

Shop Manual Correlation Chart

Maintenance and Light Repair (MLR)

The following chart correlates the jobs in the *Modern Automotive Technology Shop Manual* to the 2013 NATEF Maintenance and Light Repair (MLR) Task List.

ENGINE REPAIR

For every task in Engine Repair, 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.

Task Number and Description	Priority	Job #s
I. ENGINE REPAIR		
A. General		
1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1	2
2. Verify operation of the instrument panel engine warning indicators.	P-1	11, 138, 139, 140, 141
3. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	P-1	7
4. Install engine covers using gaskets, seals, and sealers as required.	P-1	3, 4, 27, 28, 34
5. Remove and replace timing belt; verify correct camshaft timing.	P-1	13, 28
6. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.	P-1	15
7. Identify hybrid vehicle internal combustion engine service precautions.	P-3	12, 13
I. ENGINE REPAIR		
B. Cylinder Head and Valve Train		
1. Adjust valves (mechanical or hydraulic lifters).	P-1	25

Task Number and Description	Priority	Job #s
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 necessary action.	P-1	31
2. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1	31, 33
3. Remove, inspect, and replace thermostat and gasket/seal.	P-1	36
4. Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.	P-1	31, 32
5. Perform engine oil and filter change.	P-1	6

AUTOMATIC TRANSMISSION AND TRANSAXLE

For every task in Automatic Transmission and Transaxle, 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.

Task Number and Description	Priority	Job #s
II. AUTOMATIC TRANSMISSION AND TRANSAXLE		
A. General		
1. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1	2
2. Check fluid level in a transmission or a transaxle equipped with a dipstick.	P-1	39, 44
3. Check fluid level in a transmission or a transaxle not equipped with a dipstick.	P-1	39, 44
4. Check transmission fluid condition; check for leaks.	P-2	39, 44
II. AUTOMATIC TRANSMISSION AND TRANSAXLE		
B. In-Vehicle Transmission/Transaxle		
1. Inspect, adjust, and replace external manual valve shift linkage, transmission range	P-2	39, 45

Task Number and Description	Priority	Job #s
sensor/switch, and park/neutral position switch.		
2. Inspect for leakage at external seals, gaskets, and bushings.	P-2	3, 4
3. Inspect replace and align power train mounts.	P-2	37, 38
4. Drain and replace fluid and filter(s).	P-1	44
II. AUTOMATIC TRANSMISSION AND TRANSAXLE		
C. Off-Vehicle Transmission and Transaxle		
1. Describe the operational characteristics of a continuously variable transmission (CVT).	P-3	39
2. Describe the operational characteristics of a hybrid vehicle drive train.	P-3	39

MANUAL DRIVE TRAIN AND AXLES

For every task in Manual Drive Train and Axles, the following safety requirement must be strictly enforced:

- Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

Task Number and Description	Priority	Job #s
III. MANUAL DRIVE TRAIN AND AXLES		
A. General		
1. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1	2
2. Drain and refill manual transmission/transaxle and final drive unit.	P-1	77, 78, 79, 80, 86, 89
3. Check fluid condition; check for leaks.	P-2	60, 65
III. MANUAL DRIVE TRAIN AND AXLES		
B. Clutch		
1. Check and adjust clutch master cylinder fluid level.	P-1	71, 73
2. Check for system leaks.	P-1	71, 73

Task Number and Description	Priority	Job #s
III. MANUAL DRIVE TRAIN AND AXLES		
C. Transmission/Transaxle		
1. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.	P-3	69
III. MANUAL DRIVE TRAIN AND AXLES		
D. Drive Shaft, Half Shafts, Universal and Constant-Velocity (CV) Joints		
1. Inspect, remove, and replace front-wheel drive (FWD) bearings, hubs, and seals.	P-2	68
2. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.	P-2	66, 67
III. MANUAL DRIVE TRAIN AND AXLES		
E. Differential Case Assembly		
1. Clean and inspect differential housing; check for leaks; inspect housing vent.	P-2	7, 65, 87
2. Check and adjust differential housing fluid level.	P-1	60
3. Drain and refill differential housing.	P-1	86, 89
E.1 Drive Axles		
1. Inspect and replace drive axle wheel studs.	P-2	108
III. MANUAL DRIVE TRAIN AND AXLES		
F. Four-wheel Drive/All-wheel Drive		
1. Inspect front-wheel bearings and locking hubs.	P-3	67, 68, 83, 92
2. Check for leaks at drive assembly seals; check vents; check lube level.	P-2	65, 81

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.

Task Number and Description	Priority	Job #s
IV. SUSPENSION AND STEERING SYSTEMS		
A. General		
1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1	2
2. Disable and enable supplemental restraint system (SRS).	P-1	94, 147
IV. SUSPENSION AND STEERING		
B. Related Suspension and Steering Service		
1. Inspect rack and pinion steering gear inner tie-rod ends (sockets) and bellows boots.	P-1	95
2. Determine proper power steering fluid type; inspect fluid level and condition.	P-1	91, 97
3. Flush, fill, and bleed power steering system.	P-2	97
4. Inspect for power steering fluid leakage; determine necessary action.	P-1	97
5. Remove, inspect, replace, and adjust power steering pump drive belt.	P-1	33, 97
6. Inspect and replace power steering hoses and fittings.	P-2	90, 97
7. Inspect pitman arm, relay (center link/intermediate) rod, idler arm and mountings, and steering linkage damper.	P-1	90, 94, 96
8. Inspect tie-rod ends (sockets), tie-rod sleeves, and clamps.	P-1	90
9. Inspect upper and lower control arms, bushings, and shafts.	P-1	90
10. Inspect and replace rebound and jounce bumpers.	P-1	90, 99
11. Inspect track bar, strut rods/radius arms, and related mounts and bushings.	P-1	90
12. Inspect upper and lower ball joints (with or without wear indicators).	P-1	90
13. Inspect suspension system coil springs and spring insulators (silencers).	P-1	90
14. Inspect suspension system torsion bars and mounts.	P-1	90

Task Number and Description	Priority	Job #s
15. Inspect and replace front stabilizer bar (sway bar) bushings, brackets, and links.	P-1	90, 98
16. Inspect strut cartridge or assembly.	P-1	90, 101
17. Inspect front strut bearing and mount.	P-1	90, 101
18. Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms.	P-1	90, 99
19. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.	P-1	90, 100
20. Inspect, remove, and replace shock absorbers; inspect mounts and bushings.	P-1	90, 102
21. Inspect electric power-assisted steering.	P-3	97
22. Identify hybrid vehicle power steering system electrical circuits and safety precautions.	P-2	93
23. Describe the function of the power steering pressure switch.	P-3	97
IV. SUSPENSION AND STEERING		
C. Wheel Alignment		
1. Perform prealignment inspection and measure vehicle ride height; determine necessary action.	P-1	90, 103
IV. SUSPENSION AND STEERING		
D. Wheels and Tires		
1. Inspect tire condition; identify tire wear patterns; check for correct size and application (load and speed ratings) and adjust air pressure; determine necessary action.	P-1	81, 104
2. Rotate tires according to manufacturer's recommendations.	P-1	106
3. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic).	P-1	105, 106
4. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.	P-2	105, 106
5. Inspect tire and wheel assembly for air loss; perform necessary action.	P-1	104
6. Repair tire using internal patch.	P-1	105
7. Identify and test tire pressure monitoring systems (indirect and direct) for operation; verify operation of instrument panel lamps.	P-2	105

Task Number and Description	Priority	Job #s
8. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.	P-2	105

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.

Task Number and Description	Priority	Job #s
V. BRAKES		
A. General		
1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1	2
2. Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).	P-1	107
3. Install wheel and torque lug nuts.	P-1	105, 116, 118
V. BRAKES		
B. Hydraulic System		
1. Measure brake pedal height, travel, and free play (as applicable); determine necessary action.	P-1	107
2. Check master cylinder for external leaks and proper operation.	P-1	107
3. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, loose fittings and supports; determine necessary action.	P-1	107, 111
4. Select, handle, store, and fill brake fluids to proper level.	P-1	113, 115
5. Identify components of brake warning light system.	P-3	111, 136, 138
6. Bleed and/or flush brake system.	P-1	115
7. Test brake fluid for contamination.	P-1	115

Task Number and Description	Priority	Job #s
V. BRAKES		
C. Drum Brakes		
1. Remove, clean, inspect, and measure brake drum diameter; determine necessary action.	P-1	107, 116
2. Refinish brake drum and measure final drum diameter; compare with specifications.	P-1	117
3. 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	116
4. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P-2	116
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	116
V. BRAKES		
D. Disc Brakes		
1. Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action.	P-1	107, 118
2. Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.	P-1	118
3. Remove, inspect, and replace pads and retaining hardware; determine necessary action.	P-1	118
4. Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks.	P-1	118
5. Clean and inspect rotor, measure rotor thickness, thickness variation, and lateral runout; determine necessary action.	P-1	118
6. Remove and reinstall rotor.	P-1	118
7. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications.	P-1	120
8. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications.	P-1	120
9. Retract and readjust caliper piston on an integral parking brake system.	P-3	110

Task Number and Description	Priority	Job #s
10. Check brake pad wear indicator; determine necessary action.	P-2	118
11. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.	P-1	118
V. BRAKES		
E. Power-Assist Units		
1. Check brake pedal travel with, and without, engine running to verify proper power booster operation.	P-2	114
2. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.	P-1	114
V. BRAKES		
F. Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.)		
1. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.	P-1	5, 109
2. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed.	P-2	110
3. Check parking brake operation and parking brake indicator light system operation; determine necessary action.	P-1	110
4. Check operation of brake stop light system.	P-1	136
5. Replace wheel bearing and race.	P-2	5, 109
6. Inspect and replace wheel studs.	P-1	108
V. BRAKES		
G. Electronic Brakes, and Traction and Stability Control Systems		
1. Identify traction control/vehicle stability control system components.	P-3	121
2. Describe the operation of a regenerative braking system.	P-3	111

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.

Task Number and Description	Priority	Job #s
VI. ELECTRICAL/ELECTRONIC SYSTEMS		
A. General		
1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1	2
2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P-1	136
3. Use wiring diagrams to trace electrical/electronic circuits.	P-1	130, 136, 138
4. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.	P-1	130, 136, 142
5. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P-2	130, 138, 142
6. Check operation of electrical circuits with a test light.	P-2	130, 136
7. Check operation of electrical circuits with fused jumper wires.	P-2	125, 138
8. Measure key-off battery drain (parasitic draw).	P-1	125
9. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.	P-1	125, 130, 138, 139
10. Perform solder repair of electrical wiring.	P-1	126
11. Replace electrical connectors and terminal ends.	P-1	126
VI. ELECTRICAL/ELECTRONIC SYSTEMS		
B. Battery Service		
1. Perform battery state-of-charge test; determine necessary action.	P-1	127
2. Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action.	P-1	127

Task Number and Description	Priority	Job #s
3. Maintain or restore electronic memory functions.	P-1	125, 128
4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.	P-1	127, 128
5. Perform slow/fast battery charge according to manufacturer's recommendations.	P-1	128
6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P-1	129
7. Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.	P-3	127, 128
8. Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery.	P-1	128
9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.	P-3	127, 128
VI. ELECTRICAL/ELECTRONIC SYSTEMS		
C. Starting System		
1. Perform starter current draw test; determine necessary action.	P-1	130
2. Perform starter circuit voltage drop tests; determine necessary action.	P-1	130
3. Inspect and test starter relays and solenoids; determine necessary action.	P-2	130, 131
4. Remove and install starter in a vehicle.	P-1	133
5. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action.	P-2	130
VI. ELECTRICAL/ELECTRONIC SYSTEMS		
D. Charging System		
1. Perform charging system output test; determine necessary action.	P-1	134
2. Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.	P-1	33, 134
3. Remove, inspect, and reinstall generator (alternator).	P-2	134, 135
4. Perform charging circuit voltage drop tests; determine necessary action.	P-1	134
VI. ELECTRICAL/ELECTRONIC SYSTEMS		
E. Lighting Systems		
1. Inspect interior and exterior lamps and sockets including headlights and auxiliary	P-1	136

Task Number and Description	Priority	Job #s
lights (fog lights/driving lights); replace as needed.		
2. Aim headlights.	P-2	137
3. Identify system voltage and safety precautions associated with high-intensity discharge headlights.	P-2	137
VI. ELECTRICAL/ELECTRONIC SYSTEMS		
F. Accessories		
1. Disable and enable airbag system for vehicle service; verify indicator lamp operation.	P-1	147
2. Remove and reinstall door panel.	P-1	144
3. Describe the operation of keyless entry/remote-start systems.	P-3	151
4. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.	P-1	136, 138, 139, 140, 141
5. Verify windshield wiper and washer operation; replace wiper blades.	P-1	143

HEATING AND AIR CONDITIONING

For every task in Heating and Air Conditioning, 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.

Task Number and Description	Priority	Job #s
VII. HEATING AND AIR CONDITIONING		
A. General		
1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1	2
VII. HEATING AND AIR CONDITIONING		
B. Refrigeration System Components		
1. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action.	P-1	33 152, 155
2. Identify hybrid vehicle A/C system electrical circuits and the service/safety	P-2	152

Task Number and Description	Priority	Job #s
precautions.		
3. Inspect A/C condenser for airflow restrictions; determine necessary action.	P-1	152
VII. HEATING AND AIR CONDITIONING		
C. Heating, Ventilation, and Engine Cooling Systems		
1. Inspect engine cooling and heater systems hoses; perform necessary action.	P-1	31, 33, 158
VII. HEATING AND AIR CONDITIONING		
D. Operating Systems and Related Controls		
1. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action.	P-1	159
2. Identify the source of A/C system odors.	P-2	152

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.

Task Number and Description	Priority	Job #s
VIII. ENGINE PERFORMANCE		
A. General		
1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1	2
2. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action	P-1	8
3. Perform cylinder power balance test; determine necessary action.	P-2	8
4. Perform cylinder cranking and running compression tests; determine necessary action.	P-1	9
5. Perform cylinder leakage test; determine necessary action.	P-1	9
6. Verify engine operating temperature.	P-1	31
7. Remove and replace spark plugs; inspect secondary ignition components for wear and	P-1	164, 165

Task Number and Description	Priority	Job #s
damage.		
VIII. ENGINE PERFORMANCE		
B. Computerized Controls		
1. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze-frame data; clear codes when applicable.	P-1	11, 161
2. Describe the importance of operating all OBD II monitors for repair verification.	P-1	161
VIII. ENGINE PERFORMANCE		
C. Fuel, Air Induction, and Exhaust Systems		
1. Replace fuel filter(s).	P-1	167
2. Inspect, service, or replace air filters, filter housings, and intake ductwork.	P-1	168
3. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tailpipe(s), and heat shields; determine necessary action.	P-1	173, 174, 177
4. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed.	P-1	173, 174, 177
5. Check and refill diesel exhaust fluid (DEF).	P-3	173
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	178

REQUIRED SUPPLEMENTAL TASKS

Task Number and Description	
Shop and Personal Safety	
1. Identify general shop safety rules and procedures.	1
2. Utilize safe procedures for handling of tools and equipment.	1
3. Identify and use proper placement of floor jacks and jack stands.	1
4. Identify and use proper procedures for safe lift operation.	1

Task Number and Description	
5. Utilize proper ventilation procedures for working within the lab/shop area.	1
6. Identify marked safety areas.	1
7. Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.	1
8. Identify the location and use of eyewash stations.	1
9. Identify the location of the posted evacuation routes.	1
10. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.	1
11. Identify and wear appropriate clothing for lab/shop activities.	1
12. Secure hair and jewelry for lab/shop activities.	1
13. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.	1
14. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).	1, 137
15. Locate and demonstrate knowledge of material safety data sheets (MSDS).	1, 2
Tools and Equipment	
1. Identify tools and their usage in automotive applications.	1, 11
2. Identify standard and metric designation.	2, 28, 31, 40, 172
3. Demonstrate safe handling and use of appropriate tools.	1
4. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	1
5. Demonstrate proper use of precision measuring tools (i.e., micrometer, dial indicator, dial caliper).	16, 18, 21, 27
Preparing Vehicle for Service	
1. Identify information needed and the service requested on a repair order.	2
2. Identify purpose and demonstrate proper use of fender covers, mats.	6
3. Demonstrate use of the three Cs (concern, cause, and correction).	160
4. Review vehicle service history.	2
5. Complete work order to include customer information, vehicle identifying information, customer	2

Task Number and Description	
concern, related service history, cause, and correction.	
Preparing Vehicle for Customer	
1. Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).	6