



MANUAL DRIVE TRAIN AND AXLES

For every task in Manual Drive Train and Axles, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

A. General Drive Train Diagnosis	Priority	Completed
1. Identify and interpret drive train concerns; determine necessary action.	P-1	
2. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1	
3. Check fluid condition; check for leaks; determine necessary action.	P-1	
4. Drain and refill manual transmission/transaxle and final drive unit.	P-1	
B. Clutch Diagnosis and Repair		
1. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action.	P-1	
2. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots and springs; perform necessary action.	P-1	
3. Inspect and replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing and linkage, and pilot bearing/bushing (as applicable).	P-1	
4. Bleed clutch hydraulic system.	P-1	
5. Check and adjust clutch master cylinder fluid level; check for leaks.	P-1	
6. Inspect flywheel and ring gear for wear and cracks; determine necessary action.	P-1	
7. Measure flywheel runout and crankshaft end play; determine necessary action.	P-2	
C. Transmission/Transaxle Diagnosis and Repair		
1. Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers.	P-2	
2. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.	P-3	
3. Diagnose noise concerns through the application of transmission/transaxle powerflow principles.	P-2	



4. Diagnose hard shifting and jumping out of gear concerns; determine necessary action.	P-2	
5. Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action.	P-3	
6. Disassemble, inspect, clean and reassemble internal transmission/transaxle components.	P-3	
D. Drive Shaft, and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair.		
1. Diagnose constant-velocity (CV) joint noise and vibration concerns; determine necessary action.	P-1	
2. Diagnose universal joint noise and vibration concerns; perform necessary action.	P-2	
3. Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals.	P-1	
4. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.	P-1	
5. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles.	P-2	
E. Drive Axle Diagnosis and Repair		
E.1 Ring and Pinion Gears and Differential Case Assembly		
1. Clean and inspect differential housing; check for leaks; inspect housing vent.	P-2	
2. Check and adjust differential housing fluid level.	P-1	
3. Drain and refill differential housing.	P-1	
4. Diagnose noise and vibration concerns; determine necessary action.	P-2	
5. Inspect and replace companion flange and pinion seal; measure companion flange runout.	P-2	
6. Inspect ring gear and measure runout; determine necessary action.	P-3	
7. Remove, inspect, and reinstall drive pinion and ring gear, spacers, sleeves, and bearings.	P-3	
8. Measure and adjust drive pinion depth.	P-3	
9. Measure and adjust drive pinion bearing preload.	P-3	
10. Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types).	P-3	
11. Check ring and pinion tooth contact patterns; perform necessary action.	P-3	
12. Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.	P-3	
13. Reassemble and reinstall differential case assembly; measure runout; determine necessary action.	P-3	
E.2 Limited Slip Differential		



1. Diagnose noise, slippage, and chatter concerns; determine necessary action.	P-3	
2. Measure rotating torque; determine necessary action.	P-3	
E.3 Drive Axles		
1. Inspect and replace drive axle wheel studs.	P-1	
2. Remove and replace drive axle shafts.	P-1	
3. Inspect and replace drive axle shaft seals, bearings, and retainers.	P-2	
4. Measure drive axle flange runout and shaft end play; determine necessary action.	P-2	
5. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine necessary action.	P-2	
F. Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair		
1. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.	P-3	
2. Inspect front-wheel bearings and locking hubs; perform necessary action(s).	P-3	
3. Check for leaks at drive assembly seals; check vents; check lube level.	P-3	
4. Identify concerns related to variations in tire circumference and/or final drive ratios	P-3	
5. Diagnose noise, vibration, and unusual steering concerns; determine necessary action.	P-3	
6. Diagnose, test, adjust, and replace electrical/electronic components of four-wheel drive systems.	P-3	
7. Disassemble, service, and reassemble transfer case and components.	P-3	