

**Subject:**

Diagnosis and repair  
of front drive axles  
and differentials

**Unit:**

GM K series

**Essential Reading:**

- ✔ Shop Owner
- ✔ Rebuilder
- ✔ Diagnostician
- ✔ Center Manager
- R & R (Installers)

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# The Rear Up Front

**W**ith four-wheel-drive and all-wheel-drive vehicles being produced in such huge numbers, these trucks and cars have become an important source of repair business for our industry.

Transmissions and transfer cases are now a huge part of the repair and reman market. It is also obvious that these designs use both front and rear differentials to transfer power to both sets of drive axles. This has effectively doubled the amount of differential work that will find its way to the repair shop.

Although the principles are basic to all differential work, the front differentials and drive axles have some unique issues that we will look at here. For the purpose of this article we are reviewing the front drive axles used in GM K-series trucks. The common K trucks are graded by gross-vehicle-weight capability. The K10-series 1/2-ton trucks use an 8.25-inch ring gear with ratios of 3.42, 3.73 and 4.10-1. The 3/4-ton K20 trucks use the 8.25-inch ring gear with ratios of 3.42, 3.73, 4.10 and 4.26-1, and the 1-ton K30 series uses the 9.25-inch ring gear available in ratios of 3.73, 4.10, 4.26 and 5.13-1.

When you're repairing one of these vehicles, it is important to make sure that the front and rear axle ratios match exactly and to make sure when you are ordering parts for a front drive axle to specify that to your parts vendor, because the front ring and pinion gears are cut for reverse rotation.

The K-series trucks' front-drive-axle design uses an aluminum differential case that splits in half for service and contains an electrically operated front-axle disconnect. Proper operation has the front axle disconnected from the drive axle in 2WD, and when the transfer case is shifted to a four-wheel-drive mode, power flows through the 4WD switch on the transfer case to energize the front-axle actuator, which now locks the front axle to the drive axle in

the differential to provide four-wheel-drive traction. This is a simple system, but there are many areas that if not understood can create issues for the customer and the shop.

1. Whenever removing any axles or driveshafts, match-mark the flanges so that they will be reassembled at the original locations. The vehicle manufacturer balances all these shafts and flanges during assembly, and noise, vibration and harshness (NVH) will result from reassembly in an out-of-balance position.

2. Shifting into 4WD mode will engage the transfer case, and there will be a short delay before the front axle is engaged. This delay is normal, and cold temperatures can increase the delay. When the system is in 4WD with the front axle locked, the 4X4 status light should turn on.

3. If the vehicle is shut off in 4WD, the front axle can disengage into 2WD. When the engine is restarted, the unit will re-engage 4WD with the same short delay.

4. These units can shift into 4W High "on the fly" (while moving). These units also will be hard to shift into 4WD while stationary because of lack of motion in the meshing parts resulting from lack of spline or gear match. Putting the vehicle into motion should make the shift to 4W High easy.

5. If you shift into 4 High while parked, the 4WD status light usually will not turn on until the vehicle begins to move and gear mesh is obtained.

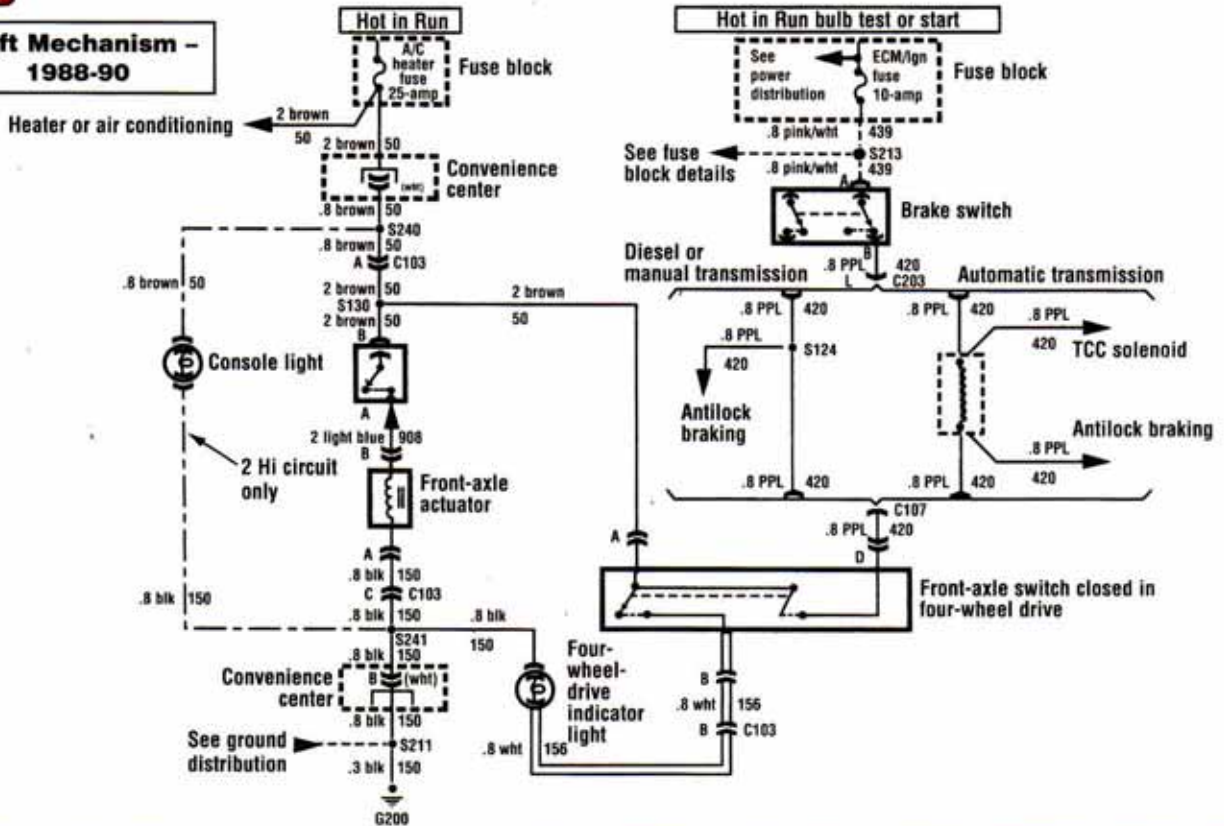
6. During the shift from 4WD to 2WD the 4X4 status light may remain on because of spline lock of the front-axle components. Releasing the gas pedal and then going back to throttle usually relaxes the components enough to release. At slow or stopped speeds it may be necessary to stop and reverse direction for a few feet to allow the components to disengage.

7. Because the axles turn at different

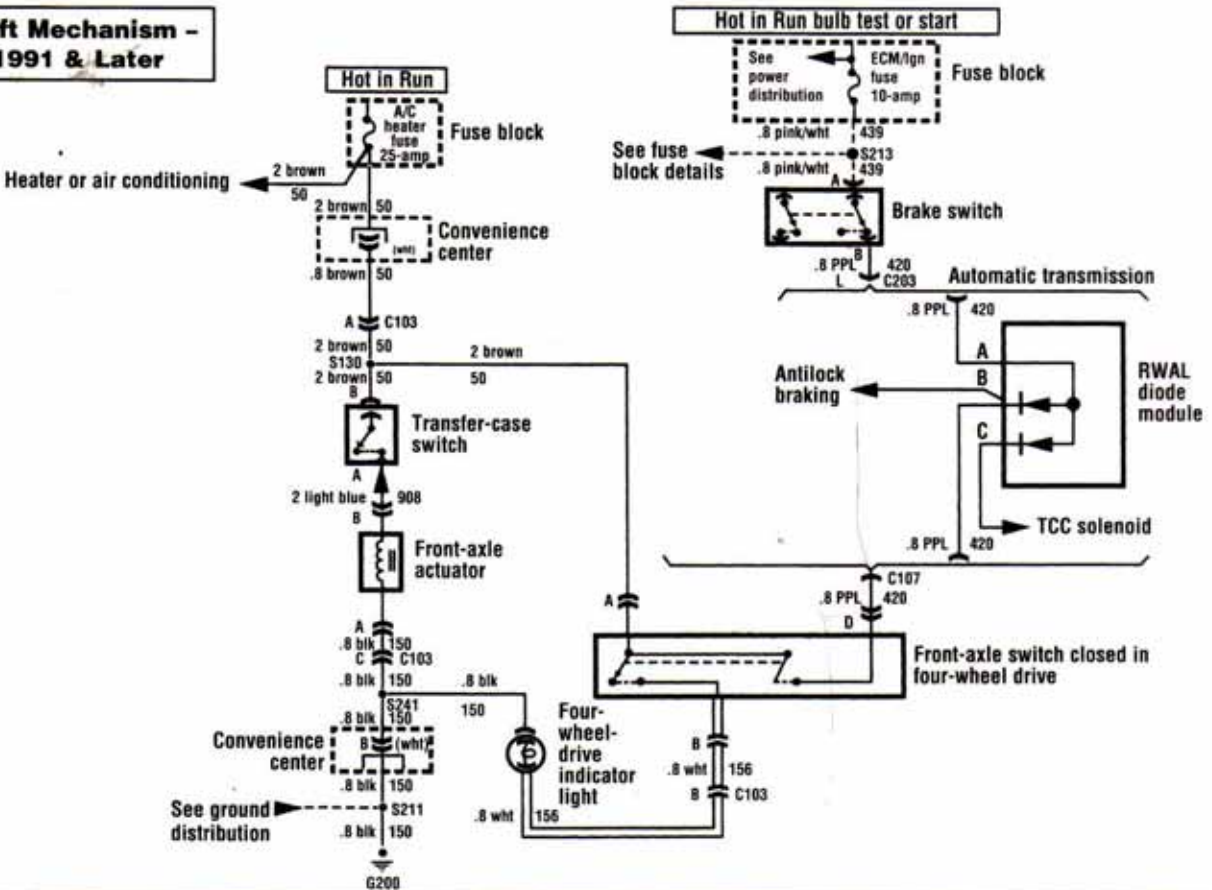
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Figure 1

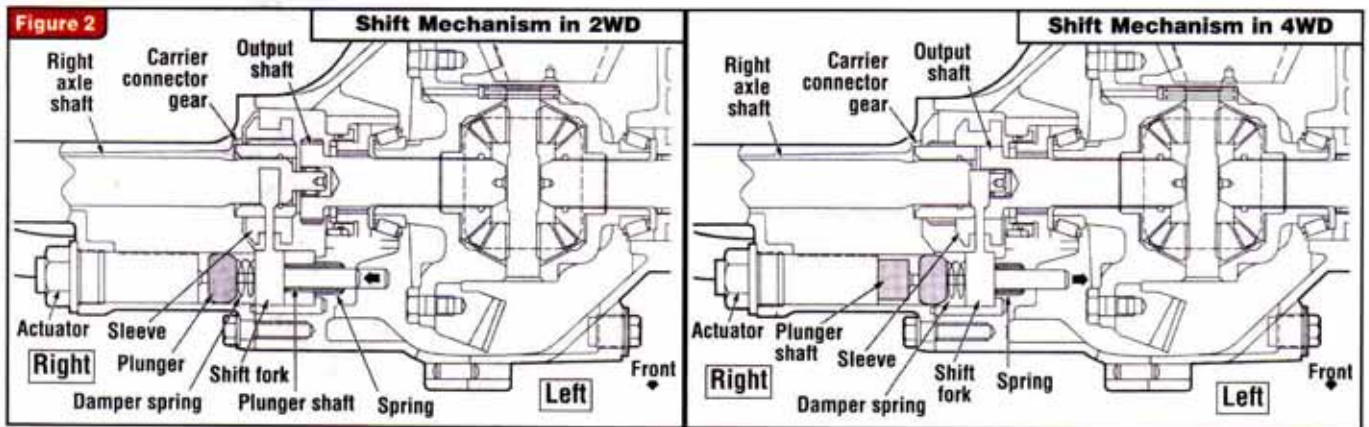
**Shift Mechanism - 1988-90**



**Shift Mechanism - 1991 & Later**







text continued from page 22 rates during turns, it is NEVER advisable to drive these vehicles in 4WD mode on dry pavement.

Another issue on the K-series front drive axles that generates a great deal of confusion and technical-hotline calls is the electric axle shift-actuator motor. The 1988-90 models used a screw-type drive motor to engage the front axle, which was equipped with a two-wire connector and had a silver body tube. In 1991 the design was changed to reduce engagement delay, and a black-bodied, three-wire "thermal gas-charged actuator" was introduced.

Unfortunately, the package included no installation instructions. The following will give you the proper way to hook up a three-wire

system when replacing a two-wire actuator. There are two brown wires and one black or blue wire. The short brown wire goes to the positive side of the transfer-case switch. The long brown wire goes to ignition on, and the black or blue wire goes to ground.

Caution: If you wish to test the three-wire black-bodied actuator by supplying 12 volts to it, do so only when it is installed properly in the front-axle case. If you put 12 volts to this unit while it is removed from the front-axle housing, it will be ruined and no good things will happen to anyone who is standing in front of it, and the guy who is holding it usually will have to change his shorts.

These 4WD systems involve many parts. We have the rear dif-

ferential and axles, the rear driveshaft, the transfer case, the front-axle driveshaft, and the front axle and differential. NVH (noise vibration and harshness) problems are always the most difficult to diagnose and a real cause of customer complaints. A bad day generally starts with the customer saying, "It wasn't like that until you worked on it."

The chart below is a pretty comprehensive factory guide to solving these problems, but you can prevent many of them by rigidly following your own set of established steps. Verify the customer's complaint, with the customer along if possible. Drive the vehicle thoroughly in all modes and ranges if possible. Match-mark all flanges,

*continues page 30*

## Diagnostic Procedures (chart continues on page 30)

**Driveshaft — Perform diagnostics of the driveshaft as shown in the following chart.**

Problem	Possible Cause	Correction
Leak at the front slip yoke (an occasional drop of lubricant leaking from the splined yoke is normal and requires no attention)	1. Rough surface on splined yoke — burred, nicked or worn 2. Defective transmission rear oil seal	1. Replace the seal. Minor burrs can be smoothed by careful honing with crocus cloth or fine stone. Replace the yoke if badly burred. 2. Replace the transmission rear oil seal and replenish the transmission oil.
Universal-joint noise	1. Center bearing 2. Worn universal-joint bearings 3. Improper lubrication 4. Loose flange bolts	1. Replace the center bearing. 2. Replace. 3. Lubricate as directed. 4. Tighten to specifications.
Ping, snap or click in driveline (usually heard on initial load after the transmission is in gear; forward or reverse)	1. Loose bushing bolts on the rear springs or upper and lower control arms 2. Loose or out-of-phase companion flange	1. Tighten the bolts to specified torque. 2. Remove companion flange, turn 180° from its original position, lubricate the splines and install. Tighten the bolts and pinion nut to specified torque.
Knocking or clunking noise in the driveline when operating the vehicle in a floating condition in high or neutral gear at up to 10 mph (16 km/h)	1. Worn or damaged universal joint 2. Side-gear hub counterbore in the differential is worn oversize.	1. Replace the worn or damaged universal joint. 2. Replace the differential case and/or the side gears.
Scraping noise	Slinger, companion flange or end yoke rubbing on rear axle or center bearing	Correct the interference.