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.

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

2. Measure rotating torque; determine necessary action.

### E.3 Drive Axles

1. Inspect and replace drive axle wheel studs.  

2. Remove and replace drive axle shafts.

3. Inspect and replace drive axle shaft seals, bearings, and retainers.

4. Measure drive axle flange runout and shaft end play; determine necessary action.

5. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine necessary action.

### 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.

2. Inspect front-wheel bearings and locking hubs; perform necessary action(s).

3. Check for leaks at drive assembly seals; check vents; check lube level.

4. Identify concerns related to variations in tire circumference and/or final drive ratios

5. Diagnose noise, vibration, and unusual steering concerns; determine necessary action.

6. Diagnose, test, adjust, and replace electrical/electronic components of four-wheel drive systems.

7. Disassemble, service, and reassemble transfer case and components.