

Diesel Technology: Drive Trains

NATEF Crosswalk

The following NATEF Drive Trains tasks (Rev. 2004) are covered in this publication. The chart shows where each task is located within the publication. The first column identifies the NATEF task by name and number. The second column identifies the exact location by unit number and assignment sheet or job sheet.

NATEF Tasks	MAVCC Tasks
A. Clutch Diagnosis and Repair—Unit 6	
1. Diagnose clutch noise, binding, slippage, pulsation, vibration, grabbing, and chatter problems; determine needed action. P-1	Assignment Sheet 1 — Diagnose clutch noise, binding, slippage, pulsation, vibration, grabbing, and chatter problems; determine needed repairs.
2. Inspect and adjust clutch linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch (includes push and pull-type assemblies); check pedal height and travel; perform needed action. P-1	Job Sheet 1 — Inspect and adjust clutch linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch (includes push and pull-type assemblies), and check pedal height and travel.
3. Inspect, adjust, repair, or replace hydraulic clutch slave and master cylinders, lines, and hoses; bleed system. P-2	Job Sheet 2 — Inspect, adjust, repair, or replace hydraulic clutch slave and master cylinders, lines and hoses; bleed system.
4. Inspect, adjust, or replace release (throw-out) bearing, sleeve, bushings, springs, housing, levers, release fork, fork pads, rollers, shafts, and seals. P-2	Job Sheet 6 — Inspect, adjust, or replace release (throw-out) bearing, sleeve, bushings, springs, housing, levers, release fork, fork pads, rollers, shafts, and seals.
5. Inspect, adjust, and replace single-disc clutch pressure plate and clutch disc. P-1	Job Sheet 5 — Inspect a single-disc and two-plate clutch pressure plate clutch disc(s), intermediate plate, and drive pins/lugs.
6. Inspect, adjust, and replace two-plate clutch pressure plate, clutch discs, intermediate plate, and drive pins/lugs. P-1	Job Sheet 5 — Inspect a single-disc and two-plate clutch pressure plate clutch disc(s), intermediate plate, and drive pins/lugs.
7. Inspect and/or replace clutch brake assembly; inspect input shaft and bearing retainer; perform needed action. P-3	Job Sheet 7 — Inspect and/or replace clutch brake assembly; inspect input shaft and bearing retainer.
8. Inspect, adjust, and replace self-adjusting/continuous-adjusting clutch mechanisms. P-3	Job Sheet 3 — Inspect, adjust, and replace, self-adjusting/continuous-adjusting clutch mechanisms.
9. Inspect and replace pilot bearing. P-2	Job Sheet 8 — Inspect and replace pilot bearing.
10. Inspect flywheel mounting area on crankshaft, rear main oil seal, and measure crankshaft end play; determine needed action. P-2	Job Sheet 11 — Inspect flywheel mounting area on crankshaft, rear main oil seal, and measure crankshaft end play.
11. Inspect flywheel, starter ring gear and measure flywheel face and pilot bore runout; determine needed action. P-2	Job Sheet 10 — Inspect flywheel, starter ring gear and measure flywheel face and pilot bore runout.

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12. Inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action. P-2	Job Sheet 9 — Inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout.
B. Transmission Diagnosis and Repair	
1. Diagnose transmission noise, shifting, lockup, jumping-out-of-gear, overheating, and vibration problems; determine needed action. P-1	Unit 4, Assignment Sheet 1 — Diagnose causes of transmission noise, shifting, lockup, jumping-out-of-gear, overheating, and vibration.
2. Diagnose transmission component failure cause, both before and during disassembly procedures; determine needed action. P-2	Throughout
3. Inspect, adjust, service, repair, or replace transmission remote shift linkages, brackets, bushing, pivots, and levers. P-2	Unit 4, Job Sheet 5 — Inspect, adjust, service, repair, or replace remote shift linkages and control assembly, brackets, bushings, pivots, and levels.
4. Inspect, test, repair, or replace air shift controls, lines, hoses, valves, regulators, filters, and cylinder assemblies. P-1	Unit 4, Job Sheet 3 — Inspect, test, adjust, repair, or replace air shift controls, lines, valves, regulators, filters, and cylinder assemblies.
5. Inspect and replace transmission mounts, insulators, and mounting bolts; determine needed action. P-3	Unit 4, Job Sheet 4 — Remove the transmission; check condition of transmission mounts, insulators, and mounting bolts. Unit 5, Job Sheet 1 — Remove transmission; check condition of transmission mounts, insulators, and mounting bolts
6. Inspect for leakage and replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; repair as needed. P-1	Unit 4, Job Sheet 1 — Inspect for leakage and replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents.
7. Check transmission fluid level and condition; determine needed service; add proper type of lubricant. P-1	Unit 1. Job Sheet 1 — Perform drive train lubrication and replace grease fittings.
8. Inspect, adjust, and replace transmission shift lever, cover, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts/safety wires. P-3	Unit 4, Job Sheet 6 — Inspect, adjust, and replace transmission shift lever assembly, top cover, and shift bar housing.
9. Remove and reinstall transmission. P-2	Unit 4, Job Sheet 4 — Remove the transmission; check condition of transmission mounts, insulators, and mounting bolts. Unit 4, Job Sheet 12 — Reinstall transmission Unit 5, Job Sheet 1 — Remove transmission; check condition of transmission mounts, insulators, and mounting bolts Unit 5, Job Sheet 3 — Reinstall transmission

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10. Inspect input shaft, gear, spacers, bearings, retainers, and slingers; replace as needed. P-3	Unit 4, Job Sheet 9 — Remove, inspect, and reinstall input shaft gear, spacers, bearing, retainers, and slingers.
11. Inspect and adjust main shaft, gears, sliding clutches, washers, spacers, bushings, bearings, auxiliary drive assemblies, retainers, and keys; replace as needed. P-3	Unit 4, Job Sheet 8 — Remove, disassemble, inspect, assemble, and reinstall the main shaft and auxiliary drive assembly.
12. Inspect countershafts, gears, bearings, retainers, and keys; adjust bearing preload and time multiple countershaft gears; replace as needed. P-3	Unit 4, Job Sheet 7 — Remove, disassemble, inspect, assemble, and reinstall the auxiliary case and its components Unit 4, Job Sheet 10 — Remove, inspect, and/or replace main countershafts, reverse idler assembly, and oil pump; time multiple countershafts.
13. Inspect output shafts, gears, washers, spacers, bearings, retainers, and keys, replace as needed. P-3	Unit 4, Job Sheet 7 — Remove, disassemble, inspect, assemble, and reinstall the auxiliary case and its components
14. Inspect reverse idler shafts, gears, bushings, bearings, thrust washers, and retainers; check reverse idler gear and end play (where applicable); replace as needed. P-3	Unit 4, Job Sheet 10 — Remove, inspect, and/or replace main countershafts, reverse idler assembly, and oil pump; time multiple countershafts.
15. Inspect synchronizer hub, sleeve, keys (inserts), springs, blocking rings, synchronizer plates, blocker pins, and sliding clutches; replace as needed. P-3	Unit 4, Job Sheet 7 — Remove, disassemble, inspect, assemble, and reinstall the auxiliary case and its components
16. Inspect transmission cases including surfaces, bores, bushings, pins, studs, and magnets; replace as needed. P-3	Unit 4, Job Sheet 11 — Inspect transmission cases
17. Inspect transmission lubrication system pumps, troughs, collectors, and slingers; service or replace as needed. P-3	Unit 4, Job Sheet 10 — Remove, inspect, and/or replace main countershafts, reverse idler assembly, and oil pump; time multiple countershafts.
18. Inspect transmission oil filters and coolers; replace as needed. P-2	Unit 4, Job Sheet 14 — Inspect transmission oil filter and cooler
19. Inspect mechanical and electronic speedometer components; determine needed action. P-3	Unit 4, Job Sheet 7 — Remove, disassemble, inspect, assemble, and reinstall the auxiliary case and its components
20. Inspect and adjust power take-off (PTO) assemblies, controls, and shafts; perform needed action. P-3	Unit 3, Job Sheet 1 — Inspect the PTO. Unit 3, Job Sheet 2 — Remove, install and adjust a PTO
21. Inspect and test function of backup light, neutral start, and warning device circuits; repair as needed. P-1.	Unit 4, Job Sheet 2 — Inspect and test function of backup lamp, neutral start, and warning device circuits

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22. Inspect and test transmission temperature gauge sending unit/sensor; determine needed action. P-3	Unit 4, Job Sheet 15 — Inspect and test transmission temperature gauge.
23. Inspect, test operation, adjust, repair, or replace automated mechanical transmission and manual electronic shift controls, shift, range and splitter solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU), neutral/in gear and reverse switches, and wiring harnesses. P-2	Unit 4, Job Sheet 17 — Inspect, adjust, repair, or replace electronic shift controls, sensors, solenoids, shift motors, indicators, control units, and wiring harnesses. Unit 5, Job Sheet 4 — Inspect, adjust, repair, or replace electronic shift controls, electronic control unit, wiring harnesses, sensors, control module, vehicle interface module, and related components.
24. Inspect, test operation, repair, or replace electronic shift selectors, air and electrical switches, displays and indicators, wiring harnesses, and air lines. P-2	Unit 4, Job Sheet 18 — Inspect, adjust, repair, or replace electronic shift selectors, air and electrical switches, displays and indicators, and wiring harnesses. Unit 5, Job Sheet 4 — Inspect, adjust, repair, or replace electronic shift controls, electronic control unit, wiring harnesses, sensors, control module, vehicle interface module, and related components.
25. Use appropriate diagnostic tools and procedures to diagnose automated mechanical transmission problems; check and record diagnostic codes, clear codes, and interpret digital multimeter (DMM) readings; determine needed repairs. P-2	Unit 4, Job Sheet 16 — Use a diagnostic tool and procedure to diagnose automated transmission problems. Unit 5, Job Sheet 4 — Inspect, adjust, repair, or replace electronic shift controls, electronic control unit, wiring harnesses, sensors, control module, vehicle interface module, and related components.
26. Inspect, test operation, adjust, repair, or replace automatic transmission electronic and manual shift controls, shift solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU), neutral/in gear and reverse switches, and wiring harnesses. P-3	Unit 4, Job Sheet 17 — Inspect, adjust, repair, or replace electronic shift controls, sensors, solenoids, shift motors, indicators, control units, and wiring harnesses. Unit 5, Job Sheet 4 — Inspect, adjust, repair, or replace electronic shift controls, electronic control unit, wiring harnesses, sensors, control module, vehicle interface module, and related components.
27. Inspect, test operation, repair, or replace automatic transmission electronic shift selectors, switches, displays and indicators, wiring harnesses. P-3	Unit 4, Job Sheet 18 — Inspect, adjust, repair, or replace electronic shift selectors, air and electrical switches, displays and indicators, and wiring harnesses. Unit 5, Job Sheet 4 — Inspect, adjust, repair, or replace electronic shift controls, electronic control unit, wiring harnesses, sensors, control module, vehicle interface module, and related components.

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<p>28. Use appropriate diagnostic tools and procedures to diagnose automatic transmission problems; check and record diagnostic codes, clear codes, and interpret digital multimeter (DMM) readings; determine needed repairs. P-3</p>	<p>Unit 4, Job Sheet 16 — Use a diagnostic tool and procedure to diagnose automated transmission problems. Unit 5, Job Sheet 4 — Inspect, adjust, repair, or replace electronic shift controls, electronic control unit, wiring harnesses, sensors, control module, vehicle interface module, and related components.</p>
<p>C. Drive and Universal Joint Diagnosis and Repair—Unit 2</p>	
<p>1. Diagnose driveshaft and universal joint noise and vibration problems; determine needed action. P-1</p>	<p>Assignment Sheet 1 — Diagnose driveshaft and U-joint problems.</p>
<p>2. Inspect, service, or replace driveshaft, slip joints, yokes, drive flanges, and universal joints; check phasing of all yokes. P-1</p>	<p>Job Sheet 1 — Inspect and service driveshaft, slip joints, yokes, drive flanges, and U-joints; check phasing of all yokes.</p>
<p>3. Inspect and replace driveshaft center support bearings and mounts; determine needed action. P-1</p>	<p>Job Sheet 2 — Remove and reinstall the driveshaft and center support bearing and mounts.</p>
<p>4. Measure and adjust drive line angles. P-2</p>	<p>Job Sheet 5 — Measure and adjust driveline angles.</p>
<p>D. Drive Axle Diagnosis and Repair—Unit 7</p>	
<p>1. Diagnose drive axle(s) drive unit noise and overheating problems; determine needed action. P-2</p>	<p>Assignment Sheet 1 — Diagnose drive axle(s) drive unit noise and overheating problems.</p>
<p>2. Check and repair fluid leaks; inspect and replace drive axle housing cover plates, gaskets, sealants, vents, magnetic plugs, and seals. P-1</p>	<p>Job Sheet 2 — Check for and repair fluid leaks; inspect and replace drive axle drive unit cover plates, gaskets, sealants, vents, magnetic plugs, and seals.</p>
<p>3. Check drive axle fluid level and condition; determine needed service; add proper type of lubricant. P-1</p>	<p>Job Sheet 1 — Check axle fluid level and condition; add proper type of lubricant.</p>
<p>4. Remove and replace differential carrier assembly. P-2</p>	<p>Job Sheet 6 — Remove and replace differential carrier, inspect case and caps, side bearing bores, and pilot bearing bore.</p>
<p>5. Inspect and replace differential case assembly including spider gears, cross shaft, side gears, thrust washers, case halves, and bearings. P-3</p>	<p>Job Sheet 7 — Inspect and replace differential case assembly including spider gears, cross shaft, side gears, thrust washers, case halves, and bearing.</p>
<p>6. Inspect and replace components of locking differential case assembly. P-3</p>	<p>Job Sheet 17 — Inspect and replace components of locking differential case assembly</p>

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7. Inspect differential carrier case and caps, side bearing bores, and pilot (spigot, pocket) bearing bores; determine needed action. P-3	Job Sheet 6 — Remove and replace differential carrier, inspect case and caps, side bearing bores, and pilot bearing bore.
8. Measure ring gear runout; determine needed repairs. P-3	Job Sheet 12 — Measure ring gear runout.
9. Inspect and replace ring and drive pinion gears, spacers, sleeves, bearing cages, and bearings. P-3	Job Sheet 8 — Inspect and replace ring and drive pinion gears, spacers, sleeves, bearing cage, and bearings.
10. Measure and adjust drive pinion bearing preload. P-3	Job Sheet 10 — Measure and adjust drive pinion bearing preload.
11. Measure and adjust drive pinion depth. P-3	Job Sheet 9 — Measure and adjust drive pinion depth.
12. Measure and adjust side bearing preload and ring gear backlash. P-3	Job Sheet 11 — Measure and adjust side bearing preload and ring gear backlash.
13. Check and interpret ring gear and pinion tooth contact pattern; determine needed action. P-3	Job Sheet 13 — Check and interpret ring gear and pinion tooth contact pattern.
14. Inspect, adjust, or replace ring gear thrust block/bolt. P-3	Job Sheet 14 — Inspect, adjust, or repair ring gear thrust block/screw.
15. Inspect, adjust, repair, or replace planetary gear-type 2-speed axle assembly including: case, idler pinion, pins, thrust washers, sliding clutch gear, shift fork, pivot, seals, cover, and springs. P-3	Job Sheet 15 — Inspect, adjust, repair, or replace planetary gear-type 2-speed axle assembly.
16. Inspect, repair, or replace 2-speed axle shift control system, speedometer adapters, motors, axle shift units, wires, air lines, and connectors. P-3	Job Sheet 16 — Inspect, repair, or replace 2-speed axle shift control system, speedometer adapters, motors, axle shift units, wires, air lines and connectors.
17. Inspect power divider (inter-axle differential) assembly; determine needed action. P-3	Job Sheet 18 — Inspect, adjust, repair, or replace air-operated power divider (inter-axle differential) lockout assembly.
18. Inspect, adjust, repair, or replace air operated power divider (inter-axle differential) lockout assembly including diaphragms, seals, springs, yokes, pins, lines, hoses, fittings, and controls. P-2	Job Sheet 18 — Inspect, adjust, repair, or replace air-operated power divider (inter-axle differential) lockout assembly.
19. Inspect, repair, or replace drive axle lubrication system; pump, troughs, collectors, slingers, tubes, and filters. P-3	Job Sheet 19 — Inspect, repair, or replace rear axle lubrication system
20. Inspect and replace drive axle shafts. P-1	Job Sheet 4 — Inspect and replace drive axle shafts

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21. Remove and replace wheel assembly; check rear wheel seal and axle flange gasket for leaks; perform needed action. P-1	Job Sheet 3 — Remove, clean, inspect, lubricate, replace, and adjust wheel bearings and seals.
22. Diagnose drive axle for wheel bearing noise and damage; perform needed action. P-2	Assignment Sheet 2 — Diagnose drive axle for wheel bearing noise and damage.
23. Inspect and test drive axle temperature gauge sending unit/sensor; determine needed action. P-3	Job Sheet 5 — Inspect and test rear axle temperature gauge and sensor
24. Clean, inspect, lubricate and replace wheel bearings; replace seals and wear rings; adjust drive axle wheel bearings. P-1	Job Sheet 3 — Remove, clean, inspect, lubricate, replace, and adjust wheel bearings and seals.
25. Inspect and test drive axle temperature sending unit/sensor; determine needed action. P-1	Job Sheet 5 — Inspect and test rear axle temperature gauge and sensor