



M.I. 1740  
\*Rev. 1

# M AINTENANCE I NSTRUCTION

## SCHEDULED MAINTENANCE PROGRAM TURBOCHARGED F, GP, & SD MODEL LOCOMOTIVES (645E3 THRU 645E3C ENGINES)

### INTRODUCTION

This Maintenance Instruction provides average recommendations which should ensure satisfactory locomotive operation and economical maintenance cost where average load factors and average climatic conditions are encountered. It is intended to serve as a guide when establishing maintenance schedules that will meet the particular requirements of individual operations, and planned economic life of the locomotive.

These recommendations are based on the following conditions:

1. Fuel oil used will meet the specifications of Maintenance Instruction 1750.
2. Lubricating oil used will meet the specifications of the applicable Maintenance Instructions and will be changed at the intervals specified in this M.I.
3. Engine coolant used will meet the specifications in Maintenance Instruction 1748.

4. Lubricating oil filters will be of a quality equal to original equipment and will be changed at the intervals specified in this M.I.
5. Procedures listed in M.I. 1705 or 1707 will be followed for new locomotives and newly installed replacement assemblies.

### INSTRUCTION REFERENCES

Abbreviations are used in this instruction to reference publications that contain information related to maintenance. The following examples are provided to aid in understanding the abbreviations used.

LSM means Locomotive Service Manual

EMM means Engine Maintenance Manual

M.I. means Maintenance Instruction

ETG means Electrical Troubleshooting Guide

\*This bulletin is revised and supersedes previous issues of this number.  
Areas of change are indicated by vertical bars.

**ONE WEEK OR 3,500 MILES**

**LUBE OIL FILTERS**

Check lube oil filter tank pressure.

LSM. Checks can be made weekly or oftener at fueling or turnaround points. Replace filter elements if tank pressure so indicates.

**FUEL FILTER**

Check pressure differential at rack mounted filter gauge.

LSM. Same note as immediately above. Use only pleated cotton-paper element.

**TRACTION MOTOR SUPPORT BEARINGS**

Check lubricant level.

Fill to overflow. M.I. 1756.

**TRACTION MOTOR GEAR CASE**

Maintain lubricant at sufficient level to provide full gear tooth dip into grease.

M.I. 1756

**AUTOMATIC COOLING SYSTEM DRAIN  
(Where Used)**

Check drain valve operation.

M.I. 582

**ONE MONTH OR 15,000 MILES**

**LUBE OIL**

Take sample for analysis.

The services of a competent laboratory may help to monitor the suitability of the oil for continued use according to M.I. 1752.

**ENGINE PROTECTOR**

Check operation.

EMM, LSM, M.I. 259 or M.I. 260

**GENERATOR PIT DRAIN ASPIRATOR**

Inspect and clean, if needed.

LSM

**AIR BOX DRAINS**

Check operation and clean, if necessary.

EMM

**BATTERY**

Check electrolyte level.

Check specific gravity.

Wash out battery boxes.

**ONE MONTH OR 15,000 MILES (CONT'D)****MAIN GENERATOR**

Inspect diode fuses, replace diodes and fuses as required.

M.I. 3317-2. Whenever generator air box panels are removed, clean the inspection windows, and inspect collector rings and brushes.

**SOAK BACK PUMP AND MOTOR**

Check operation.

With the engine shut down and soak back pump motor running, remove left rear handhole cover and check oil flow through gear train.

Observe camshaft bearings. If lube oil flows from camshaft bearings with soak back pump running and engine shut down, inspect turbo filter outlet check valve for proper operation.

**ENGINE AIR FILTER - CYCOIL TYPE  
(Where Used)**

Check oil level.

LSM

**ENGINE AIR FILTER - PAPER OR  
FIBERGLASS TYPE (Where Used)**

Check indicator. If tripped, take manometer readings and replace elements if necessary.

LSM

**ANNUNCIATOR MODULE (Where Used)**

Monitor annunciator and record lighted indicators.

LSM, ETG

Perform checks or maintenance indicated by lights.

Set annunciator switch to test position and observe that all annunciator lamps are lighted.

Place annunciator switch to reset position.

**JOURNAL BOX**

Maintain to fill plug level.

M.I. 1756, M.I. 1552

**TWO MONTHS OR 30,000 MILES****LUBE OIL FILTER - SEVEN ELEMENTS**

Change filter elements.

LSM

Clean lube oil strainer.

EMM. Fill strainer housing with oil before starting engine.

**TWO MONTHS OR 30,000 MILES (CONT'D)**

**TURBOCHARGER AND SOAK BACK OIL FILTERS**

Replace elements.

Filter elements must be of a quality equal to original equipment. The interval of change for turbocharger and soak back filter elements is influenced by load factor, kind of lubricating oil, type of operation, climatic conditions, and maintenance of main lube oil filters.

Where these factors are favorable, it may be possible to extend the period to 3 months, but do not exceed this interval.

**THREE MONTHS OR 45,000 MILES**

**FUEL FILTERS**

Clean or replace suction strainer element.

LSM

Change engine mounted filter elements.

EMM. Use only elements equal to original equipment.

Change rack mounted filter(s).

LSM. Use only pleated cotton-paper elements.

**COOLING SYSTEM**

Check inhibitor concentration.

M.I. 1748

Check for proper cooling system drain operation (Where Used).

**FUEL TANK**

Drain condensate.

LSM. More frequently during periods of high humidity or rapid temperature change.

**TRACTION MOTORS**

Replace brushes (in sets only).

M.I. 3900. Depending upon type of service and operating conditions, brush life will range from 3 to 6 months.

Clean creepage areas and blow out with clean dry air.

Visually inspect support bearing wick lubricators for dirt plugging of the wick and for excessive wear.

Clean and replace as necessary.

**INERTIAL FILTER BLOWER MOTOR**

Check operation.

**ELECTRICAL CABINET PRESSURE TAPS**

Check hoses and taps for leaks or obstructions.

**THREE MONTHS OR 45,000 MILES (CONT'D)**

**ENGINE AIR FILTERS - CYCOIL**

Change oil. Drain and fill only. LSM

**ENGINE AIR FILTERS - PAPER**

Take manometer readings. Replace elements if necessary. LSM

**ENGINE AIR FILTERS - FIBERGLASS**

Replace elements.

**TURBOCHARGER EXHAUST DIFFUSER**

Visually inspect for evidence of warpage or damage.

**EDUCTOR TUBE**

Inspect for carbon deposits and clean, if necessary. EMM

**BATTERY**

Wash cell tops and apply petroleum jelly to terminals.

Inspect battery boxes for damage or rust. Repair and paint if necessary.

**LOW VOLTAGE ELECTRICAL SYSTEM**

Check for grounds. LSM

**ENGINE**

Inspect air box. EMM

Inspect crankcase. EMM

Inspect crankshaft and connecting rods. EMM

Inspect pistons and piston rings. EMM

Inspect cylinder liners. EMM

Inspect cylinder head mechanism with engine idling and at operating temperature. EMM

Inspect engine fuel lines and connections for leaks. EMM

Inspect engine water system for leaks. EMM, LSM

**SPEED RECORDER AND DRIVE CABLE**

Lubricate

This item is not required for grease lubricated recorders. Refer to speed recorder manufacturer's bulletins.

**THREE MONTHS OR 45,000 MILES (CONT'D)**

**DOOR HARDWARE**

Lubricate hinges, latches, and linkage.

M.I. 1756

**SIX MONTHS OR 90,000 MILES**

**OIL SYSTEM**

Change engine oil.

LSM, EMM. Evaluation of engine and oil condition should dictate the frequency of this item. Type of service, type of oil, quality of filter elements, and condition of engine will influence the frequency of oil change.

Clean oil suction screens.

EMM

Clean scavenging oil screens.

EMM. Fill strainer housing with oil before starting engine.

Clean oil pan.

Clean filter housing.

**ENGINE**

Check pressure drop across aftercoolers; oil bath filter equipped engines only.

LSM. Clean air passages if necessary.

Check exhaust manifold base flange bolts for proper tightness.

**EXHAUST SYSTEM**

Remove manifold adapter and screen assembly. Check for cracks, clean screen and trap box.

EMM

**RADIATORS**

Clean air passages.

LSM and M.I. 549. Operation in certain sections of the country and during certain seasons will require more frequent cleaning due to airborne seeds and leaves.

**MAIN GENERATOR**

Inspect collector rings and brushes.

M.I. 3317-2

Reverse polarity of collector rings.

**MAIN RESERVOIR**

Replace air filter element.

LSM

Check operation of automatic drain valves.

LSM

**SIX MONTHS OR 90,000 MILES (CONT'D)****IDAC (Where Used)**

Check operation.	LSM
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**MODULE TESTING (Where Used)**

Perform self-test on modules.	LSM, ETG
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**VOLTAGE REGULATOR (Where Used)**

Check auxiliary generator output voltage.	LSM, ETG
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Check auxiliary generator reference voltage.	
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**VR MODULE (Where Used)**

Check auxiliary generator output voltage.	LSM, ETG
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**TH MODULE (Where Used)**

Check output voltage of VRR section.	LSM
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**GROUND RELAY**

Check ground relay action.	LSM
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**HANDBRAKE**

Check operation and lubricate.	M.I. 1577
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**CAB SEATS**

Lubricate cab seat posts and guide rails.	Lubriplate 630-2 or equivalent.
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**ONE YEAR OR 180,000 MILES****ENGINE BOLT AND NUT RETORQUING**

Cylinder head crab nuts.	Follow torquing procedures as outlined in the EMM. (All except those equipped with plate type crabs.)
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Main lube oil and piston cooling oil pump shaft nut.	EMM
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Head frame to crankcase bolts.	EMM
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Turbocharger to air duct bolts, aftercooler to air duct bolts, and air duct to crankcase bolts, and turbine inlet link bolts.	EMM
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**ENGINE**

Replace top deck cover seals and check latches.	EMM
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Qualify injectors.	EMM
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Set injector timing and injector rack length.	EMM
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## ONE YEAR OR 180,000 MILES (CONT'D)

## ENGINE (CONT'D)

Check engine speed.	EMM
Check overspeed trip.	EMM
Check governor pilot valve setting.	EMM. If engine speed is changed, reset on governor stand.
Remove and clean oil separator element.	EMM
Check pressure drop across aftercooler; paper and fiberglass filter equipped engines only.	LSM, EMM. Clean air passages if necessary.
Inspect crankshaft damping device.	EMM
Remove, clean, and inspect; replace if necessary.	EMM
Soak back check valve in the turbo filter inlet.	
Soak back oil pressure relief valve in the soak back filter head.	
Soak back filter bypass valve in the soak back filter head.	
Turbo oil filter check valve in the turbo filter head.	

## EXHAUST SYSTEM

Inspect manifold sections for possible cracked leg baffles or expansion joints and replace, if necessary.

## AIR COMPRESSOR

Clean air intake screen (Where Used).	LSM
Clean air filter housing and replace air filter elements. Do not attempt to clean elements.	LSM
Change oil.	M.I. 1756

## AIR FILTERS

Carbody (Inertial)	LSM
Measure pressure drop. Clean if necessary.	
Engine (Cycoil)	LSM
Change oil and clean sump.	
Check operation of variflow valves.	
Check condition of hoses.	

## ONE YEAR OR 180,000 MILES (CONT'D)

## LUBE OIL FILTER

Remove oil filter bypass valve; clean, inspect, and test. M.I. 926

## MAGNET VALVES

Clean and replace seats. M.I. 4707

## ELECTRICAL CABINETS

Air Filter LSM

Change filter element.

## Door Seals

Check for damage and leakage. Replace if necessary. Adjust lock keeper, if required.

Contact Tips LSM and applicable M.I.

Visually inspect tips of all power contactors, reversers, and brake transfer switches. Replace as required.

Check timing of time delay devices. LSM and applicable settings chart drawing.

## AUXILIARY GENERATOR

Inspect and replace brushes when required. Normal auxiliary generator brush life is between 21 and 24 months.  
Replace in sets.

## DYNAMIC BRAKE RHEOSTAT (Where Used)

Blow out with dry air. Inspect contact brush and replace if necessary. M.I. 4334

## LOAD REGULATOR - LINEAR-TYPE RHEOSTAT

Blow out with dry air and clean windings, if necessary. M.I. 4506

Check rheostat operation and replace if necessary.

## FUEL PUMP MOTOR

Inspect and clean with dry air. M.I. 4101

Replace brushes.

## STARTING MOTORS

Blow out with dry air. EMM

## CAB HEAT BLOWER MOTOR

Replace brushes.

## ONE YEAR OR 180,000 MILES (CONT'D)

## AIR CONDITIONER (Where Used)

Inspect compressor motor brushes and replace if necessary. M.I. 4122

Inspect blower motor brushes and replace if necessary.

Clean evaporator return air filter.

Clean condenser coils.

COOLING FANS AND ENGINE  
TEMPERATURE SWITCHES

Check for proper operation and setting. LSM and applicable M.I.

Replace or recondition shutter magnet valves. M.I. 4707

## DYNAMIC BRAKE GRIDS (Where Used)

Inspect and blow clean with dry air. M.I. 1601

DYNAMIC BRAKE BLOWER MOTOR  
(Where Used)

Inspect in place; renew brushes as necessary. M.I. 4104  
(Replace brushes in sets.)

## SOAK BACK PUMP MOTOR

Inspect and clean with dry air. M.I. 4101

Replace brushes.

## MAIN GENERATOR

Replace collector ring brushes. M.I. 3317-2

## TRACTION MOTOR

Check air duct bellows for alignment and leakage.  
Inspect wear plates and arm.

Replace support bearing wick lubricators. M.I. 3900

## HEAD END GEAR BOX (Where Used)

Change oil. M.I. 1252

Clean oil fill/breather assembly.

ALIGNMENT CONTROL COUPLER  
(Where Used)

Check for wear and alignment control engagement. M.I. 2703

**ONE YEAR OR 180,000 MILES (CONT'D)****COOLING SYSTEM**

Inspect and perform pressure test. LSM

Replace pressure cap if defective.

Clean or renew header screens after first year of operation. Condition of screen at this inspection can provide a basis for future cleaning. M.I. 549 and M.I. 550. The presence of metal chips at first cleaning or after engine parts have been renewed is not an abnormal condition.

**GOVERNOR**

Change oil. EMM, M.I. 1764

**BRAKE SLACK ADJUSTER SCREWS**

Coat threads, using graphite grease.

**TRUCK CENTER BEARING**

Add two quarts of oil. LSM

**AUTOMATIC MAIN RESERVOIR DRAIN VALVES**

Clean and repair.

**AUTOMATIC COOLING SYSTEM DRAIN  
(Where Used)**

Recondition automatic drain valve. M.I. 582

**TWO YEARS OR 360,000 MILES****LUBE OIL COOLER**

Check temperature differential between lube oil and cooling water into engine. LSM, M.I. 927, M.I. 928. Clean cooler, if necessary.

**HOT OIL DETECTOR**

Remove and check for operation at proper temperature. LSM

**FUEL PUMP AND MOTOR**

Replace coupling spider.

**STARTING MOTORS**

Disassemble, clean, and lubricate. EMM

Inspect brushes and replace if necessary. EMM

**AIR COMPRESSOR (Gear Type Oil Pump)**

Replace oil filter. M.I. 1144

**TWO YEARS OR 360,000 MILES (CONT'D)****SOAK BACK PUMP**

Replace coupling spider.

**COOLING SYSTEM PRESSURE CAP**

Replace cap. LSM

Inspect filler neck for damage. Replace if damaged.

**ENGINE PROTECTOR**

Replace or recondition and requalify.

M.I. 259 or M.I. 260. Qualify on test stand after renewing springs, "O" rings, and diaphragms. Replacement can be EMD Unit Exchange.

**ELECTRICAL CONTROL CIRCUITS**

Check settings and operation of non-modular protective and regulating devices and circuits. LSM

On module equipped locomotives, qualify modules and related circuits. ETG

**FUEL OIL PREHEATER (Where Used)**

Renew thermostatic valve element.

**THREE YEARS OR 540,000 MILES****ENGINE**

Replace cylinder assemblies. EMM

Replace injectors. EMM. Replacement should be EMD Unit Exchange or equivalent.

Inspect and qualify connecting rod bearings. EMM

Inspect and qualify piston cooling tubes. EMM

Install new thrust collars. EMM

Install new lower main bearings. EMM

Check rocker arms, rocker arm bushings, and cam followers. EMM

Check lash adjusters. EMM

Check exhaust valve timing. EMM

Replace water pump seals and all worn parts. EMM

Inspect lower liner inserts and replace if necessary. EMM

**THREE YEARS OR 540,000 MILES (CONT'D)****AIR COMPRESSOR**

Recondition valves.

M.I. 1144, LSM

**TRACTION MOTORS**

Replace.

Replacement motors should be EMD Unit Exchange or equivalent. Refer to non-scheduled maintenance portion of this M.I.

**MAIN GENERATOR**

Remove rectifier assemblies from air box. Remove fuses and thoroughly wash heat sink and diodes.

M.I. 3317-2.

**CAUTION**

Never use a caustic solution.

**COOLING SYSTEM**

Replace flexible coupling seals.

**BATTERY BOXES**

Clean and paint.

**SHUTTER AIR CYLINDERS**

Replace piston, piston rod, and cylinder seals.

Air test cylinder after seal replacement.

**FOUR YEARS OR 720,000 MILES****DYNAMIC BRAKE BLOWER**

Replace.

Replacement should be EMD Unit Exchange or equivalent.

**TURBOCHARGER**

Unit exchange.

EMM. Average individual operating conditions will determine frequency.

**TURBOCHARGER-TO-FILTER AIR DUCT  
(Where Used)**

Replace

**GOVERNOR**

Replace.

Replacement should be EMD Unit Exchange or equivalent.

**FUEL PUMP AND MOTOR**

Recondition.

M.I. 4101, M.I. 4110

**SOAK BACK PUMP AND MOTOR**

Recondition.

M.I. 4101, M.I. 4110

**FOUR YEARS OR 720,000 MILES (CONT'D)****AUXILIARY GENERATOR**

Replace. M.I. 1753. Replacement should be EMD Unit Exchange or equivalent.

Replace drive couplings. M.I. 1753

**INERTIAL AIR FILTER MOTOR**

Replace. Replacement should be EMD Unit Exchange or equivalent.

**COOLING FANS**

Replace. Replacement should be EMD Unit Exchange or equivalent.

**SIX YEARS OR 1,080,000 MILES****AIR COMPRESSOR**

Recondition. M.I. 1144

Recondition drive coupling. M.I. 1753

**HEAD END GEAR BOX (Where Used)**

Recondition. M.I. 1252

Recondition drive coupling. M.I. 1753

**ENGINE**

Replace crankshaft harmonic balancer (Where Used). Recondition and requalify.

Replace or recondition oil pumps. EMM. Replacement can be EMD Unit Exchange.

Remove oil pressure relief valve; clean, inspect, and test. EMM

Replace lower liner inserts. EMM

Inspect injector control linkage. Replace links, seals, and bearings if required. EMM

**MAIN GENERATOR**

(Large bearing) Remove bearing cover and inspect for grease contamination, excessive wear, and overheating. Apply new grease. M.I. 3317-1

(Small bearing) Replace bearing and bearing housing. M.I. 3317-1

**MAIN RESERVOIR SYSTEM**

Clean system and recondition valves.

**NINE YEARS OR 1,620,000 MILES****ENGINE**

Replace crankshaft viscous damper (Where Used).	EMM. Replace with gear type damper.
Replace crankshaft gear type damper (Where Used).	EMM. Recondition and requalify.

**TWELVE YEARS OR 2,160,000 MILES****ENGINE**

Replace.	Replacement should be EMD Unit Exchange or equivalent.
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**MAIN GENERATOR**

Replace.	Replacement should be EMD Unit Exchange or equivalent.
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**HIGH VOLTAGE CABLING**

Renew.	It is recognized that this work may not be required at this particular time or mileage. However, shop efficiency may require this operation at time of engine and generator Unit Exchange.
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**LOW VOLTAGE WIRING**

Renew.	Same remark as immediately above.
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NON-SCHEDULED MAINTENANCE

A definite time or mileage schedule for items listed below cannot be established due to variations in wear and component life related to operating conditions.

The following work is to be performed at wheel change time or when truck is removed for reconditioning.

**PINION**

Check for involute profile wear.

Magnaflux. M.I. 1518

**AXLE GEAR**

Check for involute profile wear.

Magnaflux. M.I. 1518

**AXLE**

Magnaflux with wheels and inner races removed. M.I. 1518

**TRACTION MOTOR**

Check bearings using heat and noise test. M.I. 3900. Whenever truck assembly is removed from locomotive, check traction motors for unusual bearing noise or heat at not less than 1500 RPM.

Jigstone commutator and clean slots. M.I. 3900. Restore smooth and concentric surface when inspection indicates need.

**CAUTION**

Do not stone commutator by hand.

**JOURNAL BOXES/JOURNAL BEARINGS**

Clean and recondition. M.I. 1552

**TRUCK ASSEMBLIES**

Inspect, test, and repair or replace the following items as necessary; frame, bolster, wear plates, liners, springs, spring seats, snubbers, brake rigging, rubber bolster springs, shock absorbers, and sander guides. M.I.'s 1501, 1504, or 1506.

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