भारतीय रेल

INDIAN RAILWAYS

पटियाला रेलइंजन कारख़ाना, पटियाला

PATIALA LOCOMOTIVE WORKS, PATIALA

HISTORY & TESTING RECORD OF 8W-DIESEL ELECTRIC TOWER CAR

DETC NO.	: M-247(230012)
TYPE	: 8 WHEELS
RAILWAY/DIVISION	: ECOR/KUR
ELECTRIC TRACTION	: BHEL
DATE OF DISPATCH	: 05.07.2023

निर्माण रिकार्ड

पटियाला रेलइंजन कारख़ाना पटियाला

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DETC NO. M-247-230012
RAILWAY/SHED: ECoR/KUR
DOD: July 2023

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PATIALA LOCOMOTIVE WORKS, PATIALA
Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-247 (230012)

PROJECT	Diesel Electric Tower Car with Under-Slung Propulsion
CUSTOMER	SSE/RRD (V) KUR/ ECOR
DETC DMW NO.	**M-247 (230012)**
. **DETC RLY/SHED**	ECOR/KUR(Khurda Road Division)
Date of Dispatch	05.07.2023
Propulsion system	BHEL

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-247 (230012)

1.0 DETC Installed & Tested Equipments:

Equipment	Make	Serial No.
Diesel Engine -1	Cummins India Ltd	25475045
Diesel Engine -2	Cummins India Ltd	25476986
Traction Alternator-1	BHEL	315230060
Traction Alternator-2	BHEL	315230059
Power Rectifier- 1	BHEL	526070119
Power Rectifier-2	BHEL	526070126
Traction Motor-1	BHEL	408230136
Traction Motor-2	BHEL	408230142
Traction Motor-3	BHEL	408230135
Traction Motor-4	BHEL	408230134
Auxiliary Alternator-1	BHEL	2302711224
Auxiliary Alternator -2	BHEL	2302711220
Rectifier Regulator Unit- 1	BHEL	230471C1221
Rectifier Regulator Unit -2	BHEL	230471C1225
Control Cubicle-1	BHEL	230CAB1003
Control Cubicle-2	BHEL	230CAB1003
Driver Desk-1	BHEL	23000DD005
Driver Desk-2	BHEL	23000DD006
Master Controlleer-1	BHEL	RECPL/MC/31
Master Controlleer-2	BHEL	RECPL/MC/33
Driver Control Switch-1	BHEL	5653
Driver Control Switch-2	BHEL	5655
MSGC Panel	BHEL	2200MSG032
Resistor Panel	BHEL	526070107/108

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-247 (230012)

2.0 SEQUENTIAL TEST

Purpose

Sequence test of control circuits.

Measuring and Testing Equipment, Auxiliary Equipment

- Digital Multimeter
- Continuity tester
- Wago connector
- DCS key
- Master Controller Unlock key
- DC Ammeter
- Insulation Tester
- All Electrical Circuit Schematics

Test Status

Individual test performance is recorded against each test performed.

Test Implementation

The fully completed routine test record is the only valid document to demonstrate that the routine test has been successfully completed. The Performed ok column in this routine test instruction merely serves the purpose of engaging the tester to verify the test progress.

All test steps in a chapter must have been successfully performed. If a test has been unsuccessful, the cause or causes must be established and remedied so that the test item can subsequently be tested with possible result. Before testing sequence test, all continuity test points are to be cleared.

Procedural Notes:

1. Disconnect all electronic system prior to Megger, Hi pot test and during welding.
3. Use DIGITAL multimeter only to check continuity and to read test point voltages.
4. Ensure that test lead does not touch body or ground during measurement of low voltage sources.

2.1 Visual Inspection

2.1.1 Rotating Equipment

Operation	Performed
• Inspect the rotating equipment for the following (Tr. Alternator, Tr. Motor, Aux alternator)	OK

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• No unwanted materials should be lying inside the machines.	OK
• No loose wires/ terminals should be available near the machines.	OK
• Ensure that the mounting bolts have been properly torque checked and marked.	OK
• Ensure that High Voltage electrical terminals are not exposed.	OK
• Check availability of warning boards	OK

2.1.2 Control Equipment and Wiring

Operation	Performed
• There should not be any loose hanging wires near the equipment / terminal boards.	OK
• Ensure all components are loaded and connections are intact.	OK
• Ensure all connectors are coupled tightly.	OK

2.1.3 Checking of TM chain cleat arrangement between TM Junction box to TM

SN	Equipment	Available
1.	Traction motor1	**OK**
2.	Traction motor2	**OK**
3.	Traction motor3	**OK**
4.	Traction motor4	**OK**

2.1.4 Inspection of Air ducts & Bellows before lowering DETC on bogies

Operation	Performed
• Traction Motor ducts are free from dirt and any foreign particle	OK
• No welding pore holes found in the TM bellows	OK
• Traction Motor bellows are free from damages	OK

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2.1.5 Inspection of Availability and Integration of Fuses

SN	Location	Fuse rating	Available
1	EQ.PANEL, 308-341	63A	**OK**
2	CC1, 341 – 311	32 A	**OK**
3	EQ Panel, 307 – 308	63 A	**OK**
4	CC1, 300 – 320	63 A	**OK**
5	Power Rectifier 1, F1-F9	550 A	**OK**
6	Power Rectifier 2, F1-F9	550 A	**OK**

3.0 Continuity Test

NOTE: CP and Driver desk are pre wired and continuity is already checked. Only external wiring and sensors cables continuity needs to be checked.

3.1 Grounding Cables Check

S.No.	EQUIPMENT	QUANTITY	AVAILABLITY	TIGHTNESS
1.	Tr. Alternator 1	2	OK	OK
2.	Tr. Alternator 2	2	OK	OK
3.	Power Rectifier 1	2	OK	OK
4.	Power Rectifier 2	2	OK	OK
5.	Traction Motor 1	1	OK	OK
7.	Traction Motor 2	1	OK	OK
8.	Traction Motor 3	1	OK	OK
9.	Traction Motor 4	1	OK	OK
10.	Control Cubicle 1	2	OK	OK
11.	Driver Desk 1	2	OK	OK
12.	Control Cubicle 2	2	OK	OK
13.	Driver Desk 2	2	OK	OK
14.	MSGC	2	OK	OK

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

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4.0 IR & HV Test for Power Circuit

4.1 Control Circuit

Operation	Performed
• Disconnect battery cables at the battery terminals of Control battery	OK
• Close the battery switch BIS110	OK
• Keep battery Switch (BCS 24) in open condition	OK
• Switch ON all switches and circuit breakers on the CP&DD	OK
• Open ground cut out switches GRCO-1 & 2	OK
• Insert DCS key and turn ON	OK
• Insert MC key and turn ON	OK
• Move ECS Switch to "RUN" position	OK
• Move Reverser handle to Forward or Reverse position	OK
• Move the Master Handle (MH) to 6th notch position on DD	OK
• Remove ECM 1 and ECM 2 connections	OK
• Disconnect LED panel from the circuit	OK
• Remove connector for Power rectifier 1 and 2	OK

4.2 Power Circuit

Operation	Performed
Rectifier	
• Disconnect positive (+ve) and negative (-ve) cables at the rectifier.	OK
• Short rectifier positive (+ve) and negative (-ve) terminals.	OK
• Short all the cables which are disconnected from rectifier.	OK

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-247 (230012)

The insulation resistance test is carried out with 1000 V Megger. Measure insulation resistance between shorted power cables at rectifier and body.

4.3 Procedure

4.3.1 Control circuit

The insulation resistance test is carried out with 500V Megger. Measure insulation resistance between wire terminals 300/100 and body

4.3.2 Power circuit - Rectifier

The insulation resistance test is carried out with 1000V Megger. Measure insulation resistance between shorted power cables at rectifier and body.

4.3.3 Observation

Test Condition	Acceptance Criteria	Observed
Power Circuit IR	> 5M Ohm	4000 MΩ
Control Circuit (DC 110V and 24V)	> 1M Ohm	03 MΩ

5.0 High Voltage test

5.1 Procedure

5.1.1 Control Circuit

High Voltage test is carried out at 2.5 KV AC voltages. The test voltage is applied between wire terminals 300/100 and body and should withstand for 01 minute.

5.1.2 Power Circuit

High Voltage test is carried out at 2.5 KV AC voltages. The test voltage is applied between shorted power cables at rectifier and body and should with stand for 01 minute.

5.1.3 Obervation

HV tester should not trip within 60 seconds in each of the above tests

Parameter	Control circuit		Power Circuit	
	Acceptance Criteria	Observed	Acceptance Criteria	Observed
Voltage Applied	1300 V AC	OK	2500 V AC	OK
Leakage Current	100mA	OK	100 mA	OK
Time Applied	60 Second	OK	60 Second	OK

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DETC no.M-247 (230012)

5.1.4 Post Test Operations

Operation	Performed
• Remove all shorting wires on the terminals	OK
• Restore all power cable connections	OK
• Connect the all removed connectors	OK

5.1.5 Batteries (110V & 24V)

Operation	Performed
• Ensure that interconnecting cables between each battery is connected and are tight.	OK
• Check the polarity of each battery and ensure that all are connected in series.	OK
• Connect the battery cable 308 at battery positive and 300 at battery negative terminal for 110V Battery.	OK
• Connect the battery cable 201 at battery positive and 200 at battery negative terminal for 24V Battery.	OK
• Measure the voltage of the battery at equipment panel or at battery charging socket using digital Multimeter. The voltage should be more than 100V across 308 and 300 terminals.	110 **V DC**
• Measure the voltage of the battery at equipment panel or at Knife Switch using digital Multimeter. The voltage should be more than 24V across 201 and 200/210 terminals.	24 **V DC**

Wait for one or two minutes after switching ON each Circuit breaker and observe for any overheating symptoms like smell, smoke, temperature etc. from the wire bunches. If any such symptoms are noticed there might be short circuit in wire bunch, check continuity in suspected area. Switch ON the following Circuit Breakers and ensure the circuit functionality is correct.

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

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6.0 SEQUENCE TEST (Auxiliary Circuit)

Sr.no	Operation	Effect	Location	Performed in Cab-1
1	Turn 110 V BCS in 3 o'clock position and measure voltage between Cable No. 311 and 300	≈ 110 V	311 as positive.	OK
2	Turn ON EL+ MCB and check voltage between wire EL+ with respect to EL-.	≈ 110 V	EL- as negative	OK
3	Turn ON CFD MCB and CFDS toggle switch	≈ 110 V	Cab Fan Driver side should operate	OK
4	Turn ON LLD MCB and LLDS toggle switch	≈ 110 V	Cab Light Driver side should operate	OK
5	Turn ON SPLD/SPLG MCB followed by Turn On SPLDS & SPLGS toggle switch	≈ 110 V	Spot light Driver side should operate. Spot light Guard side should operate	OK
6	**Turn ON Aux MCB** and HLS,SM,V MCB and switch on 110 Voltmeter toggle switch	≈ 110 V	The voltmeter should read 110V approx.	OK
			Speedometer should turn ON.	OK
			110V Supply should be available at HLS on Control Cubicle and Driver Desk.	OK
			Horn Push Buttons on Driver side and Guard Side should operate.	OK
			Foot operated horn Switch should work.	OK
6.1	**Turn ON Aux MCB** and Tail light/Flasher Light MCB and switch on Tail light Toggle switch on Driver Desk.	≈ 110 V	Tail light should operate	OK
	Turn ON Flasher Light Toggle Switch on Driver Desk.		Flasher Light should operate at both converters.	OK

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6.2	**Turn ON Aux MCB** and Marker light MCB and Marker light toggle switch on Driver Desk.	≈ 110 V	Marker light should operate	OK
6.3	**Turn ON Aux MCB** and Head Light MCB and Toggle switch in Driver Desk	≈ 110 V	Head Light Should ON/OFF in Converter-**1** and **Dim/Bright**	OK
		≈ 110 V	Head Light Should ON/OFF in Converter-**2** and **Dim/Bright**	OK
6.3.1	**Turn ON Aux MCB** and Head Light MCB and Toggle switch in Driver Desk and Turn OFF Tail Light Toggle switch in Rear Cab.	≈ 110 V	Tail Light Should ON/OFF in Rear Side (Converter-**1).**	OK
		≈ 110 V	Tail Light Should ON/OFF in Rear side (Converter-**2).**	OK
6.4	**Turn ON Aux MCB** and HT Sensor MCB	≈ 110 V	Green LED should glow in HT Sensor Display unit.	OK

6.1 SEQUENCE TEST (Control Circuit 110V & 24V)

S.No.	Operation	Condition	Performed in Cab- I
1	Ensure 110V Supply across Cable No. 1600 & 320.	SUPPLY(+) FROM BATTERY+BCS(4 POLE) ON+SYSTEM CONTROL MCB-ON & SUPPLY (-) FROM BATTERY THROUGH 63A FUSE	OK
2	Supply to MASTER CONTROLLER(MC)	OPERATION1+CONTROL MCB ON+CONTROL ON/OFF SWITCH ON (Ensure the +ve 110V supply at 1602).	OK
3	EMY RELAY (EMR) ON	OPERATION1+CONTROL MCB ON+CONTROL ON/OFF SWITCH ON+EMY TRACTION CUT-OFF PB ON	OK
4	DMR RELAY ON	OPERATION1+DMMV MCB ON (Ensure 110V +ve available at Cable Nos. 1732 and 1734).	OK
5	DEAD MAN VALVE-ACTIVE	OPERATION 1+DMMV MCB ON+EMY RELAY ON+DEAD MAN RELAY ON+Operate F/R Switch on MC+Operate Master Handle on MC.	OK
6	GOV1 EXC RELAY (ER1) ON	OPERATION1+EXC MCB ON+DCS ON+TSS(TEST)+EXC ON/OFF SWITCH ON+ECS (RUN)+GOV1 CONTROL MCB ON+EMR ON+R11 RELAY ON+S11 ON	OK

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-247 (230012)

S.No.	Operation	Condition	Performed In Cab- I
7	GOV2 EXC RELAY (ER2) ON	OPERATION1+EXC MCB ON+DCS ON+TSS(TEST)+EXC ON/OFF SWITCH ON+ECS (RUN)+GOV2 CONTROL MCB ON+EMR ON+R12 RELAY ON+S12 ON	OK
8	EXC CONTROL RELAY-1 (ECR-1) ON	OPERATION1+CONTROL MCB ON+CONTROL ON/OFF SWITCH ON+Operate F/R in MC+MC(Notch-1 to 8) +ALT EXC MCB ON +GFR INOPERATIVE+ER1 ON+SR1 OFF+{LC1(CLOSE)/LC3(CLOSE)}	OK
9	EXC CONTROL RELAY-2 (ECR-2) ON	OPERATION1+CONTROL MCB ON+CONTROL ON/OFF SWITCH ON+Operate F/R in MC+MC(Notch-1 to 8) +ALT EXC MCB ON +GFR INOPERATIVE+ER2 ON+SR2 OFF+{LC1(CLOSE)/LC3(CLOSE)}	OK
10	RCFR1 RELAY ON	OPERATION1+FAULT INDICATION MCB ON+DCS ON+RCFR-1 Toggle Switch {SS-4 SWITCH ON}	OK
11	SAFETY RELAY1 ON	OPERATION1+FAULT INDICATION MCB ON+DCS ON+ {LPR RELAY ON/ RCFR1 RELAY ON/R11 RELAY ON/ RL21 RELAY ON}	OK
12	RCFR2 RELAY ON	OPERATION1+FAULT INDICATION MCB ON+DCS ON+{SS-5 SWITCH ON}	OK
13	SAFETY RELAY 2 ON	OPERATION1+FAULT INDICATION MCB ON+DCS ON+ {LPR RELAY ON/ RCFR2 RELAY ON/R12 RELAY ON/ RL22 RELAY ON}	OK
14	PARKING BRAKE APPLICATION MAGNET VALVE ACTIVE	OPERATION1+PARKING BRAKE MCB ON+DCS ON+PRESS PARKING BRAKE APPLICATION BUTTON ON	OK
15	PARKING BRAKE RELEASE MAGNET VALVE ACTIVE	OPERATION1+PARKING BRAKE MCB ON+DCS ON+PRESS PARKING BRAKE RELEASE PUSH BUTTON	OK
16	COMPRESSOR -1/2 UNLOADER VALVE ACTIVE	OPERATION1+COMPRESSOR UNLOADER MCB ON+COMPRESSOR GOVERNOR ACTIVE	OK
17	AIR DRIER ACTIVE	OPERATION1+COMPRESSOR UNLOADER MCB ON+ COMPRESSOR GOVERNOR INACTIVE	OK
18	CUT OUT RELAY (COR1 &2) ON	OPERATION1+OPERATION2+MC (NOTCH 4 & 8)+MCS1/MCS2 OPERATE	OK

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DETC no.M-247 (230012)

S.No.	Operation	Condition	Performed In Cab- I
19	PANTO MAGNET VALVE ACTIVE	OPERATION-1+CONTROL MCB ON+DCS ON+ +PANTO UP DOWN PRESSURE SWITCH ON+PANTO UP INDICATION	OK
20	SUPPLY TO CAMERA UNIT	OPERATION1+CCTV MCB ON	OK
21	SUPPLY TO TELEPHONE EXHANGE SYSTEM	OPERATION1+TELEPHONE EXCHANGE MCB ON+AUX MCB ON	OK
22	CFG ON	OPERATION1+[F+] MCB ON+CFG MCB ON+CFG SWITCH ON	OK
23	LLG ON	OPERATION1+[L+] MCB ON+LLG/CL MCB ON+LLGS SWITCH ON	OK
24	CLS ON	OPERATION1+LLG/CL MCB ON+CL SWITCH ON	OK
25	BM1 MOTOR ON	Ensure Supply at Cable No. 305 & 300+BM1 MCB ON	OK
26	BM2 MOTOR ON	Ensure Supply at Cable No. 306 & 300+BM2 MCB ON	OK
27	AAFR1 RELAY ON	Ensure Supply at Cable No. 301 and 300.	OK
28	AAFR2 RELAY ON	Ensure Supply at Cable No. 301 and 300.	OK
29	BATTERY CHARGING(120 AH)	OPERATION1	OK
30	SUPPLY TO HEATER UNIT	OPERATION1+HEATER MCB ON	OK
31	AEFR RELAY ON	OPERATION1+FAULT INDICATION MCB ON+DCS ON+AEFR-AUX (OFF)+AEFRCO CLOSE	OK
32	AEFR-AUX RELAY ON	OPERATION1+ DCS ON+ FAULT INDICATION MCB ON+AEFR RELAY ON	OK
33	SUPPLY TO CHARGING SOCKET	OPERATION1+CHARGING SOCKET MCB ON	OK
34	SUPPLY TO CHARGING SOCKET (DESK)	OPERATION1+CHARGING SOCKET MCB ON	OK
35	SUPPLY TO 24V SYSTEM	SUPPLY TO BATTERY CHARGER+BIS (CLOSE)+ENG1 PROTECTION MCB ON+ENG2 PROTECTION MCB ON+Ensure 24V across Cable No. 201 & 210.	OK
36	FOG LIGHT ON	OPERATION 35+24V –VE AUX MCB ON+FGL MCB ON+TURN ON FOG LIGHT TOGGLE SWITCH	OK

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DETC no.M-247 (230012)

37	SEARCH LIGHT ON	OPERATION 35+24V –VE AUX MCB ON+SL MCB ON+TURN ON SEARCH LIGHT TOGGLE SWITCH	OK
38	BATTERY CHARGING AMMETER 1 READING	SUPPLY TO BATTERY CHARGER+BIS (CLOSE)	OK
39	BATTERY CHARGING AMMETER 2 READING	SUPPLY TO BATTERY CHARGER+BIS (CLOSE)	OK
40	SUPPLY TO SPU1	OPERATION 35+R81 RELAY ON+R91 RELAY ON+S11 RELAY ON+TR11 TIMER (OFF)+ENG 1 SPU MCB ON	OK
41	SUPPLY TO SPU2	OPERATION 35+R82 RELAY ON+R92 RELAY ON+S12 RELAY ON+TR12 TIMER (OFF)+ENG 2 SPU MCB ON	OK
42	LOCAL RESET RELAY1 (LRR1) ON	OPERATION 35+LOCAL REMOTE SWITCH1(L)+LOCAL ENG-1 OFF PB(OFF)+PRESS LOCAL RESET PB ENG1(US)	OK
43	LOCAL RESET RELAY2 (LRR2)ON	OPERATION 35+LOCAL REMOTE SWITCH2(L)+LOCAL ENG-2 OFF PB(OFF)+PRESS LOCAL RESET PB ENG2(US)	OK
44	LOCAL ON/OFF RELAY 1 (R81) ON	OPERATION 35+ FC21 RELAY (OFF)+LOCAL REMOTE SWITCH1 (L)+LOCAL ENG-1 OFF PB(OFF)+PRESS LOCAL ENG-1 ON PB(US)	OK
45	LOCAL ON/OFF RELAY 2 (R82) ON	OPERATION 35+ FC22 RELAY (OFF)+LOCAL REMOTE SWITCH2 (L)+LOCAL ENG-2 OFF PB(OFF)+PRESS LOCAL ENG-2 ON PB(US)	OK
46	REMOTE ON/OFF RELAY1 (R91) ON	OPERATION 35+LOCAL REMOTE SWITCH1 (R)+OPERATE DCS ENG-1 ON SWITCH+S11 RELAY ON	OK
47	REMOTE ON/OFF RELAY2 (R92) ON	OPERATION 35+LOCAL REMOTE SWITCH2 (R)+OPERATE DCS ENG-2 ON SWITCH+S12 RELAY ON	OK
48	TR11 TIMER (ON)+TR21 TIMER (ON)+HM1(ACTIVE)	OPERATION 35+R81 RELAY (ON)/R91 RELAY (ON)	OK
49	TR12 TIMER (ON)+TR22 TIMER (ON) +HM2(ACTIVE)	OPERATION 35+R82 RELAY (ON)/R92 RELAY (ON)	OK
50	R31 RELAY (HCWT-1 IND) ON	OPERATION 35+ENG1 SAFETY MCB1 ON+TS11(91°C) CONTACT (CLOSE)	OK
51	R32 RELAY (HCWT-2 IND) ON	OPERATION 35+ENG2 SAFETY MCB1 ON+TS12(91°C) CONTACT (CLOSE)	OK
52	R11 RELAY (HCWT-1) ON	OPERATION 35+ENG 1 SAFETY MCB1 (ON)+ TS11(96°C) CONTACT (CLOSE)+{RR1 RELAY(ON)/LRR1 RELAY(ON)}	OK

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DETC no.M-247 (230012)

S.No.	Operation	Condition	Performed In Cab- I
53	R12 RELAY (HCWT-2) ON	OPERATION 35+ENG 2 SAFETY MCB1 (ON)+ TS11(96°C) CONTACT (CLOSE)+{RR2 RELAY(ON)/LRR2 RELAY(ON)}	OK
54	R41 RELAY (LLOP-1) ON	OPERATION 35+ENG 1 SAFETY MCB1 (ON)+{RR1 RELAY(ON)/LRR1 RELAY(ON)/PS11 CONTACT(CLOSE)}	OK
55	R42 RELAY (LLOP-2) ON	OPERATION 35+ENG 2 SAFETY MCB1 (ON)+{RR2 RELAY(ON)/LRR2 RELAY(ON)/PS12 CONTACT(CLOSE)}	OK
56	R51 RELAY (OS-1) ON	OPERATION 35+ENG1 SAFETY MCB1(ON){RR1 RELAY(ON)/LRR1 RELAY (ON)+LM CONNECTOR TO BE CONNECTED IN LCC B1	OK
57	R52 RELAY (OS-2) ON	OPERATION 35+ENG2 SAFETY MCB1(ON){RR2 RELAY(ON)/LRR2 RELAY (ON)+ LM CONNECTOR TO BE CONNECTED IN LCC B1	OK
58	R71 RELAY (HOF-1) ON	OPERATION 35+ENG 1 SAFETY MCB1(ON)+{RR1 RELAY (ON)/LRR1 RELAY(ON)+LIMIT SWITCH AT HYDRAULIC TANK(DE-ENGAGED)	OK
59	R72 RELAY (HOF-2) ON	OPERATION 35+ENG 2 SAFETY MCB1(ON)+{RR2 RELAY (ON)/LRR2 RELAY(ON)+ LIMIT SWITCH AT HYDRAULIC TANK(DE-ENGAGED)	OK
60	FC21 RELAY (ENG-1 TRIP) ON	OPERATION 35+ENG 1 SAFETY MCB1(ON)+{R21 RELAY(OFF)/R41 RELAY(OFF)/R51 RELAY(OFF)/R61 RELAY(OFF)/R71 RELAY (OFF)}	OK
61	FC22 RELAY (ENG-2 TRIP) ON	OPERATION 53+ENG 2 SAFETY MCB1(ON)+{R22 RELAY(OFF)/R42 RELAY(OFF)/R52 RELAY(OFF)/R62 RELAY(OFF)/R72 RELAY (OFF)}	OK
62	R21 RELAY (LHOL) ON	OPERATION 53+ENG 1 SAFETY MCB2(ON){RR1 RELAY (ON)/LRR1 RELAY(ON)}	OK
63	R22 RELAY (LHOL) ON	OPERATION 53+ENG 2 SAFETY MCB2(ON){RR2 RELAY (ON)/LRR2 RELAY(ON)}	OK
64	R61 RELAY (LCWL-1) ON	OPERATION 53+ENG 1 SAFETY MCB2(ON){RR1 RELAY (ON)/LRR1 RELAY(ON)}	OK
65	R62 RELAY (LCWL-2) ON	OPERATION 53+ENG 2 SAFETY MCB2(ON){RR2 RELAY (ON)/LRR2 RELAY(ON)}	OK
66	S11 RELAY (ENG-1 ON) ON	OPERATION 1+ENGINE CONTROL SUPPLY MCB(ON)+DCS ON+ECS(IDLE)+OPERATE ENG1 ON SWITCH(ON)+ FC21 RELAY(OFF)	OK

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DETC no.M-247 (230012)

S.No.	Operation	Condition	Performed In Cab- I
67	S12 RELAY (ENG-2 ON) ON	OPERATION 1+ENGINE CONTROL SUPPLY MCB(ON)+DCS ON+ECS(IDLE)+OPERATE ENG2 ON SWITCH(ON)+ FC22 RELAY(OFF)	OK
68	RR1+ RR2 RELAYS (REMOTE READY TO START) ON	OPERATION1+CONTROL MCB(ON)+READY TO START MCB(ON)+Ensure +ve 110V supply at Cable No. 1661+ OPERATE READY TO START SWITCH IN DCS	OK
69	S13 RELAY (ENG-1 OFF) ON	OPERATION1+ENGINE CONTROL SUPPLY MCB(ON)+DCS ON+ECS(IDLE)+OPERATE ENG-1 OFF SWITCH IN DCS	OK
70	S14 RELAY (ENG-2 OFF) ON	OPERATION1+ENGINE CONTROL SUPPLY MCB(ON)+DCS ON+ECS(IDLE)+OPERATE ENG-2 OFF SWITCH IN DCS	OK
71	TRACTION CONTROL SUPPLY ON LED(ON)	OPERATION1+CONTROL MCB ON +LAMP TEST MCB ON+LAMP TEST SWITCH ON+CONTROL ON/ OFF SWITCH ON	OK
72	ENGINE 1 ON LED(ON)	OPERATION1+FAULT NDICATION MCB ON+ LAMP TEST MCB ON+LAMP TEST SWITCH ON+ DCS ON+S11 RELAY ON	OK
73	ENGINE 2 ON LED(ON)	OPERATION1+FAULT NDICATION MCB ON+ LAMP TEST MCB ON+LAMP TEST SWITCH ON+ DCS ON+S12 RELAY ON	OK
74	ENGINE 1 TRIP LED(ON)	OPERATION1+FAULT NDICATION MCB ON+LAMP TEST MCB ON+DCS ON+FC21 RELAY ON	OK
75	ENGINE 2 TRIP LED(ON)	OPERATION1+FAULT NDICATION MCB ON+LAMP TEST MCB ON+DCS ON+FC22 RELAY ON	OK
76	MOTOR EARTH FAULT LED(ON)	OPERATION1+FAULT NDICATION MCB ON+LAMP TEST MCB ON +DCS ON+GR RELAY ON	OK

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DETC no.M-247 (230012)

S.No.	Operation	Condition	Performed In Cab- I
77	PARKING BRAKE APPLICATION LED	OPERATION1+FAULT NDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+OPERATE PBG APPL SWITCH	OK
78	ALTERNATOR1 EXCTATION ON LED(ON)	OPERATION1+FAULT INDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+ECR1 RELAY ON	OK
79	ALTERNATOR2 EXCTATION ON LED(ON)	OPERATION1+FAULT INDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+ECR2 RELAY ON	OK
80	HCWT ENG1 LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+R31 RELAY OFF	OK
81	HCWT ENG2 LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+R32 RELAY OFF	OK
82	AUX ALT 1 FAILURE LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+AAFR1 RELAY OFF	OK
83	AUX ALT 2 FAILURE LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+AAFR2 RELAY OFF	OK
84	RECT1 FUSE FAILURE LED ON	OPERATION1+FAULT INDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+RL11 RELAY ON(In Rect-1)	OK
85	RECT2 FUSE FAILURE LED ON	OPERATION1+FAULT INDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+RL12 RELAY ON(In Rect-2)	OK

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DETC no.M-247 (230012)

S.No.	Operation	Condition	Performed In Cab- I
86	RECT1 COOL FAN FAILURE LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON +DCS ON+RCFR1 RELAY OFF	OK
87	RECT2 COOL FAN FAILURE LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON +DCS ON+RCFR2 RELAY OFF	OK
88	GOV-1 SUPPLY FAILURE LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+ER1 RELAY OFF	OK
89	GOV-2 SUPPLY FAILURE LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+ER2 RELAY OFF	OK
90	TRACTION MOTOR OVERLOAD LED ON	OPERATION1+FAULT INDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+{MOLR1/MOLR2/MOLR3/MOLR4} RELAY ON	OK
91	PANTO UP LED ON	OPERATION1+FAULT INDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+PANTO GOVERNOR CONTACT(CLOSE)RELAY ON	OK
92	DEAD MAN BRAKE APPL LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+DMR RELAY OFF	OK
93	AUX EARTH FAULT LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+AEFR ON+AEFR(AUX) RELAY ON	OK
94	LOW LUBE OIL PRESSURE ENG1 LED ON	OPERATION1+FAULT INDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+R41 RELAY OFF	OK
95	LOW LUBE OIL PRESSURE ENG2 LED ON	OPERATION1+FAULT INDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+R42 RELAY OFF	OK

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DETC no.M-247 (230012)

96	ENGINE1 IDLE LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON +DCS ON+ECR1 RELAY OFF+S11 RELAY (ON)	OK
97	ENGINE2 IDLE LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON +DCS ON+ECR2 RELAY OFF+S12 RELAY (ON)	OK
98	EMY TRACTION CUT OFF LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+EMR RELAY ON	OK
99	LUBE OIL TEMP TOO HIGH ENG1 LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+LUBE OIL TEMP SW ENG1(OPEN)	OK
100	LUBE OIL TEMP TOO HIGH ENG2 LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+LUBE OIL TEMP SW ENG2(OPEN)	OK
101	REV1 FOR(ON)	TO GIVE EXTERNAL AIR PRESSURE (5-7 kg/SqCm) TO EQUIPMENT GOVERNOR+OPERATION1+OPERATION2+ECS-RUN(CLOSE)+MASTER CONTROLLER(19-20)	OK
102	REV1 REV(ON)	TO GIVE EXTERNAL AIR PRESSURE TO EQUIPMENT GOVERNOR+OPERATION1+OPERATION2+{ECS-RUN(CLOSE)/TSS(ON)}+MASTER CONTROLLER(23-24)	OK
103	LC1+LC3 (ON)	TO GIVE EXTERNAL AIR PRESSURE TO EQUIPMENT GOVERNOR+{OPERATION 99/OPERATION 100}+SS1 ON+SS2 ON+SS3 ON+GROUND RELAY(OFF)+SAFETY RELAY1(OFF)+MOLR1(OFF)+ MOLR3(OFF)+MCS1(OFF)	OK
104	LC2+LC4 (ON)	TO GIVE EXTERNAL AIR PRESSURE TO EQUIPMENT GOVERNOR+{OPERATION 99/OPERATION 100}+SS1 ON+SS2 ON+SS3 ON+GROUND RELAY(OFF)+SAFETY RELAY2(OFF)+MOLR2(OFF)+ MOLR4(OFF)+MCS2(OFF)	OK

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-247 (230012)

7.0 Engine Cranking Prerequisites

Operation	Effect/Observation	Location	Performed In ENG-1
• Switch on BCS 110 V to power up the 110V control circuit		CC1	OK
• Switch on 24V Knife Switch to power up the 24V control Circuit		CC1	OK
• Switch all the Control and Aux MCBs (24V & 110V)	• Availability of power supply at the input terminals of LCCs.	CC1	OK
• Turn ON DCS key	• LED Panel will power up and display the default indications	DD	OK
• Keep ECS in IDLE Position		DD	OK
Ensure following:			
• Excitation Control Switch is off.		DD	OK
• Check 24 V battery status.	• 24 V voltmeter should show 24 V approx.	CC1	OK
• Check 110 V battery status	• 110 V voltmeter should show 110 V approx.	CC1	OK
• Check the master controller	• Master controller handle should be at 0 position	DD	OK
• Check Engine RPM meters	• 'ENG RPM' should indicate 0	CC1	OK
• There should be no active faults in the system.	• No Fault indications on the LED Panel.	DD	OK
• Operate Ready to Start Toggle Switch for a second to reset and release.	• All the relays will retain their healthy state. • All the fault Indications will disappear in LED Panel.	CC1 DD	OK

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DETC no.M-247 (230012)

• Operate Engine 1 / 2 Start toggle switch for 3 to 4 Seconds and Release.	• Engine will crank and Engine RPM shows 700 RPM in RPM Meter 1 / 2.	CC1 &2	OK
	• Engine 1 / 2 ON relay picks up	CC1	OK
	• Eng 1 / 2 ON and Eng 1 / 2 Idle indication will appear in LED Panel.	DD	OK

7.1 Engine Shutdown procedure:

Operation	Effect/Observation	Location	Performed in ENG-1
• Take the Master Handle to 0 notch and Reverser Switch to Neutral Position.	• Engine RPM will reduce to 700 RPM viewed at RPM Meter and Eng Idle Indication will appear in LED Panel	CC and DD	OK
• Press Engine 1 / 2 Off toggle switch.	• Engine 1 / 2 Trip indication appears in the LED panel.	DD	OK

7.2 Engine Safety Checks
Low Hydraulic Oil Level

Operation	Effect/Observation	Location	Performed in ENG-1
• Ensure Engin 1 / 2 is running.	• Engine 1 / 2 ON and Eng 1 / 2 Idle Indication in the LED panel.	DD	OK
• Connect a jumper wire between Cable No. LHOL 1A and LHOL 1B at Level Sensor End.	• LHOL indicator displays LO	CC1	OK
	• Engine will shutdown	Under Frame	OK
	• Engine 1 trip indication will be displayed.	LED Panel	OK
•	• In LHOL, LO indication disappears.	CC1	OK

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DETC no.M-247 (230012)

Remove the jumper wire.			
• Re Crank the Engine As per Procedure mentioned above.			OK

High Cooling Water Temperature Fault Test

Operation	Effect/Observation	Location	Performed in ENG-1
• Ensure Engine 1 / 2 is running.	• Engine 1 / 2 ON and Alt- 1 / 2 Exc. ON indication in the LED panel.	DD	OK
• Disconnect the TS11 and TS12 at Engine end.	• HCWT-1 Indication appears, Engine-1 Excitation will cut-off and Eng-1 Idle Indication will appear	DD	OK
• Restore the TS11 and TS12 at the Engine and Re Crank the Engine	• Engine trip indication will disappear in the LED panel and Eng-1 ON and Eng-1 Idle Indication will appear	DD	OK

Low Lube Oil Pressure Fault Test

Operation	Effect/Observation	Location	Performed in ENG-1
• Ensure Engine 1 / 2 is running.	• Engine 1 / 2 ON and Eng 1 / 2 Idle Indication in the LED panel.	DD	OK
• Disconnect the PS11 at Engine end.	• Low Lube Oil Pressure Eng 1 / 2 indication will appear in LED Panel	DD	OK
	• Engine will shutdown	Under Frame	OK
	• Engine 1 / 2 trip indication will be displayed.	LED Panel	OK

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DETC no.M-247 (230012)

• Restore the PS11 at Engine end and Engage Ready to Start Switch in DCS	• Low Lube Oil Pressure Eng 1 / 2 and Engine 1 / 2 trip indication will disappear	DD	OK
• Re Crank the Engine As per Procedure mentioned above.			OK

Low Coolent Level fault Test

Operation	Effect/Observation	Location	Performed in ENG-1
• Ensure Engine 1 / 2 is running.	• Engine 1 / 2 ON and Eng 1 / 2 Idle Indication in the LED panel.	DD	OK
• Connect a jumper wire between Cable No. LCWL 1A & LCWL 1B for ENG-1 and LCWL 2A & 2B for ENG-2 at Level Sensor End.	• LCWL 1 / 2 indication displays LO	CC1	OK
	• Engine will shutdown	Under Frame	OK
	• Engine 1 trip indication will be displayed.	LED Panel	OK
• Remove the jumper wire.	• In LCWL, LO indication disappears.	CC1	OK
• Re Crank the Engine As per Procedure mentioned above.			OK

8.0 LOAD TEST

Load test is carried out to check the performance of power pack installed in the DETC coach along with interconnected control system. It ensures that the power pack delivers rated output in each notch at rated speed as per the designed requirement.

Load test can be a fountain of valuable information revealing engine trouble such as low horse power, black smoke in the exhaust, hunting under load, and as well as some electrical problems like power circuit ground detection (Grounding of Alternator, Rectifier and cables up to CP can be detected).

Diesel engine (CUMMINS/BHEL) and Traction Alternator, Rectifier along with ECM shall be used for this test. After setting up the load bench, move Master Handle (MH) from IDLE to 8th notch in steps while keeping Reverser Handle (RH) in F/R position. In Load test, notch wise engine rpm and output power in kilowatts is maintained by the ECM under power limit mode.

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-247 (230012)

8.1 Test Status

Record test results in the format given below.

8.2 Test Equipment

- Digital Multimeters
- DCS key
- Master Controller Unlock key
- DC Clamp Ammeter

8.4 Test Programme

8.4.1 Test Preparations

Operation	Performed in ENG-1
• Ensure Engine is OFF and all circuit breakers and battery isolation switches are OFF.	OK
• Connect the load bank between wire no. P5(Eng-1)/P6(Eng-2) and G0.	OK
• Connect the Digital Multimeters (10A) in LCCs for measuring Actuator and Field Current.	OK
• Connect the Digital Multimeter for voltage and Digital Clamp meter for current measurement at load Bank.	OK
• Crank the Engine as per the instructions provided above.	OK
• Allow engine to run for 15 minutes before loading.	OK

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-247 (230012)

8.4.2 Traction Alternator Load Test

8.4.2.1 Notch wise Load Test

Operation	Performed in ENG-1
Start the power pack at notch-0 with load bank plate slightly dipped into the water and adjust the plate so that voltage and current LED in the LCC does not glow.	OK
Turn ON the excitation switch and change the notch position to 1st. Measure the DC current/DC voltage and calculate the power output i.e. kW reading.	OK
If the kW is lower than required, rotate the kW pot in LCC against 1st notch in clockwise direction (Load ramp-Up LED glows while adjusting the knob in LCC) until the kW matches with the required value. If kW is not increasing after 2-3 rotations, dip the plate into water to increase the load capacity and again check the kW.	OK
If kW is higher than required, rotate the kW pot against the 1st notch in anti-clockwise direction (Load ramp-Down LED glows) until the kW output matches the required value.	OK
Repeat the above steps for each of the notches.	OK
Cross-check the readings after restart and in both ascending & descending orders of notch.	OK
Record the actuator current, excitation current, Load voltage and current.	OK

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8.4.2.2 Notch wise Load Test Report

Load Test Engine A

Diesel Engine S. no.	25475045	**Traction Alternator S. no.**	315230060
Woodward ECM (Engine Control module)S. no.	BLOWHBAOFQOH	**Amplifier S. no.**	U 36A/309

Engine Safety Check

Item	Action	Performed	Remarks
HWT 1(High Water temp above 91 ° C	LED INDICATION	OK	
HWT 2(High Water temp above 91 ° C	EXCITATION OFF	OK	
LLOP(Low lube oil Pressure)	ENGINE TRIP	OK	
OS (Over speed)	ENGINE TRIP	OK	
LCWL (Low Coolant Water Level)	ENGINE TRIP WITH DELAY	OK	
LHOL(Low hydraulic Oil Level)	ENGINE TRIP WITH DELAY	OK	
HOFF (hydraulic Oil flow failure)	ENGINE TRIP	OK	
RCFR(Rectifier cooling fan failure)	EXCITATION OFF	OK	
RFF	EXCITATION OFF	OK	

Prior to load testing ensure following:

a. FP pressure should be between 5-7 kg/cm2
b. Hydraulic oil pressure should be between 130-200 bar at 1800 rpm

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DETC no.M-247 (230012)

Load test chart (Engine A) BHEL

Notch position	Engine RPM	Voltage (V)		Current (I)		KW (P) ± 3%		(P) Reference (kW)		(V)Limits		(I) limit		I actuator	I field
		Ref (V)	Act (V)	Ref (A)	Act (A)	Ref (kw)	Act (kw)	Lower Limit	Upper Limit	Ref	Act	Ref	Act	Ref	Ref
1	700	120	120	125	121	15	15	14.6	15.5	175	177	390	388	15	20
2	1000	150	155	200	205	31	31	30	32	260	265	450	445	18	19
3	1200	230	231	310	311	71	71	69	73	360	361	510	510	25	26
4	1300	280	281	350	351	98	98	95	101	450	449	570	570	30	36
5	1400	350	355	375	375	131	133	127	135	490	491	630	630	47	41
6	1500	400	405	405	403	162	163	157	167	550	553	700	700	41	49
7	1650	420	420	450	455	189	191	183	194	600	610	770	766	41	55
8	1800	425	430	490	490	208	210	202	214	660	660	810	808	40	56

After setting power, voltage & Current of the engine in full power. Run engine till full hydraulic pressure is attained. During this time monitor Engine Coolant Temperature;

Note down final reading of following gauges:

Gauge	Value	Unit
EWT	85	°C
LOT	90	°C
LOP	45	psi

Load Test Engine B

Diesel Engine S. no.	25476986	**Traction Alternator S. no.**	315230059
ECM (Engine Control module)S. no.	22607760	**Amplifier S. no.**	U36 A /302

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DETC no.M-247 (230012)

Engine Safety Check

Item	Action	Performed	Remarks
HWT 1	LED INDICATION	OK	
HWT 2	EXCITATION OFF	OK	
LLOP	ENGINE TRIP	OK	
OS	ENGINE TRIP	OK	
LWL	ENGINE TRIP WITH DELAY	OK	
LHOL	ENGINE TRIP WITH DELAY	OK	
HOFF	ENGINE TRIP	OK	
RCFR	EXCITATION OFF	OK	
RFF	EXCITATION OFF	OK	

Prior to load testing ensure following:

c. FP pressure should be between 5-7 kg/cm2

d. Hydraulic oil pressure should be between 130-200 bar at 1800 rpm

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-247 (230012)

Load test chart (Engine B) BHEL

Notch position	Engine speed	V ref	V	I ref	I	P ref	P	(P) Reference (kW)		Upper limits				I actuator	I field
	Rpm	(V)	(V)	(A)	(A)	(kW)	(kW)	Lower limit	Upper Limit	V ref	V msrd	I ref	I msrd	(A)	(A)
1	700	120	121	125	126	15	15	14.6	15.5	175	177	390	388	18	15
2	1000	150	156	200	202	31	31	30	32	260	262	450	451	16	16
3	1200	230	230	310	310	71	71	69	73	360	361	510	510	20	26
4	1300	280	281	350	353	98	99	95	101	450	451	570	575	28	28
5	1400	350	353	375	373	131	130	127	135	490	492	630	635	33	37
6	1500	400	401	405	407	162	163	157	167	550	551	700	701	37	44
7	1650	420	421	450	450	189	189	183	194	600	601	770	770	38	51
8	1800	425	430	490	490	208	210	202	214	660	660	810	808	37	54

After setting power, voltage & Current of the engine in full power. Run engine till full hydraulic pressure is attained. During this time monitor Engine Coolant Temperature;

Note down final reading of following gauges:

Gauge	Value	Unit
EWT	85	°C
LOT	90	°C
LOP	45	psi

9.0 MOVEMENT TEST

9.1 Purpose

To ensure DETC movement in right direction as per Reverser Handle position.

9.2 Measuring Equipments and Test Setup

- Multimeter

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DETC no.M-247 (230012)

- Wago connector
- DCS key
- Master Controller Unlock key

9.3 Test Status

Record the test results in the table given below

9.4 Test Implementation

Forward and Reverse movement about 10 kmph has been taken with all Traction Motors. Individual Traction Inverter data is recorded by performing the bogie cut out of each Line Contactor in MSGC. Forward and Reverse movement of Traction Motors performed and data is recorded. Based on recorded data, we verified the performance of the motor during movement test.

SAFETY AND BYPASS CHECKS (Before Movement)

SN	Test	Readings/Result	Remarks
1.	SA9 Brake Apply and release physical check at all wheels	OK	
2.	A9 Brake Apply and release physical check at all wheels	OK	
3	Parking Brake Apply and release physical check at designated wheels	OK	
4	Equipment Governor Bypass	OK	
5	Rectifier Cooling Fan - 1 Failure Bypass	OK	
6	Rectifier Cooling Fan - 2 Failure Bypass	OK	
7	Brake Pressure Control Governor Bypass	OK	
8	Parking Brake Governor Bypass	OK	
9	Functioning of Movement Restriction at 10KMPH interlock while Lifting platform is in up condition. (Excitation Off)	OK	
10	Power Ground fault in Power Pack-1 and Resetting	OK	
11	Power Ground Fault in Power pack-2 and Resetting	OK	
12	Control Circuit Earth fault (+)	OK	
13	Control Circuit Earth fault (--)	OK	

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DETC no.M-247 (230012)

LOCAL MOVEMENT TEST FROM CAB-1

SN	Test	Readings/Result	Remarks
1.	Forward movement with engine-1 in ON condition + TM-1 Traction Motor only Included (10Kmph) Notch-1	TM-1 175 A	
2.	Reverse movement with engine-1 in ON condition + TM-1 Traction Motor only Included (10Kmph) Notch-1	TM-1 180 A	
3	Forward movement with engine-1 in ON condition + TM-3 Traction Motor only Included (10Kmph) Notch-1	OK	
4	Reverse movement with engine-1 in ON condition + TM-3 Traction Motor only Included (10Kmph) Notch-1	OK	
5	Forward movement with engine-1 in ON condition + Both Traction Motors Included (10Kmph) Notch-1 TM-1 Current	TM-1 170 A	
6	Reverse movement with engine-1 in ON condition + Both Traction Motors Included (10Kmph) Notch-1 TM-1 Current	TM-1 180 A	
7	Forward movement with engine-2 in ON condition + TM-2 Traction Motor only Included (10Kmph) Notch-1	TM-2 175 A	
8	Reverse movement with engine-2 in ON condition + TM-2 Traction Motor only Included (10Kmph) Notch-1	TM-2 180 A	
9	Forward movement with engine-2 in ON condition + TM-4 Traction Motor only Included (10Kmph) Notch-1	OK	
10	Reverse movement with engine-2 in ON condition + TM-4 Traction Motor only Included (10Kmph) Notch-1	OK	
11	Forward movement with engine-2 in ON condition + Both Traction Motors Included (10Kmph) Notch-1 TM-2 Current	TM-2 165 A	
12	Reverse movement with engine-2 in ON condition + Both Traction Motors Included (10Kmph) Notch-1 TM-2 Current	TM-2 170 A	
13	Forward movement with both engines are in ON condition + All Traction Motors are Included (10Kmph) Notch-1	TM-1 180 A	
		TM-2 175 A	
14	Reverse movement with both engines are in ON condition + All Traction Motors are Included (10Kmph) Notch-1	TM-1 175 A	
		TM-2 180 A	
15	Speedometer over speed alarm function working (Ensure WD : 952mm)	OK	
16	Braking Performance SA9	OK	
17	Braking Performance A9	OK	

Signature of JE/SSE (Testing)

JAI PRAKASH GAUTAM

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PATIALA LOCOMOTIVE WORKS, PATIALA
Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-247 (230012)

18	Deadman Braking Performance	OK	
19	Emergency Braking Performance	OK	
20	Head light both beams glowing with proper focusing	OK	
21	Driver and Guard side both Tail Lights glowing	OK	
22	Driver and Guard side both Marker Lights glowing	OK	
23	Flasher Light working properly	OK	
24	Search Light glowing	OK	
25	Fog light Glowing	OK	

LOCAL MOVEMENT TEST FROM CAB-2

SN	Test	Readings/Result	Remarks
1.	Forward movement with both engines are in ON condition + All Traction Motors are Included (10Kmph) Notch-1	TM-1 180 A	
		TM-2 175 A	
2.	Reverse movement with both engines are in ON condition + All Traction Motors are Included (10Kmph) Notch-1	TM-1 170 A	
		TM-2 175 A	
3.	Head light both beams glowing with proper focusing	OK	
4.	Driver and Guard side both Tail Lights glowing	OK	
5.	Driver and Guard side both Marker Lights glowing	OK	
6.	Flasher Light working properly	OK	
7.	Search Light glowing	OK	
8.	Fog light Glowing	OK	
9.	Braking Performance SA9	OK	
10.	Braking Performance A9	OK	
11.	Deadman Braking Performance	OK	
12.	Emergency Braking Performance	OK	

Signature of JE/SSE (Testing)

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PATIALA LOCOMOTIVE WORKS, PATIALA
Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-247 (230012)

HV SENSOR, HL-TL AND LOCAL ON/OFF PERFORMANCES IN CAB I & II

SN	Test	Readings/Result	Remarks
1	Headlight-Tail light Interlock performance	OK	
2	H.V Sensor Performance	OK	
3	Engine- 1 local On / Off Function	OK	
4	Engine- 2 local On / Off Function	OK	

ALL GOVERNORS PERFORMANCE

Equipment Governor Pressure Setting (Brake Team Scope)			**MR Governor(ADV Setting) SAN Scope**		
Cut-in	4.2Kg/SqCm	OK	Cut-in	6Kg/SqCm	OK
Cut-off	3.4Kg/SqCm	OK	Cut-off	7Kg/SqCm	OK
BPC Governor Pressure Setting (Brake Team Scope)			**Parking Brake Apply and Release**		
				DCS Switch Configuration	Function
4.2Kg/SqCm	4.2Kg/SqCm	OK	Apply	OK	OK
3.4Kg/SqCm	3.4Kg/SqCm	OK	Release	OK	OK

Signature of JE/SSE (Testing)

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Air-brake equipments details of DETC-M-247

S.No.	Description	PL no.	QPL /Nos.	Supplier	Item Sr. no.
1	Distributor Valve	30358334	1	SD	24112
2	A9 brake Valve		2		-
3	SA9 brake valve		2		-
4	C2 Relay Valve		1		02-07-22
5	Auto Drain valve		3		-
6	Air whistle		4		-
7	PRV Limiting valve		4		-
8	Three way magnet valve(Parking)		2		
9	Three way magnet valve(Horn)		2		
10	Three way magnet valve(MR)		1		
11	Three way magnet valve(Compressor)		1		
12	Safety valve		1	RECON	-
13	Wiper motor	31646037	4	ESSBEE	-
14	Dome Wiper motor	31357647			
15	Air Dryer	31357179	1	PRAG	2858-07-22
16	Pantograph assembly	31920706	1	CONTRANSYS	11485-07/22
17	Servo Motor	31920706	1	CONTRANSYS	11386-06/22
18	PANTO MOUTING INSULATOR	31906011	4	IEC	22-Aug

SSE/Testing

SSE/ABS

PATIALA LOCOMOTIVE WORKS, PATIALA

DETC No. M-247(230012)				
Sr. No.	**DESCRIPTION**	**PL. No.**	**MAKE**	**Sr. No.**
1	CAB HEATER (CAB-1)	31902017	ESS BEE	565
2	CAB HEATER (CAB-2)	31902017	ESS BEE	566
3	SPEEDOMETER (CAB -1)	30906313	AAL	357
4	SPEEDOMETER (CAB -2)	30906313	AAL	358
5	SPOT LIGHT	36766215	ALTOS	-----
6	CLUSTER LIGHT	36766227	ALTOS	-----
7	MARKER & TIAL LIGHT	31907663	MATSUSHI	1085,1086,1087 & 1088
8	FLASHER LIGHT	45158563	ALTOS	563 & 564
9	FLASHER UNIT	45158563	ALTOS	564 & 565
10	FOG LIGHT	45026725	HELLA	-----
11	SEARCH LIGHT	45026713	HELLA	-----
12	HEAD LIGHT	30767040	SIGNATON	568 & 569
13	DC-DC CONVERTER	31907490	SIGNATON	552 & 553
14	BATTERY 24v	45178185	MICROTEX	843
15	BATTERY 110v	45170289	AMAR RAJA	220863-220880
16	FAN 06No.	45180910	LEC	1642,1643,1644,1645,1646 & 1647
17	FAN 04No.	45979753	LEC	1115,1118,1119 & 1120
18	TELEPHONE	45979005	ELIXER (BEETEL)	-----
19	CCTV	31902110	CP PLUS	192

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SSE/ECS

PATIALA LOCOMOTIVE WORKS, PATIALA			
DETC-ECoR-230012/KUR/ (M-247)			
S.NO.	NAME OF COMPONENTS	COMPANY	MFG. DATE & SN
1	SHELL	ECBT	135
2	HYDRAULIC PLATFORM	ORION	6096
3	LIFTING RAM	ORION	6096
4	STARTER BATTERY CHARGER	RAMYAA ELECTRO-GEAR(P) LTD.	2207-23-1024
5	RECTIFIER REGULATOR UNIT	KEL	04/23 & 230471C1221 , 230471C1225
6	RECTIFIER A & B	BHEL	526070119 & 526070126
7	MOTOR SWITCH GROUP CUBICAL	BHEL	2200MSG032
8	AUX. ALTERNATOR-1 &2	KEL	02/23 & 2302711220, 2302711224
9	ENGINE 1 & 2	CUMMINS INDUSTRIES	06/22 & 25475045 , 08/22 & 25476986
10	ALTERNATOR 1 & 2	BHEL	315230059, 315230060
11	CONTROL CUBICAL-1	BHEL	230CAB1003
12	CONTROL CUBICAL-2	BHEL	230CAB2003
13	RESISTANCE PANEL	BHEL	526070107/108
14	10 KV GENERATOR SET	AMPL	05/23 & AMPL/ES/0629
15	RADIATOR	CUMMINS INDUSTRIES	66-03-2023
16	DRILLING MACHINE	SIDDHAPURA	NOT MENTION
17	3KV DG WELDING SET	HIMALYAN	HM230P-20230206278
18	HYDRAULIC TROLLEY MOTOR	ABB	3G3J2230460028
19	CONTROL PANEL FOR RAM	ORION	6093
20	FUEL TANK	SIRHIND BODY BUILDERS	06/22 & 58
21	CABLE DRUM	KANE	03-23

Sign.....
SSE/DETC/LAS

Sign.....Desh Bandhu.....
JE/DETC/LAS

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PATIALA LOCOMOTIVE WORKS,PATIALA

DETC No.	230012

1. BOGIE FRAME:

BOGIE	FRAME NO	Make	PL No.	PO No. & dt.	Warranty Period
Panto side	SL-334	ECBT	10992169	01212419102586	As per PO/IRS conditions
Radiator Side	SL-332	ECBT		01212419102586	

2. Hydraulic Dampers (Vertical and Lateral) Make: IAI 400 / IAI 200

3. AXLES:

LOCATION	1	2	3	4
S.NO	D-8695	R-9463	R-9428	L-8224
Ultrasonic Testing	OK	OK	OK	OK

4. WHEEL DISCS NO. AND TYPE

LOCATION	1	2	3	4
GEAR END	DM/23-436	DM/23-437	DM/23-427	DM/23-434
Ultrasonic Testing	OK	OK	OK	OK
FREE END	DM/23-433	DM/23-435	DM/23-426	DM/23-415
Ultrasonic Testing	OK	OK	OK	OK

5. AXLE ROLLER BEARING (Warranty: As per PO/IRS conditions)

LOCATION		1	2	3	4
Gear End	MAKE	NBC	NBC	NBC	NBC
	PO NO. & dt	102618	102618	102618	102618
Free End	MAKE	NBC	NBC	NBC	NBC
	PO NO. & dt	102618	102618	102618	102618

6. WHEEL DISC PRESSING (PRESSURE IN KN): SPECIFIED 77.2-115.6 T

AXLE NO	1	2	3	4
BULL GEAR END	963	927	968	917
FREE END	989	949	986	996

DETC No.	230012

7. DIAMETER AFTER PROFILE TURNING: SPECIFIED 952-955 mm

AXLE NO.	1	2	3	4
DIA IN mm GE	953	953	953	953
DIA IN mm FE				
WHEEL PROFILE GAUGE (1600±1mm)	OK	OK	OK	OK

8. SUSPENSION TUBE & ITS TAPER ROLLER BEARING:

AXLE NO.		1	2	3	4
S.T.	MAKE	BHEL	BHEL	BHEL	BHEL
G.E. BEARING	MAKE	FAG	FAG	FAG	FAG
F.E. BEARING	MAKE	FAG	FAG	FAG	FAG

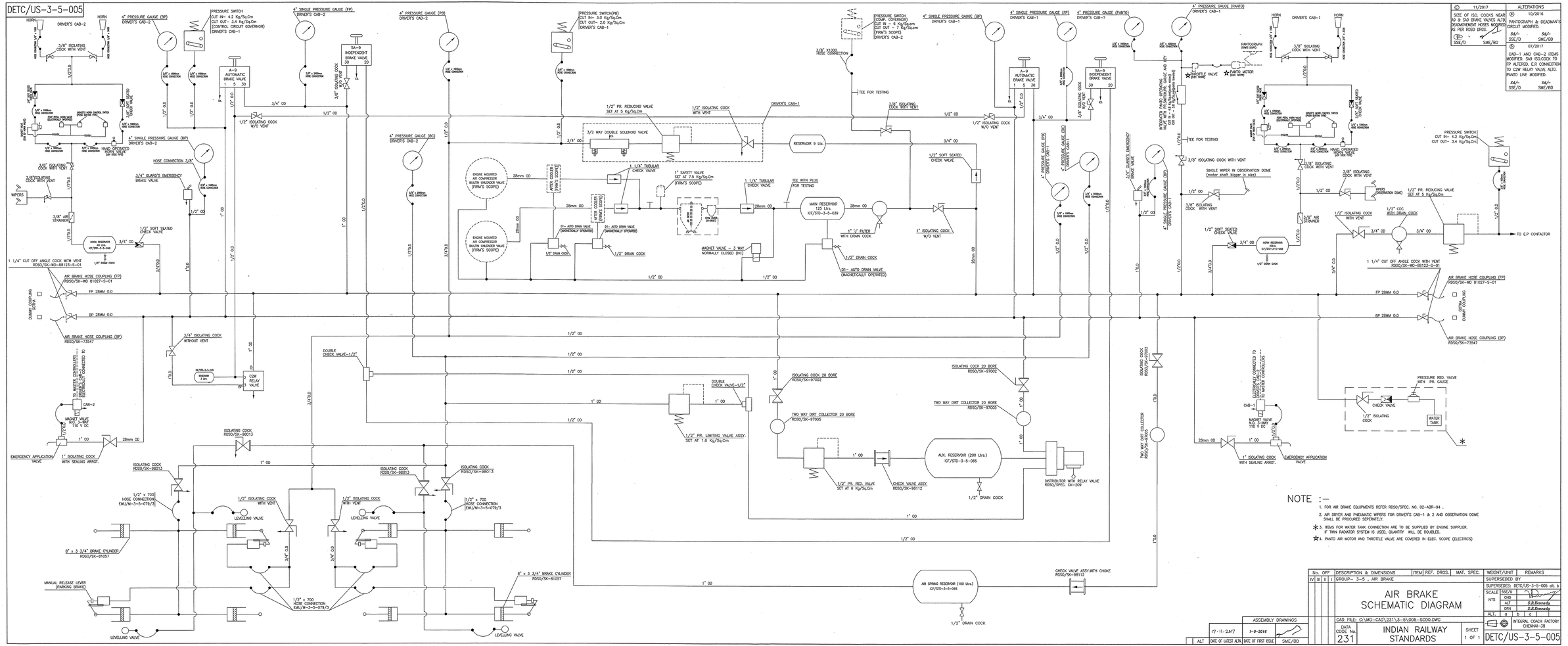
9. GEAR CASE & BACKLASH:

AXLE NO.	1	2	3	4
MAKE	BHEL	BHEL	BHEL	BHEL
BACKLASH (0.200 – 0.700mm)	0.520	0.540	0.540	0.520

10. TRACTION MOTOR : (PL No. 30906313, Warranty: As per PO/IRS conditions)

LOCATION	MAKE	PO No. & date	S. NO.
1	BHEL	100246	408230136
2	BHEL	100246	408230142
3	BHEL	100246	408230135
4	BHEL	100246	408230134

SSE/ Bogie Shop


DETC/US-3-5-005
HORN
DRIVER'S CAB-2
3/8" ISOLATING COCK WITH VENT
4" PRESSURE GAUGE (BP)
PRESSURE SWITCH CUT IN- 4.2 Kg/Sq.Cm CUT OUT- 3.4 Kg/Sq.Cm (CONTROL CIRCUIT GOVERNOR)
4" SINGLE PRESSURE GAUGE (FP)
4" PRESSURE GAUGE (PB)
PRESSURE SWITCH(PB) CUT IN- 3.0 Kg/Sq.Cm CUT OUT- 2.0 Kg/Sq.Cm
PRESSURE SWITCH, COMP. GOVERNOR CUT IN - 8 Kg/Sq.cm CUT OUT - 10 Kg/Sq.cm
4" SINGLE PRESSURE GAUGE (BP)
4" SINGLE PRESSURE GAUGE (FP)
4" PRESSURE GAUGE (PANTO)
A-9 AUTOMATIC BRAKE VALVE
SA-9 INDEPENDENT BRAKE VALVE
1/2" PR. REDUCING VALVE SET AT 5 Kg/Sq.Cm
1/2" ISOLATING COCK WITH VENT
3/2 WAY DOUBLE SOLENOID VALVE
RESERVOIR 9 Ltr.
1/2" ISOLATING COCK W/O VENT
1/2" SOFT SEATED CHECK VALVE
3/4" GUARD'S EMERGENCY BRAKE VALVE
HOSE CONNECTION 3/8"
WIPERS
3/8" AIR STRAINER
HORN RESERVOIR 40 Ltrs. ICF/STD-3-5-058
1/2" DRAIN COCK
1 1/4" CUT OFF ANGLE COCK WITH VENT RDSO/SK-MD-88123-S-01
AIR BRAKE HOSE COUPLING (FP) RDSO/SK-MD B1027-S-01
FP 28MM O.D
BP 28MM O.D
DUMMY COUPLING
AIR BRAKE HOSE COUPLING (BP) RDSO/SK-73547
3/4" ISOLATING COCK WITHOUT VENT
ICF/STD-3-5-126 RESERVOIR 9 LTRS
CDW RELAY VALVE
DOUBLE CHECK VALVE-1/2"
1/2" PR. LIMITING VALVE ASSY. SET AT 1.6 Kg/Sq.Cm
TO MOTOR CONTROLLERS ELECTRICALLY CONNECTED TO CAB-2
MAGNET VALVE N.C. 1-WAY 110 V DC
EMERGENCY APPLICATION VALVE
1" ISOLATING COCK WITH SEALING ARRGT.
ISOLATING COCK RDSO/SK-98013
1/2" x 700 HOSE CONNECTION EMU/M-3-5-079/3
1/2" ISOLATING COCK WITH VENT
LEVELLING VALVE
8" x 3 3/4" BRAKE CYLINDER RDSO/SK-81057
MANUAL RELEASE LEVER (PARKING BRAKE)
1/2" x 700 HOSE CONNECTION EMU/M-3-5-079/3
1/2" ISOLATING COCK WITH VENT
1/2" x 700 HOSE CONNECTION EMU/M-3-5-079/3
8" x 3 3/4" BRAKE CYLINDER RDSO/SK-81057
LEVELLING VALVE
1/2" ISOLATING COCK WITH VENT
LEVELLING VALVE
1/2" x 700 HOSE CONNECTION EMU/M-3-5-079/3
1/2" ISOLATING COCK WITH VENT
LEVELLING VALVE
1/2" x 700 HOSE CONNECTION EMU/M-3-5-079/3
8" x 3 3/4" BRAKE CYLINDER RDSO/SK-81057
LEVELLING VALVE
ENGINE MOUNTED AIR COMPRESSOR BUILTIN UNLOADER VALVE (FIRM'S SCOPE)
28mm OD
AFTER COOLER (FIRM'S SCOPE)
1" SAFETY VALVE SET AT 7.5 Kg/Sq.Cm (FIRM'S SCOPE)
1/4" TUBULAR CHECK VALVE
MAIN RESERVOIR 125 Ltrs. ICF/STD-3-5-039
1 1/4" TUBULAR CHECK VALVE
TEE WITH PLUG FOR TESTING
1" 'J' FILTER WITH DRAIN COCK
1" ISOLATING COCK W/O VENT
1/2" DRAIN COCK
D1- AUTO DRAIN VALVE (MAGNETICALLY OPERATED)
MAGNET VALVE - 3 WAY NORMALLY CLOSED (NC)
TEE FOR TESTING
3/8" ISOLATING COCK WITH VENT
SINGLE WIPER IN OBSERVATION DOME (motor shaft bigger in size)
3/8" ISOLATING COCK WITH VENT
1/2" SOFT SEATED CHECK VALVE
HORN RESERVOIR 40 Ltrs. ICF/STD-3-5-058
1/2" DRAIN COCK
3/8" AIR STRAINER
1/2" ISOLATING COCK WITH VENT
1/2" CCC WITH DRAIN COCK
1/2" PR. REDUCING VALVE SET AT 5 Kg/Sq.Cm
WIPER (OBSERVATION DOME)
TO E.P CONTACTOR
1 1/4" CUT OFF ANGLE COCK WITH VENT RDSO/SK-MD-88123-S-01
AIR BRAKE HOSE COUPLING (FP) RDSO/SK-MD B1027-S-01
AIR BRAKE HOSE COUPLING (BP) RDSO/SK-73547
ISOLATING COCK 20 BORE RDSO/SK-97002
TWO WAY DIRT COLLECTOR 20 BORE RDSO/SK-97005
1/2" PR. RED. VALVE SET AT 6 Kg/Sq.Cm
CHECK VALVE ASSY. RDSO/SK-98112
AUX. RESERVOIR (200 Ltrs.) ICF/STD-3-5-065
1/2" DRAIN COCK
DISTRIBUTOR WITH RELAY VALVE RDSO/SPEC. GH-209
AIR SPRING RESERVOIR (150 Ltrs.) ICF/STD-3-5-066
1/2" DRAIN COCK
CHECK VALVE ASSY.WITH CHOKE RDSO/SK-98112
ISOLATING COCK RDSO/SK-98013
TWO WAY DIRT COLLECTOR RDSO/SK-97005
ELECTRICALLY CONNECTED TO 'D1' MOTOR CONTROLLERS
CAB-1
MAGNET VALVE N.O. 1-WAY 110 V DC
1" ISOLATING COCK WITH SEALING ARRGT.
EMERGENCY APPLICATION VALVE
PRESSURE RED. VALVE WITH PR. GAUGE
CHECK VALVE
1/2" ISOLATING COCK
WATER TANK
PRESSURE SWITCH CUT IN- 4.2 Kg/Sq.Cm CUT OUT- 3.4 Kg/Sq.Cm
NOTE :—
1. FOR AIR BRAKE EQUIPMENTS REFER RDSO/SPEC. NO. 02-ABR-94 .
2. AIR DRYER AND PNEUMATIC WIPERS FOR DRIVER'S CAB-1 & 2 AND OBSERVATION DOME SHALL BE PROCURED SEPERATELY.
3. ITEMS FOR WATER TANK CONNECTION ARE TO BE SUPPLIED BY ENGINE SUPPLIER. IF TWIN RADIATOR SYSTEM IS USED, QUANTITY WILL BE DOUBLED.
4. PANTO AIR MOTOR AND THROTTLE VALVE ARE COVERED IN ELEC. SCOPE (ELECTRICS)
ALTERATIONS
C 11/2017 SIZE OF ISO. COCKS NEAR AB & SA9 BRAKE VALVES ALTD. DEADMOVEMENT HOSES MODIFIED AS PER RDSO DRGS. SSE/D SME/BD
B 10/2016 PANTOGRAPH & DEADMAN'S CIRCUIT MODIFIED. SE/- SSE/D SME/BD
A 07/2017 CAB-1 AND CAB-2 ITEMS MODIFIED. SA9 ISO.COCK TO FP ALTERED. E.P. CONNECTION TO CDW RELAY VALVE ALTD. PANTO LINE MODIFIED. SE/- SSE/D SME/BD
ASSEMBLY DRAWINGS
ALT DATE OF LATEST ALTN 17-11-2017 DATE OF FIRST ISSUE 1-9-2016 SME/BD
No. OFF IV III II I
DESCRIPTION & DIMENSIONS
ITEM
REF. DRGS.
MAT. SPEC.
WEIGHT/UNIT
REMARKS
GROUP- 3-5 , AIR BRAKE
SUPERSEDED BY
SUPERSEDES: DETC/US-3-5-005 alt. b
AIR BRAKE SCHEMATIC DIAGRAM
SCALE NTS
SSE/D
CHD
ALT
DRN S.S.Kennedy
ALT. a b c
CAD FILE: C:\MD-CAD\231\3-5\005-SC00.DWG
DATA CODE No. 231
INDIAN RAILWAY STANDARDS
SHEET 1 OF 1
INTEGRAL COACH FACTORY CHENNAI-38
DETC/US-3-5-005
FORM I.R A1c 1470 x 600