



Tech Tip

4x4 SERVICE 116

SERVICING FOUR-WHEEL DRIVES

Preventative Maintenance Can Minimize Costly Repairs

Travel any city in the USA and you will observe a market saturated with four-wheel drive trucks and SUV's. With this fleet comes some required but neglected maintenance, which is imperative in preventing costly repairs. The majority of these 4x4 owners are not familiar with the operating procedures or characteristics that can result in major component damage. Most assume that no special maintenance is necessary, especially if the four-wheel drive feature is seldom used. We have a responsibility to educate and continually remind the customer of the required maintenance. Offering a free safety inspection may result in identifying a problem before it turns into a major component failure. This simple courtesy can provide the shop with many service opportunities. Let's consider some areas that need a periodic inspection and attention.

TIRE INSPECTION

What better way to start a safety check than with a tire inspection or rotation? For years, the tire manufacturers have stressed the importance of tire rotation. Many tire companies offer this service free as a sales incentive, knowing that the majority of the customers will not exercise the option on a scheduled basis. A tire rotation every five to six thousand miles will ensure a more uniform wear pattern with all four tires. The vehicle manufacturers print the recommendation in the owner's manuals, accompanied by an illustration as to how the tires should be positioned during the rotation. Unfortunately, the service is procrastinated on and seldom gets performed.

Obviously, two tires will wear prematurely. With a two-wheel drive vehicle this does not pose a major problem. If the condition occurs on a four-wheel drive vehicle, some major performance problems and mechanical damage can occur. In addition, the 4x4 applications will scallop or dip the tires on the front end, if not rotated frequently. This condition pro-

notes a vibration and a noise condition that is often mistaken as bearing related.

Tire pressure is another condition that can promote an array of problems including premature wear, uneven wear, poor ride conditions, noise, unstable handling characteristics, and transfer case related problems on 4x4 applications. The recommended tire inflation pressure is listed on the vehicle's placard, located on the driver's side door edge or the rear compartment lid. Do not inflate the tires to the pressure listed on the tire itself. Inspect and adjust the tire pressure when the tires are cold. A tire pressure variance as minimal as 2–3 pounds of pressure can affect the life and performance of the tires and 4x4 driveline components.

There is much to consider when evaluating the wear pattern of a vehicle's tires, including rim widths, offsets, alignment conditions, vehicle weight distribution, suspension, steering components, road surface conditions and driving habits.

Circumference Variations: Variations in the circumference of the tires from front to rear spells big trouble for 4x4 equipped vehicles. A lot of good technicians have missed the diagnosis and needlessly replaced a lot of expensive parts. Failure to rotate the tires at the proper intervals results in premature wear conditions, usually with the front tires. To get the bounce, vibration and noise out, the vehicle owner often replaces the front tires. This results in a circumference variation from front to rear.

When this condition exists, the driveline components can be subjected to extreme pressure. The symptoms often involve a jerking or binding while driving in four-wheel drive, especially on a hard road surface such as blacktop, and while turning. To an experienced operator it will be obvious that the components are under extreme pressure. Most vehicle manufacturers recommend against 4x4 operation on a dry hard surface. Off-road or a slippery surface will allow

slippage, reducing any transfer case pressure.

Another symptom may involve a system that has been locked into 4x4 and will not disengage. This condition is especially pronounced on transfer cases that shift with an electric motor. The manual shift systems may require extreme pressure to disengage the system. To confirm, place the vehicle on a lift with the wheels suspended. With the engine running, shift the system into 4x4 and lightly accelerate. Slowly bring the wheels to a stop and disengage the transfer case. If the system will disengage while on the lift, this confirms that the binding transfer case was due to tire circumference variations.

Replacing a tire or tires with a different brand can promote the same condition, as tire brands vary in circumference even though they may be stamped as the same size. Low air pressure can promote the same. Measure the outer circumference of the tires and compare, as this may save you a lot of diagnostic time and the customer some money that would be spent needlessly.

Power Transfer Unit Failure: The All-Wheel-Drive Town & Country, Caravan and Voyager vehicles have cost Chrysler a bundle in transfer case warranties. Initially, Chrysler suspected a design problem with their power transfer unit (PTU), as the failures had been extreme. Later, the engineers determined that the culprit had been lack of proper tire maintenance. Failure to rotate the tires and maintain an even front to rear wear pattern had been the reason for the PTU failures. The variation in tire circumference from front to rear results in an extreme heat build-up in the PTU. The condition occurs due to the variation in rotational speeds and torque transfer between the front and rear drive components. A variance in tire circumference as minimal as 0.5% can result in an overheated and damaged PTU. Chrysler recommends a tire rotation every 7,500 miles, or less. At a cost of \$1,200 for a transfer unit, the vehicle owner will want to pay closer attention to the recommended service intervals and have the tires rotated on time. Maintain the proper air pressure, and when a tire replacement is necessary, replace all four tires with a matched set.

BRAKE INSPECTION

How conclusive is your brake inspection? A close inspection of the brake system components is imperative, especially on 4x4 applications that have been

subjected to off-road operation. A simple friction replacement may not be in the best interest of your shop or the vehicle owner. Examine the friction for wear patterns that would indicate the need for a complete system overhaul. The wear pattern of the disc pads may require a further examination to isolate the cause of the friction wear conditions. Some of the conditions could include:

- 1) Corroded caliper guide pins or bolts, which restrict caliper movement.
- 2) Damaged bushings, sleeves or grommets.
- 3) Worn out caliper seals, from extreme heat or usage, resulting in the piston not retracting during brake release.
- 4) Pitted or corroded pistons, due to moisture accumulation in the system.
- 5) Anti-rattle clips and springs that have lost their tension, resulting in brake noise complaints.
- 6) With drum brakes, check for worn self-adjusting levers or stretched cables, which can prevent self-adjustment, promoting low brake pedal complaints.
- 7) Damaged or worn-out return springs and hold-down springs, which can promote residual drag and premature wear.
- 8) Sticking and binding of the emergency brake cables, due to mud and water entry.
- 9) Damaged brake hoses that may restrict fluid flow.

Any of these conditions can promote premature or uneven friction wear. Identifying a system that may be susceptible can save you much frustration with a customer who doesn't understand why the friction wore out prematurely, or why the brake performance conditions exist. When a set of disc pads are installed, they assume that they got a complete job. Any problems such as noise, brake pull, or premature wear must have been due to something that you failed to do, or you must have installed some defective parts. We know different, but they will never accept it. The key point is to properly identify potential problems and make recommendations. If the customer is not receptive, note the conditions and observations on the repair order.

TRANSMISSION & TRANSFER CASE SERVICE

Do you monitor the mileage since the last transmission flush and filter change and advise the customer, or just wait until they request the service? The life of the transmission depends on keeping the system clean. Flush machines are widely used and recommended by the vehicle manufacturers, as they remove the contaminated fluid. The procedure should include a new filter with the fresh fluid. A transmission specialist will always recommend a new filter with a system flush. Re-establishing the integrity of the fluid dispersants, anti-oxidants, seal swell additives, friction modifiers, detergents and corrosion inhibitors is necessary to maintain good transmission performance. Pay special attention to the vehicle manufacturer's fluid recommendation, as some are application specific.

Vehicle manufacturers recommend transmission service intervals at an average of 30,000 miles. Further, they advise that vehicles subjected to severe service, such as city driving, extreme climatic conditions, towing heavy loads, and fleet vehicles that make numerous stops, should all have their transmission serviced at 15,000 mile intervals. Many 4x4 vehicles fit this severe service category. Is the vehicle equipped with a transmission fluid cooler? If the vehicle fits the severe service category and it is not equipped with a fluid cooler, one should be recommended.

A Factory Solution: You must consider modifications made by the vehicle manufacturers to alleviate performance conditions. For example: Owners of 1999–2000 K series trucks and the Cadillac Escalade may complain about a “bump” sensation as the vehicle is accelerated from a stop. The symptom is usually confined to a single “bump.” The reason for the symptom is a slip-stick condition between the rear drive shaft slip yoke and the transfer case output shaft. To correct the condition, a revised transfer case fluid is available. The new fluid is blue in color and it contains improved friction modifiers to eliminate the symptoms. GM recommends the following procedure:

- 1) Drain the fluid from the transfer case.
- 2) Refill with 2 quarts of the improved fluid GM P/N 12378508 (Canada P/N 10853626).
- 3) Drive the vehicle for five miles.

- 4) With the transfer case at operating temperature, drain the transfer case fluid again.
- 5) Refill with new fluid.
- 6) It may require 100 miles of driving for the “bump” symptom to be completely eliminated.

If a technician was not aware of the fluid modification, he could easily reintroduce a problem into the system and never realize what he had done. The customer would be angry and convinced that his service had damaged their vehicle.

The symptom illustrated is not to be confused with a launch shudder condition, which involves a shudder or shake symptom that may occur multiple times. Also, it should not be confused with a driveline clunk on acceleration, following a deceleration. This symptom is due to a combination of minute clearances or lash between all the gears in the driveline, making it impossible to isolate a single component as the culprit. This is a common complaint with 4x4 owners.

LOCKING HUBS

For those serious off-road vehicles, a complete hub disassembly, inspection and bearing packing should be performed annually. When the vehicle is operated in muddy conditions or subjected to water, seepage is certain. The leakage promotes a rusty sludge that can prevent the locking mechanism from functioning and promote bearing failure.

U-JOINTS

When the universal joints are operated within their designed angle variation, they are almost bullet-proof. Problems often occur when the vehicle is fitted with a suspension lift that places the universal joints at an extreme angle, promoting wear or breakage. Another reason for a high failure rate is negligence. When stuck, the operator often turns the steering wheel from lock to lock in an effort to obtain traction. When subjected to this condition, the half-shaft U-joints are certain to fail. When applicable, make certain the U-joints are properly lubricated.

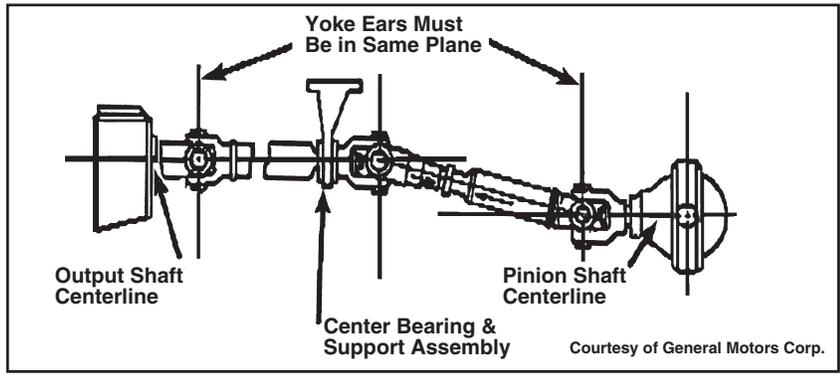
When driveline vibrations are present, check the driveshaft for damage or foreign material adhering to the shaft. Remove any accumulated debris. Check for foreign material embedded in the U-joints, loose bolts



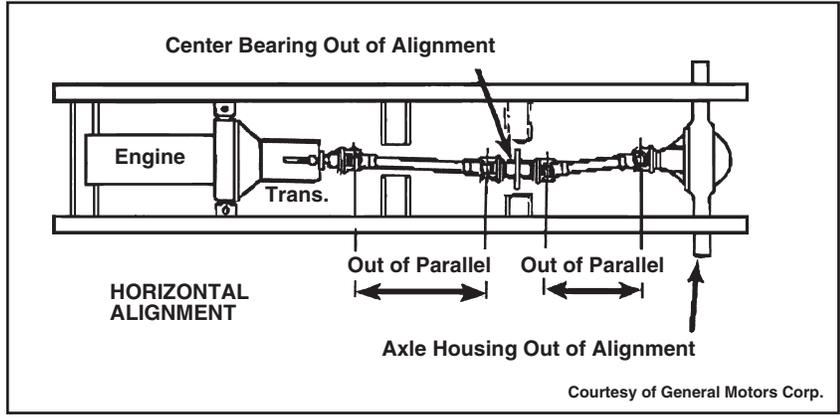
or worn needle bearings. Rust can usually be seen oozing from a dry needle bearing cap, due to lack of lubrication. If the driveshaft has been removed for U-joint replacement, or other repairs, make certain it is properly phased when reinstalling. If you are not familiar with driveshaft phasing, refer to a service manual that illustrates the procedure. The procedure should include measurements and adjustments to ensure proper driveshaft phasing, balancing, flange alignment, runout, and vertical and horizontal driveshaft alignment (see illustrations). These steps

are imperative in pinpointing and solving driveline vibrations, especially when you are following someone else's repair attempts, working on a vehicle with a modified suspension, or a vehicle that has been in a collision.

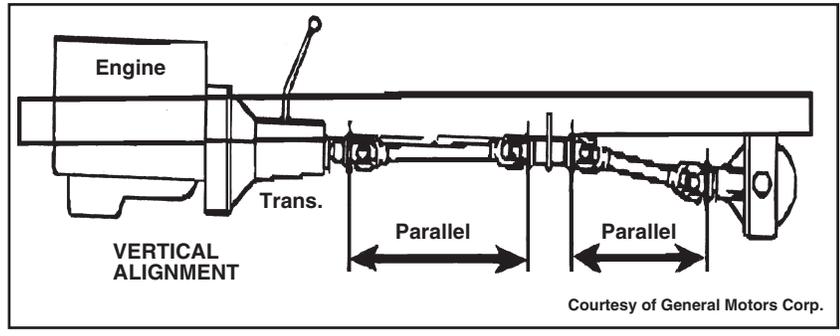
Four-wheel drive vehicles require a level of service and preventative maintenance that can be lucrative for your business. The customer benefits from the service, as many expensive repairs can be circumvented.



Phase Alignment of 2-Piece Drive Shaft
(3-Piece Shaft is Similar)



Horizontal Alignment of Drive Shaft



Vertical Alignment of Drive Shaft

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