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| 20. | Air test operation of clutch and servo assemblies. | P-1 |
| 21. | Inspect roller and sprag clutch, races, rollers, sprags, springs, cages, and retainers; determine necessary action. | P-1 |
| 22. | Inspect bands and drums; determine necessary action. | P-2 |
| 23. | Describe the operational characteristics of a continuously variable transmission (CVT) | P-3 |
| 24. | Describe the operational characteristics of a hybrid vehicle drive train. | P-3 |

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.

III. MANUAL DRIVE TRAIN AND AXLES

A. General Drive Train Diagnosis

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| 1. | Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. | P-1 |
| 2. | Identify and interpret drive train concern; determine necessary action. | P-1 |
| 3. | Research applicable vehicle and service information, such as drive train system operation, fluid type, vehicle service history, service precautions, and technical service bulletins. | P-1 |
| 4. | Locate and interpret vehicle and major component identification numbers. | P-1 |
| 5. | Diagnose fluid loss, level, and condition concerns; determine necessary action. | P-1 |
| 6. | Drain and fill manual transmission/transaxle and final drive unit. | P-1 |

III. MANUAL DRIVE TRAIN AND AXLES

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 hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action. P-1
4. Inspect and replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing and linkage, and pilot bearing/bushing (as applicable). P-1
5. Bleed clutch hydraulic system. P-1
6. Inspect flywheel and ring gear for wear and cracks; determine necessary action. P-1
7. Inspect engine block, core plugs, rear main engine oil seal, clutch (bell) housing, transmission/transaxle case mating surfaces, and alignment dowels; determine necessary action. P-1
8. Measure flywheel runout and crankshaft end play; determine necessary action. P-2

III. MANUAL DRIVE TRAIN AND AXLES

C. Transmission/Transaxle Diagnosis and Repair

1. Remove and reinstall transmission/transaxle. P-1
2. Disassemble, clean, and reassemble transmission/transaxle components. P-1
3. Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action. P-2
4. Diagnose noise concerns using transmission/transaxle powerflow principles. P-2
5. Diagnose hard shifting and jumping out of gear concerns; determine necessary action. P-2

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| 6. | Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers. | P-2 |
| 7. | Inspect, replace, and align powertrain mounts. | P-2 |
| 8. | Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces. | P-2 |
| 9. | Remove and replace transaxle final drive. | P-3 |
| 10. | Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs. | P-2 |
| 11. | Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action. | P-1 |
| 12. | Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings. | P-1 |
| 13. | Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action. | P-3 |
| 14. | Remove, inspect, measure, adjust, and reinstall transaxle final drive pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case assembly. | P-3 |
| 15. | Inspect lubrication devices (oil pump or slingers); perform necessary action. | P-3 |
| 16. | Inspect, test, and replace transmission/transaxle sensors and switches. | P-2 |
| 17. | Describe the operational characteristics of an electronically controlled manual transmission/transaxle. | P-3 |

III. MANUAL DRIVE TRAIN AND AXLES

D. Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair

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| 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. | Remove and replace front wheel drive (FWD) front wheel bearing. | P-1 |
| 4. | Inspect, service, and replace shafts, yokes, boots, and CV joints. | P-1 |

5. Inspect, service, and replace shaft center support bearings. P-3
6. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles. P-2

III. MANUAL DRIVE TRAIN AND AXLES

E. Drive Axle Diagnosis and Repair

1. Ring and Pinion Gears and Differential Case Assembly

1. Diagnose noise and vibration concerns; determine necessary action. P-2
2. Diagnose fluid leakage concerns; determine necessary action. P-1
3. Inspect and replace companion flange and pinion seal; measure companion flange runout. P-2
4. Inspect ring gear and measure runout; determine necessary action. P-2
5. Remove, inspect, and reinstall drive pinion and ring gear, spacers, sleeves, and bearings. P-2
6. Measure and adjust drive pinion depth. P-2
7. Measure and adjust drive pinion bearing preload. P-2
8. 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-2
9. Check ring and pinion tooth contact patterns; perform necessary action. P-1
10. Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case. P-2
11. Reassemble and reinstall differential case assembly; measure runout; determine necessary action. P-2

2. Limited Slip Differential

1. Diagnose noise, slippage, and chatter concerns; determine necessary action. P-3
2. Clean and inspect differential housing; refill with correct lubricant and/or P-2

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3. Inspect and reinstall limited slip differential components. P-3
4. Measure rotating torque; determine necessary action. P-3

3. Drive Axle Shaft

1. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine necessary action. P-2
2. Inspect and replace drive axle shaft wheel studs. P-1
3. Remove and replace drive axle shafts. P-1
4. Inspect and replace drive axle shaft seals, bearings, and retainers. P-2
5. Measure drive axle flange runout and shaft end play; determine necessary action. P-2

III. MANUAL DRIVE TRAIN AND AXLES

F. Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair

1. Diagnose noise, vibration, and unusual steering concerns; determine necessary action. P-3
2. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets. P-3
3. Remove and reinstall transfer case. P-3
4. Disassemble, service, and reassemble transfer case and components. P-3
5. Inspect front-wheel bearings and locking hubs; perform necessary action. P-3
6. Check drive assembly seals and vents; check lube level. P-3
7. Diagnose, test, adjust, and replace electrical/electronic components of four-wheel drive systems. P-3
8. Identify concerns related to variations in tire circumference and/or final drive ratios. P-3