



ELECTRO-MOTIVE

M.I. 1728
MAINTENANCE INSTRUCTION

*Rev. H

SCHEDULED MAINTENANCE PROGRAM
DOMESTIC STATIONARY POWER UNITS
WITH TURBORCHARGED ENGINES

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

INTRODUCTION

This Maintenance Instruction provides average recommendations which should ensure satisfactory engine 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 engine and associated equipment.

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 Maintenance Instructions 1760 and 1764 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. Operating load limitations will be adhered to.
6. Torquing procedures contained in this M.I. will be followed for new engines and newly installed replacement assemblies.

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.

EMM means Engine Maintenance Manual

OM means Operating Manual

M.I. means Maintenance Instruction

CAUTION

If the only available diesel fuel does not meet the sulfur content, distillation recovery, or sediment and ash specifications contained in M.I. 1750, observe the schedules and cautions given in M.I. 1725, Scheduled Maintenance Program — Export Stationary Power Units With Turbocharged Engines.

The use of good quality, high alkaline reserve lubricating oils is strongly recommended where only high sulfur fuels are available for use.

NOTE

The following recommendations are applicable to stationary power units used for emergency power.

1. Unit should be operated at least once a week.
2. Operate unit at idle for a sufficient period of time to allow coolant temperature to stabilize at 49°C (120°F) or higher.

If minimum temperature cannot be obtained at idle speed, gradually apply load until temperature stabilizes.

3. Operate unit at full speed, full load for a minimum of one hour.

BEFORE EACH START**(NON-AUTOMATIC START UNITS)****LUBE OIL SYSTEM**

Check for lube oil in pan and strainer housing. Add oil if required. EMM, M.I. 1760

NOTE

If engine requires prelube, recheck lube oil level in pan as a quantity will transfer to external system (cooler, filter, strainer and piping). Add oil if required.

COOLING SYSTEM

Check coolant level. Add coolant if necessary. OM, M.I. 1748

NOTE

Do not continue to operate engine requiring periodic addition of coolant. Check for possible coolant leak and repair if required.

FUEL SYSTEM

Check fuel supply and open fuel supply valves. OM

Prime system. OM

AIR SYSTEM

Drain condensate. OM

Check system pressure. OM

Check oil supply in air line lubricator. EMM

ENGINE

- Check overspeed trip lever OST to ensure it is in the running "latched" position. EMM
- Open cylinder test valves and manually bar over engine one complete revolution, check for liquid ejected from valves, and close test valves. If fluid discharge is observed from any cylinder, find the cause and make necessary repairs prior to starting the engine.
- Prelube engine if unit has been shut down for over 48 hours. EMM. Unless equipped with immersion heater system.
- Check racks. EMM. Move injector control lever to check for freedom of movement with no binding of injectors.
- Ensure exhaust stack is open.

GOVERNOR

- Check oil level. Add oil if necessary. EMM, M.I. 1764

IMMEDIATELY AFTER EACH START

(NON-AUTOMATIC START UNITS)

INSPECT FOR LEAKS

- Cooling system
- Fuel oil system
- Lube oil system
- Exhaust system
- Air system

LUBE OIL SYSTEM

- Check lube oil level in pan with engine at idle. EMM
- Check lube oil pressure at engine. OM

COOLING SYSTEM

- Check operation of external cooling system. OM

FUEL SYSTEM

- Check for proper fuel pressure. OM

ENGINE

- Check cylinder test valves for leakage. Tighten if required. EMM
- Check handhole covers for leakage. Tighten if required. EMM
- Check air box drains for proper operation and clean, if necessary. EMM. If drains are kept closed, drain every 4 hours.
- Check for unusual noises or sounds, or any fault indications (lights or alarm), as provided.

PERFORM THE FOLLOWING ITEMS ON CALENDAR TIME BASIS

DAILY

(NON-AUTOMATIC START UNITS)

INSPECT FOR LEAKS

- Cooling system
- Fuel oil system
- Lube oil system
- Exhaust system
- Air system

LUBE OIL SYSTEM

Check lube oil level in pan. Add oil if required. EMM, M.I. 1760

COOLING SYSTEM

Check coolant level. Add coolant if necessary. OM, M.I. 1748

NOTE

Do not continue to operate engine requiring periodic addition of coolant. Check for possible coolant leak and repair as required.

FUEL SYSTEM

Check fuel supply. OM

AIR SYSTEM

Drain condensate from lines and tanks.

GOVERNOR

Check oil level. Add oil if required. EMM, M.I. 1764

WEEKLY

(AUTOMATIC START UNITS)

ENGINE SHUT DOWN

LUBE OIL SYSTEM

Check for lube oil in pan and strainer housing. Add oil if required. EMM, M.I. 1760

NOTE

If engine requires prelube, recheck lube oil level in pan as a quantity will transfer to external system (cooler, filter, strainer and piping). Add oil if required.

COOLING SYSTEM

Check coolant level. Add coolant if necessary.

OM, M.I. 1748

NOTE

Do not continue to operate engine requiring periodic addition of coolant. Check for possible coolant leak and repair if required.

FUEL SYSTEM

Check fuel supply.

OM

AIR SYSTEM

Drain condensate.

OM

Check system pressure.

OM

Check oil supply in air line lubricator.

EMM

ENGINE

Prior to maintenance start, check overspeed trip lever OST to ensure it is in the running "latched" position.

EMM

Prior to maintenance start, open cylinder test valves and manually bar over engine one complete revolution, check for liquid ejected from valves, and close test valves.

If fluid discharge is observed from any cylinder, find the cause and make the necessary repairs prior to starting the engine.

Prelube engine if unit has been shut down for over 48 hours.

EMM. Unless equipped with immersion heater system.

Check racks.

EMM. Move injector control lever to check for freedom of movement with no binding of injectors.

Prior to maintenance start, ensure that exhaust stack is open.

GOVERNOR

Check oil level. Add oil if necessary.

EMM, M.I. 1764

ENGINE RUNNING

INSPECT FOR LEAKS

Cooling system
Fuel oil system
Lube oil system
Exhaust sytem
Air system

LUBE OIL SYSTEM

- Check lube oil level in pan with engine at idle. EMM
- Check lube oil pressure at engine. OM

COOLING SYSTEM

- Check operation of external cooling system. OM

FUEL SYSTEM

- Check for proper fuel pressure. OM

ENGINE

- Check cylinder test valves for leakage. Tighten if required. EMM
- Check handhole covers for leakage. Tighten if required. EMM
- Check air box drains for proper operation and clean, if necessary. EMM. If drains are kept closed, drain every 4 hours.
- Check for unusual noises or sounds, or any fault indications (lights or alarm), as provided.

EVERY MONTH

LUBE OIL SYSTEM

- Take sample for analysis. The services of a competent laboratory should be used to monitor the suitability of the oil for continued use according to M.I. 1760.

LUBE OIL CIRCULATING PUMP AND MOTOR (Where Used)

- Check for proper operation. OM

IMMERSION HEATER (Where Used)

- Check for proper operation. OM

EVERY TWO MONTHS

AUXILIARY TURBOCHARGER FILTER (Where Used)

- Replace elements. OM

IN-LINE LUBE OIL STRAINER (Where Used)

- Clean strainer screen.

EVERY YEAR

LUBE OIL CIRCULATING PUMP AND MOTOR (Where Used)

Inspect and clean with dry air.

Replace brushes.

If equipped with DC motor.

Remove and clean check valve.

LUBE OIL FILTERS

Change filter elements.

EMM. Unless the 1400 hour filter change has occurred first.

Clean lube oil strainer.

EMM. Fill strainer housing with oil before starting engine.

TURBOCHARGER OIL FILTER

Replace filter elements.

EMM. Unless 1400 hour filter change has occurred first.

SOAK BACK OIL FILTER (Where Used)

Replace filter element.

EMM. Unless 1400 hour filter change has occurred first.

ELECTRICAL CONTROL CABINET AND ASSOCIATED EQUIPMENT (Where Used)

Check operation of protective devices.

Protective switches, relays, and alarm indicators.

Visually inspect and clean:

Voltage regulator.

M.I. 4523 or appropriate manufacturer's voltage regulator manual.

All relays, contactors, and circuit breakers.

OM

Remove circuit breakers from compartments.

Clean insulators.

Lubricate linkage bearings.

Check operation.

COOLING SYSTEM

Check operation and setting of engine water temperature control(s).

Check torque on flexible pipe coupling bolts.

Take cooling water sample for lab analysis and corrosion test.

M.I. 1748. Unless 2000 hour sampling has occurred first.

LUBE OIL COOLER

Check temperature differential between lube oil and cooling water into engine.

OM and M.I. 927. Clean cooler, if necessary.

EVERY TWO YEARS

FUEL FILTERS

Change engine mounted filter elements.	EMM. Unless 2000 hour filter change has occurred first.
Clean or replace suction strainer element.	OM. Unless 2000 hour maintenance has occurred first.

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.
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LUBE OIL CIRCULATING PUMP AND MOTOR (Where Used)

Replace.	Replacement can be EMD Unit Exchange.
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EVERY THREE YEARS

COOLING SYSTEM THERMOSTATIC VALVE

Replace "O" rings and thermostatic elements.	EMM, M.I. 581
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EVERY FOUR YEARS

COOLING SYSTEM PRESSURE CAP

Replace.	Unless 16,000 hour replacement has occurred first.
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EVERY FIVE YEARS

FREQUENCY GENERATOR COUPLING SPIDER (Where Used)

Replace.	Unless 16,000 hour replacement has occurred first.
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EVERY SIX YEARS

ENGINE

Replace top deck cover seals and check latches.	EMM. Unless 8000 hour replacement has occurred first.
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Replace cylinder head grommets, inlet and outlet seals, and lower liner seals.	EMM. Unless 16,000 hour cylinder assembly replacement has occurred first.
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MAIN GENERATOR

Remove bearing cover and inspect for grease contamination, excessive wear, and overheating. Apply new grease.	Unless 60,000 hour lubrication has occurred first. M.I. 3327 or M.I. 3328 for EMD generators. If generator is other than EMD, refer to manufacturer's manual.
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PERFORM THE FOLLOWING ITEMS ON RUNNING TIME BASIS

AFTER THE FIRST 350 HOURS OF OPERATION

ENGINE NUT AND BOLT TIGHTNESS CHECK Check that the following nuts and bolts are tightened to the correct values specified in the EMM.

- Cylinder head crab nuts. All except those equipped with plate type crabs.
- Exhaust manifold flange bolts.
- Cylinder liner water inlet line nuts and bolts.
- Head frame to crankcase bolts.
- Turbocharger to air duct bolts, aftercooler to air duct bolts, and air duct to crankcase bolts, and turbine inlet link bolts.
- Engine mounting bolts.
- Miscellaneous nuts and bolts, and all piping connections.

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 connection for leaks. EMM
- Inspect engine water system for leaks. EMM

EVERY 350 HOURS

FUEL FILTER

- Check fuel pressure gauge with engine at rated RPM. On units where gauge is connected to filter input side, change filter elements if pressure is greater than 345 kPa (50 psi).
On units where gauge is connected on filter output side, change filter elements if pressure is less than 83 kPa (12 psi).

LUBE OIL FILTER

- Check lube oil pressure at filter input with engine at rated RPM. Change filter elements if input pressure is greater than 172 kPa (25 psi).

EVERY 700 HOURS

ENGINE PROTECTOR

Check operation.

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

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.

OM, M.I. 442

ENGINE AIR FILTER - PANEL TYPE OIL BATH (Where Used)

Check oil level.

OM, M.I. 440

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

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

OM

HEAT EXCHANGER

Inspect corrosion zinc electrodes.

EMM

EVERY 1400 HOURS

LUBE OIL FILTERS

Change filter elements.

OM

Clean lube oil strainers.

EMM. Fill strainer housing with oil before starting engine.

TURBOCHARGER OIL FILTER

Replace filter element.

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

SOAK BACK OIL FILTER (Where Used)

Replace filter element.

Same as above.

AUXILIARY TURBOCHARGER FILTER (Where Used)

Replace elements.

EMM

PROTECTIVE DEVICES

Check operation.

OM, EMM

EVERY 2000 HOURS

FUEL FILTERS

- | | |
|--|---|
| Clean or replace suction strainer element. | OM |
| Change engine mounted filter elements. | EMM. Use only elements equal to original equipment. |

COOLING SYSTEM

- | | |
|--|---|
| Take cooling water sample for lab analysis and corrosion test. | M.I. 1748. Unless the yearly sampling has occurred first. |
|--|---|

ENGINE AIR FILTERS - CYCOIL TYPE (Where Used)

- | | |
|----------------------------------|--------------|
| Change oil. Drain and fill only. | OM, M.I. 442 |
|----------------------------------|--------------|

ENGINE AIR FILTER - PANEL TYPE OIL BATH (Where Used)

- | | |
|----------------------------------|--------------|
| Change oil. Drain and fill only. | OM, M.I. 440 |
|----------------------------------|--------------|

ENGINE AIR FILTERS - PAPER TYPE (Where Used)

- Take manometer readings. Replace elements if necessary.

NOTE

Take manometer readings whenever the annunciator light indicates a plugged filter.
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ENGINE AIR FILTERS - FIBERGLASS TYPE

- | | |
|-------------------|----|
| Replace elements. | OM |
|-------------------|----|

STARTING MOTORS (Electric)

- | | |
|------------------------|-----|
| Blow out with dry air. | EMM |
|------------------------|-----|

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 |

EVERY 4000 HOURS

EXHAUST SYSTEM

Remove exhaust manifold-to-turbocharger adapter assembly.

EMM. Clean screen and trap box. Observe recommendations found in EMM concerning checking for cracks.

TURBOCHARGER EXHAUST DIFFUSER

Visually inspect for evidence of warpage or damage.

EMM

EDUCTOR TUBE (Exhaust Stack Mounted)

Inspect for carbon deposits and clean, if necessary.

EMM

LUBE OIL SYSTEM

Change engine oil.

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 pan.

EMM

Clean filter housing.

EMM

Clean oil suction screens.

EMM

Clean scavenging oil screens.

EMM. Fill strainer housing with oil before starting engine.

ENGINE

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

EMM. Clean air passages if necessary.

Check exhaust manifold base flange bolts for proper tightness.

EMM

MAIN GENERATOR

If equipped, inspect brushes and collector rings. Replace brushes if required.

M.I. 3327 or M.I. 3328 for EMD generator. If generator is other than EMD, refer to manufacturer's manual.

If equipped, reverse polarity of collector rings.

GOVERNOR

Change oil.

EMM, M.I. 1764

Lubricate linkage moving parts.

EMM

Lubricate governor synchronizing motor, motor bearings. (Where used.)

EMM

EVERY 8000 HOURS

ENGINE NUT AND BOLT RETORQUING

Cylinder head crab nuts.	Follow retorquing procedures if called for in the EMM.
Main lube oil and piston cooling oil pump shaft nut.	EMM
Head frame to crankcase bolts.	EMM
Turbocharger to air duct bolts, aftercooler to air duct bolts, air duct to crankcase bolts, and turbine inlet link bolts.	
Engine mounting bolts.	
Miscellaneous nuts and bolts, and all piping connections.	

ENGINE

Replace top deck cover seals and check latches.	EMM
Qualify injectors.	EMM
Check injector timing and injector rack length.	EMM
Check engine speed.	EMM
Check overspeed trip.	EMM
Remove and clean oil separator element.	EMM
Check pressure drop across aftercooler; paper and fiberglass filter equipped engines only.	EMM. Clean air passages if necessary.
Inspect crankshaft damping device.	EMM
Remove, clean, and inspect; replace if necessary:	
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.	EMM
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MAIN GENERATOR AND BRUSHLESS EXCITER (If Equipped)

Clean and visually inspect.	M.I. 3327 or M.I. 3328
If equipped, replace collector ring brushes.	M.I. 3327

EXTERNAL EXCITER

Clean and visually inspect. M.I. 3706

Inspect and replace brushes when required. Replace brushes in sets only.

ENGINE AIR FILTER - CYCOIL TYPE (Where Used)

Change oil and clean sump. OM, M.I. 442

Check operation of variflow valves.

Check condition of hoses.

ENGINE AIR FILTERS - PANEL TYPE OIL BATH (Where Used)

Change oil. Clean sump and filter media. OM, M.I. 440

SOAK BACK PUMP MOTOR (Where Used)

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

Replace brushes. M.I. 4101

COOLING SYSTEM

Inspect and perform pressure test. OM

Replace pressure cap if defective. OM

LUBE OIL FILTER

Remove internal oil filter bypass valve; clean, inspect, and test. (Where used.) M.I. 926

LUBE OIL FILTER AND OIL COOLER BYPASS VALVES (Where Used)

Remove, clean, inspect, and test. EMM

STARTING MOTORS (Air)

Disassemble, clean, inspect and lubricate. EMM

STARTING MOTORS (Electric)

Disassemble, clean, inspect and lubricate. EMM

Inspect brushes and replace if necessary. EMM

EVERY 16,000 HOURS**FUEL PUMP**

Replace coupling spider.

SOAK BACK PUMP (Where Used)

Replace coupling spider.

FREQUENCY GENERATOR (Where Used)

Replace coupling spider.

COOLING SYSTEM

Replace pressure cap. (Where used.) OM

Inspect filler neck for damage. Replace if damaged. (Where used.) OM

ENGINE

Replace cylinder assemblies. EMM. Except where Premium Power Packs are used.

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

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

Check lash adjusters. EMM

Check exhaust valve timing. EMM

Inspect lower liner inserts, and replace if required. EMM

EVERY 30,000 HOURS

ENGINE

Replace power assemblies. EMM. Provided Premium Power Assemblies are used.

Install new thrust collars. EMM

Replace injectors. EMM

Install new lower main bearings. EMM

Install new upper conn. rod bearings. Inspect and qualify lower conn. rod bearing for re-use.

Replace water pump seals and all worn parts. EMM

Replace lash adjusters. EMM

Inspect lower liner inserts and replace if required. EMM

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

TURBOCHARGER

Unit Exchange.

EMM. Average individual operating conditions will determine frequency.

TURBOCHARGER-TO-FILTER AIR DUCT (Where Used)

Replace.

COOLING SYSTEM

Replace flexible coupling seals.

LUBE OIL COOLER

Inspect, clean, and test.

M.I. 927

HEAT EXCHANGER

Inspect, clean, and test.

EMM

GOVERNOR

Replace.

Replacement should be EMD Unit Exchange or equivalent.

GOVERNOR BOOSTER SERVO (Where Used)

Disassembly, clean, inspect, and replace O-ring seals.

EMM

FUEL PUMP

Replace or recondition.

M.I. 4110. Replacement can be EMD Unit Exchange.

SOAK BACK PUMP AND MOTOR (Where Used)

Replace or recondition.

M.I. 4101, M.I. 4110. Replacement can be EMD Unit Exchange.

EVERY 60,000 HOURS**ENGINE**Replace vibration damper or harmonic balancer.
(Where used.)

EMM. Replace with gear type damper.

Replace or recondition oil pumps.

EMM. Replacement can be EMD Unit Exchange.

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

EMM

Replace crankshaft damping device.

EMM. Replace with new or reconditioned gear type damper. If already equipped with gear type damper, recondition and requalify.

MAIN GENERATOR

Remove bearing cover and inspect for grease contamination, excessive wear and overheating. Apply new grease.

M.I. 3327 or M.I. 3328 for EMD generators. If generator is other than EMD, refer to manufacturer's manual.

EVERY 120,000 HOURS

ENGINE

Unit Exchange.

GENERATOR

Unit Exchange.

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