2016
Automobile Program
Standards

Summary of Changes

10/24/2016

Summary of Changes

1. Minimum Requirements for Accreditation

There were no changes to this area.

2. Instructor Qualifications

There were no changes to instructor qualifications.

3. **Task List and Assumptions**

The NATEF task list was reviewed and updated in ~~June 2012~~ October 2016.

3. 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.

* individual training programs being evaluated for accreditation should ~~have written and detailed~~ document 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.~~4. 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.

5. It is assumed that:

* All required supplemental tasks are being taught.

4. **Task List Changes –** only those tasks that were changed, added or removed are included in this document.

2013 Maintenance and Light Repair (MLR)
Task List

I. ENGINE REPAIR

A. General

1. Research ~~applicable~~ vehicle ~~and~~ service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

5. ~~Remove and replace timing belt; verify correct camshaft timing.~~ Verify engine mechanical timing. ~~P-1~~ P-2

7. Identify service precautions related to service of the internal combustion engine of a hybrid vehicle. ~~internal combustion engine service precautions.~~ ~~P-3~~ P-2

I. ENGINE REPAIR

B. Cylinder Head and Valve Train

1. Adjust valves (mechanical or hydraulic lifters). ~~P-1~~ P-3

2. Identify components of the cylinder head and valve train. P-1

I. ENGINE REPAIR

C. Lubrication and Cooling Systems

1. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, ~~and~~ heater core, and galley plugs; determine needed action. P-1

2. Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1

4. Inspect and test coolant; drain and recover coolant; flush and refill cooling system; ~~with recommended coolant~~use proper fluid type per manufacturer specifications~~s~~; bleed air as required. P-1

5. Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required. P-1

6. Identify components of the lubrication and cooling systems. P-1

ER Total Tasks		
P-1	~~12~~	12
P-2	~~0~~	~~-~~2
P-3	1	1
	~~13~~	15

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

A. General

1. Research ~~applicable~~ vehicle ~~and~~ service information~~,~~ including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

5. Identify drive train components, and configuration. P-1

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

B. In-Vehicle Transmission/Transaxle

1. Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch. P-2

2. Inspect for leakage at external seals, gaskets, and bushings. ~~P-2~~ P-1

3. Inspect, replace and/or align power train mounts. P-2

4. Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.~~.~~ P-1

AT Total Tasks		
P-1	~~4~~	**6**
P-2	~~4~~	3
P-3	2	2
	~~10~~	11

III. MANUAL DRIVE TRAIN AND AXLES

A. General

1. Research ~~applicable vehicle, and service~~vehicle service information including~~,~~ fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

2. Drain and refill manual transmission/transaxle and final drive unit;~~.~~ ~~U~~use proper fluid type per manufacturer specification. P-1

4. Identify manual drive train and axle components and configuration. P-1

III. MANUAL DRIVE TRAIN AND AXLES

B. Clutch

1. Check and adjust clutch master cylinder fluid level; use proper fluid type per manufacturer specifications~~.~~ P-1

2. Check for hydraulic system leaks. P-1

III. MANUAL DRIVE TRAIN AND AXLES

C. Transmission/Transaxle

1. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.	~~P-3~~	P-2

III. MANUAL DRIVE TRAIN AND AXLES

D. Drive Shaft, Half Shafts, Universal Joints and Constant-Velocity (CV) Joints ~~(f~~Front, ~~r~~Rear, ~~a~~All wheel and 4-~~-~~wheel drive)

1. Inspect, remove, and/or replace ~~front-wheel drive (FWD)~~ bearings, hubs, and seals.	P-2
2. Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints.	P-2
3. Inspect ~~front-wheel bearings and~~ locking hubs.	P-3
4. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.	P-2

III. MANUAL DRIVE TRAIN AND AXLES

E. Differential Case Assembly

1. Clean and inspect differential ~~housing~~ case; check for leaks; inspect housing vent.	~~P-2~~	P-1
2. Check and adjust differential ~~housing~~ case fluid level; use proper fluid type per manufacturer specification.	P-1	
~~1.~~3. Drain and refill differential housing.	P-1	
4. Inspect and replace drive axle wheel studs.	P-1	

~~**E.1 Drive Axles**~~

~~1.~~5. ~~Inspect and replace drive axle wheel studs.~~	~~P-2~~	

~~**III. MANUAL DRIVE TRAIN AND AXLES**~~

~~**F. Four-wheel Drive/All-wheel Drive**~~

1. ~~Inspect front-wheel bearings and locking hubs.~~	~~P-3~~	
2. ~~Check for leaks at drive assembly seals; check vents; check lube level.~~	~~P-2~~	

MD Total Tasks		
P-1	~~6~~	~~9~~ **9**
P-2	~~6~~	5
P-3	~~2~~	1
	~~14~~	15

IV. SUSPENSION AND STEERING SYSTEMS

A. General

1. Research ~~applicable~~ vehicle ~~and~~ service information~~,~~ including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

2. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation. P-1

3. Identify suspension and steering system components and configurations. P-1

IV. SUSPENSION AND STEERING

B. Related Suspension and Steering Service

2. ~~Determine proper power steering fluid type; i~~Inspect power steering fluid level and condition. P-1

3. Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification.~~.~~ P-2

4. Inspect for power steering fluid leakage.~~; determine necessary action.~~ P-1

5. Remove, inspect, replace, and/or adjust power steering pump drive belt. P-1

7. Inspect pitman arm, relay (centerlink/intermediate) rod, idler arm, ~~and~~ mountings, and steering linkage damper. P-1

10. Inspect and replace rebound and/or jounce bumpers. P-1

15. Inspect and/or ~~-~~replace front/rear stabilizer bar (sway bar) bushings, brackets, and links. P-1

16. Inspect, remove, and/or replace strut cartridge or assembly~~.~~; inspect mounts and bushings. ~~P-1~~ P-2

20. Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings. P-1

~~1.~~21. Inspect electric ~~power-assisted~~ power steering assist system. ~~P-3~~ P-2

23. Describe the function of ~~the power steering pressure switch~~ steering and suspension control systems and components, (i.e. active suspension, and stability control). P-3

IV. SUSPENSION AND STEERING

C. Wheel Alignment

1.	Perform prealignment inspection; ~~and~~ measure vehicle ride height.~~; determine necessary action.~~	P-1
2.	Describe alignment angles (camber, caster and toe)	P-1

IV. SUSPENSION AND STEERING

D. Wheels and Tires

1.	Inspect tire condition; identify tire wear patterns; check for correct tire size, ~~and~~ application (load and speed ratings), and ~~adjust~~ air pressure as listed on the tire information placard/label.~~; determine necessary action.~~	P-1	
2.	Rotate tires according to manufacturer's recommendations~~.~~ including vehicles equipped with ~~T~~tire ~~P~~pressure ~~M~~monitoring ~~S~~systems (TPMS)	P-1	
3.	Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly~~. (static and dynamic)~~.	P-1	
4.	Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.	~~P-2~~	P-1
~~1.~~5.	Inspect tire and wheel assembly for air loss; ~~perform~~ determine needed action.	P-1	
~~5.~~6.	Repair tire ~~using~~ following vehicle manufacturer approved procedure.~~internal patch.~~	P-1	
~~2.~~7.	Identify ~~and test~~ tire pressure monitoring systems (indirect and direct) ~~for proper operation~~ calibrate system; verify operation of instrument panel lamps.	P-2 ~~P-1~~	
~~3.~~8.	Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system, including relearn procedure.	~~P-2~~ P-1	

SS Total Tasks		
P-1	~~26~~	29
P-2	~~6~~	6
P-3	~~2~~	1
	~~34~~	36

V. BRAKES

A. General

1.	Research ~~applicable~~ vehicle ~~and~~ service information~~,~~ including fluid type vehicle service history, service precautions, and technical service bulletins.	P-1
4.	Identify brake system components and configuration.	P-1

V. BRAKES

B. Hydraulic System

1. ~~Measure brake pedal height, travel, and free play (as applicable); determine necessary action.~~Describe proper brake pedal height, travel, and feel. P-1

3. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports ~~and supports; determine necessary action~~. P-1

4. Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.~~.~~ P-1

5. Identify components of hydraulic brake warning light system. P-3

V. BRAKES

C. Drum Brakes

1. Remove, clean, and inspect, ~~and~~ brake drum; measure brake drum diameter; determine ~~necessary action.~~serviceability. P-1

2. Refinish brake drum and measure final drum diameter; compare with specification~~s~~. P-1

3. Remove, clean, ~~and~~ inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. P-1

5. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments. ~~P-2~~ P-1

V. BRAKES

D. Disc Brakes

1. Remove and clean caliper assembly; inspect for leaks and damage/wear ~~to caliper housing~~; determine needed action. P-1

2. ~~Clean and i~~Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action. P-1

3. Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action. P-1

4. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads and inspect for leaks. P-1

5. Clean and inspect rotor and mounting surface, measure rotor thickness, thickness variation, and lateral runout; determine needed action. P-1

6. Remove and reinstall/replace rotor. P-1

7. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications. P-1

8. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications. P-1

9. Retract and re-adjust caliper piston on an integral parking brake system. ~~P-3~~ P-2

10. Check brake pad wear indicator; determine needed action. ~~P-2~~ P-1

V. BRAKES

E. Power-Assist Units

~~1.~~2. ~~Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.~~ Identify components of the brake ~~r~~power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. P-1

V. BRAKES

F. Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.)

~~1.~~2. Check parking brake ~~cables~~ system ~~and~~ components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed. P-2

BR Total Tasks		
P-1	~~26~~	29
P-2	~~6~~	5
P-3	~~4~~	3
	~~36~~	37

VI. ELECTRICAL/ELECTRONIC SYSTEMS

A. General

1. Research ~~applicable~~ vehicle ~~and~~ service information~~,~~ including vehicle service history, service precautions, and technical service bulletins. P-1

5. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. ~~P-2~~ P-1

6. Check operation of electrical circuits ~~with~~ using a test light. P-2

7. Using fused jumper wires ~~C~~check operation of electrical circuits. ~~with using fused jumper wires.~~ P-2

10. ~~Perform solder repair of electrical wiring.~~ ~~P-1~~

11. ~~Replace electrical connectors and terminal ends.~~ ~~P-1~~

10. Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder reapir) P-1

11. Identify electrical/electronic system components and configuration. P-1

VI. ELECTRICAL/ELECTRONIC SYSTEMS

B. Battery Service

~~1.~~2. Confirm ~~and load~~ proper battery capacity for vehicle application; perform battery capacity and load test; determine needed action. P-1

7. ~~Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.~~Identify safety precautions for high voltage systems on ~~hybrid~~ electric, hybrid-electric, and diesel vehicles. ~~P-3~~ P-2

8. Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-1

9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. ~~P-3~~ P-2

VI. ELECTRICAL/ELECTRONIC SYSTEMS

C. Starting System

6. Demonstrate knowledge of an ~~automotive~~ automatic idle-stop/start-stop system. P-3

VI. ELECTRICAL/ELECTRONIC SYSTEMS

D. Charging System

2. Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. P-1

3. Remove, inspect, and/or re-install generator (alternator). P-2

4. Perform charging circuit voltage drop tests; determine needed action. ~~P-1~~ P-2

VI. ELECTRICAL/ELECTRONIC SYSTEMS

E. ~~Lighting Systems~~ Lighting, Instrument Cluster, Driver Information, and Body Electrical Systems

1. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed. P-1

2. Aim headlights. P-2

3. Identify system voltage and safety precautions associated with high-intensity discharge headlights. P-2

~~VI. ELECTRICAL/ELECTRONIC SYSTEMS~~

~~F. Accessories~~

4. Disable and enable ~~airbag~~ supplemental restraint system (SRS) ~~for vehicle service~~; verify indicator lamp operation. P-1

5. Remove and reinstall door panel. P-1

6. Describe the operation of keyless entry/remote-start systems. P-3

7. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators. P-1

8. Verify windshield wiper and washer operation; replace wiper blades. P-1

EE Total Tasks		
P-1	~~26~~	26
P-2	~~8~~	-10
P-3	~~3~~	-2
	~~37~~	38

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) ~~HEATING AND AIR CONDITIONING~~

A. General

1. Research ~~applicable~~ vehicle ~~and~~ service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins. P-1

2. Identify heating, ventilation and air conditioning (HVAC) components and configuration. P-1

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)~~HEATING AND AIR CONDITIONING~~

B. Refrigeration System Components

1. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; visually inspect A/C components for signs of leaks; determine needed action. P-1

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)~~HEATING AND AIR CONDITIONING~~

C. Heating, Ventilation, and Engine Cooling Systems

1. Inspect engine cooling and heater systems hoses and pipes; ~~perform~~ determine needed action. P-1

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)~~HEATING AND AIR CONDITIONING~~

D. Operating Systems and Related Controls

HA Total Tasks		
P-1	~~5~~	~~6~~
P-2	2	2
P-3	0	0
	~~7~~	~~8~~

1. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; ~~perform~~ determine needed action. P-1

VIII. ENGINE PERFORMANCE

A. General

1. Research ~~applicable~~ vehicle ~~and~~ service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Perform engine absolute ~~(vacuum/boost)~~ manifold pressure tests (vacuum/boost); ~~determine necessary action~~document results. ~~P-1~~ P-2
3. Perform cylinder power balance test; ~~determine necessary action~~document results. P-2
4. Perform cylinder cranking and running compression tests; ~~determine necessary action.~~document results ~~P-1~~ P-2
5. Perform cylinder leakage test; ~~determine necessary action.~~document results. ~~P-1~~ P-2

VIII. ENGINE PERFORMANCE

B. Computerized Controls

1. Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable. P-1
2. Describe the ~~importance~~ use of ~~operating all~~the OBD~~II~~ monitors for repair verification. P-1

VIII. ENGINE PERFORMANCE

C. Fuel, Air Induction, and Exhaust Systems

1. Replace fuel filter(s) where applicable. ~~P-1~~ P-2
4. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; ~~,~~ determine needed action. P-1
5. Check and refill diesel exhaust fluid (DEF). ~~P-3~~ P-2

EP Total Tasks		
P-1	~~12~~	**8**
P-2	~~7~~	**7**
P-3	~~1~~	0
	15	15

VIII. ENGINE PERFORMANCE

D. Emissions Control Systems

1. Inspect, test, and service positive crankcase ventilation (PCV) filter/breather ~~cap,~~ valve, tubes, orifices, and hoses; perform necessary action. P-2

Grand Total - Tasks		
P-1	~~117~~	125
P-2	~~34~~	40
P-3	~~15~~	10
Task Totals	~~166~~	175
REQUIRED SUPPLEMENTAL TASKS	43	43
Total	~~209~~	218

2013 Automobile Service Technology (AST)
TASK LIST

I. ENGINE REPAIR

A. General: Engine Diagnosis; Removal and Reinstallation (R & R)

2. Research applicable vehicle and service information, ~~such as~~ including fluid type, internal engine operation, vehicle service history, service precautions, and technical service bulletins. P-1

6. ~~Remove and replace timing belt; verify correct camshaft timing~~ Verify engine mechanical timing. P-1

8. Inspect, remove and/or replace engine mounts. P-2

9. ~~Identify hybrid vehicle internal combustion engine service precautions.~~Identify service precautions related to service of the internal combustion engine of a hybrid vehicle. ~~P-3~~ P-2

10. Remove and reinstall engine on a newer vehicle quipped with ~~in an~~ OBD~~II or newer vehicle;~~ reconnect all attaching components and restore the vehicle to running condition. P-3

I. ENGINE REPAIR

C. Engine Block Assembly Diagnosis and Repair

1. Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer). P-2

I. ENGINE REPAIR

D. Lubrication and Cooling Systems Diagnosis and Repair

1. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, ~~and~~ heater core, and galley plugs; determine needed action. P-1

3. Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1

4. Inspect and test coolant; drain and recover coolant; flush and refill cooling system; ~~with recommended~~ use proper ~~coolant~~ fluid type per manufacturer specification; bleed air as required. P-1

8. Inspect and test fan(s) and fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action~~.~~ P-1

10. Perform engine oil and filter change; use proper fluid type per manufacturer specification. P-1

ER Tasks		
P-1	20	20
P-2	~~6~~	7
P-3	~~3~~	2
	29	29

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

A. General: Transmission and Transaxle Diagnosis

2. Research ~~applicable~~ vehicle ~~and~~ service information including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

4. Check fluid level and condition in a transmission or a transaxle equipped with a dip-stick. P-1

5. Check fluid level and condition in a transmission or a transaxle not equipped with a dip-stick. P-1

6. Perform stall test; determine needed action. ~~P-3~~ P-2

10. Demonstrate knowledge of pressure test involving transmission equipped with electronic pressure control. P-3

11. Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information. P-2

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

B. In-Vehicle Transmission/Transaxle Maintenance and Repair

1. Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch. ~~P-2~~ P-1

3. Inspect, test, adjust, repair, and/or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses; demonstrate understanding of relearn procedure. P-1

4. Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification. P-1

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

C. Off-Vehicle Transmission and Transaxle Repair

1. Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and ~~mating~~ mounting surfaces. ~~P-1~~ P-2

2. Inspect, leak test, flush, and/or replace transmission/transaxle oil cooler, lines, and fittings. P-1

AT Tasks

P-1	10	10
P-2	~~5~~	6
P-3	4	4
	19	20

III. MANUAL DRIVE TRAIN AND AXLES

A. General: Drive Train Diagnosis

2. Research ~~applicable~~ vehicle and service information~~,~~ including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

4. Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification. P-1

III. MANUAL DRIVE TRAIN AND AXLES

B. Clutch Diagnosis and Repair

~~1.~~2. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; ~~perform~~ determine needed action. P-1

~~2.~~3. Inspect and/or ~~-~~replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing/ ~~and~~ linkage, and pilot bearing/bushing (as applicable). P-1

5. Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification. P-1

8. Describe the operation and service of a system that uses a dual mass flywheel. P-3

III. MANUAL DRIVE TRAIN AND AXLES

C. Transmission/Transaxle Diagnosis and Repair

1. Inspect, adjust, lubricate, and/or replace ~~reinstall~~ shift linkages, brackets, bushings, cables, pivots, and levers. P-2

2. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle. ~~P-3~~ P-2

III. MANUAL DRIVE TRAIN AND AXLES

D. Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair (Front, Rear, All-wheel, 4-wheel drive)

2. Diagnose universal joint noise and vibration concerns; ~~perform~~ determine needed action. P-2

3. Inspect, remove, and/or replace ~~front wheel drive (FWD)~~ bearings, hubs, and seals. P-1

4. Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints. P-1

III. MANUAL DRIVE TRAIN AND AXLES

E. Drive Axle Diagnosis and Repair

E.1 Ring and Pinion Gears and Differential Case Assembly

1. Clean and inspect differential ~~housing~~ case; check for leaks; inspect housing vent. ~~P-2~~ P-1

2. Check and adjust differential ~~housing~~ case fluid level; use proper fluid type per manufacturer specification. P-1

3. Drain and refill differential ~~housing~~ case; using proper fluid type per manufacturer specification, P-1

4. Inspect and replace companion flange and/or ~~-~~pinion seal; measure companion flange runout. P-2

III. MANUAL DRIVE TRAIN AND AXLES

F. Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair

2. Inspect ~~front-wheel bearings and~~ locking hubs; ~~perform~~determine needed action(s). P-3

3. Check for leaks at drive assembly and transfer case seals; check vents; check ~~lube~~fluid level; use proper fluid type per manufacturer specification. P-3

4. Identify concerns related to variations in tire circumference and/or final drive ratios. ~~P-3~~ P-2

MD Tasks		
P-1	~~17~~	18
P-2	~~8~~	9
P-3	~~5~~	4
	~~30~~	31

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

1. Research ~~applicable~~ vehicle ~~and~~ service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

2. Identify and interpret suspension and steering system concerns; determine needed action. ~~P-1~~ P-2

IV. SUSPENSION AND STEERING

B. Steering Systems Diagnosis and Repair

1. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation. P-1

3. Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action. P-2

6. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; ~~perform~~ determine needed action. P-2

8. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed. ~~P-2~~ P-1

9. ~~Determine proper power steering fluid type; i~~Inspect power steering fluid level and condition. P-1

10. Flush, fill, and bleed power steering system; using proper fluid type per manufacturer specification. P-2

12. Remove, inspect, replace, and/or adjust power steering pump drive belt. P-1

15. Inspect, remove, and/or replace power steering hoses and fittings.

16. Inspect, remove and/or replace pitman arm, relay (centerlink/intermediate) rod, idler arm, ~~and~~ mountings, and steering linkage damper. P-2

17. Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps. P-1

19. Inspect electric ~~power-assisted~~ power steering assist system. P-3

IV. SUSPENSION AND STEERING

C. Suspension Systems Diagnosis and Repair

3. Inspect, remove and/or replace ~~install~~ upper and lower control arms, bushings, shafts, and rebound bumpers. P-3

4. Inspect, remove and/or replace ~~install~~ strut rods and bushings. P-3

5. Inspect, remove and/or replace ~~install~~ upper and/or lower ball joints (with or without wear indicators). P-2

6. Inspect, remove and/or replace ~~install~~ steering knuckle assemblies. P-3

7. Inspect, remove and/or replace ~~install~~ short and long arm suspension system coil springs and spring insulators. P-3

8. Inspect, remove and/or replace ~~install~~ torsion bars and mounts. P-3

9. Inspect, remove and/or replace ~~install~~ front/rear stabilizer bar (sway bar) bushings, brackets, and links. P-3

10. Inspect, remove and/or replace ~~install~~ strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount. P-3

11. Inspect, remove and/or replace ~~install~~ track bar, strut rods/radius arms, and related mounts and bushings. P-3

12. ~~Inspect rear suspension system leaf spring(s), bushings, center pins/bolts, and mounts.~~ Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts. P-1

IV. SUSPENSION AND STEERING

D. Related Suspension and Steering Service

1. Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings. P-1

2. Remove, inspect, ~~and~~ service, and/~~-~~or replace front and rear wheel bearings. P-1

3. ~~Describe the function of the power steering pressure switch.~~ Describe the function of suspension and steering control systems and components, (i.e. active suspension and stability control). P-3

IV. SUSPENSION AND STEERING

E. Wheel Alignment Diagnosis, Adjustment, and Repair

2. Perform prealignment inspection; ~~and~~ measure vehicle ride height; ~~perform~~ determine needed action. P-1

5. Check ~~SAI (steering axis inclination)~~ ssteering ~~axis inclination~~axis inclination (SAI) and included angle; determine needed action. P-2

IV. SUSPENSION AND STEERING

F. Wheels and Tires Diagnosis and Repair

1. Inspect tire condition; identify tire wear patterns; check for correct, ~~tire~~ tire size, ~~and~~ application (load and speed ratings), ~~-~~and ~~adjust~~ air pressure as listed on the tire information placard/label.~~; determine necessary action.~~ P-1

3. Rotate tires according to manufacturer's recommendations including vehicles equipped with ~~T~~tire ~~P~~pressure ~~M~~monitoring ~~S~~system (TPMS)~~.~~ P-1

5. Diagnose tire pull problems; determine needed action. ~~P-2~~ P-1

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~~ P-1

8. Inspect tire and wheel assembly for air loss; ~~perform~~ determine needed action. P-1

9. Repair tire ~~using internal patch.~~following vehicle manufacturer approved procedure.	P-1		
10. Identify ~~and test~~ tire pressure monitoring system (indirect and direct) ~~for proper operation~~, calibrate system; verify operation of instrument panel lamps.	~~P-2~~	P-1	
11. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS);~~.~~ ~~I~~including relearn procedure.		P-1	

SS Tasks		
P-1	~~22~~	26
P-2	~~22~~	19
P-3	11	11
	55	56

V. BRAKES

A. General: Brake Systems Diagnosis

2. Research ~~applicable~~ vehicle ~~and~~ service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1	

V. BRAKES

B. Hydraulic System Diagnosis and Repair

6. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, ~~and~~ wear, ~~check for~~ and loose fittings/supports ~~and supports~~; determine needed action.	P-1	
9. Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacture specification.~~.~~	P-1	
11. Identify components of hydraulic brake warning light system.	P-2	

V. BRAKES

C. Drum Brake Diagnosis and Repair

2. Remove, clean, and inspect brake drum;~~,~~ ~~and~~ measure brake drum diameter; determine ~~necessary action~~ serviceability.	P-1	
3. Refinish brake drum and measure final drum diameter; compare with specification~~s~~.	P-1	
4. Remove, clean, ~~and~~ inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.	P-1	
6. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.	~~P-2~~	P-1

V. BRAKES

D. Disc Brake Diagnosis and Repair

2. Remove and clean caliper assembly; inspect for leaks, ~~and~~ damage, and ~~/~~wear ~~to caliper housing~~; determine needed action. P-1

3. ~~Clean and i~~Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action. P-1

4. Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action. P-1

5. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks. P-1

6. Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action. P-1

7. Remove and reinstall/replace rotor. P-1

8. Refinish rotor on vehicle; measure final rotor thickness and compare with specification~~s~~. P-1

9. Refinish rotor off vehicle; measure final rotor thickness and compare with specification~~s~~. P-1

10. Retract and re-adjust caliper piston on an integrated parking brake system. ~~P-3~~ P-2

11. Check brake pad wear indicator; determine needed action. ~~P-2~~ P-1

V. BRAKES

E. Power-Assist Units Diagnosis and Repair

2. ~~Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.~~ Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. P-1

V. BRAKES

F. Related Systems (i.e. Wheel Bearings, Parking Brakes, Electrical) Diagnosis and Repair

1. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action. ~~P-3~~ P-2

2. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings. ~~P-1~~ P-2

3. Check parking brake ~~cables~~ ~~system~~ ~~and~~ components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed. ~~P-2~~ P-1

6. Replace wheel bearing and race. ~~P-2~~ P-3

8. Remove, reinstall and/or replace ~~reinstall~~ sealed wheel bearing assembly. ~~P-2~~ P-1

V. BRAKES

G. Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS) and Electronic Stability Control (ESC) Systems Diagnosis and Repair

1. Identify and inspect electronic brake control system components (ABS, TCS, ~~ECS~~ ESC); determine needed action. P-1

~~2. Identify traction control/vehicle stability control system components.~~ ~~P-3~~

2. Describe the operation of a regenerative braking system. P-3

BR Tasks		
P-1	~~33~~	36
P-2	~~10~~	8
P-3	~~8~~	6
	~~51~~	50

VI. ELECTRICAL/ELECTRONIC SYSTEMS

A. General: Electrical System Diagnosis

1. Research applicable vehicle and service information, including vehicle service history, service precautions, and technical service bulletins. P-1

5. ~~Demostrate~~Demonstrate proper use of a test light on an electrical circuit. P-1

6. Use fused jumper wires to ~~C~~check operation of electrical circuits. ~~with using fused jumper wires.~~ P-1

11. ~~Replace electrical connectors and terminal ends.~~ Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder reapir) ~~P-1~~ P-1

12. ~~Repair wiring harness.~~ ~~P-3~~

13. ~~Perform solder repair of electrical wiring.~~ ~~P-1~~

VI. ELECTRICAL/ELECTRONIC SYSTEMS

B. Battery Diagnosis and Service

2. Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine needed action. P-1

7. ~~Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.~~ Identify safety precautions for high voltage systems on ~~hybrid~~ electric, hybrid-electric, and diesel vehicles. ~~P-3~~ P-2

8. Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-1

9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. ~~P-3~~ P-2

VI. ELECTRICAL/ELECTRONIC SYSTEMS

C. Starting System Diagnosis and Repair

7. Demonstrate knowledge of ~~automotive~~ automatic idle-stop/start-stop system. P-2

VI. ELECTRICAL/ELECTRONIC SYSTEMS

D. Charging System Diagnosis and Repair

3. Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. P-1

4. Remove, inspect, and/or replace generator (alternator). P-1

VI. ELECTRICAL/ELECTRONIC SYSTEMS

F. ~~Gauges, Warning Devices~~ Instrument Cluster and Driver Information Systems Diagnosis and Repair

1. Inspect and test gauges and gauge sending units for causes of abnormal ~~gauge~~ readings; determine needed action. P-2

3. Reset maintenance indicators as required. P-2

VI. ELECTRICAL/ELECTRONIC SYSTEMS

G. ~~Horn and Wiper/Washer Diagnosis and Repair~~Body Electrical Systems Diagnosis and Repair

1. ~~Diagnose (troubleshoot) causes of incorrect horn operation; perform necessary action.~~ Describe operation of comfort and convenience accessories and related circuits (such as: power window, power seats, pedal height, power locks, truck locks, remote start, moon roof, sun roof, sun shade, remote keyless entry, voice activation, steering wheel controls, back-up camera, park assist, cruise control, and auto dimming headlamps); determine needed repairs.	~~P-1~~	P-3
~~1.~~2. ~~Diagnose (troubleshoot) causes of incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action.~~ Describe operation of security/anti-theft systems and related circuits (such as: theft deterrent, door locks, remote keyless entry, remote start, and starter/fuel disable); determine needed repairs.	~~P-2~~	P-3
~~2.~~3. ~~Diagnose (troubleshoot) windshield washer problems; perform necessary action.~~ Describe operation of entertainment and related circuits (such as: radio, DVD, remote CD changer, navigation, amplifiers, speakers, antennas, and voice-activated accessories); determine needed repairs.	~~P-2~~	P-3
4. Describe operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, park assist, and back-up camera); determine needed repairs.	P-3	
5. Describe body electronic systems circuits using a scan tool; check for module communication errors (data bus systems); determine needed action.	P-3	
6. Describe the process for software transfer, software updates, or reprogramming of electronic modules.	P-3	

~~**VI. ELECTRICAL/ELECTRONIC SYSTEMS**~~

~~**H. Accessories Diagnosis and Repair**~~

1. ~~Diagnose (troubleshoot) incorrect operation of motor-driven accessory circuits; determine necessary action.~~	~~P-2~~	
2. ~~Diagnose (troubleshoot) incorrect electric lock operation (including remote keyless entry); determine necessary action.~~	~~P-2~~	

3. ~~Diagnose (troubleshoot) incorrect operation of cruise control systems; determine necessary action.~~ ~~P-3~~
4. ~~Diagnose (troubleshoot) supplemental restraint system (SRS) problems; determine necessary action.~~ ~~P-2~~
5. ~~Disable and enable an airbag system for vehicle service; verify indicator lamp operation.~~ ~~P-1~~
6. ~~Remove and reinstall door panel.~~ ~~P-1~~
7. ~~Check for module communication errors (including CAN/BUS systems) using a scan tool.~~ ~~P-2~~
8. ~~Describe the operation of keyless entry/remote-start systems.~~ ~~P-3~~
9. ~~Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.~~ ~~P-1~~
10. ~~Verify windshield wiper and washer operation, replace wiper blades.~~ ~~P-1~~

EE Tasks		
P-1	~~34~~	28
P-2	~~13~~	11
P-3	~~5~~	6
	~~52~~	45

HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

For every task in Heating, Ventilation, and Air Conditioning (HVAC), 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.

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)~~HEATING AND AIR CONDITIONING~~

A. General: A/C System Diagnosis and Repair

2. Research ~~applicable~~ vehicle ~~and~~ service information including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins. P-1
5. Identify refrigerant type; select and connect proper gauge set/test equipment; record temperature and pressure readings. P-1

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)~~HEATING AND AIR CONDITIONING~~

B. Refrigeration System Component Diagnosis and Repair

1. Inspect, remove and/or replace A/C compressor drive belts, pulleys, and tensioners; visually inspect A/C components for signs of leaks; determine needed action. P-1

2. Inspect, test, service and/or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed. P-2

3. Remove, inspect, ~~and~~ reinstall, and or replace A/C compressor and mountings; determine recommended oil type and quantity. P-2

5. Determine need for an additional A/C system filter; ~~perform~~ determine needed action. P-3

6. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; ~~perform~~ determine needed action. P-2

7. ~~Inspect A/C condenser for airflow restrictions; perform necessary action.~~ Inspect for proper A/C condenser airflow; determine needed action. P-1

10. Inspect evaporator housing water drain; ~~perform~~ determine ~~necessary~~needed action. P-1

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)~~HEATING AND AIR CONDITIONING~~

C. Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair

1. Inspect engine cooling and heater systems hoses and pipes; determine ~~necessary~~needed action. P-1

2. Inspect and test heater control valve(s); ~~perform~~ determine ~~necessary~~needed action. P-2

3. Determine procedure to remove, inspect, reinstall, and or replace heater core. P-2

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)~~HEATING AND AIR CONDITIONING~~

D. Operating Systems and Related Controls Diagnosis and Repair

1. Inspect and test ~~A/C heater~~ HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; ~~perform~~ determine ~~necessary~~needed action. P-1

4. Inspect and test HVAC system control panel assembly; determine needed action. P-3

5. Inspect and test ~~A/C heater~~ HVAC system control cables, motors, and linkages; ~~perform~~ determine ~~necessary~~needed action. P-3

6. Inspect ~~A/C heater~~ HVAC system ducts, doors, hoses, cabin filters, and outlets; ~~perform~~ determine ~~necessary~~needed action. P-1

7. Identify the source of ~~A/C~~HVAC system ~~oders~~odors. P-2

8. Check operation of automatic or semi-automatic ~~heating, ventilation, and air conditioning (~~HVAC~~)~~ control systems; determine need action. P-2

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)~~HEATING AND AIR CONDITIONING~~

E. Refrigerant Recovery, Recycling, and Handling

2. ~~Identify and recover A/C system refrigerant.~~ Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required. P-1

3. Recycle, label, and store refrigerant. P-1

4. ~~Evacuate and charge A/C system; add refrigerant oil as required.~~ P-1

HA Tasks		
P-1	~~17~~	16
P-2	14	14
P-3	4	4
	~~35~~	34

VIII. ENGINE PERFORMANCE

A. General: Engine Diagnosis

2. Research ~~applicable~~ vehicle ~~and~~ service information, including vehicle service history, service precautions, and technical service bulletins. P-1

5. Perform engine absolute ~~(vacuum/boost)~~ manifold pressure tests (vacuum/boost); determine ~~necessary~~needed action. P-1

11. Verify correct camshaft timing~~.~~ Including engines equipped with variable valve timing (VVT) systems. P-1

VIII. ENGINE PERFORMANCE

B. Computerized Controls Diagnosis and Repair

1. Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable. P-1

4. Describe the ~~importance of running all~~ use of OBD~~II~~ monitors for repair verification. P-1

VIII. ENGINE PERFORMANCE

C. Ignition System Diagnosis and Repair

2. Inspect and test crankshaft and camshaft position sensor(s); ~~perform~~ determine ~~necessary~~needed action. P-1

3. Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram/initialize as ~~necessary~~needed. P-3

4. ~~Inspect, test, service, and replace components of the EGR system including tubing, exhaust passages, vacuum/pressure controls, filters, and hoses; perform necessary~~needed ~~action.~~ ~~P-2~~

VIII. ENGINE PERFORMANCE

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

2. Inspect and test fuel pump(s) and pump control systems for pressure, regulation, and volume; determine needed action. P-1

3. Replace fuel filter(s) where applicable. P-2

6. Inspect, test and/or replace fuel injectors. P-2

9. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action. P-1

11. Check and refill diesel exhaust fluid (DEF). P-2

VIII. ENGINE PERFORMANCE

E. Emissions Control Systems Diagnosis and Repair

1. Diagnose oil leaks, emissions, and drivability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action. P-3

2. Inspect, test, service and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; determine needed action. P-2

3. Diagnose emissions and drivability concerns caused by the exhaust gas recirculation (EGR) system; inspect, test, service and/or replace electrical/electronic sensors, controls, wiring, tubing, exhaust passages, vacuum/pressure controls, filters and hoses of exhaust gas recirculation (EGR) system; determine needed action. P-3

4. Inspect and test electrical/electronically-operated components and circuits of air secondary injection systems; determine ~~necessary~~needed action. P-2

5. Diagnose emissions and drivability concerns caused by the catalytic converter system; determine ~~necessary~~needed action. P-3

6. Inspect and test components and hoses of the evaporative emissions control (EVAP) system; ~~perform~~ determine ~~necessary~~needed action. P-1

EP Tasks		
P-1	19	19
P-2	~~12~~	13
P-3	~~7~~	6
	38	38

AST Grand Total - Tasks		
P-1	~~172~~	176
P-2	~~90~~	87
P-3	~~47~~	43
REQUIRED SUPPLEMENTAL TASKS	43	43
	~~352~~	349

2013 Master Automobile Service Technology (MAST)
Task List

I. ENGINE REPAIR

A. General: Engine Diagnosis; Removal and Reinstallation (R & R)

2.	Research ~~applicable~~ vehicle ~~and~~ service information ~~such as~~ including fluid type, internal engine operation, vehicle service history, service precautions, and technical service bulletins.	P-1	
6.	~~Remove and replace timing belt; verify correct camshaft timing~~. Verify engine mechanical timing.	P-1	
7.	Inspect, remove and replace engine mounts.	P-2	
8.	Inspect, remove and/or replace engine mounts.	P-2	
9.	~~Identify hybrid vehicle internal combustion engine service precautions~~. Identify service precautions related to service of the internal combustion engine of a hybrid vehicle.	~~P-3~~	P-2
10.	Remove and reinstall engine on a newer vehicle equipped with OBD;~~in an OBDII or newer vehicle;~~ reconnect all attaching components and restore the vehicle to running condition.	P-3	

I. ENGINE REPAIR

B. Cylinder Head and Valve Train Diagnosis and Repair

1.	Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification~~s~~ and procedure~~s~~.	P-1	
13.	Inspect and/or measure camshaft for runout, journal wear and lobe wear.	~~P-2~~	P-3

I. ENGINE REPAIR

C. Engine Block Assembly Diagnosis and Repair

1.	Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).	~~P-2~~	P-1
13.	Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance and/or silencer); inspect shaft(s) and support bearings for damage and wear; determine ~~necessary~~needed action; reinstall and time.	P-2	

I. ENGINE REPAIR

D. Lubrication and Cooling Systems Diagnosis and Repair

3. Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1

4. Inspect and/or test coolant; drain and recover coolant; flush and refill cooling system; ~~with recommended~~ ~~with~~use proper fluid type per manufacturer specification ~~coolant~~; bleed air as required. P-1

8. Inspect and test fan(s) ~~(electrical or mechanical)~~ and fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action. P-1

10. Perform engine oil and filter change; use proper fluid type per manufacturer specification.

ER Tasks		
P-1	~~23~~	24
P-2	~~17~~	16
P-3	11	11
	51	51

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

A. General: Transmission and Transaxle Diagnosis

2. Research ~~applicable~~ vehicle ~~and~~ service information including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

8. Perform stall test; determine ~~necessary~~needed action. ~~P-3~~ P-2

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

B. In-Vehicle Transmission/Transaxle Maintenance and Repair

1. Inspect, adjust, and/or ~~-~~replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch. ~~P-2~~ P-1

3. Inspect, test, adjust, repair, and/or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses; perform demonstrated understanding of the relearn procedure.~~-~~ P-1

4. Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification. P-1

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

C. Off-Vehicle Transmission and Transaxle Repair

1. Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and ~~mating~~ mounting surfaces. ~~P-1~~ P-2

2. Inspect, leak test, ~~and~~ flush and/or replace transmission/transaxle oil cooler, lines, and fittings. P-1

6. Disassemble, clean, and inspect transmission/transaxle. ~~P-2~~ P-1

7. Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, switches, solenoids, sleeves, retainers, brackets, check valves/balls, screens, spacers, and gaskets). P-2

9. Assemble transmission/transaxle. ~~P-2~~ P-1

11. Measure transmission/transaxle end play and/or preload; determine ~~necessary~~needed action. P-1

12. Inspect, measure, and/or ~~-~~replace thrust washers and bearings. P-2

19. Inspect clutch drum, piston, check-balls, springs, retainers, seals, ~~and~~ friction plates, ~~and~~ pressure plates, and bands ~~and drums~~; determine ~~necessary~~needed action. P-2

22. Inspect ~~roller and sprag~~ one-way clutches, races, rollers, sprags, springs, cages, retainers; determine ~~necessary~~needed action. P-2

AT Tasks		
P-1	~~15~~	17
P-2	~~20~~	19
P-3	~~4~~	3
	39	39

III. MANUAL DRIVE TRAIN AND AXLES

A. General: Drive Train Diagnosis

2. Research ~~applicable~~ vehicle ~~and~~ service information including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

4. Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification. P-1

III. MANUAL DRIVE TRAIN AND AXLES

B. Clutch Diagnosis and Repair

3. Inspect and/or replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing/ ~~and~~ linkage, and pilot bearing/bushing (as applicable). P-1

5. Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification. P-1

6. Inspect flywheel and ring gear for wear, ~~and~~ cracks, ~~;~~ and ~~discoloration determine~~discoloration; determine ~~necessary~~needed action. P-1

8. Describe the operation and service of a system that uses a dual mass flywheel. P-3

III. MANUAL DRIVE TRAIN AND AXLES

C. Transmission/Transaxle Diagnosis and Repair

1. Inspect, adjust, lubricate, and/or replace ~~reinstall~~ shift linkages, brackets, bushings, cables, pivots, and levers. P-2

2. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle. ~~P-3~~ P-2

6. Disassemble, inspect clean, and reassemble internal transmission/transaxle components. ~~P-3~~ P-2

III. MANUAL DRIVE TRAIN AND AXLES

D. Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair (Front, Rear, All-wheel ~~drive~~, 4-wheel drive)

1. Diagnose universal joint noise and vibration concerns; perform ~~necessary~~needed action. P-2

3. Inspect, remove, and/or replace ~~front wheel drive (FWD)~~ bearings, hubs, and seals. P-1

4. Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints. P-1

III. MANUAL DRIVE TRAIN AND AXLES

E. Drive Axle Diagnosis and Repair

E.1 Ring and Pinion Gears and Differential Case Assembly

1. Clean and inspect differential ~~housing~~ case; check for leaks; inspect housing vent. P-2 P-1

2. Check and adjust differential ~~housing~~ case fluid level; use proper fluid type per manufacturer specification. P-1

3. Drain and refill differential ~~housing~~ case; use proper fluid type per manufacturer specification. P-1

5. Inspect and replace companion flange and/or ~~-~~pinion seal; measure companion flange runout. P-2

7. Remove, inspect, ~~and~~ reinstall and/or replace drive pinion and ring gear, spacers, sleeves, and bearings. P-3

12. Disassemble, inspect, measure, ~~and~~ adjust, and/or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case. P-3

III. MANUAL DRIVE TRAIN AND AXLES

F. Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair

2. Inspect ~~front wheel bearing~~ locking hubs; ~~perform~~ determine ~~necessary~~needed action. P-3

3. Check for leaks at drive assembly and transfer case seals; check vents; check ~~lube~~ fluid level; use proper fluid type per manufacturer specification. P-3

4. Identify concerns related to variations in tire circumference and/or final drive ratios. P-2

6. Diagnose, test, adjust, and/or replace electrical/electronic components of four-wheel drive/all-wheel drive systems.

7. Disassemble, service, and reassemble transfer case and components. ~~P-3~~ P-2

MD Tasks		
P-1	~~17~~	18
P-2	~~12~~	16
P-3	~~20~~	16
	~~49~~	50

IV. SUSPENSION AND STEERING

A. General: Suspension and Steering Systems

1. Research ~~applicable~~ vehicle ~~and~~ service information~~,~~ including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

IV. SUSPENSION AND STEERING

B. Steering Systems Diagnosis and Repair

1. Disable and enable supplemental restraint system (SRS)~~;~~ verify indicator lamp operation. P-1

3. Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine ~~necessary~~needed action. P-2

8. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed. ~~P-2~~ P-1

9. ~~Determine proper power steering fluid type; i~~Inspect power steering fluid level and condition. P-1

10. Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification. P-2

12. Remove, inspect, replace, and/or adjust power steering pump drive belt. P-1

15. Inspect, remove and/or replace power steering hoses and fittings. P-2

16. Inspect, remove and/or replace pitman arm, relay (centerlink/intermediate) rod, idler arm, ~~and~~ mountings, and steering linkage damper. P-2

17. Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps. P-1

18. Inspect, ~~T~~test and diagnose ~~components of electronically-controlled~~ electrically-assisted power steering systems (including using a scan tool); determine ~~necessary~~needed action. ~~P-3~~ P-2

20. ~~Inspect electric power-assisted steering.~~Test power steering system pressure; determine ~~necessary~~needed action. ~~P-3~~ P-2

IV. SUSPENSION AND STEERING

C. Suspension Systems Diagnosis and Repair

3. Inspect, remove, and/or replace ~~install~~ upper and lower control arms, bushings, shafts, and rebound bumpers. P-3

4. Inspect, remove, and/or replace ~~install~~ strut rods and bushings. P-3

5. Inspect, remove, and/or replace ~~install~~ upper and/or lower ball joints (with or without wear indicators). P-2

6. Inspect, remove, ~~-~~and/or replace ~~install~~ steering knuckle assemblies. P-3

7. Inspect, remove, and/or replace ~~install~~ short and long arm suspension system coil springs and spring insulators. P-3

8. Inspect, remove, and/or replace ~~install~~ torsion bars and mounts. P-3

9. Inspect, remove, and/or replace ~~install~~ front/rear stabilizer bar (sway bar) bushings, brackets, and links. P-3

10. Inspect, remove, and/or replace ~~install~~ strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount. P-3

11. Inspect, remove, and/or replace ~~install~~ track bar, strut rods/radius arms, and related mounts and bushings. P-3

12. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts. ~~Inspect rear suspension system leaf spring(s), bushings, center pins/bolts, and mounts.~~ P-1

IV. SUSPENSION AND STEERING

D. Related Suspension and Steering Service

1. Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings. P-1

2. Remove, inspect, ~~and~~ service and/or replace front and rear wheel bearings. P-1

3. Describe the function of suspension and steering control systems and components, (i.e. active suspension, and stability control).~~Describe the function of the power steering pressure switch.~~ steering and suspension control systems and components, (i.e. active suspension, and stability control). P-3

IV. SUSPENSION AND STEERING

E. Wheel Alignment Diagnosis, Adjustment, and Repair

2. Perform prealignment inspection;~~ and~~ measure vehicle ride height; ~~perform~~ determine ~~necessary~~needed action. P-1

5. Check ~~SAI (steering axis inclination)~~ steering axis inclination (SAI) and included angle; determine ~~necessary~~needed action. P-2

7. Check for front wheel setback; ~~determine~~determine ~~necessary~~needed action. P-2

IV. SUSPENSION AND STEERING

F. Wheels and Tires Diagnosis and Repair

1. Inspect tire condition; identify tire wear patterns; check for correct ~~tire~~ tire size~~, and~~ application (load and speed ratings), and ~~adjust~~ air pressure as listed on the tire information placard/label.~~; determine necessary action.~~	P-1	
3. Rotate tires according to manufacturer's recommendations including vehicles equipped with tire ~~P~~pressure ~~M~~monitoring ~~S~~systems (TPMS)~~.~~	P-1	
5. Diagnose tire pull problems; determine ~~necessary~~needed action.	~~P-2~~	P-1
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~~	P-1
9. Repair tire ~~using internal patch.~~following vehicle manufacturer approved procedure.	P-1	
10. Identify ~~and test~~ indirect and direct tire pressure monitoring system (TPMS); ~~(indirect and direct) for proper operation~~ calibrate system; verify operation of instrument panel lamps.	~~P-2~~	P-1
11. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system; including relearn procedure~~.~~	P-1	

SS Tasks		
P-1	~~23~~	27
P-2	~~22~~	20
P-3	~~12~~	10
	57	57

V. BRAKES

A. General: Brake Systems Diagnosis

2. Research ~~applicable~~ vehicle ~~and~~ service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1	

V. BRAKES

B. Hydraulic System Diagnosis and Repair

5. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine ~~necessary~~needed action.	~~P-3~~	P-1

6. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, ~~and~~ wear; ~~check for~~ and loose fittings/supports ~~and supports~~; determine ~~necessary~~needed action. P-1

9. Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.~~.~~ P-1

11. Identify components of hydraulic brake warning light system. P-2

V. BRAKES

C. Drum Brake Diagnosis and Repair

2. Remove, clean, and inspect brake drum; ~~and~~ measure brake drum diameter; determine serviceability. ~~necessary action.~~ P-1

4. Remove, clean, inspect, and/or replace~~-~~ brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. P-1

6. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments. ~~P-2~~ P-1

V. BRAKES

D. Disc Brake Diagnosis and Repair

2. Remove and clean caliper assembly; inspect for leaks~~, and~~ damage, wear~~/wear to caliper housing~~; determine ~~necessary~~needed action. P-1

3. ~~Clean and~~ Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine ~~necessary~~needed action. P-1

4. Remove, inspect, and/or replace brake pads and retaining hardware; determine ~~necessary~~needed action. P-1

5. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake~~-~~ pads~~; and~~ inspect for leaks. P-1

6. Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine ~~necessary~~needed action. P-1

7. Remove and reinstall/replace rotor. P-1

10. Retract and re-adjust caliper piston on an integrated parking brake system. ~~P-3~~ P-2

11. Check brake pad wear indicator; determine ~~necessary~~needed action. ~~P-2~~ P-1

V. BRAKES

E. Power-Assist Units Diagnosis and Repair

2. ~~Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.~~ Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. P-1

V. BRAKES

F. ~~Miscellaneous~~ Related Systems (i.e. Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair

1. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine ~~necessary~~needed action. ~~P-3~~ P-1

2. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings. ~~P-1~~ P-2

3. Check parking ~~brake cables~~ system and components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed. ~~P-2~~ P-1

6. Replace wheel bearing and race. ~~P-2~~ P-3

7. Remove~~,~~ and reinstall, and/or replace sealed wheel bearing assembly. ~~P-2~~ P-1

V. BRAKES

G. ~~Electronic Brake, Traction and Stability Control Systems~~ Electronic Brake ~~c~~Control: Antilock Brake (ABS), Traction Control (TCS), and Electronic Stability Control Systems (ESC) Diagnosis and Repair

1. Identify and inspect electronic brake control system components (ABS, TCS, ESC); determine ~~necessary~~needed action. P-1

2. ~~Identify traction control/vehicle stability control system components.~~ ~~P-3~~

~~3.~~2. Describe the operation of a regenerative braking system. P-3

~~4.~~3. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns ~~-~~associated with the electronic brake control system; determine ~~necessary~~needed action. P-2

~~5.~~4. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine ~~necessary~~needed action. P-2

~~6.~~5. Depressurize high-pressure components of an electronic brake control system. ~~P-3~~ P-2

~~7.~~6. Bleed the electronic brake control system hydraulic circuits. P-1

~~8.~~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-3~~ P-2

~~9.~~8. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.). ~~P-3~~ P-1

BR Tasks		
P-1	~~34~~	40
P-2	~~12~~	11
P-3	~~11~~	5
	~~57~~	56

VI. ELECTRICAL/ELECTRONIC SYSTEMS

A. General: Electrical System Diagnosis

1. Research ~~applicable~~ vehicle ~~and~~ service information including vehicle service history, service precautions, and technical service bulletins. P-1

5. ~~Check operation of electrical circuits with a test light.~~ Demonstrate proper use of a test light on an electrical circuit. P-1

6. ~~Check operation of electrical circuits with fused jumper wires.~~ Use fused jumper wires to check operation of electrical circuits. P-1

10. ~~Replace electrical connectors and terminal ends.~~Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including ~~soldor~~solder repairs) P-1

11. ~~Repair wiring harness.~~ ~~P-1~~

12. ~~Perform solder repair of electrical wiring.~~ ~~P-1~~

~~1.~~11. Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs. P-2

~~2.~~12. Repair ~~CAN/~~data bus wiring harness. P-1

VI. ELECTRICAL/ELECTRONIC SYSTEMS

B. Battery Diagnosis and Service

2. Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine ~~necessary~~needed action. P-1

7. ~~Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.~~ Identify safety precautions for high voltage systems on ~~hybrid~~ electric, hybrid electric, and diesel vehicles. ~~P-3~~ P-2

8. Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-1

9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. ~~P-3~~ P-2

VI. ELECTRICAL/ELECTRONIC SYSTEMS

C. Starting System Diagnosis and Repair

7. Demonstrate knowledge of an automatic idle-stop/start-stop system. P-2

VI. ELECTRICAL/ELECTRONIC SYSTEMS

D. Charging System Diagnosis and Repair

3. Inspect, adjust, and/~~-~~or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. P-1

4. Remove, inspect, and/or replace ~~re-install~~ generator (alternator). P-1

VI. ELECTRICAL/ELECTRONIC SYSTEMS

F. ~~Gauges, Warning Devices,~~ Instrument Cluster and Driver Information Systems Diagnosis and Repair

1. Inspect and test gauges and gauge sending units for causes of abnormal ~~gauge~~ readings; determine ~~necessary~~needed action. P-2

2. Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine ~~necessary~~needed action. P-2

3. Reset maintenance indicators as required. P-2

VI. ELECTRICAL/ELECTRONIC SYSTEMS

G. ~~Horn and Wiper/Washer Diagnosis and Repair~~Body Electrical Systems Diagnosis and Repair

1. Diagnose operation of comfort and convenience accessories and related circuits (such as: power window, power seats, pedal height, power locks, truck locks, remote start, moon roof, sun roof, sun shade, remote keyless entry, voice activation, steering wheel controls, back-up camera, park assist, cruise control, and auto dimming headlamps); determine needed repairs. P-2

2. Diagnose operation of security/anti-theft systems and related circuits (such as: theft deterrent, door locks, remote keyless entry, remote start, and starter/fuel disable); determine needed repairs. P-2

3. Diagnose operation of entertainment and related circuits (such as: radio, DVD, remote CD changer, navigation, amplifiers, speakers, antennas, and voice-activated accessories); determine needed repairs. P-3

4. Diagnose operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, park assist, and back-up camera); determine needed repairs. P-1

5. Diagnose body electronic systems circuits using a scan tool; check ~~formodule~~for module communication errors (data bus systems); determine ~~necessary~~needed action. P-2

6. Describe the process for software transfer, software updates, or reprogramming of electronic modules. P-2

~~Diagnose (troubleshoot) causes of incorrect horn operation; perform necessary action.~~ ~~P-1~~

~~Diagnose (troubleshoot) causes of incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action.~~ ~~P-2~~

~~Diagnose (troubleshoot) windshield washer problems; perform necessary action.~~ ~~P-2~~

VI. ELECTRICAL/ELECTRONIC SYSTEMS

H. Accessories Diagnosis and Repair

Diagnose (troubleshoot) incorrect operation of motor-driven accessory circuits; determine necessary action.	P-2
Diagnose (troubleshoot) incorrect electric lock operation (including remote keyless entry); determine necessary action.	P-2
Diagnose (troubleshoot) incorrect operation of cruise control systems; determine necessary action.	P-3
Diagnose (troubleshoot) supplemental restraint system (SRS) problems; determine necessary action.	P-2
Disable and enable an airbag system for vehicle service; verify indicator lamp operation.	P-1
Remove and reinstall door panel.	P-1
Check for module communication errors (including CAN/BUS systems) using a scan tool.	P-2
Describe the operation of keyless entry/remote-start systems.	P-3
Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.	P-1
Verify windshield wiper and washer operation, replace wiper blades.	P-1
Diagnose (troubleshoot) radio static and weak, intermittent, or no radio reception; determine necessary action.	P-3
Diagnose (troubleshoot) body electronic system circuits using a scan tool; determine necessary action.	P-3
Diagnose the cause(s) of false, intermittent, or no operation of anti-theft systems.	P-3
Describe the process for software transfers, software updates, or flash reprogramming on electronic modules.	P-3

EE Tasks

P-1	36	30
P-2	14	16
P-3	8	1
	58	47

HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

For every task in Heating, Ventilation, and Air Conditioning (HVAC), 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.

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) ~~HEATING AND AIR CONDITIONING~~

A. General: A/C System Diagnosis and Repair

2. Research ~~applicable~~ vehicle ~~and~~ service information including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins. P-1

5. Identify refrigerant type; select and connect proper gauge set~~;~~/test equipment; record temperature and pressure readings. P-1

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

B. Refrigeration System Component Diagnosis and Repair

1. Inspect, remove, and/or replace A/C compressor drive belts, pulleys, ~~and~~ tensioners and visually inspect A/C components for signs of leaks;~~;~~ determine ~~necessary~~needed action. P-1

2. Inspect, test, service and/or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed. P-2

3. Remove, inspect, ~~and/or~~ reinstall and/or replace A/C compressor and mountings; determine recommended oil type and quantity. P-2

7. Inspect for proper A/C condenser ~~for~~ airflow ~~restrictions~~; ~~perform~~ determine ~~necessary~~needed action. P-1

8. Remove, inspect, and ~~reinstall~~ replace receiver/drier or accumulator/drier; determine recommended oil type and quantity. P-2

11. Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and/or control module ~~PCM~~) to interrupt system operation; determine needed action.

12. Determine procedure to remove and reinstall evaporator; determine required oil type and ~~-~~quantity. P-2

13. Remove, inspect, ~~and~~ reinstall, and/or replace condenser; determine required oil type and quantity. P-2

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)~~HEATING AND AIR CONDITIONING~~

C. Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair

1. Inspect engine cooling and heater systems hoses and pipes; perform ~~necessary~~needed action. P-1

4. Determine procedure to remove, inspect, and/or ~~reinstall~~ replace heater core. P-2

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)~~HEATING AND AIR CONDITIONING~~

D. Operating Systems and Related Controls Diagnosis and Repair

1. Inspect and test ~~A/C heater~~ HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; perform ~~necessary~~needed action. P-1

4. Inspect and test ~~A/C heater~~ HVAC system control panel assembly; determine ~~necessary~~needed action. P-3

5. Inspect and test ~~A/C heater~~ HVAC system control cables, motors, and linkages; perform ~~necessary~~needed action. P-3

6. Inspect ~~A/C heater~~ HVAC system ducts, doors, hoses, cabin filters, and outlets; perform ~~necessary~~needed action. P-1

7. Identify the source of ~~A/C~~ HVAC system odors. P-2

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)~~HEATING AND AIR CONDITIONING~~

E. Refrigerant Recovery, Recycling, and Handling

2. Identify ~~and recover~~ A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required.~~.~~ P-1

4. ~~Evacuate and charge A/C system; add refrigerant oil as required.~~ ~~P-1~~

~~HA Tasks~~ HA Tasks		
P-1	~~17~~	16
P-2	17	17
P-3	4	4
	~~38~~	37

VIII. ENGINE PERFORMANCE

A. General: Engine Diagnosis

2. Research ~~applicable~~ vehicle ~~and~~ service information including vehicle service history, service precautions, and technical service bulletins. P-1

4. Diagnose the cause of excessive oil ~~comsumption~~consumption, coolant ~~comsumpton~~consumption, unusual exhaust color, odor, and sound; determine ~~necessary~~needed action. P-2

5. Perform engine absolute ~~(vacuum/boost)~~ manifold pressure tests (vacuum/boost); determine ~~necessary~~needed action. P-1

11. Verify correct camshaft timing including engines equipped with variable valve timing systems (VVT). P-1

VIII. ENGINE PERFORMANCE

B. Computerized Controls Diagnosis and Repair

1. Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable. P-1

3. Perform active tests of actuators using a scan tool; determine ~~necessary~~needed action. ~~P-2~~ P-1

4. Describe the ~~importance of running all~~ use of OBD~~II~~ monitors for repair verification. P-1

5. Diagnose the causes of emissions or ~~driveability~~ drivability concerns with stored or active diagnostic trouble codes (DTC); obtain, graph, and interpret scan tool data. P-1

6. Diagnose emissions or ~~driveability~~drivability concerns without stored or active diagnostic trouble codes; determine ~~necessary~~needed action. P-1

8. Diagnose ~~driveability~~drivability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, ~~A/C~~ HVAC, automatic transmissions, non-OEM installed accessories, or similar systems); determine ~~necessary~~needed action. ~~P-3~~ P-2

VIII. ENGINE PERFORMANCE

C. Ignition System Diagnosis and Repair

1. Diagnose (troubleshoot) ignition system related problems such as no-starting, hard starting, engine misfire, poor ~~driveability~~drivability, spark knock, power loss, poor mileage, and emissions concerns; determine ~~necessary~~needed action. P-2

3. Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram/initialize as ~~necessary~~needed. P-3

VIII. ENGINE PERFORMANCE

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

1. Diagnose (troubleshoot) hot or cold no-starting, hard starting, poor ~~driveability~~drivability, incorrect ~~-~~ idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling,~~-~~ poor~~-~~ mileage, dieseling, and emissions problems; determine ~~necessary~~needed action. P-2

4. Replace fuel filter(s) where applicable. ~~P-1~~ P-2

7. Inspect, ~~and~~ test, and/or replace fuel injectors. P-2

10. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; ~~repair or replace as needed.~~determine needed action. P-1

12. Check and refill diesel exhaust fluid (DEF). ~~P-3~~ P-2

13. Test the operation of turbocharger/supercharger systems; determine ~~necessary~~needed action. ~~P-3~~ P-2

VIII. ENGINE PERFORMANCE

E. Emissions Control Systems Diagnosis and Repair

1. Diagnose oil leaks, emissions, and ~~driveability~~drivability concerns caused by the positive crankcase ventilation (PCV) system; determine ~~necessary~~needed action. P-3

2. Inspect, test,~~-~~ service, ~~and~~ and/or replace ~~service~~ positive crankcase ventilation (PCV) filter/breather ~~cap,~~ valve, tubes, orifices, and hoses; perform ~~necessary~~needed action. P-2

3. Diagnose emissions and ~~driveability~~drivability concerns caused by the exhaust gas recirculation (EGR) system; inspect, ~~and~~ test, ~~-~~service and/or replace electrical/electronic sensors, controls,~~-and~~ wiring~~-of exhaust gas recirculation (EGR) systems~~ tubing, exhaust passages, vacuum/pressure controls, filters and hoses of exhaust gas recirculation (EGR) systems; determine ~~necessary~~needed action. ~~P-3~~ P-2

4. Diagnose emissions and ~~driveability~~drivability concerns caused by the secondary air injection system; ~~and catalytic converter systems~~ components and circuits of air injection systems; inspect, test, repair, and/or replace electrical/electronically-operated components and circuits of secondary air injection ~~determine~~systems; determine ~~necessary~~needed action. P-2

5. Diagnose emissions and ~~driveability~~drivability concerns caused by the evaporative emissions control (EVAP) system; determine ~~necessary~~needed action. ~~P-2~~ P-1

~~1. Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action.~~

6. Diagnose emission and drivability concerns caused by catalytic converter system; determine needed action. ~~P-2~~ P-2

~~2. Inspect, test, service, and replace components of the EGR system including tubing, exhaust passages, vacuum/pressure controls, filters, and hoses; perform necessary action.~~

7. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action. ~~P-2~~ 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-2~~

10. ~~Inspect and test components and hoses of the evaporative emissions control system; perform necessary action.~~ ~~P-1~~

11. ~~Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action.~~ ~~P-3~~

EP Tasks		
P-1	21	21
~~P-2~~	~~17~~	18
P-3	~~9~~	4
	~~47~~	43

	Grand Total - Tasks	
P-1	~~186~~	193
P-2	~~131~~	133
P-3	~~79~~	54
REQUIRED SUPPLEMENTAL TASKS	43	43
	~~439~~	423

Task List Priority Item Totals (by accreditation level)

Maintenance & Light Repair

P-1 = ~~117~~ 121 95% = ~~111~~ 115 tasks
P-2 = ~~34~~ 40 80% = ~~27~~ 32 tasks
P-3 = ~~15~~ 10 50% = ~~8~~ 5 tasks

Required Supplemental Tasks = 43

Automobile Service Technology

P-1 = ~~172~~ 176 95% = ~~163~~ 167 tasks
P-2 = ~~90~~ 87 80% = ~~72~~ 70 tasks
P-3 = ~~47~~ 43 50% = ~~24~~ 22 tasks

Required Supplemental Tasks = 43

Master Automobile Service Technology

P-1 = ~~186~~ 193 95% = ~~177~~ 183 tasks
P-2 = ~~131~~ 133 80% = ~~105~~ 106 tasks
P-3 = ~~79~~ 54 50% = ~~40~~ 27 tasks

Required Supplemental Tasks = 43

TOOLS AND EQUIPMENT

HAND TOOLS

Combination Wrenches:
Standard (1/4" – 1 1/4") (optional)
Crowfoot Wrench Set – Standard (optional)
Scraper:
~~Carbon 1"~~ Plastic
~~Screw Starter:~~
~~Phillips~~
~~Standard~~
Socket Set - 1/4" Drive:
1/4" - 1/2" Standard Depth (optional)
1/4" - 1/2" Deep (optional)
Socket Set - 3/8" Drive:
5/16" - 3/4" Standard Depth (6 point)(optional)
3/8" - 3/4" Deep (6 point)(optional)

Spark Plug Sockets 5/8", 13/16", 9/16"
Spark Plug Sockets 14mm
Socket Set - 1/2" Drive:
7/16" - 1 1/8" Standard Depth (optional)
7/16" - 1 1/8" Deep (optional)

GENERAL LAB/SHOP EQUIPMENT

Impact Socket Sets - 3/8" Drive (Standard - optional)
Impact Socket Set - 3/8" Drive ~~and Metric)~~(8mm-19mm)
Impact Sockets - 1/2" Drive (7/16" - 1 1/8")(optional)
Micrometers - (Outside Type) 0-1", 1-2", 2-3", 3-4", 4-5" ~~(Outside Type)~~
Tap and Die Set - Standard (optional)
Twist Drill Set ~~– 1/64" – 1/2"~~
~~Vernier~~ Calipers

SPECIALTY TOOLS AND EQUIPMENT

MAINTENANCE & LIGHT REPAIR

SUSPENSION & STEERING
Spring Compressor Tool
Tire Pressure Monitoring System Tool (TPMS) as appropriate

BRAKES
Brake Bleeder, (Pressure or Vacuum)

ENGINE PERFORMANCE
Cylinder Power Balance Tester (scan tool/manual method)

SPECIALTY TOOLS AND EQUIPMENT

AUTOMOBILE SERVICE TECHNOLOGY

SUSPENSION & STEERING
Tire Mounting Machine ~~(rim clamp type)~~

BRAKES
Brake Bleeder, (Pressure or Vacuum)
Caliper Piston Retraction Set

HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)
A/C Leak Detector (to meet current industry standard)
A/C Manifold Gauge Set or equivalent (to meet current industry standard)
~~Refrigerant Charging Station (to meet current industry standard)~~
A/C Refrigerant Recovery/Recycling/Recharging Station ~~Machine~~ (to meet current industry standard)
A/C Sealant Detector Kit

ENGINE PERFORMANCE
Cylinder Power Balance Tester (Scan Tool/Manual Method)
Evaporative Emissions Control System (EVAP)
~~Timing Advance Light~~

ELECTRICAL/ELECTRONIC SYSTEMS
Molding and Trim~~Door Panel~~ Trim Tool(s)

MANUAL DRIVE TRAIN AND AXLES
~~Front Wheel Drive~~ Engine Support Fixture

SPECIALTY TOOLS AND EQUIPMENT

MASTER AUTOMOBILE SERVICE TECHNOLOGY

SUSPENSION & STEERING
Tire Mounting Machine ~~(rim clamp type)~~

BRAKES
Caliper Piston Retraction Set

HEATING AND AIR CONDITIONING
A/C Leak Detector (to meet current industry standards)
A/C Manifold Gauge Set or equivalent (to meet current industry standards)
~~Refrigerant Charging Station (to meet current industry standards) or equivalent~~
A/C Refrigerant Identification Equipment
Refrigerant Recovery/Recycling/Recharging Station ~~Machine~~ (to meet current industry standards)

ENGINE PERFORMANCE

Evaporative Emissions Control System (EVAP)

ELECTRICAL/ELECTRONIC SYSTEMS

~~Door~~ Molding and ~~Panel~~ Trim Removal Tool(s)

MANUAL DRIVE TRAIN AND AXLES

~~Front Wheel Drive~~ Engine Support Fixture

ENGINE REPAIR

Micrometer (Depth)

0 - 6"

0 - ??mm

DEFINITIONS – TECHNICAL TERMS

INTERPRET
To explain the operation/condition of component or system

DEMONSTRATE
To show the understanding of components or system

IDENTIFY
To describe the component or system

INSPECT
To verify condition of component or system via visual examination

DESCRIBE
To represent or give an account of the component or system