Engineering Standard

ESR 0550

OVERHAUL OF 48 CLASS ENGINE ASSEMBLY

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Document control

Revision	Date	Summary of change
(RSS 0550) 1.0	August 2007	Based on TRS 1522
(RSS 0550) 1.1	May 2008	Reference to some RSS standards amended
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Summary of changes from previous version

Summary of change	Section
NOTE – If the final document is small enough for the 'Contents' and 'Document control' to fit on one page remove the page break between the existing pages 2 and 3. HOWEVER if the 'Document control' page carries over to a second page separate pages must be used for 'Contents' and 'Document control'	

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1 Scope

This standard provides procedures, qualifications and testing necessary for reconditioning 48 Class, Alco 251B-6LS engine assemblies and their associated systems. The engine system includes the diesel engine, main alternator, auxiliary generators, lubricating oil system, cooling water system, fuel oil system and air inlet and exhaust systems.

2 General

This standard shall be used in conjunction with the Alco Maintenance Instructions MI's, Comeng Maintenance Instruction CMI 16-19, and RailCorp ESR standards as listed to provide clarification, amplification and additional requirements where necessary.

The overhauled engine system shall be required to operate reliably for a minimum period of six (6) years.

Record sheets for component stripdown, rebuild, tolerances and clearances shall be completed with one copy retained by the Repairer and one copy supplied to the Purchaser.

3 Definitions

OEM is an abbreviation for Original Equipment Manufacturer

ESR is an abbreviation for RailCorp Rolling Stock Standard

MI is an abbreviation for Maintenance Instruction

CMI is an abbreviation for Comeng Maintenance Instruction

DRP is an abbreviation for Renewal Parts List

4 Special tools

Special tools, gauges and fixtures in accordance with Alco Maintenance Instructions MI's 11027, 11035 and 11089 and traction shall be used during overhaul of the engine assembly.

5 Disassembly

The engine assembly shall be removed from the locomotive and components disassembled in accordance with RailCorp Standards: ESR's 0551, 0552, 0553, 0554, 0555, 0558, 0559, 0560, 0561, 0573, 0603 and 0619.

Air elbows, engine turning gear, governor drive and linkage, camshaft gear covers, oil catcher(generator end), header, water outlet and elbows, turbocharger mounting, crankcase exhauster, overspeed trip and generator connection shall be removed from the engine/locomotive and disassembled, where appropriate, in accordance with Alco Maintenance Instructions MI's 11001, 11013, 11014, 11019, 11027, 11035, 11052 and 11089.

Where possible system pipe work shall be maintained as a set and shall be reinstalled on the locomotive from which it was removed. Flanges shall be match marked and pipes tagged with the locomotive number to ensure correct assembly.

6 Replacement parts

All replacement parts shall be genuine GE-Alco to the latest revision unless otherwise specified or approved by the Purchaser.

It is mandatory to renew the following components:-

6.1 Engine air intake system

Engine air filter, Farr Dynacell T520	P/N F52711,	2 off
Indicator, Filter Warning (Woodward)	P/N 3875-315	

6.2 Air elbow cylinder head to block (DRP 12801)

Gasket, elbow to block	Alco P/N 2154022-1,	6 off
Gasket, elbow to head	Alco P/N 21522826,	6 off

6.3 Air inlet pipe, expansion joint and support (DRP 12802)

Gasket, pipe to cylinder block	Alco P/N 2154023

6.4 Expansion joint, air inlet pipe to turbosupercharger

Gasket, expansion joint	Alco P/N 2154874	
Gasket, expansion joint, to turbosupercharger & air pipe	Alco P/N 2154875	2 off
Gasket, support to gear cover	Alco P/N 2152472	

6.5 Piping, water and water outlet header (DRP 14080)

Gasket, branch pipe to header	Alco P/N 2152234-1	6 off
Gasket, branch pipe to cylinder head	Alco P/N 2153363	6 off
Gasket, coupling	Alco P/N 1671311	

6.6 Piping, water to aftercooler, lubricating oil cooler and cylinder block

Gasket, pipe and elbow connections	Alco P/N 2152284	6 off

6.7 Water from turbosupercharger

Gasket, branch pipe to turbosupercharger	Alco P/N 2152235
Gasket, branch pipe to water outlet header	Alco P/N 2152234

6.8 Vent, water, aftercooler to cylinder block

Gasket, elbow to head	Alco P/N 2152232
Gasket, elbow to block	Alco P/N 2152233

6.9 Gear cover, generator end (DRP 11602)

Gasket, cover to cylinder block	Alco P/N 2152265	
Gasket, inspection cover to gear cover	Alco P/N 2152266	

6.10 Oil catcher (generator end) (DRP 11902)

Gasket, oil catcher	Alco P/N 21526714	
Lockwire, 0.054×6 ft.	Alco P/N 2157001	

6.11 Overspeed trip (DRP 13617)

Gasket, upper to lower housing	Alco P/N 21522610-1	
Oil seal, for shaft	Alco P/N 2361343-1	
Oil seal, for lever arm	Alco P/N 2361344-1	
Lockwire, 0.080 x 24 in. soft steel	Alco P/N 2157002	
Gasket, cover to housing	Alco P/N 2152269	
Gasket, shim to cylinder block and housing	Alco P/N 21522613-1	2 off
Dowel, straight cam to trip shaft, 5/16 x 1-1/2	Alco P/N 23611121	
Dowel, straight handle to cam, 1/4 x 1-1/2	Alco P/N 23611117	

6.12 Governor drive and linkage (DRP 13613)

Bearing, needle, in support	Alco P/N 2152854	2 off
Ball bearing, pinion and drive gear shaft	Alco P/N 2151791	2 off
Bearing, needle, in lever pin to bearing support	Alco P/N 2152854	2 off
Bearing, needle, in lever	Alco P/N 2152854	2 off
Bearing, needle, in link	Alco P/N 2152853	2 off
Gasket, (“O” ring) bearing housing to camshaft gear cover	Alco P/N 2361471	

6.13 Crankcase exhauster (DRP 14084)

Gasket, housing to bracket and inlet ring, 1/16” thick.	Alco P/N 2401781	2 off
Gasket, elbow to blower and cylinder block	Alco P/N 2153322	2 off
Gasket, drain pipe to cylinder block, (In-line engine)	Alco P/N 2151187	
Gasket, blower to vent connection	Alco P/N 1639091	

6.14 Generator connection (DRP 11901)

Lockwire, cap screw locking, 0.106 x 72 in.	Alco P/N 2157003	
Lockwire, 0.080 x 72 in.	Alco P/N 2157002	

6.15 Piping, lubricating oil (DRP 14165)

Lubricating oil pump to cooler, strainer and cylinder block

Gasket, pipe to L.O. pump and cooler	Alco P/N 2152283	2 off
Gasket, pipe to cooler and valve	Alco P/N 2152267	2 off
Gasket, pipe to cooler	Alco P/N 2152283	
Gasket, pipe to valve	Alco P/N 21522811-1	2 off
Gasket, coupling, relief valve to strainer pipe	Alco P/N 1671312	
Gasket, pipe to strainer	Alco P/N 2152283	
Gasket, elbow to block	Alco P/N 2152284	

6.16 Engine piping (Drawing No. 207-713)

All the hoses listed below are shown on Drawing No 207-713 an example of which can be seen in Appendix B.

Hose, flexible, lube oil to top filter	Alco P/N 24026036
Hose, flexible, lube oil to bottom filter	Alco P/N 24023578
Hose, flexible, lube oil from filter	Alco P/N 24026036
Hose, flexible, lube oil from bottom filter	Alco P/N 24023580
Hose, flexible, fuel oil filter to header	Alco P/N 24023544
Hose, flexible, fuel oil return from header	Alco P/N 24023544
Hose, flexible, lube oil bypass to engine base	Alco P/N 24014042

6.17 320F turbosupercharger only

Hose, flexible, lube oil header rail to supercharger	Alco P/N 2402359
Hose, flexible, turbocharger oil line vent pipe	Alco P/N 24023534
Hose, flexible, water to turbo	Alco P/N 24023517
Hose, flexible, lube oil drain from supercharger	Alco P/N 24023516
Hose, flexible, turbo to turbo filter	Drg No DEMCC-105

6.18 Naper turbosupercharger only

Hose, flexible, lube oil header rail to turbo	Drg No DEMCC-001
Hose, flexible, water to turbo	Drg No DEMCC-002
Hose, flexible, lube oil drain from turbo to engine	Drg No DEMCC-003
Hose, flexible, water outlet to flower pot	Drg No DEMCC-004
Hose, flexible, water outlet to flower pot	Drg No DEMCC-005

Genuine GE-Alco lockwire is not required. Alternative suppliers must be approved by the Purchaser.

All quantities are for a single item unless shown otherwise.

The engine air filters and indicator on 48 Class Locomotives fitted with Napier Turbochargers shall be replaced in accordance with Comeng Maintenance Instruction CMI 16-19 and ESR 0255. Arrow on filters indicates the direction of air flow.

All other engine assembly components shall be replaced on the basis of condition as specified in Alco Maintenance Instructions MI's 11013, 11019, 11035 and 11089, and RailCorp Standards: ESR's 0551, 0553, 0554, 0555, 0558, 0559, 0560, 0561, 0573, 0603 and 0619.

All new and re-used parts shall be stored in an area free from the effects of climate and dust.

7 Cleaning

Major engine assembly components shall be cleaned in accordance with and RailCorp Standards: ESR's 0255, 0551, 0552, 0553, 0554, 0555, 0558, 0559, 0560, 0561, 0573, 0603 and 0619.

All other engine assembly components shall be cleaned with a non toxic organic cleaner such as Quaker Solv cleaner or equivalent. All internal passageways are to be thoroughly cleaned. Gasket faces shall be thoroughly cleaned and care must be taken so as not to scratch these faces. Rinse cleaned components with steam/water spray to remove any residue.

8 Inspection and reconditioning procedure

The engine, main alternator, auxiliary generators and associated systems shall be reconditioned in accordance with the following ESR standards and Alco Maintenance Instructions;

Block, pan and crankshaft main bearings and caps	ESR 0559
Power assembly	ESR 0551
Crankshaft and free end drive assembly	ESR 0553
Camshaft assembly	ESR 0554
Crankcase exhauster	ESR 0619
Lubricating oil system	ESR 0555
Fuel oil system	ESR 0558
Cooling water system	ESR 0573
Exhaust manifold	ESR 0561
Napier turbocharger (48 class locomotive)	ESR 0255
Alco 320F turbocharger (48 class locomotive)	ESR 0552
Napier NA-155Mk.3 turbocharger (48 class locomotive)	ESR 0560
Main alternator	ESR 0620

Auxiliary generators	ESR 0583
Oil catcher, power take-off end	MI 11013
Air elbows	MI 11089
Turning Arrangement (48 class locomotive)	MI 11014
Governor drive and control linkage (48 class locomotive)	MI 11027
Header, water outlet and elbows	MI 11019
Crankcase exhauster (48 class locomotive)	MI 11001
Overspeed trip (48 class locomotive)	MI 11052
Generator connection	MI 11035

9 Assembly

Assembly and installation of the engine assembly shall be in accordance with RailCorp Standards: ESR's 0255, 0551, 0552, 0553, 0554, 0555, 0558, 0559, 0560, 0561, 0573, 0603 and 0619, Alco Maintenance Instructions 11001, 11013, 11014, 11019, 11027, 11035, 11052, and 11089.

The main alternator shall be reapplied and aligned to the power take off end of the diesel engine in accordance with Alco MI 11035. The auxiliary generators shall be fitted prior to carrying out the crankshaft deflection test. Check the backlash of the power take off and auxiliary generator drive gears.

Prior to installation of the engine assembly to a locomotive the lubricating oil drain pipe is to be attached to the engine sump pan.

10 Tolerances

During inspection, assembly and installation all required dimensions, clearances, tolerances and torques shall be in accordance with RailCorp Standards: ESR's 0255, 0551, 0552, 0553, 0554, 0555, 0558, 0559, 0560, 0561, 0573, 0603 and 0619, Alco Maintenance Instructions 11001, 11013, 11014, 11019, 11027, 11035, 11052 and 11089.

The maximum allowable crankshaft deflection shall be $\pm$ 0.00075 inches.

11 Painting

The engine assembly shall be painted prior to the attachment of the main alternator. All openings, orifices, hoses and connections such as main alternator, flange faces, pipe threads, gauge glass faces, name plates and governor shall be masked before painting. The exhaust manifold, bellows and gas inlet casing shall not be painted.

11.1 Surface preparation

Remove all dirt, grease and oil using an appropriate cleaning compound in accordance with AS 1627.1.

Power tool clean bare steel areas to Class 2 standard in accordance with AS 1627.2. Feather all paint edges, lightly sand all previously applied paintwork with an appropriate grade of paper, remove sanding debris and spot prime on the same day as tool cleaning.

11.2 Painting

Apply one (1) coat of red oxide zinc phosphate alkyd primer to all bare steel areas to a minimum dry film thickness of 38 micrometres (μm). Allow an appropriate drying time and overcoat.

Apply one (1) coat of full gloss petrol and oil resistant enamel, alpine green, BS 4800 14C 31, to a minimum dry film thickness of 25 μm to the spot primed and previously painted surface. Allow an appropriate drying time and overcoat.

Repeat Step 2 allow 24 hours drying time. The primer shall be approved under GPC-C-162 and the Finish shall be approved under GPC-E-24.

12 Performance

The overhauled engine assembly and associated systems shall be required to operate reliably for a minimum period of six (6) years.

13 Storage and transportation

If the assembled engine is not to be immediately installed in a locomotive, then EMD Locomotive Storage Procedure MI 1726 shall be used as a guide to protect the engine assembly.

For storage and transportation purposes cover plates shall be applied to all external openings and orifices on the engine assembly. Hose caps shall be applied to all unattached hose ends. Cover grills shall be applied to the main alternator and auxiliary generators. They shall also be protected from the weather during transportation. A suitable lifting beam shall be used for lifting the engine assembly. The engine assembly shall be supported at its mounting feet on a suitable stand and shall be adequately secured to prevent tipping or movement during transportation.

All lifting lugs shall be fracture tested and certified in accordance with ESR 0072.

14 Identification

All identification requirements for traceable engine assembly components shall be in accordance with the LMIS Locomotive Component Reference Manual and RailCorp Standards: ESR's 0255, 0551, 0552, 0553, 0554, 0555, 0558, 0559, 0560, 0561, 0573, 0603 and 0619.

15 Referenced standards

15.1 RailCorp standards

ESR 0300 Specification for application of non destructive testing.

ESR 0255 Napier & Brown Boveri turbochargers

ESR 0551 Overhaul of power assembly

ESR 0552 48 class locomotive 320F turbocharger overhaul specification.

ESR 0553 48 & 80 class locomotives engine crankshaft & free end drive assembly overhaul specification.

ESR 0554 48 & 80 class locomotives engine camshaft assembly overhaul specification.

ESR 0555 48 & 80 class locomotives lubrication oil system overhaul specification.

ESR 0558 48 & 80 class locomotives fuel system overhaul specification.

ESR 0559 48 & 80 class locomotives engine block and pan overhaul specification.

ESR 0560 48 class locomotive engine governor overhaul specification.

ESR 0561 Overhaul of engine exhaust manifold.

ESR 0573 48 & 80 class locomotives cooling water system overhaul specification.

ESR 0603 Diesel electric locomotives auxiliary generators overhaul.

ESR 0619 Inspection, service and testing of crankcase exhaust motors.

15.2 Alco maintenance manual

MI 11001 Alco Maintenance Manual - 48 class crankcase exhauster.

MI 11002 Alco Maintenance Manual - 48 class filter, engine air Intake, oil bath type.

MI 11013 Alco Maintenance Manual - 48 & 80 class oil catcher, power take-off end.

MI 11014 Alco Maintenance Manual - 48 class engine turning arrangement.

MI 11019 Alco Maintenance Manual - 48 & 80 class header, water outlet and elbow.

MI 11027 Alco Maintenance Manual - 48 class governor drive and control linkage.

MI 11035 Alco Maintenance Manual - 48 & 80 class traction generator.

MI 11052 Alco Maintenance Manual - 48 class engine overspeed trip.

MI 11089 Alco Maintenance Manual - 48 & 80 class air elbow.

DRP 11602 Alco Part List - 48 class cover, gear, generator end.

DRP 11901 Alco Part List - 48 class generator connection.

DRP 11902 Alco Part List - 48 & 80 class oil catcher (generator end).

DRP 12801 Alco Part List - 48 & 80 class air elbow, cylinder head to block.

DRP 12802 Alco Part List - 48 class air Inlet pipe, expansion joint & support.

DRP 13613 Alco Part List - 48 class governor drive and linkage.

DRP 13617 Alco Part List - 48 class overspeed trip.

DRP 14077 Alco Part List - 48 class fuel oil piping.

DRP 14080 Alco Part List - 48 class piping, water and water outlet header.

DRP 14084 Alco Part List - 48 class crankcase exhauster.

DRP 14165 Alco Part List - 48 class lubricating oil piping.

DRP 14449 Alco Part List - 48 class generator connection.

15.3 Australian & British standards

AS 1627.1 Metal finishing – preparation and preheat treatment of surfaces

AS 1627.2 Metal finishing – preparation and preheat treatment of surfaces

15.4 RailCorp drawings

207-713 Engine piping, flexible hose assemblies 48 class locomotive.

15.5 Other standards

GPC-E-24 Full gloss oil and petrol resistant enamel

GPC-C-162

Comeng maintenance instruction CMI 16-19

EMD locomotive storage procedure MI 1726