

## 2008 NATEF AUTOMOBILE STANDARDS CORRELATIONS

### **MANUAL DRIVE TRAIN & AXLES**

**For every task in Manual Drive Train & 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.

<b>A. General Drive Train Diagnosis</b>	<b>Student Edition</b>	<b>Technical Applications</b>
1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. (P-1)	HB-48	Job Sheet MD-1
2. Identify and interpret drive train concern; determine necessary action. (P-1)	MD-569 through MD-577, MD-614 through MD-615, MD-634 through MD-635	Job Sheet MD-14
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)	HB-48, MD-557 through MD-568, MD-592 through MD-593, MD-614 through MD-615, MD-625 through MD-632	Job Sheet HB-4
4. Locate and interpret vehicle and major component identification numbers. (P-1)	HB-48	Job Sheets HB-1, HB-2
5. Diagnose fluid loss, level, and condition concerns; determine necessary action. (P-1)	MD-592 through MD-593, MD-615	Job Sheet MD-13
6. Drain and fill manual transmission/transaxle and final drive unit. (P-1)	MD-592, MD-645	Job Sheet MD-12
<b>B. Clutch Diagnosis and Repair</b>	<b>Student Edition</b>	<b>Technical Applications</b>
1. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action. (P-1)	MD-569 through MD-572	Diagnostic Sheet MD-1  Job Sheet MD-6

<b>B. Clutch Diagnosis and Repair (continued)</b>	<b>Student Edition</b>	<b>Technical Applications</b>
2. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform necessary action. (P-1)	MD-564 through MD-567	Job Sheet MD-4
3. Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action. (P-1)	MD-566 through MD-567	Job Sheet MD-5
4. Inspect and replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing and linkage, and pilot bearing/bushing (as applicable). (P-1)	MD-563 through MD-568, MD-574 through MD-576	Job Sheets MD-2, MD-3, MD-7
5. Bleed clutch hydraulic system. (P-1)	MD-567	Job Sheet MD-5
6. Inspect flywheel and ring gear for wear and cracks; determine necessary action. (P-1)	MD-574 through MD-575	Job Sheet MD-8
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)	MD-576, MD-584, MD-595	Job Sheet MD-10
8. Measure flywheel runout and crankshaft end play; determine necessary action. (P-2)	MD-574 through MD-575	Job Sheet MD-9
<b>C. Transmission/Transaxle Diagnosis and Repair</b>	<b>Student Edition</b>	<b>Technical Applications</b>
1. Remove and reinstall transmission/transaxle. (P-1)	MD-594, MD-597, MD-639 through MD-640, MD-644 through MD-645	Job Sheet MD-15
2. Disassemble, clean, and reassemble transmission/transaxle components. (P-1)	MD-595 through MD-597, MD-640 through MD-644	Job Sheet MD-19
3. Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action. (P-2)	MD-595 through MD-597, MD-642 through MD-643	Job Sheet MD-20

<b>C. Transmission/Transaxle Diagnosis and Repair</b> <i>(continued)</i>	<b>Student Edition</b>	<b>Technical Applications</b>
4. Diagnose noise concerns using transmission/transaxle powerflow principles. (P-2)	MD-592 through MD-593, MD-634 through MD-636	Diagnostic Sheet MD-2  Job Sheet MD-14
5. Diagnose hard shifting and jumping out of gear concerns; determine necessary action. (P-2)	MD-592 through MD-593	Diagnostic Sheet MD-2  Job Sheet MD-14
6. Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers. (P-2)	MD-588 through MD-590, MD-638 through MD-639	Job Sheet MD-11
7. Inspect, replace, and align powertrain mounts. (P-2)	MD-597, MD-636	Job Sheet MD-22
8. Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces. (P-2)	MD-595	Job Sheet MD-16
9. Remove and replace transaxle final drive. (P-3)	MD-639 through MD-640, MD-644 through MD-645	
10. Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs. (P-2)	MD-595 through MD-596, MD-642 through MD-643	Job Sheet MD-18
11. Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action. (P-1)	MD-643 through MD-644	Job Sheet MD-46
12. Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings. (P-1)	MD-596, MD-642 through MD-643	Job Sheet MD-21
13. Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action. (P-3)	MD-634 through MD-635	Diagnostic Sheet MD-7

<b>C. Transmission/Transaxle Diagnosis and Repair</b> <i>(continued)</i>	<b>Student Edition</b>	<b>Technical Applications</b>
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)	MD-642 through MD-645	Job Sheet MD-45
15. Inspect lubrication devices (oil pump or slingers); perform necessary action. (P-3)	MD-677	
16. Inspect, test, and replace transmission/transaxle sensors and switches. (P-2)	MD-631 through MD-632	Job Sheet MD-44
17. Describe the operational characteristics of an electronically controlled manual transmission/transaxle. (P-3)	MD-677 through MD-678	
<b>D. Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair</b>	<b>Student Edition</b>	<b>Technical Applications</b>
1. Diagnose constant-velocity (CV) joint noise and vibration concerns; determine necessary action. (P-1)	MD-653	Diagnostic Sheet MD-8  Job Sheet MD-47
2. Diagnose universal joint noise and vibration concerns; perform necessary action. (P-2)	MD-604 through MD-605, MD-614 through MD-615	Job Sheet MD-25
3. Remove and replace front wheel drive (FWD) front wheel bearing. (P-1)	MD-664 through MD-665	Job Sheet MD-49
4. Inspect, service, and replace shafts, yokes, boots, and CV joints. (P-1)	MD-660 through MD-662	Job Sheet MD-48
5. Inspect, service, and replace shaft center support bearings. (P-3)	MD-601 through MD-604	Job Sheet MD-23
6. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles. (P-2)	MD-602 through MD-604	Job Sheet MD-24

<b>E. Drive Axle Diagnosis and Repair</b> <b>1. Ring and Pinion Gears and Differential Case Assembly</b>	<b>Student Edition</b>	<b>Technical Applications</b>
1. Diagnose noise and vibration concerns; determine necessary action. (P-2)	MD-604 through MD-605, MD-614 through MD-615	Diagnostic Sheet MD-3  Job Sheet MD-26
2. Diagnose fluid leakage concerns; determine necessary action. (P-1)	MD-615	Diagnostic Sheet MD-5  Job Sheet MD-28
3. Inspect and replace companion flange and pinion seal; measure companion flange runout. (P-2)	MD-619	Job Sheet MD-38
4. Inspect ring gear and measure runout; determine necessary action. (P-2)	MD-617 through MD-619	Job Sheet MD-35
5. Remove, inspect, and reinstall drive pinion and ring gear, spacers, sleeves, and bearings. (P-2)	MD-617 through MD-619	Job Sheet MD-36
6. Measure and adjust drive pinion depth. (P-2)	MD-618 through MD-619	Job Sheet MD-37
7. Measure and adjust drive pinion bearing preload. (P-2)	MD-617	Job Sheet MD-32
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)	MD-617 through MD-618	Job Sheet MD-33
9. Check ring and pinion tooth contact patterns; perform necessary action. (P-1)	MD-617 through MD-618	Job Sheet MD-34
10. Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case. (P-2)	MD-615 through MD-621	Job Sheet MD-30
11. Reassemble and reinstall differential case assembly; measure runout; determine necessary action. (P-2)	MD-615 through MD-621	Job Sheet MD-31

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<b>2. Limited Slip Differential</b>	<b>Student Edition</b>	<b>Technical Applications</b>
1. Diagnose noise, slippage, and chatter concerns; determine necessary action. (P-3)	MD-610 through MD-612	Diagnostic Sheet MD-4
2. Clean and inspect differential housing; refill with correct lubricant and/or additive. (P-2)	MD-615 through MD-619	Job Sheet MD-29
3. Inspect and reinstall limited slip differential components. (P-3)	MD-610 through MD-612	Job Sheet MD-27
4. Measure rotating torque; determine necessary action. (P-3)	MD-612	
<b>3. Drive Axle Shaft</b>	<b>Student Edition</b>	<b>Technical Applications</b>
1. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine necessary action. (P-2)	MD-619 through MD-621	Diagnostic Sheet MD-6 Job Sheet MD-41
2. Inspect and replace drive axle shaft wheel studs. (P-1)	MD-619 through MD-620	Job Sheet MD-39
3. Remove and replace drive axle shafts. (P-1)	MD-620 through MD-621	Job Sheet MD-42
4. Inspect and replace drive axle shaft seals, bearings, and retainers. (P-2)	MD-620 through MD-621	Job Sheet MD-43
5. Measure drive axle flange runout and shaft end play; determine necessary action. (P-2)	MD-619 through MD-620	Job Sheet MD-40
<b>F. Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair</b>	<b>Student Edition</b>	<b>Technical Applications</b>
1. Diagnose noise, vibration, and unusual steering concerns; determine necessary action. (P-3)	MD-679	Diagnostic Sheet MD-10
2. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets. (P-3)	MD-677 through MD-678	Job Sheet MD-50

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<b>F. Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair (continued)</b>	<b>Student Edition</b>	<b>Technical Applications</b>
3. Remove and reinstall transfer case. (P-3)	MD-679 through MD-680, MD-685	Job Sheet MD-51
4. Disassemble, service, and reassemble transfer case and components. (P-3)	MD-680 through MD-685	Job Sheet MD-52
5. Inspect front-wheel bearings and locking hubs; perform necessary action. (P-3)	MD-686 through MD-688	Job Sheet MD-53
6. Check drive assembly seals and vents; check lube level. (P-3)	MD-679	
7. Diagnose test, adjust, and replace electrical/electronic components of four-wheel drive systems. (P-3)	MD-677 through MD-678	Diagnostic Sheet MD-9
8. Identify concerns related to variations in tire circumference and/or final drive ratios. (P-3)	MD-608 through MD-612	