

APPENDIX I

ASE CERTIFICATION

Courtesy of the National Institute for Automotive Service Excellence. For an up-to-date task list, contact ASE at (703) 713-3800 and request an Automobile Preparation Guide.

Automotive and truck technicians have the opportunity to take National Institute for Automotive Service Excellence (ASE) certification tests voluntarily to become ASE-certified technicians. Certification helps technicians prove their abilities to themselves, to their employers, and to their customers. ASE certification requires that you pass one or more tests and have at least two years of automotive repair work experience. School training can be used to substitute for part of the work experience requirement. You may take the test(s) before completing the work experience requirement. You will receive the score report, and then when the experience requirement is completed, you will receive certification.

There are eight automotive service tests, and one is A3, Manual Drivetrains and Axles. There are eight medium/heavy truck service tests, and one is T3, Drivetrain. The A3 test has 40 questions, taken from these content areas:

<i>Content Area</i>	<i>Questions</i>
A. Clutch diagnosis and repair	6
B. Transmission diagnosis and repair	6
C. Transaxle diagnosis and repair	8
D. Drive (half) shaft and universal joint/constant-velocity (CV) joint diagnosis and repair (front- and rear-wheel drive)	6
E. Rear axle diagnosis and repair	7
1. Ring and pinion gears	(3)
2. Differential case assembly	(2)
3. Limited slip differential	(1)
4. Axle shafts	(1)
F. Four-wheel drive component diagnosis and repair	7

Each of the content areas are divided into groups of tasks. These are the things that a drivetrain technician should be able to do. For a current task list, call ASE and request an Automobile Preparation Guide or visit their website at www.ase.com.

TASK LIST: MANUAL DRIVETRAIN AND AXLES

A. Clutch Diagnosis and Repair

1. Diagnose clutch noise, binding, slippage, pulsation, chatter, pedal feel/effort, and release problems; determine needed repairs.
2. Inspect, adjust, and replace clutch pedal linkage, cables and automatic adjuster mechanisms, brackets, bushings, pivots, and springs.
3. Inspect, adjust, replace, and bleed hydraulic clutch slave and master cylinders, lines, and hoses.
4. Inspect, adjust, and replace release (throw-out) bearing, lever, and pivot.
5. Inspect and replace clutch disc and pressure plate assembly.
6. Inspect and replace pilot bearing.
7. Inspect and measure flywheel and ring gear; repair or replace as necessary.
8. Inspect engine block, clutch (bell) housing, and transmission case mating surfaces; determine needed repairs.
9. Measure flywheel-to-block runout and crankshaft end play; determine needed repairs.
10. Measure clutch (bell) housing bore-to-crankshaft runout and face squareness; determine needed repairs.
11. Inspect, replace, and align powertrain mounts.

B. Transmission Diagnosis and Repair

1. Diagnose transmission noise, hard shifting, jumping out of gear, and fluid leakage problems; determine needed repairs.
2. Inspect, adjust, and replace transmission external shifter assembly, shift linkages, brackets, bushings/grommets, pivots, and levers.
3. Inspect and replace transmission gaskets, sealants, seals, and fasteners; inspect sealing surfaces.
4. Remove and replace transmission; inspect transmission mounts.
5. Disassemble and clean transmission components; reassemble transmission.

6. Inspect, repair, and/or replace transmission shift cover and internal shift forks, bushings, levers, shafts, sleeves, detent mechanisms, interlocks, and springs.
7. Inspect and replace input (clutch) shaft, bearings, and retainers.
8. Inspect and replace mainshaft, gears, thrust washers, bearings, and retainers/snap rings.
9. Inspect and replace synchronizer hub, sleeve, keys (inserts), springs, and blocking (synchronizing) rings; measure blocking ring clearance.
10. Inspect and replace counter (cluster) gear, shaft, bearings, thrust washers, and retainers/snap rings.
11. Inspect and replace reverse idler gear, shaft, bearings, thrust washers, and retainers/snap rings.
12. Measure and adjust shaft, gear, and synchronizer end play.
13. Measure and adjust bearing preload.
14. Inspect, repair, and replace extension housing and transmission case mating surfaces, bores, bushings, and vents.
15. Inspect and replace speedometer drive gear, driven gear, and retainers.
16. Inspect, test, and replace transmission sensors and switches.
17. Inspect lubrication devices; check fluid level and refill with proper fluid.

C. Transaxle Diagnosis and Repair

1. Diagnose transaxle noise, hard shifting, jumping out of gear, and fluid leakage problems; determine needed repairs.
2. Inspect, adjust, and replace transaxle external shift assembly, linkages, brackets, bushings/grommets, cables, pivots, and levers.
3. Inspect and replace transaxle gaskets, sealants, seals, and fasteners; inspect sealing surfaces.
4. Remove and replace transaxle; inspect, replace, and align transaxle mounts.
5. Disassemble and clean transaxle components; reassemble transaxle.
6. Inspect, repair, and/or replace transaxle shift cover and internal shift forks, levers, bushings, shafts, sleeves, detent mechanisms, interlocks, and springs.
7. Inspect and replace input shaft, bearings, and retainers.
8. Inspect and replace output shaft, gears, thrust washers, bearings, and retainers/snap rings.
9. Inspect and replace synchronizer hub, sleeve, keys (inserts), springs, and blocking (synchronizing) rings; measure blocking ring clearance.
10. Inspect and replace reverse idler gear, shaft, bearings, thrust washers, and retainers/snap rings.
11. Inspect, repair, and replace transaxle case mating surfaces, bores, bushings, and vents.
12. Inspect and replace speedometer drive gear, driven gear, and retainers.
13. Inspect, test, and replace transaxle sensors and switches.

14. Diagnose differential assembly noise and vibration problems; determine needed repairs.
15. Remove and replace differential assembly.
16. Inspect, measure, adjust, and replace differential pinion gears (spiders), shaft, side gears, thrust washers, and case.
17. Inspect and replace differential side bearings.
18. Measure shaft end play/preload (shim/spacer selection procedure).
19. Inspect lubrication devices; check fluid level and refill with proper fluid.

D. Drive (Half) Shaft and Universal Joint/Constant-Velocity (CV) Joint Diagnosis and Repair (Front- and Rear-Wheel Drive)

1. Diagnose shaft and universal/CV joint noise and vibration problems; determine needed repairs.
2. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.
3. Inspect, service, and replace shaft center support bearings.
4. Check and correct propeller shaft balance.
5. Measure shaft runout.
6. Measure and adjust shaft angles.

E. Rear-Wheel-Drive Axle Diagnosis and Repair

1. Ring and Pinion Gears

1. Diagnose noise, vibration, and fluid leakage problems; determine needed repairs.
2. Inspect and replace companion flange and pinion seal; measure companion flange runout.
3. Measure ring gear runout; determine needed repairs.
4. Inspect and replace ring and pinion gear set, collapsible spacers, sleeves (shims), and bearings.
5. Measure and adjust drive pinion depth.
6. Measure and adjust drive pinion preload (collapsible spacer or shim type).
7. Measure and adjust differential (side) bearing preload and ring and pinion backlash (threaded cup or shim type).
8. Perform ring and pinion tooth contact pattern checks; determine needed adjustments.

2. Differential Case Assembly

1. Diagnose differential assembly noise and vibration problems; determine needed repairs.
2. Remove and replace differential assembly.

3. Inspect, measure, adjust, and replace differential pinion gears (spiders), shaft, side gears, thrust washers, and case.
4. Inspect and replace differential side bearings.
5. Measure differential case runout; determine needed repairs.

3. Limited Slip Differential

1. Diagnose limited slip differential noise, slippage, and chatter problems; determine needed repairs.
2. Inspect, flush, and refill with correct lubricant.
3. Inspect, adjust, and replace clutch (cone/plate) pack.

4. Axle Shafts

1. Diagnose rear axle shaft noise, vibration, and fluid leakage problems; determine needed repairs.
2. Inspect and replace rear axle shaft wheel studs.
3. Remove, inspect, and replace rear axle shafts, seals, bearings, and retainers.
4. Measure rear axle flange runout and shaft end play; determine needed repairs.

F. Four-Wheel-Drive Component Diagnosis and Repair

1. Diagnose four-wheel-drive assembly noise, vibration, shifting, and steering problems; determine needed repairs.
2. Inspect, adjust, and repair transfer case manual shifting mechanisms, bushings, mounts, levers, and brackets.
3. Remove and replace transfer case.
4. Disassemble and clean transfer case and components; reassemble transfer case.
5. Inspect and service transfer case and internal components; check lube level.
6. Inspect, service, and replace front drive (propeller) shafts and universal/CV joints.
7. Inspect, service, and replace front drive axle knuckles and driving shafts.
8. Inspect, service, and replace front-wheel bearings and locking hubs.
9. Check transfer case and front axle seals and remote vents.
10. Diagnose, test, adjust, and replace electrical/electronic components of four-wheel-drive systems.