



MAINTENANCE INSTRUCTION

LOCOMOTIVE STORAGE PROCEDURES

GENERAL

Storage procedures for General Motors locomotives and their component parts are divided into three main categories as follows:

1. Preparation for storage.
2. Storage.
3. Inspection.

A copy of this procedure should be placed in a conspicuous place with the stored equipment so that any one deprocessing a unit will be alerted to remove all materials used in processing.

Original packing material should be removed upon receipt of shipment so that equipment can be inspected for shipping damage. Bags and boxes used for shipment purposes are not intended for, nor do they provide, adequate protection for outside storage even for relatively short periods.

It is advisable to perform any maintenance necessary on equipment that has been in service before storage preparations are made.

Carbonaceous deposits often form in the oil pan and the top deck of engines that have been in service and when such engines are stored, the rust preventatives used tend to loosen such deposits. These deposits may peel away and clog important oil passages when the engine is again placed in service. To prevent this, the areas involved should be sprayed with diesel fuel oil to break up the deposits and then the oil system should be carefully flushed to remove this material. Follow the flushing instructions given in M.I. 1757.

The materials recommended for storage will not cause deterioration of seals or other equipment and the equipment can be put back into service without washing out protective fluids, provided the engine is pre-lubed and the turbocharger auxiliary lube oil pump (when the engine is so equipped) is actuated and allowed to pump oil to the turbocharger bearings for its full timed period before barring over the engine or starting attempt is made.

Where vapor phase inhibitor paper (VPI) is used it should be placed with the white side toward the surface to be protected. When the white surface turns brown, its protective quality is gone, and fresh VPI paper must be used.

CAUTION: Use VPI only in areas outlined in the storage procedure. Do not use inside of engine or electrical equipment. VPI causes copper and zinc discoloration and also causes silicone seals to harden and take a permanent set.

Indicator cards should be used with desiccant bags, and inspection made of the color periodically. These bags and cards should be renewed if the color of the card so indicates. Desiccant bags must be placed so that if an excess of water accumulates in the bags, the water will not drip on electrical equipment or finished surfaces.

Some designations for packaging and preservative materials are abbreviated in the text, but are more fully described in the materials list that follows. A vendor's name is provided for certain materials, and a military standard number for others. Such military standard materials or their equivalent can be obtained from any protective packaging material company.

*This bulletin is revised and supersedes previous issues of this number.

MATERIAL LIST

<u>Product</u>	<u>Vendor or Specification</u>
Nalco 41RR (Corrosion Inhibitor)	Nalco Chemical Co. Oak Brook, Illinois
Tectyl 823EM CAUTION: Use only Tectyl 823 bearing the EM suffix letters.	Ashland Chemical Co. Schiller Park, Illinois or Valvoline Oil Co. (Ashland Oil Co.) Ashland, Kentucky
Diesel Fuel Oil	EMD Maintenance Instruction 1750
Lubricating Oil	EMD Maintenance Instruction 1752 (1761 Export)
Governor Oil	EMD Maintenance Instruction 1764
V.P.I. - B (Vapor Phase Inhibitor Barrier Paper)	MIL-P-3420 - Type 1, Style C, Class 1 & 2
Air Brake Cylinder Grease	AAR Specification 914-66
Barrier Material, Water-vaporproof, Flexible	MIL-B-131
Barrier Material, Greaseproof, Waterproof, Flexible	MIL-B-121
Desiccant, Activated, Bagged	MIL-D-3464
Corrosion Preventive Compound, Grade 4 (P-19)	MIL-C-16173
Tape, Waterproof Pressure Sensitive	PPP-T-60b
Petroleum Jelly (Stanolind Petrolatum)	Standard Oil Co. of Indiana Chicago, Illinois

NOTE: The referenced MIL specification material is for a guide only. Equivalent material may be used.

PREPARATION FOR STORAGE

To adequately circulate preservative fluids to all internal engine parts and components of the cooling system, it is necessary to run the engine at idle speed for a short interval. It is suggested that the preliminary preparations listed be followed in order to process them simultaneously during a single short run of the engine.

AIR COMPRESSOR OR COMPRESSOR/EXHAUSTER

1. Drain all air lines and sumps of water.

2. Drain oil from crankcase.
3. Charge crankcase with Tectyl 823EM.
4. Pump Tectyl 823EM through crankshaft and spray upper crankcase areas, including underside of pistons.
5. Remove discharge and suction valves from each cylinder and spray a light coat of Tectyl 823EM in each cylinder and on the valves.

ENGINE COOLING SYSTEM

1. Drain cooling system, including cab heaters and piping.
2. Prepare an engine coolant solution using Nalco 41RR and cold water. The concentration should be .6 to 1.2 fluid ounces of Nalco 41RR per gallon of cold water. The solution can be adequately mixed by first putting the preservative in the expansion tank and then filling the system. (See Maintenance Instruction 1748 for basic coolant guidelines.)
3. Fill system completely so that entire system, including the expansion tank, will be preserved.

ENGINE FUEL SYSTEM

1. If a good grade of fuel has been used as recommended in Maintenance Instruction 1750, it will provide the necessary protection for the injectors, fuel pump, and other system components.
2. If fuel grade is not considered satisfactory, drain tank and add a sufficient quantity of high quality fuel for use during the short engine run period.

ENGINE GOVERNOR

1. If the governor has been operating with turbine type oil recommended in Maintenance Instruction 1764, the oil will provide adequate rust and oxidation prevention properties.
2. If governor oil is not considered satisfactory, drain and fill to normal operating level with Tectyl 823EM.

FAN AND SPEED INCREASER DRIVE

1. Drain oil from gear case.
2. Fill gear case to operating level with Tectyl 823 EM.

ENGINE LUBE OIL SYSTEM

1. Drain lube oil system, including filter elements and housings and engine strainer housing. It is not necessary to replace filter elements with new elements.

2. Charge the lubricating oil system with Tectyl 823EM as would normally be done at lube oil change. Make certain that the strainer housing is full and that the turbocharger filter and auxiliary filter housings are filled with preservative oil.
3. Start the engine and run at idle speed for approximately 15 minutes without load to properly circulate the protective fluids throughout the engine lube oil system. Alternately energize and de-energize the governor overriding solenoid ORS to thoroughly flush the load regulator vane motor and associated piping. The engine should remain relatively cool during the circulating run.
4. Stop the diesel engine.

STORAGE

The following storage procedures will provide sufficient protection for equipment being stored for a period of up to two years. In cases where the storage period will exceed two years, all procedures contained in PREPARATION FOR STORAGE and STORAGE must be repeated at two year intervals.

ENGINE COOLING SYSTEM

Drain the engine cooling system and cab heaters. After draining is completed, plug any fill pipes or vents. Leave all drain valves open. This should prevent any freezing problems caused by any retained water.

CAUTION: Do not reuse the Nalco 41RR solution to charge another system.

ENGINE FUEL SYSTEM

1. Drain the fuel tank and piping. Remove drain plugs from end of tank and spray Tectyl 823EM into the tank.
2. Replace plugs and plug fuel tank vents.
3. Purge fuel system with Tectyl 823EM.
4. When Tectyl flows from the fuel return line at the engine mounted fuel filters, bar the engine over one complete revolution.
5. Allow fuel lines to drain.

6. Remove filter elements. Drain and clean filter housings. Spray filter housing with Tectyl 823EM, and replace filter elements, filter housing, and covers.

ENGINE LUBE OIL SYSTEM

1. Drain the Tectyl 823EM from the lube oil system, including filter elements and housings and the strainer housing.

NOTE: If the preservative oil is to be used on more than one engine, it must be filtered or strained before reuse.

2. Disconnect and drain oil pressure line to governor.
3. If the lube oil cooler is equipped with a vent, wrap the vent with VPI-B and secure with pressure sensitive tape.

ENGINE GOVERNOR

1. Drain oil or Tectyl 823EM from governor.
2. Hang two 1 lb bags of desiccant on the exterior of the governor and wrap the entire governor with MIL-B-131 barrier paper. Make certain the governor is completely covered and the wrap as air tight as possible. Seal with pressure sensitive tape.

ENGINE

1. Spray each airbox with Tectyl 823EM.
2. Spray each cylinder liner bore with a mist of Tectyl 823EM as the ports of each liner are uncovered by barring the engine over.
3. Close airbox covers and check seals for proper position. Check that cylinder test valves are closed.
4. Remove oil pan covers and spray lower end of cylinder liners with mist of Tectyl 823EM. Replace covers.
5. Coat all parts under the engine top deck covers with a stream or spray of Tectyl 823EM.
6. Fasten the top deck covers securely and tape all edges with pressure sensitive tape. Apply

plywood exhaust stack covers and seal with MIL-B-131 barrier material and pressure sensitive tape.

7. Engine Air Intakes

- a. On units with filters mounted on the engine blowers, completely cover the filter units with MIL-B-131 barrier material and secure with pressure sensitive tape.
- b. On units with carbonyl mounted oil bath, fiberglass element, or paper element engine air filters, disconnect the hoses leading to blower inlets and cover the openings with MIL-B-131 barrier material and secure with pressure sensitive tape.
- c. On turbocharged units, disconnect the hose leading to the turbo inlet and cover the opening with MIL-B-131 and secure with pressure sensitive tape.

8. Coat all external unpainted machined surfaces such as the coupling, cylinder test valves, and injector control shaft linkage bearings with MIL-C-16173, Grade 4 or equivalent.

AIR COMPRESSOR OR COMPRESSOR/EXHAUSTER

1. Drain Tectyl 823EM from crankcase.
2. Wrap air filter with MIL-B-131 and seal with pressure sensitive tape.
3. Wrap breather cap and all safety valves with MIL-B-131 and seal with pressure sensitive tape.

ELECTRIC STARTING MOTOR

Coat pinion gear with Tectyl 823EM.

LOAD REGULATOR

1. Drain oil from vane motor and governor oil connection piping.
2. On commutator type load regulators, remove cover, place MIL-B-121 between brushes and commutator and replace cover. Wrap entire unit with MIL-B-131 barrier material and seal with pressure sensitive tape.

3. On face plate type load regulators, cover *entire unit with MIL-B-131 barrier material* and seal with pressure sensitive tape.

MAIN GENERATOR OR ALTERNATOR

1. Coat all unpainted external steel surfaces with MIL-C-16173, Grade 4 or equivalent.
2. Raise brushes and place a sheet of MIL-B-121 *barrier material between brushes and commutator or slip rings.*
3. Place eight 1 lb bags of desiccant in lower part of generator airbox or brush holder area. *Suspend bags so as not to contact metal. Care should be taken so that bags can be removed without breaking.*
4. Wrap shaft between generator and generator coupling with VPI-B and secure with pressure sensitive tape.
5. Enclose entire coupling end of the generator, using MIL-B-131 barrier material and seal with pressure sensitive tape.
6. On DC generators with the lower brush holder area open, wrap the entire brush holder end of the generator with MIL-B-131 barrier material and seal with pressure sensitive tape.
7. On generators with an airbox and blowers, cover each blower intake with MIL-B-131 barrier material and seal with pressure sensitive tape. Seal airbox access panels with pressure sensitive tape.

AUXILIARY MOTORS

1. Raise brushes and place a sheet of MIL-B-121 barrier material between brushes and commutator of all DC motors.
2. Wrap all auxiliary motors with MIL-B-131 barrier material and secure with pressure sensitive tape.

TRACTION MOTOR BLOWERS

Cover air inlet with VPI-B and seal with pressure sensitive tape.

GENERATOR BLOWER

Cover air inlet with MIL-B-131 barrier material and secure with pressure sensitive tape.

AUXILIARY GENERATOR

1. Raise brushes and place a sheet of MIL-B-121 barrier material between brushes and commutator.
2. Place two 1 lb bags of desiccant under inspection covers, one on each side.
3. *Cover both ends of generator with MIL-B-131 and seal with pressure sensitive tape.*
4. Coat all unpainted external steel surfaces with MIL-C-16173, Grade A, or equivalent.
5. Wrap VPI-B paper around shaft between generator and engine, and seal with pressure sensitive tape.

ELECTRICAL CABINETS

1. Remove and package all fuses in MIL-B-131 barrier material and seal with pressure sensitive tape.
2. Open all switches and circuit breakers.
3. Protect all exposed contact tips with a thin film of petroleum jelly.
4. Wrap resistors with MIL-B-131 barrier material and seal with pressure sensitive tape.
5. Suspend ten 1 lb bags of desiccant at various points in the main electrical cabinet, and seal all openings with pressure sensitive tape. Seal openings where cables come through from the outside with pressure sensitive tape.
6. Seal the opening to the electrical cabinet air filter with MIL-B-131 barrier material and secure with pressure sensitive tape.
7. Suspend three 1 lb bags of desiccant in the auxiliary electrical cabinet and seal all openings with pressure sensitive tape.

ELECTRICAL EQUIPMENT LOCATED OUTSIDE OF ELECTRICAL CABINETS

1. Apply light coat of petroleum jelly to contact tips of contactors and wrap contactors with MIL-B-131 barrier material and seal with pressure sensitive tape.
2. Wrap resistors, switches, and magnet valves with MIL-B-131 barrier material and seal with pressure sensitive tape.
3. Cover ground light housings, pushbutton switch boxes, and all electrical receptacles with MIL-B-121 barrier material and seal with pressure sensitive tape.

CONTROL STAND

1. Suspend three 1 lb bags of desiccant inside of control stand.
2. Seal all openings with pressure sensitive tape.
3. Coat all unpainted metal control handles with MIL-C-16173, Grade 4 or equivalent.

TRACTION MOTORS

1. Remove brushes and screws holding brush leads from traction motors. Wrap brushes in MIL-B-131 barrier material, seal with pressure sensitive tape, and store brushes in locomotive cab.
2. Suspend four 1 lb bags of desiccant at commutator end of motor. Place bags so they do not contact any moveable parts of the motor. Replace covers and seal with pressure sensitive tape.
3. Cover vents on pinion gear end of motor with MIL-B-121 barrier material and seal with pressure sensitive tape.
4. Seal drain holes on commutator end with pressure sensitive tape.
5. Cover air outlets with MIL-B-121 barrier material and seal with pressure sensitive tape.
6. Slide plywood cover between unattached end of traction motor air duct and motor or locomotive underframe. Seal with pressure sensitive tape.

7. Check lubricant level of gear case and support bearing caps. Fill to operating level.
8. Seal gear case openings and overflow drains with pressure sensitive tape.

TRUCK JOURNAL BOXES

Roller Bearing Type -

Add lubricant as necessary. Locomotives with roller bearing journal boxes must be moved periodically while in storage to prevent brinelling of the journals.

Friction Type -

Add lubricant as necessary. Jack up journal boxes and place oak wooden blocks between journal box and tie bar and wire in place.

AIR BRAKE EQUIPMENT

1. Remove brake cylinder end and apply cylinder grease on inside of cylinder and piston. Replace cover.
2. Seal vent on underside of cylinder with pressure sensitive tape.
3. Wrap piston end of cylinder with VPI-B and seal with pressure sensitive tape.

BATTERIES

1. Disconnect and insulate battery leads at the battery. Secure the ends.
2. Grease all terminals with petroleum jelly.
3. Used batteries (when stored) should be cleaned with sodium bicarbonate or soda ash.
4. Check fluid level and charge batteries.
5. Clean and paint battery boxes.

CARBODY

1. Seal all fan and exhaust openings in roof with MIL-B-121 barrier material and pressure sensitive tape.
2. Seal all air intake openings with MIL-B-121 barrier material and pressure sensitive tape.

3. Empty sand boxes and seal openings with pressure sensitive tape.
4. Apply Tectyl 823EM to door locks and hinges.
5. Boarding up of windows, hatches, grills, etc., may or may not be deemed necessary depending upon the conditions of the storage area and upon the anticipated length of storage.

MISCELLANEOUS

1. Bell

Wrap the bottom of the bell with MIL-B-121 barrier material and seal with pressure sensitive tape.

2. Headlights And Class Lights

Cover lenses with MIL-B-121 barrier material and seal with pressure sensitive tape.

3. Belts And Sheaves

Remove belts and store in flat position. Coat sheaves with MIL-C-16173 or equivalent.

4. Water Coolers

Service according to manufacturer's instructions.

5. Air Filters

All engine and carbody air filters should be cleaned and oiled before storage, and should be reserviced when the locomotive is taken out of storage.

6. Steam Generators

Refer to manufacturer's instructions for protection of coils, valves, pumps, belts and sheaves, and electrical equipment.

7. Windshield Wipers

Remove wiper blades, package in MIL-B-131 barrier material sealed with pressure sensitive tape, and store in cab. Wrap wiper arms with VPI-B and seal with pressure sensitive tape.

8. Speed Recorder

Wrap with MIL-B-131 barrier material and seal with pressure sensitive tape.

9. General Couplings

Coat metal portions with MIL-C-16173 or equivalent, wrap with VPI-B and seal with pressure sensitive tape.

10. Gauge Glasses

Cover with MIL-B-131 barrier material and seal with pressure sensitive tape.

11. Air Hoses

Remove from mountings, wrap with MIL-B-121 barrier material, seal with pressure sensitive tape and store in locomotive cab. Seal air pipes with MIL-B-121 barrier material and seal with pressure sensitive tape.

INSPECTION

Perform the following inspections at the intervals listed below:

THREE MONTHS

1. Lift engine top deck covers and inspect for initial signs of corrosion. More intensive inspection should not be attempted unless signs of corrosion are found. Usually a spray of Tectyl 823EM is all that is necessary to terminate progressive corrosion before it reaches serious proportions.

CAUTION: Do not bar engine over during this inspection.

2. Locomotives equipped with roller bearing journals should be moved to prevent brinelling of bearing journals and to distribute lubricant to the axle and pinion gears and motor support bearings.
3. Check fluid and charge batteries.
4. Replace all sealing materials disturbed during this inspection. Do not reuse original materials.

SIX MONTHS

1. Inspect engine airbox and oil pan for signs of corrosion.

2. Inspect desiccant color cards on all equipment where desiccant bags are used and replace bags and cards where necessary.
3. Inspect VPI material and replace if material color so indicates.
4. Replace all sealing materials disturbed during inspection. Do not reuse original material.

CAUTION: Do not bar engine over during this inspection.