

MLR Shop Manual Correlation Chart

The following chart correlates the jobs in the *Modern Automotive Technology MLR 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	5
2. Verify operation of the instrument panel engine warning indicators.	P-1	6
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	8, 9
5. Remove and replace timing belt; verify correct camshaft timing.	P-1	10
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	11
7. Identify hybrid vehicle internal combustion engine service precautions.	P-3	2
I. ENGINE REPAIR		
B. Cylinder Head and Valve Train		
1. Adjust valves (mechanical or hydraulic lifters).	P-1	12
I. ENGINE REPAIR		
C. Lubrication and Cooling Systems		
1. Perform cooling system pressure and dye tests to identify leaks; check coolant	P-1	13

Task Number and Description	Priority	Job #s
condition and level; inspect and test radiator, pressure cap, coolant recovery tank, and heater core and galley plugs; determine necessary action.		
2. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1	14
3. Remove, inspect, and replace thermostat and gasket/seal.	P-1	15
4. Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.	P-1	13, 16
5. Perform engine oil and filter change.	P-1	17

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	5, 18
2. Check fluid level in a transmission or a transaxle equipped with a dipstick.	P-1	18
3. Check fluid level in a transmission or a transaxle not equipped with a dipstick.	P-1	18
4. Check transmission fluid condition; check for leaks.	P-2	18
II. AUTOMATIC TRANSMISSION AND TRANSAXLE		
B. In-Vehicle Transmission/Transaxle		
1. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.	P-2	19
2. Inspect for leakage at external seals, gaskets, and bushings.	P-2	18
3. Inspect, replace, and align power train mounts.	P-2	20, 21

Task Number and Description	Priority	Job #s
4. Drain and replace fluid and filter(s).	P-1	22
II. AUTOMATIC TRANSMISSION AND TRANSAXLE		
C. Off-Vehicle Transmission and Transaxle		
1. Describe the operational characteristics of a continuously variable transmission (CVT).	P-3	23
2. Describe the operational characteristics of a hybrid vehicle drive train.	P-3	23

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	5
2. Drain and refill manual transmission/transaxle and final drive unit.	P-1	24
3. Check fluid condition; check for leaks.	P-2	25
III. MANUAL DRIVE TRAIN AND AXLES		
B. Clutch		
1. Check and adjust clutch master cylinder fluid level.	P-1	26
2. Check for system leaks.	P-1	26
III. MANUAL DRIVE TRAIN AND AXLES		
C. Transmission/Transaxle		
1. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.	P-3	23

Task Number and Description	Priority	Job #s
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	27
2. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.	P-2	27, 28
III. MANUAL DRIVE TRAIN AND AXLES		
E. Differential Case Assembly		
1. Clean and inspect differential housing; check for leaks; inspect housing vent.	P-2	24
2. Check and adjust differential housing fluid level.	P-1	24
3. Drain and refill differential housing.	P-1	24
E.1 Drive Axles		
1. Inspect and replace drive axle wheel studs.	P-2	29
III. MANUAL DRIVE TRAIN AND AXLES		
F. Four-wheel Drive/All-wheel Drive		
1. Inspect front-wheel bearings and locking hubs.	P-3	30
2. Check for leaks at drive assembly seals; check vents; check lube level.	P-2	30

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		
A. General		
1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1	5
2. Disable and enable supplemental restraint system (SRS).	P-1	31

Task Number and Description	Priority	Job #s
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	32
2. Determine proper power steering fluid type; inspect fluid level and condition.	P-1	33
3. Flush, fill, and bleed power steering system.	P-2	35
4. Inspect for power steering fluid leakage; determine necessary action.	P-1	33
5. Remove, inspect, replace, and adjust power steering pump drive belt.	P-1	14
6. Inspect and replace power steering hoses and fittings.	P-2	34
7. Inspect pitman arm, relay (center link/intermediate) rod, idler arm and mountings, and steering linkage damper.	P-1	32
8. Inspect tie-rod ends (sockets), tie-rod sleeves, and clamps.	P-1	32
9. Inspect upper and lower control arms, bushings, and shafts.	P-1	32
10. Inspect and replace rebound and jounce bumpers.	P-1	32
11. Inspect track bar, strut rods/radius arms, and related mounts and bushings.	P-1	32
12. Inspect upper and lower ball joints (with or without wear indicators).	P-1	32
13. Inspect suspension system coil springs and spring insulators (silencers).	P-1	32
14. Inspect suspension system torsion bars and mounts.	P-1	32
15. Inspect and replace front stabilizer bar (sway bar) bushings, brackets, and links.	P-1	32
16. Inspect strut cartridge or assembly.	P-1	32
17. Inspect front strut bearing and mount.	P-1	32
18. Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms.	P-1	32
19. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.	P-1	32
20. Inspect, remove, and replace shock absorbers; inspect mounts and bushings.	P-1	36
21. Inspect electric power-assisted steering.	P-3	37
22. Identify hybrid vehicle power steering system electrical circuits and safety precautions.	P-2	2, 37
23. Describe the function of the power steering pressure switch.	P-3	38

Task Number and Description	Priority	Job #s
IV. SUSPENSION AND STEERING		
C. Wheel Alignment		
1. Perform prealignment inspection and measure vehicle ride height; determine necessary action.	P-1	39
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	40
2. Rotate tires according to manufacturer's recommendations.	P-1	41
3. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic).	P-1	41
4. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.	P-2	42
5. Inspect tire and wheel assembly for air loss; perform necessary action.	P-1	40, 42
6. Repair tire using internal patch.	P-1	42
7. Identify and test tire pressure monitoring systems (indirect and direct) for operation; verify operation of instrument panel lamps.	P-2	42
8. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.	P-2	42

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	5
2. Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).	P-1	43
3. Install wheel and torque lug nuts.	P-1	40
V. BRAKES		
B. Hydraulic System		
1. Measure brake pedal height, travel, and free play (as applicable); determine necessary action.	P-1	43
2. Check master cylinder for external leaks and proper operation.	P-1	43
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	44
4. Select, handle, store, and fill brake fluids to proper level.	P-1	45
5. Identify components of brake warning light system.	P-3	46
6. Bleed and/or flush brake system.	P-1	45
7. Test brake fluid for contamination.	P-1	45
V. BRAKES		
C. Drum Brakes		
1. Remove, clean, inspect, and measure brake drum diameter; determine necessary action.	P-1	47
2. Refinish brake drum and measure final drum diameter; compare with specifications.	P-1	48
3. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-	P-1	47

Task Number and Description	Priority	Job #s
adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.		
4. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P-2	47
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	47
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	49
2. Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.	P-1	49
3. Remove, inspect, and replace pads and retaining hardware; determine necessary action.	P-1	49
4. Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks.	P-1	49
5. Clean and inspect rotor, measure rotor thickness, thickness variation, and lateral runout; determine necessary action.	P-1	49
6. Remove and reinstall rotor.	P-1	49
7. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications.	P-1	50
8. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications.	P-1	50
9. Retract and readjust caliper piston on an integral parking brake system.	P-3	49
10. Check brake pad wear indicator; determine necessary action.	P-2	49
11. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.	P-1	49
V. BRAKES		
E. Power-Assist Units		
1. Check brake pedal travel with and without engine running to verify proper power	P-2	51

Task Number and Description	Priority	Job #s
booster operation.		
2. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.	P-1	51
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	52
2. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust, or replace as needed.	P-2	53
3. Check parking brake operation and parking brake indicator light system operation; determine necessary action.	P-1	53
4. Check operation of brake stop light system.	P-1	64
5. Replace wheel bearing and race.	P-2	52
6. Inspect and replace wheel studs.	P-1	29
V. BRAKES		
G. Electronic Brakes, and Traction and Stability Control Systems		
1. Identify traction control/vehicle stability control system components.	P-3	54
2. Describe the operation of a regenerative braking system.	P-3	54

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	5

Task Number and Description	Priority	Job #s
2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P-1	55
3. Use wiring diagrams to trace electrical/electronic circuits.	P-1	55
4. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.	P-1	55
5. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P-2	55
6. Check operation of electrical circuits with a test light.	P-2	55
7. Check operation of electrical circuits with fused jumper wires.	P-2	67
8. Measure key-off battery drain (parasitic draw).	P-1	55
9. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.	P-1	55
10. Perform solder repair of electrical wiring.	P-1	56
11. Replace electrical connectors and terminal ends.	P-1	56
VI. ELECTRICAL/ELECTRONIC SYSTEMS		
B. Battery Service		
1. Perform battery state-of-charge test; determine necessary action.	P-1	57
2. Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action.	P-1	57
3. Maintain or restore electronic memory functions.	P-1	58
4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.	P-1	58
5. Perform slow/fast battery charge according to manufacturer's recommendations.	P-1	58
6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P-1	59
7. Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.	P-3	56
8. Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery.	P-1	58
9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.	P-3	57, 58

Task Number and Description	Priority	Job #s
VI. ELECTRICAL/ELECTRONIC SYSTEMS		
C. Starting System		
1. Perform starter current draw test; determine necessary action.	P-1	60
2. Perform starter circuit voltage drop tests; determine necessary action.	P-1	60
3. Inspect and test starter relays and solenoids; determine necessary action.	P-2	60
4. Remove and install starter in a vehicle.	P-1	61
5. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action.	P-2	60
VI. ELECTRICAL/ELECTRONIC SYSTEMS		
D. Charging System		
1. Perform charging system output test; determine necessary action.	P-1	62
2. Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.	P-1	14, 62
3. Remove, inspect, and reinstall generator (alternator).	P-2	63
4. Perform charging circuit voltage drop tests; determine necessary action.	P-1	62
VI. ELECTRICAL/ELECTRONIC SYSTEMS		
E. Lighting Systems		
1. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.	P-1	64
2. Aim headlights.	P-2	65
3. Identify system voltage and safety precautions associated with high-intensity discharge headlights.	P-2	65
VI. ELECTRICAL/ELECTRONIC SYSTEMS		
F. Accessories		
1. Disable and enable air bag system for vehicle service; verify indicator lamp operation.	P-1	31
2. Remove and reinstall door panel.	P-1	66
3. Describe the operation of keyless entry/remote-start systems.	P-3	66
4. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.	P-1	67

Task Number and Description	Priority	Job #s
5. Verify windshield wiper and washer operation; replace wiper blades.	P-1	68

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	5
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	14, 69
2. Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions.	P-2	2
3. Inspect A/C condenser for airflow restrictions; determine necessary action.	P-1	69
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	13
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	69
2. Identify the source of A/C system odors.	P-2	69

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	5
2. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action	P-1	70
3. Perform cylinder power balance test; determine necessary action.	P-2	70
4. Perform cylinder cranking and running compression tests; determine necessary action.	P-1	71
5. Perform cylinder leakage test; determine necessary action.	P-1	71
6. Verify engine operating temperature.	P-1	73
7. Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1	72
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	73
2. Describe the importance of operating all OBD II monitors for repair verification.	P-1	73
VIII. ENGINE PERFORMANCE		
C. Fuel, Air Induction, and Exhaust Systems		
1. Replace fuel filter(s).	P-1	75
2. Inspect, service, or replace air filters, filter housings, and intake ductwork.	P-1	75
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	76
4. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields;	P-1	76, 77

Task Number and Description	Priority	Job #s
repair or replace as needed.		
5. Check and refill diesel exhaust fluid (DEF).	P-3	76, 77
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	78

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, 4
3. Identify and use proper placement of floor jacks and jack stands.	1
4. Identify and use proper procedures for safe lift operation.	1
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, 31, 54
14. Demonstrate awareness of the safety aspects of high-voltage circuits (such as high intensity	65

Task Number and Description	
discharge (HID) lamps, ignition systems, injection systems, etc.).	
15. Locate and demonstrate knowledge of material safety data sheets (MSDS).	1
Tools and Equipment	
1. Identify tools and their usage in automotive applications.	4
2. Identify standard and metric designation.	3
3. Demonstrate safe handling and use of appropriate tools.	4
4. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	4
5. Demonstrate proper use of precision measuring tools (i.e., micrometer, dial indicator, dial caliper).	3
Preparing Vehicle for Service	
1. Identify information needed and the service requested on a repair order.	5
2. Identify purpose and demonstrate proper use of fender covers, mats.	5
3. Demonstrate use of the three Cs (concern, cause, and correction).	5
4. Review vehicle service history.	5
5. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	5
Preparing Vehicle for Customer	
1. Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).	5