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Government of India - Ministry of Railways
Research, Designs & Standards
Organization, LUCKNOW – 226011

No. EL/3.1.10/2 (Cab AC) **Dated: As signed**

Principal Chief Electrical Engineer,

1. Central Railway, Mumbai, CST-400 001.
2. East Central Railway, Hazipur-844101.
3. East Coast Railway, Chandrashekharpur, Bhubaneshwar-751016.
4. Eastern Railway, Fairlie Place, Calcutta-700001.
5. North Central Railway, Block-A, Subedarganj, Allahabad- 211033.
6. Northern Railway, Baroda House, New Delhi-110001.
7. North Eastern Railway, Gorakhpur-273001.
8. South Central Railway, Secunderabad-500 071.
9. South East Central Railway, Bilaspur-495004.
10. South Eastern Railway, Garden Reach, Calcutta-700 043.
11. Southern Railway, Park Town, Chennai-600 003.
12. South Western Railway, Hubli-580020.
13. West Central Railway, Jabalpur-482001.
14. Western Railway, Churchgate, Mumbai-400 020
15. North East Frontier Railway, Maligaon, Guwahati-781011
16. North Western Railway, Jaipur- 302 006

Sub: Special Maintenance Instructions No. RDSO/2016/EL/SMI/0293 Rev. '1' – 2025 Dated 25.02.2025

A Special Maintenance Instructions (SMI) for roof mounted air conditioning system for cabs of Electric Locomotives/EMU/Vande Bharat has been issued.

Copy of above SMI can be downloaded from RDSO's website through the following path.

www.rdso.indianrailways.gov.in---->Specifications/drawings---->Loco, EMU & Power supply---->other important links for Loco---->SMI/MS/TC---->serial number wise---->MASTER LIST OF SPECIL MAINTENANCE INSTRUCTION.

This is for your reference and record please.

Encl: As above

25.02.25

(Nirdosh Kumar Gupta)
for Director General/Electrical

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सत्यमेव जयते

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SPECIAL MAINTENANCE INSTRUCTION No. RDSO/2016/EL/SMI/0293 Rev. '1' Dated: 25.02.2025

1.0 Title:

Maintenance instructions for roof mounted air conditioning system for cabs of Electric Locomotives and EMU/Vande Bharat.

2.0 Object:

Roof mounted cab AC units are being provided on the electric locomotives and in EMU/Vande Bharat trains. Based on the field experience, it has been observed that there is a need to revise the Special maintenance instruction keeping in view of reliability, performance, maintenance of the Roof Mounted AC Package Unit.The SMI has been revised to follow guidelines/instructions for maintenance of cab ACs.

3.0 Maintenance activities during minor schedules:-

SN	Activities	IT	IA	IB	IC
3.1	**General**				
3.1.1	Check the loco logbook and attend the defects recorded.	✔	✔	✔	✔
3.1.2	Run the AC unit in (Off, Auto, Manual cooling) all modes. Attend to any abnormalities observed.	✔	✔	✔	✔
3.1.3	Clean dust from control panel by compressed air or vacuum cleaner and tighten the cable terminals.		✔	✔	✔

3.1.4	Remove return air filters by opening the grill. Clean these filters with water/vacuum cleaner or compressed air.		✔	✔	✔
3.1.5	Check for damaged/jointed cable.		✔	✔	✔
3.1.6	Ensure top cover of AC unit proper locking and gasket. Replace gasket if damaged.		✔	✔	✔
3.1.7	Run the AC unit for half an hour and record the current drawn by various equipments with the help of clamp tester. Equipment / Nominal Current AC unit in cooling mode: 4.5 - 6.0 Amp. AC unit in heating mode: 2.0 - 3.0 Amp. Compressor Motor: 2.0 - 4.0 Amp. Condenser Motor: 0.6 - 0.8 Amp. Blower Motor: 0.4 - 0.6 Amp.		✔	✔	✔
3.1.8	Switch 'ON' the AC unit (Blower motor ON, Condenser motor ON, Compressor ON) and rotary switch set the manual cooling mode then check the time delay relay for its operation. Compressor must start within 180+15 Sec.		✔	✔	✔
3.1.9	Run the AC unit in auto mode and check the cut-in and cut-out of thermostat. If thermostat is not working properly check the following: • Clean the cooling sensor probe and heater sensor probe. • Ensure Thermostat connector is properly tightened.		✔	✔	✔
3.1.10	Ensure that there is no leakage of condensate water from trough to driver cab. Rectify any leakage.		✔	✔	✔
3.1.11	Clean and inspect the condenser coil.			✔	
3.1.12	Clean and inspect the evaporator coil.			✔	
3.1.13	Clean and inspect the drainage holes.			✔	
3.2	**Control Panel**				
3.2.1	Check intactness of control panel connectors.		✔	✔	✔
3.2.2	Check working of rotary switch by rotating forward and backward. Replace, if found loose, damaged and jammed.		✔	✔	✔
3.2.3	Check the working of all LED's indications for proper function: **i)** Rotate the rotary switch in manual cooling mode position and check the status of LED (Main -ON, BLR-ON, COMP-ON, COOL-ON). **ii)** Rotate the rotary switch in Auto mode position and check the status of LED (Main- ON, BLR-ON, COMP-ON, COOL-ON in summer) and (Main - ON, BLR-ON, HTR-ON in winter). In case LEDs do not light up, check 110 V AC control supply. Rectify any abnormalities.		✔	✔	✔
3.2.4	Check and clean step-down transformer (Control Transformer) 415V/110V and its connections.		✔	✔	✔
3.3	**Condenser Motor and Blower Motor**		✔	✔	✔
3.3.1	Clean the body of condenser motor and blower motor by compressed air.		✔	✔	✔
3.3.2	Check condenser motor visually for crack on blade or body.		✔	✔	✔
3.3.3	Check and ensure mounting of fasteners are properly tightened.		✔	✔	✔
3.3.4	Check connection at terminal boxes of motor for proper tightens & cables are terminated with lugs.		✔	✔	✔
3.3.5	Check insulation resistance of motors by 500 V DC megger from the control panel. Attend the motors if insulation resistance is less		✔	✔	✔

	than 2 MΩ				
3.3.6	Check motors for any abnormal sound while running.		✔	✔	✔
3.4	**Compressor**				
3.4.1	Check and ensure mounting fasteners are properly tightened.		✔	✔	✔
3.4.2	Check electrical terminal box is properly tightened and cables are terminated with lugs.		✔	✔	✔
3.4.3	In case of abnormal sound: • Check the sequence of electric connection. • Ensure that the winding resistances of compressor motor between R, Y & B phases are balanced ± 3%.		✔	✔	✔
3.5	**Heater**				
3.5.1	Ensure proper mounting of heater without touching side bodies.		✔	✔	✔
3.5.2	Ensure proper clamping of electric wires to heater.		✔	✔	✔
3.5.3	Remove dust accumulation on heating element gently by soft brush/dry air.		✔	✔	✔
3.5.4	Clean thermostat temperature probe (OHP). Replace if cracked or broken.		✔	✔	✔
3.5.5	Check heater at the beginning of winter season by checking current drawn at control panel by clamp tester. (Nominal 2.0 - 3.0 Amp.)		✔	✔	✔
3.6	**Trough**				
3.6.1	Make sure condensate/rain water drains properly. This can be checked by opening the evaporator top and condenser top of the system by pouring water into the trough and clean the trough pipe by adequate size of round brush. It should be assured that there is no blockage in drain pipes.		✔	✔	✔
3.6.2	Ensure that there is no leakage of water to cab.		✔	✔	✔
3.7	**OHP (Over heat protection), HP (High pressure), LP Low pressure)**				
3.7.1	Check the mounting fasteners are properly tighten.		✔	✔	✔
3.7.2	Ensure that control wires to HP/LP/OHP cut-out are properly clamped.		✔	✔	✔
3.8	**Time Delay Relay (TDR)**				
3.8.1	Clean the complete assembly by compressed dry air jet.		✔	✔	✔
3.8.2	Check the condition of the TDR for physical damage.		✔	✔	✔
3.8.3	Tighten terminal & mounting screws.		✔	✔	✔
3.8.4	Replace damage thimbles/lugs.		✔	✔	✔
3.9	**MCBs (Miniature circuit breaker) & MPCB (Motor protection circuit breaker)**				
3.9.1	Clean the MCSs and MPCS with dry compressed air.		✔	✔	✔
3.9.2	Check the condition of MCBs and MPCB for physical damage.		✔	✔	✔
3.9.3	Ensure that end locks are provided.		✔	✔	✔
3.9.4	Tighten electric cable connections and DIN rail screws.		✔	✔	✔
3.10	**Contactors**				
3.10.1	Clean the contactors with dry compressed air.		✔	✔	✔
3.10.2	Check continuity between the incoming and outgoing terminals.		✔	✔	✔
3.10.3	Ensure tightness of connection.		✔	✔	✔
3.11	**Connector**				
3.11.1	Open the connectors and check for flash marks/damage to pins.		✔	✔	✔
3.11.2	Ensure that they are tightened properly.		✔	✔	✔
3.11.3	Remove moisture by blowing air through hot air gun.		✔	✔	✔

4.0 Maintenance activities during major schedules:-

SN	Activities	TOH	IOH	POH
4.1	All items of IC schedule	✔	✔	✔
4.2	**General**			
4.2.1	Replace the return air filters by opening the grill.	Replace		
4.2.2	Ensure proper locking of top cover of AC unit and provision of gasket. Replace gasket.	Replace		
4.2.3	Replace gasket provided at bottom of Cab AC unit.	Replace		
4.4	**Condenser motor and Blower motor**			
4.4.1	Run motor on no load for 15 minutes and check the following: • Bearing noise- Normal noise. • Bearing temperature rise above ambient should not more than 10°C. • SPM (Shock pulse meter) reading - 20 dB max. (Green zone). Replace bearings if defective. • Check the setting of MPCB for current rating, if the rating is below the blower and condenser motor maximum current rating then increase it up to the maximum value.	✔	✔	✔
4.4.2	Overhauling of blower and condenser fan motor: • Measure Insulation Resistance (IR) between motor terminals and frame before and after overhauling. The value should not be less than 100MΩ when the measured with 1000 V DC megger. • Check terminal block and connecting lead for any physical damage or any flash mark. • Perform HV (Di-electric) test on stator by applying 1.5 kV AC apply for one minute. The leakage current which should not exceed 1.0 mA. • SCT (Surge comparison test) of stator at 1 kV. • Measure starting current of motors on no load. It should not exceed 14A. No load current of motors should not exceed 1.4A. • Measure winding resistance of motors between UV, VW and WU phases. Ensure that they are balanced ± 10%. • Spray water over running motor by jet having 10 mm dia from all side. After spray check IR value. It should not be less than 100MΩ.	✔	✔	✔
4.5	**Refrigerant pipe line /Thermostatic expansion Valve**			
4.5.1	Check visually for proper clamping/support and use tube type clamping on the copper line.	✔	✔	✔
4.5.2	Ensure that thermostatic expansion valve of distributors to evaporator coil does not have any sharp bend or kinks.	✔	✔	✔
4.5.3	Ensure the proper clamping of the sensor bulb of the thermostatic valve on the suction pipe at 3 o'clock position.	✔	✔	✔
4.6	**Evaporator/Condenser Fins**			
4.6.1	Check that the mounting fasteners are properly tightened.	✔	✔	✔
4.6.2	Ensure that there is no damage to fins.	✔	✔	✔
4.6.3	Proper combing should be done on evaporator and condenser fins.	✔	✔	✔

4.6.4	Clean the evaporator and condenser fins with pressurized water and blow dry with moisture free air at 10-15 psi.	✔	✔	✔
4.7	**OHP (Over heat protection), HP (High pressure), LP (Low pressure) Cut-outs:**			
4.7.1	Disconnect blower motor through MPCB to cause compressor tripping on low pressure (LP) 30±5 psi. Disconnect condenser fan motor through MPCB to cause compressor tripping in (HP) 450±15 psi.	✔	✔	✔
4.7.2	Check the tripping of heater through OHP by switching off the blower. The probe of digital thermometer should be placed near the OHP sensor and the heater should trip at 65°C.	✔	✔	✔
4.8	**Time Delay Relay (TDR)**			
4.8.1	Check the time setting on test bench. (180±15 sec.)	✔	✔	✔

5.0 Trouble Shooting

SN	Fault/Indication	Examine / Trouble shoot
5.1	HP Trip- Glows when the pressure of compressor is high (Max 450±15 psi).	• Ensure 3-phase supply. • Check that all MCBs are ON • Ensure availability of 110V supply. • Check and ensure that condenser inlet and outlet air opening are not obstructed or blocked. • Check Condenser Motor Operation (Working) • Check air flow of condenser fan. It should be in upward direction. • Check the condenser fan blade defective/broken. • Check the dust on surface of condenser coil
5.2	LP Trip - Glows when the pressure of compressor is Low (Min. 30±5 psi).	• Check all MCBs and ensure 3-phase supply. • Check availability of 110V supply. • Check and ensure that return & supply air opening are not obstructed or blocked. • Air flow of blower fan motor should be in downward direction. • Feel the cooling coil by hand when compressor is running • Check the suction pressure by pressure gauge and ensure it is between 60 to 70 psi when compressor is running. • Working of Condenser Motor
5.3	Compressor trip- Glows when compressor trips.	• Check all MCBs and ensure 3-phase supply. • Check that supply and return air filter are clean. • Check the current of compressor (2.0-4.0 Amp.)
5.4	OHP trip-Glow when there is excess of heat through heater. (65±5°C)	• Check all MCBs and ensure 3-phase supply • Check and tighten all power lead connections at terminals. • Air flow of blower fan motor should be in Clockwise direction. • Check the setting of OHP.
5.5	Less Cooling	• Check that return air filter is not blocked • Check that the current of compressor is not less than 2.0 Amp. • If the suction pressure is less than 80 psi, when compressor is OFF and steady state is achieved, check leakage from joint of compressor, HP/LP cut-outs and filter drier with soap

		solutionor HLD if available. Attend any leakage and recharge with refrigerant as indicated in the number plate.
5.6	Over Current	• Check that supply and return air filter are clean. • Check that the suction pressure is between 60 and 65 psi

6.0 Application to Class of Locomotives:

All Electric locomotives and EMU/Vande Bharat trains fitted with cab AC units.

7.0 Agency of Implementation:

All Electric Loco sheds

POH workshops

25.02.25

(Nirdosh Kumar Gupta)
for Director General/Electrical