

# Automotive Technology/ Four Main Areas

Cross-reference to Show-Me standards (main report)

| Measurable Learner Objective and Task Statement  | Knowledge (Content)                               | Performance (Goals)                   | National Standards (NATEF) |
|--|---|---------------------------------------|----------------------------|
| <b>INTRODUCTION TO AUTOMOTIVE TECHNOLOGY</b>   |   |                                       |                            |
| <b>A. Safety</b>   |   |                                       |                            |
| 1. Describe how to use chemicals safely  | CA-1,3,4. MA-1,3<br>SC-1,7 HP-7                   | 1-1,2,4,5,7, 2-3,<br>3-1,2,3,6 4-5,7  |                            |
| 2. Demonstrate the safe use of hand tools  | CA-1,3,4. MA-1,3<br>SC-1,2,7 HP-7                 | 1-1,2,4,5,7, 2-3,<br>3-1,2,3,6 4-5,7  |                            |
| 3. Demonstrate the safe use of power tools   | CA-1,3,4. MA-1,3<br>SC-1,2,7 HP-7                 | 1-1,2,4,5,7, 2-3,<br>3-1,2,3,6 4-5,7  |                            |
| 4. Practice the safe use of personal protective equipment (i.e., clothing and safety glasses)  | CA-1,3,4. MA-1,3<br>SC-1,2,7 HP-7                 | 1-1,2,4,5,7, 2-3,<br>3-1,2,3,6 4-5,7  |                            |
| 5. Describe how to use fire protection equipment safely  | CA-1,3,4,6 MA-1,3<br>SC-1,2,7 HP=3,7              | 1-1,2,4,5,7, 2-3,<br>3-1,2,3,6 4-5,7  |                            |
| 6. Demonstrate the safe use of shop equipment  | CA-1,3,4. MA-1,3<br>SC-1,2,7 HP-7                 | 1-1,2,4,5,7, 2-3,<br>3-1,2,3,6 4-5,7  |                            |
| 7. Comply with personal and environmental safety practices in accordance with federal, state, and local safety and environmental regulations/guidelines  | CA-1,3,4. MA-1,3<br>SC-1,2,7,8 HP-3,7<br>SS-3,4,6 | 1-1,2,4,5,7, 2-3,<br>3-1,2,3,6 4-5,7  |                            |
| 8. Identify and provide access to information involving <b>hybrid</b> electrical systems emphasis on safety including location of disconnect features of specific vehicle high voltage systems | CA-1,3,4. MA-1,3<br>SC-1,2,7 HP-7                 | 1-1,2,4,5,7, 2-3,<br>3-1,2,3,6 4-5,7  |                            |
| Other:   |   |                                       |                            |
| <b>B. Shop Operation</b>   |   |                                       |                            |
| 1. Demonstrate effective communication skills (oral and written)   | CA-1,3,4,6  | 1-1,2,4,5,7, 2-3,6<br>3-1,2,3,6 4-5   |                            |
| 2. Complete work order and estimates to include customer information, customer concern, related service history, cause, and correction   | CA-1,3,4,6<br>MA-1,3 SS-4                         | 1-1,2,4,5,7, 2-3,6,7<br>3-1,2,3,6 4-5 |                            |
| 3. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins  | CA-1,3,4,6<br>MA-1,3 SS-4                         | 1-1,2,4,5,7, 2-3,6,7<br>3-1,2,3,6 4-5 |                            |

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| Other:   |                     |   |                            |  |
| <b>C. Employability Skills</b>   |                     |   |                            |  |
| 1. Demonstrate a good work ethic (i.e., relations with other, dependability, attitude, and personal hygiene)                       | CA-1,3,4,6 SS-4,6   | 1-1,2,4,5,7, 2-3,6<br>3-1,2,3,6 4-5               |                            |  |
| 2. Demonstrate teamwork  | CA-1,3,4,6 SS-4,6   | 4.5, 4.6  |                            |  |
| 3. Demonstrate job-seeking techniques (i.e., write a resume, search for a job, arrange references, and apply interview techniques) | CA-1,3,4,6 SS-4,6   | 1-1,2,4,5,7, 2-3,6,7<br>3-1,2,3,6 4-5,8           |                            |  |
| 4. Describe legal issues of sexual harassment in the workplace   | CA-1,3,4,6 SS-4,6   | 1-1,2,4,5,7, 2-3,6,7<br>3-1,2,3,6 4-2,5,8         |                            |  |
| 5. Identify employment eligibility requirements (e.g. valid driver's license, background check ect.)                               | CA-1,3,4,6 SS-3,4,6 | 1-1,2,4,5,7, 2-3,6,7<br>3-1,2,3,6<br>4-2,,3,4,5,8 |                            |  |
| Other:   |                     |   |                            |  |
| <b>D. Leadership Competencies**</b>  |                     |   |                            |  |
| 1. Demonstrate an understanding of SkillsUSA, its structure, and activities  | CA-1, CA-3, SS-3,6  | 4-2,3,4,5,6,8                                     |                            |  |
| 2. Demonstrate an understanding of one's personal values   | CA-1, CA-3, SS-3,6  | 4-2,3, 4,5  |                            |  |
| 3. Perform tasks related to effective personal management skills   | CA-1, CA-3, SS-4,6  | 4-2,3, 4,5  |                            |  |
| 4. Demonstrate interpersonal skills  | CA-1,3,5,6 SS-6     | 1-1,2,4,5,7, 2-3,6,7<br>3-1,2,3,6 4-2,5           |                            |  |
| 5. Demonstrate etiquette and courtesy  | CA-1,3,5,6 SS-6     | 4-2,3, 4,5  |                            |  |
| 6. Demonstrate effectiveness in oral and written communication   | CA-1,3,5,6 SS-6     | 1-1,2,4,5,7, 2-3,6,7<br>3-1,2,3,6 4-5             |                            |  |

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| 7. Develop and maintain a code of professional ethics  | CA-1,3,5,6 SS-6           | 4-1,2,3,4,5                           |                            |
| 8. Maintain a good professional appearance   | SS-3,4,6                  | 4-1,2,3,4,5                           |                            |
| 9. Perform basic tasks related to securing and terminating employees   | CA-1,3,4,6 SS-3,4,6       | 2-6, 4-3, 4,5,6                       |                            |
| 10. Perform basic parliamentary procedures in a group meeting  | CA-1,3,4,5,6<br>SS-3,6    | 2-1,2,3 4-2,3,4,6                     |                            |
| Other:<br><b>**NOTE: These competencies are addressed in the Missouri SkillsUSA Curriculum Guide lessons.</b>  |                           |                                       |                            |
| <b>IV. STEERING AND SUSPENSION</b>   |                           |                                       |                            |
| <b>A. General Suspension and Steering Systems Diagnosis</b>  |                           |                                       |                            |
| 1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.                               | CA-1,3,4<br>MA-1,3 SS-4   | 1-1,2,4,5,7, 2-3,6,7<br>3-1,2,3,6 4-5 | Task 4A.1 P-1              |
| 2. Identify and interpret suspension and steering system concerns; determine necessary action.   | CA-1,3,4<br>MA-1,2,3 SS-4 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5         | Task 4A.2 P-1              |
| 3. Research applicable vehicle and service information, such as suspension and steering system operation, vehicle service history, service precautions, and technical service bulletins. | CA-1,3,4<br>MA-1,2,3 SS-4 | 1-1,2,4,5,7, 2-3,6,7<br>3-1,2,3,6 4-5 | Task 4A.3 P-1              |
| 4. Locate and interpret vehicle and major component identification numbers.  | CA-1,3,4                  | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5         | Task 4A.4 P-1              |
| Other:   |                           |                                       |                            |
| <b>B. Steering Systems Diagnosis and Repair</b>  |                           |                                       |                            |
| 1. Disable and enable supplemental restraint system (SRS).   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5         | Task 4B.1 P-1              |

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| 2. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).  | CA-1,3,4<br>MA-1,2,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4B.2 P-1              |
| 3. Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action.                                    | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4B.3 P-2              |
| 4. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action. | CA-1,3,4<br>MA-1,2,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4B.4 P-2              |
| 5. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action.     | CA-1,3,4<br>MA-1,2,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4B.5 P-2              |
| 6. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4B.6 P-2              |
| 7. Adjust non-rack and pinion worm bearing preload and sector lash.   | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4B.7 P-2              |
| 8. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.  | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4B.8 P-2              |
| 9. Inspect and replace rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.  | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4B.9 P-2              |
| <b>B. Steering Systems Diagnosis and Repair (Con't)</b>   |                             |                               |                            |
| 10. Determine proper power steering fluid type; inspect fluid level and condition.  | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4B.10 P-1             |
| 11. Flush, fill, and bleed power steering system.   | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4B.11 P-2             |
| 12. Diagnose power steering fluid leakage; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4B.12 P-2             |
| 13. Remove, inspect, replace, and adjust power steering pump belt.  | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4B.13 P-1             |
| 14. Remove and reinstall power steering pump.   | CA-1,3,4                    | 1-1,2,4,5,7,                  | Task 4B.14 P-2             |

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|  | MA-1,3 SC-1,2                  | 3-1,2,3,6 4-5                   |                            |
| 15. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.                                  | CA-1,3,4<br>MA-1,3 SC-1,2      | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 4B.15 P-2             |
| 16. Inspect and replace power steering hoses and fittings.   | CA-1,3,4<br>MA-1,3 SC-1,2      | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 4B.16 P-2             |
| 17. Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper.   | CA-1,3,4<br>MA-1,2,3 SC-1,2    | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 4B.17 P-2             |
| 18. Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.  | CA-1,3,4<br>MA-1,2,3 SC-1,2    | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 4B.18 P-2             |
| 19. Test and diagnose components of electronically controlled steering systems using a scan tool; determine necessary action.    | CA-1,3,4<br>MA-1,3 SC-1,2      | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 4B.19 P-3             |
| 20. Inspect and test electric power assist steering.   | CA-1,3,4<br>MA-1,3 SC-1,2      | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 4B.20 P-3             |
| 21. Identify hybrid vehicle power steering system electrical circuits, service and safety precautions.                           | CA-1,3,4<br>MA-1,3 SC-1,2 HP-7 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5,7 | Task 4B.21 P-3             |
| Other:   |                                |                                 | P-3                        |
| <b>C. Suspension Systems Diagnosis and Repair</b>  |                                |                                 |                            |
| 1. Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action. | CA-1,3,4<br>MA-1,2,3 SC-1,2    | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 4C.1 P-1              |
| 2. Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action.              | CA-1,3,4<br>MA-1,2,3 SC-1,2    | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 4C.2 P-1              |
| 3. Remove, inspect, and install upper and lower control arms, bushings, shafts, and rebound bumpers.                             | CA-1,3,4<br>MA-1,3 SC-1,2      | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 4C.3 P-1              |
| 4. Remove, inspect and install strut rods and bushings.  | CA-1,3,4                       | 1-1,2,4,5,7,                    | Task 4C.4 P-2              |

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|   | MA-1,3 SC-1,2             | 3-1,2,3,6 4-5                 |                            |
| <b>C. Suspension Systems Diagnosis and Repair (Con't)</b>   |                           |                               |                            |
| 5. Remove, inspect, and install upper and/or lower ball joints.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4C.5 P-1              |
| 6. Remove, inspect, and install steering knuckle assemblies.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4C.6 P-2              |
| 7. Remove, inspect, and install short and long arm suspension system coil springs and spring insulators.                                | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4C.7 P-3              |
| 8. Remove, inspect, install, and adjust suspension system torsion bars; inspect mounts.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4C.8 P-3              |
| 9. Remove, inspect, and install stabilizer bar bushings, brackets, and links.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4C.9 P-2              |
| 10. Remove, inspect, and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount. | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4C.10 P-1             |
| 11. Remove, inspect, and install leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.            | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4C.11 P-3             |
| Other:  |                           |                               |                            |
| <b>D. Related Suspension and Steering Service</b>   |                           |                               |                            |
| 1. Inspect, remove, and replace shock absorbers.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4D. 1 P-1             |
| 2. Remove, inspect, and service or replace front and rear wheel bearings.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4D.2 P-1              |
| 3. Test and diagnose components of electronically controlled suspension systems using a scan tool; determine necessary action.          | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4D.3 P-3              |
| 4. Diagnose, inspect, adjust, repair or replace components of electronically controlled   | CA-1,3,4                  | 1-1,2,4,5,7,                  | Task 4D. 4 P-3             |

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| steering systems (including sensors, switches, and actuators); initialize system as required.  | MA-1,3 SC-1,2               | 3-1,2,3,6 4-5                 |                            |
| 5. Describe the function of the idle speed compensation switch. (i.e., pressure switch)  | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4D.5 P-3              |
| 6. Lubricate suspension and steering systems.  | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4D.6 P-2              |
| Other:   |                             |                               |                            |
|  |                             |                               |                            |
| <b>E. Wheel Alignment Diagnosis, Adjustment, and Repair</b>  |                             |                               |                            |
| 1. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action.  | CA-1,3,4<br>MA-1,2,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4E.1 P-1              |
| 2. Perform prealignment inspection and measure vehicle ride height; perform necessary action.  | CA-1,3,4<br>MA-1,2,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4E.2 P-1              |
|  |                             |                               |                            |
| 3. Prepare vehicle for wheel alignment on the alignment machine; perform four wheel alignment by checking and adjusting front and rear wheel caster, camber; and toe as required; center steering wheel. | CA-1,3,4<br>MA-1,2,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4E.3 P-1              |
| 4. Check toe-out-on-turns (turning radius); determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4E.4 P-2              |
| 5. Check SAI (steering axis inclination) and included angle; determine necessary action.   | CA-1,3,4<br>MA-1,2,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4E.5 P-2              |
| 6. Check rear wheel thrust angle; determine necessary action.  | CA-1,3,4<br>MA-1,2,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4E.6 P-1              |
| 7. Check for front wheel setback; determine necessary action.  | CA-1,3,4<br>MA-1,2,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4E.7 P-2              |

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| 8. Check front and/or rear cradle (subframe) alignment; determine necessary action.                                 | CA-1,3,4<br>MA-1,2,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4E.8 P-3              |
| 9. Identify vehicles with systems which require steering angle sensor recalibration.                                | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 |                            |
| Other:  |                             |                               |                            |
| <b>F. Wheel and Tire Diagnosis and Repair</b>   |                             |                               |                            |
| 1. Inspect tire condition; identify tire wear patterns; check and adjust air pressure; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4F.1 P-2              |
| 2. Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.                                    | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4F.2 P-1              |
| 3. Rotate tires according to manufacturer's recommendations.  | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4F.3 P-1              |
| 4. Measure wheel, tire, axle flange, and hub runout; determine necessary action.                                    | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4F.4 P-2              |
| 5. Diagnose tire pull problems; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4F.5 P-2              |
| 6. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static, dynamic, and road force). | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4F.6 P-1              |
| <b>F. Wheel and Tire Diagnosis and Repair (Con't)</b>   |                             |                               |                            |
| 7. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.               | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4F.7 P-2              |
| 8. Reinstall wheel; torque lug nuts.  | CA-1,3,4<br>MA-1,3 SC-1,2   | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 4F.8 P-1              |
| 9. Inspect tire and wheel assembly for air loss; perform necessary action.  | CA-1,3,4                    | 1-1,2,4,5,7,                  | Task 4F.9 P-1              |

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# Automotive Technology/ Four Main Areas

Cross-reference to Show-Me standards (main report)

| Measurable Learner Objective and Task Statement  | Knowledge (Content)       | Performance (Goals)                   | National Standards (NATEF) |
|--|---------------------------|---------------------------------------|----------------------------|
|  | MA-1,3 SC-1,2             | 3-1,2,3,6 4-5                         |                            |
| 10. Repair tire using internal patch.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5         | Task 4F.10 P-1             |
| 11. Inspect, diagnose, and calibrate tire pressure monitoring system.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5         | Task 4F.11 P-2             |
| Other:   |                           |                                       |                            |
| <b>V. BRAKES</b>   |                           |                                       |                            |
| <b>A. General Brake Systems Diagnosis</b>  |                           |                                       |                            |
| 1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.             | CA-1,3,4<br>MA-1,3 SS-4   | 1-1,2,4,5,7, 2-3,6,7<br>3-1,2,3,6 4-5 | Task 5A.1 P-1              |
| 2. Identify and interpret brake system concern; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5         | Task 5A.2 P-1              |
| 3. Research applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions, and technical service bulletins. | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5         | Task 5A.3 P-1              |
| 4. Locate and interpret vehicle and major component identification numbers.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5         | Task 5A.4 P-1              |
| Other:   |                           |                                       |                            |
| <b>B. Hydraulic System Diagnosis Repair</b>  |                           |                                       |                            |
| 1. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5         | Task 5B.1 P-1              |
| 2. Measure brake pedal height, travel, and free play (as applicable); determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5         | Task 5B.2 P-1              |

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| Measurable Learner Objective and Task Statement   | Knowledge (Content)       | Performance (Goals)             | National Standards (NATEF) |
|---|---------------------------|---------------------------------|----------------------------|
| 3. Check master cylinder for internal/external leaks and proper operation; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 5B.3 P-1              |
| <b>B. Hydraulic System Diagnosis Repair (Con't)</b>   |                           |                                 |                            |
| 4. Remove, bench bleed, and reinstall master cylinder.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 5B.4 P-1              |
| 5. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 5B.5 P-2              |
| 6. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action. | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 5B.6 P-1              |
| 7. Replace brake lines, hoses, fittings, and supports.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 5B.7 P-2              |
| 8. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 5B.8 P-2              |
| 9. Select, handle, store, and fill brake fluids to proper level.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5,7 | Task 5B.9 P-1              |
| 10. Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 5B.10 P-3             |
| 11. Inspect, test, and/or replace components of brake warning light system.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 5B.11 P-3             |
| 12. Bleed and/or flush brake system.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5   | Task 5B.12 P-1             |
| 13. Test brake fluid for contamination. (e.g., copper sulfate, water, etc.)   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5,7 | Task 5B.13 P-1             |

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|--|---------------------------|-------------------------------|----------------------------|
| Other:   |                           |                               |                            |
| <b>C. Drum Brake Diagnosis and Repair</b>  |                           |                               |                            |
| 1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5C.1 P1               |
| 2. Remove, clean, inspect, and measure brake drums; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5C.2 P-1              |
| 3. Refinish brake drum; measure final drum diameter.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5C.3 P-1              |
| 4. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5C.4 P-1              |
| 5. Inspect and install wheel cylinders.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5C.5 P-2              |
| <b>C. Drum Brake Diagnosis and Repair (Con't)</b>  |                           |                               |                            |
| 6. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5C.6 P-2              |
| 7. Install wheel, torque lug nuts, and make final checks and adjustments.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5C.7 P-1              |
| Other:   |                           |                               |                            |
| <b>D. Disc Brake Diagnosis Repair</b>  |                           |                               |                            |
| 1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pulsation concerns; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5D.1 P-1              |
| 2. Remove caliper assembly; inspect for leaks and damage to caliper housing; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5D.2 P-1              |

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|--|---------------------------|-------------------------------|----------------------------|
|  |                           |                               |                            |
| 3. Clean and inspect caliper mounting and slides/pins for operation, wear, and damage; determine necessary action.                           | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5D.3 P-1              |
| 4. Remove, inspect and replace pads and retaining hardware; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5D.4 P-1              |
| 5. Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts. | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5D.5 P-3              |
| 6. Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks.                               | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5D.6 P-1              |
| 7. Clean, inspect, and measure rotor thickness, lateral runout, and thickness variation; determine necessary action.                         | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5D.7 P-1              |
| 8. Remove and reinstall rotor.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5D.8 P-1              |
| 9. Refinish rotor on vehicle; measure final rotor thickness.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5D.9 P-1              |
| 10. Refinish rotor off vehicle; measure final rotor thickness.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5D.10 P-1             |
| 11. Retract caliper piston on an integrated parking brake system.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5D.11 P-3             |
| 12. Install wheel, torque lug nuts, and make final checks and adjustments.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5D.12 P-1             |
| 13. Check brake pad wear indicator system operation; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5D.13 P-2             |
| Other:   |                           |                               |                            |

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|--|----------------------------|-------------------------------|-----------------------------------|
| <b>E. Power Assist Units Diagnosis and Repair</b>  |                            |                               |                                   |
| 1. Test pedal free travel; check power assist operation.   | CA-1,3,4<br>MA-1,3 SC-1,2  | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5E.1 P-2                     |
| 2. Check vacuum supply to vacuum-type power booster.   | CA-1,3,4<br>MA-1,3 SC-1,2  | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5E.2 P-1                     |
| 3. Inspect the vacuum-type power booster unit for leaks; inspect the check valve for proper operation; determine necessary action. | CA-1,3,4<br>MA-1,3 SC-1,2  | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5E.3 P-1                     |
|  |                            |                               |                                   |
| 4. Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine necessary action.          | CA-1,3,4<br>MA-1,3 SC-1,2  | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5E.4 P-3                     |
| 5. Measure and adjust master cylinder pushrod length.  | CA-1,3,4<br>MA-1,3 SC-1,2  | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5E.5 P-3                     |
| Other:   |                            |                               |                                   |

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|---|----------------------------|-------------------------------|----------------------------|
| <b>F. Miscellaneous Diagnosis and Repair</b>  |                            |                               |                            |
| 1. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action.                           | CA-1,3,4<br>MA-1,3 SC-1,2, | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5F.1 P-1              |
| 2. Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust bearings.             | CA-1,3,4<br>MA-1,3 SC-1,2  | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5F.2 P-1              |
| 3. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed. | CA-1,3,4<br>MA-1,3 SC-1,2  | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5F.3 P-2              |
| 4. Check parking brake and indicator light system operation; determine necessary action.                                      | CA-1,3,4<br>MA-1,3 SC-1,2  | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5F.4 P-1              |
| 5. Check operation of brake stop light system; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,2  | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5F.5 P-1              |
| 6. Replace wheel bearing and race.  | CA-1,3,4<br>MA-1,3 SC-1,2  | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5F.6 P-2              |
| 7. Inspect and replace wheel studs.   | CA-1,3,4<br>MA-1,3 SC-1,2  | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5F.7 P-1              |
| 8. Remove and reinstall sealed wheel bearing assembly.  | CA-1,3,4<br>MA-1,3 SC-1,2  | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5F.8 P-1              |
| Other:  |                            |                               |                            |

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|---|---------------------------|-------------------------------|----------------------------|
| <b>G. Electronic Brake and Traction Control Systems</b>   |                           |                               |                            |
| 1. Identify and inspect electronic brake control system components; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5G.1 P-1              |
| 2. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system ; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5G.2 P-2              |
| 3. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5G.3 P-1              |
| 4. Depressurize high-pressure components of the electronic brake control system (includes disabling of electronic braking system and other appropriate safety procedures).  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5G.4 P-3              |
| 5. Bleed the electronic brake control system hydraulic circuits.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5G.5 P-1              |
| 6. Remove and install electronic brake control system electrical/electronic and hydraulic components.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5G.6 P-3              |
| 7. Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data). | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5G.7 P-1              |
| 8. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb/vehicle height, final drive ratio, etc.).   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5G.8 P-3              |
| 9. Identify traction control/vehicle stability control system components.   | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5G.9 P-3              |
| 10. Describe the operation of a regenerative braking system.  | CA-1,3,4<br>MA-1,3 SC-1,2 | 1-1,2,4,5,7,<br>3-1,2,3,6 4-5 | Task 5G.10 P-3             |
| Other:  |                           |                               |                            |
|   |                           |                               |                            |
|   |                           |                               |                            |

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|--|---------------------------|----------------------------|-------------------------------|
|  |                           |                            |                               |
| <b>VI. ELECTRICAL/ELECTRONIC SYSTEMS</b>   |                           |                            |                               |
| <b>A. General Electrical System Diagnosis</b>  |                           |                            |                               |
| 1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.                             | CA-1,3,4                  | 1-1,4,5,7,10<br>2-6,7 3-5  | <b>NATEF</b><br>Task 6A.1 P-1 |
| 2. Identify and interpret electrical/electronic system concern; determine necessary action.  | CA-1,4<br>MA-1,3, SC-7    | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6A.2 P-1                 |
| 3. Research applicable vehicle and service information, such as electrical/electronic system operation; vehicle service history, service precautions, and technical service bulletins. | CA-1,3,4                  | 1-1,4,5,7,10<br>2-6,7 3-5  | Task 6A.3 P-1                 |
| 4. Locate and interpret vehicle and major component identification numbers.  | CA-1,3,4                  | 1-1,4,5,7,10<br>2-6,7 3-5  | Task 6A.4 P-1                 |
| 5. Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits using principles of electricity (Ohm's Law).  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6A.5 P-1                 |

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|--|---------------------------|----------------------------|----------------------------|
| 6. Use wiring diagrams during diagnosis of electrical circuit problems.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6A.6 P-1              |
| 7. Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems, including: source voltage, voltage drop, current flow, and resistance | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6A.7 P-1              |
| 8. Check electrical circuits with a test light; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6A.8 P-2              |
| 9. Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6A.9 P-2              |
| 10. Check electrical circuits using fused jumper wires; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6A.10 P-2             |
| 11. Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6A.11 P-1             |
| 12. Measure and diagnose the cause(s) of excessive parasitic draw; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6A.12 P-1             |
| 13. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6A.13 P-1             |
| 14. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; perform necessary action.                            | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6A.14 P-1             |
| 15. Remove and replace terminal end from connector; replace connectors and terminal ends.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6A.15 P-1             |

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# Automotive Technology/ Four Main Areas

Cross-reference to Show-Me standards (main report)

| Measurable Learner Objective and Task Statement  | Knowledge (Content)       | Performance (Goals)        | National Standards (NATEF) |
|--|---------------------------|----------------------------|----------------------------|
| <b>A. General Electrical System Diagnosis (Con't)</b>  |                           |                            |                            |
| 16. Repair wiring harness (including CAN/BUS systems).   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6A.16 P-1             |
| 17. Perform solder repair of electrical wiring.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6A.17 P-1             |
| 18. Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6A.18 P-2             |
| Other:   |                           |                            |                            |
| <b>B. Battery Diagnosis and Service</b>  |                           |                            |                            |
| 1. Perform battery state-of-charge test; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6B. 1 P-1             |
| 2. Perform battery capacity test; confirm proper battery capacity for vehicle application; determine necessary action. | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6B. 2 P-1             |
| 3. Maintain or restore electronic memory functions.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6B.3 P-1              |
| 4. Inspect, clean, fill, and/or replace battery, battery cables, connectors, clamps, and hold-downs.                   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6B,4 P-1              |
| 5. Perform battery charge.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6B.5 P-1              |

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|---|----------------------------|----------------------------|-----------------------------------|
| 6. Start a vehicle using jumper cables or an auxiliary power supply.  | CA-1,3,4<br>MA-1,3 SC-1,7  | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6B.6 P-1                     |
| 7. Identify high voltage circuits of electric or hybrid electric vehicle and related safety precautions.  | CA-1,3,4<br>MA-1,3 SC-1,7  | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6B.7 P-3                     |
| 8. Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry following battery disconnect. | CA-1,3,4<br>MA-1,3 SC-1,7  | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6B.8 P-1                     |
| 9. Identify hybrid vehicle auxiliary (12v) battery service, repair and test procedures.   | CA-1,3,4<br>MA-1,3 SC-1,7  | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6B.9 P-3                     |
| Other:  |                            |                            |                                   |
| <b>C. Starting System Diagnosis and Repair</b>  |                            |                            |                                   |
| 1. Perform starter current draw tests; determine necessary action.  | CA-1,3,4<br>MA-1,3SC-1,7   | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6C.1 P-1                     |
| 2. Perform starter circuit voltage drop tests; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7  | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6C.2 P-1                     |
| <b>C. Starting System Diagnosis and Repair (Con't)</b>  |                            |                            |                                   |
| 3. Inspect and test starter relays and solenoids; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,7  | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6C.3 P-1                     |
| 4. Remove and install starter in a vehicle.   | CA-1,3,4<br>MA-1,3 SC-1,7  | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6C.4 P-1                     |

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|--|---------------------------|----------------------------|----------------------------|--|
| 5. Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action.                         | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6C.5 P-2              |  |
| 6. Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition.                  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6C.6 P-2              |  |
| Other:   |                           |                            |                            |  |
| <b>D. Charging System Diagnosis and Repair</b>   |                           |                            |                            |  |
| 1. Perform charging system output test; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6D.1 P-1              |  |
| 2. Diagnose charging system for the cause of undercharge, no-charge, and overcharge conditions (includes PCM controlled charging). | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6D.2 P-1              |  |
| 3. Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioners; check pulley and belt alignment.       | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6D.3 P-1              |  |
| 4. Remove, inspect, and install generator (alternator).  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6D.4 P-1              |  |
| 5. Perform charging circuit voltage drop tests; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6D.5 P-1              |  |
| Other:   |                           |                            |                            |  |

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|---|---------------------------|----------------------------|----------------------------|
| <b>E. Lighting Systems Diagnosis and Repair</b>   |                           |                            |                            |
| 1. Diagnose the cause of brighter than normal, intermittent, dim, or no light operation; determine necessary action (includes BCM controlled lighting). | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6E.1 P-1              |
| 2. Inspect, replace, and aim headlights and bulbs.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6E.2 P-2              |
| 3. Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6E.3 P-2              |
| 4. Identify system voltage and safety precautions associated with high intensity discharge headlights.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6E.4 P-2              |
| Other:  |                           |                            |                            |
| <b>F. Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair</b>  |                           |                            |                            |
| 1. Inspect and test gauges and gauge sending units for cause of abnormal gauge readings; determine necessary action.                                    | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6F.1 P-1              |
| 2. Inspect and test connectors, wires, and printed circuit boards of gauge circuits; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6F.2 P-3              |
| 3. Diagnose the cause of incorrect operation of warning devices and other driver information systems; determine necessary action.                       | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6F.3 P-1              |
| 4. Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action.                             | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6F.4 P-3              |

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|--|---------------------------|----------------------------|----------------------------|
| Other:   |                           |                            |                            |
| <b>G. Horn and Wiper/Washer Diagnosis and Repair</b>   |                           |                            |                            |
| 1. Diagnose incorrect horn operation; perform necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6G.1 P-1              |
| 2. Diagnose incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action. | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6G.2 P-1              |
| 3. Diagnose incorrect washer operation; perform necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6G.3 P-2              |
| Other:   |                           |                            |                            |
| <b>H. Accessories Diagnosis and Repair</b>   |                           |                            |                            |
| 1. Diagnose incorrect operation of motor-driven accessory circuits; determine necessary action.                  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6H.1 P-1              |
| 2. Diagnose incorrect heated glass, mirror, or seat operation; determine necessary action.                       | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6H.2 P-3              |
| 3. Diagnose incorrect electric lock operation (including remote keyless entry); determine necessary action.      | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6H.3 P-1              |
| 4. Diagnose incorrect operation of cruise control systems; determine necessary action.                           | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6H.4 P-3              |
| 5. Diagnose supplemental restraint system (SRS) concerns; determine necessary action.                            | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6H.5 P-1              |
| 7. Diagnose radio static and weak, intermittent, or no radio reception; determine necessary action.              | CA-1,3,4                  | 1-1,2,5,7                  | Task 6H.6 P-3              |

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|--|---------------------------|----------------------------|----------------------------|--|
|  | MA-1,3 SC-1,7             | 3-1,2,3,6 4-5              |                            |  |
| 8. Remove and reinstall door panel.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6H.7 P-1              |  |
| 9. Diagnose body electronic system circuits using a scan tool; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6H.9 P-2              |  |
| 10. Check for module communication (including CAN/BUS systems) errors using a scan tool.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6H.10 P-2             |  |
| <b>H. Accessories Diagnosis and Repair (Con't)</b>   |                           |                            |                            |  |
| 11. Diagnose the cause of false, intermittent, or no operation of anti-theft systems.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6H.11 P-3             |  |
| 12. Describe the operation of keyless entry/remote-start systems.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6H.12 P-3             |  |
| 13. Perform software transfers, software updates, or flash reprogramming on electronic modules.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 6H.13 P-3             |  |
| Other:   |                           |                            |                            |  |
| <b>VIII. ENGINE PERFORMANCE</b>  |                           |                            |                            |  |
| <b>A. General Engine Diagnosis</b>   |                           |                            |                            |  |
| 1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8A.1 P-1              |  |
| 2. Identify and interpret engine performance concern; determine necessary action.  | CA-1,3,4                  | 1-1,2,5,7                  | Task 8A.2 P-1              |  |

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|--|---------------------------|----------------------------|----------------------------|--|
|  | MA-1,3 SC-1,7             | 3-1,2,3,6 4-5              |                            |  |
| 3. Research applicable vehicle and service information, such as engine management system operation, vehicle service history, service precautions, and technical service bulletins. | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8A.3 P-1              |  |
| 4. Locate and interpret vehicle and major component identification numbers.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8A.4 P-1              |  |
| 5. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8A.5 P-2              |  |
| 6. Diagnose abnormal engine noise or vibration concerns; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8A.6 P-3              |  |
| 7. Diagnose abnormal exhaust color, odor, and sound; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8A.7 P-2              |  |
| 8. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8A.8 P-1              |  |
| 9. Perform cylinder power balance test; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8A.9 P-2              |  |
| 10. Perform cylinder cranking and running compression tests; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8A.10 P-1             |  |
| 11. Perform cylinder leakage test; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8A.11 P-1             |  |
| 12. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action.   | CA-1,3,4                  | 1-1,2,5,7                  | Task 8A.12 P-1             |  |

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|--|---------------------------|----------------------------|----------------------------|--|
|  | MA-1,3 SC-1,7             | 3-1,2,3,6 4-5              |                            |  |
| 13. Prepare 4 or 5 gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings; interpret readings, and determine necessary action.                  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8A.13 P-3             |  |
| 14. Verify engine operating temperature; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8A.14 P-1             |  |
| 15. Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action. | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8A.15 P-1             |  |
| 16. Verify correct camshaft timing.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8A.15 P-1             |  |
| Other:   |                           |                            |                            |  |
| <b>B. Computerized Engine Controls Diagnosis and Repair</b>  |                           |                            |                            |  |
| 1. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8B.1 P-1              |  |
| 2. Diagnose the causes of emissions or driveability concerns with stored or active diagnostic trouble codes; obtain, graph, and interpret scan tool data.                | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8B.2 P-1              |  |
| 3. Diagnose emissions or driveability concerns without stored diagnostic trouble codes; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8B.3 P-1              |  |
| 4. Check for module communication (including CAN/BUS systems) errors using a scan tool.  | CA-1,3,4                  | 1-1,2,5,7                  | Task 8B.4 P-2              |  |

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|---|---------------------------|----------------------------|----------------------------|--|
|   | MA-1,3 SC-1,7             | 3-1,2,3,6 4-5              |                            |  |
| 5. Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8B.5 P-1              |  |
| 6. Access and use service information to perform step-by-step diagnosis.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8B.6 P-1              |  |
| 7. Diagnose driveability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories, or similar systems); determine necessary action. | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8B.7 P-3              |  |
| 8. Perform active tests of actuators using a scan tool; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8B.8 P-1              |  |
| 9. Describe the importance of running all OBDII monitors for repair verification.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8B.9 P-1              |  |
| Other:  |                           |                            |                            |  |
| <b>C. Ignition System Diagnosis and Repair</b>  |                           |                            |                            |  |
| 1. Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8C.1 P-1              |  |
| 2. Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8C.2 P-1              |  |
| 3. Inspect and test crankshaft and camshaft position sensor(s); perform necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8C.3 P-1              |  |

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# Automotive Technology/ Four Main Areas

Cross-reference to Show-Me standards (main report)

| Measurable Learner Objective and Task Statement   | Knowledge (Content)       | Performance (Goals)        | National Standards (NATEF) |
|---|---------------------------|----------------------------|----------------------------|
| 4. Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram as necessary.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8C.4 P-1              |
| Other:  |                           |                            |                            |
| <b>D. Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair</b>   |                           |                            |                            |
| 1. Diagnose hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine necessary action. | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8D.1 P-1              |
| 2. Check fuel for contaminants and quality; determine necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8D.2 P-2              |
| 3. Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8D.3 P-1              |
| 4. Replace fuel filters.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8D.4 P-2              |
| 5. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8D.5 P-2              |
| 6. Inspect and test fuel injectors.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8D.6 P-1              |
| 7. Verify idle control operation.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8D.7 P-1              |

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|--|---------------------------|----------------------------|----------------------------|
| 8. Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s); perform necessary action.     | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8D.8 P-1              |
| 9. Perform exhaust system back-pressure test; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8D.9 P-1              |
| 10. Test the operation of turbocharger/supercharger systems; determine necessary action  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8D.10 P-3             |
| Other:   |                           |                            |                            |
| <b>E. Emissions Control Systems Diagnosis and Repair</b>   |                           |                            |                            |
| 1. Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action.                                 | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8E.1 P-2              |
| 2. Inspect, test and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.                                | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8E.2 P-2              |
| 3. Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8E.3 P-1              |
| 4. Inspect, test, service and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses; perform necessary action. | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8E.4 P-2              |
| 5. Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action.                                      | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8E.5 P-2              |
| 6. Diagnose emissions and driveability concerns caused by the secondary air injection and catalytic converter systems; determine necessary action.                                 | CA-1,3,4                  | 1-1,2,5,7                  | Task 8E.6 P-2              |

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|--|---------------------------|----------------------------|----------------------------|-----|
|  | MA-1,3 SC-1,7             | 3-1,2,3,6 4-5              |                            |     |
| <b>E. Emissions Control Systems Diagnosis and Repair (Con't)</b>   |                           |                            |                            |     |
| 7. Inspect and test mechanical components of secondary air injection systems; perform necessary action.                                | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8E.7                  | P-3 |
| 8. Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action.     | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8E.8                  | P-3 |
| 9. Inspect and test catalytic converter efficiency.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8E.9                  | P-1 |
| 10. Diagnose emissions and driveability concerns caused by the evaporative emissions control system; determine necessary action.       | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8E.10                 | P-1 |
| 11. Inspect and test components and hoses of the evaporative emissions control system; perform necessary action.                       | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8E.11                 | P-1 |
| 12. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action. | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8E.12                 | P-1 |
| Other:   |                           |                            |                            |     |
| <b>F. Engine Related Service</b>   |                           |                            |                            |     |
| 1. Adjust valves on engines with mechanical or hydraulic lifters.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8F.1                  | P-1 |
| 2. Remove and replace timing belt; verify correct camshaft timing (includes evaluation of tensioner and related parts).                | CA-1,3,4                  | 1-1,2,5,7                  | Task 8F.2                  | P-1 |

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|---|---------------------------|----------------------------|----------------------------|--|
|   | MA-1,3 SC-1,7             | 3-1,2,3,6 4-5              |                            |  |
| 3. Remove and replace thermostat and gasket/seal.   | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8F.3 P-1              |  |
| 4. Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.                              | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8F.4 P-1              |  |
| 5. Perform common fastener and thread repairs, to include: remove broken bolt, restore internal and external threads, and repair internal threads with a threaded insert. | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8F.5 P-1              |  |
| 6. Perform engine oil and filter change.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8F.6 P-1              |  |
| 7. Identify hybrid vehicle internal combustion engine service precautions.  | CA-1,3,4<br>MA-1,3 SC-1,7 | 1-1,2,5,7<br>3-1,2,3,6 4-5 | Task 8F.7 P-3              |  |
| Other:  |                           |                            |                            |  |
|   |                           |                            |                            |  |
|   |                           |                            |                            |  |
|   |                           |                            |                            |  |

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