	120	154	188	256	324	426
2586	180	64	57	92	127	163	198	268	338	444
2667	171	66	63	99	135	172	208	280	353	462
2748	77	68	69	106	144	181	219	293	368	480

**GEAR 5**

Engine	HP		HP required for each percent grade							
	RPM	Avail	MPH	-1%	0%	1%	2%	3%	5%	7%
982	71	18	1	11	21	31	41	61	82	112
1091	83	20	1	13	24	35	46	69	91	125
1200	96	22	2	14	26	39	51	76	100	137
1309	104	24	2	16	29	43	56	83	110	150
1418	113	26	3	18	32	47	62	91	120	163
1527	122	28	4	20	36	51	67	98	130	177
1637	131	30	5	22	39	56	73	106	140	190
1746	139	32	7	25	43	60	78	114	150	204
1855	148	34	8	27	46	65	84	123	161	218
1964	157	36	10	30	50	70	91	131	171	232
2073	165	38	12	33	55	76	97	140	182	246
2182	174	40	14	37	59	81	104	149	193	261
2291	183	42	17	40	64	87	111	158	205	275
2400	185	44	19	44	69	93	118	167	217	290
2509	183	46	22	48	74	100	125	177	228	306
2618	179	48	26	52	79	106	133	187	241	321
2728	105	50	29	57	85	113	141	197	253	337

**GEAR 4**

Engine	HP		HP required for each percent grade							
	RPM	Avail	MPH	-1%	0%	1%	2%	3%	5%	7%
970	70	12	1	8	15	21	28	42	55	75
1131	88	14	2	9	17	25	33	49	64	88
1293	103	16	2	11	20	29	38	56	74	100
1455	116	18	2	12	22	33	43	63	83	113
1616	129	20	3	14	25	36	48	70	92	126
1778	142	22	4	16	28	41	53	78	102	139
1940	155	24	4	18	31	45	58	85	112	152
2101	168	26	6	20	35	49	64	93	122	166
2263	181	28	7	23	38	54	70	101	132	179
2425	184	30	8	25	42	59	76	109	143	193
2586	180	32	10	28	46	64	82	118	153	207
2748	77	34	12	31	50	69	88	126	164	222
2800	3	35	13	32	52	71	90	129	168	226

## THE WAY WE WERE . . . . Continued

### MAKING SENSE OF THE NUMBERS

Back in the 80s Cummins Engine Company developed a computer program, Vehicle Mission Simulation, to help big-rig truck fleets and truck and engine salesmen properly spec-out a truck. We chose values as closely to the situational truck as we could. There can be an endless number of situational results, however, once the key factors of the vehicle's configuration are loaded in (engine, gearing, and GCW selections), the resulting output tables approximate one another.

We chose a Dodge 3500 pickup and trailer in-tow for a gross combined weight of 20,000 pounds. Our engine selection was a 185 horsepower/420 torque engine rating. The engine is not Dodge specific, but rather a 24-valve engine with a lower rpm range (max 2600 rpm). The transmission chosen was the six-speed, as the program does not have Dodge's automatic gear ratios loaded in it. We are limited to the non-Dodge engine rating and the six-speed transmission as the VMS software has not been updated to reflect newer Dodge pickup truck numbers. We were stretching the VMS software. Remember, VMS is designed for the big-rigs and complete Dodge data was not always available. The gearing: 3.73.

Let's put our truck example on the road and use the VMS computer (the computer program equals lots of math—more than I can comprehend) to see how much power it takes to go up a given grade. With the VMS output/number we can analyze the performance of the situational vehicle, and let you make a determination as to a reasonable top-of-the-hill speed.

### CONCLUSION

Wow, the printout is confusing? Or is it? It clearly shows the horsepower required for each percent grade. It clearly shows the horsepower available at a given rpm. Thus, I drew a break line labeled 185 that approximates the lower horsepower offerings from Dodge. The break line is not gospel (note that I did not subtract the 5.69 horsepower parasitic load). And, there is not anything that can account for head, side or tail winds that can exponentially effect the horsepower requirements and fuel used on a given trip. To the left of the break line there is power to pull the grade at the noted speed. To the right—the engine power cannot pull the grade.

I wish we had come upon the VMS program long ago. This dramatic (is it really dramatic, or did you intuitively know the result from your personal experiences?) table/results could have been used hundreds of times over to help owners set realistic expectations for the performance of their trucks.

I'll reemphasize, the numbers are not exact. With the available 185 horsepower engine rating (gee—only 175 hp was available in the '94 and '95 manual transmission trucks, 180 hp on automatics up until '98.5, so this table can *exactly* predict their performance) you can see a downshift to fifth gear, and a road speed of 46 mph is necessary to climb a 5% grade with the total 20,000 pound load. Oops . . . we didn't factor in the horsepower required for the fan, alternator or air conditioner. To climb a 7% grade the speed drops to 32 mph. Oops . . . Mr. MoPower's rig

was actually 20,750 lbs. I'd say that his 30/35 mph is right-on-the-money in terms of a realistic expectation for his '98 truck with a 180/420 engine and automatic transmission.

I'm hopeful this demonstration has cleared up some misconceptions that Mr. MoPower his new friend, Mr. Stocktruck, and others might have had.

### NEWER TRUCKS, 2003 TRUCKS AND HIGHER HORSEPOWER

I can clearly see the comments from the readership, "That was then, this is now! I've got the super HO engine and a six-speed in my 2003 truck with a 3.73 final gear ratio, those numbers don't mean anything to me."

Not so fast Mr. HO. Just as we drew a breakline for gears 4, 5 and 6 of our situational truck with the 180 hp engine, you can use the mathematical formula and or the charts on pages 37 to draw the breakline to approximate the speed, percent grade and required horsepower needed for a situation. With 305 hp your HO truck will be capable of a higher travel speed. Same holds true for the 240 hp automatic transmission equipped trucks, but, as you can see, there are limits.

### Okay to Downshift—2003 Trucks

As I and the TDR's Jim Anderson, have already heard, there are low power complaints on the 2003 trucks (primarily automatics). At times you want to swap with the owner and let them drive an '89 to '98 automatic-equipped truck where the horsepower was 180 hp or less. Nevertheless, expectations run high, but reality often intervenes.

The great thing about the 2003 HPCR engine is the higher rpm operating range. One only has to know the mathematical equation for horsepower,  $HP = (\text{torque} \times \text{RPM}) \div 5252$ , to understand how rpm and extended torque output are helpful (see the graphs on page 37). The easy answer to maintaining your speed is to downshift your automatic transmission (thus, more rpm) to generate a higher horsepower (the ability to maintain speed) number. Go ahead—downshift!

### Run It Like You Stole It

As I had occasion to talk with some friends at Cummins I asked about prolonged usage at high rpm. The comment: "Tell 'em to run it like they stole it!" Seriously, the HPCR engine does have a running range of 1400-3200rpm. This is a big increase over the range of the old 12-valve engines that wouldn't go much beyond 2800 rpm. The 24-valve engines raised the rev range to 3200 rpm. For the record, the Cummins engine will come apart at approximately 4300 rpm, thus making a high-rev number of 3200 not look so high after all. Again, downshift and run it like you stole it, as the high rpm won't be detrimental to the engine.

**Robert Patton**  
TDR Staff