



# **AUTOMOTIVE SERVICE**

**ASE**

**Brakes,  
Steering and Suspension,  
Electrical/Electronics,  
Engine Performance**

**NATEF  
7/1/2008**

## TASK LIST AND ASSUMPTIONS

The NATEF task list was reviewed and updated in January 2008. A national committee was assembled in Torrance, California to review the standards used in the automobile certification program. The committee consisted of individuals representing the major automobile manufacturers, automobile repair shop owners and technicians, automobile instructors and trainers, and automobile equipment and parts suppliers.

The committee reviewed the standards, task list, tools and equipment list, program hours, and instructor qualifications. The committee was also provided the most current National Institute for Automotive Service Excellence (ASE) Automobile Technician Tests Task Lists for reference purposes.

All the tasks are assigned a priority number: P-1, P-2, or P-3. Please refer to the Task List Information in the Policies section for additional information on the requirements for instruction on tasks. *Note: A task is a psychomotor or cognitive entry-level learning activity consisting of one or more measurable steps accomplished through an instructor presentation, demonstration, visualization or a student application.*

Theory instruction and hands-on performance of all the basic tasks will provide initial training for **entry-level** employment in the automotive service field or further training in any or all of the specialty areas. Competency in the tasks will indicate to employers that the graduate is skilled in that area.

1. It is assumed that:

- \* in all areas, appropriate theory, safety, and support instruction will be required for performing each task;
- \* the instruction has included identification and use of appropriate tools and testing and measurement equipment required to accomplish certain tasks;
- \* the student has received the necessary training to locate and use current reference and training materials from accepted industry publications and resources;
- \* in all areas, the student has demonstrated the ability to write work orders and warranty reports, to include information regarding problem resolution and the results of the work performed for the customer and manufacturer. The writing process will incorporate the “Three C’s” (concern, cause and correction) as a format to communicate this information.

2. It is assumed that:

- \* all diagnostic and repair tasks described in this document are to be accomplished in accordance with manufacturer's recommended procedures and safety precautions as published.

3. It is assumed that:

- \* individual training programs being evaluated for certification should have written and detailed performance standards for each task covered and taught in the curriculum;
- \* the learning progress of students will be monitored and evaluated against these performance standards;
- \* a system is in place that informs all students of their individual progress through all phases of the training program.

4. It is assumed that:

- \* individual courses of study will differ across automobile technician training programs;
- \* development of appropriate learning delivery systems and tests which monitor student progress will be the responsibility of the individual training program.

5. It is assumed that:

- \* all students will receive instruction in the storage, handling, and use of Hazardous Materials as required in Hazard Communication Title 29, Code of Federal Regulation Part 1910.1200, 'Right to Know Law', and state and local requirements;
- \* hazardous and toxic materials will be handled, removed and recycled or disposed of according to federal, state, and local regulations.

## **DEFINITIONS – TECHNICAL TERMS**

ADJUST - To bring components to specified operational settings.

ALIGN - To r restore the proper position of components.

ANALYZE - Assess the condition of a component or system.

ASSEMBLE (REASSEMBLE) - To fit together the components of a device or system.

BALANCE - To establish correct linear, rotational or weight relationship.

BLEED - To remove air from a closed system.

CAN – Controller Area Network. CAN is a network protocol (SAE J2284/ISO 15765-4) used to interconnect a network of electronic control modules

CHARGE - To bring to a specified state, e.g., battery or air conditioning system.

CHECK - To verify condition by performing an operational or comparative examination.

CLEAN - To rid component of foreign matter for the purpose of reconditioning, repairing, measuring or reassembling.

DEGLAZE – To remove a smooth glossy surface.

DETERMINE - To establish the procedure to be used to perform the necessary repair.

DETERMINE NECESSARY ACTION – Indicates that the diagnostic routine(s) is the primary emphasis of a task. The student is required to perform the diagnostic steps and communicate the diagnostic outcomes and corrective actions required addressing the concern or problem. The training program determines the communication method (worksheet, test, verbal communication, or other means deemed appropriate) and whether the corrective procedures for these tasks are actually performed.

DIAGNOSE - To identify the cause of a problem.

DISASSEMBLE - To separate a component's parts as a preparation for cleaning, inspection or service.

DISCHARGE - To empty a storage device or system.

EVACUATE - To remove air, fluid or vapor from a closed system by use of a vacuum pump.

FLUSH - To internally clean a component or system.

HIGH VOLTAGE – Voltages of 50 volts and higher.

HONE - To restore or resize a bore by using rotating cutting stones.

JUMP START - To use an auxiliary power supply to assist a battery to crank an engine.

LOCATE – Determine or establish a specific spot or area.

MEASURE - To determine existing dimensions/values for comparison to specifications.

NETWORK - A system of interconnected electrical modules or devices.

ON-BOARD DIAGNOSTICS (OBD) - Diagnostic protocol which monitors computer inputs and outputs for failures.

PARASITIC DRAW - Electrical loads which are still present when the ignition circuit is OFF.

PERFORM - To accomplish a procedure in accordance with established methods and standards.

PERFORM NECESSARY ACTION – Indicates that the student is to perform the diagnostic routine(s) and perform the corrective action item. Where various scenarios (conditions or situations) are presented in a single task, at least one of the scenarios must be accomplished.

PURGE - To remove air or fluid from a closed system.

REMOVE - To disconnect and separate a component from a system.

REPAIR - To restore a malfunctioning component or system to operating condition.

REPLACE - To exchange a component; to reinstall a component.

RESURFACE – To restore correct finish.

SERVICE - To perform a procedure as specified in the owner's or service manual.

TEST - To verify condition through the use of meters, gauges or instruments.

TORQUE - To tighten a fastener to specified degree or tightness (in a given order or pattern if multiple fasteners are involved on a single component).

VERIFY - To confirm that a problem exists after hearing the customer's concern; or, to confirm the effectiveness of a repair.

VOLTAGE DROP - A reduction in voltage (electrical pressure) caused by the resistance in a component or circuit.

# NATEF TASK LIST

## SUSPENSION AND STEERING

**For every task in Suspension and Steering, 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.**

### IV. SUSPENSION AND STEERING

#### A. General Suspension and Steering Systems Diagnosis

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1
2. Identify and interpret suspension and steering system concerns; determine necessary action. 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. P-1
4. Locate and interpret vehicle and major component identification numbers. P-1

### IV. SUSPENSION AND STEERING

#### B. Steering Systems Diagnosis and Repair

1. Disable and enable supplemental restraint system (SRS). P-1
2. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring). P-1
3. Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action. P-2
4. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine

necessary action.

5. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action. P-2
6. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action. P-2
7. Adjust non-rack and pinion worm bearing preload and sector lash. P-3
8. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets. P-2
9. Inspect and replace rack and pinion steering gear inner tie rod ends (sockets) and bellows boots. P-2
10. Determine proper power steering fluid type; inspect fluid level and condition. P-1
11. Flush, fill, and bleed power steering system. P-2
12. Diagnose power steering fluid leakage; determine necessary action. P-2
13. Remove, inspect, replace, and adjust power steering pump belt. P-1
14. Remove and reinstall power steering pump. P-2
15. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment. P-2
16. Inspect and replace power steering hoses and fittings. P-2
17. Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper. P-2
18. Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps. P-1
19. Test and diagnose components of electronically controlled steering systems using a scan tool; determine necessary action. P-3
20. Inspect and test electric power assist steering. P-3
21. Identify hybrid vehicle power steering system electrical circuits, service and P-3

safety precautions.

#### **IV. SUSPENSION AND STEERING**

##### **C. Suspension Systems Diagnosis and Repair**

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|-----|---|-----|
| 1.  | Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action.       | P-1 |
| 2.  | Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action.                    | P-1 |
| 3.  | Remove, inspect, and install upper and lower control arms, bushings, shafts, and rebound bumpers.                                   | P-2 |
| 4.  | Remove, inspect and install strut rods and bushings.  | P-2 |
| 5.  | Remove, inspect, and install upper and/or lower ball joints.  | P-1 |
| 6.  | Remove, inspect, and install steering knuckle assemblies.   | P-2 |
| 7.  | Remove, inspect, and install short and long arm suspension system coil springs and spring insulators.                               | P-3 |
| 8.  | Remove, inspect, install, and adjust suspension system torsion bars; inspect mounts.  | P-3 |
| 9.  | Remove, inspect, and install stabilizer bar bushings, brackets, and links.  | P-2 |
| 10. | Remove, inspect, and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount. | P-1 |

11. Remove, inspect, and install leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts. P-3

#### **D. Related Suspension and Steering Service**

1. Inspect, remove, and replace shock absorbers. P-1
2. Remove, inspect, and service or replace front and rear wheel bearings. P-1
3. Test and diagnose components of electronically controlled suspension systems using a scan tool; determine necessary action. P-3
4. Diagnose, inspect, adjust, repair or replace components of electronically controlled steering systems (including sensors, switches, and actuators); initialize system as required. P-3
5. Describe the function of the idle speed compensation switch. P-3
6. Lubricate suspension and steering systems. P-2

### **IV. SUSPENSION AND STEERING**

#### **E. Wheel Alignment Diagnosis, Adjustment, and Repair**

1. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action. P-1
2. Perform prealignment inspection and measure vehicle ride height; perform necessary action. 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. P-1
4. Check toe-out-on-turns (turning radius); determine necessary action. P-2
5. Check SAI (steering axis inclination) and included angle; determine P-2

necessary action.

6. Check rear wheel thrust angle; determine necessary action. P-1
7. Check for front wheel setback; determine necessary action. P-2
8. Check front and/or rear cradle (subframe) alignment; determine necessary action. P-3

#### **IV. SUSPENSION AND STEERING**

##### **F. Wheel and Tire Diagnosis and Repair**

1. Inspect tire condition; identify tire wear patterns; check and adjust air pressure; determine necessary action. P-1
2. Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action. P-2
3. Rotate tires according to manufacturer's recommendations. P-1
4. Measure wheel, tire, axle flange, and hub runout; determine necessary action. P-2
5. Diagnose tire pull problems; determine necessary action. P-2
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6. Dismount, inspect, and remount tire on wheel; Balance wheel and tire assembly (static and dynamic). P-1
7. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor. P-2
8. Reinstall wheel; torque lug nuts. P-1
9. Inspect tire and wheel assembly for air loss; perform necessary action. P-1
10. Repair tire using internal patch. P-1
11. Inspect, diagnose, and calibrate tire pressure monitoring system. P-2

## **BRAKES**

**For every task in Brakes, 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.**

### **V. BRAKES**

#### **A. General Brake Systems Diagnosis**

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1
2. Identify and interpret brake system concern; determine necessary action. P-1
3. Research applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions, and technical service bulletins. P-1
4. Locate and interpret vehicle and major component identification numbers. P-1

#### **B. Hydraulic System Diagnosis and Repair**

1. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law). P-1
2. Measure brake pedal height, travel, and free play (as applicable); determine necessary action. P-1
3. Check master cylinder for internal/external leaks and proper operation; determine necessary action. P-1
4. Remove, bench bleed, and reinstall master cylinder. P-1
5. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action. 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. P-1

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| 7.  | Replace brake lines, hoses, fittings, and supports.  | P-2 |
| 8.  | Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).                           | P-2 |
| 9.  | Select, handle, store, and fill brake fluids to proper level.  | P-1 |
| 10. | Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves. | P-3 |
| 11. | Inspect, test, and/or replace components of brake warning light system.  | P-3 |
| 12. | Bleed and/or flush brake system.   | P-1 |
| 13. | Test brake fluid for contamination.  | P-1 |

**V. BRAKES**

**C. Drum Brake Diagnosis and Repair**

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| 1. | Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.  | P-1 |
| 2. | Remove, clean, inspect, and measure brake drums; determine necessary action.  | P-1 |
| 3. | Refinish brake drum; measure final drum diameter.   | 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. | P-1 |
| 5. | Inspect and install wheel cylinders.  | P-2 |
| 6. | Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings.  | P-2 |
| 7. | Install wheel, torque lug nuts, and make final checks and adjustments.  | P-1 |

**V. BRAKES**

**D. Disc Brake Diagnosis and Repair**

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|----|--|-----|
| 1. | Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or | P-1 |
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- pulsation concerns; determine necessary action.
2. Remove caliper assembly; inspect for leaks and damage to caliper housing; determine necessary action. P-1
  3. Clean and inspect caliper mounting and slides/pins for operation, wear, and damage; determine necessary action. P-1
  4. Remove, inspect and replace pads and retaining hardware; determine necessary action. P-1
  5. Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts. P-3
  6. Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks. P-1
  7. Clean, inspect, and measure rotor thickness, lateral runout, and thickness variation; determine necessary action P-1
  8. Remove and reinstall rotor. P-1
  9. Refinish rotor on vehicle; measure final rotor thickness. P-1
  10. Refinish rotor off vehicle; measure final rotor thickness. P-1
  11. Retract caliper piston on an integrated parking brake system. P-3
  12. Install wheel, torque lug nuts, and make final checks and adjustments. P-1
  13. Check brake pad wear indicator system operation; determine necessary action. P-2

## **V. BRAKES**

### **E. Power Assist Units Diagnosis and Repair**

1. Test pedal free travel; check power assist operation. P-2
2. Check vacuum supply to vacuum-type power booster. P-1
3. Inspect the vacuum-type power booster unit for leaks; inspect the check valve for proper operation; determine necessary action. P-1
4. Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine necessary action. P-3
5. Measure and adjust master cylinder pushrod length. P-3

## **V. BRAKES**

### **F. Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair**

1. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action. P-1
2. Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust bearings. P-1
3. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed. P-2
4. Check parking brake and indicator light system operation; determine necessary action. P-1
5. Check operation of brake stop light system; determine necessary action. P-1
6. Replace wheel bearing and race. P-2
7. Inspect and replace wheel studs. P-1
8. Remove and reinstall sealed wheel bearing assembly. P-1

## **V. BRAKES**

### **G. Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair**

1. Identify and inspect electronic brake control system components; determine necessary action. 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. 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. P-1
4. Depressurize high-pressure components of the electronic brake control system. P-3

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| 5.  | Bleed the electronic brake control system hydraulic circuits.  | P-1 |
| 6.  | Remove and install electronic brake control system electrical/electronic and hydraulic components.   | 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). | P-1 |
| 8.  | Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).   | P-3 |
| 9.  | Identify traction control/vehicle stability control system components.   | P-3 |
| 10. | Describe the operation of a regenerative braking system.   | P-3 |

## **ELECTRICAL/ELECTRONIC SYSTEMS**

**For every task in Electrical/Electronic Systems, 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.**

### **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

#### **A. General Electrical System Diagnosis**

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|----|---|-----|
| 1. | Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.                             | P-1 |
| 2. | Identify and interpret electrical/electronic system concern; determine necessary action.  | P-1 |
| 3. | Research applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins. | P-1 |
| 4. | Locate and interpret vehicle and major component identification numbers.  | P-1 |

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|-----|--|-----|
| 5.  | Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits using principles of electricity (Ohm's Law).   | P-1 |
| 6.  | Use wiring diagrams during diagnosis of electrical circuit problems.   | 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. | P-1 |
| 8.  | Check electrical circuits with a test light; determine necessary action.   | P-2 |
| 9.  | Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.  | P-2 |
|     |  |     |
| 10. | Check electrical circuits using fused jumper wires; determine necessary action.  | P-2 |
| 11. | Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action.  | P-1 |
| 12. | Measure and diagnose the cause(s) of excessive parasitic draw; determine necessary action.   | P-1 |
| 13. | Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.   | P-1 |
| 14. | Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; perform necessary action.                              | P-1 |
| 15. | Remove and replace terminal end from connector; replace connectors and terminal ends.  | P-1 |
|     |  |     |
| 16. | Repair wiring harness (including CAN/BUS systems).   | P-1 |
| 17. | Perform solder repair of electrical wiring.  | P-1 |
| 18. | Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures  | P-2 |

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **B. Battery Diagnosis and Service**

1. Perform battery state-of-charge test; determine necessary action. P-1
2. Perform battery capacity test; confirm proper battery capacity for vehicle application; determine necessary action. P-1
3. Maintain or restore electronic memory functions. P-1
4. Inspect, clean, fill, and/or replace battery, battery cables, connectors, clamps, and hold-downs. P-1
5. Perform battery charge. P-1
6. Start a vehicle using jumper cables or an auxiliary power supply. P-1
7. Identify high voltage circuits of electric or hybrid electric vehicle and related safety precautions. P-3
8. Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry following battery disconnect. P-1
9. Identify hybrid vehicle auxiliary (12v) battery service, repair and test procedures. P-3

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **C. Starting System Diagnosis and Repair**

1. Perform starter current draw tests; determine necessary action. P-1
2. Perform starter circuit voltage drop tests; determine necessary action. P-1
3. Inspect and test starter relays and solenoids; determine necessary action. P-2
4. Remove and install starter in a vehicle. P-1
5. Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action. P-2
6. Differentiate between electrical and engine mechanical problems that cause a P-2

slow-crank or no-crank condition.

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **D. Charging System Diagnosis and Repair**

1. Perform charging system output test; determine necessary action. P-1
2. Diagnose charging system for the cause of undercharge, no-charge, and overcharge conditions. P-1
3. Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioners; check pulley and belt alignment. P-1
4. Remove, inspect, and install generator (alternator). P-1
5. Perform charging circuit voltage drop tests; determine necessary action. P-1

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **E. Lighting Systems Diagnosis and Repair**

1. Diagnose the cause of brighter than normal, intermittent, dim, or no light operation; determine necessary action. P-1
2. Inspect, replace, and aim headlights and bulbs. P-2
3. Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action. P-2
4. Identify system voltage and safety precautions associated with high intensity discharge headlights. P-2

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **F. Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair**

1. Inspect and test gauges and gauge sending units for cause of abnormal gauge readings; determine necessary action. P-1
2. Inspect and test connectors, wires, and printed circuit boards of gauge circuits; determine necessary action. P-3
3. Diagnose the cause of incorrect operation of warning devices and other driver information systems; determine necessary action. P-1

4. Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action. P-3

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **G. Horn and Wiper/Washer Diagnosis and Repair**

1. Diagnose incorrect horn operation; perform necessary action. P-1
2. Diagnose incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action. P-1
3. Diagnose incorrect washer operation; perform necessary action. P-2

## **VI. ELECTRICAL/ELECTRONIC SYSTEMS**

### **H. Accessories Diagnosis and Repair**

1. Diagnose incorrect operation of motor-driven accessory circuits; determine necessary action. P-1
2. Diagnose incorrect heated glass, mirror, or seat operation; determine necessary action. P-3
3. Diagnose incorrect electric lock operation (including remote keyless entry); determine necessary action. P-1
4. Diagnose incorrect operation of cruise control systems; determine necessary action. P-3
5. Diagnose supplemental restraint system (SRS) concerns; determine necessary action. P-1
6. Disarm and enable the airbag system for vehicle service. P-1
7. Diagnose radio static and weak, intermittent, or no radio reception; determine necessary action. P-3
8. Remove and reinstall door panel. P-1
9. Diagnose body electronic system circuits using a scan tool; determine necessary action. P-2
10. Check for module communication (including CAN/BUS systems) errors using a scan tool. P-2
11. Diagnose the cause of false, intermittent, or no operation of anti-theft systems. P-3

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|-----|---|-----|
| 12. | Describe the operation of keyless entry/remote-start systems.                               | P-3 |
| 13. | Perform software transfers, software updates, or flash reprogramming on electronic modules. | P-3 |

## ENGINE PERFORMANCE

**For every task in Engine Performance 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.**

### VIII. ENGINE PERFORMANCE

#### A. General Engine Diagnosis

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|----|---|-----|
| 1. | Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.                         | P-1 |
| 2. | Identify and interpret engine performance concern; determine necessary action.  | P-1 |
| 3. | Research applicable vehicle and service information, such as engine management system operation, vehicle service history, service precautions, and technical service bulletins. | P-1 |
| 4. | Locate and interpret vehicle and major component identification numbers.  | P-1 |
| 5. | Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.  | P-2 |
| 6. | Diagnose abnormal engine noise or vibration concerns; determine necessary action.   | P-3 |
| 7. | Diagnose abnormal exhaust color, odor, and sound; determine necessary action.   | P-2 |
| 8. | Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.   | P-1 |

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|-----|--|-----|
| 9.  | Perform cylinder power balance test; determine necessary action.   | P-2 |
| 10. | Perform cylinder cranking and running compression tests; determine necessary action.   | P-1 |
| 11. | Perform cylinder leakage test; determine necessary action.   | P-1 |
| 12. | Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action.   | P-1 |
| 13. | Prepare 4 or 5 gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings; interpret readings, and determine necessary action.                  | P-3 |
| 14. | Verify engine operating temperature; determine necessary action.   | 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. | P-1 |
| 16. | Verify correct camshaft timing.  | P-1 |

## **VIII. ENGINE PERFORMANCE**

### **B. Computerized Engine Controls Diagnosis and Repair**

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|----|--|-----|
| 1. | Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.  | 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.   | P-1 |
| 3. | Diagnose emissions or driveability concerns without stored diagnostic trouble codes; determine necessary action.   | P-1 |
| 4. | Check for module communication (including CAN/BUS systems) errors using a scan tool.   | P-2 |
| 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. | P-1 |

6. Access and use service information to perform step-by-step diagnosis. 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. P-3
8. Perform active tests of actuators using a scan tool; determine necessary action. P-1
9. Describe the importance of running all OBDII monitors for repair verification. P-1

**VIII. ENGINE PERFORMANCE**

**C. Ignition System Diagnosis and Repair**

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. P-1
2. Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action. P-1

3. Inspect and test crankshaft and camshaft position sensor(s); perform necessary action. P-1
4. Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram as necessary. P-2

**VIII. ENGINE PERFORMANCE**

**D. Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair**

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 P-1

- necessary action.
2. Check fuel for contaminants and quality; determine necessary action. P-2
  3. Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action. P-1
  4. Replace fuel filters. P-2
  5. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air. P-2
  6. Inspect and test fuel injectors. P-1
  7. Verify idle control operation. P-1
  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. P-1
  9. Perform exhaust system back-pressure test; determine necessary action. P-1
  10. Test the operation of turbocharger/supercharger systems; determine necessary action. P-3

## **VIII. ENGINE PERFORMANCE**

### **E. Emissions Control Systems Diagnosis and Repair**

1. Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action. P-2
2. Inspect, test and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action. P-2
3. Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action. P-1
4. Inspect, test, service and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses; P-1

perform necessary action.

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|-----|---|-----|
| 5.  | Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action.      | P-2 |
| 6.  | Diagnose emissions and driveability concerns caused by the secondary air injection and catalytic converter systems; determine necessary action. | P-2 |
| 7.  | Inspect and test mechanical components of secondary air injection systems; perform necessary action.  | P-3 |
| 8.  | Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action.                 | P-3 |
| 9.  | Inspect and test catalytic converter efficiency.  | P-1 |
| 10. | Diagnose emissions and driveability concerns caused by the evaporative emissions control system; determine necessary action.                    | P-1 |
| 11. | Inspect and test components and hoses of the evaporative emissions control system; perform necessary action.                                    | P-1 |
| 12. | Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action.              | P-1 |

## **VIII. ENGINE PERFORMANCE**

### **F. Engine Related Service**

1. Adjust valves on engines with mechanical or hydraulic lifters. P-1
2. Remove and replace timing belt; verify correct camshaft timing. P-1
3. Remove and replace thermostat and gasket/seal. P-1
4. Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action. 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. P-1
6. Perform engine oil and filter change. P-1
7. Identify hybrid vehicle internal combustion engine service precautions. P-3

## Task List Priority Item Totals (by area)

### V. Brakes

P-1 = 39      95% = 37 tasks

P-2 = 10      80% = 8 tasks

P-3 = 11      50% = 6 tasks

### VI. Electrical/Electronic Systems

P-1 = 39      95% = 37 tasks

P-2 = 13      80% = 10tasks

P-3 = 10      50% = 5 tasks

### IV. Suspension and Steering

P-1 = 25      95% = 24 tasks

P-2 = 25      80% = 20 tasks

P-3 = 11      50% = 6 tasks

### VIII. Engine Performance

P-1 = 39      95% = 37 tasks

P-2 = 12      80% = 10 tasks

P-3 = 750% = 4 tasks