Modern Automotive Technology
Chapter 59

Drive Shafts and Transfer Cases
Learning Objectives

- Identify and describe the parts of a modern drive shaft assembly.
- Explain the functions of a drive shaft.
- Describe the different types of universal joints.
- List the different types of drivelines.
- Identify the major parts of four-wheel-drive drivelines.
- Explain the basic operation of a transfer case.
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1. A Hotchkiss Driveline has an exposed drive shaft that operates a rear axle assembly mounted on springs.

2. The Rear Yoke holds the rear universal joint and transfers torque to gears in the rear axle assembly.
Hotch Kiss Driveline

- An exposed drive shaft operates a rear axle assembly mounted on springs
- Most common type of driveline
- Universal joints are used at both ends of the drive shaft
- Cross-and-roller universal joints are most commonly used
Drive Shaft

Connects the transmission output shaft with the rear axle assembly
Drive Shaft

Typical drive shaft assembly
3. A hollow metal tube that transfers turning power from front universal joint to rear universal joint is known as the **Drive Shaft**

4. The transmission output shaft is connected to the front universal joint by the **Slip Yoke**
Slip Yoke
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5. The Transfer Case sends power to both the front and rear axle assemblies.

6. The rear of the Torque Tube is formed as a rigid part of the rear axle housing.
Transfer Case

[Diagram of a vehicle showing the transfer case, transmission, front and rear drive axles, and other related components.]
Transfer Case Construction

- Shift selector hub
- 2-wheel and 4-wheel mode
  high–low range
- Section A double lip teflon seal
- Input shaft and fixed planetary
- Front case half
- Mounting adapter
- Double-up assembly
- Shift detent assembly
- Vent connection
- 4-wheel drive indicator light switch
- Main shaft and speedo drive gear assembly
- Shift rail and dual-fork assembly
- Shift lever and cam assembly
- Oil pump and filter assembly
- Front output shaft and single cardan joint assembly
- Rear output yoke
- Steel washer
- Rubber seal
- Double-up teflon seal
- Fill plug
- Drain plug
- Sprocket and chain
Power Flow
Four-Wheel Drive versus All-Wheel Drive

- Four-wheel drive has a transfer case separate from the transmission
  - drive ranges such as 2H, 4H, and 4L are provided
- All-wheel drive has the transfer case included as part of the transaxle
Four-Wheel Drive versus All-Wheel Drive
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7. The Front Universal Joint is a swivel connection that fastens the slip yoke to the drive shaft.

8. The cross and roller joint, also called a Cardan Universal Joint is the most common type of drive shaft universal joint.
Universal Joint

- Drive yoke
- Cross
- Driven yoke
- Power in
- Turning power through angle
- Power out
- Bearing cap
Types of Universal Joints

- Cross-and-roller or cardan universal joint
- Ball-and-trunnion (housing) universal joint
- Constant velocity universal joint
Cross-and-Roller
Constant Velocity Joint

Speed changes at the output of the first joint are offset by speed changes at the other joint.
Constant Velocity Drive Shaft
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9. To hold the middle of a two-piece drive shaft, a Center Support Bearing is needed.

10. The Rear Universal Joint is another flex joint connecting the drive shaft to the differential yoke.
Center Support Bearing
Center Support Bearing

- Center support bearing housing
- Rubber cushion ring
- Roller bearing
- Dust shield
- Front-to-rear drive shaft splines
- Drive shaft
Cross-and-Roller Driveshaft Assembly

- Slip yoke
- Bearings
- Seal
- Bearing cap
- Bearing cap retaining ring
- Cross
- Front universal joint
- Rear universal joint
- Drive shaft
- Rear yoke
- Clamp strap
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