MASTERTECH

Driveline Maintenance Tips

REFERENCE BOOK AND TECH NEWS

December 2015

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Introduction

Figure 1: Expensive, broken universal joint

This Month's program contains four relatively short lessons, with one overriding theme:

Always check and follow service instructions when servicing driveline components.

The first lesson addresses a maintenance issue with some Ram 2500 through 5500, four-wheel drive universal joints. This is a case where skipping a small maintenance task can cause some very expensive damage (Figure 1).

The goal of the second lesson is to leave you with a clear understanding that you should consult service information before maintaining or replacing driveline components in newer vehicles.

The third lesson presents an overview of the Hellcat Challenger's manual transmission cooling system, which requires a unique fill procedure.

The fourth lesson provides an example of another unique driveline process: The rear drive unit "relearn" procedure that is required for Jeep Renegades.

Finally, Tech News introduces the updated "Nine-Speed Diagnostic Process Tutorial" recently posted on TechCONNECT.

Remember that the book and the presentation may contain unique information. So, reviewing both may be required to complete the posttest successfully.

Heavy-duty Ram Front Universal Joints

Universal joint failures

Recently, there has been an increase in failures of the double cardan universal joints ("u-joints") on certain heavy-duty Ram's front drive shafts. In some cases, catastrophic failures have caused extensive damage to vehicles and tremendous customer dissatisfaction. Failures at highway speeds may damage the transfer case, front driveshaft and axle, and the floor pan, leading to repair costs approaching $20,000 (Figure 2).

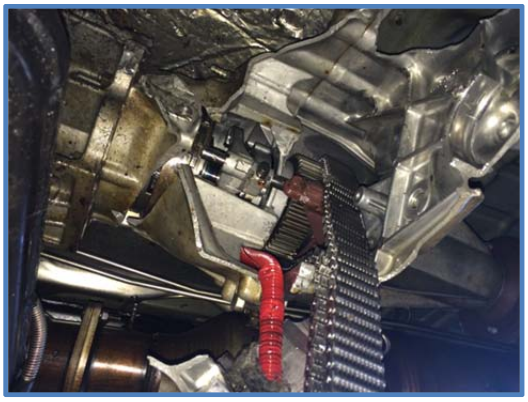


Figure 2: Destroyed transfer case

Reasons for failure

The root- cause of the u-joint failures is a lack of lubrication. The u-joints are simply overlooked during scheduled maintenance; and, as the affected trucks get older, more failures are showing up.

A few factors can further reduce the life expectancy of unlubricated u-joints:

- 2003 through 2013 heavy-duty, four-wheel drive Rams do not use front axle disconnects. Therefore, the front driveshaft always spins when the vehicle is moving.
- The increased ride height (from 2007 on) leads to a more severe working angle, which further stresses the u-joints.
- Failures are more common on fleet vehicles.

Preventing failure

Proper maintenance can prevent failure of the u-joints. Lubricate all double cardan joints at every oil change using Mopar type MS-6560 lithium based grease or an equivalent. Lubrication requirements are detailed in service information and the owners' manual. Also, there is a reminder sticker on the left front fender.

Many u-joints use "flush" or "midget" fittings, which require using a needle adaptor, while other units are equipped with conventional Zerk fittings (Figure 3).

Figure 3: Grease needle and flush fitting

To reduce future failures, inspect the double cardan joints and the transfer case (near the front output shaft) during service, because vibration from a failing u-joint can induce stress cracks in this area. In addition, failing u-joints may show signs of distress, including gaps in the bearing area, and rusty powder on the yoke surfaces.

Warranty coverage

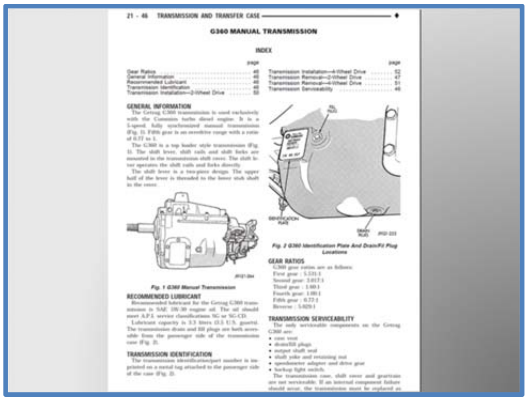
Since damage caused by improper maintenance is not covered under warranty, any repair costs may be declined by the powertrain service center (PTSC) unless complete maintenance records show that the u-joints have been properly maintained.

If everyone who maintained these Rams would have consulted and followed the published service instructions, there would be very few failed double cardan joints.

Driveline Maintenance Tips

Special procedures for newer vehicles

In the past, service procedures for driveline components like differentials and manual transmissions (generally) were standardized (Figure 4). Therefore, once a technician learned to maintain or replace a component, they did not have to consult service information again.


21 - 46 TRANSMISSION AND TRANSFER CASE

G360 MANUAL TRANSMISSION

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Figure 4: Old driveline procedures were standardized

"Smart" drive units, components with no way to verify fluid levels, and maintenance procedures that vary by model make it advisable to consult service information for every operation.

This month's Master Tech is not supposed to be a comprehensive guide to driveline component service techniques. The examples are included to demonstrate why it is important to verify any special requirements before starting work.

General lubrication tips

Unless instructed otherwise, assume that a vehicle is supposed to be level when you check any fluid levels (Figure 5).

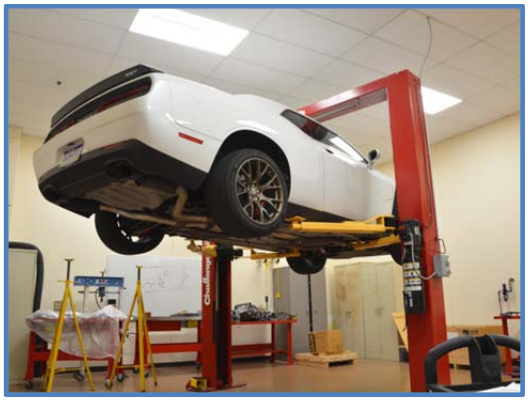

Figure 5: Level vehicle, unless specified otherwise

If a driveline unit is overfilled, lubricant may spray out of the vent. If it sprays on a hot exhaust system, it will smoke, smell, and could possibly ignite (Figure 6). Also, lubricant may be forced out of the seals.

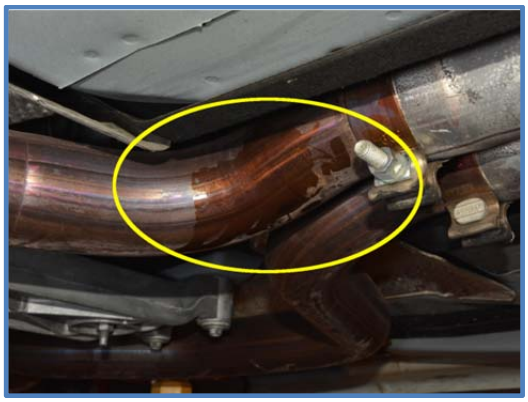

Figure 6: Lubricant on exhaust pipe

Often, the first signs of an under filled gearbox are increased noise and difficulty shifting, especially downshifting. In addition, low lubricant causes friction damage to bearings and gears, and synchronizers in transmissions. Increased friction leads to increased heat, which breaks down the lubricant and accelerates the destruction cycle.

Either way, filling drivetrain components to the proper level is important for reliable operation.

Similar transmission, different procedures

Following exact procedures, even by option level may be important. The 6-speed Hellcat Challenger uses a unique, cooled version of the TR6060 transmission (Figure 7). In the presentation, we demonstrate the Challenger Hellcat's fill procedure, which is completely different from the procedure used in other Challenger and Viper TR6060s.

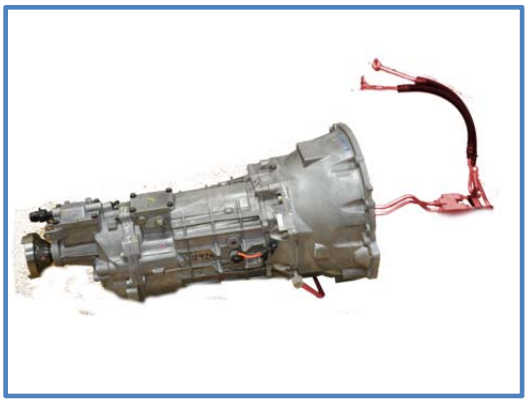

Figure 7: TR6060 with cooling

Low volumes require high accuracy

Fill precision can be critical. For example, the rear drive unit (RDU) on a Renegade only requires 0.6 liter (about 19 ounces) of lubricant (Figure 8). Proportionally, a small measurement error could lead to a significantly under filled RDU.

Figure 8: Low volumes leave little room for error

Also, checking the level requires following a very strict procedure; and the unit is NOT filled to the bottom of the inspection plug (Figure 9).

We would not know any of this if we had not checked service information.

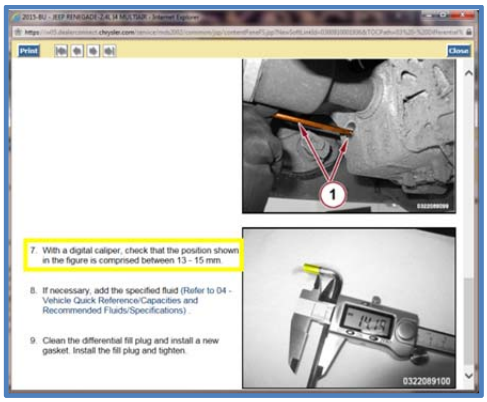

Figure 9: Special level check from service information

Use specified lubricants

Similarly, the G56 manual used in Rams is only filled to 16 mm (5/8-in) below the fill plug hole. If we had not checked service information, we would have probably filled it until fluid ran out of the hole, leaving it overfilled.

Make sure to consult service information, section "04 - Vehicle Quick Reference" to verify the correct lubricant for the application. It can be tricky sometimes. The G56 is used by several manufacturers, and many specify 75w-90. However, for Rams, Mopar ATF + 4 is required.

If the Wrangler NSG370 is filled with gear lube that does not meet the requirements of MS9224, the synchronizers will deteriorate rapidly. By the way, the NSG370 is filled to the bottom of the fill/check hole.

One Dart, but several targets

Some units require different fill levels and check methods for the same transmission in different models and with different engines. Service information, section 21, describes three different fill requirements for the C635 manual in the 2016 Dodge Dart.

Hopefully, we have clearly demonstrated the lesson's key point: Do not make assumptions about driveline components' maintenance and replacement requirements. Check service information.

Hellcat TR6060 Features

The TR6060, built by Tremec, is a high-performance, six-speed manual transmission that is used in several American and Australian muscle cars. The best of which are the 2008 to current Vipers and the manual Dodge Challengers.

Figure 10: Special TR6060 for Hellcat Challenger

Hellcat TR6060 use a cooling system

The Hellcat Challenger uses a unique version of the 6060, with unique maintenance requirements (Figure 10). The Hellcat version can handle 881 Nm (650 ft.-lbs.) of torque and is equipped with a cooling system powered by a gerotor oil pump mounted inside the front cover of the unit. The pump draws oil from the transmission sump through a pickup tube, and pushes it through a cooler line to a bypass valve. Under normal conditions, the fluid circulates through the bypass valve back to the transmission.

The pump circulates fluid whenever the countershaft is turning (Figure 11). Therefore, anytime the clutch is engaged with the engine running, fluid is circulated. At 3000 engine RPM, the entire volume of fluid passes through the system about every 30 seconds

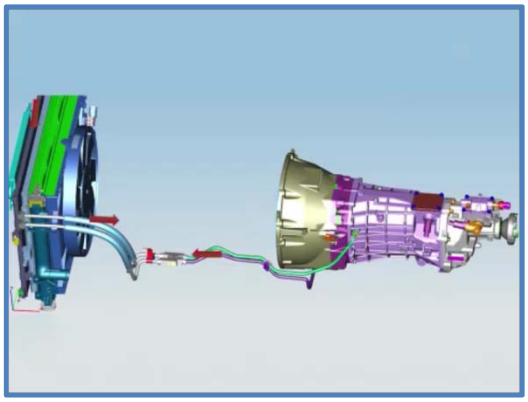

Figure 11: Gerotor pump circulates lubricant for cooling only (no lubrication)

Bypass valve

Under severe conditions, if the fluid reaches 95 °C (203 °F), the bypass closes and fluid circulates through dedicated oil cooler mounted in front of the radiator.

The same cooler and bypass valve is used for automatic transmission equipped Challengers. If replacement is required,

the cooler and the low temperature radiator (LTR) are replaced as one unit. However, the cooler lines can be disconnected and replaced separately, using the transmission cooler line disconnect tool number 8875A.

Cooling system faults

Cooling system failure modes include leaks at the fittings or leaks from damaged cooling system components, and, although very unlikely, a damaged pump could cause unusual noises and little or no heat transfer to the cooler.

If the cooling system is not functional, prolonged operation near the transmission's maximum torque capacity, can breakdown the lubricant, overheat components, and damage the transmission. However, the biggest danger this transmission faces is damage caused by under filling.

Unique maintenance procedure

As in other FCA applications, the Hellcat version requires ATF +4, but unlike the other applications, this version requires an extra 775 ml (26 oz.) of fluid to fill the cooling system.

Figure 12: Do not remove the "level" plug!

The Hellcat TR6060 has a fill/level check plug, but the plug is useless on the cooler equipped version of this transmission. If the plug is removed, and fluid is allowed to drop to the level of the hole, the transmission will be under filled by about 20% (Figure 12).

As discussed earlier, under filled transmissions fail, probably starting with a destroyed second gear, causing very unhappy customers.

Since there is no way to check the fluid level, the only way to verify the amount of fluid is to drain and refill the transmission. The transmission cannot be "topped-off." To ensure the correct fill level:

- Consult the newly updated procedure in service information, which explains how to drain and purge the transmission, cooler, and lines, using low-pressure compressed air.
- Measure out the correct amount of ATF+4.
- Remove the upper cooler line from the transmission.
- Use a suitable transfer pump to fill the transmission through the upper cooler line fitting.
- Reinstall the transmission line.

As always, refer to service information for the most up-to-date, accurate, and detailed instructions, and, in this case, an instructional video.

RDU Reprogramming

Another example of the importance of consulting service information is the unique procedure required when replacing the rear drive unit on Jeep Renegades.

> *Note: Some service information documents refer to the RDU as a "rear drive module" ("RDM"). In this lesson, we will stick with rear drive unit ("RDU.")*

The RDU uses an electronically controlled, variable wet clutch to control the amount of torque supplied to the rear wheels (Figure 13).

Figure 13: Rear drive unit

Currently, Renegade RDUs have no serviceable internal components, so you have to replace defective units as an assembly.

For proper RDU operation, the drive train control module (DTCM) needs to "learn" certain characteristics about the replacement unit. These characteristics are conveyed in the RDU's "classification number," which you will enter into the scan tool during the RDU relearn procedure. If the relearn procedure is not completed, the powertrain control module (PCM) may set a diagnostic trouble code (DTC) and limit vehicle speed.

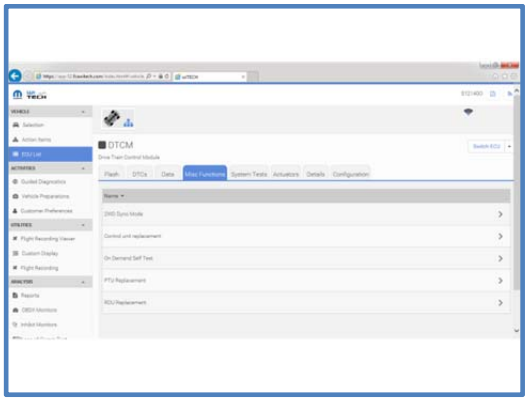

Figure 14: wiTECH Misc Functions tab

RDM Relearn procedure overview

The first step of the relearn is to obtain and record the new number. There are two ways. You can record last two characters of the number stamped into the housing near the label; or, if you have a smartphone that can read barcodes, you can scan the smaller bar code on the right side of the label to display the number.

To begin the relearn procedure, connect the scan tool and enter the DTCM through the vehicle topology screen.

Enter the Misc. Functions tab, and then select RDU Replacement (Figure 14).

The scan tool will guide you through the relearn procedure, including when to enter the new two-digit classification number.

When the scan tool prompts you to turn the ignition OFF and ON, the relearn procedure is complete.

The bottom line is once again, maintenance and repair of driveline components is not as consistent as it used to be. Check service information before starting the job.

Learn more

Check out the Learning Center site to find classes covering subjects related to this month's topics.

Also, do not forget to read the new, monthly STAR Center news. You can find the STAR Center News by logging on to TechCONNECT and clicking the "STAR Center News" link on the left side of the screen.

Next month

Be sure to join us next month when we will cover some ABS tips, including diagnosing active wheel speed sensors, and offer some electric parking brake (EPB) tips.

Questions or comments

If you have any questions or comments about a Master Tech presentation, or would like to suggest topics for future Master Techs, please contact us at mastertech@chrysler.com.

Be sure to include your contact information so we can get back to you!

Master Tech Posttest

Navigate to the Learning Center's "Course Search" function and enter "MT1512T."

Select the "course" to take the posttest.

Complete the posttest by January 15 for certification credit.

> *Note: Since the changes to the Master Tech are new, the window for posttest completion is extended until January 31.*

TECH NEWS

Nine-speed Tutorial Update Highlights

A new tutorial for upgraded software

Over the past several months, the nine-speed transmission engineering team has introduced several improvements to the transmission's hardware, software, and diagnostics. Due to these improvements, a revised "Nine-speed Diagnostic Process Tutorial" has been posted to Tech CONNECT. The new tutorial matches the new diagnostic software, and it is streamlined to provide a quick "one-stop" shop with links to relevant service bulletins and accurate diagnostics help for the most common DTCs. The tutorial applies to the nine-speed available in Jeep Cherokees and Chrysler 200s. In this lesson, we will highlight some of the presentation's key points.

The goals of the new software and procedures include eliminating the replacement of good transmissions, increasing customer satisfaction, improving the transmission's durability reputation, and improving technicians' diagnostic speed and accuracy.

A new diagnostics approach due to a transmission mechanical change

At one time DTC U0402 "Implausible data received from TCM" (transmission control module) usually indicated an internal transmission failure, which required replacing the transmission.

Currently, most U0402 DTCs are set by overly sensitive vehicle diagnostics software. Therefore, the DTC seldom reoccurs after the PCM and TCM software are updated to the latest versions.

A mechanical change was made to the transmissions installed in all vehicles built after October 20, 2014. So, in these vehicles, U0402 rarely indicates a transmission failure. Do not replace one of these transmissions due to the DTC.

However, for vehicles built before October 20, 2014, the code may indicate a mechanical fault. Follow the updated diagnostic process tutorial carefully.

The bottom line is, to prevent DTCs, ALWAYS update nine-speed Cherokees and 200s to the latest TCM and PCM software, whether there is a DTC or not. If you are diagnosing DTC U0402 on a vehicle with a mechanically updated transmission, and there are no other related DTCs, update the TCM and PCM, and wait to see if the DTC reoccurs.

Most importantly, before you service a nine-speed automatic, select the link in the TechCONNECT "What's New" section to review the updated tutorial.


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