

2026

Annual Inspection Diesel Locomotive

Feather River Rail Society

WP1503

| | |
|---------------------------|---------------------------------|
| Make: EMD | Serial Number: 72692-3 |
| Model: SW1500 | Manufacture Date: May 1973 |
| Prime Mover: 12-645E | Fuel Oil Capacity: 1100 Gallons |
| Main Generator: D32 | Lube Oil Capacity: 284 Gallons |
| Alternator: N/A | Coolant Capacity: 230 Gallons |
| Auxiliary Generator: A-10 | Hour Meter: N/A |
| Traction Motors: D77 (4) | |
| Air Compressor: | |

With reference to manufacturer's service literature, this locomotive has been inspected, serviced, repaired and otherwise made ready for the service type indicated below:

Signature - Nicholas Manos, CMO

| Mechanic Initials | Full Name |
|-------------------|----------------|
| NM | Nicholas Manos |
| EM | Eric Manos |
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| Service Type | Approved (Y/N) | Date of Approval | Limitations |
|------------------|----------------|------------------|-------------|
| Run A Locomotive | | | |
| Yard switching | | | |
| Caboose train | | | |

| Item | Section | Task | Required Tools | INSP INIT | Date |
|------|--------------|---|--|-----------|------|
| 1 | Pre-movement | Drain condensate from oil sump | <ul style="list-style-type: none"> Wrench, 12" adjustable Bucket, waste | | |
| 2 | Pre-movement | Drain condensate from fuel sump | <ul style="list-style-type: none"> Wrench, 12" adjustable Bucket, waste | | |
| 3 | Pre-movement | Remove any exhaust stack covers | | | |
| 4 | Safety | Secure locomotive in place by setting handbrake and chocking wheels | <ul style="list-style-type: none"> Chocks, wheel | | |
| 5 | Safety | Shutdown locomotive, if running. Remove reverser handle and lockout and/or tag the generator field switch in OFF position. Verify isolation switch is in 'START/ISOLATE' position and tag. Verify main battery switch is 'OFF' and tag. Remove starter fuse | <ul style="list-style-type: none"> Tags Marker | | |
| 6 | Safety | Secure track <u>and</u> locomotive with BLUE FLAG to notify other personnel of the presence of workmen | <ul style="list-style-type: none"> Flag(s), Blue | | |
| 7 | Battery | Inspect battery cases for cracks, swelling or other damage. Inspect battery wells/boxes for spills and corrosion. Wash out any corrosion with baking soda solution, followed by clean water rinse | <ul style="list-style-type: none"> Gloves, insulated/chemical resistant Shield, face | | |
| 8 | Battery | Verify all battery connections are tight and corrosion free. USING APPROPRIATE INSULATED GLOVES AND TOOLS, Disassemble and clean any corroded contacts and coat with dielectric grease before reassembly | <ul style="list-style-type: none"> Gloves, insulated Wrench, 3/4" insulated | | |
| 9 | Battery | Inspect electrolyte levels in all cells. Electrolyte level should be 1/4" from bottom of fill tube. Fill with distilled water ONLY | <ul style="list-style-type: none"> Gloves, insulated/chemical resistant Shield, face | | |
| 10 | Battery | Replace all battery caps and check physical battery installation. Shim with wood, as needed | <ul style="list-style-type: none"> Gloves, insulated/chemical resistant Shield, face | | |
| 11 | Battery | Charge batteries a minimum of 24 hours, 72 hours is ideal. Post flag while charging to alert personnel of the potential presence of hydrogen gas | <ul style="list-style-type: none"> Flag, "Batteries Charging" | | |
| 12 | Battery | Remove charger. Close and secure battery boxes | | | |
| 13 | Walk Around | Inspect pilots and footboard soundness and mounting security | | | |
| 14 | Walk Around | Verify pilot clearance over top of rail is at <u>least</u> 2.5" | <ul style="list-style-type: none"> Measure | | |
| 15 | Walk Around | Inspect condition of brake hoses and glad hands, replacing any worn or damaged gaskets | | | |
| 16 | Walk Around | Inspect condition of MU hoses and fittings | | | |
| 17 | Walk Around | Inspect condition and operation of MU valves | | | |
| 18 | Walk Around | Inspect sander piping, hose and fittings for condition and security | | | |
| 19 | Walk Around | Verify all number boards, markings and stencils are sound, legible and accurate | | | |
| 20 | Walk Around | Inspect stairwells, walkways and all access doors/panels. Verify all latches, floor and stair tread, toe plates and handrails are secure and sound | | | |

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| 21 | Walk Around | Inspect folding walkway bridge, rails and safety chains. Verify all mounts are secure and that all hinges and latches are in place and operable | | | |
| 22 | Walk Around | Inspect physical condition of all lights and housings | | | |
| 23 | Walk Around | Verify all grab bars are securely mounted and sound. Verify minimum 2.5" clearance to mounting surface | • Measure | | |
| 24 | Walk Around | Verify all cab doors open and close properly. Lube hinges. Verify lock operation. Lube lock with dry graphite. | | | |
| 25 | Walk Around | Verify cab and engine room fire extinguishers are present and properly and securely mounted. Verify 'FIRE EXTINGUISHER INSIDE' stenciling or signage is present and legible on engine room door. Verify extinguisher has been serviced within the past year. Schedule service, as needed, keeping in mind it must be qualified through the end of the operating season | | | |
| 26 | Walk Around | Inspect seats and armrests. Verify secure mounting and proper range of adjustment | | | |
| 27 | Walk Around | Inspect all glass for cracks and/or breakage | | | |
| 28 | Walk Around | Verify all mirrors and armrests are in place and sound | | | |
| 29 | Walk Around | Replace all windshield wiper rubber | | | |
| 30 | Couplers | Inspect coupler, coupler mounting and draft gear for excessive wear and broken or cracked components | | | |
| 31 | Couplers | Inspect cutting lever(s) for secure mounting, soundness and proper operation | | | |
| 32 | Couplers | Center the coupler. Close and lock the knuckle. Verify there is a minimum of 1.75" of travel between pin lift rod and pin lift eye | • Measure | | |
| 33 | Couplers | Verify the center of the pin lift rod is no more than 3.75" beyond the rear face of the coupler horn | • Measure | | |
| 34 | Couplers | Inspect coupler height. From the top of the rail, the center of the coupler must be between 31.5" and 34.5" | • Measure • Level, box | | |
| 35 | Couplers | Engage coupling lever and verify smooth opening of the knuckle | | | |
| 36 | Trucks | Inspect overall truck for any dragging or loose equipment, missing securements or any physical damage | | | |
| 37 | Trucks | Inspect all sanding pipes and pipe clips | | | |
| 38 | Trucks | Inspect truck frame for cracks or damage | | | |
| 39 | Trucks | Inspect swing hanger for breaks, bends and cracks | | | |
| 40 | Trucks | Inspect swing hanger pin or bushing clearance (.125" MAX) | | | |
| 41 | Trucks | Inspect swing hanger bearing block wear (.125" MAX between halves) | | | |
| 42 | Trucks | Inspect leaf springs for cracks, breaks or other damage | | | |

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| 43 | Trucks | Inspect leaf springs for weakness, indicated by a gap of more than .125" underneath end of second longest leaf | | | |
| 44 | Trucks | Inspect spring plank to safety strap clearance for MIN .375" clearance | | | |
| 45 | Trucks | Inspect all journal box coil springs for breaks | | | |
| 46 | Trucks | Fill both truck center plate cups full with journal oil | | | |
| 47 | Suspension Journals | Not applicable to this unit | | | |
| 48 | Suspension Journals | Not applicable to this unit | | | |
| 49 | Suspension Journals | Not applicable to this unit | | | |
| 50 | Suspension Journals | Not applicable to this unit | | | |
| 51 | Suspension Journals | Not applicable to this unit | | | |
| 52 | Suspension Journals | Not applicable to this unit | | | |
| 53 | Hyatt Journals | Inspect for loose or broken bolts and pedestal liners | | | |
| 54 | Hyatt Journals | Inspect journal box to pedestal liner clearance (.375" MAX each side) | • Measure | | |
| 55 | Hyatt Journals | Visually inspect oil condition. Gold coloring indicates excessive brass wear material is present and the oil should be drained | | | |
| 56 | Hyatt Journals | Inspect oil level. Fill to overflow using journal oil, available in pitcher marked 'JOURNAL OIL' on the mechanic's workbench | • Oil, journal | | |
| 57 | Wheels | Inspect wheels for cracks or breaks | | | |
| 58 | Wheels | Inspect each wheel for flat spots. Using a wheel defect gauge, check for any single spot larger than 2.5" or any two adjoining spots greater than 2" each. Record result in Appendix A | • Gauge, wheel defect | | |
| 59 | Wheels | Inspect wheel for shelling. Using a wheel defect gauge, check for any single spot larger than 2.5" or any two adjoining spots greater than 2" each. Record result in Appendix A | • Gauge, wheel defect | | |
| 60 | Wheels | Inspect wheel for any chips or gouges in the flange that exceeds 1.5" in length and .5" in width, as measured at the top of the flange. Record result in Appendix A | • Gauge, wheel defect | | |
| 61 | Wheels | Measure for thin flange condition with wheel defect gauge. Holding gauge at 90 degree angle to back face of rim, slide the 7/8" slot over the flange. The gauge must NOT slide down to the point of contact with the wheel tread. Record result in Appendix A | • Gauge, wheel defect | | |
| 62 | Wheels | Using wheel condemning gauge, check for a high flange. Hold gauge against back face of rim and tip should contact wheel tread, showing flange is less than 1.5" tall. If the gauge is stopped by contact with the top of the flange, the tread has worn and the flange is too high. Record result in Appendix A | • Gauge, wheel condemning | | |

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| 63 | Wheels | Measure rim thickness by placing wheel gauge against back face of rim. Lower gauge until the front of gauge touches the flange and then read the thickness on the back gauge scale. Thickness must be .75" or greater for switcher, 1" or greater for road locomotive. Record result in Appendix A | <ul style="list-style-type: none"> Gauge, wheel condemning | | |
| 64 | Brakes | Inspect all brake rigging - levers, bushings, pins, clips and other fasteners | | | |
| 65 | Brakes | Inspect all brake pipes and pipe clips | | | |
| 66 | Brakes | Inspect truck air isolation valves and verify operation | | | |
| 67 | Brakes | Verify brake cylinder is securely fastened to truck | | | |
| 68 | Brakes | Inspect brake shoe alignment. Shoes must make full contact with wheel tread. Mis-aligned shoes indicate worn, broken or improperly assembled rigging | | | |
| 69 | Brakes | Inspect brake shoe condition. Replace any damaged shoe (broken, excessive cracking or missing material) | | | |
| 70 | Brakes | Inspect brake shoe thickness. Replace any composite shoe that has friction material thickness less than .375". Replace any cast iron shoe that has friction material thickness less than .5". Record shoe thickness in Appendix A | <ul style="list-style-type: none"> Measure | | |
| 71 | Brakes | With brakes released, verify brake shoe to wheel clearance is .75" MAX | <ul style="list-style-type: none"> Measure | | |
| 72 | Brakes | Inspect handbrake operation after removing cover. Clean and lubricate, as needed. Replace cover | | | |
| 73 | Air Reservoirs | Inspect reservoirs for physical damage | | | |
| 74 | Air Reservoirs | Confirm reservoirs are securely fastened to frame | | | |
| 75 | Air Reservoirs | Verify no signs of leakage or corrosion at tattle-tales | | | |
| 76 | Air Reservoirs | Replace centrifugal aftercooler filter | <ul style="list-style-type: none"> Filter, centrifugal aftercooler air Ratchet, 3/8" drive Extension, 3/8" drive 6" Socket, 3/8" drive 9/16" | | |
| 77 | Fuel Tank | Verify all gauges and gauge glasses are clean and operational with appropriate scale attached. Check gauges for leaks. All gauges should provide the same reading | | | |
| 78 | Fuel Tank | Verify all shutoff valves are operational. Leave gauge shutoff valves fully open after exercise. Check for leaks | | | |
| 79 | Fuel Tank | Inspect fuel tank body for damage and/or leaks | | | |
| 80 | Fuel Tank | Verify tank is securely mounted with no broken or loose fasteners | | | |
| 81 | Fuel Tank | Verify vent pipes are clean, open and securely fastened in place | | | |
| 82 | Fuel Filters | Not applicable to this unit | | | |
| 83 | Fuel Filters | Replace engine mounted fuel filters | <ul style="list-style-type: none"> Filter(s), spin-on engine fuel | | |

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| 84 | Fuel Filters | Remove and clean fuel sight glasses, if not clear. Reinstall with new gaskets | • Gasket, fuel glass | | |
| 85 | Fuel Pump | Remove fuel pump motor cover and inspect motor brushes. Replace any brush that does not have at least one wear limit line visible OR has length less than 1/4 of original | • Brush(es), fuel pump motor | | |
| 86 | Fuel Pump | Inspect commutator for wear, scoring, pitting or abnormal discoloration. Clean as needed, using compressed air at 40PSI and/or a clean lint-free cloth. Use NO solvents. Secure fuel pump motor cover when done | • Compressed air, 40PSI | | |
| 87 | Fuel Test | Notify all personnel working on the engine, then remove tag from main battery switch before closing switch. Activate fuel pump and prime fuel system. Prime until no bubbles are seen in sight glass nearest the engine. Verify there is no fuel present in other glass | | | |
| 88 | Fuel Test | While running fuel pump (may need a helper), open top deck covers and inspect all fuel rail and connections to each injector. Verify no fuel leaks are visible in the lines or at the injector(s) | | | |
| 89 | Fuel Test | Verify no fuel leaks are visible in supply, return and filter fuel lines external to the engine. Pay particular attention to the fuel filter chest and the sight glass bases | | | |
| 90 | Fuel Test | Turn off fuel pump, open main battery switch and restore tag to switch | | | |
| 91 | Cleaning | Remove all debris, trash, discarded parts, rags, cans, etc from the locomotive | | | |
| 92 | Cleaning | Using compressed air at 40PSI, dust all components under cab and in electrical lockers. Dust reverser and relay arc chutes. Dust from top to bottom and allow 10 minutes for any dust to settle. Do not secure doors or panels at this time | • Compressed air, 40PSI | | |
| 93 | Cleaning | Vacuum entire cab, under cab and electrical locker areas | • Vacuum | | |
| 94 | Cleaning | Replace all car body filters | • Filter media, car body | | |
| 95 | Cleaning | Clean all engine exhaust carbon traps | | | |
| 96 | Cleaning | Clean all oily buildup from top of engine valley between cylinder banks | • Mineral spirits | | |
| 97 | Cleaning | Clean top deck cover areas of excessive runoff from engine valley | • Mineral spirits | | |
| 98 | Cleaning | Clean engine air boxes. Avoid disturbing intake port surfaces to prevent pushing carbon into cylinders. Verify all air box drains are clean and clear. Do not secure air box covers at this time | • Mineral spirits | | |
| 99 | Cleaning | Clean engine room floor of any grease, oil or coolant. Note location and severity of any excessive fluid leaks for later repair. Do not clean engine at this time | • Mineral spirits | | |
| 100 | Cleaning | Drain pollution tank into suitable waste bucket | | | |
| 101 | Cooling Fill | Check cooling system gauge glass. Clean if dirty. Verify gauge scale is legible, if installed | | | |
| 102 | Cooling Fill | Close all drains, replace water pump and compressor drain plugs. Open overflow drain and both gauge glass valves | • Wrench, 12" adjustable | | |

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| 103 | Cooling Fill | Fill cooling system until gauge glass level is approximately 1" below FULL mark of dead engine scale. If no scale exists, fill approximately 3/4 of the gauge glass. DO NOT OVERFILL. Use previously recovered coolant or clean water. If using clean water, make note to apply water treatment <u>after</u> locomotive is released for service | | | |
| 104 | Cooling Test | Remove crankcase covers | | | |
| 105 | Cooling Test | Close overflow drain valve and replace any fill caps/plugs. Using compressed air, pressurize system to 20PSI. Maintain for at least 10 minutes | • Compressed air, 20PSI | | |
| 106 | Cooling Test | Inspect cooling system for leaks. Check all pipes, hoses, radiators and manifolds. Check head seals and pipes, as installed, at top deck. Check cylinder liner walls, manifolds and connections in air box. Check lower liner seal area in crankcase. | | | |
| 107 | Cooling Test | Note and correct any leakage. Some minor seepage is acceptable at this point but must be checked after engine is (later) warmed to operating temperature. DO NOT run engine at this time | | | |
| 108 | Cooling Test | Remove air supply and de-pressurize cooling system | | | |
| 109 | Lube Oil Filter | Assuming engine has not run in the previous 12 hours, loosen all nuts on the lube oil filter housing. Allow any trapped oil to drain, then remove nuts and open housing. Remove retainer (if present) and old filter elements, then clean housing and retainer. Note any metal or other objects in bottom of housing | <ul style="list-style-type: none"> • Ratchet, 1/2" drive • Extension, 1/2" drive 6" • Adapter, 1/2" to 3/4" drive • Socket, 3/4" drive 1 1/4" | | |
| 110 | Lube Oil Filter | Clean and check housing cover gasket and mating surface. Replace if damaged | • Gasket, lube oil filter cover | | |
| 111 | Lube Oil Filter | Install new oil filter elements, being sure to seat them fully. If provided, apply retainer and tighten nut by hand, then 1/8 turn with wrench | <ul style="list-style-type: none"> • Filters, engine lube oil • Wrench, 12" adjustable | | |
| 112 | Lube Oil Filter | Close filter housing door and run down all nuts by hand. Tighten nuts to 30 foot-pounds in a star pattern. Repeat using final torque of 60 foot-pounds | <ul style="list-style-type: none"> • Torque wrench, 1/2" drive • Extension, 1/2" drive 6" • Adapter, 1/2" to 3/4" drive • Socket, 3/4" drive 1 1/4" | | |
| 113 | Lube Oil Filter | Clean housing and drip tray. Renew Pigmat in bottom of drip tray | | | |
| 114 | Lube Oil Strainer | Open oil strainer chest cover to access the coarse suction strainer. Clean with solvent and brass brushes. Examine strainer for damage and repair or replace, as needed | | | |
| 115 | Lube Oil Strainer | Undo hand-wheel holding lube oil strainer crab in place. Remove crab and fine lube oil strainers. Clean with solvent and brass brushes. Examine strainer for damage and repair or replace, as needed | | | |
| 116 | Lube Oil Strainer | Clean strainer housing and all mating surfaces. Renew gaskets on housing and strainers. Re-install strainers | • Gasket kit, lube oil strainer | | |
| 117 | Lube Oil Strainer | Install strainer crab and hand-wheel. Tighten hand-wheel firmly. Install suction strainer chest cover and clean entire top of strainer housing | | | |

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|------|---------------|--|---|--------------|------|
| 118 | Lube Oil Pump | Remove pump cover for main lube oil pump. Tighten shaft nut to 325 foot-pounds . Clean mating surfaces, replace gasket and secure pump cover. Tighten pump cover bolts to 24 foot-pounds . Safety wire keyed bolt, if installed | <ul style="list-style-type: none"> Gasket, lube oil pump cover Torque wrench, 3/4" drive Extension, 3/4" drive 6" Socket, 3/4" drive 1 1/2" Torque wrench, 3/8" drive Ratchet, 3/8" drive Extension, 3/8" drive 6" Socket, 3/8" drive 9/16" | | |
| 119 | Oil Separator | Clean the oil separator. Disconnect the blower suction hoses from the cover and remove the housing cover | <ul style="list-style-type: none"> Screwdriver, 5/16" flat | | |
| 120 | Oil Separator | Remove the screen element and clean with solvent | | | |
| 121 | Oil Separator | Inspect the cover gasket and clean the mating surface. Replace gasket, as needed | <ul style="list-style-type: none"> Gasket, oil separator housing | | |
| 122 | Oil Separator | Re-install the screen element and housing cover. Re-attach and secure blower suction hoses | | | |
| 123 | Air Intake | Inspect blower(s) for leaks, visible damage and loose mounting hardware | | | |
| 124 | Air Intake | Change engine air intake filters | <ul style="list-style-type: none"> Filter(s), engine air intake Ratchet, 3/8" drive Extension, 3/8" drive 6" Socket, 3/8" drive 9/16" | | |
| 125 | Pre-Lube | Open all cylinder test valves. Verify smooth operation. DO NOT close at this time | <ul style="list-style-type: none"> Wrench, test valve | | |
| 126 | Pre-Lube | Connect external oil pump and fresh oil supply to the pressure fitting feeding the engine oil pump. Open valve located beyond fitting. Engage pump and verify oil flow | <ul style="list-style-type: none"> Oil, engine lube | | |
| 127 | Pre-Lube | After one minute of successful oil flow, bar engine over at least 360 degrees. Continue barring until pointer indicates 356 degrees | <ul style="list-style-type: none"> Barring tool | | |
| 128 | Pre-Lube | At approximately 3 minutes, check for oil flow at rocker arms, camshaft bearings and main bearings. Switch off pump when oil flow is verified | | | |
| 129 | Pre-Lube | If oil flow is not seen after 5 minutes, shut off pump and diagnose blockage. Repeat prime until successful | | | |
| 130 | Pre-Lube | Close valve for pre-lube fitting and remove external oil pump | | | |
| 131 | Pre-Lube | Check oil level. If below 'FULL/Not running" mark, add oil to the suction strainer chest. If overfilled, drain from sump*. DO NOT RUN with overfilled sump. * Normal operation of the locomotive the previous season will result in some oil consumption, thus adding fresh oil during pre-lube will rarely, if ever, result in an overfilled condition | <ul style="list-style-type: none"> Oil, engine lube | | |
| 132 | Engine | Inspect layshaft linkage, seals and bearings. Operate layshaft to verify smooth operation. If resistance or sticking is felt, determine if cause is layshaft linkage or fuel injector rack. Repair linkage, if required, and address any fuel injector rack issues in the next step | | | |

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| 133 | Engine | The flywheel pointer should indicate 356 from previous work. If not, rotate flywheel until the pointer indicates 356. Starting with the first row of Appendix B (flywheel setting of 356), complete the letter column tasks on each cylinder indicated in the row. Letter column tasks are defined in Appendix C. Once a row is finished, reference the next row, rotate the flywheel to the position indicated and perform all tasks for cylinders listed in that row. Repeat until all rows in Appendix B have been worked | | | |
| 134 | Engine | Torque all crab nuts to 1800 foot-pounds in banks of four, using an 'X' pattern. | <ul style="list-style-type: none"> • Torque multiplier, 12:1 • Torque wrench, 3/4" drive • Socket, 1" drive 2 3/4" (2) | | |
| 135 | Engine | Torque all top deck frame bolts to 30 foot-pounds | <ul style="list-style-type: none"> • Torque wrench, 3/8" drive • Extension, 3/8" drive 6" • Socket, 3/8" drive 9/16" | | |
| 136 | Engine | Torque oil pan to crankcase mounting bolts to 450 foot-pounds | <ul style="list-style-type: none"> • Torque wrench, 3/4" drive • Extension, 3/4" drive 6" • Socket, 3/4" drive 1 1/2" | | |
| 137 | Engine | Clean seals and mating surfaces for air box inspection covers. Inspect seals and replace, as needed. Install cover and tighten firmly | <ul style="list-style-type: none"> • Gasket, engine inspection cover | | |
| 138 | Engine | Clean seals and mating surfaces for crankcase inspection covers. Inspect seals and replace, as needed. Install cover and tighten firmly | <ul style="list-style-type: none"> • Gasket, engine inspection cover | | |
| 139 | Engine | Clean seals and mating surfaces for top deck covers. Inspect seals and replace, as needed. Secure top deck covers and verify latches operate correctly and draw the cover down tight. Fasten in alternating pairs to prevent cover distortion | | | |
| 140 | Engine | Torque exhaust manifold base bolts to 130 foot-pounds | <ul style="list-style-type: none"> • Torque wrench, 1/2" drive • Extension, 1/2" drive 6" • Socket, 1/2" drive 1 1/16" | | |
| 141 | Engine | Inspect front engine accessories, identifying and repairing source(s) of any significant leaks | | | |
| 142 | Engine | Clean engine exterior, working top to bottom, front to back | <ul style="list-style-type: none"> • Mineral spirits | | |
| 143 | Driveline | Inspect all drive shafts, drive shaft covers, gearing, pillow blocks, belts etc for any traction motor blowers, compressor drive and/or mechanical cooling fan. Verify satisfactory condition and security | | | |
| 144 | Driveline | Inspect mechanical traction motor blower ducts for proper mounting. Verify fan blade set screw is tight | | | |
| 145 | Driveline | Inspect traction motor blower motors for proper security. Verify wire, conduit and connections are not damaged and motor is not oil fouled | | | |
| 146 | Governor | Inspect governor oil clarity. If oil appears diluted or discolored, drain governor oil | | | |

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| 147 | Governor | Inspect governor oil level. If governor oil gauge has two lines, fill governor to the topmost line. If gauge has only one line, then fill until oil is just above the line*. ALWAYS ADD GOVERNOR OIL SLOWLY. Use governor oil, available in pitcher marked 'GOVERNOR' on the mechanic's workbench. Add a small amount, then wait two full minutes for it to settle out. Two full minutes. Two minutes. * Single line gauges are meant to indicate proper level when engine is running and warm. Recheck these governors during run testing | <ul style="list-style-type: none"> Oil, governor | | |
| 148 | Governor | Inspect electrical signal plug for damage and secure connection | | | |
| 149 | Governor | Clean governor case and all name/scale plates. Verify oil release button is pressed IN (no red line showing) | <ul style="list-style-type: none"> Mineral spirits | | |
| 150 | Compressor | Check cylinders, heads, manifolds, intercoolers etc for damage or evidence of leaks | | | |
| 151 | Compressor | Change compressor air intake filter(s). Change compressor lube oil filter, if equipped | <ul style="list-style-type: none"> Filter, compressor intake air Filter, compressor lube oil | | |
| 152 | Compressor | Inspect compressor oil clarity. If oil appears diluted or discolored, drain compressor oil | | | |
| 153 | Compressor | Inspect compressor oil level, adding oil until 'FULL' mark is reached. Use compressor oil, available in pitcher marked 'COMPRESSOR' on the mechanic's workbench | <ul style="list-style-type: none"> Oil, Compressor lube | | |
| 154 | Compressor | Clean breather, as needed | | | |
| 155 | Compressor | Inspect magnetic valves. switches and relays on equipment rack for leaks, damage, loose mounting or faulty connections | | | |
| 156 | Startup | Verify all cylinder test valves are still open | <ul style="list-style-type: none"> Wrench, test valve | | |
| 157 | Startup | Check all fluid levels - Coolant, engine oil, governor oil and compressor oil | | | |
| 158 | Startup | Notify all personnel working on or near engine of startup. Clear all tools and supplies. Verify barring tool is removed from flywheel. Install starter fuse and close battery switch | | | |
| 159 | Startup | Turn on control circuits, but do NOT activate fuel pump. Have a helper, if needed, hold layshaft fully OUT. Rotate engine 5-7 seconds to clear cylinders of any liquid. Release hold on layshaft | | | |
| 160 | Startup | Close all cylinder test valves | <ul style="list-style-type: none"> Wrench, test valve | | |
| 161 | Startup | Activate fuel pump and prime fuel system until no bubbles are seen in fuel sight glass. Crank engine until started, but not more than 10 seconds. If engine does not start within 10 seconds, wait 5 minutes before attempting another start | | | |
| 162 | Startup | Verify oil pressure is indicated within 45 seconds. Pressure for cold oil should be > 50psi | | | |
| 163 | Startup | Verify coolant level is still indicated in the gauge glass and it is within the 'running' range | | | |
| 164 | Startup | Verify governor oil is present within the gauge glass and between the two lines. If single line gauge, oil should show in glass but may not be up to the line | | | |

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| 165 | Startup | Check lube oil strainers for proper operation. With engine at idle, slightly loosen the large wing nut holding the strainers in place. Carefully raise the strainer furthest from the engine. Oil should leak out around the top of the strainer flange. If no oil appears, shut down the engine and check oil supply passages and strainer seals. Secure strainers | | | |
| 166 | Startup | Verify all air drains are closed and air pressure is building in the system | | | |
| 167 | Startup | Allow engine to idle for 15 minutes, then re-check for safe levels of engine oil, coolant and governor oil. Leave engine running until temperature reaches 130 degrees Fahrenheit. This will take approximately 45 - 60 minutes, depending on ambient temperature. Continue with the next tasks in this chart. You will be instructed when to stop and check engine temperature | | | |
| 168 | Running Brake | Verify wheel chocks are securely in place and release handbrake | | | |
| 169 | Running Brake | Verify air system is charged. Verify equalizing reservoir is holding at 90 psi - adjust as needed and record value in Appendix A. Perform a full brake set using the independent brake control. Verify all brakes set with piston extension. Record independent pressure reading from gauge in Appendix A | | | |
| 170 | Running Brake | Inspect pistons on each truck. Check for any air leakage. Measure and record piston travel in Appendix A. Maximum allowable piston travel is set at total cylinder travel - 1.5". In most cases, this mean maximum allowable travel is 6.5" | • Measure | | |
| 171 | Running Brake | Perform a full brake release using the independent brake control. Verify all brakes release and all pistons retract fully. Verify independent gauge indicates 0 psi | | | |
| 172 | Running Brake | Perform a full service set using the automatic brake control. Verify all brakes are set. Verify both equalizing reservoir and brake pipe pressure read ~70 psi. Verify independent gauge indicates same pressure recorded previously | | | |
| 173 | Running Brake | Bail off the brake application by depressing the independent brake control. Verify all brakes release. Verify independent gauge indicates 0 psi. Return automatic to release position | | | |
| 174 | Running Brake | Perform a first service/minimum set using the automatic brake control. Verify equalizing reservoir and brake pipe are reduced 5-7 psi. Return automatic brake handle to release position | | | |
| 175 | Running Brake | Perform an emergency application with the automatic brake handle. Verify equalizing and brake pipe gauges indicate 0 psi and the PC light illuminates. | | | |
| 176 | Running Brake | Quickly return the automatic handle to the release position. Verify brake system DOES NOT reset | | | |
| 177 | Running Brake | Place the automatic handle in the emergency position and leave it there for 1 minute, then move it to the release position. Verify PC light extinguishes and pressure builds in the equalizing reservoir and brake pipe. Allow 2-3 minutes for system to charge. | | | |
| 178 | Running Brake | Open the emergency brake valve on the fireman's side of the cab. Verify brake pipe and equalizing reservoir gauges go to 0 psi and PC light illuminates. Close emergency brake valve | | | |

| Item | Section | Task | Required Tools | INSP INIT | Date |
|------|-----------------|--|----------------|--------------|------|
| 179 | Running Brake | Place the automatic handle in the emergency position and leave it there for 1 minute, then move it to the release position. Verify PC light extinguishes and pressure builds in the equalizing reservoir and brake pipe. Allow 2-3 minutes for system to charge. | | | |
| 180 | Running Brake | Reduce equalizing reservoir and brake pipe pressure 15 psi using the automatic handle. Turn the cutoff valve to "OUT" position. Observe and record brake pipe leakage for 60 seconds. Brake pipe loss must not exceed 5 psi total. Equalizing reservoir must show <u>no loss</u> during this test | | | |
| 181 | Running Brake | Turn brake pipe cutoff valve to "IN" and return automatic brake handle to release position | | | |
| 182 | Running Brake | Exit cab to rear of engine. While holding on to rear brake pipe hose firmly to prevent injury from flailing hose, open angle cock and dump all air pressure. Close angle cock and verify all brakes are set. Enter cab and verify PC light is illuminated and brake pipe and equalizing reservoirs indicate 0 psi. | | | |
| 183 | Running Brake | Place the automatic handle in the emergency position and leave it there for 1 minute, then move it to the release position. Verify PC light extinguishes and pressure builds in the equalizing reservoir and brake pipe. Allow 2-3 minutes for system to charge. Apply handbrake | | | |
| 184 | Running Air | Test horn and bell operation | | | |
| 185 | Running Air | Verify windshield wiper motor operation*. Clean and lubricate mechanism, as needed *DO NOT operate if rubber has not been replaced and/or verified good - window scratches may result | | | |
| 186 | Running Air | Verify automatic drain valves are exhausting periodically. If they are not exhausting at all, verify they are closed with a <i>counterclockwise</i> motion. If they are closed down with a <i>clockwise</i> motion they will stay closed and will not exhaust at all | | | |
| 187 | Running Air | Operate all manual drain valves until no visible moisture is observed | | | |
| 188 | Running Air | Verify compressor cut in occurs at 125-130 PSI and cut out occurs at 135-140 PSI, with an approximate 10 PSI differential. Adjust as needed and record value in Appendix A | | | |
| 189 | Lighting | Verify platform, ground, number, class and ditch lights are operational (when installed) | | | |
| 190 | Lighting | Verify forward and rear headlights function in all three intensities | | | |
| 191 | Lighting | Verify engine room lights are operational | | | |
| 192 | Lighting | Verify instrument and overhead cab lights are operational | | | |
| 193 | Running Cooling | Check coolant level. Mark running level on gauge glass with tie wrap. Level should be 1/2 to 3/4 of the RUNNING scale. Fill as required to reach this level, but DO NOT OVERFILL | | | |
| 194 | Running Cooling | Inspect radiator shutter pistons and linkage for damage. Verify secure mounting | | | |
| 195 | Running Cooling | Test radiator shutter operation, if not already observed. Use test handle near temperature switches in engine compartment. Verify prompt operation in full range of motion, with no binding. Restore test lever | | | |

| Item | Section | Task | Required Tools | INSP INIT | Date |
|------|-----------------|---|-----------------------------|-----------|------|
| 196 | Running Cooling | Inspect mechanical fan and idler pulleys and belts while operating, being observant for unusual vibration and/or noise | | | |
| 197 | Running Cooling | Inspect electric cooling fan contactors and switches. Manually operate all electric cooling fans and verify proper operation of each | | | |
| 198 | Fluid Checks | Verify engine coolant temperature gauge indicates at least 130 degrees Fahrenheit | | | |
| 199 | Fluid Checks | Check governor oil level. Level should be at upper line of two line gauge, or at line of 1 line gauge. Add governor oil with engine at idle speed. ALWAYS ADD GOVERNOR OIL SLOWLY. Use governor oil, available in pitcher marked GOVERNOR on the mechanic's workbench. Add a small amount, then wait two full minutes for it to settle out. Two full minutes. Two minutes. | • Oil, governor | | |
| 200 | Shutdown Test | Shutdown locomotive using emergency shutdown located on the RIGHT walkway*. After shutdown, set isolation switch to START/ISOLATE. Open battery switch and remove starter fuse. Tag out battery switch. Drain air reservoirs *If emergency shutdown switch is a manual pull cable, reset cutoff valve after actuation by pushing in the reset rod at the base of the valve. Valve is located on bottom front of fuel tank, at end of cable | | | |
| 201 | Fluid Checks | Check engine oil 5 minutes after engine shutdown. Add fresh oil to strainer chest to bring oil level to FULL mark. DO NOT OVERFILL | • Oil, engine lube | | |
| 202 | Fluid Checks | Verify compressor oil indicates FULL | • Oil, compressor lube | | |
| 203 | Injector Racks | Verify engine coolant temperature gauge indicates at least 130 degrees Fahrenheit | | | |
| 204 | Injector Racks | While engine is still warm, open top covers and prepare to set the fuel racks on each injector. Engine must be warm or rack settings will not be accurate. Perform this task with expediency immediately following engine shutdown | | | |
| 205 | Injector Racks | For governors with terminal shaft scales, install screw-type injector jack and set layshaft to indicate 1.00" on the scale. Secure jack and layshaft | • Jack, screw-type governor | | |
| 206 | Injector Racks | Not applicable to this unit | | | |

| Item | Section | Task | Required Tools | INSP INIT | Date |
|------|------------------|--|--|-----------|------|
| 207 | Injector Racks | <p>Measure injector fuel rack using injector rack gauge tool*. Place tool over the rack and push the gauge firmly against the injector body, or if the injector has a calibrating slide, against the calibrating slide. Observe the indicator. If pointer is centered, rack setting is correct</p> <p>If pointer is offset toward injector, rack is too long. Using wrenches, loosen linkage locknut and then turn linkage adjusting nut until pointer is centered</p> <p>If pointer is offset away from injector, rack is too short. Adjust nut until pointer <u>passes</u> center and indicates too long, then adjust back to center. This helps compensate for backlash.</p> <p>While holding adjusting nut in place with one wrench, tighten locknut with the other. Check with gauge once more to verify no deviation occurred when tightening locknut. Check rack setting with gauge once more to verify no deviation occurred when tightening locknut. Repeat for all injectors</p> <p>*Gauge pointer should be centered when measuring 1". Use 1" gauge block to calibrate if gauge reading is suspect</p> | <ul style="list-style-type: none"> Gauge, injector rack Wrenches, 7/8" box (2) | | |
| 208 | Injector Racks | Once all injector racks have been set, remove governor jack and verify layshaft operates freely | | | |
| 209 | Running Governor | Open flywheel access panel and place reflector for photo tachometer | <ul style="list-style-type: none"> Photo tachometer | | |
| 210 | Running Governor | Restore starter fuse, close battery switch and start engine. Allow idle to stabilize and air to pump up. Apply full independent brake and verify handbrake is set and wheels are chocked | | | |
| 211 | Running Governor | Verify engine coolant temperature is AT LEAST 130 degrees Fahrenheit before proceeding | | | |
| 212 | Running Governor | Verify generator field switch is set to OFF. Set isolation switch to RUN. Verify reverser is inserted and centered | | | |
| 213 | Running Governor | Beginning with Idle and working up through each throttle position, record the RPM of the engine at each throttle position in Appendix A. DO NOT run engine above position 4 for any extended period of time. Use a helper and have one person work the throttle and one person record RPM readings, QUICKLY. Return engine to idle and set isolation switch to START/ ISOLATE | | | |
| 214 | Running Governor | <p>With one person remaining at the flywheel and observing RPM, move to the governor. Smoothly move the layshaft at a moderately slow rate to increase engine RPM until the overspeed trips and engine shuts down*. Gently allow the layshaft to return to idle position. Record RPM of overspeed trip in Appendix A and reset the overspeed trip lever. Remove photo tachometer indicator and restore flywheel access panel. Restart engine at idle</p> <p>* DO NOT rev engine more than 50 RPM above MAX RPM listed, regardless of overspeed trip actuation</p> | | | |

| Item | Section | Task | Required Tools | INSP INIT | Date |
|------|--------------------|--|----------------|-----------|------|
| 215 | Running Governor | Test governor low oil shutdown feature by pressing in on lube oil diaphragm screw. This screw is located on the engine side of the governor, directly opposite the low oil shutdown button. Hold the screw in and use a timer to determine the interval from first press until the low oil shutdown button pops, exposing the red line. Alarm bell should sound and engine should shutdown immediately. Verify shutdown occurs within 30 - 50 seconds. Release screw and push low oil button back in. Restart engine at idle | | | |
| 216 | Running Governor | Test low water shutdown on engine protection device (EPD) equipped locomotives. While engine is idling, close the water test valve under the EPD. The low water button on the EPD should immediately pop and lube oil pressure will drop to 0 psi. After 30 - 50 seconds, the governor button will pop, exposing the red line*. The alarm bell will sound and the engine should immediately shutdown. Open test valve, push button and restart engine at idle *DO NOT let the engine continue running in the event the governor does not shut the engine down | | | |
| 217 | Running Governor | Verify generator field switch is set to OFF. Set isolation switch to RUN. Move throttle to position 4. Repeat low water shutdown test and verify the governor button pops and engine shuts down as soon as the water test valve is closed, with almost no delay*. Open test valve and push in low oil button. Set isolation switch to START/ISOLATE and restart engine at idle *DO NOT let the engine continue running in the event the governor does not shut the engine down | | | |
| 218 | Handbrake | Verify full independent brake is applied and handbrake is set. Remove wheel chocks and notify personnel of possible locomotive movement | | | |
| 219 | Handbrake | Release independent brake. Verify 0 psi cylinder pressure. Set isolation switch to RUN. Set generator field switch to ON. Move reverser to select FORWARD. Move throttle to position 1 and note any movement. Locomotive should not move, but if it does, return throttle to IDLE and locomotive should immediately stop. If it stops, handbrake is effective. If it does not stop, apply full independent. | | | |
| 220 | Handbrake | Adjust handbrake, as needed, and repeat test until handbrake is tested effective. Set handbrake when finished | | | |
| 221 | Emergency Shutdown | Shutdown locomotive using emergency shutdown located on the LEFT walkway*. After shutdown, set isolation switch to START/ISOLATE and open battery switch. Tag out battery switch and remove starter fuse and reverser. Drain air reservoirs *If emergency shutdown switch is a manual pull cable, reset cutoff valve after actuation by pushing in the reset rod at the base of the valve. Valve is located on bottom front of fuel tank, at end of cable | | | |
| 222 | Emergency Shutdown | Verify red border and stencils for 'EMERGENCY STOP' or 'FUEL CUTOFF' are present and legible on both sides of engine | | | |
| 223 | Electrical | VERIFY engine is stopped and battery switch is open and tagged out | | | |

| Item | Section | Task | Required Tools | INSP INIT | Date |
|------|----------------|--|---|-----------|------|
| 224 | Electrical | With battery switch open, measure battery voltage at battery switch and record in Appendix A. LEAVE SWITCH OPEN | | | |
| 225 | Electrical | Inspect all wiring for arcing, loose connections, damages connectors. damaged insulation, improper bends and insufficient mechanical protection at frame mounts and passages. Repair, as needed | | | |
| 226 | Electrical | Inspect condition of all knife switches and fuse holders paying particular attention to battery switch | | | |
| 227 | Electrical | Inspect all relays (ER, FPC, PCR, RCR, FOR, FPR, etc) paying close attention to condition of coils, interlocks and wire connections. Replace interlock contacts, as needed. Repair or replace damaged covers, as needed | <ul style="list-style-type: none"> • Screwdriver, #2 Phillips • Screwdriver, 5/16" flat • Screwdriver, 1/4" flat | | |
| 228 | Electrical | Inspect power contactors (BF, ST, etc). Remove arc chutes and check contactor tips for wear. Verify contactor tips are secure and no base metal is visible on the tips. Discoloration, pitting, etc is allowed so long as no base metal is visible. DO NOT attempt to sand or clean contact tips. Inspect interlocks and replace contacts, as needed | <ul style="list-style-type: none"> • Screwdriver, #2 Phillips • Screwdriver, 5/16" flat • Screwdriver, 1/4" flat | | |
| 229 | Electrical | Clean reverser armature and check for free rotation. Rotate cam in both directions, by hand. Assure brushes have adequate travel | | | |
| 230 | Electrical | Inspect reverser interlocks for proper connection. Adjust interlock contacts, as needed | | | |
| 231 | Electrical | Inspect reverser cam pivot points and/or bearings. Lubricate as needed/equipped | | | |
| 232 | Electrical | Secure all electrical locker doors and panels | | | |
| 233 | Electrical | Verify all high voltage cabinets are clearly labeled with legible "DANGER 600 Volts" or "DANGER HIGH VOLTAGE" signs or decals. Renew, as needed | | | |
| 234 | Load Regulator | VERIFY engine is stopped and battery switch is open and tagged out | | | |
| 235 | Load Regulator | Inspect load regulator wiring and connection security | | | |
| 236 | Load Regulator | Inspect load regulator rheostat to verify it is not cracked and shows no sign of burning or overheating (discoloration) | | | |
| 237 | Load Regulator | Verify brush is not cracked, broken or missing. Verify flexible connection from brush to arm is sound and secure | | | |
| 238 | Load Regulator | Inspect any terminal boards for damage or evidence of overheating/burning. Clean with compressed air | <ul style="list-style-type: none"> • Compressed air, 40PSI | | |
| 239 | Main Generator | VERIFY engine is stopped and battery switch is open and tagged out | | | |
| 240 | Main Generator | Remove generator covers to expose internal workings. Inspect all latch tension and mounting | | | |
| 241 | Main Generator | Using compressed air at 40PSI, clean interior thoroughly | <ul style="list-style-type: none"> • Compressed air, 40PSI | | |
| 242 | Main Generator | Inspect commutator for threading. Threading is characterized by multiple lines across the copper bar and is caused by abrasive brushes, dirty air flow, heavy sparking or loss of commutator film | | | |

| Item | Section | Task | Required Tools | INSP INIT | Date |
|------|---------------------|--|--|-----------|------|
| 243 | Main Generator | Inspect commutator for grooving. Grooving is characterized by one or more grooves across the copper and is caused by low brush current (defective/low spring pressure) or dust particles | | | |
| 244 | Main Generator | Inspect commutator for copper drag. Copper drag is characterized by a very thin skin of copper being dragged from the bars into the slots between the bars. This indicates brush friction is too high, possibly caused by excessive spring tension | | | |
| 245 | Main Generator | Inspect commutator for bar edge burning. This condition presents as a rough trailing edge on the commutator bars and is caused by sparking | | | |
| 246 | Main Generator | Inspect brush holders for any signs of arcing or damaged connections. Verify all brush leads are intact and their connections to the holder are tight | | | |
| 247 | Main Generator | Verify brush holder mounting to motor frame is secure and sound. Verify brush holder clearance to commutator is between .125" and .1875" | <ul style="list-style-type: none"> • Measure | | |
| 248 | Main Generator | Replace any brushes that are cracked or broken. Replace any National brush not showing at least two wear limit lines. Replace any Carbone brush not showing at least one wear limit line. Replace any unmarked brush that is less than 1/4 of its original length. Sand-in new brushes with 00 grade sandpaper pulled in direction of rotation | <ul style="list-style-type: none"> • Brush(es), main generator • #00 sandpaper | | |
| 249 | Main Generator | Verify brush is moving free within holder. Work brushes up and down several times to free them and remove any foreign matter | | | |
| 250 | Main Generator | Inspect brush spring tension. Operate each brush spring and note that it moves smoothly with firm tension. If any spring is loose or sticks while moving, replace the brush holder. Spring tension must be the same for all brushes. Adjust spring tension, as needed (4 - 4.5 lbs) | <ul style="list-style-type: none"> • Measure • Gauge, spring | | |
| 251 | Main Generator | Not applicable to this unit | | | |
| 252 | Main Generator | Not applicable to this unit | | | |
| 253 | Main Generator | Not applicable to this unit | | | |
| 254 | Main Generator | Not applicable to this unit | | | |
| 255 | Main Generator | Not applicable to this unit | | | |
| 256 | Main Generator | Replace and secure generator covers | | | |
| 257 | Auxiliary Generator | VERIFY engine is stopped and battery switch is open and tagged out | | | |
| 258 | Auxiliary Generator | Remove generator covers to expose internal workings. Inspect all latch tension and mounting | <ul style="list-style-type: none"> • Screwdriver, 5/16" flat | | |
| 259 | Auxiliary Generator | Using compressed air at 40PSI, clean interior thoroughly | <ul style="list-style-type: none"> • Compressed air, 40PSI | | |
| 260 | Auxiliary Generator | Inspect commutator for threading. Threading is characterized by multiple lines across the copper bar and is caused by abrasive brushes, dirty air flow, heavy sparking or loss of commutator film | | | |
| 261 | Auxiliary Generator | Inspect commutator for grooving. Grooving is characterized by one or more grooves across the copper and is caused by low brush current (defective spring pressure) or dust particles | | | |

| Item | Section | Task | Required Tools | INSP INIT | Date |
|------|---------------------|---|--|-----------|------|
| 262 | Auxiliary Generator | Inspect commutator for copper drag. copper drag is characterized by a very thin skin of copper being dragged from the bars into the slots between the bars. This indicates brush friction is too high, possibly caused by excessive spring tension | | | |
| 263 | Auxiliary Generator | Inspect commutator for bar edge burning. This condition presents as a rough trailing edge on the commutator bars and is caused by sparking | | | |
| 264 | Auxiliary Generator | Inspect brush holders for any signs of arcing or damaged connections. Verify all brush leads are intact and their connections to the holder are tight | | | |
| 265 | Auxiliary Generator | Verify brush holder mounting to motor frame is secure and sound. Verify brush holder clearance to commutator is .125" | <ul style="list-style-type: none"> • Measure | | |
| 266 | Auxiliary Generator | Replace any brushes that are cracked or broken. Replace any National brush not showing at least two wear limit lines. Replace any Carbone brush not showing at least one wear limit line. Replace any unmarked brush that is less than 1/4 of its original length. Sand-in new brushes with #00 grade sandpaper pulled in direction of rotation | <ul style="list-style-type: none"> • Brush(es), generator aux • Sandpaper, #00 | | |
| 267 | Auxiliary Generator | Verify brush is moving free within holder. Work brushes up and down several times to free them and remove any foreign matter | | | |
| 268 | Auxiliary Generator | Inspect brush spring tension. Operate each brush spring and note that it moves smoothly with firm tension. If any spring is loose or sticks while moving, replace the brush holder. Spring tension must be the same for all brushes. Adjust spring tension, as needed (1.5 - 2.5 lbs) | <ul style="list-style-type: none"> • Measure • Gauge, spring | | |
| 269 | Auxiliary Generator | Replace and secure generator covers | <ul style="list-style-type: none"> • Screwdriver, 5/16" flat | | |
| 270 | Alternator | Not applicable to this unit | | | |
| 271 | Alternator | Not applicable to this unit | | | |
| 272 | Alternator | Not applicable to this unit | | | |
| 273 | Alternator | Not applicable to this unit | | | |
| 274 | Alternator | Not applicable to this unit | | | |
| 275 | Running Move | Restore starter fuse, close battery switch and start engine. Allow idle to stabilize and air to pump up. Apply full independent brake and remove wheel chocks | | | |
| 276 | Running Move | Verify engine coolant temperature is AT LEAST 120 degrees Fahrenheit before proceeding | | | |
| 277 | Running Move | Release handbrake and relocate engine with its full length over the inspection pit | | | |
| 278 | Running Move | Apply full independent and turn off the generator field. Set handbrake | | | |
| 279 | Voltage Regulator | With engine running idle, connect voltmeter negative lead to negative side of battery switch. Connect positive lead to the top end of the auxiliary generator fuse | <ul style="list-style-type: none"> • Voltmeter | | |
| 280 | Voltage Regulator | With engine at throttle 4, adjust the voltage regulator rheostat until the voltage indicated is 74VDC. Apply dab of Duco cement to rheostat to hold setting | <ul style="list-style-type: none"> • Voltmeter • Cement, Duco | | |
| 281 | Voltage Regulator | Check voltage in all throttle positions and confirm voltage is between 73 and 75 VDC. Avoid prolonged operation at throttle settings above position 4 | <ul style="list-style-type: none"> • Voltmeter | | |

| Item | Section | Task | Required Tools | INSP INIT | Date |
|------|-------------------|---|---|-----------|------|
| 282 | Voltage Regulator | If voltage regulator is equipped with 72VDC reference tap, move positive lead of voltmeter to to the positive terminal of the tap. Set engine to throttle 8 and confirm voltage is between 71.5 and 72.5 VDC. Avoid prolonged operation at throttle 8. Voltage is not externally adjustable. If out of spec, make a note for regulator repair | <ul style="list-style-type: none"> • Voltmeter | | |
| 283 | Voltage Regulator | Remove voltmeter and secure lockers | | | |
| 284 | Traction Motors | Secure locomotive in place by chocking wheels | | | |
| 285 | Traction Motors | Shutdown locomotive. Remove reverser handle and lockout and/or tag the generator field switch in OFF position. Verify isolation switch is in 'START/ISOLATE' position and tag. Verify main battery switch is 'OFF' and tag. Remove starter fuse and drain air reservoirs | | | |
| 286 | Traction Motors | Secure track <u>and</u> locomotive with BLUE FLAG to notify other personnel of the presence of workmen | | | |
| 287 | Traction Motors | Inspect all traction motor cables for condition of bent, squeezed, overheated, burnt or damaged insulation. Verify all mounting is secure and that wear plates, grommets and seals are providing adequate protection for cables and traction motor | | | |
| 288 | Traction Motors | Verify ground wire is properly secured from the motor frame to the locomotive frame | | | |
| 289 | Traction Motors | Verify all traction motor cable splices have protective sleeves in place. Sleeves must be free of damage and extend at least 2 inches beyond each side of the connection | | | |
| 290 | Traction Motors | Inspect all blower bellows and ducts for integrity | | | |
| 291 | Traction Motors | Remove all traction motor brush inspection covers | <ul style="list-style-type: none"> • Ratchet, 3/8" drive • Extension, 3/8" drive 6" • Socket, 3/8" drive 9/16" | | |
| 292 | Traction Motors | Using compressed air at 40PSI, clean interior thoroughly | <ul style="list-style-type: none"> • Compressed air, 40PSI | | |
| 293 | Traction Motors | Inspect commutator for threading. Threading is characterized by multiple lines across the copper bar and is caused by abrasive brushes, dirty air flow, heavy sparking or loss of commutator film | | | |
| 294 | Traction Motors | Inspect commutator for grooving. Grooving is characterized by one or more grooves across the copper and is caused by low brush current (defective spring pressure) or dust particles | | | |
| 295 | Traction Motors | Inspect commutator for copper drag. copper drag is characterized by a very thin skin of copper being dragged from the bars into the slots between the bars. This indicates brush friction is too high, possibly caused by excessive spring tension | | | |
| 296 | Traction Motors | Inspect commutator for bar edge burning. This condition presents as a rough trailing edge on the commutator bars and is caused by sparking | | | |
| 297 | Traction Motors | Inspect brush holders for any signs of arcing or damaged connections. Verify all brush leads are intact and their connections to the holder are tight | | | |
| 298 | Traction Motors | Verify brush holder mounting to motor frame is secure and sound. Torque brush holder to frame bolts to 150 foot-pounds | <ul style="list-style-type: none"> • Torque wrench, 3/4" drive • Extension, 3/4" drive 3" • Socket, 3/4" drive 1 5/16" | | |

| Item | Section | Task | Required Tools | INSP INIT | Date |
|------|------------------|---|---|-----------|------|
| 299 | Traction Motors | Verify brush holder clearance to commutator is between .125" and .1875" | <ul style="list-style-type: none"> • Measure | | |
| 300 | Traction Motors | Replace any brushes that are cracked or broken. Replace any National brush not showing at least two wear limit lines. Replace any Carbone brush not showing at least one wear limit line. Replace any unmarked brush that is less than 1/4 of its original length. Sand-in new brushes with #00 grade sandpaper pulled in direction of rotation | <ul style="list-style-type: none"> • Brush(es), traction motor • Sandpaper, #00 | | |
| 301 | Traction Motors | Verify brush is moving free within holder. Work brushes up and down several times to free them and remove any foreign matter | | | |
| 302 | Traction Motors | Constant pressure brush holders do not need to have spring pressure checked unless there is evidence of overheating or flash damage. In this case, see MI 3900 for procedures | | | |
| 303 | Traction Motors | For older variable tension brush holders, Inspect brush spring tension. Operate each brush spring and note that it moves smoothly with firm tension. If any spring is loose or sticks while moving, replace the brush holder. Spring tension must be the same for all brushes. Adjust spring tension, as needed (9 - 11 lbs) | <ul style="list-style-type: none"> • Measure • Gauge, spring | | |
| 304 | Traction Motors | Replace all traction motor inspection covers and secure hardware. Do not over torque | <ul style="list-style-type: none"> • Ratchet, 3/8" drive • Extension, 3/8" drive 6" • Socket, 3/8" drive 9/16" | | |
| 305 | Traction Motors | Open gearbox access cover and inspect gear teeth for wear or damage. Check top of gear tooth dimension and verify at least .125" on pinion and .25" on axle | <ul style="list-style-type: none"> • Measure | | |
| 306 | Traction Motors | If gears are lightly coated with grease that appears light brown, add two packs of crater. If gears appear well lubricated, add one pack of crater. Secure gearbox cover | <ul style="list-style-type: none"> • Grease, crater | | |
| 307 | Deferred Repairs | Repair items listed in Appendix E which indicate a schedule of 'annual' | | | |
| 308 | Conclusion | Once certain all work is completed, restore starter fuse and remove all tags. Clean locomotive of any remaining tools. Remove blue flag protection | | | |
| 309 | Conclusion | Review entire annual inspection packet, making sure all fields are marked, dated and signed, as needed. When complete, submit to CMO for inspection sign-off and release for service, if applicable | | | |

Wheel and Brake Condition

| Wheel | Flat Spots (Y/N) | Shelling (Y/N) | Chips/Gouges (Y/N) | Thin Flange (Y/N) | High Flange (Y/N) | Rim Thickness (in) | Shoe Thickness (in) | Piston Travel (in) | Air Leaks (Y/N) | Comments |
|-------|------------------|----------------|--------------------|-------------------|-------------------|--------------------|---------------------|--------------------|-----------------|----------|
| L1 | | | | | | | | | | |
| L2 | | | | | | | | | | |
| L3 | | | | | | | | | | |
| L4 | | | | | | | | | | |
| R4 | | | | | | | | | | |
| R3 | | | | | | | | | | |
| R2 | | | | | | | | | | |
| R1 | | | | | | | | | | |

Numbering: Wheel L1 is the front wheel on the fireman's side of the locomotive

645E Engine Speed

| Throttle Position | Min RPM | Max RPM | Measured RPM |
|-------------------|---------|---------|--------------|
| Idle | 307 | 323 | |
| 1 | 307 | 323 | |
| 2 | 390 | 398 | |
| 3 | 475 | 483 | |
| 4 | 545 | 575 | |
| 5 | 645 | 653 | |
| 6 | 730 | 738 | |
| 7 | 800 | 830 | |
| 8 | 900 | 908 | |
| Trip | | | |

Air System

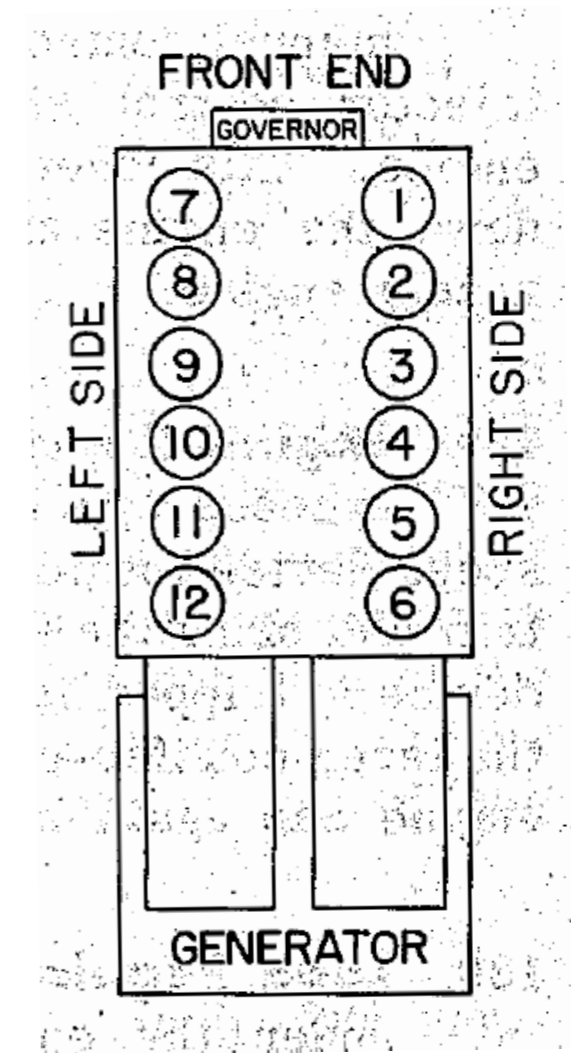
| Parameter | Spec PSI | Measured PSI |
|-----------------------------------|----------|--------------|
| Equalizing reservoir / brake pipe | 90 | |
| Independent (full application) | 40 | |
| Compressor cut in | 130 | |
| Compressor cut out | 140 | |

Battery Voltage

| Measurement | Spec DC Volts | Measured DC Volts |
|-------------------------------------|---------------|-------------------|
| Engine stopped, battery switch open | 64 | |
| Engine running, throttle position 4 | 74 | |
| Engine running, throttle position 8 | 73-75 | |
| Fixed output, throttle position 8 | 72 | |

One Rotation Engine Inspection and Tune - V12 US Rail

| Set Flywheel Position Pointer (TDC -4) * | Perform Letter Tasks on Cylinder Number(s) | | | | | |
|---|--|----|----|-------|------|------------|
| | A-J, R, S | K | L | M | N | O, P, Q, S |
| 356 | 1 | 3 | 2 | 3,2 | 8 | |
| 15 | 12 | 10 | 11 | 10,11 | 4 | 5 |
| 41 | 7 | 9 | 8 | 9,8 | 3,6 | 2 |
| 66 | | | | | 10,1 | 11 |
| 90 | 4 | 5 | 6 | 5,6 | 9,12 | 8 |
| 116 | 3 | 2 | 1 | 2,1 | 7 | |
| 135 | 10 | 11 | 12 | 11,12 | 5 | 6 |
| 161 | 9 | 8 | 7 | 8,7 | 2,4 | 1 |
| 186 | | | | 11,3 | | 12 |
| 210 | 5 | 5 | 8 | 8,4 | 8,10 | 7 |
| 236 | 2 | 1 | 3 | 1,3 | 9 | |
| 255 | 11 | 12 | 10 | 12,10 | 6 | 4 |
| 281 | 8 | 7 | 9 | 7,9 | 1,5 | 3 |
| 306 | | | | | 12,2 | 10 |
| 330 | 6 | 4 | 4 | 4,5 | 7,11 | 9 |



* The flywheel is located on the rear of the engine. Rotate flywheel counterclockwise, as viewed facing rear of engine. Said differently, push flywheel down from the left side of the engine.

Rotation: Left (Counterclockwise)

Firing order: 1-12-7-4-3-10-9-5-2-11-8-6

Appendix C

Annual Inspection Record

| Procedure | Purpose | Description | Tools and Parts Required |
|-----------|---------------------------|--|--|
| A | Remove rocker arms | For all three rocker arms, loosen rocker arm adjusting screw locknut and rotate adjusting screw several turns counterclockwise. Remove the bolts and washers for the oil jumper at the camshaft pillow block. Remove the rocker arm shaft nuts and washers (if provided). Remove the rocker shaft caps, preserving original location (left/right). Remove rocker arm assembly and place in a secure and safe location, being careful not to scratch any machined surface | <ul style="list-style-type: none"> • Bar, 36" 3/4" drive breaker • Extension, 3/4" drive 3" • Socket, 3/4" drive 1 7/16" • Ratchet, 3/8" drive • Extension, 3/8" drive 6" • Socket, 3/8" drive 7/16" • Tray, magnetic parts • Screwdriver, 1/2" flat • Wrench, 15/16" box |
| B | Inspect valve bridges | Remove each valve bridge and inspect springs, seats, button and lash adjusters. Look for breakage, cracking and/or discoloration. Press lash adjusters to check for smooth action and spring return. Set aside, preserving original location each bridge was removed from (left/right) | |
| C | Inspect valve springs | Visually inspect all 4 valve assemblies, looking at condition of springs, seats and keepers. Look for breakage, cracking and/or discoloration | <ul style="list-style-type: none"> • Light, inspection • Mirror, inspection |
| D | Measure valve stem height | Using valve checking tram, verify all valves stem heights are within 1/16" of each other. Clean head surface, valve stem end and tram feet prior to each measurement | <ul style="list-style-type: none"> • Tram, valve checking • Indicator, dial |
| E | Install valve bridges | Clean head bridge seat and replace valve bridge in the same location it was removed from with casting boss toward camshaft | |
| F | Inspect fuel injector | Visually inspect fuel injector and fuel jumper. Look for breakage, cracking and/or discoloration. Verify injector slide operates easily and smoothly (no binding). Verify injector slide is properly seated in rack. Tighten injector crab nut to 50 foot-pounds . Tighten fuel jumper bolts at injector and fuel rail to 40 foot-pounds | <ul style="list-style-type: none"> • Torque wrench, 3/8" drive 75ft/lb • Extension, 3/8" drive 6" • Socket, 3/8" drive 5/8" • Socket, 3/8" drive 15/16" |
| G | Tighten liner/head nuts | <p>Tighten all head nuts to 240 foot-pounds* beginning at topmost nut, followed by bottommost nut and then alternating in a clockwise fashion**</p> <p><i>*note: This is the correct torque for 645E, 567C, 567D liners and 567B type 3 liners. Type 3 liners can be identified by a 1/8" hole/dish drilled off center on the end of the liner stud. 567B type 1 and 2 liners are torqued to 300 foot pounds. Use caution and check <u>each</u> cylinder in all 567B engines</i></p> <p><i>**note: this is NOT the correct sequence for installing a <u>new</u> head gasket. See EMD pointers April 15, 1968 for correct installation procedure</i></p> | <ul style="list-style-type: none"> • Torque wrench, 3/4" drive • Extension, 3/4" drive 8" • Socket, 3/4" drive 1 1/16" |
| H | Install rocker arms | Clean oil jumper gasket surface at camshaft pillow block and place a new gasket. Inspect rocker arm cam rollers and adjusting screws. Install rocker arm assembly. Install rocker arm shaft caps in original position, orienting the long end toward the camshaft. Fit washers (if provided) and nuts on rocker shaft studs. Run down rocker shaft nuts before tightening rocker shaft nuts to 150 foot-pounds initial torque, then tighten to 300 foot-pounds final. Install oil jumper bolts and lock washers and torque to 84 inch-pounds | <ul style="list-style-type: none"> • Torque wrench, 3/4" drive • Extension, 3/4" drive 3" • Socket, 3/4" drive 1 7/16" • Torque Wrench, 3/8" drive in/pd • Extension, 3/8" drive 6" • Socket, 3/8" drive 7/16" • Scraper, carbide gasket • Gasket, oil jumper |

Appendix C

Annual Inspection Record

| Procedure | Purpose | Description | Tools and Parts Required |
|-----------|---|---|--|
| I | Time injector | Insert injector timing gauge in provided hole of injector body. Tighten or loosen the rocker adjusting screw until gauge just passes over the injector follower. Tighten adjusting screw locknut while holding adjuster screw position. Recheck with gauge. | <ul style="list-style-type: none"> • Screwdriver, 1/2" flat • Wrench, 15/16" box • Gauge, injector timing |
| J | Adjust valve bridges | Starting with left valve bridge, turn the rocker arm adjusting screw clockwise until lash adjuster just touches the last valve. In other words, one valve will touch before the other - use the second touch (last) as the guiding event. Turn the adjusting screw 1 1/2 additional turns clockwise. Now, check that the valve bridge is firmly seated in the head with no looseness. If loose, turn adjusting screw clockwise until no looseness is felt, then turn 1/4 additional turn. Tighten adjusting screw locknut while holding adjuster screw position. Push rocker arm down several times to exercise the lash adjusters, then check each lash adjuster with the lash gauge, which should fully insert between the lash adjuster body and the end of the valve stem | <ul style="list-style-type: none"> • Screwdriver, 1/2" flat • Wrench, 15/16" box • Gauge, 1/16" lash |
| K | Inspect rings (up) | Rings should be bright in appearance and free in groove. Inspect for cracks or breaks. Inspect first ring for excessive loss of chrome. Inspect for evidence of blow-by on lower rings (brown streaks) | <ul style="list-style-type: none"> • Light, inspection |
| L | Inspect rings (down) | Rings should be bright in appearance and free in groove. Inspect for cracks or breaks. Inspect first ring for excessive loss of chrome. Inspect for evidence of blow-by on lower rings (brown streaks) | <ul style="list-style-type: none"> • Light, inspection |
| M | Check piston cooling oil pipe alignment | Install a gauge in the specified piston oil cooling pipe after all other work is completed for the current crankshaft position but before rotating flywheel into next position. Have a helper monitor gauge entry into piston passage while you slowly turn flywheel. Be careful as any misalignment will further bend and perhaps destroy the cooling pipe. Verify gauge enters piston inlet hole and can be turned freely once in position. Remove gauge following next crankshaft manipulation | <ul style="list-style-type: none"> • Gauge, piston cooling pipe alignment (2) • Light, inspection |
| N | Inspect piston skirt | Piston skirt should be free of scuffing, scoring and discoloration | <ul style="list-style-type: none"> • Light, inspection |
| O | Inspect piston top and upper liner wall | Top of piston should be dry, free of excessive carbon and show a starburst pattern indicating even fuel spray from the injector | <ul style="list-style-type: none"> • Light, inspection |
| P | Inspect upper liner wall | Liner wall should be free of scuffing, scoring and discoloration | <ul style="list-style-type: none"> • Light, inspection |
| Q | Inspect valve heads | Valve head should be free of cracks and discoloration | <ul style="list-style-type: none"> • Camera, Inspection |
| R | Inspect lower liner wall | Liner wall should be free of scuffing, scoring and discoloration | <ul style="list-style-type: none"> • Light, inspection |
| S | Inspect rod bearing | Inspect bearing surfaces for scoring, scuffing, discoloration or loss of tin | <ul style="list-style-type: none"> • Light, inspection |

Repair List

| Item Number | Reported Issue | Date Reported | Action Needed | Scheduled Resolution | Actual Resolution |
|-------------|--|---------------|---------------|----------------------|-------------------|
| 1 | The fireman side electric cab heater is not working. The blower heater, not the strip heater | 01/01/2025 | Repair | 2026 Annual | |
| 2 | Brake piston on engineer's side, third axle from the front is occasionally sticking on retraction/release. Needs cleaning and new cup | | Repair | 2026 Annual | |
| 3 | The gauge for the pollution tank is broken and always shows 'full' | 01/01/2025 | Replace | 2026 Annual | |
| 4 | The speed recorder does not work | 01/01/2025 | Repair | Working | |
| 5 | The centrifugal air filter drain valve sticks. Needs to be cleaned after new filter installation | | Repair | 2026 Annual | |
| 6 | The fan shaft forward bearing is making noise and may need replacement | 01/01/2025 | Monitor | N/A | |
| 7 | Automatic brake reportedly charges brake pipe to main reservoir pressure on occasion when handle is moved from 'service' to 'release' position (can't duplicate) | 06/01/2025 | Monitor | N/A | |
| 8 | EPD is incorrect model for this unit, according to former CMO. No malfunctions noted | 01/01/2025 | Monitor | N/A | |

Required Parts and Supplies

| Part Number(s) | Quantity Required | Item | Description |
|--------------------|-------------------|--------------------------------------|--|
| 570-020-025 | 1 | Filter, car body | Koch filter pad, poly, dual-den, tac, 20"x2'5"x2", Box of 20 |
| AB-10 | 1 | Filter, centrifugal aftercooler air | Clark AB-10 |
| PA1777 | 1 | Filter, compressor intake air | Baldwin air filter, 5-31/32" x 8-5/32" |
| BT267 | 1 | Filter, compressor lube oil | Baldwin oil filter, spin-on, full-flow |
| BA3964 | 1 | Filter, engine intake air | Baldwin air filter, 18-3/4" x 5", Pack of 4 (bag type) |
| P1510 | 4 | Filter, engine lube oil | Baldwin oil filter, 29 3/8" L, 6 1/2" OD |
| BF971 | 2 | Filter(s), spin-on engine fuel | Baldwin fuel filter, 7 1/8", 3 11/16" OD |
| 8496989 | 1 | Gasket kit, lube oil strainer | |
| 8291349 | AN | Gasket, engine inspection cover | Round cover |
| 8369658 | 1 | Gasket, centrifugal aftercooler cap | |
| 8104055 | 2 | Gasket, fuel glass | |
| 8330035 | AN | Gasket, lube oil filter cover | |
| 8029498 | 1 | Gasket, lube oil pump cover | |
| 8029167 | 12 | Gasket, oil jumper | |
| 8173851 | 1 | Gasket, oil separator housing | |
| 8025988 | AN | Gasket, piston cooling tube | |
| 8142354 / 40040025 | AN | Gasket, manifold to water inlet tube | |
| 8305815 | AN | Seal, water inlet to cylinder liner | |
| 8320144 | 2 | Strainer, lube oil | |
| 8308586 | 1 | Strainer, scavenging | |
| | AN | Brush(es), fuel pump motor | |
| | AN | Brush(es), generator aux | |
| | AN | Brush(es), main generator | |
| | AN | Brush(es), traction motor | |
| 235084 | AN | Oil, engine lube | Chevron Delo 710LS 20w-40 |
| 235084 | AN | Oil, governor | Chevron Delo 710LS 20w-40 |
| | AN | Oil, journal | |
| | AN | Oil, compressor lube | SAE 30, Non-detergent |
| | AN | Grease, crater | |
| 62435 | AN | Cement, Duco | Duco household cement, 1oz tube |
| MAT440 | AN | Mat, oil absorbent | Pigmat sorbent pad, 22 gal, 15 in x 20 in, oil, white, polypropylene 100ct |
| | AN | Mineral spirits | |
| | AN | Sandpaper, #00 | |

AN = As needed

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