

# Undercar Digest

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## Performance Diesel Clutches

*Special thanks to Perfection Clutch in Timmonsville, S.C., for the use of its facility to install the performance clutch in this vehicle.*

The design, operation and engineering of clutches, especially those used in high-performance vehicles like the diesel truck shown in this article, are highly technical. A high-performance clutch must provide clamping force and be able to handle the torque loads of these engines while still giving the driver smooth operation without requiring excessive application force. This requires extensive engineering knowledge and manufacturing expertise, along with proper installation procedures.

After installing this clutch system we took the truck for a test drive. The owner of the vehicle performed many power shifts. On the rural country roads on which the vehicle was driven, shifting under full power at extremely high speeds did nothing but put your back into the seat so that you couldn't touch the dashboard. There was absolutely no evidence of slippage.

A few weeks later this truck was drag-raced in four-wheel-drive mode. It was started in third gear with the tach fully red-lined to spool up to turbo and then accelerated down the drag strip. The clutch was up to the challenge, and after the race the truck was driven back home, maintaining velvet-smooth shifting.



Performance diesels are commonplace today. These trucks are just an example of the variety and types of vehicles using diesel power that require a heavy-duty clutch.



This late-model Dodge truck has a few bolt-on performance upgrades. Horsepower on these trucks can easily exceed two or three times that of the average gasoline-powered truck. The driveline – particularly the No. 1 coupling component, the clutch – is critical.



Clutch problems include slippage, insufficient free play and engagement difficulty. One of the primary checks of a clutch is for initial free play. If you don't know what is normal, however, you won't know what is abnormal.



Another clutch check on a performance diesel vehicle involves driving at highway speeds and accelerating, or downshifting and accelerating. Watch the tachometer on the dash. Often, initial slippage of the clutch will show up as an engine-speed spike. You should always perform this check before doing any clutch work on a performance diesel.



The first step in replacing a clutch on most diesel pickups is to remove the shift linkage from the transmission. This is easily done through the passenger compartment. Of course, you need to be careful to keep the vehicle's interior clean and keep track of all the bolts, clips, trim pieces etc.





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Marking or indexing the driveshaft in relation to the yoke on the differential is a procedure that has existed as long as universal joints have been used. Failure to do this can result in imbalance and vibration.



8

After removing the transmission, don't remove the pressure plate and clutch disc immediately. Do a quick visual inspection for obvious problems such as broken parts, scraping, binding or, in this case, a dowel pin missing from the bellhousing.



7a



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There is a dowel pin on only the right-hand side. Also notice the transmission input shaft in the area that would have been contacting the pilot bearing. Only the tip of the shaft has been contacting the pilot bearing. Failure to notice such items may lead you to replace the clutch without curing the real problems.



7b

The transmission with the transfer case still attached is mounted securely on a transmission jack. Depending on your work habits, you may wish to remove the transfer case separately to reduce the overall weight, but many transmissions on diesel pickups can be lowered with the transfer case in place. The primary consideration is to support the transmission properly on a transmission jack. Also note the supports at the front of the vehicle. When you are removing the transmission from a diesel pickup it is best to securely support the vehicle, not just rely upon the lift pads.

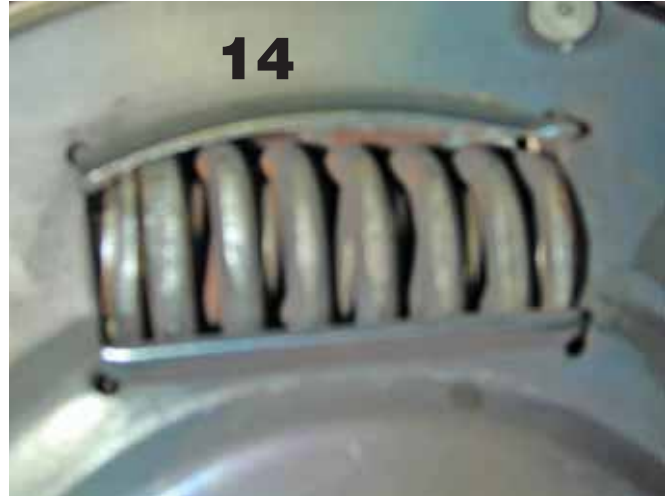


10

The area of the bellhousing where the dowel pin was missing had a buildup of rust and scale. Also note the starter-motor mounting position and its teeth. This is a good time to determine whether a different flywheel has been installed and whether clutch-in and starter-motor engagement is correct. Installation of certain aftermarket performance flywheels and clutch systems may require addition of spacers for the starter motor. Dodge has spacers available for some options, and they are included in premium aftermarket kits.



**11**  
With the clutch assembly and flywheel removed, a quick visual inspection shows everything to be in good order except for the missing dowel pin. There are no cracks, nicks, breaks, pry marks, areas of contact with rotating components etc., so at this time the clutch reinstallation can begin.



**14**  
This is a close-up view of one of those springs.



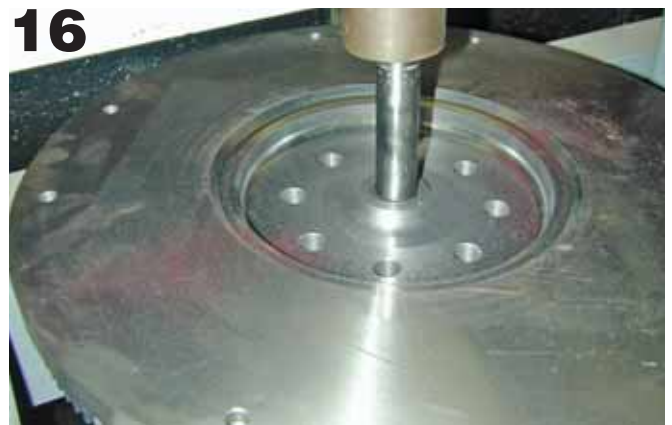
**12**  
One key to how well a new clutch will work is determining what was wrong with the old one. Note that the pilot bearing has been pressed too far into the flywheel. The bearing should be flush. This is why just the end of the transmission input shaft was contacting the pilot bearing. Along with the missing dowel pin, this easily could have led to a misaligned clutch disc and possible engagement slippage or other problems.



**15**  
The release bearing slides on the transmission input shaft. Note the small metal shavings and particles on the part of the input shaft that contacted the pilot bearing.



**13**  
Note the rust or red dust around the damping springs on the clutch disc that was removed. There are no cracks in the disc, but the damping spring openings at the 11 and 1 o'clock positions appear larger and the springs are not being properly retained. This is one sign of a clutch that is starting to fail. On a performance clutch that is engineered to handle the torque, this will not be an issue.



**16**  
It is common in the industry to tap pilot bearings or bushings into flywheels, but the best way to install them is with a press. This will provide uniform force and prevent any damage that might result from tapping with a hammer.





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The owner of the pickup examines the clutch assembly's variable-torque feature. As this clutch rotates faster, centrifugal force increases the clamping force. This allows high-performance diesels with higher engine speeds and shift points to maintain the proper clamping load at the right time for smooth shifts with no slipping.



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The technician is lubricating the input-shaft tower with a grease suitable for the application. The release bearing rides on this part of the shaft. A new fork and release bearing are being installed with the clutch kit. Reusing old components such as clutch forks and pivots is a dangerous habit to get into, because they can interfere with movement of the release bearing.

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A technician trial-fits the new button-type clutch disc onto the input shaft to check for binding that would prevent proper clutch operation. This disc is marked "flywheel side" to prevent any confusion about which side goes toward the flywheel, making it almost goof-proof.



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A new flywheel is being installed. Resurfacing flywheels is common in the industry, but engineering test analysis has proved in many instances that machining a flywheel simply lowers the hard spots without really removing them, and this can cause various clutch-related problems. Replacing the flywheel is strongly recommended when a performance clutch is installed. Torquing the flywheel bolts in the correct sequence is critical to proper clutch operation. Be sure to clean the flywheel after installation.



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This clutch kit includes a new pivot ball for the fork. The polymer ball is on a hexagon steel stud screwed into the bellhousing. Be careful when removing the original pivot ball, since the steel stud may bind in the aluminum-alloy bellhousing.



22

To prevent problems caused by grease or other contaminants, the technician is cleaning the new pressure plate with a solvent that will leave no residue on the surface.

## AP Executive Addresses Aftermarket Symposium

Jim Gerber, AP Exhaust executive vice president, addressed the Global Automotive Aftermarket Symposium (GAAS) and shared an in-depth look at AP's decade-long partnership with a software-development firm in India in pursuit of streamlined data processing and internal data exchange, with resulting efficiencies in cataloging and product design and production.

Gerber explained the various prior limitations of AP's cataloging and outlined specific areas targeted for improvement, which included the need to:

- Issue catalogs consistent with ECAT standards as well as print catalogs
- Greatly reduce the time needed to issue both print and electronic catalogs
- Substantially reduce cataloging and production costs
- Allow for custom e-output to meet internal and individual customer needs.

By partnering with a global company already intimately familiar with the U.S. automotive aftermarket and having an extensive body of IT talent and manpower, AP was able to dramatically improve workflow and inter/intra-departmental efficiencies while reducing design time and costs, resulting in reduced time to get catalogs and products to market.

Customer benefits include much faster awareness of products available and resulting increases in order fill and customer satisfaction, with information gathered from multiple sources fully integrated into a single, searchable database.

"Our progress with this program was achieved in three phases," he said. "Generation One, from 1998 through 2000, resulted in automated output report generation and an astonishing reduction in catalog preparation time from eight months to three weeks. Generation Two involved creating a centralized database compliant with the new ECAT/AAIA standards, resulting in our creation of CD-ROM catalogs.

"Having achieved substantial customer benefits in the first two phases, we focused our Generation Three efforts on developing interdepartmental linking tools in order to foster the free and efficient exchange of data internally. With this enhanced and standardized company communications protocol, we were able to greatly reduce the time required to design, test, produce and market new products, resulting in still greater customer benefit and satisfaction."



Jim Gerber

23



An input shaft is being used to position the clutch disc properly while the pressure plate is bolted into position. Many technicians believe that a metal input shaft is a better alignment tool than the molded plastic ones included in clutch kits.

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One of the new dowel pins has been installed in the bellhousing. Installing new dowel pins in previously cleaned holes ensures correct alignment of the transmission with the engine.

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With the unit properly supported on a transmission jack, the input shaft of the transmission is being inserted through the pressure plate and into the clutch disc. The shaft should slide through the clutch and into the pilot bearing easily if you have the components aligned properly.

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