MEDHA®

Driver's Manual

25 kV AC Three Phase Propulsion & Other Equipment For TRAIN18

Type MAE675U- TRAIN18

Kindly refer the Manual kept at the following path:

T:\Training_Material\Released Manuals with IM\Approval

Changes in the manual are done as per ECR: 1219 - 033520 - E

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6/9/2021

MEDHA

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25 kV AC Three Phase Propulsion & Other Equipment For TRAIN18

Type MAE675U-TRAIN18

IM - 270 rev 1.1

MEDHA SERVO DRIVES PVT. LTD.

Information in this document is subject to change without notice.

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Chapter 1

INTRODUCTION

Conventional EMUs use DC traction motors which are directly connected to the rectifier. The current trend for last decade is to move from DC traction motors to AC traction motors, which offer better control, better reliability and are less prone to breakdown and repair.

In this regard, RDSO has released specification no. RDSO/PE/SPEC/EMU/0096-2008 (Rev. 04) for producing 3-phase drive propulsion equipment for AC EMUs. ICF proposed to design Trainset with 50% motoring with all power components underslung. This trainset has coach with sitting arrangement. Coach in configuration is of different type such as driving AC chair car, AC chair car and executive AC chair car.

1.1 List of Abbreviations used

Acronym	Description
AC	Alternating Current
ACU	Auxiliary converter Unit
ADC	Analog to Digital Converter
AIP	Analog Input
ATC	Auxiliary Traction Converter
BC	Brake Cylinder
BCP	Brake Cylinder Pressure
BE	Braking effort
CAN	Controlled Area Network
CCU	Coach Control Unit.
DC	Direct Current
DCS Key	Driver control Switch Key
DE	Driving End
DE	Driving End
DIP	Digital Input
DOP	Digital Output
DPRAM	Dual Port Random Access Memory
DSP	Digital Signal Processor
DTC	Driving trailer coach
EBCU	Electronic Brake Control Unit
EBL	Emergency Brake Loop
ECN	Ethernet Consist Network
ED	Electro Dynamic
EEPROM	Electrically Erasable and Programmable Read Only Memory
EMU	Electrical Multiple Unit
EOL	Emergency Off Loop
EP	Electro Pneumatic

Acronym	Description
EPCC	Enhanced Passenger comfort computer
EPCU	Enhanced Passenger comfort unit
FDP	Fault Data Pack
HWTL	Hard Wired Train Line
AC	Alternating Current
ACU	Auxiliary Converter Unit
BE	Braking effort
DSP	Digital Signal Processor
DTC	Driving trailer coach
HSCB	High Speed Circuit Breaker
ICF	Integral Coach Factory, Chennai
LED	Light Emitting Diode
MC	Motor Coach
MSDPL	Medha Servo Drives Pvt. Ltd.
PA PIS	Passenger Announcement and Passenger Information System
PWM	Pulse Width Modulation
RDSO	Research Development and Standards Organization
TC	Trailer Coach
TCMS	Train Control and Management System
TE	Tractive Effort
TM	Traction Motor
TSA	Traction system Austria
AWS	Auxiliary warning system
CAN	Controlled Area Network
CCU	Central Control Unit
DC	Direct Current
DE	Driving End
ED	Electro Dynamic
EP	Electro Pneumatic
HWTL	Hard Wired Train Line

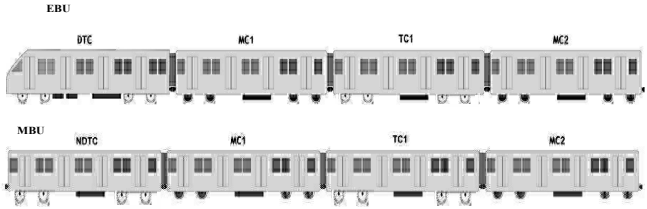
Abbreviation	Description
LTC	Line and Traction Converter
LTCU	Line and Traction Converter Computer
MAK	Medha Kolkata Metro
MCU	Main Control Unit
MVB	Multifunction Vehicle Bus
NDE	Non Driving End
NDTC	Non Driving Trailer Coach
PCC	Passenger comfort computer
PS	Power Supply
RDM	Rescue Drive Mode
TC	Trailer Coach
TCN	Train communication network
TIC	Traction Inverter Computer
TM	Traction Motor
USB	Universal Serial Bus
WTB	Wire train bus

Chapter 2

SYSTEM OVERVIEW

One basic unit of 4-car unit is the building block for Train 18 rake formation. Each basic unit consists of one Driver Trailer Coach (DTC) at the end, two Motor Coaches (MC) and one Trailer Coach (TC). Each middle basic unit consists of Non driving Trailer Car (NDTC), two motor car (MC) and one Trailer Car (TC).

Four such basic units are coupled together to form one rake of 16 cars:



2.1 Driving Trailer Coach (DTC)

DTC is a non-powered vehicle with a driver cab at one end. The driver cab is furnished with a pre-fabricated driver desk. All driving operations are possible from this driver desk. Feedback from the system in all the coaches/ basic units is available for viewing by motor man on the driver desk. In this regard, CCU aggregates the information from all the coaches and a 10.4" TFT driver display screen provides information to motor man. Further an illuminated indication panel is provided for important driving related information for quick viewing by motor man. Various gauges are also provided for viewing MR, BP, BC pressure. Motor man can also control the passenger information system from the driver desk DTC. Apart from the driver cab is called as passenger saloon area. Passenger saloon area is similar to trailer coach, except the space occupied by driver cab.

DTC also consists of battery box, battery charger and compressor which are mounted underslung. Rest of the DTC apart from the driver cab is passenger saloon area which consists of pantry, RMPU control unit, mono block pump controller, CRW, GCRW panel and various end wall panels. It is a air-conditioned coach. All passenger comfort related load are controlled by driver from driver cab.

2.2 Motor Coach (MC)

MC is a powered vehicle with one traction motor driving each axle. The motor coach consists Line and Traction Converter Unit (LTC) for each Bogie mounted underslung.

Also Brake chopper resister is mounted underslung. Transformer secondary cable for both LTC unit from power transformer come from Trailer Coach through underslung mounted IV Coupler. It also consists of passenger saloon area, pantry, RMPU, mono block pump controller, electrical cabinet and various end wall panels. It is air-conditioned coach. The passenger saloon area is similar to trailer coach.

2.3 Trailer Coach (TC)

TC is a non-powered vehicle with only a passenger saloon area. The passenger saloon area includes lights, fans, emergency lights, air handling unit (for ventilation), and passenger information system consisting of LED displays and speakers (for announcements).

TC consists of a pantograph, vacuum circuit breaker and HV isolator on roof. it also consists of auxiliary converter unit and power transformer mounted undeslung. Power to LTC units of both motor coaches is distributed from same power transformer.

2.4 Non Driving Trailer Coach (NDTC).

NDTC consists of passenger saloon area, pantry, RMPU, mono block pump controller, electrical cabinet and various End wall panels. It is a air-conditioned coach.

Non Driving Trailer Coach (NDTC) is similar to DTC except driver related interface. It also consists of battery box, battery charger and compressor mounted underslung. It also consists of passenger saloon area which consists of

pantry, RMPU control unit, mono block pump controller, and various end wall panels. It is a air-conditioned coach.

Chapter 3

SAFETY FEATURES

3.1 Particulars of the Train

Table 3.1 gives the leading particulars of EMU stock, on which supplied equipment is fitted.

Track gauge	1,676 mm
Coach length over body	23,100 mm
Max. width over body side	3,240 mm
Maximum permissible axle load (any coach)	17.00 tonnes

Table 3.1

Table 3.2 gives data about EMU coach formation.

Number of Coaches in Basic Unit	4 per basic unit
Train formation	16 coaches
Maximum Service Speed	160 km/ hr
Maximum Test Speed	176 km/ hr
OHE Line Voltage	25kV AC, 50 Hz
Variations in OHE Line Supply	Normal variation: 19 kV to 27.5 kV Occasional max (cut-off): 30 kV Occasional min: 16.5 kV Cut off voltage: 16 kV Frequency variation: 46 Hz to 54 Hz

Table 3.2

Operating climatic conditions for EMU Coaches:

Temperature Range	-5ºC to 50ºC Average Annual Ambient of 35ºC
Altitude	Coastal Area (Sea Level)
Rainfall	Very Heavy (up to 2500 mm during rainy season)
Water flooding	Max speed of 8 km/ h in water up to 203 mm above rail level with wave effect
Relative Humidity	Up to 98% during rainy season which last 5 months

Table 3.3

3.2 Train Propulsion Characteristics

3.2.1 With Axle Hung Fully Suspended Motor for EMU

- **Tractive effort and braking effort curves**

Based on the acceleration, deceleration and other requirements of the specification, the following tractive effort and braking effort curves are arrived. Below is the tractive effort and braking effort curve (electrical) Vs speed per MC of the EMU.

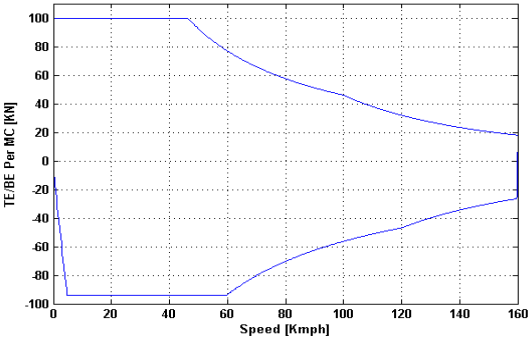


Fig 3.1 Tractive Effort vs speed curve

The braking effort of EMU is a total sum of electrical (regenerative) and electro-pneumatic braking efforts. Fig. 3.2 is the graph of Electrical (regenerative) braking effort and total braking effort (including Electro-pneumatic braking effort) along with TE. The difference between the two graphs is the electro-pneumatic braking effort that is required at different speeds.

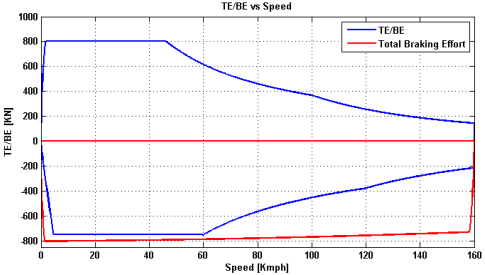


Fig 3.2 TE & Regenerative Braking Effort and Total Braking Effort (including EP Brake) for maximum braking operation for 16-car rake

Chapter 4

DRIVER DESK LAYOUT EQUIPMENT

Driver Desk is provided in driver cab for user interface. All equipment such as switches, lamps, master controller, DDU, PIS interface which are required for driver interface are mounted on driver desk. Layout of equipment are given in below sections.

4.1 Driver Desk overview

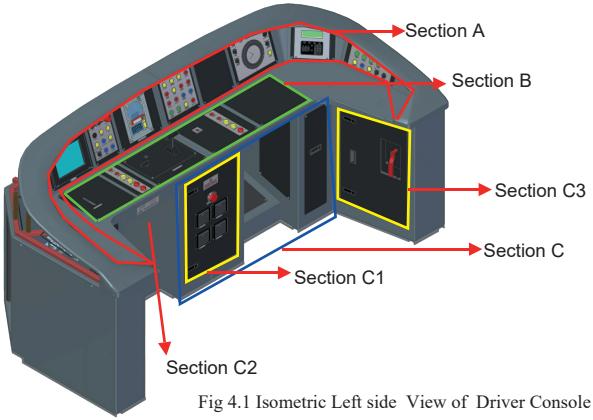


Fig 4.1 Isometric Left side View of Driver Console

Driver's cab is for motor man and guard. The left-hand side of the driver's cab is the workstation for the motor man. The operation switches, lamps, gauges displays which are used motor man during driving are provided in front of motor man. The right-hand side is designed for the guard.

4.1.1 Detailed view of Driver Desk (Section-A)

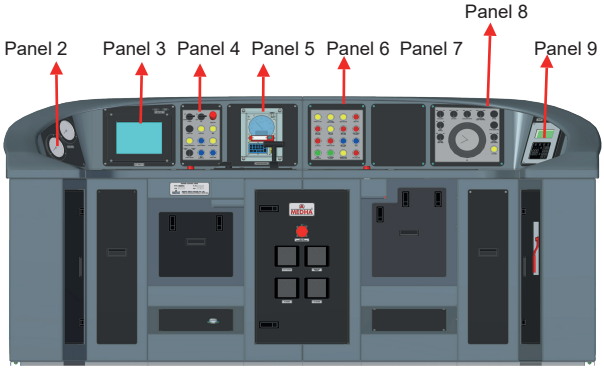


Fig 4.2 Front View of Driver desk

4.1.1.1 Panel 1 Cabin Control Switches

Fig 4.3 Panel-1_Cabin control Switches

4.1.1.2 Panel-2_ MR-BP Duplex Gauge and BC Gauge

Fig 4.4 Panel-2_ MR-BP Duplex Gauge and BC Gauge

4.1.1.3 Panel-3_ Main Display Panel

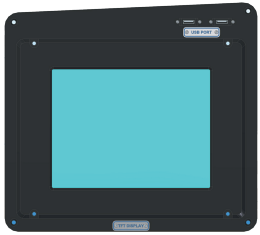


Fig 4.5 Panel-3_ Main Display Panel

4.1.1.4 Panel-4_ Driving Control Switches

Fig 4.6

4.1.1.5 Panel-5_ Speed Recorder

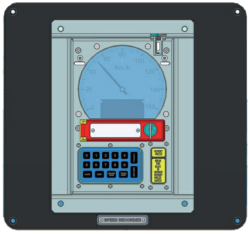


Fig 4.7

4.1.1.6 Panel-6_Indications for Train Functional Parameters

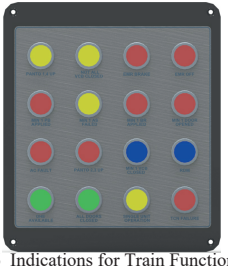


Fig 4.8 Panel-6_Indications for Train Functional Parameters

4.1.1.7 Panel-7_ TPWS Display Unit (Dummy Panel)

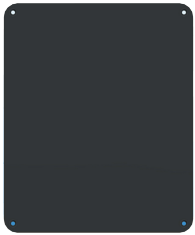


Fig 4.9 Panel-7_Dummy Panel Future Provision TPWS Display Unit

4.1.1.8 Panel-8_ Cabin Control Switches for Assistant Driver and Gauges

Fig 4.10 Panel-8_ Cabin Control Switches for Assistant Driver and Gauges

4.1.1.9 Section-A_Panel-9_ MMI unit of PIS (Operation by Assistant Driver)

Fig 4.11 Panel-9_ MMI unit of PIS (Operation by Assistant Driver)

4.1.1.10 Panel-10_ Doors Control Switches

Fig 4.12 Panel-10_ Doors Control Switches

4.2 (Section-B)

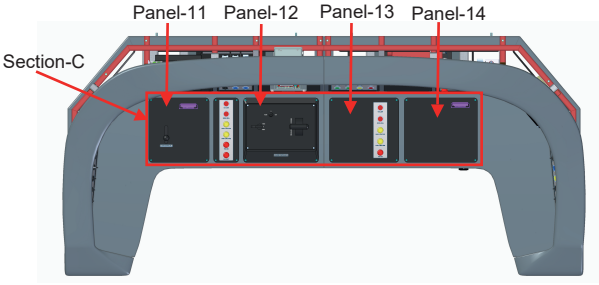


Fig 4.13

4.2.1 Panel-11_ Brake Controller

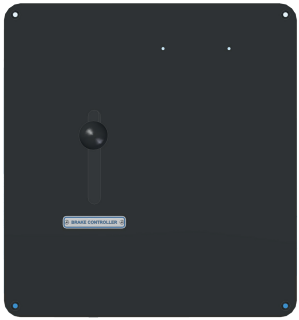


Fig 4.14 Section-B_Panel-11_ Brake Controller

4.2.2 Panel-12_ Master Controller, Horn, Signal bell and VCD Reset Switch

Fig 4.15 Panel-12_ Master Controller & indication switches

4.2.3 Panel-13_ Mic,Horn , Signal Bell and VCD Reset Switch

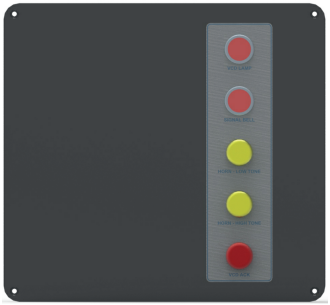


Fig 4.16

4.3 Under Driver Desk Front View (Section-C)

4.3.1 Front Bottom Side Components of Driver Desk (Section-C1)

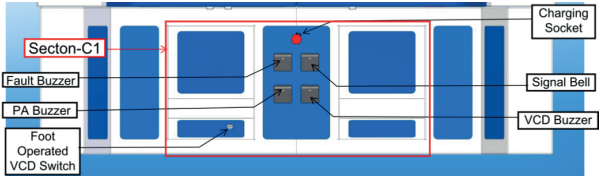


Fig 4.18: Front Bottom side components of Driver Desk (Section-C1)

4.3.2 Front Bottom _Internal side components of Driver Desk (Section-C2)

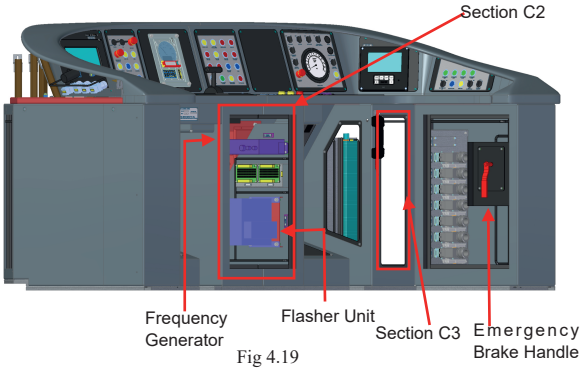


Fig 4.19

4.3.3 Bottom Left side components of Drivers desk (Section-C3)

Fig 4.20

SECTION	Panel Name	Description	QTY	APPLICATION
A	Panel-1	SHORT LEVER 2 POSITION MAINTAIN TYPE	1	CAB LIGHT-DRIVER
		SHORT LEVER 2 POSITION MAINTAIN TYPE	1	CAB FAN=DRIVER
		SHORT LEVER 2 POSITION MAINTAIN TYPE	1	CAB LIGHT SPOT-DRIVER
		SHORT LEVER 2 POSITION MAINTAIN TYPE	1	WIPER ON/OFF
		LONG LEVER 3 POSITION MAINTAIN TYPE	1	HL MAIN
		LONG LEVER 3 POSITION MAINTAIN TYPE	1	BLIND PLUG
		LONG LEVER 3 POSITION MAINTAIN TYPE	1	WIPER SPEED CONTROL
		PUSH BUTTON MOMENTARY-BLUE	1	WASHER PUMP
	Panel-2	MR/BP GAUGES-4 INCH-DRIVER	1	MR/BP GAUGES-4 INCH-DRIVER
		BC GAUGE -4 INCH-DRIVER	1	BC GAUGE -4 INCH-DRIVER

SECTION	Panel Name	Description	QTY	APPLICATION
A	Panel-3	DISPLAY UNIT MDS740 V2(DIALS) FOR MAK676	1	TCMS DISPLAY
		USB PORT	1	USB PORT
	Panel-4	SHORT LEVER 2 POSITION MAINTAIN TYPE	1	PANTO MODE
		ILLUMINATED PUSH BUTTON MAINTAIN-YELLOW	1	FLASHER-light
		ILLUMINATED PUCH BUTTON MAINTAIN ACTION-Yellow	1	PAS ACK
		DUMMY PLATE	1	TPWS ACK
		LONG LEVER 3 POSITION MOMENTARY TYPE	1	PANTO
		LONG LEVER 3 POSITION MOMENTARY TYPE	1	MC
		MUSHROOM TYPE-RED	1	EMR OFF
		ILLUMINATED PUSH BUTTON MOMENTARY-BLUE	1	LAMP TEST

Equipment

SECTION	Panel Name	Description	QTY	APPLICATION
A	Panel-4	PUSH BUTTON MOMENTARY-BLUE	1	FAULT RESET
		ILLUMINATED PUSH BUTTON MOMENTARY-YELLOW	1	CRUISE CONTROL
		ILLUMINATED PUSH BUTTON MOMENTARY-YELLOW	1	ENS
		MUSHROOM TYPE-YELLOW	1	EMR OFF
		ILLUMINATED PUSH BUTTON MOMENTARY-	1	Min1 Panto Up
	Panel-5	MBOM MRT918 REC,WM160,VER-4,FOR MAE675V2	1	SPEEDOMETER
	Panel-6	INDICATOR – RED	1	TCN FAILURE
		INDICATOR-YELLOW	1	EMR BRAKE
		INDICATOR – RED	1	EMR OFF
		INDICATOR – RED	1	MIN1 BR APPLIED
		INDICATOR – RED	1	AC FAULT
		INDICATOR – RED	1	MIN1 PB APPLIED
		INDICATOR-RED	1	MIN1 DOOR OPENED

SECTION	Panel Name	Description	QTY	APPLICATION
A	Panel-6	INDICATOR-YELLOW	1	SINGLE UNIT OPERATION
		INDICATOR-YELLOW	1	MIN1 AS FAILED
		INDICATOR-YELLOW	1	PANTO 1,4 UP
		INDICATOR-YELLOW	1	NOT ALL MC ON
		INDICATOR-BLUE	1	RDM
		INDICATOR-RED	1	PANTO 2,3 UP
		INDICATOR-BLUE	1	MIN1 MC ON
		INDICATOR-GREEN	1	OHE AVAILABLE
		INDICATOR-GREEN	1	ALL DOORS CLOSED
	Panel-7	TPWS DISPLAY	1	TPWS DISPLAY
	Panel-8	SHORT LEVER 2 POSITION MAINTAIN TYPE	1	CAB LIGHT SPOT-ASST DRIVER
		SHORT LEVER 2 POSITION MAINTAIN TYPE	1	CAB FAN-ASST DRIVER
		SHORT LEVER 2 POSITION MAINTAIN TYPE	1	CAB LIGHT-ASST DRIVER
		SHORT LEVER 2 POSITION MAINTAIN TYPE	1	MARKER LIGHT-RED
		SHORT LEVER 2 POSITION MAINTAIN TYPE	1	MARKER LIGHT-WHITE

SECTION	Panel Name	Description	QTY	APPLICATION
A	Panel-8	ILLUMINATED PUSH BUTTON MAINTAIN-YELLOW	1	FLASHER-ASST DRIVER
		SHORT LEVER 3 POSITION MAINTAIN TYPE	1	PUBLIC ADDRESS(MICROPHONE ON/OFF)
		SHORT LEVER 2 POSITION MOMENTARY TYPE	1	Passenger LIGHTS CONTROL SW
		BLIND PLUG,BLACK,704.964.8	1	BLIND PLUG
		BLIND PLUG,BLACK,704.964.8	1	BLIND PLUG
		DUMMY PLATE	1	TPWS EMR BRAKE
		BP GAUGE-4INCH-ASST DRIVER	1	BP GAUGE-6INCH-ASST DRIVER
	Panel 9	PIS MMI	1	PIS MMI
	Panel-10	SELECTOR SWITCH ACTUATOR 3 POSITIONS, SHORT LEVER, FLUSH MOUNTING MOMENTARY TYPE	1	PIS RESET

SECTION	Panel Name	Description	QTY	APPLICATION
A	PANEL-10	PUSHBUTTON ACTUATOR, FLUSH MOUNTING,PLASTIC GREEN	1	Door Open Left
		PUSHBUTTON ACTUATOR, FLUSH MOUNTING,PLASTIC GREEN	1	Door Open Left
		PUSHBUTTON ACTUATOR, FLUSH MOUNTING,PLASTIC GREEN	1	Door Open right
		PUSHBUTTON ACTUATOR, FLUSH MOUNTING,PLASTIC GREEN	1	Door Open right
		PUSHBUTTON ACTUATOR, FLUSH MOUNTING,PLASTIC YELLOW	1	Door Warning bell
		INDICATOR-YELLOW	4	RMPU ON
		PUSHBUTTON ACTUATOR, FLUSH MOUNTING,PLASTIC BLUE	1	Door Close
B	Panel-11	BRAKE CONTROLLER	1	BRAKE CONTROLLER

SECTION	Panel Name	Description	QTY	APPLICATION
B	Panel-12	MUSHROOM TYPE-YELLOW	1	HORN HIGH TONE-DRIVER
		MUSHROOM TYPE-YELLOW	1	HORN LOW TONE-DRIVER
		MUSHROOM TYPE-RED	1	VCD ACK-DRIVER
		MUSHROOM TYPE-RED	1	VCD RESET
		INDICATOR – RED	1	VCD INDICATION -DRIVER
		ILLUMINATED PUSH BUTTON MOMENTARY-RED	1	SB-DRIVER
		MASTER CONTROLLER	1	MASTER CONTROLLER
	Panel-13	MUSHROOM TYPE-YELLOW	1	HORN LOW TONE-ASST. DRIVER
		MUSHROOM TYPE-YELLOW	1	HORN HIGH TONE-ASST. DRIVER
		MUSHROOM TYPE-RED	1	VCD ACK-ASST. DRIVER
		INDICATOR – RED	1	VCD INDICATION-ASST .DRIVER
		ILLUMINATED PUSH BUTTON MOMENTARY-RED	1	SB-ASST DRIVER
		MIC	1	MIC
C1	DESK DOOR	VCD BUZZER	1	VCD BUZZER
		FAULT BUZZER	1	FAULT BUZZER
		PA BUZZER	1	PA BUZZER

SECTION	Panel Name	Description	QTY	APPLICATION
C1	DESK DOOR	SIGNAL BELL	1	SIGNAL BELL
		METAL CLAD SOCKET,32A,440VAC	1	110VAC CHARGING SOCKET
	DRIVER RIGHT FOOT	FOOT OPERATED VCD SW	1	FOOT OPERATED VCD SW
C2	-	Flasher Unit	1	Flasher Unit
		Frequency Generator.	1	Frequency Generator.
		Brake Controller	1	Brake Controller
C3	-	CONNECTOR MALE-09320463001	4	CRW INTERFACE =71-X01,=71-X02,=71-X03,=71-X04
		CRIMP CONTACT,MALE,09 33 000 6105	184	
		HOUSING 09 30 024 0302	4	
		GUIDE PIN 09 33 000 9908	8	
		GUIDE BUSH 09 33 000 9909	8	
		CRIMP TERMINAL,MALE,09 32 064 3001	1	EXT INTERFACE =71-X05
		CRIMP CONTACT,MALE,09 33 000 6105	64	
		HOUSING 09 30 024 0302	1	
		GUIDE PIN 09 33 000 9908	2	

SECTION	Panel Name	Description	QTY	APPLICATION
C3	-	GUIDE BUSH 09 33 000 9909	2	EXT INTERFACE =71-X05
		HOUSING 09 30 024 0302	1	Comm Connector =71-X06
		CONNECTOR-MALE	2	
		METAL ADAPTOR	2	
		CONNECTOR MALE	1	
		QUINTAX-4+SHIELDING CRIMP CONTACT,MALE (CONNECTOR)	4	
		HAND D CRIMP CONTACT,09 15 000 6125,MALE	30	
		HINGED FRAME FOR 6MODULE,09 14 024 0303	1	
		CRIMP TERMINAL,MALE,09 32 064 3001	1	71-X07 Spare
		CRIMP CONTACT,MALE,09 33 000 6105	64	
		HOUSING 09 30 024 0302	1	
		GUIDE PIN 09 33 000 9908	2	

SECTION	Panel Name	Description	QTY	APPLICATION
C3		GUIDE BUSH 09 33 000 9909	2	
		CRIMP TERMINAL,MAL E,09 32 064 3001	1	71-X08 Spare
		CRIMP CONTACT,MAL E,09 33 000 6105	64	
		HOUSING 09 30 024 0302	1	
		GUIDE PIN 09 33 000 9908	2	
		GUIDE BUSH 09 33 000 9909	2	
		280-833, 4 CONDUCTOR THROUGH TERMINAL BL	100	TL TB =70-X01
		WAGO GROUP MARKER,249-119	1	
		WAGO END PLATES, P/NO : 280-314	1	
		MARKER CARDS,1-100,209-502S(1-100)	1	
		END STOP FOR DIN35 RAIL, GREY	2	

Chapter 5

DRIVER DISPLAY UNIT (DDU)

TCMS DDU provides information for the TCMS system to support motor man in operating rake while normal operation, as well as in case of malfunction of a subsystem.

DDU supports the maintenance staff in setting basic system parameters and fault finding. In case of failure of TCMS DDU, train can still be operated. There is one DDU installed in each DTC cab.

DDU communicates with TCMS and performs the following basic functions:

Provide an interface to control train functions

- Display operational status of train functions
- Display diagnostic events

There are two user groups:

- Driver ID and
- Maintenance ID

These IDs and corresponding user names can be configured (add or remove) through Medha configuration software.

5.1 Menu Description

5.1.1 Head line area

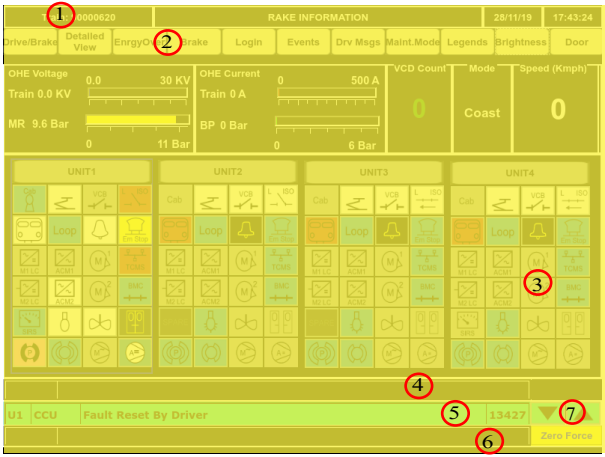


Fig. 5.1

Screen layout consists of 7 sections which are described below:

5.1.1.1 Section 1 - Head line area

Head Line area gives the information about train number configured, screen heading, date and time fields.

5.1.1.2 Section 2 – Soft key buttons area:

The soft key button area contains 10 touch sensitive buttons for different menu entries.

5.1.1.3 Section 3 – Main Screen area:

The main screen area shows the actual content of the selected screen. If required, further touch sensitive buttons are shown in the main screen area.

5.1.1.4 Section 4 - High Priority Message field:

Active diagnostic events which require acknowledgement by motor man are present in high priority message field area. For each event, the source of the event (basic unit number) and its event text are displayed along with an acknowledge button. If no such event is present, the text field and acknowledge button are not displayed. The events are presented in the order of their time of occurrence, across all event sources. When the acknowledge button is pressed, the respective event is acknowledged and disappears from this area. Clicking on the event is available at events list.

5.1.1.5 Section 5 - Scrolling Events area:

All pending active events are presented in scrolling events area in a scrolling pattern. For each event, the source of the event (basic unit, module details) and its event texts are displayed. If no such event is present, the text field is not displayed. Motor man can manually scroll up and down the list with the provided scroll buttons.

5.1.1.6 Section 6 - Pop up Messages area:

Pop up messages area is used to show informative (Popup) messages to motor man depending on the operational status of the train. If no popup message is pending, the area shall be blank.

5.1.1.7 Section 7 - Vmax area:

Vmax area indicates the maximum available/ allowed speed of the train. If traction interlock condition is detected by CCC, then ‘Zero Force’ appears in this area.

Table 5.1 gives the information of color significance of different symbols.

TYPE	ICON	FUNCTION
Type 1		Ready, Released for operation
Type 2		Fault communication
Type 3		Displayed, OFF
Type 4		MCB tripped
Type 5		Manual isolated or blocked for operation
Type 6		Alarm
Type 7		Warning
Type 8		ON or pressure OK
Type 9		Special status
Type 10		Empty Spare

Table 5.1

5.1.2 DDU screen views

5.1.2.1 Train level view

Fig 5.2 shows the train level view of DDU. Rake level, all the important symbols (basic unit wise), OHE voltage, OHE current, train speed, and train operational mode information are displayed here.

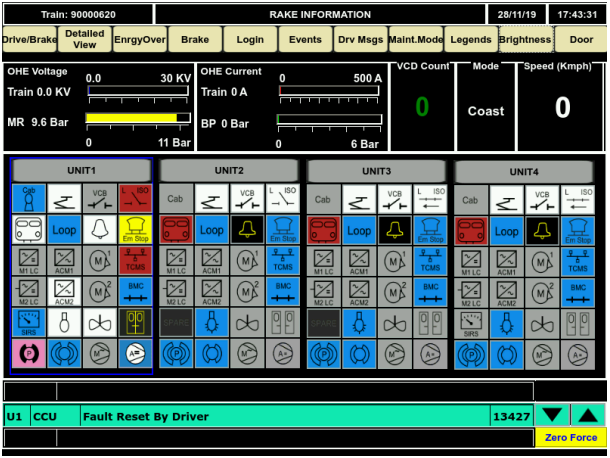


Fig. 5.2

5.1.2.2 Basic unit view

Basic unit view shows a graphical representation of the front basic unit, which consists DTC, MC1, TC, and MC2 cars. It provides a status overview of the major systems in the coaches. Fig 5.3 shows DDU front view for Basic unit 1.

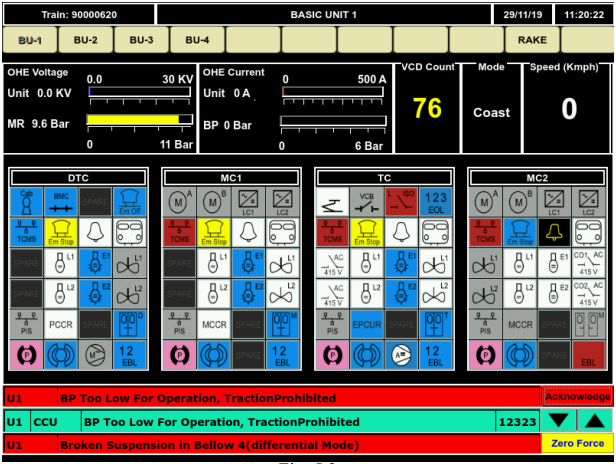


Fig. 5.3

5.1.2.3 Drive/ Brake view

Drive/ Brake view screen shows the OHE line voltage, current as well as traction effort values for each basic unit in the train. The small triangle type indicator indicates the set value for tractive/ braking effort, as percentage of the maximum available tractive/ braking effort. The set value is calculated by the function that distributes the desired efforts across the available basic units as a function of available traction systems, basic unit weight and other parameters. Consequently, at a given position of the master controller, the set values for different basic units can differ.

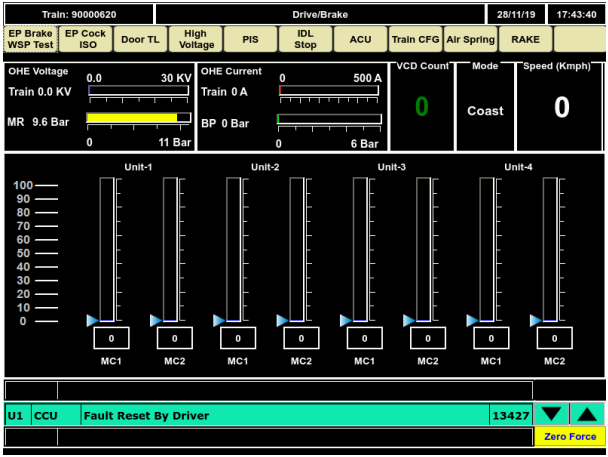


Fig. 5.4

The large level graph and the value beneath indicate the achieved total tractive/ braking effort as percentage of the maximum available tractive/ braking effort. The bar graph and value shown in orange color gives information about braking effort whereas the blue color gives information about tractive effort. The maximum available tractive and braking effort is dependent on the weight and speed of a basic unit.

The braking efforts are combined values for electrical (ED) and pneumatic (EP) brakes. The solid bars in each basic unit show the actual (achieved) traction/ braking effort values. The actual achieved value is displayed in the label

below the solid bars for each basic unit as shown in Fig 5.4.

5.1.2.4 Air Spring Overview Screen

Air Spring Overview screen gives information about bellow wise air suspension pressure values (in bars), end basic unit MR, and BP pressure values (in bars). The sensor healthiness information is displayed in color decoding of sensor name field. In case of sensor failure, corresponding value is shown in X, color of name field shall be differed. Basic unit level navigation can be possible through 'BU-x Suspension' soft key. Sensor name field color coding is shown below:

Background Color	Information
Airspr Bellow x (Blue)	Sensor healthy and within Range
Airspr Bellow x (White)	Sensor faulty
Airspr Bellow x (Yellow)	Sensor value showing out of range
Airspr Bellow x (Black)	Sensor override from DDU
Airspr Bellow x (Red)	Air Spring Suspension failed
Airspr Bellow x (Grey)	Sensor Status Isolated by System

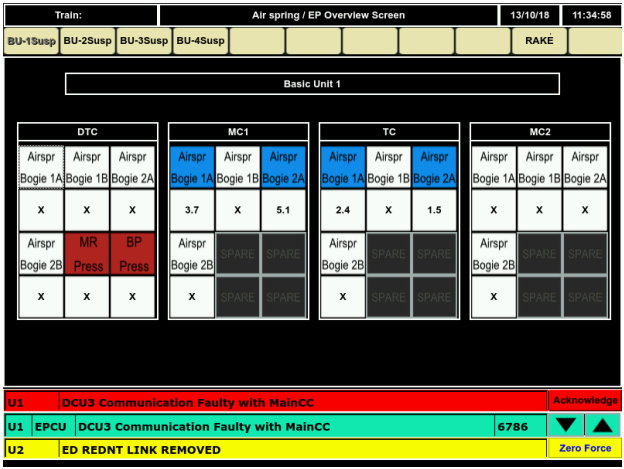


Fig. 5.5

5.1.2.5 Energy Overview

Energy Overview screen, shown in Fig 5.6 displays the energy consumption and energy regeneration values for each basic unit and for the whole train. It also displays the total distance traveled by train. Energy details of each basic unit is available in cumulative and trip wise.

Trip wise data is available for latest entered driver ID. Trip can be reset by using store track option in energy overview screen or by entering a new user ID from login screen.

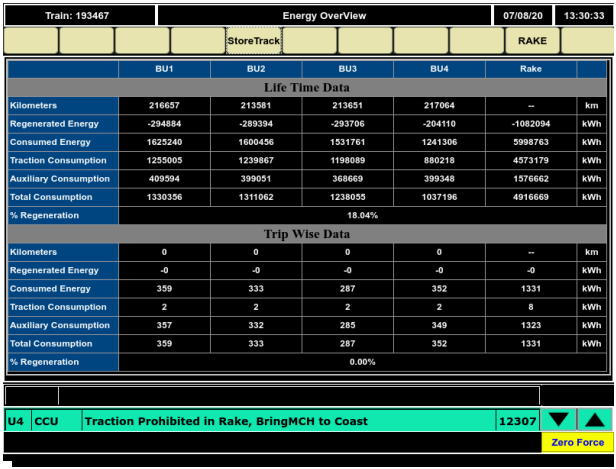


Fig. 5.6

5.1.2.6 Login Screen

Login screen, shown in Fig 5.7 is used to enter new user ID or to logout from existing user. Driver ID can be logged out using reset ID/ logout button. This screen is available only in occupied cab. User can change the train number from this screen.

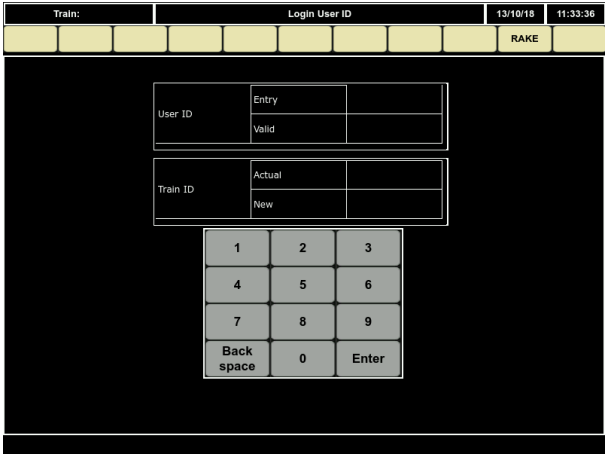


Fig. 5.7

5.1.2.7 Events Screen

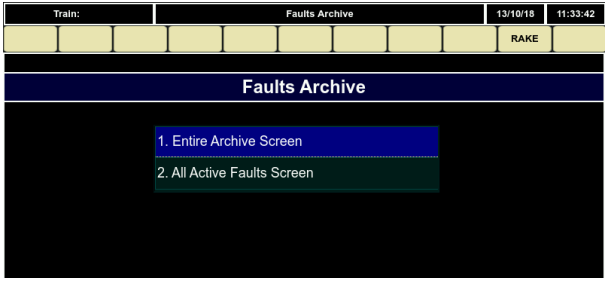


Fig. 5.8

Faults/ events are categorized into two types:

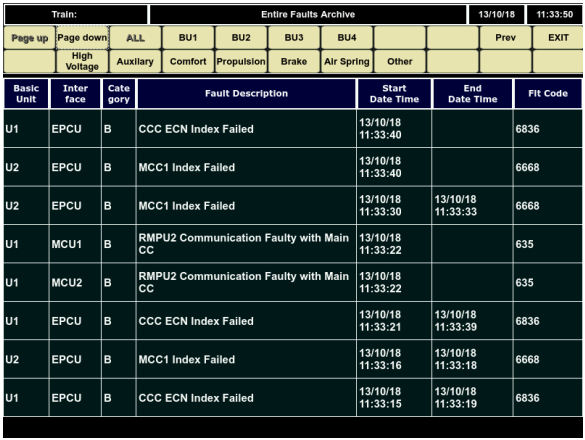


Fig. 5.9

- Entire fault Archive Type – It consists of all logged events along with recovery details.
- Active Fault Archive Type – It consists of only the present active faults information.

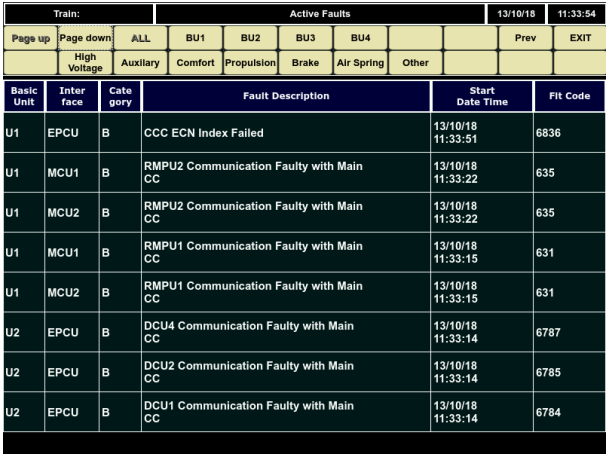


Fig. 5.10

All faults screen gives information about fault description, start time, end time (if recovered), basic unit number, and module information along with fault category.

In case of all active fault screen, same information is available except ‘End Time’ column.

5.1.2.8 Driver/ Crew Messages Screen

Driver Messages screen, shown in Fig 5.11 displays only the active fault/ event information which is required for motor man. HMI fault reset option is also available in this screen.

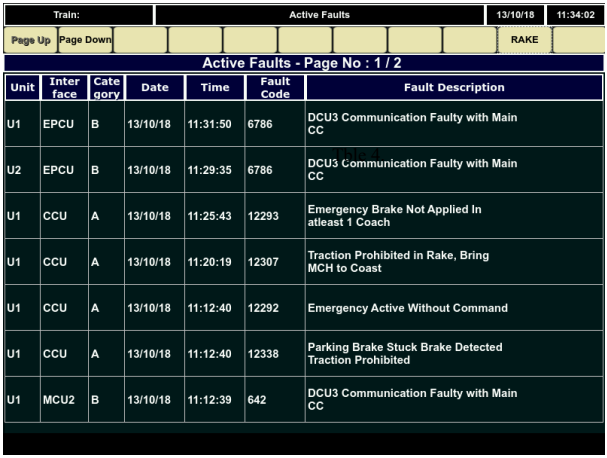


Fig. 5.11

5.1.2.9 Brake

Brake screen, shown in Fig 5.12 gives information about basic unit level and brake cylinder pressures (EP system) of train. This screen consists of two sections. First section consists all brake pressures status and second section gives options for enabling/ disabling holding brake to the train. This can be useful for the motor man while brake test validation.

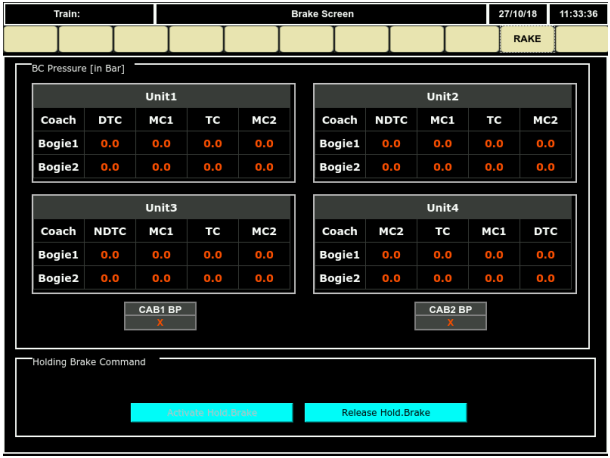


Fig. 5.12

5.1.2.10 Brightness Control

When user press ‘Brightness’ soft key, then the brightness control appears on the screen. Touch on the bar chart, controls the brightness of the screen. This brightness control disappears when user touches again the same brightness button.

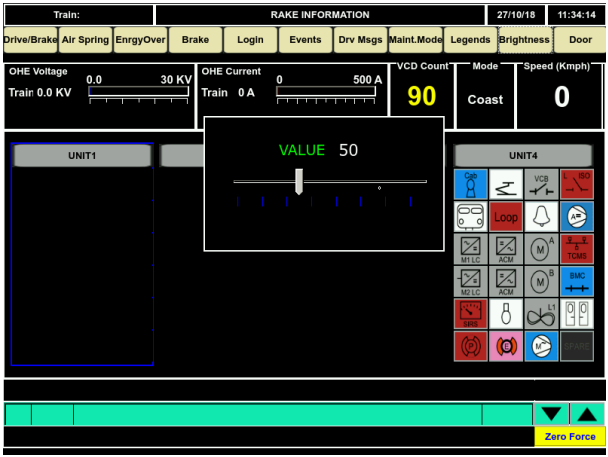


Fig. 5.13

5.1.2.11 Maintenance Mode Screen

Fig 5.14 displays different options available in the maintenance mode.

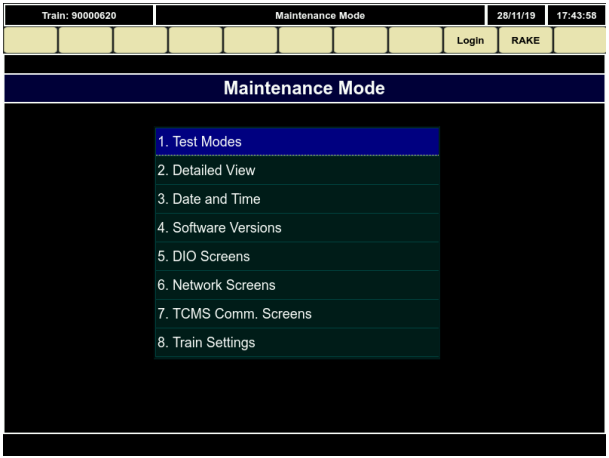


Fig. 5.14

1. Test Modes

Test Modes are defined to validate train level wiring verification, train lines checking, DTC-CAB wiring, brake related tests, etc. All test modes have few entry conditions. Before entering into any test, these entry conditions are to be satisfied.

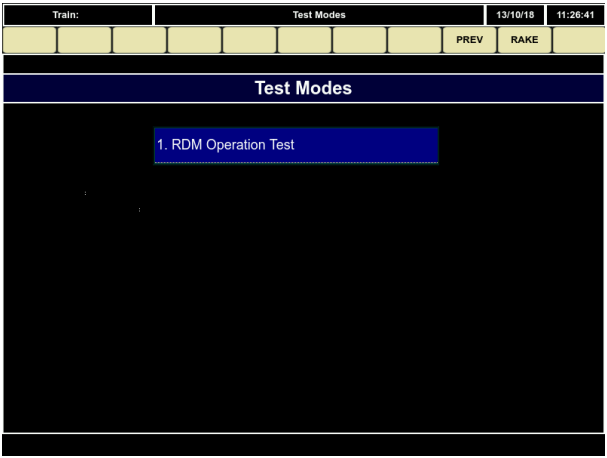


Fig. 5.15

1. RDM Operation Test

In RDM Operation test, two sub tests are available i.e.,

Frequency Input Test: Frequency Input test is defined to validate Frequency generator unit functionality. Based on selected MCH%, FGU generates the frequency to train line. All MCC, MCCR nodes which are available in basic units of the train monitors the frequency and sends back the status to CCC for validation. Finally CCC gives final results with validity information to DDU.

Train Line test: It is defined to check the present status of important train line covers Panto, VCB switches, MCH Inputs (Direction – FWD, REV, Mode

- Drive, Brake, Coast) routing to MCC and MCCR nodes which are available in all basic units of the train.

2. Detailed View

Detailed view option is defined to give information about sub system level parameter monitoring for train level functional checking. The parameters which are available in the screens can be changed or re-arranged through configuration software.

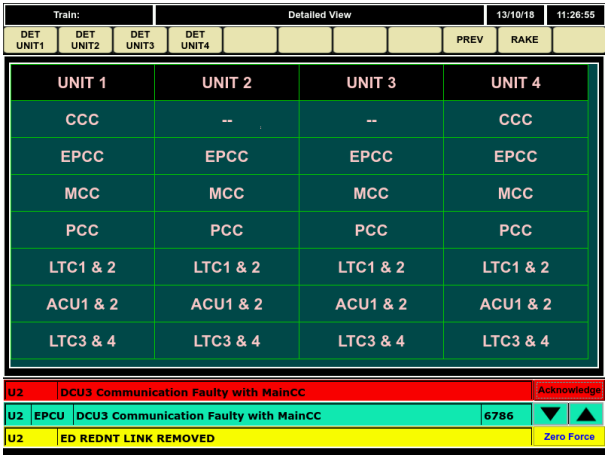


Fig. 5.16

3. Date & Time

Date and Time feature is defined to set date and time in train. User is requested to change the date & time through navigation keys and press ‘Enter’ for final configuration. All TCMS systems update the date and time locally. Following screen gives information about date & time settings.

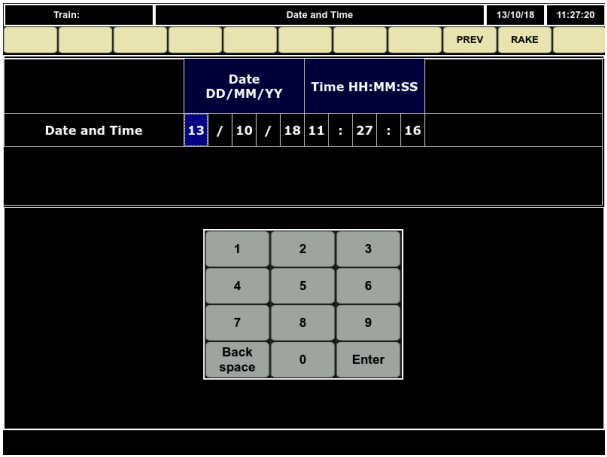


Fig. 5.17

4. Software Version

This screen used to view software version details of various modules of Train18.

5. DIO

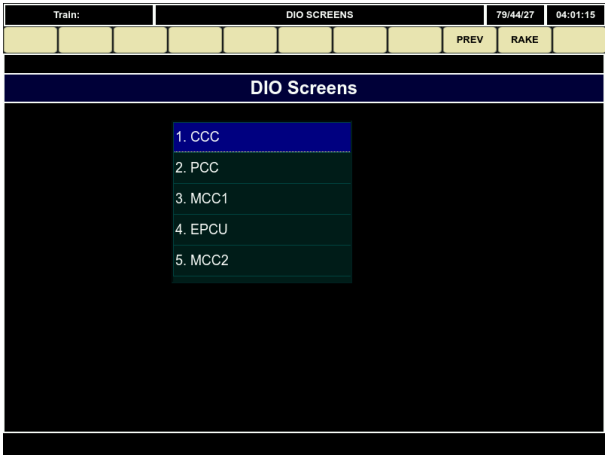


Fig. 5.18

This screen is used to view digital inputs and outputs of various control units CCC DIO screen is shown in Fig 5.19.

Fig. 5.19

6. Network screens

Network screens gives information about rake level ETB, ECN modules health information.

7. TCMS Communication Screen

TCMS screen used to view communication health information between various modules. Provision is given to view, Basic unit wise modules communication status. Module wise communication health status shown in Fig 5.20.

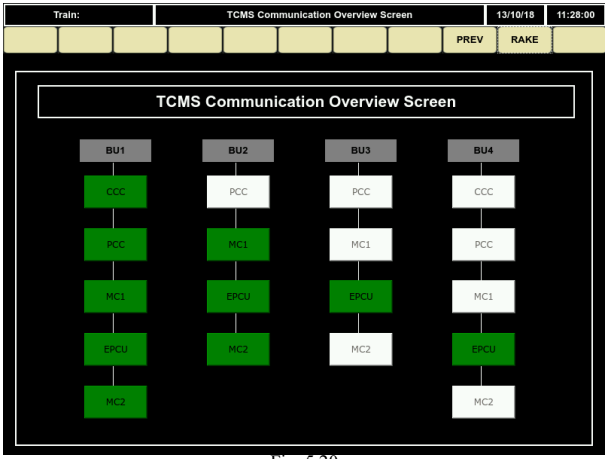


Fig. 5.20

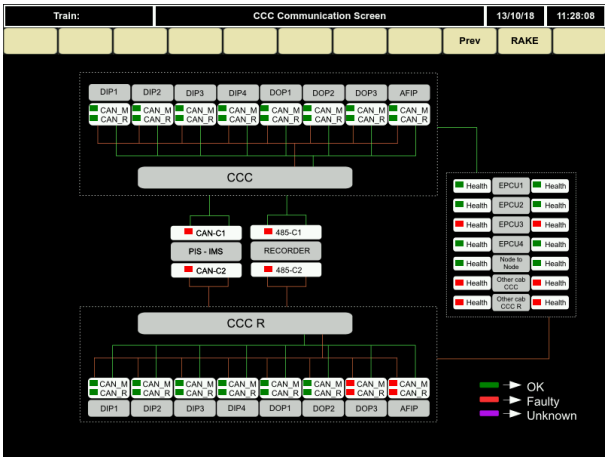


Fig. 5.21

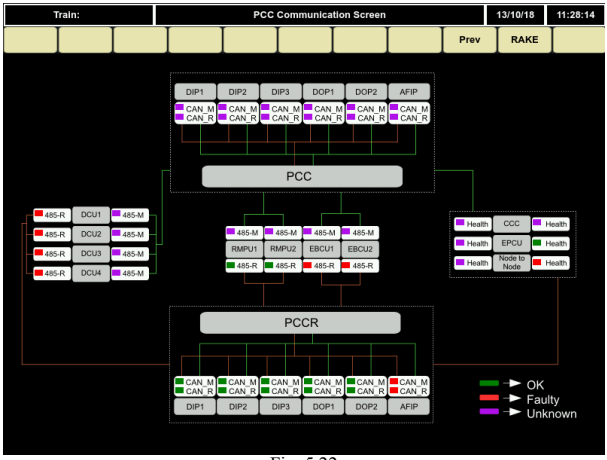


Fig. 5.22

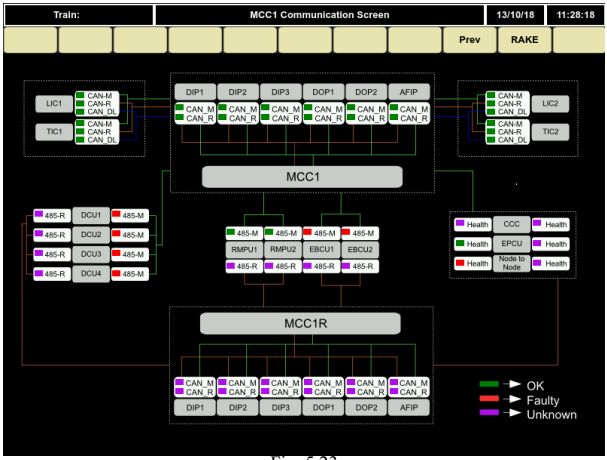


Fig. 5.23

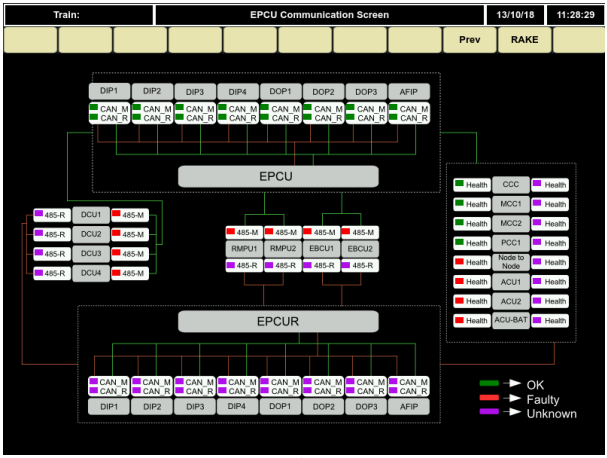


Fig. 5.24

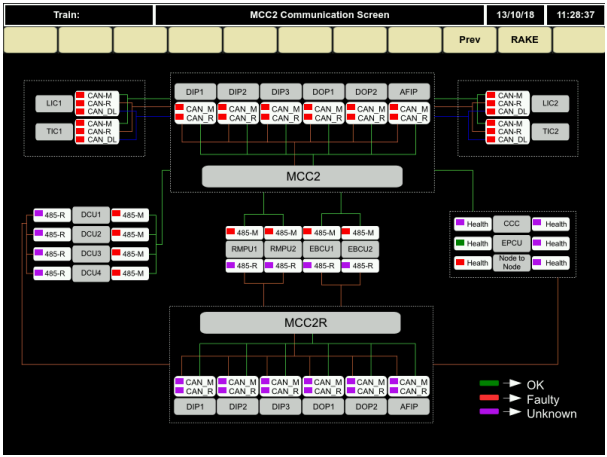


Fig. 5.25

8. Idle Stop

This option to be used to allow the pendrive safe removal function

9. Train Settings

Train settings are defined to forcibly change the normal functionality of EMU operation. Some of these settings can be done by Maintenance person (Main.ID is required). All settings can be done when predefined entry conditions are satisfied. Some of the settings are not allowed in train running case. All these entry conditions are displayed when navigating through selected settings in the train settings menu. TCMS stores the changed settings information and displays suitable message in DDU. All

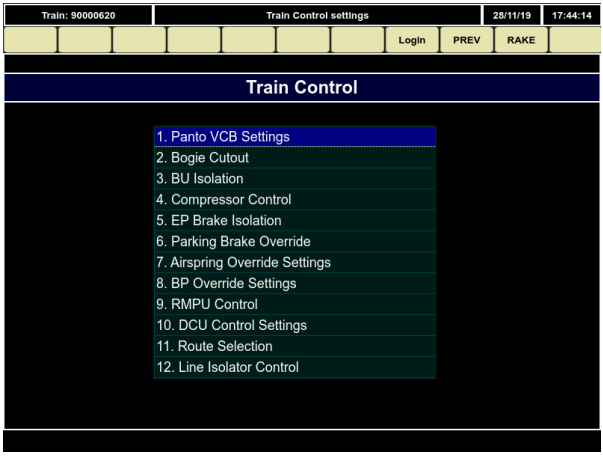


Fig. 5.26

these changed setting information are stored in TCMS until power Reset.

1. Panto and VCB Settings

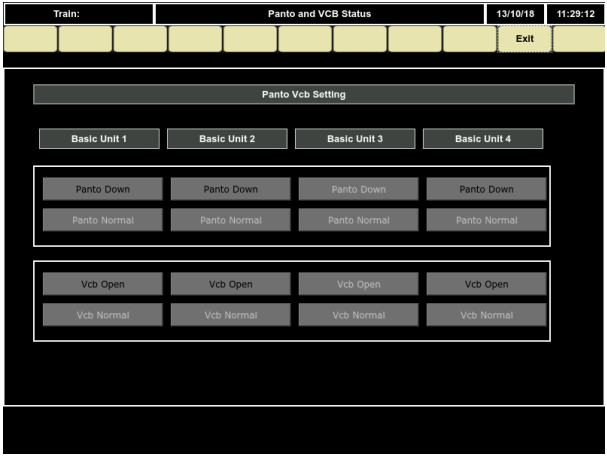


Fig. 5.27

Panto and VCB setting are used to open VCB and to down the pantograph of any particular basic unit in the rake formation. But VCB close operation and raising of pantograph operation are not possible.

2. Bogie Cutout

Bogie cutout setting is used to isolate the bogie1/ bogie 2/ both bogies of selected basic unit in the rake formation. For isolated bogies, traction, electrical braking are not available.

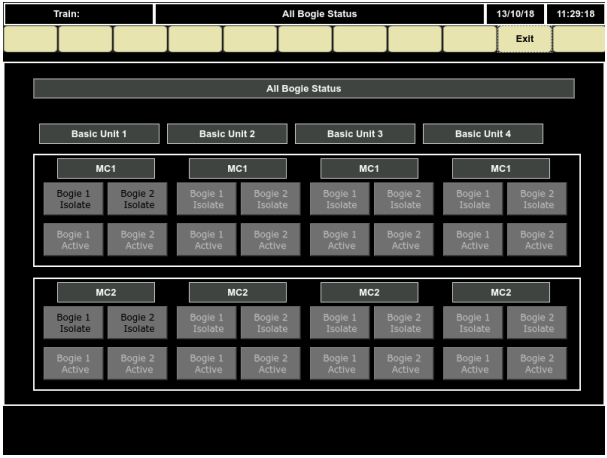


Fig. 5.28

3. BU Isolation

BU Isolation setting is used to isolate the basic unit from the rake formation. For isolated basic unit, power is not available for traction and braking operation, since pantograph is made down by system. For this unit, aux supply is available through change over contactors from adjacent basic units (if power available). This feature is as good as basic unit isolation switches functionality which are available on ECC panel of DTC Cab.

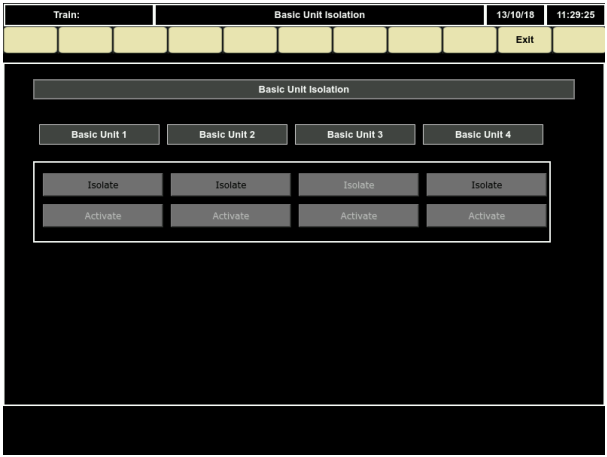


Fig. 5.29

4. Compressor Control

Compressor Control setting is used to control the compressor from DDU. In this setting, we can switch ON or switch OFF compressor of any of basic unit. Once compressor ON command is received from this setting, then the corresponding compressor shall be ON until pressure is reached to healthy range.

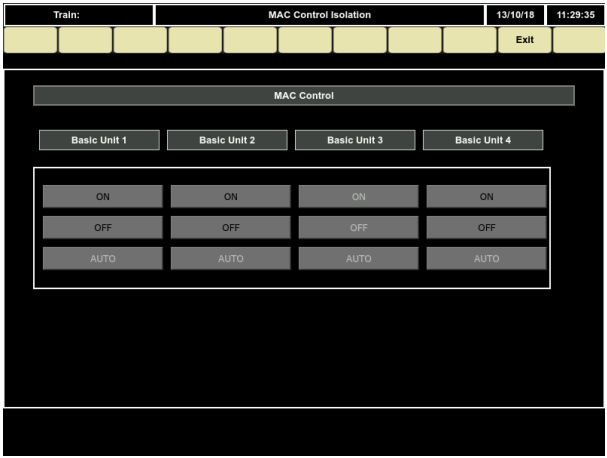


Fig. 5.30

5. EP Brake Isolation

EP Brake Isolation setting is used to isolate the EP unit (bogie/ coach level) functionality of any basic unit in the rake formation. Once EP unit is isolated coach wise, then MCC/ MCCR prohibits EP brake to that coach and considers coach EP brake availability as Zero.

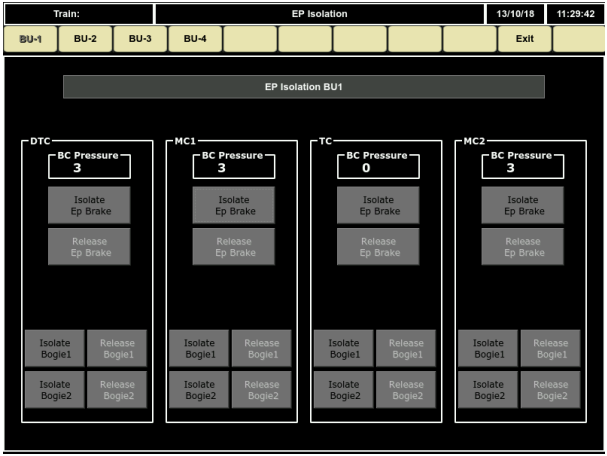


Fig. 5.31

6. Parking Brake Override

Parking Brake Override setting is used to override the parking brake status in the selected basic unit. Once override is selected, then TCMS ignores parking brake status of that basic unit for parking brake lamp driving, stuck brake condition checking, Vmax limitation due to parking brake stuck, etc.

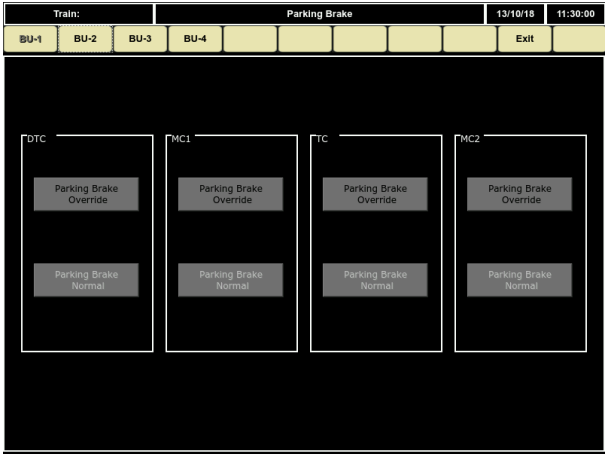


Fig. 5.32

7. Air spring Override Settings

Air spring override setting is used to override the air spring status in the selected coach in a basic unit. Once override is selected, then TCMS ignores air spring failure status of selected coach, so that speed restriction due to suspension failure feature gets bypassed.

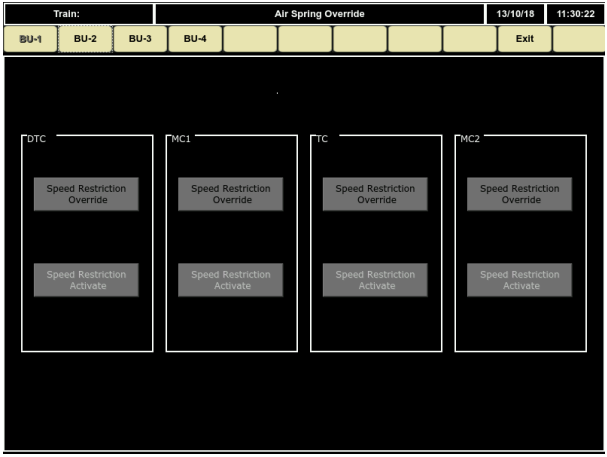


Fig. 5.33

8. BP override settings

BP override setting is used to override the BPstatus in the selected coach in a basic unit. Once override is selected, then TCMS ignores corresponding BP status of selected coach, so that speed restriction due to BP failure feature gets bypassed.

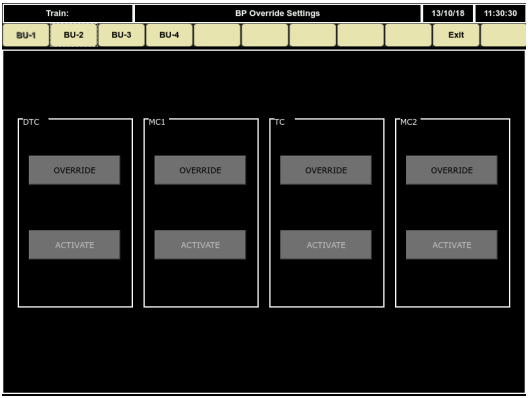


Fig 5.34

9. RMPU Control Screen

RMPU control screen can be used to give forced RMPU command either 50% or 100% or OFF command in any coach for any RMPU.

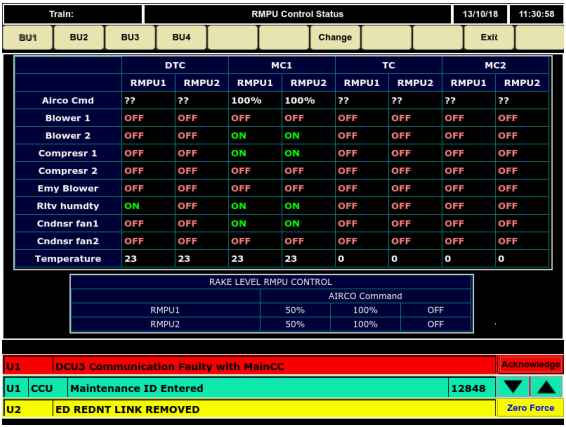


Fig 5.35

10. Door Control Settings

Door control settings screen can be used to provide door open/ close command to any door in any coach.

In case of failure of All door proving loop, provision is given to override the ADCR relay, so that Door Proving Loop can be ignored for traction.

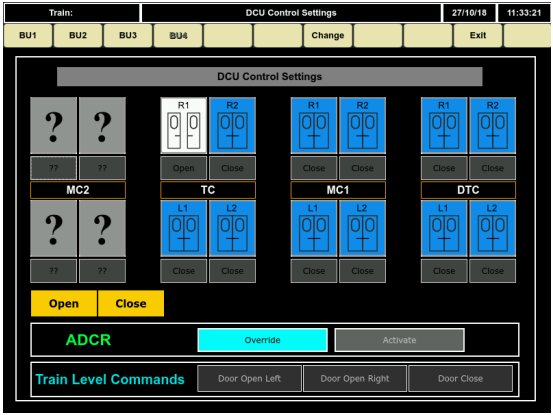


Fig 5.36

11. PIS Route Selection

There is a provision to select the train route through TCMS display. This feature can be useful to enable destination information only on head code, in case of PIS MMI is non functional and unable to select the train route.

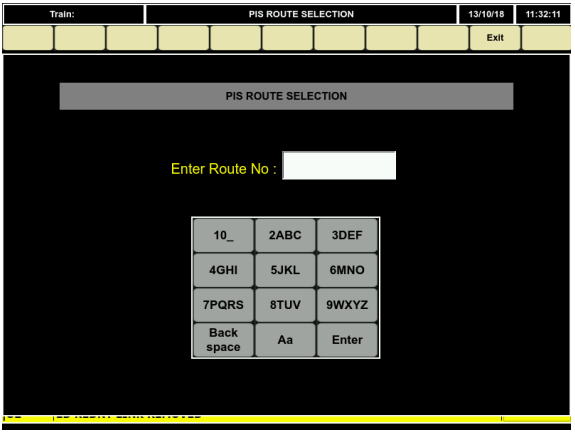


Fig 5.37

12. Display Legends Information

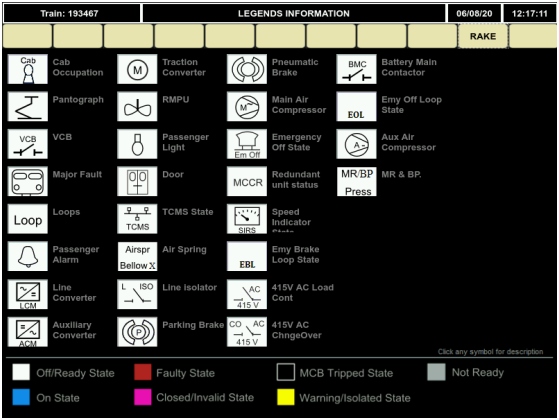


Fig 5.38

Chapter 6

CAB REAR WALL PANEL & ECC PANELS

DTC coach contains two rear wall panels, CRW and GCRW. MC, TC, and NDTC contains one ECC panel in each coach.

6.1 DTC CRW

6.1.1 Isometric View of DTC CRW

One electrical cubicle is provided at rear side of driver driver cab. It houses all electrical and electronics components required for rake level control. It houses CCU'S, LRMS, TPWS, ECN Switches, MCB's, Relays & contactors for various application. Equipment layouts are shown in below section

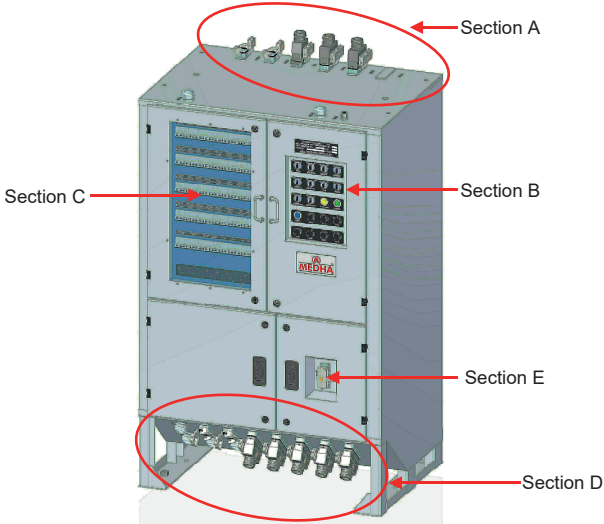


Fig 6.1 Isometric View of DTC_CRW

6.1.2 DTC_CRW Front view without Door

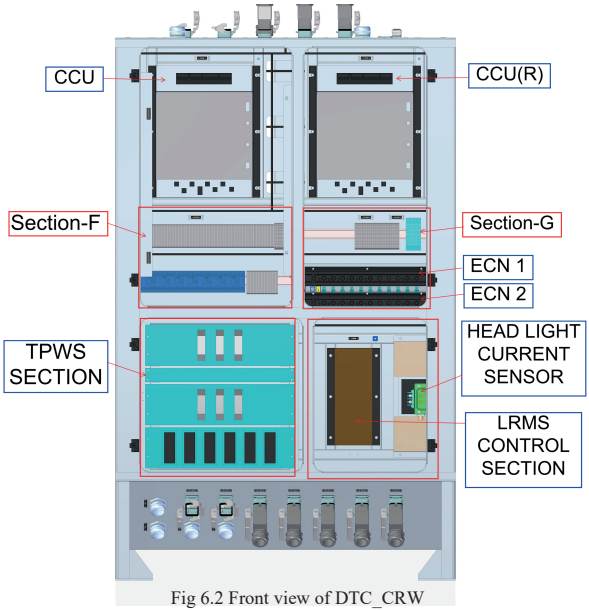


Fig 6.2 Front view of DTC_CRW

6.1.3 DTC_CRW Rear view without Door

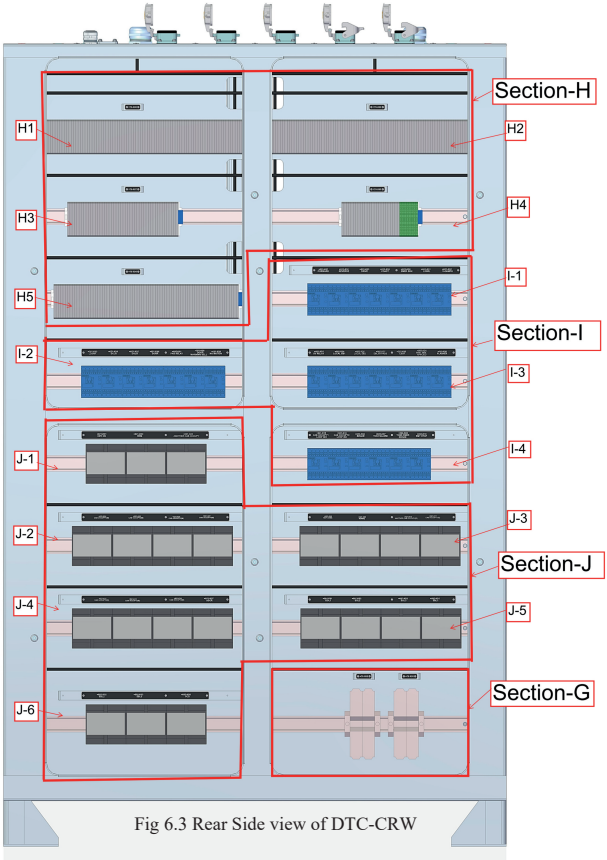


Fig 6.3 Rear Side view of DTC-CRW

DTC_CRW_EQUIPMENT DETAILS			
SECTION	**MATERIAL DESCRIPTION**	**QTY**	**APPLICATION**
TOP view of DTC_CRW (Section-A)			
A	HOUSING:09 30 006 0302	1	110VDC BN ,=71-X21
	CRIMP TERMINAL MALE:09 14 002 3051	1	
	CRIMP CONTACT MALE,09 11 000 6125	2	
	2 Modules HINGED FRAME(A..C):09 14 006 0303	1	
	HAN MODULAR GUIDE PIN,09 14 000 9908	2	
	HAN MODULAR GUIDE BUSHING,09 14 000 9909	2	
A	HOUSING:09 30 006 0302	1	110VDC ,BD 71-X22
	CRIMP TERMINAL MALE:09 14 002 3051	1	
	CRIMP CONTACT,MALE,09 11 000 6114	2	
	2 Modules HINGED FRAME(A..C):09 14 006 0303	1	
	HAN MODULAR GUIDE PIN,09 14 000 9908	2	
	HAN MODULAR GUIDE BUSHING,09 14 000 9909	2	
A	CONNECTOR MALE-09320463001	1	EWP TL1 =71-X23
	CRIMP CONTACT,MALE,09 33 000 6105	46	
	HOUSING 09 30 024 0302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	

DTC_CRW_EQUIPMENT DETAILS			
SECTION	**MATERIAL DESCRIPTION**	**QTY**	**APPLICATION**
TOP view of DTC_CRW (Section-A)			
A	CONNECTOR MALE-09 32 032 3001	1	EWP TL2 =71-X24
	CRIMP CONTACT,MALE,09 33 000 6105	32	
	HOUSING-'09300160302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	
A	CONNECTOR MALE-09320463001	1	DOOR INTERFACE =71-X25
	CRIMP CONTACT,MALE,09 33 000 6105	46	
	HOUSING 09 30 024 0302	2	
	GUIDE PIN 09 33 000 9908	4	
	GUIDE BUSH 09 33 000 9909	4	
Switching & Indication Panel of DTC_CRW (Section-B)			
B	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	DRIVER AUTHENTICATION SW =021-S02
	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	UV ISO SW =081-S02
	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	BAL ISO =093-S01
	PUSHBUTTON ACTUATOR, FLUSH MOUNTING,PLASTIC YELLOW	1	START ALL MAC =071-S03
	PUSH BUTTON ACTUATOR,GREEN,704.032.518	1	PB RELEASE SW =072-S02
	P/NO : 704.032.618,ILPB ACTUATOR,FLUSH M	1	PB APPLY SW =072-S01
	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	CAB SELECTOR SW =021-S01

DTC_CRW_EQUIPMENT DETAILS			
SECTION	**MATERIAL DESCRIPTION**	**QTY**	**APPLICATION**
B	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	TPWS ISO SW =092-S02
B	ACTUATOR,FLUSHMOUNTING, BLACK,704.405.018	1	BATTERY SUPPLY =081-S01
	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	EMERGENCY OFF BYPASS =091-S02
	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	SINGLE UNIT OPERATION =091-S03
	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	EMER BRAKE BYPASS =092-S01
	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	LBSR BYPASS SW =092-S07
	MULTI LED FAIL SAFE,110VDC,10-4H22.1032P	1	LAMP
	MULTI LED,BLUE,110VDC,10-4H22.1036P	1	LAMP
	BLIND PLUG,BLACK,704.964.8	4	BLIND PLUGS
	SWITCH ELEMENT FOR PUSH BUTTON SWITCH (NO SWITCHING ELEMENT)	20	Quantity may vary according to usage as per requirement
B	SWITCH ELEMENT FOR SNAP ACTION SWITCH (NC SWITCHING ELELMENT)	8	
	Marking for 3rd switching element 53/63	5	
	Marking for 3rd switching element 64/54	5	
	Marking for 3rd switching element 51/61	5	
	Marking for 3rd switching element 62/52	5	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
MCB Panel of DTC_CRW (Section-C)			
C	MCB,2POLE,440VDC,8A	41	PANTO MC SUPPLY =011-F01
			CAB OCCUPY1 SUPPLY =021-F01
			CAB OCCUPY2 SUPPLY =021-F02
			DBC SUPPLY =022-F01
			ECN1 CB =041-F01
			ECN2 CB =041-F02
			TCMS DISPLAY =041-F03
			DCU LEFT SUPPLY =051-F01
			DCU RIGHT SUPPLY =051-F02
			DCU TL SUPPLY =051-F03
			DPL SUPPLY =051-F04
			DTC SUPPLY =061-F01
			CCU1 SUPPLY =061-F02
			CCU2 SUPPLY =061-F03
			PB TL SUPPLY =072-F01
			BATTERY CONTROL SUPPLY =081-F01
			EOL SUPPLY =091-F01
			EBL SUPPLY =092-F01
			EMER BRAKE SUPPLY =092-F02

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
C	MCB,2POLE,440VDC,8A	41	EBL BYPASS SUPPLY =092-F03
			BAL SUPPLY =093-F01
			SB SUPPLY =094-F01
			PASSENGER ALARM =095-F01
			CAB LIGHT SUPPLY =102-F01
			SPOT LIGHT SUPPLY =102-F02
			MAIN HEAD LIGHT SUPPLY =103-F01
			MARKER LIGHT SUPPLY =103-F02
			FLASHER LIGHT SUPPLY =103-F03
			RMPU CONTROL MCB =111-F01
			DRIVER CAB FANS =112-F01
			LRMS MCB =131-F01
			SPEED INDICATOR =134-F01
			WIPER SUPPLY LEFT =132-F01
			WIPER SUPPLY RIGHT = 132-F02
			HEAD CODE SUPPLY=121-F04
			110VAC SOCKET =135-F01
			TPWS =133-F01 (User Railway scope)
			TPWS =133-F02 (User Railway scope)
			TPWS =133-F03 (User Railway scope)

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
			TPWS =133-F04 (User Railway scope)
			TPWS =133-F05 (User Railway scope)
	AXILLARY CONTACT,2NO	41	FOR ALL 2P MCBS
Bottom view of DTC_CRW (Section-D)			
D	CONNECTOR MALE-09320463001	4	DRIVER DESK INTERFACE CONN =71-X11, =71-X12, =71-X13, =71-X14 (PS, DOP, CCU, CCU(R), DIP, TL)
	CRIMP CONTACT,MALE,09 33 000 6105	184	
	HOUSING 09 30 024 0302	4	
		8	
	GUIDE BUSH 09 33 000 9909	8	
	CRIMP TERMINAL,MALE,09 32 064 3001	1	GCRW INTERFACE CONN=71-X15
	CRIMP CONTACT,MALE,09 33 000 6105	64	
	HOUSING 09 30 024 0302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
D	HOUSING:09 30 006 0302	2	=71-X17(110VDC BD), =71-X16(110VDC BN)
	CRIMP TERMINAL MALE:09 14 002 3051	2	
	CRIMP CONTACT,MALE,09 11 000 6114	4	
	2 Modules HINGED FRAME(A..C):09 14 006 0303	2	
	HAN MODULAR GUIDE PIN,09 14 000 9908	4	
	HAN MODULAR GUIDE BUSHING,09 14 000 9909	4	
ON DOOR component of DTC_CRW (Section-E)			
E	CONNECTOR MALE-09 32 032 3001	1	SHUNTING PANEL =71-X18
	CRIMP CONTACT,MALE,09 33 000 6105	32	
	HOUSING-'09300160302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	
Front View of DTC_CRW Section-F			
F	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	140	PS TB =70-X06
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	10	
	WAGO GROUP MARKER,249-119	1	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
F	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	ADJACENT JUMPER, P/NO : 280-402	50	
	ADJACENT JUMPER,GREY,32A,281-402	20	
Section-G			
G	TERMINAL BLOCK,WFF35/AH-1029300000	2	110VDC BN distribution TB =70-X03
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
	FTTB,2WAY,0.2TO16SQ .MM,GRY,283-901	5	
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	25	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	4	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	STEP DOWN JUMPER,GRY,32A,283-414	7	
	ADJACENT JUMPER,GREY,32A,281-402	15	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
G	TERMINAL BLOCK,WFF35/AH-1029300000	2	110VDC BD distribution TB =70-X02
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
	FTTB,2WAY,0.2TO16SQ .MM,GRY,283-901	2	
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	14	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	4	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	STEP DOWN JUMPER,GRY,32A,283-414	7	
	ADJACENT JUMPER,GREY,32A,281-402	7	
Rear view of DTC_CRW			
Section-H			
H1	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	96	CCU1 DIP =70-X08
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
		2	
	END STOP FOR DIN35 RAIL, GREY		
H2	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	96	CCU2 DIP =70-X09
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
H3	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	50	CCU DOP =70-X07
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
H4	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	22	AIP/FIP TB =70-X05
	GROUP MARKER,GRY,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4-CONDUCTOR GROUND TB,GRN-YEL,280-837	8	
H5	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	80	TL TB =70-X04
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
Section-I			
I-1	AUX.CONTACTOR,4NO, 3RH2140-2XF40-0LA2	21	FORWARD =022-K01
			REVERSE =022-K02
			DRIVE =022-K03
			COAST =022-K05
			EMER BRK =022-K06
			LDSRL =051-K01
			V<5KMPH =051-K02
I-2			LDSRR =051-K03
			DCLR =051-K04
			DOLR =051-K05
			DORR =051-K06
			PAS RELAY =095-K01

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
			DOOR WARNING BELL =051-K08
			NO MOTION =051-K09
I-3			UV RELAY =081-K01
			LOCAL EB1 =092-K04
			LOCAL EB2 =092-K05
			EBL BYPASS =092-K07
			LBSR =092-K08
			MIN1 BRK APPLIED =093-K01
			FLASHER =103-K01
I-4	AUX.CONTACTOR,2NO +2NC,3RH2122-2XF40-0LA2	6	CAB OCCUPY1 LOOP ISO =021-K15
			CAB OCCUPY2 LOOP ISO =021-K16
			BRAKE =022-K04
			TCN FAILURE =022-K07
			TCMS EMER BRAKE =092-K06
			EMY STOP =092-K10
			LBSR2=092-K11
Section-J			
J-1	8CHANGEOVER RELAYCOIL,D8-U204(334980411)	22	KEY ON =021-K01
			RDM =021-K02
			ANOTHER CAB OCCUPY =021-K03
J-2			CAB OCCUPY1(M) =021-K04
			CAB OCCUPY2(M) =021-K05
			CAB OCCUPY3(M) =021-K06

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
			CAB OCCUPY4(M) =021-K07
J-3			KEY ON(R) =021-K08
			RDM(R) =021-K09
			ANOTHER CAB OCCUPY(R) =021-K10
			CAB OCCUPY1(R) =021-K11
J-4			CAB OCCUPY2(R) =021-K12
			CAB OCCUPY3(R) =021-K13
			CAB OCCUPY4(R) =021-K14
			ADCR =051-K07
J-5			EOL1 =091-K01
			EOL2 =091-K02
			EOL3 =091-K03
			EBL1 =092-K01
J-6			EBL2 =092-K02
			EBL3 =092-K03
			SHUNTING RELAY=022-K08
			VCD =092-K09
J	8CHANGEOVER RELAY SOCKET,V93(338003 930)	22	BASE FOR ALL 8 CHANGEOVER RELAYS

6.2 DTC GCRW

One Electrical Cubicle is provided at guard rear side of DTC cab. It houses all electrical & electronics components required for rake level control. It houses PCU'S, EBCU's, CCTV NVRs,CCTV Ethernet Switches MCB's, Relays & contactors for various application. Equipment layouts are shown in below section.

6.2.1 DTC_GCRW Isometric View

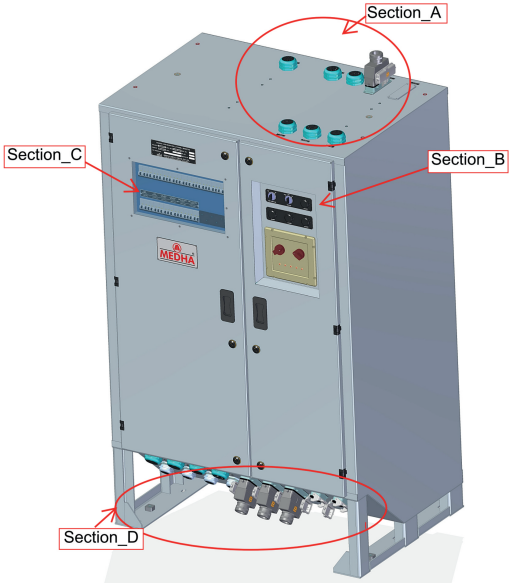


Fig 6.4 Isometric View of DTC_GCRW

6.2.2 DTC_GCRW Front view without Door

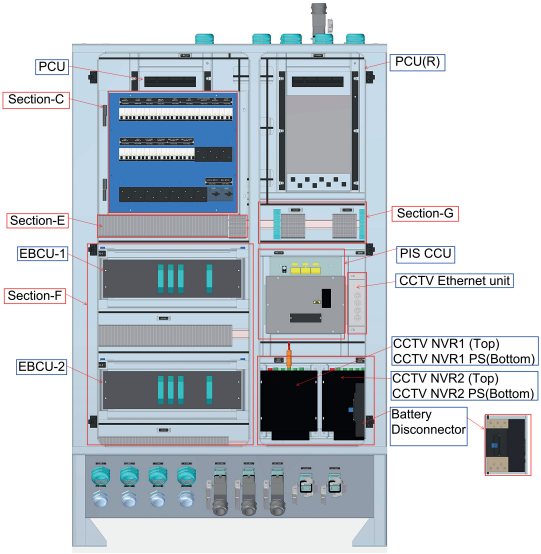


Fig 6.5 Front view of DTC_GCRW

6.2.3 DTC_GCRW Rear view without Door

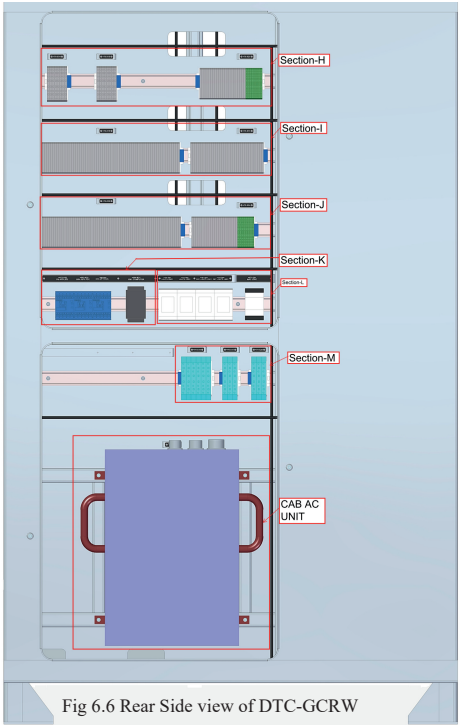


Fig 6.6 Rear Side view of DTC-GCRW

6.2.4 DTC_GCRW_Equipment list

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
TOP view of DTC_GCRW (Section-A)			
A	CONNECTOR MALE-09320463001	1	RMPU & PIS 110VDC INTERFACE =71-X66
	CRIMP CONTACT,MALE,09 33 000 6105	46	
	HOUSING 09 30 024 0302	2	
	GUIDE PIN 09 33 000 9908	4	
	GUIDE BUSH 09 33 000 9909	4	
Switch Panel of DTC_GCRW (Section-B)			
B	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	EMY LIGHTS SW =101-S02
	ACTUATOR,FLUSHMOUNTING,BLACK,704.403.018	1	MAC SW =071-S01
	BLIND PLUG,BLACK,704.964.8	4	BLIND PLUGS
	SWITCH ELEMENT FOR PUSH BUTTON SWITCH (NO SWITCHING ELEMENT)	3	Qty may change according to the requirement
	SWITCH ELEMENT FOR SNAP ACTION SWITCH (NC SWITCHING ELELMENT)	3	
	Marking for 3rd switching element 53/63	5	
	Marking for 3rd switching element 64/54	5	
	Marking for 3rd switching element 51/61	5	
	Marking for 3rd switching element 62/52	5	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
MCB Panel (Section-C)			
C	MCB,2POLE,440V DC,8A	20	PCU SUPPLY =064-F01
		20	PCU(R) SUPPLY =064-F02
		20	MAC SUPPLY =071-F01
		20	PB SUPPLY =072-F02
		20	EBCU1 SUPPLY =073-F01
		20	EBCU2 SUPPLY =073-F02
		20	LIGHTS LINE1 SUPPLY =101-F01
		20	LIGHTS LINE2 SUPPLY =101-F02
		20	EMY LIGHTS LINE1 SUPPLY =101-F03
		20	EMY LIGHTS LINE2 SUPPLY =101-F04
		20	PIS SUPPLY =121-F01
		20	ICD SUPPLY =121-F02
		20	DBDS SUPPLY =121-F03
		20	SSD Supply =121-F04 (Spare)
		20	CCTV LCD SUPPLY =122-F01
		20	CCTV1 SUPPLY =122-F02
		20	CCTV2 SUPPLY =122-F03
		20	BATT CHARGER SUPPLY =081-F03
		20	HLSCB=081-F04
		20	IC Door Supply CB GCRW =051-F05
	AXILLARY CONTACT,2NO	20	FOR ALL 2P MCBS
C	MPCB 3P,28A,3RV20214 NA10,RAILWAY GRADE	2	CAB AC MPCB =012-F02
			MAC MPCB =071-F02

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
Bottom of DTC_GCRW			
D	CRIMP TERMINAL,MALE,09 32 064 3001	2	CRW INTERFACE CONN(=71-X64) & BRAKE INTERFACE(=71-X62)
	CRIMP CONTACT,MALE,09 33 000 6105	128	
	HOUSING 09 30 024 0302	2	
	GUIDE PIN 09 33 000 9908	4	
	GUIDE BUSH 09 33 000 9909	4	
D	CONNECTOR MALE-09320463001	1	BRAKE INTERFACE =71-X63
	CRIMP CONTACT,MALE,09 33 000 6105	46	
	HOUSING 09 30 024 0302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	
D	HOUSING:09 30 006 0302	2	110VDC BN (=71-X60) , 110VDC BD(71-X61)
	CRIMP TERMINAL MALE:09 14 002 3051	2	
	CRIMP CONTACT,MALE,09 11 000 6114	4	
	2 Modules HINGED FRAME(A..C):09 14 006 0303	2	
	HAN MODULAR GUIDE PIN,09 14 000 9908	4	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
E	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	90	PS TB =70-X23
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	10	
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	ADJACENT JUMPER, P/NO : 280-402	20	
	ADJACENT JUMPER,GREY,32A,281-402	10	
F	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	120	EBCU1 =70-X12
	GROUP MARKER,GRY,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4-CONDUCTOR GROUND TB,GRN-YEL,280-837	8	
F	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	120	EBCU2 =70-X13
	GROUP MARKER,GRY,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
	END STOP FOR DIN35 RAIL, GREY	2	
	4-CONDUCTOR GROUND TB,GRN-YEL,280-837	8	
G	FTTB,2WAY,0.2TO16SQ.MM,GRY ,283-901	2	110VDC BN distribution TB =70-X21
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	14	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	4	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	STEP DOWN JUMPER,GRY,32A,283-414	7	
	ADJACENT JUMPER,GREY,32A,281-402	7	
G	FTTB,2WAY,0.2TO16SQ.MM,GRY ,283-901	2	110VDC BD distribution TB =70-X22
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	14	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	4	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	STEP DOWN JUMPER,GRY,32A,283-414	7	
	ADJACENT JUMPER,GREY,32A,281-402	7	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
H	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	BD_EMY LIGHTS =70-X14
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	110V BN LIGHTS =70-X15
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	40	PIS TB =70-X25
	GROUP MARKER,GRY,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4-CONDUCTOR GROUND TB,GRN-YEL,280-837	8	
I	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	35	PCU DOP =70-X18
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
I	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	72	PCU1 DIP =70-X19
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
J	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	72	PCU2 DIP =70-X20
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	22	AIP/FIP TB =70-X24
	GROUP MARKER,GRY,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4-CONDUCTOR GROUND TB,GRN-YEL,280-837	8	
K	INSTANTANEOUS RELAY,4CHANE OVER,110VDC	1	EMY COMPUTER =064-K01
	SOCKET FOR DGG-U203 RELAY, MODEL: V23	1	BASE FOR ALL 4 CHANGEOVER RELAYS

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
K	AUX.CONTACTOR,4NO,3RH2140-2XF40-0LA2	3	PB APPLIED RELAY =072-K02
			BRAKE APPLIED PCC =093-K02
			BRAKE APPLIED PCC(R) =093-K03
L	CONTACTOR,3P,110VDC,9A,LC1D096FLS207	4	EMY LIGHTS LINE1 =101-Q03
			EMY LIGHTS LINE2 =101-Q04
			LIGHTS LINE1 =101-Q01
			LIGHTS LINE2 =101-Q02
	CONTACTOR,3P,32A,110V,LC1D326FLS207	1	MAC CONT =071-Q01
	AUXILIARY CONTACT BLOCK,LADN206,2NO	1	
M	FTTB,2WAY,0.2TO16SQ.MM,GRY,283-901	6	MAC & CAB AC INPUT I/P TB =70-X16
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	4	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	ADJACENT JUMPER,GRAY,70A,283-402	3	
	FTTB,2WAY, 0.2TO10SQ.MM,BLUE,284-904	3	MAC O/P TB =70-X17
	MARKER CARDS,1-10,209-502S(1-10)	1	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
M	END STOP FOR DIN35 RAIL, GREY	2	
	WAGO GROUP MARKER,249-119	1	
	FTTB,2WAY, 0.2TO10SQ.MM,BLUE,284-904	3	CAB AC O/P TB =70-X26
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	WAGO GROUP MARKER,249-119	1	
Right Side of the Panel	MCCB 250A 3 POLE -3VL3725 2DC36 0AA0-Z	1	BATTERY DISCONNECTOR =081-F02
	AUXILIARY SWITCH FOR MCCB 3VL400	1	
Left Side of the Panel	TERMINAL BLOCK,WFF70/AH-1029400000	2	BATT.CHARGING I/P =70-X10
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
	TERMINAL BLOCK,WFF70/AH-1029400000	2	BATT.CHARGING O/P =70-X11
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	

6.3 MC ECC

One Electrical Cubical is provided at driving end of MC cab. It houses all electrical & electronics components required for rake level control. It houses MCUS, EBCUS, MCB, Relays & contactor for various application. Equipment layouts are shown in below section.

6.3.1 Isometric View of MC ECC

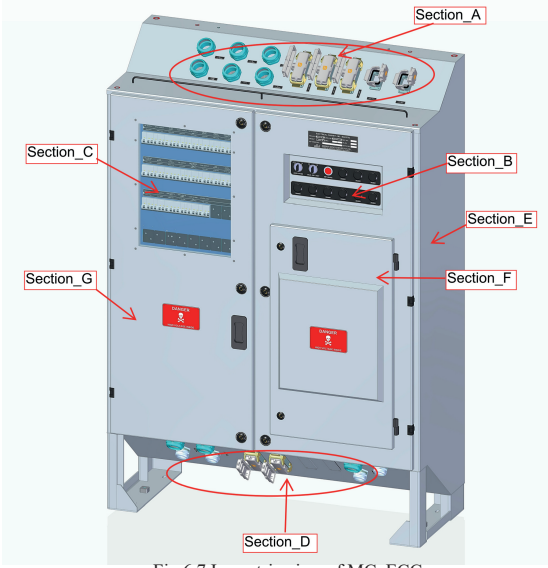


Fig 6.7 Isometric view of MC_ECC

6.3.2 Front view of MC_ECC

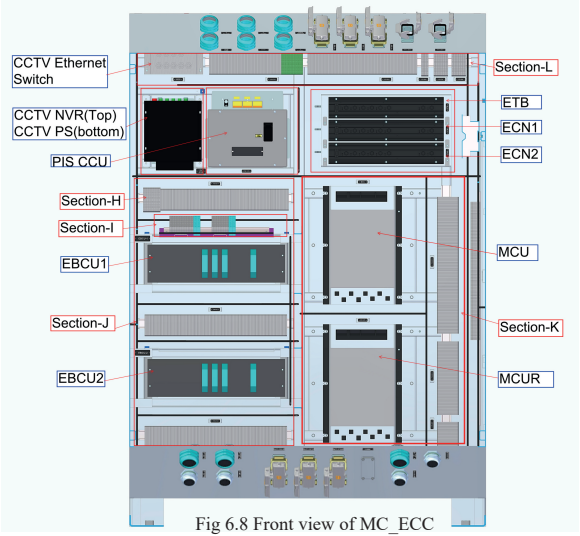


Fig 6.8 Front view of MC_ECC

6.3.3 MC_ECC EQUIPMENT DETAILS

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
TOP view of MC_ECC (Section-A)			
A	CONNECTOR MALE-09320463001	2	=71-X01 (TL1) ,=71-X05(EXT Interface)
	CRIMP CONTACT,MALE,09 33 000 6105	92	
	HOUSING 09 30 024 0302	2	
	GUIDE PIN 09 33 000 9908	4	
	CONNECTOR MALE-09320463001	1	=71-X02 (TL2)
	CRIMP CONTACT,MALE,09 33 000 6105	46	
	HOUSING 09 30 024 0302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH a09 33 000 9909	2	
	HOUSING:09 30 006 0302	1	=71-X04(110V DC BN)
	CRIMP TERMINAL MALE:09 14 002 3051	1	
	CRIMP CONTACTS MALE:09 11 000 6116	2	
	2 Modules HINGED FRAME(A..C):09 14 006 0303	1	
	HAN MODULAR GUIDE PIN,09 14 000 9908	2	
	HAN MODULAR GUIDE BUSHING,09 14 000 9909	2	
	HOUSING:09 30 006 0302	1	=71-X03(110V DC BD)
	CRIMP TERMINAL MALE:09 14 002 3051	1	
	CRIMP CONTACT,MALE,09 11 000 6114	2	
	2 Modules HINGED FRAME(A..C):09 14 006 0303	1	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
A	HAN MODULAR GUIDE PIN,09 14 000 9908	2	
	HAN MODULAR GUIDE BUSHING,09 14 000 9909	2	
Switching & Indication Panel of MC_ECC (Section-B)			
B	INDICATOR,FLUSH MOUNTING,RED,704.006.218	1	EMY BRAKE =092-P01
	MULTI LED FAIL SAFE,110VDC,10-4H22.1032P	1	LAMP FOR EMY BRAKE
	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	LBSR BYPASS SW =092-S01
	BLIND PLUG,BLACK,704.964.8	9	BLIND PLUGS
	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	LOCAL EMY LIGHTS =101-S01
	SWITCH ELEMENT FOR PUSH BUTTON SWITCH (NO SWITCHING ELEMENT)	2	Quantity may vary according to usage as per requirement
	SWITCH ELEMENT FOR SNAP ACTION SWITCH (NC SWITCHING ELELMENT)	2	
	Marking for 3rd switching element 53/63	5	
	Marking for 3rd switching element 64/54	5	
	Marking for 3rd switching element 51/61	5	
	Marking for 3rd switching element 62/52	5	
MCB Panel MC_ECC (Section-C)			
C	MCB,2POLE,440VDC,8A	24	PB SUPPLY =072-F01
			EBCU1 SUPPLY =073-F01
			EBCU2 SUPPLY =073-F02
			MC COMN SUPPLY =062-F01

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
C	MCB,2POLE,440VDC,8A	24	MCU SUPPLY =062-F02
			MCU(R) SUPPLY =062-F03
			ECN1 SUPPLY =041-F01
			ECN2 SUPPLY =041-F02
			PIS SUPPLY =121-F01
			ICD CB SUPPLY =121-F02
			DBDS CB SUPPLY =121-F03
			CCTV MCB SUPPLY =122-F02
			DCU LEFT SUPPLY =051-F01
			DCU RIGHT SUPPLY =051-F02
			PAS SUPPLY =095-F01
			EMY LIGHTS LINE1 =101-F03
			EMY LIGHTS LINE2 =101-F04
			LIGHTS LINE1 =101-F01
			LIGHTS LINE2 =101-F02
			EMY BRAKE SUPPLY =092-F01
			LTC1 SUPPLY =032-F01

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
C	MCB,2POLE,440VDC,8A	24	LTC2 SUPPLY =032-F02
			HLS CB =081-F01
			ETB CB =041-F03
	AXILLARY CONTACT,2NO		FOR ALL MCBS
Bottom view of MC_ECC (Section-D)			
D	CONNECTOR MALE-09320463001	1	=71-X06 (LTC Interface)
	CRIMP CONTACT,MALE,09 33 000 6105	46	
	HOUSING 09 30 024 0302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	
	CRIMP TERMINAL,MALE,09 32 064 3001	1	=71-X07 (Brake Interface cables 110V DC)
	CRIMP CONTACT,MALE,09 33 000 6105	64	
	HOUSING 09 30 024 0302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	
	CONNECTOR MALE-09320463001	1	BRK INTERFACE (71-X130)
	CRIMP CONTACT,MALE,09 33 000 6105	46	
	HOUSING 09 30 024 0302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
Right side view of MC_ECC (Section-E)			
E	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	72	MCU2 DIP =70-X03
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	TERMINAL BLOCK,WFF35/AH-1029300000	2	BN =70-X17
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
Right Door rear view of MC_ECC (Section-F)			
F	TERMINAL BLOCK,WFF35/AH-1029300000	6	415V AC =70-X13
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
F	FTTB,2WAY,0.2TO16SQ.MM,GRY,283-901	10	415VAC distribution TB =70-X14
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END STOP FOR DIN35 RAIL, GREY	4	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	ADJACENT JUMPER,GRAY,70A,283-402	6	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
F	MPCB 3 POLE 6A 415VAC	2	LTC BLW1 SUPPLY =032-F15
	AUX CONTACT	2	LTC BLW2 SUPPLY =032-F16
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	10	U/F TB =70-X15
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	
Left Door rear view of MC_ECC (Section-G)			
Left Door rear side components (Section G)	CONTACTOR,3P,110VDC, 9A,LC1D096FLS207	4	EMY LIGHTS LINE1 =101-Q03
			EMY LIGHTS LINE2 =101-Q04
			LIGHTS LINE1 =101-Q01
			LIGHTS LINE2 =101-Q02
	AUX.CONTACTOR,4NO,3 RH2140-2XF40-0LA2	8	PB APPLIED =072-K01
			EBL BYPASS =092-K04
			PASSENGER ALARM =095-K01
			LDSLR =051-K01
			LDSRR =051-K02
			BRAKE APPLIED MCU =093-K01
			LBSR =092-K06

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
Left Door rear side components (Section G)	AUX.CONTACTOR,2NO+2 NC,3RH2122-2XF40-0LA2	2	EMY VALVE =092-K05
		2	LBSR2 =092-K07
	INSTANTANEOUS RELAY,4CHANE OVER,110VDC	1	EMY COMPUTER =062-K01
	SOCKET FOR DGG-U203 RELAY, MODEL: V23	1	BASE FOR ALL 4 CHANGEOVER RELAYS
	8CHANGEOVER RELAYCOIL,D8-U204(334980411)	3	EBL1 =092-K01
			EBL2 =092-K02
			EBL3 =092-K03
	8CHANGEOVER RELAY SOCKET,V93(338003930)	3	BASE FOR ALL 8 CHANGEOVER RELAYS
Front View of MC_ECC Section-H			
H	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	100	PS TB =70-X01
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652		
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	ADJACENT JUMPER, P/NO : 280-402	20	
	ADJACENT JUMPER,GREY,32A,281-402	10	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
Section-I			
I	FTTB,2WAY,0.2TO16SQ.MM,GRY,283-901	2	110VDC BN distribution TB =70-X10
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	14	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	4	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	STEP DOWN JUMPER,GRY,32A,283-414	7	
	ADJACENT JUMPER,GREY,32A,281-402	7	
	ADJACENT JUMPER,GRAY,70A,283-402	2	
	FTTB,2WAY,0.2TO16SQ.MM,GRY,283-901	2	110VDC BD distribution TB =70-X09
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	4	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	STEP DOWN JUMPER,GRY,32A,283-414	6	
	ADJACENT JUMPER,GREY,32A,281-402	7	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
Section-J			
J	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	120	EBCU1 =70-X11
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	120	EBCU2 =70-X12
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
Section-K			
K	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	72	MCU1 DIP =70-X02
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
K	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	35	MCU DOP =70-X04
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	50	AIP/FIP TB =70-X07
	GROUP MARKER,GRY,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4-CONDUCTOR GROUND TB,GRN-YEL,280-837	8	
Section-L			
L	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	76	TL TB =70-X05
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	110V BN LIGHTS =70-X06

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
L	MARKER CARDS,1-10,209-502S(1-10)	1	110V BN LIGHTS =70-X06
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	4	HVPT =70-X08
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	BD_EMY LIGHTS =70-X16
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	WAGO END PLATES, P/NO : 280-314	1	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4-CONDUCTOR GROUND TB,GRN-YEL,280-837	15	

6.4 TC ECC

One Electrical Cubicle is provided at driving end of TC cab. It houses all electrical & electronics components required for rake level control. It houses EPCU'S, EBCU'S, MCB's, Relays & contactors for various application. Equipment layouts are shown in below section.

6.4.1 Isometric View of TC ECC

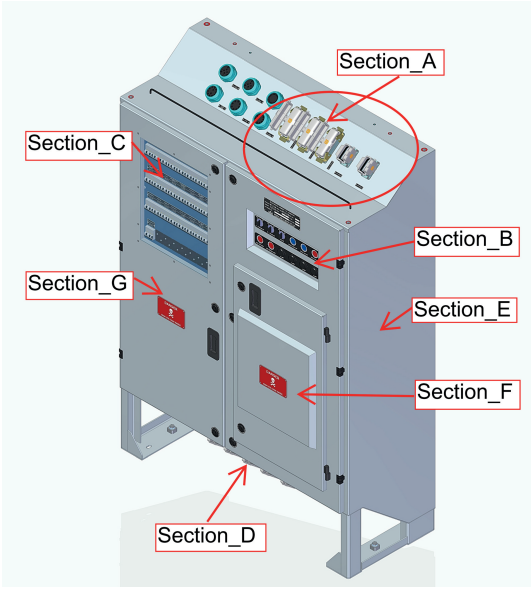


Fig 6.9 Isometric View of TC_ECC

6.4.2 Front view of TC_ECC without Door

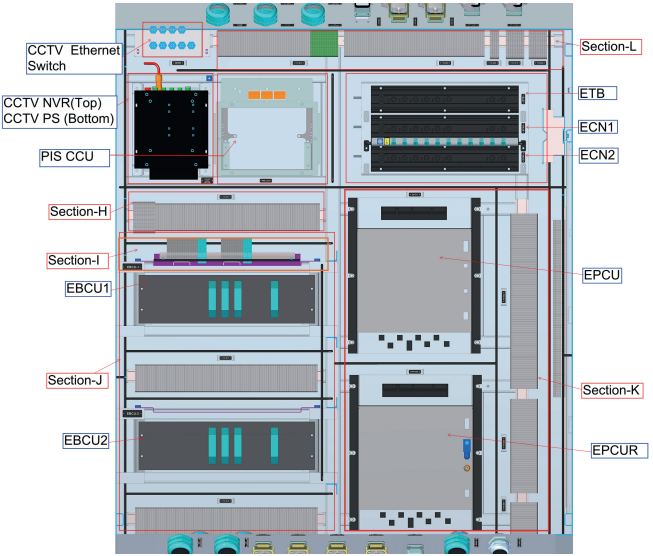


Fig 6.10 Front view of TC_ECC

6.4.3 MC_ECC EQUIPMENT DETAILS

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
TC_ECC_TOP SIDE COMPONENTS_Section-A			
	CRIMP CONTACT,MALE,09 33 000 6105	128	TL 1 & EXT Interface TOP =71-X01,=71-X05
	CRIMP TERMINAL,MALE,09 32 064 3001	2	
	HOUSING 09 30 024 0302	2	
	GUIDE PIN 09 33 000 9908	4	
	GUIDE BUSH 09 33 000 9909	4	
	CONNECTOR MALE-09320463001	1	PIS EXT Interface =71-X02
	CRIMP CONTACT,MALE,09 33 000 6105	46	
	HOUSING 09 30 024 0302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	
A	HOUSING:09 30 006 0302	1	110VDC BN =71-x04
	CRIMP TERMINAL MALE:09 14 002 3051	1	
	CRIMP CONTACTS MALE:09 11 000 6116	2	
	2 Modules HINGED FRAME(A..C):09 14 006 0303	1	
	HAN MODULAR GUIDE PIN,09 14 000 9908	2	
	HAN MODULAR GUIDE BUSHING,09 14 000 9909	2	
	HOUSING:09 30 006 0302	1	110VDC BD =71-X03
	CRIMP TERMINAL MALE:09 14 002 3051	1	
	CRIMP CONTACT,MALE,09 11 000 6114	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
A	2 Modules HINGED FRAME(A..C):09 14 006 0303	1	110VDC BD =71-X03
	HAN MODULAR GUIDE PIN,09 14 000 9908	2	
	HAN MODULAR GUIDE BUSHING,09 14 000 9909	2	
TC_ECC_SWITCHING & INDICATION PANEL COMPONENTS_Section-B			
B	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	AAC SW =074-S01
	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	EMY LIGHTS ON =101-S01
	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	LBR BYPASS SW =092-S01
	INDICATOR,FLUSHMOUNTING ,BLUE,704.006.618	1	LOCAL PANTO UP =011-P01
	INDICATOR,FLUSHMOUNTING ,BLUE,704.006.618	1	LOCAL VCB ON =011-P02
	INDICATOR,FLUSH MOUNTING,RED,704.006.218	1	OHE AVAILABLE =011-P03
	INDICATOR,FLUSH MOUNTING,RED,704.006.218	1	EMY OFF LAMP =091-P01
	INDICATOR,FLUSH MOUNTING,RED,704.006.218	1	EMY BRAKE LAMP =092-P01
	MULTI LED FAIL SAFE,110VDC,10-4H22.1032P	3	LAMP
	MULTI LED,BLUE,110VDC,10-4H22.1036P	2	LAMP
	BLIND PLUG,BLACK,704.964.8	4	BLIND PLUGS
	SWITCH ELEMENT FOR PUSH BUTTON SWITCH (NO SWITCHING ELEMENT)	6	Quantity may vary according to usage as per requirement
	SWITCH ELEMENT FOR SNAP ACTION SWITCH (NC SWITCHING ELELMENT)	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
B	Marking for 3rd switching element 53/63	5	Quantity may vary according to usage as per requirement
	Marking for 3rd switching element 64/54	5	
	Marking for 3rd switching element 51/61	5	
	Marking for 3rd switching element 62/52	5	
TC_ECC_MCB PANEL COMPONENTS_Section-C			
C	MCB,2POLE,440VDC,8A	24	PB SUPPLY SUPPLY =072-F01
			EBCU1 SUPPLY =073-F01
			EBCU2 SUPPLY =073-F02
			ECN1 SUPPLY =041-F01
			ECN2 SUPPLY =041-F02
			PIS SUPPLY =121-F01
			ICD CB =121-F02
			DBDS CB =121-F03
			CCTV MCB =122-F02
			DCU LEFT SUPPLY =051-F01
			DCU RIGHT SUPPLY =051-F02
			PAS SUPPLY SUPPLY =095-F01
			EMY LIGHTS LINE1 =101-F03
			EMY LIGHTS LINE2 =101-F04
			LIGHTS LINE1 =101-F01

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
C	MCB,2POLE,440VDC,8A	24	LIGHTS LINE2 =101-F02
			EMY BRAKE SUPPLY =092-F01
			ACU CB =032-F01
			PANTO&VCB SUPPLY =011-F01
			LINE ISOLATOR SUPPLY =031-F09
			ETB CB =041-F03
			TC SUPPLY =063-F01
			EPCU(R) SUPPLY =063-F03
			EPCU SUPPLY =063-F02
			HLSCB =081-F01
	MCB,2P,16A,5SY5216-7KK11,RAILWAY GRADE	1	AAC SUPPLY =074-F01
	AUXILLARY CONTACT,2NO	26	FOR ALL 2P MCBS
D	CONNECTOR MALE-09320463001	1	ACU Interface =71-X06
	CRIMP CONTACT,MALE,09 33 000 6105	46	
	HOUSING 09 30 024 0302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	
	CRIMP TERMINAL,MALE,09 32 064 3001	1	EBCU Interface =71-X07
	CRIMP CONTACT,MALE,09 33 000 6105	64	
	HOUSING 09 30 024 0302	1	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
D	GUIDE PIN 09 33 000 9908	2	TXFR CONTROL =71-X08
	GUIDE BUSH 09 33 000 9909	2	
	CONNECTOR MALE-09320463001	1	
	CRIMP CONTACT,MALE,09 33 000 6105	46	
	HOUSING 09 30 024 0302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	
	CONNECTOR MALE-09 32 032 3001	1	TXFR 415VAC =71-X09
	MALE CONTACT, 09 33 000 6102	32	
	HOUSING-'09300160302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	
	CONNECTOR MALE-09320463001	1	BRK INTERFACE (71-X130)
	CRIMP CONTACT,MALE,09 33 000 6105	46	
	HOUSING 09 30 024 0302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
TC_ECC_RIGHT SIDE COMPONENTS_Section-E			
E	TERMINAL BLOCK,WFF35/AH-1029300000	2	BN DISTRIBUTION TB =70-X17
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	96	EPCU2 DIP =70-X03
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
TC_ECC_RIGHT DOOR REAR SIDE COMPONENTS_Section-F			
F	TERMINAL BLOCK,WFF35/AH-1029300000	6	415V AC =70-X13
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
	FTTB,2WAY,0.2TO16SQ.MM,GRY,283-901	15	415VAC distribution TB =70-X14
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END STOP FOR DIN35 RAIL, GREY	4	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	ADJACENT JUMPER,GRAY,70A,283-402	8	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
F	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	24	U/F TB =70-X15
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	MPCB 3 POLE 6A 415VAC	6	TXFR OIL PUMP MPCB =031-F01
			TXFR BLW1 HIGH SPEED MPCB =031-F04
			TXFR BLW1 LOW SPEED MPCB =031-F03
			TXFR BLW2 HIGH SPEED MPCB =031-F06
			TXFR BLW2 LOW SPEED MPCB =031-F05
			TXFR OIL PUMP MPCB2 =031-F02
	AUX CONTACT	6	FOR ALL 3P MPCBS
	CONTACTOR,3P,110VDC, 9A,LC1D096FLS207	8	TXFR OIL PUMP CONT1 =031-Q01
			TXFR BLW1 HIGH SPEED2 CONT =031-Q05
			TXFR BLW1 LOW SPEED CONT =031-Q03
			TXFR BLW2 HIGH SPEED 2 CONT =031-Q08

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
F	CONTACTOR,3P,110VDC, 9A,LC1D096FLS207	8	TXFR BLW2 LOW SPEED CONT =031-Q06
			TXFR BLW1 HIGH SPEED1 CONT =031-Q04
			TXFR BLW2 HIGH SPEED 1 CONT =031-Q07
			TXFR OIL PUMP CONT2 =031-Q02
G	CONTACTOR,3P,110VDC, 9A,LC1D096FLS207	7	AAC CONT =074-Q01
			EMY LIGHTS LINE1 =101-Q03
			EMY LIGHTS LINE2 =101-Q04
			LIGHTS LINE1 =101-Q01
			LIGHTS LINE2 =101-Q02
			LINE ISO OFF =031-Q09
			LINE ISO ON =031-Q10
	AUX.CONTACTOR,4NO,3 RH2140-2XF40-0LA2	11	PB APPLIED =072-K01
		11	EBL BYPASS =092-K04
		11	PASSENGER ALARM =095-K01
		11	LDSLR =051-K01
		11	LDSRR =051-K02
		11	BAL RELAY EPCU1 =093-K01
		11	BAL RELAY EPCU2 =093-K02
		11	LBSR =092-K06

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
G		11	PANTO STATUS RELAY =011-K01
		11	VCB STATUS RELAY =011-K02
		11	VCB ON =011-K03
	AUX.CONTACTOR,2NO+2 NC,3RH2122-2XF40-0LA2	2	EMY VALVE =092-K05
			LBSR2 =92-K07
	INSTANTANEOUS RELAY,4CHANE OVER,110VDC	1	EMY COMPUTER =063-K01
	SOCKET FOR DGG-U203 RELAY, MODEL: V23	1	BASE FOR ALL 4 CHANGEOVER RELAYS
	8CHANGEOVER RELAYCOIL,D8-U204(334980411)	7	EBL1 =092-K01
			EBL2 =092-K02
			EBL3 =092-K03
			EOL1 RELAY =091-K01
			EOL2 RELAY =091-K02
			EOL3 RELAY =091-K03
			EOL123 RELAY =091-K04
	8CHANGEOVER RELAY SOCKET,V93(338003930)	7	BASE FOR ALL 8 CHANGEOVER RELAYS
TC_ECC_FRONT SIDE COMPONENTS			
Section-H			
H	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	90	PS TB =70-X01
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	10	
	WAGO GROUP MARKER,249-119	1	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
H	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	ADJACENT JUMPER, P/NO : 280-402	20	
	ADJACENT JUMPER,GREY,32A,281-402	10	
Section- I			
I	FTTB,2WAY,0.2TO16SQ.MM,GRY,283-901	4	110VDC BN distribution TB =70-X10
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	14	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	4	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	STEP DOWN JUMPER,GRY,32A,283-414	7	
	ADJACENT JUMPER,GREY,32A,281-402	7	
	ADJACENT JUMPER,GRAY,70A,283-402	2	
	FTTB,2WAY,0.2TO16SQ.MM,GRY,283-901	2	110VDC BD distribution TB =70-X09
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
I	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	4	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	STEP DOWN JUMPER,GRY,32A,283-414	6	
	ADJACENT JUMPER,GREY,32A,281-402	7	
Section- J			
J	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	120	EBCU1 =70-X11
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	120	EBCU2 =70-X12
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
Section- K			
K	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	50	AIP/FIP TB =70-X07
	GROUP MARKER,GRY,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4-CONDUCTOR GROUND TB,GRN-YEL,280-837	20	
	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	50	EPCU DOP =70-X04
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	96	EPCU1 DIP =70-X02
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
Section- L			
L	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	50	PIS TB =70-X19
	ADJACENT JUMPER, P/NO : 280-402	10	
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4-CONDUCTOR GROUND TB,GRN-YEL,280-837	15	
	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	76	TL TB =70-X05
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	4	HVPT =70-X08
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
L	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	BD_EMY LIGHTS =70-X16
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	110V BN LIGHTS =70-X06
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	DIODE PANEL =011-T01		

6.5 NDTC ECC

One Electrical Cubical is provided at driving end of NDTC cab. It houses all electrical & electronics components required for rake level control. It houses PCUS, EBCUS, MCB, Relays, and contactor for various application. Equipment layouts are shown in below section.

6.5.1 Isometric View of NDTC ECC

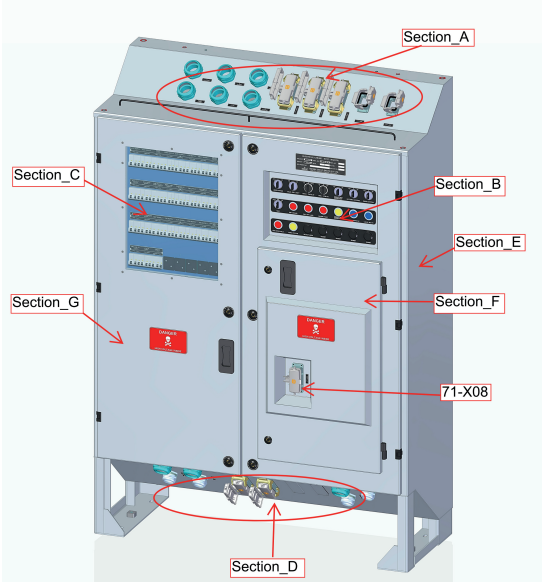


Fig 6.11 Isometric view of NDTC_ECC

6.5.2 Front view of NDTC_ECC without Door

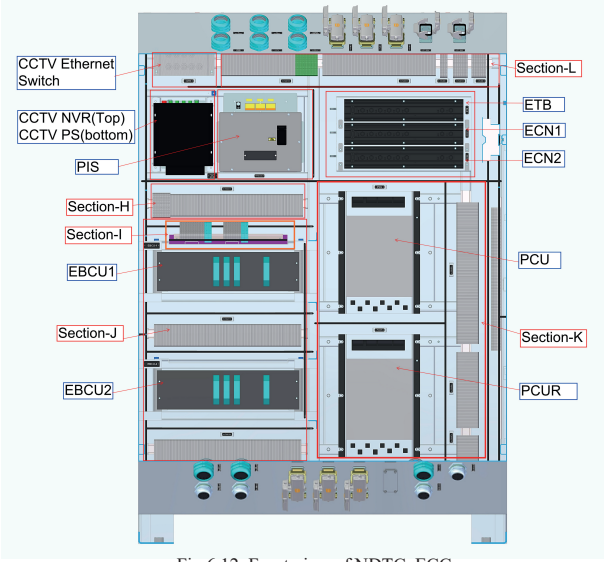


Fig 6.12 Front view of NDTC_ECC

6.5.3 NDTC_ECC EQUIPMENT DETAILS

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
Top view of NDTC_ECC(Section-A)			
A	CONNECTOR MALE-09320463001	2	=71-X01(TL1) ,=71-X05(EXT I/F)
	CRIMP CONTACT,MALE,09 33 000 6105	92	
	HOUSING 09 30 024 0302	2	
	GUIDE PIN 09 33 000 9908	4	
	GUIDE BUSH 09 33 000 9909	4	
A	CONNECTOR MALE-09320463001	1	=71-X02(TL2)
	CRIMP CONTACT,MALE,09 33 000 6105	46	
	HOUSING 09 30 024 0302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	
	HOUSING:09 30 006 0302	1	=71-X04(110V DC BN)
	CRIMP TERMINAL MALE:09 14 002 3051	1	
	CRIMP CONTACTS MALE:09 11 000 6116	2	
	2 Modules HINGED FRAME(A..C):09 14 006 0303	1	
	HAN MODULAR GUIDE PIN,09 14 000 9908	2	
	HAN MODULAR GUIDE BUSHING,09 14 000 9909	2	
	HOUSING:09 30 006 0302	1	=71-X03(110V DC BD)
	CRIMP TERMINAL MALE:09 14 002 3051	1	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
	CRIMP CONTACT,MALE,09 11 000 6114	2	
	2 Modules HINGED FRAME(A..C):09 14 006 0303	1	
	HAN MODULAR GUIDE PIN,09 14 000 9908	2	
	HAN MODULAR GUIDE BUSHING,09 14 000 9909	2	
Switching & Indication Panel view of NDTC_ECC(Section-B)			
B	INDICATOR,FLUSH MOUNTING,RED,704.006.218	1	EMY BRAKE 092-P01
	ACTUATOR,FLUSHMOUNTING ,BLACK,704.403.018	1	MAC SW =071-S01
	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	SINGLE UNIT OPERATION SW =021-S01
	ACTUATOR,FLUSHMOUNTING ,BLACK,704.405.018	1	BATTERY CONTROL SW =081-S01
	ACTUATOR,FLUSHMOUNTING ,BLACK,704.405.018	1	RMPU CONTROL SW
	INDICATOR,FLUSH MOUNTING,RED,704.006.218	1	MAJOR FAULT-Red =091-P02
	ACTUATOR,FLUSHMOUNTING ,BLACK,704.095.018	1	LOCAL PANTO UP-BLACK =011-S01
	ACTUATOR,FLUSHMOUNTING ,BLACK,704.095.018	1	LOCAL VCB ON-BLACK =011-S02
	INDICATOR,FLUSH MOUNTING,704.006.418	1	SINGLE UNIT OPERATION-YELLOW LAMP (021-P01)
	INDICATOR,FLUSHMOUNTING ,BLUE,704.006.618	1	LOCAL PANTO UP-LAMP BLUE =011-P01

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
B	INDICATOR,FLUSHMOUNTING,BLUE,704.006.618	1	LOCAL MC ON -LAMP BLUE =011-P02
	INDICATOR,FLUSH MOUNTING,RED,704.006.218	1	EMY OFF LAMP =091-P01
	INDICATOR,FLUSH MOUNTING,RED,704.006.218	1	OHE AVAILABLE LAMP=091-P03
	INDICATOR,FLUSH MOUNTING,704.006.418	1	RMPU STATUS LAMP
	MULTI LED FAIL SAFE,110VDC,10-4H22.1032P	4	LAMP
	MULTI LED,YELLOW,110VDC,10-4H22.1034P	2	LAMP
	MULTI LED,BLUE,110VDC,10-4H22.1036P	2	LAMP
	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	LBSR BYPASS SW 092-S01
	BLIND PLUG,BLACK,704.964.8	3	BLIND PLUGS
	SELECTOR SWITCH ACTUATOR 2 POS,SHORT LEV	1	EMY LIGHTS ON =101-S01
	SWITCH ELEMENT FOR PUSH BUTTON SWITCH (NO SWITCHING ELEMENT)	2	Quantity may vary according to usage as per requirement
	SWITCH ELEMENT FOR SNAP ACTION SWITCH (NC SWITCHING ELELMENT)	2	
	Marking for 3rd switching element 53/63	5	
	Marking for 3rd switching element 64/54	5	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
	Marking for 3rd switching element 51/61	5	
	Marking for 3rd switching element 62/52	5	
MCB Panel view of NDTC_ECC (Section-C)			
C	MCB,2POLE,440VDC,8A	28	PB SUPPLY SUPPLY =072-F01
			EBCU1 SUPPLY =073-F01
			EBCU2 SUPPLY =073-F02
			NDTC COMN SUPPLY =064-F01
			PCU SUPPLY =064-F02
			PCU(R) SUPPLY =064-F03
			ECN1 SUPPLY =041-F01
			ECN2 SUPPLY =041-F02
			PANTO & MC SUPPLY =011-F01
			CAB OCCUPY CONTROL SUPPLY =021-F01
			ETB SUPPLY =041-F03
			MAC SUPPLY =071-F01
			RMPU CONTROL SUPPLY =111-F01
			PIS SUPPLY =121-F01

SECTION	MATERIAL DESCRIPTION		APPLICATION
C	MCB,2POLE,440VDC,8A	28	ICD CB =121-F02
			DBDS CB =121-F03
			CCTV MCB =122-F02
			DCU LEFT SUPPLY =051-F01
			DCU RIGHT SUPPLY =051-F02
			PAS SUPPLY SUPPLY =095-F01
			EMY LIGHTS LINE1 =101-F03
			EMY LIGHTS LINE2 =101-F04
			LIGHTS LINE1 =101-F01
			LIGHTS LINE2 =101-F02
			EMY BRAKE SUPPLY =092-F01
			BATTERY CONTROL SUPPLY =081-F01
			BATT CHARGER SUPPLY =081-F03
			HLS CB =081-F04
C	AXILLARY CONTACT,2NO	28	FOR ALL MCBS
Bottom View of NDTC_ECC(Section-D)			
D	CONNECTOR MALE-09320463001	1	=71-X06(BATTERY CHAGER INTERFACE)
	CRIMP CONTACT,MALE,09 33 000 6105	46	
	HOUSING 09 30 024 0302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
D	CRIMP TERMINAL,MALE,09 32 064 3001	1	=71-X07(BRAKE INTERFACE))
	CRIMP CONTACT,MALE,09 33 000 6105	64	
	HOUSING 09 30 024 0302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	
	CONNECTOR MALE-09320463001	1	BRK INTERFACE (71-X130)
	CRIMP CONTACT,MALE,09 33 000 6105	46	
	HOUSING 09 30 024 0302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	
Right side view of NDTC_ECC(Section-E)			
E	TERMINAL BLOCK,WFF35/AH-1029300000	2	BN =70-X17
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
E	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	72	PCU(R) DIP =70-X03
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
Right Side Rear View of NDTC_ECC (Section-F)			
F	TERMINAL BLOCK,WFF35/AH-1029300000	6	BATTERY DISCONNECTOR =70-X13
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
F	FTTB,2WAY,0.2TO16SQ.MM,GRY,283-901	10	415VAC distribution TB =70-X14
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END STOP FOR DIN35 RAIL, GREY	4	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	ADJACENT JUMPER,GRAY,70A,283-402	6	
	FTTB,2WAY, 0.2TO10SQ.MM,BLUE,284-904	3	U/F TB =70-X15
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	WAGO GROUP MARKER,249-119	1	
	END & INTERMEDIATE PLATE,GRY,284-325	1	
	MCCB 250A 3 POLE - 3VL3725 2DC36 0AA0-Z	1	BATTERY DISCONNECTOR (081-F02)
	AUXILIARY SWITCH FOR MCCB 3VL400	1	AUX BLOCK FOR BATTERY DISCONNECTOR

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
ON DOOR			
F	CONNECTOR MALE-09 32 032 3001	1	SHUNTING PANEL =71-X24
	CRIMP CONTACT,MALE,09 33 000 6105	32	
	HOUSING-'09300160302	1	
	GUIDE PIN 09 33 000 9908	2	
	GUIDE BUSH 09 33 000 9909	2	
F	MPCB 3P,28A,3RV20214NA10,RAILWAY GRADE	1	MAC MPCB =071-F02
	CONTACTOR,3P,32A,110V,LC1D326FLS207	1	MAC CONT =071-Q01
	AUXILIARY CONTACT BLOCK,LADN206,2NO	1	
Left side Door Rear View of NDTC_ECC (Section-G)			
G	CONTACTOR,3P,110VDC,9A,LC1D096FLS207	4	EMY LIGHTS LINE1 =101-Q03
			EMY LIGHTS LINE2 =101-Q04
			LIGHTS LINE1 =101-Q01
			LIGHTS LINE2 =101-Q02
	AUX.CONTACTOR,4NO,3RH2140-2XF40-0LA2	8	PB APPLIED =072-K01
			EBL BYPASS =092-K04
			PASSENGER ALARM =095-K01
			LDSLR =051-K01
			LDSRR =051-K02

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
G			BRAKE APPLIED PCU =093-K01
			BRAKE APPLIED PCU(R) =093-K02(spare)
			LBSR =092-K06
	AUX.CONTACTOR,2NO+2 NC,3RH2122-2XF40-0LA2	3	EMY VALVE =092-K05
		3	EMER STOP =092-K07
			LBSR2 =092-K08
	INSTANTANEOUS RELAY,4CHANE OVER,110VDC	1	EMY COMPUTER =064-K01
	SOCKET FOR DGG-U203 RELAY, MODEL: V23	1	BASE FOR ALL 4 CHANGEOVER RELAYS
	8CHANGEOVER RELAYCOIL,D8-U204(334980411)	7	EBL1 =092-K01
			EBL2 =092-K02
			EBL3 =092-K03
			ANOTHER CAB OCCUPY =021-K01
			CAB OCCUPY1(M) =021-K02
			CAB OCCUPY2(M) =021-K03
			ANOTHER CAB OCCUPY(R) =021-K04
	8CHANGEOVER RELAY SOCKET,V93(338003930)	7	BASE FOR ALL 8 CHANGEOVER RELAYS
Front View of NDTC_ECC			
Section-H			
H	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	100	PS TB =70-X01
	WAGO GROUP MARKER,249-119	1	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	ADJACENT JUMPER, P/NO : 280-402	20	
	ADJACENT JUMPER,GREY,32A,281-402	10	
Section-I			
I	FTTB,2WAY,0.2TO16SQ.MM,GRY,283-901	2	110VDC BN distribution TB =70-X10
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	14	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	4	
	FTTB,2WAY,0.2TO16SQ.MM,GRY,283-901	2	110VDC BN distribution TB =70-X10
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	14	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	4	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	STEP DOWN JUMPER,GRY,32A,283-414	7	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
	ADJACENT JUMPER,GREY,32A,281-402	7	
	ADJACENT JUMPER,GRAY,70A,283-402	2	
I	FTTB,2WAY,0.2TO16SQ.MM,GRY,283-901	2	110VDC BD distribution TB =70-X09
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	4	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	STEP DOWN JUMPER,GRY,32A,283-414	6	
	ADJACENT JUMPER,GREY,32A,281-402	7	
Section-J			
J	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	120	EBCU1 =70-X11
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
J	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	120	EBCU2 =70-X12
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
Section-K			
K	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	30	AIP/FIP TB =70-X07
		1	
	WAGO END PLATES, P/NO : 280-314	1	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4-CONDUCTOR GROUND TB,GRN-YEL,280-837	8	
	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	72	PCU DIP =70-X02
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
k	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	35	PCU DOP =70-X04
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
Section-L			
L	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	76	TL TB =70-X05
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	110V BN LIGHTS =70-X06
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
L	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	BD_EMY LIGHTS =70-X16
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	280-833, 4 CONDUCTOR THROUGH TERMINAL BL	50	PIS TB =70-X19
	ADJACENT JUMPER, P/NO : 280-402	10	
	WAGO GROUP MARKER,249-119	1	
	WAGO END PLATES, P/NO : 280-314	1	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4-CONDUCTOR GROUND TB,GRN-YEL,280-837	15	

Chapter 7

END WALL OVERVIEW

7.1 MC_P1/TC _P1-Panel Description

One End Wall panel (P1) is located at the right side of driving end or ECC End on TC and MC coach. P1 panel consists of MC/TC houses Terminal Blocks & MCBs. Equipment layouts are shown in below section.

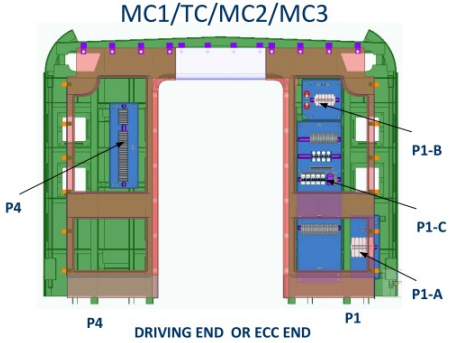


Fig 7.1 P1-Pannel Arrangement in MC/TC Coach

7.2 Panel P1 Detailed View of MC/TC Coach

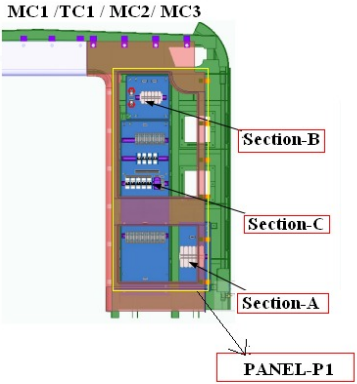


Fig 7.2 Panel P1 Equipment Details of MC/TC Coach

7.2.1 Panel P1-A (Section A)

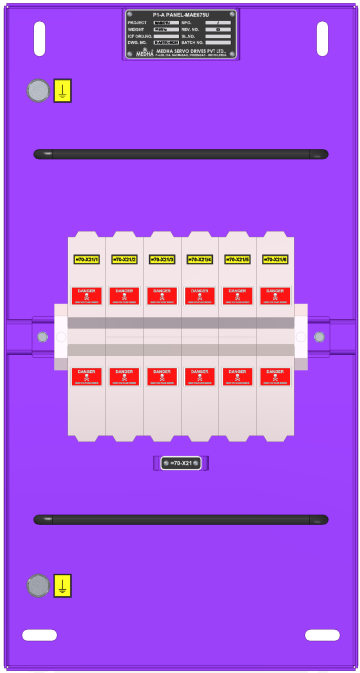


Fig 7.3 Panel P1 (Section A)

7.2.2 Panel P1-B (Section B)

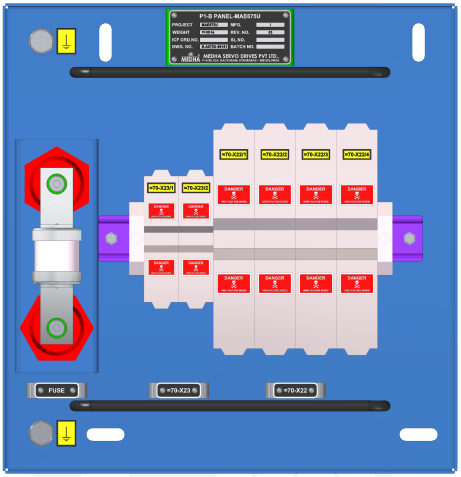


Fig 7.4 Panel P1 (Section B)

7.2.3 Panel P1-C (Section C)

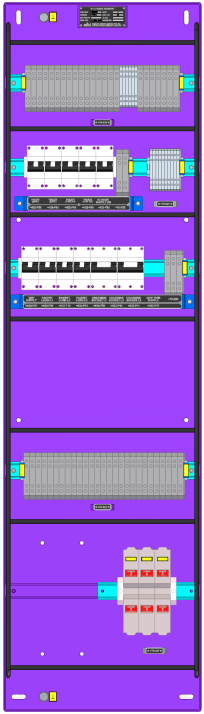


Fig 7.5 Panel P1 (Section C)

EQUIPMET LIST OF P1-PANEL OF MC/TC COACH			
SECTION	**MATERIAL DESCRIPTION**	**QTY**	**APPLICATION**
A	TERMINAL BLOCK,WFF70/AH-1029400000	9	415VAC Distribution TB for IV coupler 70-X21 (415V AC TB P1)
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
B	TERMINAL BLOCK,WFF70/AH-1029400000	4	BN Distribution for Electrical panels 70-X22 (BN TB P1)
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
	TERMINAL BLOCK,WFF35/AH-1029300000	2	BN Distribution for Electrical panels 70-X23 (110V BD TB P1)
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
C	FTTB,2WAY,0.2TO16SQ.MM,GRY,283-901	30	70-X24 (230V & 110V AC DISTRIBUTION)
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	ADJACENT JUMPER,GRAY,70A,283-402	6	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
C	GROUP MARKER,GRY,249-119	3	70-X25 (230V & 110V AC O/P)
	4-CONDUCTOR THROUGH TB,GRY,281-652	32	
	END & INTERMEDIATE PLATE,GRY,281-334	1	
	FTTB,2WAY,0.2TO16SQ. MM,GRY,283-901	30	
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	ADJACENT JUMPER,GRAY,70A,283-402	8	
	END STOP FOR DIN35 RAIL, GREY	2	
	FTTB,2WAY,0.2TO16SQ. MM,GRY,283-901	2	70-X38 (IC DOOR CB)
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4-CONDUCTOR THROUGH TB,GRY,281-652	10	70-x37
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	END STOP FOR DIN35 RAIL, GREY	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
C	MCB,2P,10A,5SY5 210-7KK11,RAILWAY GRADE	1	TOILET1 230V CB =032-F03
	MCB,2P,10A,5SY5 210-7KK11,RAILWAY GRADE	1	TOILET2 230V CB =032-F04
	MCB,2P,8A,5SY5208-7KK11,RAILWAY GRADE	1	TOILET1 110V DC CB =032-F05
	MCB,2P,8A,5SY5208-7KK11,RAILWAY GRADE	1	TOILET2 110V DC CB =032-F06
	MCB,2P,10A,5SY5 210-7KK11,RAILWAY GRADE	1	WIFI SUPPLY CB =032-F07
	MCB,2P,50A,5SY4250-7KK11,RAILWAY GRADE	3	PANTRY LOAD1 =032-F08 PANTRY LOAD2 =032-F18 PANTRY LOAD3 =032-F19
	MCB,2P,8A,5SY5208-7KK11,RAILWAY GRADE	1	CHARGING SOCKET L1 =032-F09
	MCB,2P,8A,5SY5208-7KK11,RAILWAY GRADE	1	CHARGING SOCKET L2 =032-F10
	MCB,2P,8A,5SY5208-7KK11,RAILWAY GRADE	1	CHARGING SOCKET L3 =032-F11
	MPCB 3P,36A,3RV2021-4PA10,RAILWAY GRADE	1	230V TXFR SUPPLY =032-F17
	MCB,2P,8A,5SY5208-7KK11,RAILWAY GRADE	1	IC DOOR SUPPLY DE CB =051-F03
	TERMINAL BLOCK,WFF70/AH-1029400000	3	415VAC Distribution TB for IV coupler 70-X21 (415V AC TB P1)
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	

7.3 NDTC_P1-Panel Description

One End Wall panel (P1) is located in left side of non driving end or toilet end on NDTC coach. P1 panel consists of NDTC houses Terminal Block, MCBs & contactor. Equipment layouts are shown in below section.

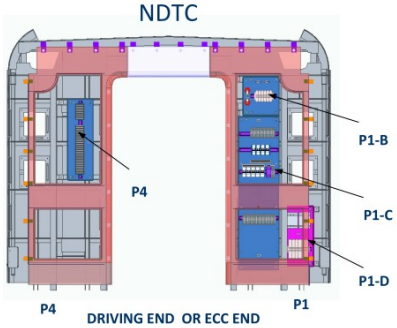
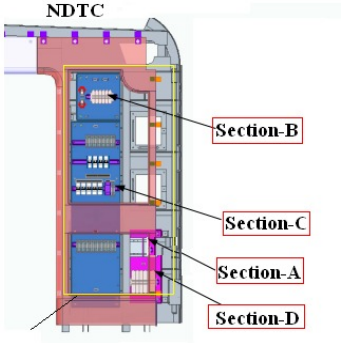


Fig 7.6 P1 Panel Arrangement in NDTC Coach

7.4 Panel P1 Detailed view of NDTC Coach



Panel P1-Equipment Details of NDTC Coach

7.4.1 Panel P1-A (Section-A)

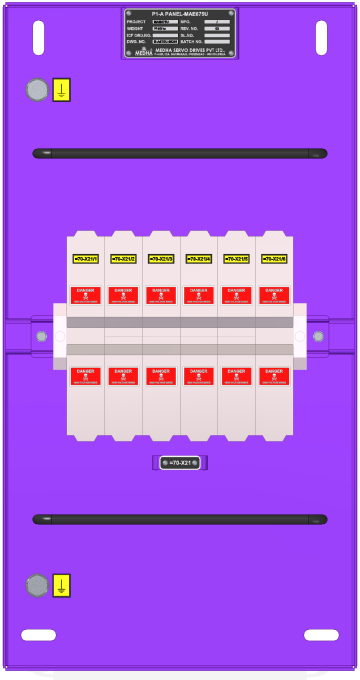


Fig 7.8 Panel P1 (Section A)

7.4.2 Panel P1-B (Section-B)

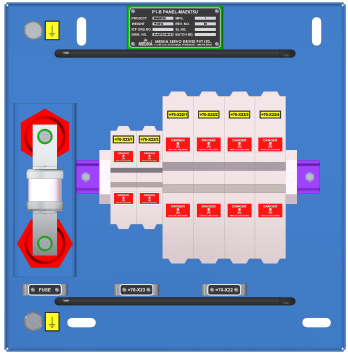


Fig 7.9 Panel P1(Section B)

7.4.3 Panel P1-C (Section-C)

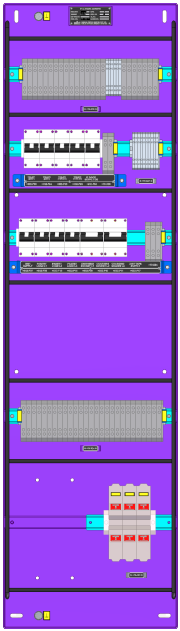


Fig 7.10 Panel-P1 (Section C)

7.4.3 Panel P1-D (Section A&D)

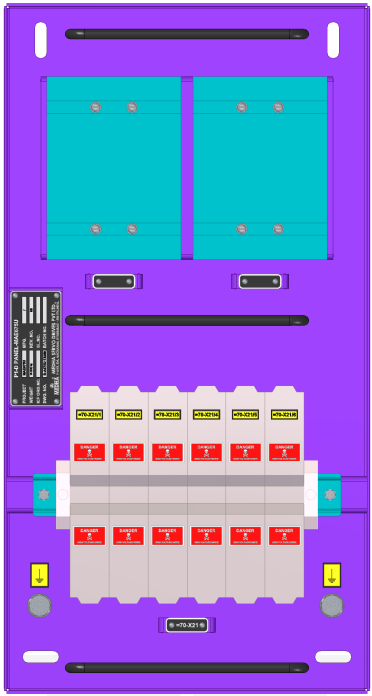


Fig 7.11 Panel P1 (Section-A&D)

EQUIPMET LIST OF P1-PANEL OF MC/TC COACH			
SECTION	**MATERIAL DESCRIPTION**	**QTY**	**APPLICATION**
A	TERMINAL BLOCK,WFF70/AH-1029400000	9	415VAC Distribution TB for IV coupler 70-X21 (415V AC TB P1)
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
B	TERMINAL BLOCK,WFF70/AH-1029400000	4	BN Distribution for Electrical panels 70-X22 (BN TB P1)
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
	TERMINAL BLOCK,WFF35/AH-1029300000	2	BN Distribution for Electrical panels 70-X23 (110V BD TB P1)
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
C	FTTB,2WAY,0.2TO16SQ. MM,GRY,283-901	30	70-X24 (230V & 110V AC DISTRIBUTION)
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	ADJACENT JUMPER,GRAY,70A,283-402	6	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
C	FTTB,2WAY,0.2TO16SQ. MM,GRY,283-901	30	70-X25 (230V & 110V AC O/P)
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	ADJACENT JUMPER,GRAY,70A,283-402	15	
	END STOP FOR DIN35 RAIL, GREY	2	
	FTTB,2WAY,0.2TO16SQ. MM,GRY,283-901	2	70-X38 (IC DOOR CB) Rev. Confidential and Proprietary Information □ Medha Servo Drives Pvt. Ltd.Page of
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	10	CHANGE OVER CONT INTF =70-X37
	WAGO TERMINAL NUMBERING,209-502S(1-50)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
C	MCB,2P,10A,5SY5 210-7KK11,RAILWAY GRADE	1	TOILET1 230V CB =032-F03
	MCB,2P,10A,5SY5 210-7KK11,RAILWAY GRADE	1	TOILET2 230V CB =032-F04
	MCB,2P,8A,5SY5208-7KK11,RAILWAY GRADE	1	TOILET1 110V DC CB =032-F05
	MCB,2P,8A,5SY5208-7KK11,RAILWAY GRADE	1	TOILET2 110V DC CB =032-F06
	MCB,2P,10A,5SY5 210-7KK11,RAILWAY GRADE	1	WIFI SUPPLY CB =032-F07
	MCB,2P,50A,5SY5250-7KK11,RAILWAY GRADE	1	PANTRY LOAD1 =032-F08 PANTRY LOAD1 =032-F18 PANTRY LOAD1 =032-F19
	MCB,2P,8A,5SY5208-7KK11,RAILWAY GRADE	1	CHARGING SOCKET L1 =032-F09
	MCB,2P,8A,5SY5208-7KK11,RAILWAY GRADE	1	CHARGING SOCKET L2 =032-F10
	MCB,2P,8A,5SY5208-7KK11,RAILWAY GRADE	1	CHARGING SOCKET L3 =032-F11
	MPCB 3P,36A,3RV2021-4PA10,RAILWAY GRADE	1	230V TXFR SUPPLY =032-F17
D	CONTACTOR,3POLE,225A,AF146B-30-22-12	2	CHANGE OVER CONTACTOR
	MCB,2P,8A,5SY5208-7KK11,RAILWAY GRADE	1	IC DOOR SUPPLY DE CB =051-F03

7.5 DTC_P2-Panel Description

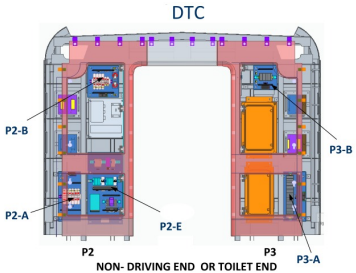


Fig 7.12 P2-Panel Arrangement in DTC Coach

7.6 Panel P2 Detailed view of DTC Coach

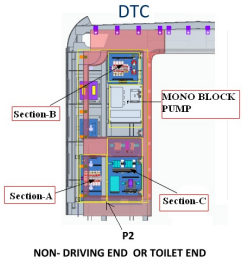


Fig 7.13 Panel P2 Equipment Details of DTC Coach

One End Wall panel (P2) is located at the left side of non driving end or toilet end on DTC coach. P2 panel consists of DTC houses Tbs, MCBs, MPCB, Reading lights mono

block pump (User Railway scope). Equipment layouts are shown in below sections.

7.6.1 Panel P2-A (Section-A)

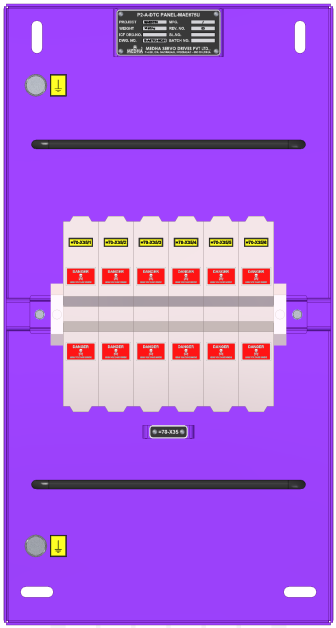


Fig 7.14 Panel P2 (Section A)

7.6.2 Panel P2-B (Section-B)

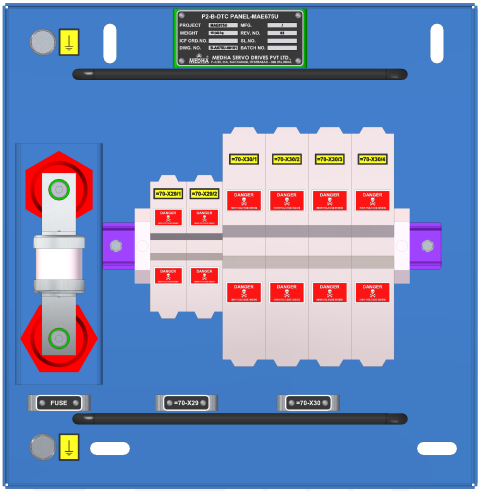


Fig 7.15 Panel P2 (Section B)

7.6.3 Panel P2-C (Section-C)

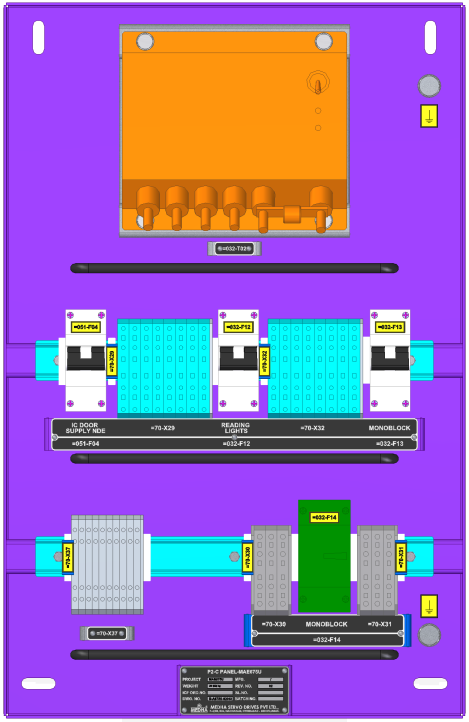


Fig 7.16 Panel P2 (Section C)

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
A	TERMINAL BLOCK,WFF70/AH-1029400000	6	415VAC Distribution TB for IV coupler =70-X35
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
B	TERMINAL BLOCK,WFF70/AH-1029400000	4	BN Distribution for iv coupler =70-X30
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
	TERMINAL BLOCK,WFF35/AH-1029300000	2	BD Distribution for iv coupler =70-X29
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
C	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	Reading light MCB input =70-X33
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
C	FTTB,2WAY,0.2TO16SQ.MM,GRY,283-901	6	415AC DISTRIBUTION TB =70-X31
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	ADJACENT JUMPER,GRAY,70A,283-402	3	
	WAGO GROUP MARKER,249-119	1	
	FTTB,2WAY,0.2TO16SQ.MM,GRY,283-901	5	MON BLOCK MCB INPUT & OUTPUT =70-X32
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	WAGO GROUP MARKER,249-119	1	
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	Reading light MCB output =70-X34
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	ADJACENT JUMPER,GREY,32A,281-402		

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
C	FTTB,2WAY,0.2TO16SQ. MM,GRY,283-901	3	230VAC TXFR O/P =70-X36
	MARKER CARDS,1-10,209-502S(1-10)	2	
	END STOP FOR DIN35 RAIL, GREY	1	
	END & INTERMEDIATE PLATE,GRY,283-325	1	
	WAGO GROUP MARKER,249-119	1	
	MCB,2P,8A,5SY5208-7KK11,RAILWAY GRADE	1	READING LIGHT 1 =032-F09
	MCB,2P,8A,5SY5208-7KK11,RAILWAY GRADE	2	MONO BLOCK 110VDC MCB =032-F10
			IC DOOR SUPPLY NDE =051-F06
	MPCB 3P,4A,3RV20111EA10,RAILWAY GRADE	1	MONO BLOCK MCB =032-F11
	MCB,3POLE,440V,40A,S203M-K40UC	1	230VAC TRANSFROMER I/P SUPPLY =032-F08
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	70-X37
	4-CONDUCTOR THROUGH TB,GRY,281-652	10	
	END STOP FOR DIN35 RAIL, GREY	2	

7.7 MC_P2-Panel Description

One End Wall panel (P2) is located at the Left side of non driving end or toilet end on MC/ TC/ NDTC coach. P2 panel consists of MC1/TC/NDTC houses Terminal blocks, MCBs, Reading Lights Mono Block pump(User Railway scope). MC2 houses all the material same as MC1 and additionally 415V changeover contactors are placed. Equipment layouts are shown in below section.

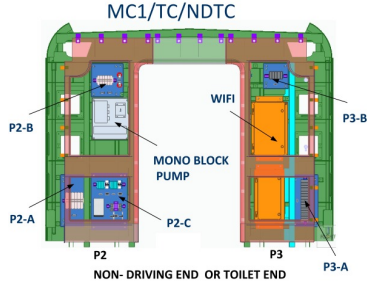


Fig 7.17 P2 Panel Arrangement in MC1/TC/NDTC

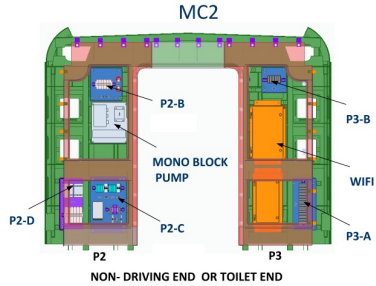


Fig 7.18 P2 Panel Arrangement in MC2

7.8 Panel P2 Detailed view of MC1& MC2 Coach

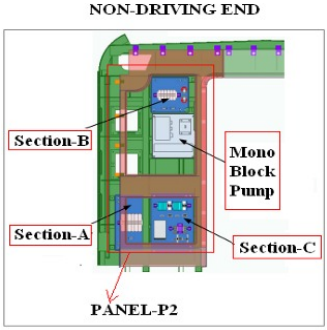


Fig 7.19 Panel-P2 Equipment details of MC1 /TC/ NDTC coach

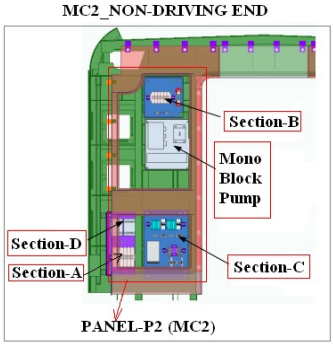


Figure 7.20 Panel-P2 Equipment details of MC2 Coach

7.8.1 Panel P2 -A(Section A)

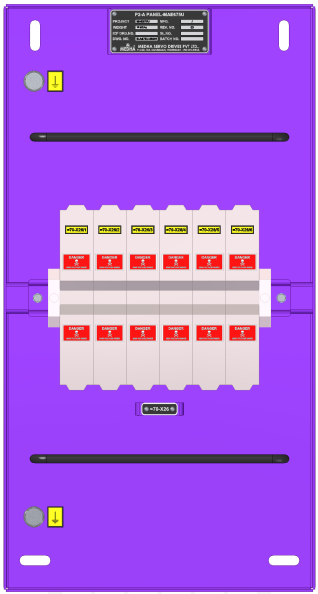


Fig 7.21 Panel P2 (Section A)

7.8.2 Panel P2-B (Section B)

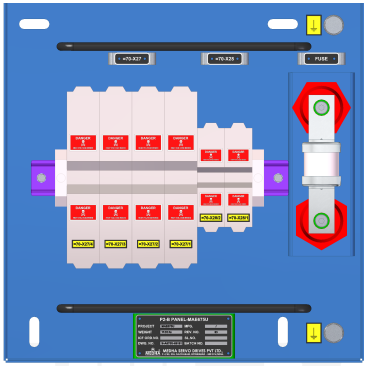


Fig 7.22 Panel P2 (Section B)

7.8.3 Panel P2-C (Section C)

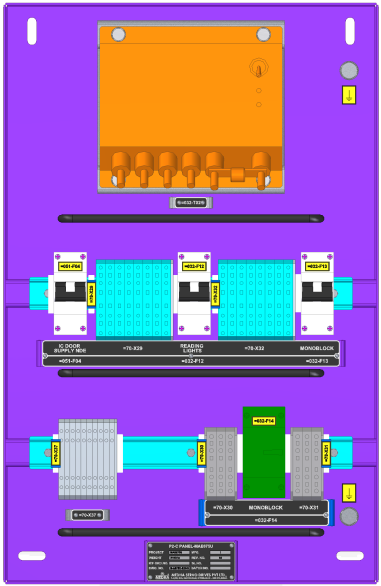


Fig 7.23 Panel P2 (Section C)

7.8.4 Panel P2-D (Section D)

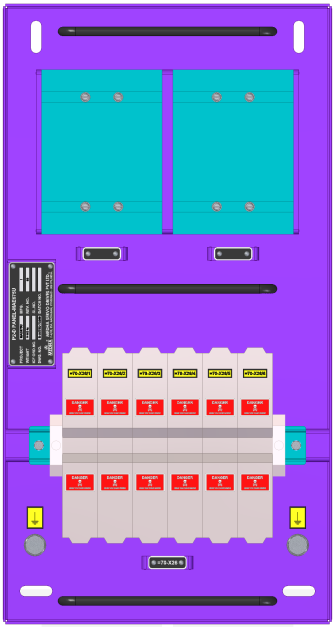


Fig 7.24 Panel P2 (Section D)

7.8.5 Panel P2-E (Section E)

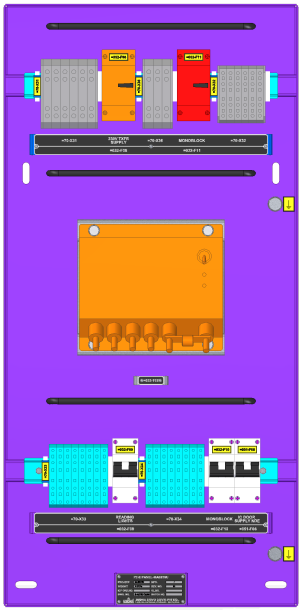


Fig 7.25 Panel P2 (Section E)

EQUIPMET LIST OF P2-PANEL OF MC/ TC/ NDTC/ MC2 COACH			
SECTION	**MATERIAL DESCRIPTION**	**QTY**	**APPLICATION**
A	TERMINAL BLOCK,WFF70/AH-1029400000	6	415VAC Distribution TB for IVcoupler =70-X26
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
B	TERMINAL BLOCK,WFF70/AH-1029400000	4	BN Distribution for iv coupler =70-X27
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
	TERMINAL BLOCK,WFF35/AH-1029300000	2	BD Distribution for iv coupler =70-X28
	END BRACKETS FOR TB,WEW 35/1-1059000000	2	
C	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	Reading light MCB input =70-X29
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
C	TERMINAL BLOCK,10MM2,GRY,284-901	6	MON BLOCK MCB INPUT & OUTPUT =70-X30 & =70-X31
	END STOP FOR DIN35 RAIL, GREY	4	
	END & INTERMEDIATE PLATE,GRY,284-325	4	
	MARKER CARDS,1-10,209-502S(1-10)	1	
	WAGO GROUP MARKER,249-119	1	
	ADJACENT JUMPER,GRY,41A,284-402	5	
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	Reading light MCB output =70-X32
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	MCB,2P,8A,5SY5208-7KK11,RAILWAY GRADE	3	READING LIGHT 1 =032-F12
			MONO BLOCK 110VDC MCB =032-F13
			IC DOOR SUPPLY NDE =051-F04
	MPCB 3P,4A,3RV20111EA10, RAILWAY GRADE	1	MONO BLOCK MCB =032-F14

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
D	CONTACTOR,3POLE,225 A,AF146B-30-22-12	2	In MC-2 Only
E	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	70-X33
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	
	TERMINAL BLOCK,10MM2,GRY,284-901	6	70-X35, 70-X32
	END STOP FOR DIN35 RAIL, GREY	4	
	END & INTERMEDIATE PLATE,GRY,284-325	4	
	MARKER CARDS,1-10,209-502S(1-10)	1	
	WAGO GROUP MARKER,249-119	1	
	ADJACENT JUMPER,GRY,41A,284-402	5	
	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	8	70-X34
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	

SECTION	MATERIAL DESCRIPTION	QTY	APPLICATION
E	MCB,2P,8A,5SY5208-7KK11,RAILWAY GRADE	3	32-F09
			32-F10
			51-F06
	MPCB 3P,4A,3RV20111EA10,RAILWAY GRADE	1	32-F11
	MPCB 3P,36A,3RV2021-4PA10,RAILWAY GRADE		32-F08
	FTTB,2WAY,0.2TO16SQ.MM,GREY	9	70-X31
	END & INTERMEDIATE PLATE,GRY,283-325	4	
	END STOP FOR DIN35 RAIL, GREY	10	
	300W DC DC CONVERTER-(MODEL DD-300-1)	1	32-T02

7.9 Panel P3 Description Of All Coaches

One End Wall panel (P3) is located at the right side of non driving end or toilet end on all the coaches (DTC/ MC/ TC/ NDTC) .P3 panel consists of P3 houses Terminal Blocks. Equipment layouts are shown in below section.

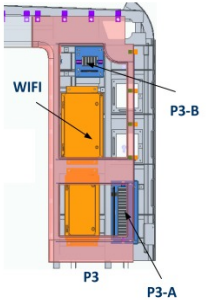


Fig 7.26 P3 Panel Arrangement of all Coaches

7.9.1 Panel P3 Detailed View(MC/TC/NDTC)

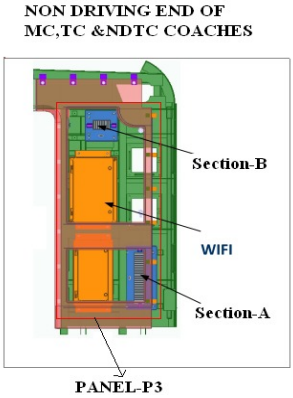


Fig 7.27 Panel P3 Detailed View of MC/TC/NDTC

Panel-P3 Detailed View(DTC)

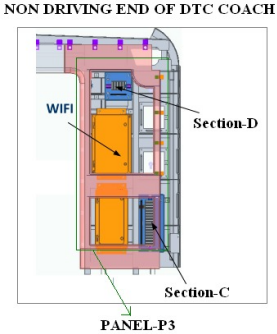


Fig 7.28 Panel P3 Detailed View of DTC Coach

7.9.3 Detailed View of MC/TC/NDTC/ P3-A(Section A&C)

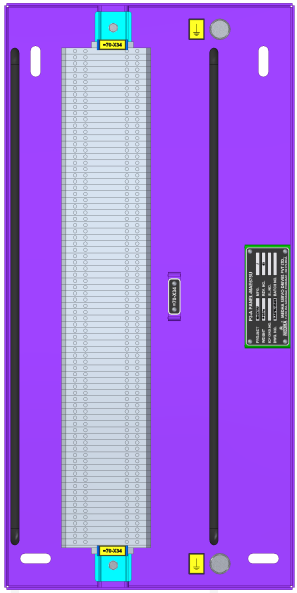


Fig 7.29 MC/ TC/ NDTC_Panel P3 (section-A)

7.9.4 Detailed view of MC / TC/ NDTC_P3-B (Section -B&D)

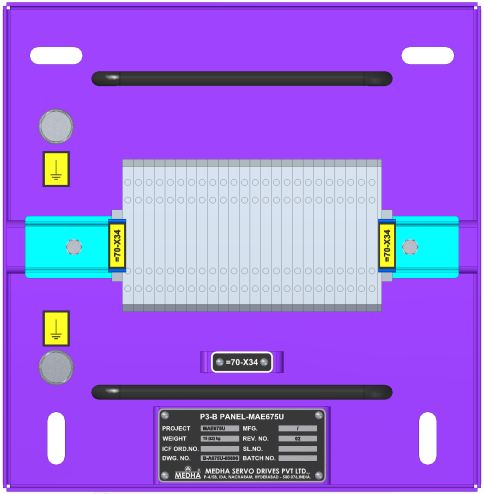


Fig 7.30 MC/ TC/ NDTC Panel P3 (Section-B)

PANEL_P3 EQUIPMENT LIST FOR MC, TC & NDTC COACHES			
SECTION	**DESCRIPTION**	**QTY**	**APPLICATION**
WIFI	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	6	WIFI input TB
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	
A & B	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	104	TRAIN LINES 70-X34 (TL EWP2) (F1&F2- 80 nos , A&G COUPLER- 20nos)
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	2	
	WAGO GROUP MARKER,249-119	4	
	END STOP FOR DIN35 RAIL, GREY	4	

PANEL_P3 EQUIPMENT LIST FOR DTC COACHES			
SECTION	**DESCRIPTION**	**QTY**	**APPLICATION**
WIFI	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	6	WIFI input TB
	MARKER CARDS,1-10,209-502S(1-10)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	
C & D	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	104	TRAIN LINES 70-X37 (TL EWP2) (F1&F2□ 80 nos , A&G COUPLER 20nos)
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	2	
	WAGO GROUP MARKER,249-119	4	
	END STOP FOR DIN35 RAIL, GREY	4	

7.10 Panel P4 Description

7.10.1 MC/TC/NDTC_Panel-P4 Detailed View

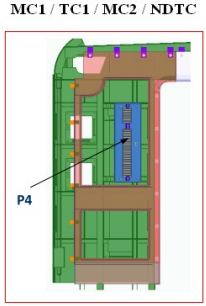


Fig 7.31 Panel-P4 Location in MC/ TC/ NDTC COACHES

7.10.2 MC/TC/NDTC_Panel-P4 Component Details

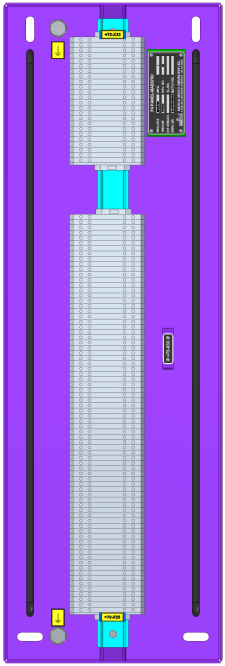


Fig 7.32 P4 Component Details

EQUIPMENT LIST OF P4-PANEL OF MC/ TC/ NDTC COACHES			
SECTION	**MATERIAL DESCRIPTION**	**QTY**	**APPLICATION**
P4	4 THROUGH TERMINAL BLOCK,P/NO : 281-652	100	TRAIN LINES 70-X33 (TL EWP1) (F1&F2--80nos , A&G COUPLER□ 20nos)
	MARKER CARDS,1-100,209-502S(1-100)	1	
	END AND INTERMEDIATE PLATE,P/NO: 281-334	1	
	WAGO GROUP MARKER,249-119	1	
	END STOP FOR DIN35 RAIL, GREY	2	

Chapter 8

SHUNTING PANEL

Shunting panel is a small panel used to drive the train during master controller failure in DT cab. This panel consist of few important switches which are required to move the train. This shunting panel is located in DTC driving cab inside DTC CRW panel. This panel has an open cable end with assembled connector to get interfaced with DTC CRW panel. It can be used to drive the rake, in case if master controller fails.

This shunting panel can also be integrated with NDTC ECC panel to move individual basic unit.

Main components of the shunting panel are:

- Direction selection switch
- Cab occupation switch
- Drive Push button
- Brake push button
- Emergency OFF push button.

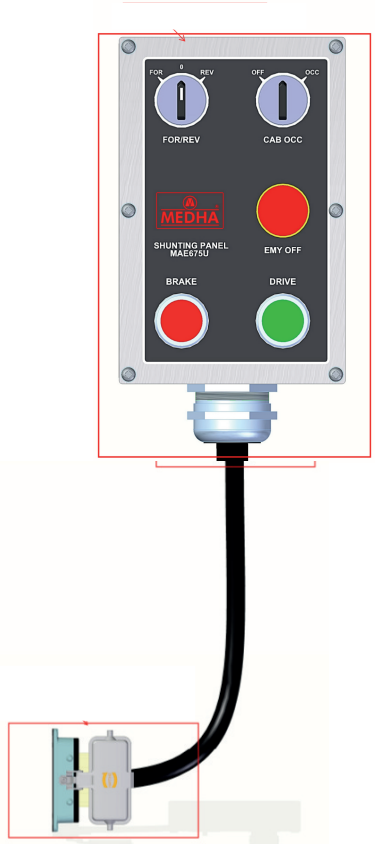


Fig 8.1 Detailed view of Shunting Panel

Chapter 9

AUXILIARY CONVERTER

9.1 Introduction

There are two auxiliary converters available in each basic unit, mounted under slung in TC coach. These auxiliary coveters generate 415 V AC and 110 V DC to provide supply to various loads. A 20 kVA isolation transformer is provided in each coach to convert 415 V AC supply to 230 V AC and 110 V AC. 230 V AC supply is used for pantry related loads and toilet related loads like shaver and hand drier. 110 V AC supply is used for laptop and mobile charging for passengers.

9.2 Auxiliary technical details

9.2.1 AC1 Electrical Data

Requirements	Parameters
Input Voltage	Single phase 285 Vac to 450 Vac input from Auxiliary secondary winding of main transformer
Control Supply	77 V to 137.5 V DC from battery (110 Vdc nominal)
Output capacity	Output: 275 kVA, 415 V±5% (L-L), 50 Hz±3%, 3 Phase, Sine wave (at >19 kVac OHE) At <19 kVac OHE, output voltage shall drop by maintaining V/F ratio constant.
Short time rating	For 415 Vac output: 150% of rated current for 5 Seconds without increasing active power.
Efficiency	> 92%
Noise Level	< 80dB(A)
Voltage - THD	<=5%

Table 9.1

9.2.2 AC2 & DC Converter Electrical Data

Requirements	Parameters
Input Voltage	Single phase 285 Vac to 450 Vac input from auxiliary secondary winding of main transformer
Control Supply	77 V to 137.5 Vdc from battery (110 Vdc nominal)
Output capacity	**Output-1:** 235 kVA, 415 V±5% (L-L), 50 Hz±3%, 3 Phase, Sine wave (at >19 kVac OHE) At <19 k Vac OHE, output voltage shall drop by maintaining V/F ratio constant. **Output-2:** 110 to 125 V DC (It is varying as per DC load sharing current requirement) DC Power: 30 kW at 110 V DC (BN, BD and Battery charger loading on this).
Short time rating	For 415 Vac output: 150% of rated current for 5 seconds without increasing active power. For 110 Vdc output: Current limit topology is used. So there will not be any short time rating.
Efficiency	> 92%
Noise Level	< 80dB(A)
Voltage-THD	<=5%

Table 9.2

9.2.3 Auxiliary Converter Cubicle Climatic and Environmental Data

Requirements	Parameters
Operating Temperature	Outside ambient temperature: 0-50ºC
Cooling	Forced cooling by build in blower
Type of mounting	Under-slung
Ingress Protection	IP-65 upto 400 mm height from track level. Above 400 mm, it is IP-20. Magnetics and terminals are in IP-20 protection zone.
Humidity	98%.

Table 9.3

9.2.4 Battery Charging System Electrical Data

Requirements	Parameters
Input Voltage	115 V to 125 Vdc (From BN Bus i.e. from DC output of ACU)
Control Supply	77 V to 137.5 V DC from battery (110 Vdc nominal)
Output capacity	77 V to 115 Vdc (It varies as per battery charging current requirement) Charging current: 33 A (charging current limit is provided at 30 A)
Short time rating	Current limit topology is used. So there will not be any short time rating.
Efficiency	>95%
Noise Level	< 80dB(A)

Table 9.4

9.2.5 Battery Charging System Climatic & Environmental Data

Requirements	Parameters
Operating Temperature	Outside ambient temperature: 0-50ºC
Cooling	Natural cooling
Type of mounting	Under-slung
Ingress Protection	IP-65
Humidity	98%.

Table 9.5

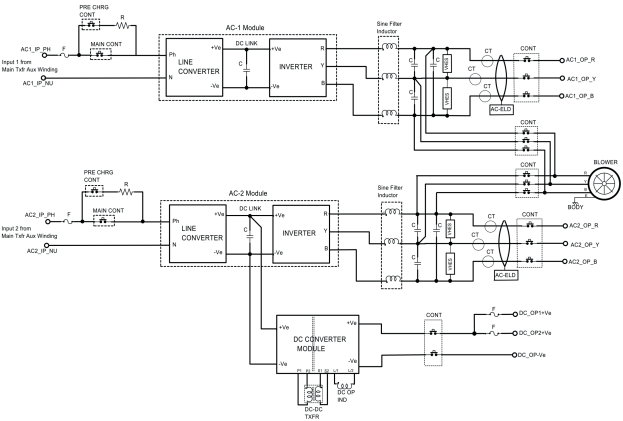
9.3 Functional Description

Auxiliary power supply consists of two physical cubicles in each basic unit.

1. **Auxiliary Converter Unit (ACU):** ACU is mounted under frame of TC coach. Each ACU consists of two 415 Vac 3-phase inverter modules (AC1 and AC2) and one 110 V DC converter module.
2. **Battery Charging System (BCS):** BCS is mounted under frame of DTC/ NDTC coach. The function of BCS unit is to charge the battery.

9.3.1 Auxiliary Converter Unit (ACU)

ACU consists of below functional sections.



9.3.1.1 Input section

Input of the auxiliary inverter is taken from the auxiliary secondary windings of main transformer. Input section consists of input fuse and input isolation contactor. The purpose of input fuse is to protect converter from over current. Input isolation contactor is used to isolate the converter from input, in case of any failure occurred inside the converter. One pre-charging circuit is used to charge DC link capacitors during initial start up condition.

9.3.1.2 Line converter

Line converter converts variable single phase AC input to fixed DC-link by controlling pulses of IGBTs using DSP controller. Line converter maintains unity power factor at AC input. There are two line converters provided in each aux inverter unit. Output of two line converters is connected in parallel to share the total DC link power. Inverter and DC-DC converter modules are connected to the common DC link.

Power scheme of one line converter is shown below.

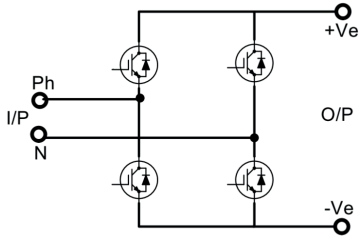


Fig 9.1

9.3.1.3 3-Phase Inverter

3-Phase inverter converts DC-link voltage to 415 Vac, 3-phase output by controlling pulses of IGBTs using DSP controller. Inverter output maintains V/F constant. Inverter module has pulse to pulse short circuit protection.

Power scheme of inverter is shown below.

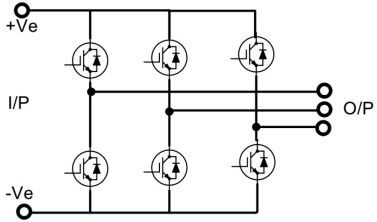


Fig 9.2

9.3.1.4 3-Phase Sine filter

3-Phase sine filter is provided at output of 3-phase inverter to get a pure sine wave output. Inductors and capacitors are used to build sine filter.

9.3.1.5 DC Converter

DC converter takes supply form DC-link of AC2 and converts DC-link voltage to isolated and regulated 110 Vdc output by controlling pulses of IGBTs using DSP controller. DC converter consists of H-bridge converter, isolation transformer, rectifier and filter. DC converter also regulates output voltage to maintain current share at output.

Power scheme of DC converter is shown in Fig 9.3.

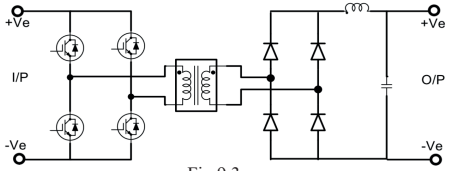


Fig 9.3

9.3.1.6 Output Section

Contactors are provided in 415 Vac and 110 V DC output to isolate ACU from loads, in case of failure. Voltage, current, and ELD sensors are provided to monitor and control ACU parameters and to protect it.

9.3.1.7 Controller Module

Controller module controls the line converter and inverter. It is also responsible for monitoring and protecting the complete auxiliary inverter and record the faults in the memory. It also interfaces with TCMS to get commands and send status to display at driver cabin.

9.3.1.8 Cooling system

Forced air cooling is provided for auxiliary converter unit, by using blower inside the auxiliary converter enclosure. This blower is used for cooling all IGBT based modules and magnetics. It sucks air from the air inlet and forces through all IGBT module heat sinks and all magnetics and then leaves out to air outlet. This blower takes 3-phase 415 V AC supply from inverter (AC1 or AC2) internal supply.

9.3.2 Battery Charging System (BCS)

Battery charging system is a PWM based IGBT converter, which gets supply from BN bus and charge the battery with constant voltage and constant current limit topology.

There is a reverse flow diode in battery charger, which conducts at the time of battery back-up. BCS has one contactor, called BN contactor which isolates BN bus from BD bus.

There is a controller module, which is responsible for monitoring and protecting the complete battery charger and record the faults in the memory. It also interfaces with TCMS to get commands and to send status to display at driver cabin.

Battery charger unit is made with natural cooled design.

Power scheme of battery charger module is shown in Fig 9.4.

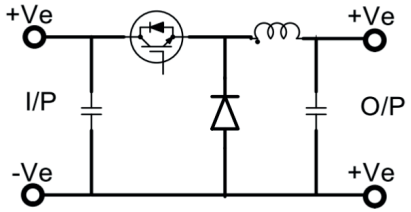


Fig 9.4

Chapter 10

BRAKE SYSTEM DESIGN

Following are the different types of brake systems present in Train18:

1. Regenerative brake or electro dynamic brake
2. Pneumatic brake or auto brake
3. Electro-pneumatic brake
4. Parking brake

10.1 Auto Brake

Auto brake is a pneumatic brake and is controlled by Auto brake handle provided in DTC. Whenever auto brake handle is moved, BP pressure drops and equivalent difference in pressure is developed in brake cylinder by triple valve of EP unit. Hence braking effort, equivalent to brake cylinder pressure gets developed.

10.2 Service Brake

Service brake is a combination of ED (Electro Dynamic/ Regeneration) and EP (Electro Pneumatic) braking. Based on MCH brake command requested by motor man, CCU

calculates total required Braking Effort (BE) and this is distributed among various basic units for final brake application. Based on the braking effort received at MCU, MCU further performs brake blending among ED brake and EP brake for final brake application.

Following are the components or control systems used for incorporation and actuation of service brake:

10.2.1 Master controller

Master controller is an interface to motor man for issuing morting request, braking demand, forward & reverse directions, dead man handle & emergency brake. Generally, occupied cab master controller will be active to issue command.

10.2.2 TPWS Interface

At present, there is no TPWS interface in Train -18. But provision is given to incorporate this feature in future. Two TPWS brake application related digital inputs are interfaced with CCU to know the brake status/ request of TPWS. One digital input gives information about service brake request and the second digital input gives information about emergency brake applied information. In case of service brake request given by TPWS through digital input, CCU considers it as full service brake request.

10.2.3 CCU1 and CCU2

CCU1 and CCU2 is redundant control system located in DTC and interfaced with Master controller for reading

brake commands. It also calculates the brake force based on the train weight (load sensors), availability of different EP units and regenerative brake force available. Then it redistributes all the brake force among different basic units for brake application through ETB.

10.2.4 MCU and MCUR

MCU receives total brake force to be applied from CCU through ETB. After that MCU calculates the available regenerative brake force and remaining are considered as EP brake. So always priority is given to ED brake while applying the service brake. Remaining brake effort is applied as EP brake in trailer coaches first, then in MC coach. Normally MCU will act as EP brake master and communicates with both EBCUs of that coach. In case of failure of MCU as EP brake master, MCUR will take over as EP brake master and communicates with EBCUs for EP brake application.

EP brake force = Total brake force - Available regenerative brake force

10.2.5 Application and holding valve

Application and holding valves are solenoid valves which are available in EP brake unit. Application valve is energized to open solenoid valve. It is used to charge the air into brake cylinder for application of EP brake. Similarly holding solenoid valve is energized to close valve. It is used to discharge the air from brake cylinder for release of EP brake.

Chapter 11

HIGH VOLTAGE SYSTEM OVERVIEW

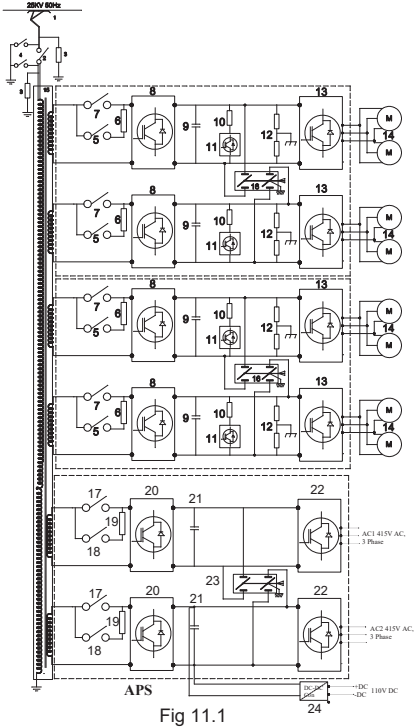


Fig 11.1

S.NO	Details
1	Pantograph
2	Vacuum Circuit Breaker (VCB)
3	Surge arrester
4	HV Earthing switch
5	Pre-charging Contactor
6	Pre-charging Resistor
7	Line Contactor
8	Line Converter
9	DCLink Capacitor Bank
10	Brake chopper resistor
11	Brake chopper IGBT
12	Earth fault detection resistors
13	Traction Inverter
14	Traction Motors
15	Traction Transformer
16	DC Link Earthing Switch
17	Main Contactor
18	Pre charging Contactor
19	Pre charging Resistor
20	Line Contactor
21	DC Link Capacitor
22	3 Phase Inverter
23	Earthing Switch
24	DC-DC Converter

Fig. 11.1 shows the power schematic of Train 18 with emphasis on the traction converters. 25 kV OHE voltage is connected to the transformer primary winding through the Vacuum Circuit Breaker (VCB). When transformer primary windings are not connected to OHE lines, an

earthing switch (connected in parallel to VCB) is used to ground the transformer primary winding and pantograph.

Transformer secondary has 4 traction windings rated at 603 kV A each and 2 auxiliary windings rated at 234 kVA each. Transformer is oil cooled with help of oil pump and blowers which cool the radiator through which oil is circulated using the oil pump.

There are two forced air cooled line and traction converter cubicles per each MC. Each line and traction converter cubicle consists of one line converter, DC link and one traction inverter. The line converter interfaces with transformer secondary traction winding on one side and DC link on the other side. The line converter consists of single-phase full bridge rectifier with IGBTs as active switching devices. The DC link consists of earth leakage detection circuit, DC link capacitor bank, and brake chopper circuit (for over voltage protection). The traction inverter consists of a 3-phase full bridge inverter with IGBTs as active switching devices. The line and traction converter come with its own Line and Traction computer, which control and protect the converter. Line and Traction Control Unit (LTCU) controls both the line converter and traction inverter and then communicates with the Main Control Unit (MCU) through CAN interface.

Two auxiliary converters are provided in TC coach. One auxiliary converter generates 3 phase 415 V AC supply and other Auxiliary converter generates 3 phase 415 V AC supply and DC 110 V supply.

There is a pantry transformer provided in each coach, which takes 415 V AC as input supply and converts to 230 V AC and 110 V AC. Mainly 230 V AC supply is used for pantry and hand drier, shaver in toilet. Mainly 110 V AC supply is used for laptop charging and mobile charging. Mainly 110 V DC supply is used as control supply for all the control units, relays, contactors, lamps etc.

Chapter 12

PANTOGRAPH CONTROL

12.1 Purpose

The main purpose of pantograph is to collect the supply from overhead OHE for train propulsion system and to send back energy to the OHE during regeneration braking.

The pantograph is mounted on the roof of TC coach.

One auxiliary compressor is mounted under frame in TC coach to build pressure in panto reservoir for pantograph electro pneumatic control initially. During normal run, main compressor is used to maintain the pressure for panto operation.

12.2 Train level panto control

In case of normal mode, CCC shall derive panto up/ down commands and send to all the basic units and MCC units for final action.

In case of panto momentary switch is operated toward ‘up’ in the occupied cab, CCC drives panto up command by checking the ‘Panto up’ digital input signal pulse status and sends to all MCC units through ETB communication for final action. Likewise, CCU detects all momentary inputs based on a pulse read for a specific time.

Similarly in case, panto momentary switch is operated toward ‘down’ in the occupied cab, CCC drives panto down command by checking the ‘down’ digital input signal pulse status and sends to all MCC units through ETB communication for final action.

At the same time, corresponding train lines are generated from occupied cab. MCC also determines up, down commands through train lines. MCC ignores these commands in case of normal mode. Train line commands are accepted only during RDM mode.

Fig 12.1 logical diagram shows train level panto command derivation.

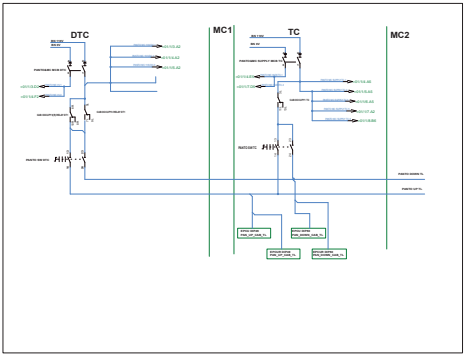


Fig 12.1

12.2.1 Basic unit level panto control

Based on panto related commands received from ETB (in case of normal mode) or panto related commands derived from train lines (in case of RDM mode), EPCC drives panto up digital output by considering following conditions.

- Panto selector switch mode
- No EOL loop condition triggered
- No Panto low pressure switch is detected
- Panto up command detected
- No basic unit isolation is selected and
- No VCB contactor stuck at high-level condition occurred.

EPCC drives the panto down digital output based on panto down command detected or if any above conditions are not satisfied.

In case VCB trip condition occurs in the basic unit, EPCC downs the pantograph when VCB contactor stuck at high condition is detected (unable to open VCB condition).

The following logical diagram gives information about basic unit level panto control.

12.2.2 Pantograph status Indication Lamps

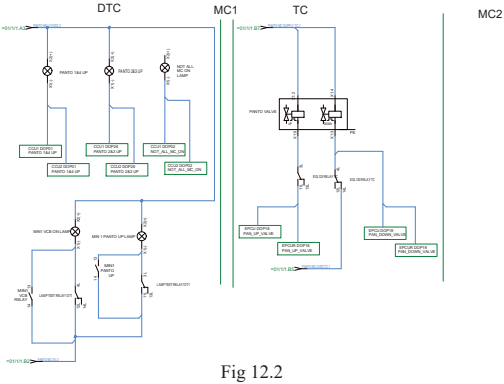


Fig 12.2

In driver desk, one lamp is available related to pantograph status name it as ‘min 1 panto up’. This lamp is driven through state of panto hard-wired train line.

This state of panto hardwired train line is driven by any of EPCC unit in TC coach based on panto up status and OHE voltage available information.

In DDU rake screen and individual basic units screens, panto symbol is available. DDU gets each basic unit Panto status from EPCC, based on panto status will be displayed on DDU.

12.2.3 Auto Drop Down (ADD) feature

ADD feature, available in pantograph design is used to lower the pantograph automatically in case of any break

or damages of the collector strip. This feature helps to avoid further damage of pantograph as well as catenary.

- ADD feature status can be detected by EPCU through ADD pressure switch.
- In case of pantograph healthy condition, which means no ADD detected, pressure switch status becomes ON (pressure is greater than 3.0 bar).
- In case pantograph lowers by ADD feature, the pressure switch status becomes OFF (pressure is less than 2.7 bar).
- With the detection of pressure switch status as OFF by EPCU, EPCU opens VCB immediately and generate fault message and send the same information to CCU.
- EPCU disables pantograph UP control operationG.

12.2.4 Over Reach Detection (ORD) feature

- ORD feature, available in pantograph design is used to lower the pantograph automatically in case pantograph raises beyond the set height limit.
- This ORD feature status can be detected by EPCU through ORD pressure switch.
- In case pantograph healthy operation, which means no ORD detected, pressure switch status becomes ON (pressure is about 0 bar).

- In case, pantograph lowers by ORD feature, the pressure switch status become OFF (pressure is greater than 1 bar).
- On detection of pressure switch status OFF by EPCU, EPCU opens VCB immediately and generate fault message and sends the same information to CCU.
- EPCU disables pantograph UP control operation until fault can be reset by maintenance person.

12.2.5 Panto mode

- On driver desk Panto mode selector switch is provided with 2 selection positions to select Panto 1-4 mode or Panto 2-3 mode.
- In corresponding position one train line will be generated, which can be used during RDM mode.
- Based on the selection, corresponding Pantos will made UP.
- In case of one panto failure of corresponding mode, corresponding panto UP lamp indication (Either Panto 1-4 UP or Panto 2-3 UP lamp) will start blinking.
- Based on this driver need to move the switch to other position to select the other 2 pantos.

Chapter 13

VCB CONTROL

13.1 Purpose

VCB is used as a line circuit breaker to close and open the power circuit and also to break the circuit under overload and short circuit conditions. It provides connection between catenary and propulsion equipment. It is placed in roof of TC coach.

It is an electro pneumatic control. EPCC drives one digital output to energize VCB on relay, only if pantograph has already raised, providing supply to electro pneumatic valve for VCB close operation.

13.2 Train Level VCB Control

In case of normal mode, CCC derives VCB close or open commands and send to all basic unit EPCC units for final action.

In case VCB momentary switch is operated toward ‘ON’ position in the occupied cab, CCC derives VCB close command by checking the ‘ON’ digital input signal pulse status and sends to all EPCC units through ETB communication for final action.

Similarly In case VCB momentary switch is operated toward ‘OFF’ position in the occupied cab, CCC derives VCB open command by check the ‘OFF’ digital input signal pulse status and sends to all EPCC units through ETB communication for final action.

At the same time corresponding train lines are generated from occupied cab. EPCC also determines VCB close, open commands through train lines. But EPCC ignores these commands in case of normal mode, but considers only in RDM mode.

The following logical diagram shows train level VCB command derivation.

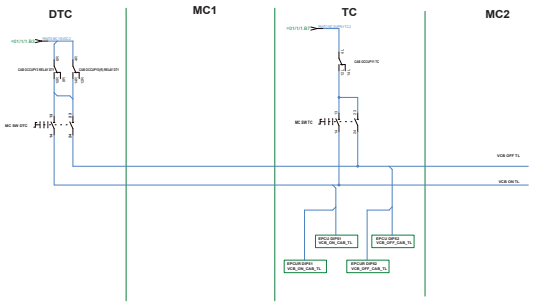


Fig 13.1

13.2.1 Basic unit level VCB control

Based on VCB related commands received from ETB (in case of normal mode) or panto related commands derived from train lines (in case of RDM mode), EPCC drives VCB ON digital output by considering following conditions.

- No EOL loop condition triggered
- No Panto low pressure switch is detected
- Panto up command detected
- No basic unit isolation is selected and
- No VCB contactor stuck at high-level condition occurred.

EPCC opens VCB based on the VCB open command detected or any of the above condition are satisfied

In case VCB trip condition occurs in the basic unit, EPCC opens VCB.

The following logical diagram gives information about basic unit level VCB control.

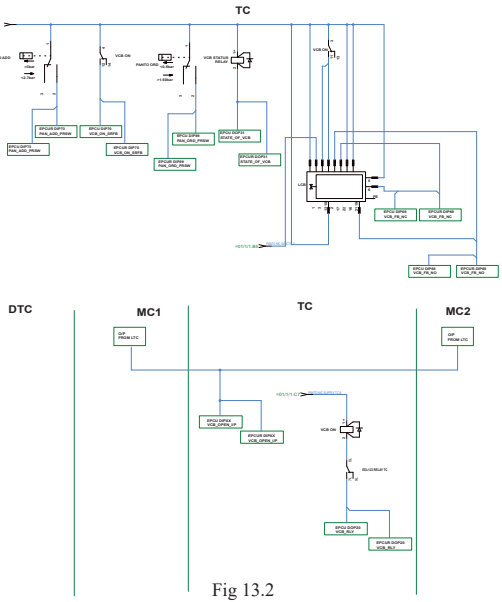


Fig 13.2

13.2.1.1 VCB Status Indication Lamps

In driver desk one lamp is available related to VCB on status name it as ‘min 1 VCB close’. This lamp is driven through state of VCB hard-wired train line.

This state of VCB hardwired train line is driven by any of EPCC unit in MC coach based on VCB on feedback status.

In DDU rake screen, individual basic units screens, VCB symbol is available. DDU gets each basic unit VCB status

from EPCC, based on this VCB status will be displayed on DDU.

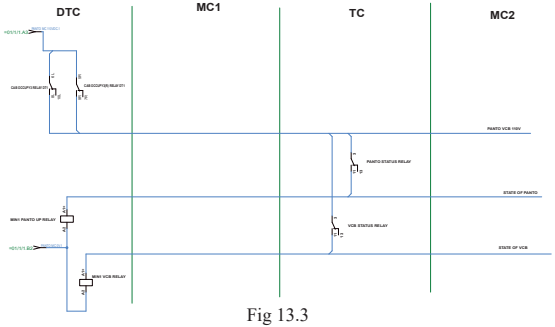


Fig 13.3

EPCC will know the status of VCB by read redundant feedback auxiliary NO, NC contacts.

13.2.2 Drive Brake Control

Drive Brake Control of the train is controlled by CCU present in DTC based on the inputs received from Driver's Desk. CCU will accept the drive brake controls only in case the cab is occupied by inserting a key switch.

13.2.3 SHUNTING PANEL

Shunting panel is a small used to drive the train during Master controller failure in DT Cab. This panel consist of few important switches used to drive the train. This shunting panel is located in DTC driving cab inside DTC CRW panel. This panel has a open cable end with assembled connector to get interfaced with DTC CRW

panel. It can be used to drive the rake, in case of master controller is failed.

This Shunting Panel can also get integrated with NDTC ECC panel to move Individual Basic Unit.

Main components of the shunting panel are given below

- Direction selection switch
- Cab occupation switch
- Drive Push button
- Brake push button
- Emergency OFF push button

Chapter 14

TCMS

Train Control and Management System (TCMS) consists of following subsystem:

- Two redundant CCUs in DTC for train level control.
- MCUs in MC coach for basic unit level control.
- PCU for passenger related load control, main air compressor control and parking brake control.
- EPCU for transformer related blowers and oil pump control.
- Frequency generator for distributing TE/ BE % through train line. In case of special RDM mode, this will be used by MCU/ MCUR for TE/ BE calculation.
- Redundant ETB and ECN communication.

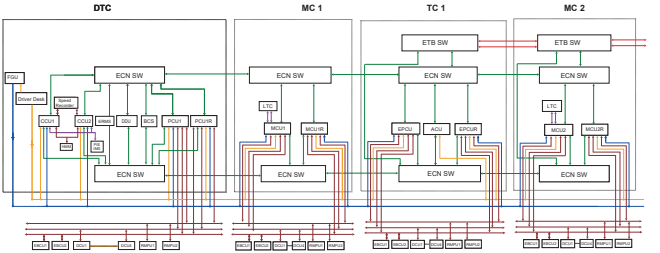


Fig. 14.1. Interconnection of Different Control Units in End Basic Unit

Fig 14.1 shows interconnection of different control units of Train Control and Management System (TCMS). CCU1 and CCU2 acts as interface to loco pilot and receives all the driver inputs, analyzes it and transmits control data to EPCUs using ETB network, used for motor control. EPCU analyzes this received control data and finally updates the control data to different units connected to it i.e.,

- Passenger comfort related commands to PCU1, PCU2 of DTC and MC coach.
- Auxiliary control unit is also communicated using ECN communication
- Traction and brake commands to MCC of MC coaches.

All these interfaces communicate with EPCU to update their status for data recording purpose by DMC and for performing closed loop control action by EPCU using the same medium in response to the control data received from EPCU. Finally, this status data is routed to CCU from EPCU using ETB. CCU uses this status data for fine

control of traction and braking parameters of the train and also sends the same data to EPCU for recording data in local flash, ERMS is located in DTC1 coach. It gets the data from all basic units EPCUs and, transmits to remote server to view the status of rake on Medha provided website through internet and to update the status to the human machine interface.

Fig 14.2 shows the inter connectivity of different control units in the middle basic unit. These units perform the same function of end basic unit.

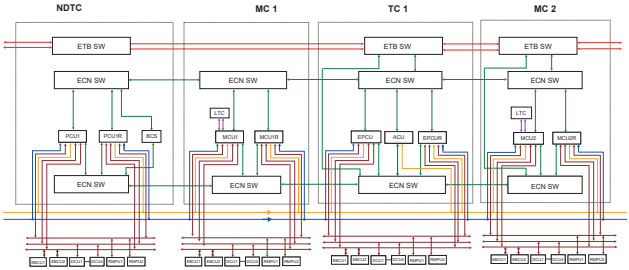


Fig 14.2 Interconnection of Different Control Units in Middle Basic Unit

14.1 Sub System Overview

Following are subsystems of TCMS

14.1.1 Central Control Unit (CCU)

CCU is a dual redundant system located in DTC and is part of integrated control system provided for Train 18. CCU is used as complete control master for entire EMU formation. All the control related calculations are done by CCU & it is distributed to different control systems in other coaches through dual redundant ETB communication for final action. There are two CCUs in each driving trailer coach working in active-standby mode for central control and monitoring. So in one rake formation, there will four CCUs present, out of which one CCU in occupied DTC will be working as Master, other CCU in occupied DTC as active-standby and remaining two CCUs in non-occupied DTC will be working as slave.

14.1.2 Driver Display Unit (DDU or HMI)

Driver Display Unit (DDU) is based on TFT LCD and is a human machine interface through which user interacts with the system. There are two displays in the train, one in each end driver cab of DTC (Cab1, Cab2). Display module gets the data from all the basic units EPCUs through redundant ECN communication. It provides user with the necessary data of what exactly is going within the system and it has a user friendly menu driven operation. Driver display unit serves the following functions:

- Viewing of entire train operational status
- Viewing of individual basic unit operational status
- Fault announcements, wherever driver information/ intervention is required
- Viewing of active faults information
- Viewing of fault/ event history
- Viewing of train energy consumed and regenerated information
- Self test modes
- Software versions of the sub modules of the system
- Individual bogie isolation feature
- Individual pantograph and VCB opening feature
- Train configuration information etc

14.1.3 Frequency Generator Unit (FGU)

Frequency Generator Unit (FGU) is located in DTC and it generates a frequency signal (TE/ BE%) corresponding to drive/ brake command given by motor man. This frequency signal is run as HWTL signal for CCU, MCU, and MCUR of all basic units. In case of ETB failure, this frequency signal is used to derive %TE or %BE demand.

14.1.4 Main control Unit (MCU)

Two MCUs are provided in each MC coach. Normally MCU1 is master. In case of any failure in MCU, MCU2 becomes master. MCU performs all control related calculations on the basis of data received from CCU and

data read through digital inputs and analog inputs for that particular basic unit. All the control related calculation for MC are done by MCU and it is communicated to other control systems such as TIC & LIC (control computers of Traction Converter) through dual redundant CAN communication for final action. This is available in each MC coach of each basic unit. Normally MCU is responsible for EP Brake control, door control, RMPU control of corresponding coach. MCUR will take over control function only when MCU is not healthy.

14.1.5 Main Control Unit _ Redundant (MCUR)

MCUR is located in MC coach. MCUR is redundant system to MCU. All the braking and passenger comfort related functions are done by MCUR in case of failure of MCU.

14.1.6 Passenger Comfort Unit (PCU)

PCU2 is provided in DTC, NDTC and TC coaches with 100% Redundancy. PCU system will be responsible for controlling all passenger comfort related functions in the Train 18 EMU rake mainly, coach lighting, RMPU control, door control. In addition to this, PCU will also control change-over contactors of Auxiliary Power Supply (coach to coach change-over contactors used when one Auxiliary Converter fails), Main compressor & parking brake as per the commands received from CCU through ETB and ECN.

PCU also controls compressor and parking brake. PCU in TC coach controls VCB and pantograph, in addition to

the function done by PCU of DTC/ NDTC. It monitors various power transformer related parameters such as flow, pressure, temperature and controls cooling blowers. PCU is located in DTC/ TC/ NDTC coach and is responsible for passenger related load control of that coach.

14.2 TCMS Redundancy Concept

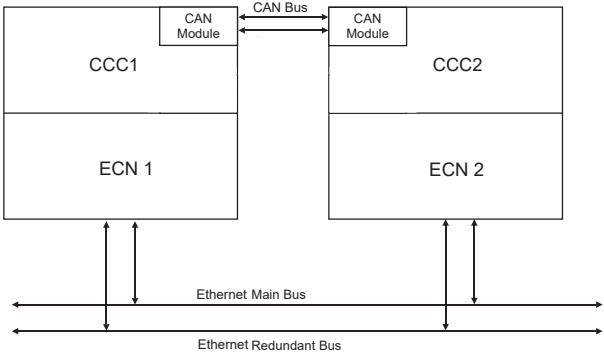


Fig 14.3 CCU interconnection Diagram

14.2.1 Redundancy in CCU

Each DTC of EMU train will consist of two CCUs; each CCU acting as the redundant system in-case of failure of the other CCU.

All Inputs and outputs connection are exactly same for both CCU. So all critical inputs required for train control

such as master controller TE/BE%, various master controller position such as Key-ON, RDM, drive, brake, coast, forward, reverse, emergency brake are completely duplicated in both CCUs. In addition to this all train related commands such as Pantograph control, VCB control, parking brake control, light and RMPU control, ventilation Control are also duplicated in both the CCUs.

The train is controlled by either one of the CCUs called the Master CCU based on Cab Occupation and Health of the CCU (If both CCUs of occupied cab are healthy, priority is given to CCU with lower Serial No.) and the other healthy CCU of the same DTC will become Active-standby CCU and will do all the control calculations but doesn't send control data to EPCUs of different basic unit for final control.

The two CCUs in non occupied coach will work as slave CCU after ETB Inauguration and these slave CCUs only monitor the inputs and update them to the master CCU.

- Two CCUs of same cab communicate with each other and exchange their health status via two ECN channels. So each CCU knows the exact health status of the other CCU. In addition to this, CCUs also exchanges all digital inputs status read along with their health & master controller TE/BE % through dual redundant CAN communication. So in case of input channel failure or input card failure, corresponding channel status can be taken from healthy CCU. Similarly in case of failure or wrong reading of master controller TE/BE% by any CCU, same can be

corrected by value read through ECN communication from other CCU.

- If there is any critical failure in Master CCU and it detects that the Active-standby CCU is healthy, then Master CCU relinquishes its mastership, and hence Active-standby CCU of same occupied cab will become master.

14.3 Frequency Generator

One frequency generator is provided in each DTC. Frequency generator is interfaced with Master-Controller for reading TE/ BE%. Frequency generator reads TE/BE% in terms of analog value (voltage/ current) and converts them into equivalent frequency. This frequency is distributed train wide through train Line. TE/ BE% frequency will be used by CCU, MCU and MCUR under different failure cases for TE/ BE % demand calculation & train control.

14.4 Redundancy for PCUs

Unit level redundancy is provided for PCUs in TC, DTC and NDTC coach. All the functions are executed by redundant PCU in case of main PCU is fails.

14.5 Redundancy in Master Controller Interface

There are two nos of independent potentiometers provided inside master controller to read TE/ BE%. One potentiometer is connected to CCU1, 2nd potentiometer is

connected to potentiometer is connected to frequency generator for determination of TE/ BE% independently.

In addition to above, frequency generator output is connected to CCUs also. In case of failure of any potentiometer or processing circuit of any CCU, correct TE/ BE% can be determined by TE/ BE% read from other CCU and frequency input read from frequency generator.

For determining drive, brake, coast and emergency Brake position 6 NO and 6 NC contacts are provided. These contacts are connected to CCU1 and CCU2. In case of misbehavior of any one input, exact state can be derived from combination of other contacts.

Similarly for key switch ON/ OFF, forward/ reverse and redundant contacts are provided for interfacing with CCU1 and 2 of any DTC. So misbehavior of any one input will not lead to failure.

Even when Train Communication Network (ECN) fails completely (or partially for one or more Motor Coaches), individual MCUs (without ECN access to CCU) can continue to work based on the frequency generator output. In this mode (special RDM mode) of operation, overall train level control functions will not be possible for coaches which do not have ECN communication, however they can directly interpret frequency generator output and derive their motoring and braking commands.

When all possibility of normal operation fails (including ECN and frequency generator), then rescue drive mode facility is available, whereby all motor coaches can be

controlled using hard-wired train line wires instead of train communication network. In this mode train line wires can only command motoring / braking and same will be applied at prior configured TE/BE rates by individual motor coaches with overall speed restrictions.

14.6 Redundancy ETCN communication

For communication between control systems of different basic units dual redundant ETB communication is provided. Both medium of ETB network carries the same information on network. In case of failure of any one medium or noise on any one medium, transition to healthy medium is done automatically without loss of data.

For communication between different control systems inside basic unit, dual redundant ECN communication is provided. Both medium of ECN network carries the same information on network. In case of failure of any one medium or noise on any one medium,transition to healthy medium is done automatically without any loss of data.

14.7 Redundancy in communication with LTC unit

Redundant CAN communication is provided between MCU and Line converter and Traction Converter (LTC) control unit for transfer of various traction & control related commands. In case of failure of any one medium or noise on any one medium, transition to healthy medium is done without any loss of data.

14.8 Hard wired Train Line wires

In addition to control data exchange through redundant ETB/ ECN communication, hard-wired train lines are maintained for all essential control signals such as drive, brake coast, forward, reverse, TE/ BE% frequency, emergency brake loop, brake release loop, emergency off loop, VCB and pantograph control line etc.

During normal mode of operation, data is taken from ECN control packet. In case of rescue drive mode (RDM), train line status are used for train movement with limited features.

14.9 Redundancy for MCUs

Unit level redundancy is provided for MCUs in MC coach. All the functions (i.e. passenger comfort related functions like door control, RMPU control, brake control with EBCU) are executed by redundant MCU, in case of main MCU is failure

Chapter 15

FAILURE MODES WITHIN TCMS SUB SYSTEMS

S.No	Sub system	Module/ Failure	Effect on Train Operation	Redundancy Operation
1	CCU	Digital Input card channel failure	No effect on EMU operation	No need to change the CCU mastership. Channel fault can be identified through fault diagnostic. Faulty channel status can be taken from healthy CCU of same cab through ECN communication. Both CCUs exchange digital inputs, digital outputs & analog input status along with their respective health status through ECN communication periodically.
2	CCU	Digital Input card failure	No effect on EMU operation	No need to change the CCU mastership. Channel fault can be identified through fault diagnostic. Faulty channel status can be taken from healthy CCU of same cab through ECN communication. Both CCUs exchange digital input, digital output & analog input status along with their respective health status through ECN communication periodically.

S.No	Sub system	Module/ Failure	Effect on Train Operation	Redundancy Operation
3	CCU	Digital Output card failure	No effect on EMU operation	CCC2 Takes over mastership to drive outputs
4	CCU	TE/ BE Analog input failure	No effect on EMU operation & TE/ BE% can be deduced correctly	No need to change the CCU mastership. CCC2 also monitors TE/BE frequency and the same will be communicated to CCC1 through ECN communication.
5	CCU	TE/BE frequency input failure	No effect on EMU operation & TE/BE% can be deduced correctly	No need to change the CCU mastership. CCC2 also monitors TE/BE frequency and the same will be communicated to CCC1 through ECN communication.
6	CCU	One ETB channel/ cable failure	No effect on EMU operation	No need to change the CCU mastership. System can run on healthy ETB network and all control & status data exchange can happen normally.
7	CCU	One CCU failure/ one power supply failure	No effect on EMU operation	Healthy CCU of same occupied cab will detect the failure of other CCU when it does not get any heartbeat through ECN communication. With this healthy CCU of occupied cab will become master & controls the train without any deterioration.

S.No	Sub system	Module/ Failure	Effect on Train Operation	Redundancy Operation
8	CCU	Both CCU of occupied cab fail	in occupied cab driving is not possible due to non avialability of VCD functionality	MCU & MCUR will start working on train line. Train can be run in RDM mode (fixed TE/BE) or Special RDM mode (TE/BE still controlled by Master Controller).
9	MCU	Digital Input card channel failure	No effect on EMU operation	No master ship change over. All the DIP data is exchanged between MCU1 and MCU2.
10	MCU	Digital Input card failure	No effect on EMU operation	No master ship change over. All the DIP data is exchanged between MCU1 and MCU2.
11	MCU	Digital output channel failure	No effect on EMU Operation	No mastership change over will happen,Redundant unit will drive the same outputs in parallel
12	MCU	One ETB cable failure	No effect on EMU operation	MCU will keep receiving control data through healthy ETB cable.
13	MCU	MCU control card failure	Traction Will not occur	Mastership changeover to MCU2. All the functions are executed by MCU2
14	MCU	MCU analog input channel failure related to EP brake	No effect on EMU operation. Traction & all braking can happen normally	No mastership changeover. All the analog IO data is ecxhanged between MCU1 and MCU2.
15	MCU	CAN comm fail between MCU and LTC	No effect on EMU operation	No mastership change over. All the traction related functions are exicuted with redundant CAN communication.
16	MCU	Both CAN comm fail between MCU and LTC	No effect on EMU operation	Traction Will not occur for that MC coach, Overall TE Force will reduce.

S.No	Sub system	Module/ Failure	Effect on Train Operation	Redundancy Operation
17	MCU	MCU analog input failure related to load weighing system	No effect on EMU operation.	Load weighing sensors are redundant & connected to MCUR also. MCU will receive weight information & spring deflection information from MCUR through ECN communication.
18	MCU	Frequency input failure for TE/BE%	No effect on EMU operation. Traction & all braking can happen normally	All functionality can be achieved in Normal & RDM mode of operation.
19	MCU	One ECN cable failure	No effect on EMU operation.	Through redundant ECN communication MCC gets commands from CCC and MCC sends status data to CCUs.
20	MCU	Both ECN cable failure or TCN card failure	Traction Will not occur for that MC coach,Overall TE Force will reduce.	Traction Will not occur for that MC coach, Overall TE Force will reduce.
21	PCU	Digital Input card card failure	No effect on passenger comfort functions	Faulty channel health will be detected by fault diagnostic. Failed digital input status will be ignored & will be driven to default state. All passenger comfort functions, Main Air compressor & parking brake work as per the command received from MCU through ECN.
22	PCU	Digital Input card failure	No effect on passenger comfort functions	No mastership change over. All DIP data is exchanged between PCU1 and PCU2.

S.No	Sub system	Module/ Failure	Effect on Train Operation	Redundancy Operation
23	PCU	Digital output channel failure	No effect on EMU Operation.	No mastership change over will happen,Redundant unit will drive the same outputs in parallel
24	PCU	PCU analog input channel failure related to Load sensor	No effect on load measurement & spring deflection.	As per current scheme of MRVC phase II, if two pressure sensors are provided per bogie, it can be connected to two different analog inputs. So failure of one analog input will not affect load measurement & spring deflection measurement.
25	PCU	One ECN channel/ cable failure	No effect on passenger related load operations	PCU will automatically switchover to redundant ECN network. All passenger comfort functions, Main Air compressor & parking brake work as per the command received from MCU through ECN.
26	PCU	Both ECN channels / cable failure or card failure	No effect on EMU operation.	Mastership will switch over to PCU2
27	PCU	PCU control card failure/ power supply failure	No effect on EMU operation.	Mastership will switch over to PCU2
28	DDU	One ECN cable failure	No effect on EMU operation	DDU is connected to both ECNs in DTC coach. All the functions will done through redundunt cable.
29	ACU	One ECN cable failure	No effect on EMU operation	ACU is connected to both ECNs in MC coach. All the functions will done through redundunt cable.

S.No	Sub system	Module/ Failure	Effect on Train Operation	Redundancy Operation
30	ERMS	One ECN cable failure	No effect on EMU operation	ERMS is connected to both ECNs in DTC1 coach. All the functions will done through redundunt cable.
31	ECN-DTC	ECN switch failure	No effect on EMU operation	All the functions are exicuted with redundant ECN switch.
32	ECN-MC	ECN switch failure	No effect on EMU operation	All the functions are exicuted with redundant ECN switch.
33	ECN-TC	ECN switch failure	No effect on EMU operation	All the functions are exicuted with redundant ECN switch.
34	ECN-NDTC	ECN switch failure	No effect on EMU operation	All the functions are exicuted with redundant ECN switch.
35	ECN-TC1	ECN switch failure	No effect on EMU operation	All the functions are exicuted with redundant ECN switch.

Chapter 16

KEY INTERLOCKING SYSTEM

Purpose of key interlocking system is to prevent staff from accidental working with line voltage equipment without grounding the line voltage components. The general idea of the key interlocking system is based on the principle that, a number of safety actions be carried out in the correct order and every action performed properly releases a key, that is used in the next action until the high voltage under slung converter cubicles doors are safely opened for inspection and maintenance work. The high voltage equipment i.e, pantograph, line circuit breaker, earthing switch are directly or indirectly part of the key interlocking system.

Step 1: Down the pantograph by operating the deactivation switch in driver's cab.

Step 2: Ground LCB with the earthing switch. The blue Key – A from the pantograph air isolating cock is inserted into the lock of the earthing switch and the operating handle of the earthing switch is turned to earth position.

Step 3: The yellow Key – B from the earthing switch removed after grounding LCB is inserted in DC link earthing switch unit. The DC link Earthing switch unit is common for both LHS and RHS LTC units. DC link earth switch is operated to the earth position to ground the DC link. It is however recommended to wait for 5 minutes until the capacitors become discharged through the bleeder resistors/ discharging resistors after the pantograph is lowered.

Step 4: The released Green key from the DC link earthing switch can be used to open either the LHS or RHS LTC unit doors.

16.1 Convert the vehicle to RDM

When TCN failure lamp becomes ON and/ or event no 12324/ 14372 is active (TCN failure rake runs in special RDM mode, if rake is unable to run or move the key to RDM position) and/ or rake is unable to run in normal mode, move the key to RDM position.

- To use this mode, rake should be run to clear the section.
- In this mode, speed is restricted to kmph
- Driver display unit may not function.

Chapter 17

PIS

17.1 Introduction

PIS comprises Head Code Display (HCD), Man Machine Interface (MMI), Car Control (CC), Ambient Noise Measurement (ANM), speakers, and microphone.

Passenger information system for Train-18 gives required information to the passengers in a train throughout the journey in both visual and audio form. System has a provision for public announcement, where driver can address all the passengers in the train. It also has a provision for Inter Communication (IC) between driver and guard.

PIS is employed in Train-18 to provide the information like train route, next arriving station, current station, and safety messages to passengers in both visual and audio form. Along with the above information, it also displays current time in the in-coach (DSD) displays. It also provides intercommunication between driver in front cab and guard in the end cab. The main aim of this system is to provide convenience to the passengers by providing station information and other required information.

17.2 List of Abbreviations used

S.No	Acronym	Description
1	ANM	Ambient Noise Measurement
2	CC	Car Control
3	CAN	Controller Area Network
4	DTC	Driving Trailer Coach
5	EBU	End Basic Unit
6	GPS	Global Positing System
7	HCD	Head Code Display
8	IC	Inter-Communication
9	LED	Light Emitting Diode
10	MBU	Middle Basic Unit
11	MC	Motor Coach
12	MMI	Man Machine Interface
13	NDTC	Non-Driving Trailer Coach
14	PA	Public Address
15	PECU	Passenger Emergency Communication Unit
16	PIS	Passenger Information System
17	SDBD	Side Destination Board Display
18	SSD	Single Side Display
19	TC	Trailer Coach
20	TR	Train Radio

17.3 System Overview

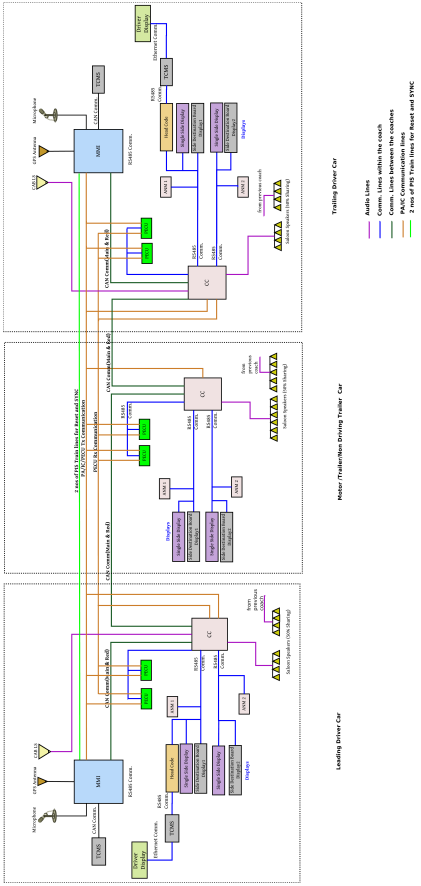


Fig 17.1

1. MMIs and CCs in leading coaches are interfaced using CAN network.
2. One MMI in the trailing coach behaves as master and other MMI behaves as slave, based on the direction of journey.
3. CC acts as local master and interfaces with all the display boards, ANMs, and PECUs through RS485 communication network, using two channels for redundancy.
4. The leading and trailing coaches consist of Man Machine Interface (MMI) with GPS antenna, head code display, one Car Control unit (CC) with in built audio amplifier, two SSDs, two SDBDs, two ANMs, two PECUs, one cab loud speaker, eight saloon speakers, and one microphone.
5. All other coaches contain two DSDs, one CC unit with built in audio amplifier, two ANMs, four ETBs, and four loud speakers.
6. All other coaches other than leading and trailing coaches contain one Car Control (CC) with built in audio amplifier unit, two SSDs, two SDBDs, two ANMs, two PECUs, and eleven saloon speakers.
7. Speaker of 6 watt R.M.S. rating is provided with 50% of sharing, in case of single power amplifier failure in CC unit. Therefore at least half of the speakers would be still operative in the coach.

8. Public addressing system is provided to enable communication between guard and passenger.
9. Inter-comm is provided to enable communication between driver and guard.
10. Whenever emergency talk back unit is pressed, information is displayed to driver/ guard through MMI. Passenger can talk to driver/ guard using passenger emergency communication unit.
11. One train line provides common hard reset to entire PIS system.
12. MMI unit is interfaced to CCTV display unit through RS-485 communication to enable nearby camera views, when PECU is operated while emergency.

17.4 Scope of Supply and Location of each equipment in coach

S.No	Sub-system	Scope of Supply	DTC (2)	MC (8)	TC (4)	NDTC (2)	16-car Total
1	Microphone	Medha	1	X	X	X	2
2	Cab Loudspeaker	Medha	1	X	X	X	2
3	Head Code unit (HCD)	Medha	1	X	X	X	2
4	Man Machine Interface (MMI)	Medha	1	X	X	X	2
5	GPS Antenna	Medha	1	X	X	X	2
6	Car Control (CC)	Medha	1	1	1	1	16
7	Saloon Loudspeaker	Medha	8	11	11	11	170

S.No	Sub-system	Scope of Supply	DTC (2)	MC (8)	TC (4)	NDTC (2)	16-car Total
8	Ambient Noise Measurement (ANM)	Medha	2	2	2	2	32
9	In Coach Displays (SSD)	Medha	2	2	2	2	32
10	Passenger Emergency Communication unit (PECU)	Medha	2	2	2	2	32
11	Side Destination Board Display (SDBD)	Medha	2	2	2	2	32

Location of each equipment in coach

S.No	Sub-system	DTC (2)	MC (8)	TC (4)	NDTC (2)
1	Microphone	Driver Desk	X	X	X
2	Cab Loudspeaker	Driver cab roof	X	X	X
3	Head Code	Driver Cab front top side	X	X	X
4	Man Machine Interface (MMI)	Driver Desk	X	X	X
5	GPS Antenna	Driver Desk	X	X	X
6	Car Control (CC)	GCRW	ECC	ECC	ECC
7	Saloon Loudspeaker	Roof	Roof	Roof	Roof
8	Ambient Noise Measurement (ANM)	Roof	Roof	Roof	Roof
9	In Coach Displays (SSD)	Wall mouting	Wall	Wall mouting	Wall mouting
10	Passenger Emergency Communication unit (PECU)	Near to GCRW & ECC	Near to ECC	Near to ECC	Near to ECC
11	Side Destination Board Display (SDBD)	Middle of the Coach outside	Middle of the Coach outside	Middle of the Coach outside	Middle of the Coach outside

17.4.1 Man Machine Interface (MMI)

Man machine interface is an user friendly module, which consists of 20x4 backlit alphanumeric (English) LCD display with 21 button keypad, that includes 12 alphanumeric keys, two up/ down keys for volume control/ platform direction keys/ menu surfing keys, and remaining are functional keys, for user interface. This module, which is mounted on the driver desk is mainly used for configuration and displaying the menu options, system status, and route information to user (Driver/ Guard). User can know the status of each sub system from MMI. User can enable PA, IC, TR communication, using the keys provided on the keyboard. It has three indication LEDs (PA, IC,TR), which displays the audio communication enable/ disable status. MMI takes care of all operations such as train route simulation using GPS and fault diagnostic of the complete PIS system. Train route database of PIS system is stored in MMI.

17.4.2 Car Control Unit (CC) :

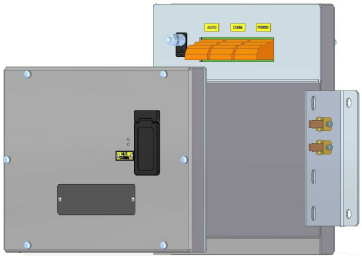


Fig 17.2

Car controller, which acts as local master is the main system to control and command all sub systems in particular coach. Upon receipt of train route from MMI, CC transfers the required information to all display units to display the train route. On receipt of station triggers from MMI, CC will transfer arrival and departure information to in-coach displays and audio data to the speakers. All sub systems in a coach like head code display, double side display, side destination board display, and ambient noise measurement unit are connected through RS485 to car controller unit. It also monitors the health of all sub systems, which are under its control and exchanges the data with MMI for central data storage. Speakers are routed from CC in coach by 50% audio sharing through two channels.

17.4.3 Head Code Display (HCD)

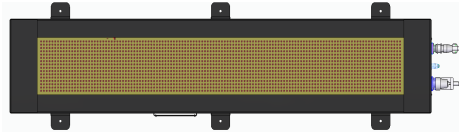


Fig 17.3

Head code, which is provided at front end of the driving coach (leading and trailing), above the lookout glass display, consists of LED boards. LED matrix size is 16x128.

HCD displays:

1. Train number
2. Name of destination station in english, hindi and regional language.

In case of communication failure between car control and head code, driver/ guard can manually select the train route through TCMS display unit located in driver/ guard cabin.

17.4.4 Side Destination Board Display (SDBD)

Fig 17.4

Side destination board display system is provided on each side of the coach. It displays the information in two parts. In one part, coach number and train number is displayed. In second part, train name and source to destination is displayed in english, hindi, and regional languages. Matrix size: 16x128.

Side destination board display system displays:

1. Train number
2. Coach number
3. Train name
4. Source to destination
5. Text messages in english, hindi, and regional languages.

17.4.5 In-Coach Display unit (Single Side Display)

In-coach display unit consists of multi color LED boards (16X144). ICD displays the route related information of present station and next station to the passengers throughout the journey. In addition to the route related

data, ICD also displays the safety messages upon receiving triggers from CC.

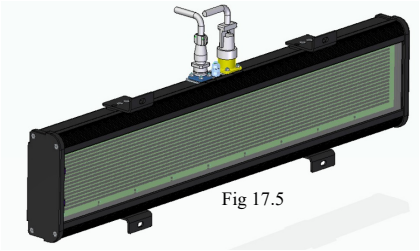


Fig 17.5

17.4.6 Ambient Noise Measurement (ANM) unit

ANM is a noise measurement module, which consists of a microphone. It detects the background noise and measures the noise level and sends the same to CC. CC will adjust the volume level of saloon speakers, based on the background noise received from ANM.

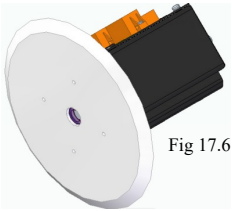


Fig 17.6

17.4.7 Speakers

Speakers of 6 watt R.M.S. rating are provided. 50% of

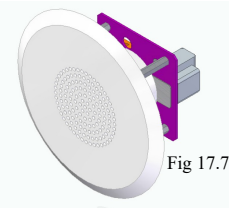


Fig 17.7

sharing is provided for the speakers, in case of single power amplifier failure in CC unit. Therefore atleast half of the speakers will be still operative in the coach.

17.4.8 Passenger Emergency Communication Unit (PECU)

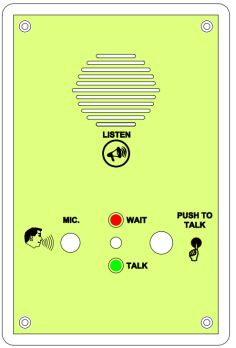


Fig 17.8

Passenger emergency communication unit provides the emergency communication between driver/ guard and passengers. When a passenger emergency communication unit is operated by passenger in any particular coach, an indication is given to the driver/ guard on MMI screen. Driver/ guard will acknowledge PECU request in MMI to enable the communication with passenger. PECU contains a switch to press, in case of emergency. When user presses the switch, information will be transferred to CC unit through RS485 communication. In-turn the information is posted to MMI through CAN communication. Audio processing circuit takes the microphone audio signal from PECU as input and generates differential audio signal and also takes the audio output signal from microphone interfaced with MMI and amplifies the signal, which is delivered as audio to the passenger.

17.4.9 GPS Antenna

A rugged GPS antenna with anti-theft protection of required cable length is provided for use on rail vehicles.

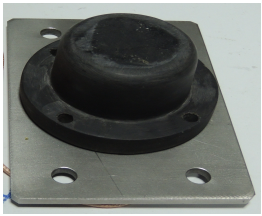
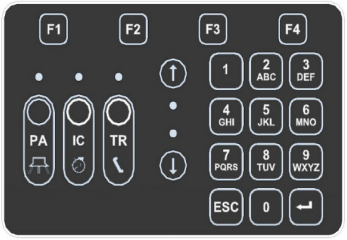


Fig 17.9

17.4.10 MMI Keypad

MMI Keypad and Menu Screen



1st Press	2nd Press	3rd Press	4th Press	5th Press
0				
1				
2	A	B	C	
3	D	E	F	
4	G	H	I	
5	J	K	L	
6	M	N	O	
7	P	Q	R	S
8	T	U	V	
9	W	X	Y	Z

Key	1st Press	2nd Press
PA	Enable	Disable
IC	Enable	Disable
TR	Disable	Disable

Note :

1. F1, F2, F3, F4 functional keys for selection(Back, Select, Confirm, Enter, Menu...)
2. If 'Up Key' Pressed previous menu screen will be displayed.
3. If 'Down Key' Pressed next menu screen will be displayed.
4. 0-9 Keys can be used for data entry (Numeric / Alphanumeric)
5. 'ESC' Key can be used to reset the PIS system and deselect the Journey by long pressing up to '5Sec' continuously.
6. '↵' Key can be used to get the Menu Grant forcefully without Cab Occupied input by long pressing up to '5Sec' continuously.
7. 'PA' can be used to operate Public Addressing
8. 'IC' can be used to operate Inter Communication
9. 'TR' operation is disabled as we doesn't have Train Radio interface.

Fig 17.10

17.5 Main Menu Screens Flow

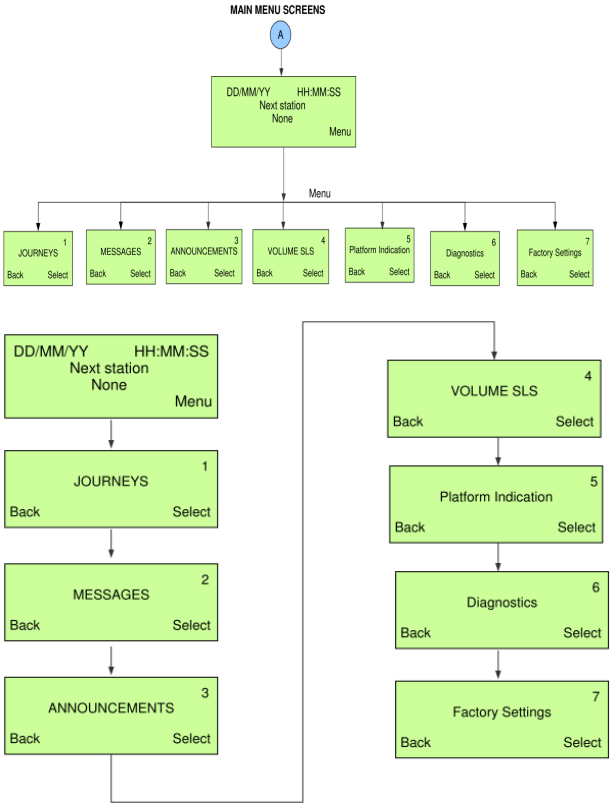


Fig 17.11

17.6 Power up initialization

After power ON, MMI displays a screen as shown in Fig 17.12 and Fig 17.13.

Cab 1 MMI Shows :

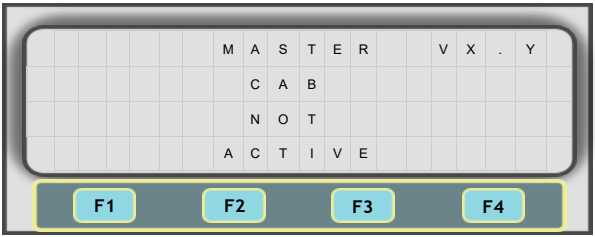


Fig 17.12

Cab 2 MMI Shows :

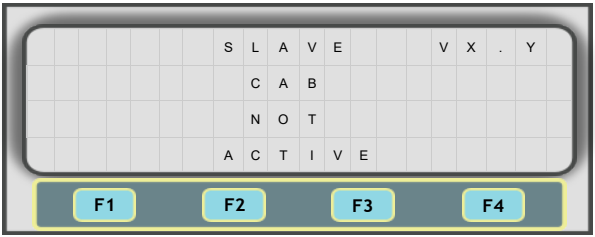


Fig 17.13

17.6.1 PIS Master ship :

Long press ‘Enter’ key on MMI of Cab1. Master MMI screen appears as shown in Fig 17.14.

Cab 1 MMI Shows :

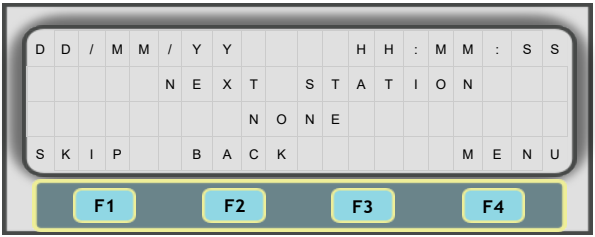


Fig 17.14

- Row 1 → Displays GPS date and time/ GPS signal status.

If GPS signal is good, then it displays date and time. If GPS signal is poor, it displays a text “GPS signal poor” on LCD screen.

- Row 2 → Displays present/ next station based on the train position and distance traveled
- Row 3 → Displays ‘None’ in default condition, when journey is not selected and displays the station ID, if journey is selected
- Row 4 → Displays Menu screen access options

Other Cab2 MMI unit becomes slave and MMI screen appears as shown in Fig 17.15.

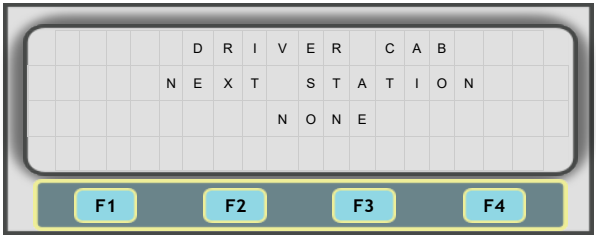


Fig 17.15

- Row 1 → Displays cab details
- Row 2 → Displays present/ next station based on the train position and distance traveled
- Row 3 → Displays “None” in default condition, when journey is not selected and displays station ID, if journey is selected.

17.6.2 Journey selection procedure

Once MMI takes the master ship, it displays default menu screen as shown in Fig 17.16.

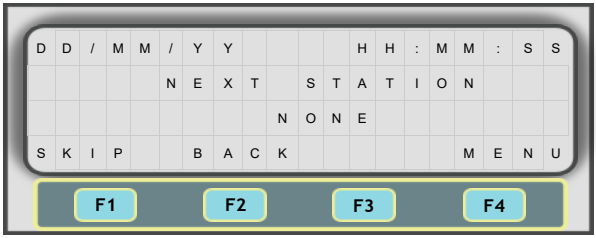


Fig 17.16

By pressing F4, MMI displays the menu screen as shown in Fig 17.17.

Fig 17.17

Press ‘F4’ to enter the journey details. MMI displays a screen shown in Fig 17.18.

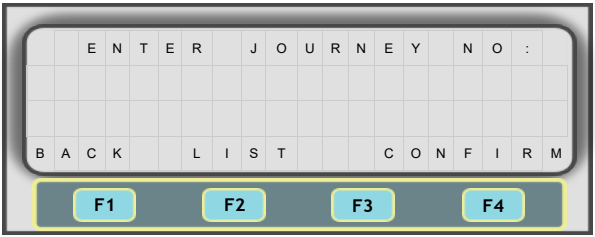


Fig 17.18

Enter journey number using alphanumeric keypad, provided on MMI unit. After entering the journey number, press ‘F4’ to confirm. ‘F1’ acts as cancel key. If a wrong number is entered, press ‘F1’ to cancel.

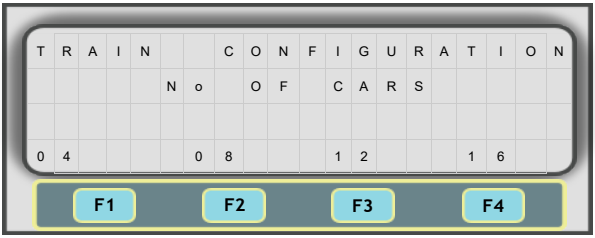


Fig 17.19

Press ‘F4’ to confirm the train configuration as 16 car.

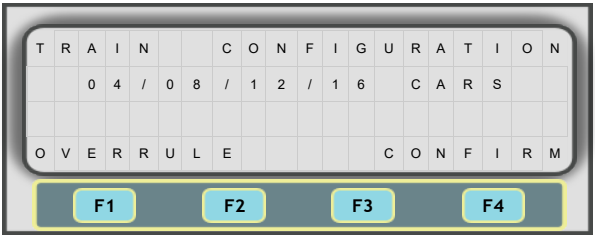


Fig 17.20

If entered journey number is not available in MMI, MMI displays a screen shown in Fig 17.21.

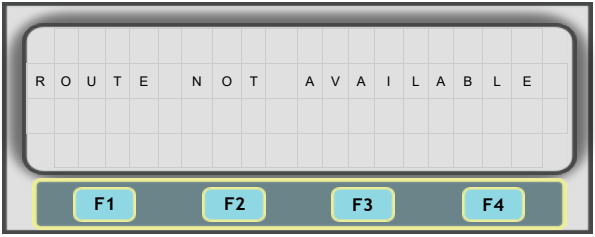


Fig 17.21

If entered journey number is available in MMI, screen displays a message, as shown in Fig 17.22.

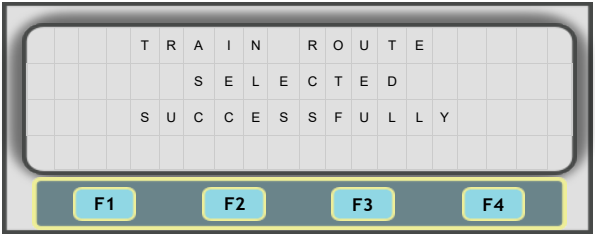


Fig 17.22

After confirmation screen, MMI displays journey information as shown in Fig 17.23 and 17.24.

Master MMI Screen (Cab 1)

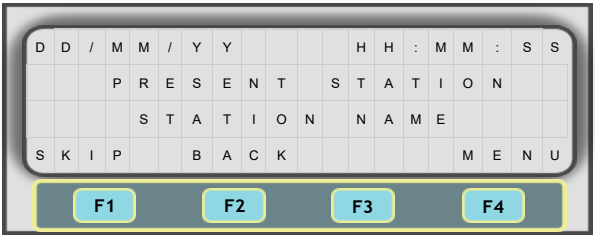


Fig 17.23

Slave MMI Screen (Cab 2)

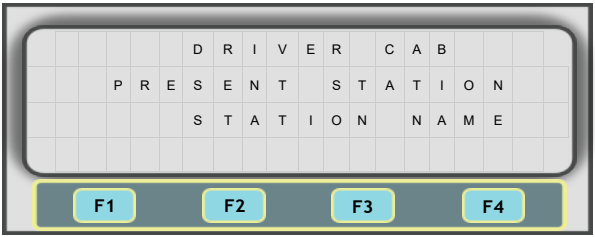
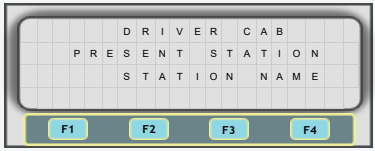
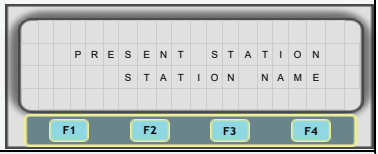
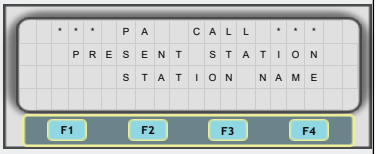
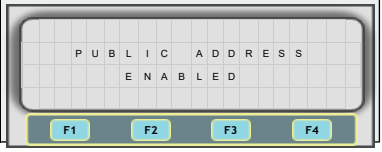
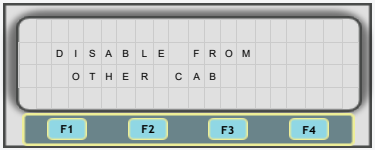
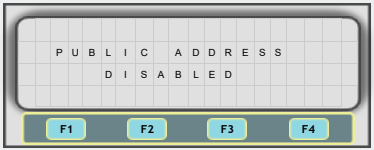
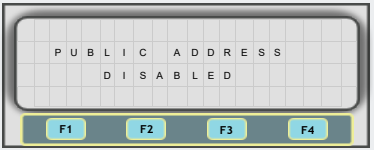


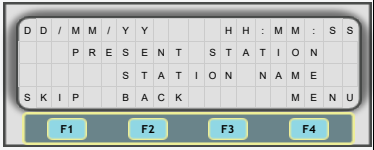
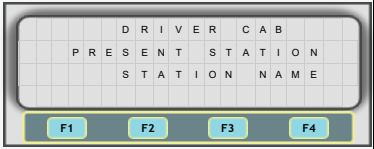
Fig 17.24

17.7 Public Address

Driver/ Guard can enable the public address to make announcements to the passengers.

STEP	ACTION	
1	Check initial condition	MMI of Cab 1 shows:  MMI of Cab 2 shows: 
2	Press PA button on MMI Keypad	MMI of Cab 1 shows:  MMI of Cab 2 shows: 

STEP	ACTION	
4	Speak through Cab 1 of MMI Microphone.	Voice shall be heard from other end cab and Saloon loudspeakers
5	Speak through Cab 2 of MMI Microphone.	No voice shall be heard from Cab and Saloon loudspeakers
6	Press 'PA' button on the MMI keypad	MMI of Cab 2 shows: 
7	Press 'PA' button again on the MMI keypad	MMI of Cab 1 shows:  MMI of Cab 2 shows: 

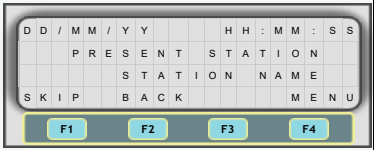
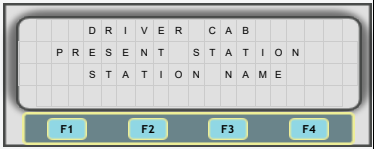
STEP	ACTION	
8	Disable 'PA' operation. Both MMI and PA indication LEDs go Off.	MMI of Cab 1 shows:  MMI of Cab 2 shows: 
9	Speak through Microphone of Cab 1 and Cab 2	No Voice shall be heard from Cab and Saloon loudspeakers

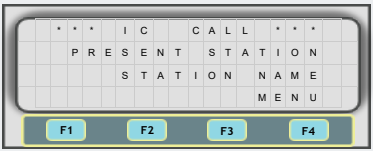
NOTE

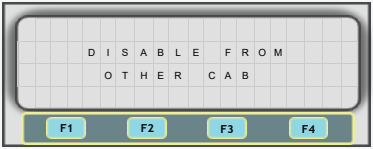
- Only initiator can disable the Public Addressing (PA).
- When non-initiator tries to disable PA, MMI doesnot allow to disable and displays a message, “Disable from Other cab”.

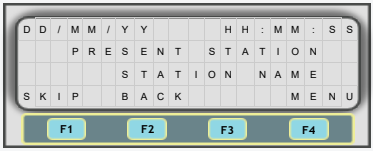
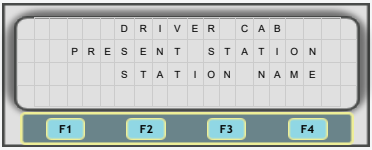
17.7.1 Inter Communication:

Procedure to enable inter communication between driver and guard during journey is as follows.

STEP	ACTION	
1	Check initial condition	MMI of Cab 1 shows:  MMI of Cab 2 shows: 
2	Press ‘IC’ button on the MMI keypad of Cab 1. Both MMI IC indication LEDs starts blinking and jingle sound shall be heared from both cab loudspeakers.	MMI of Cab 1 shows:  MMI of Cab 2 shows: 

STEP	ACTION	
3	Press ‘IC’ button on the MMI keypad of Cab 2. Both MMI IC indication LEDs will be ON continuously.	MMI of Cab 1 shows:  MMI of Cab 2 shows: 
4	During IC calling	MMI of Cab 1 shows:  MMI of Cab 2 shows: 

STEP	ACTION	
5	Speak through Master MMI Microphone.	Voice shall be heard from Cab-2 loudspeaker.
6	Speak through Slave MMI Microphone.	Voice shall be heard from Cab-1 loudspeaker.
7	Press 'IC' Button on the MMI Keypad of Cab 2	MMI of Cab 1 shows: 
8	Again press the 'IC' button on the MMI keypad of Cab 1	MMI of Cab 1 shows:  MMI of Cab 2 shows: 

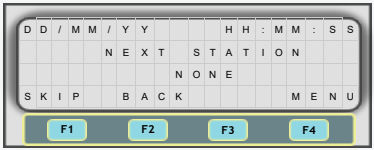
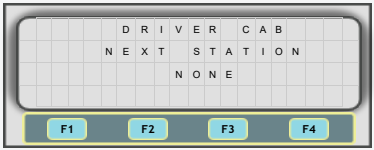
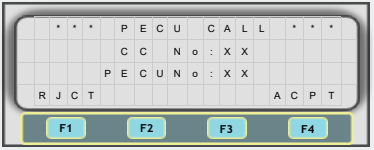
STEP	ACTION	
9	After disabling the IC operation, both MMI keypad IC indication LEDs go OFF.	MMI of Cab 1 shows:  MMI of Cab 2 shows: 
10	Speak through Microphone of Cab 1 and Cab 2	No Voice shall be heard from any of the Cab loudspeakers

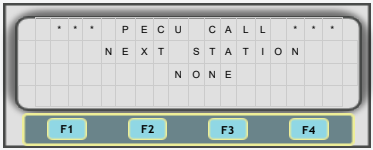
NOTE

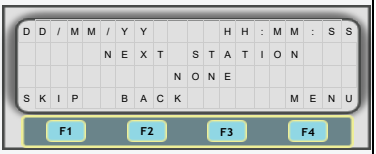
- Only initiator can disable the Inter-communication (IC).
- When non-initiator tries to disable the inter-communication, MMI does not allows to disable IC and displays a message “Disable from Other cab”.

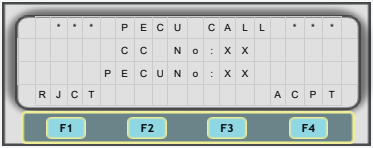
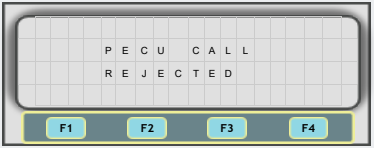
17.7.2 PECU (Guard-Passenger Communication)

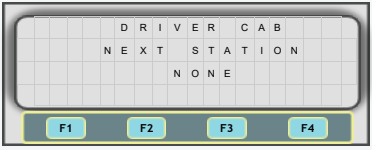
Procedure to enable PECU call between guard and passenger during journey is as follows

STEP	ACTION	
1	Check initial condition in PECU. Indication LED blinks continuously in red color and push button LED shall be in OFF condition.	MMI of Cab 1 shows:  MMI of Cab 2 shows: 
2	Press PECU call button on the PECU of any coach. PECU indication LED glows continuously in RED color and PECU push button LED shall be in ON condition.	The MMI of Cab 1 shows:  Once PECU call request is received, MMI displays CC number and PECU number. The MMI of Cab 2 shows: 

STEP	ACTION	
3	Press 'F4' button on MMI keypad of Cab 1. PECU indication LED color changes from red to green and push button LED will be continuously ON.	MMI of Cab 1 shows:  After displaying confirmation message, MMI displays the following screen  MMI of Cab 2 shows: 
4	Speak through CAB1 microphone and observe voice at PECU	Voice shall be heard from PECU speaker
5	Speak through PECU microphone and observe voice at CAB1 loudspeaker	Voice shall be heard from CAB1 loudspeaker

STEP	ACTION	
6	Press 'F4' button on MMI keypad of Cab 1. PECU indication LED color changes from red to green and push button LED will be continuously ON.	MMI of Cab 1 shows:  After displaying confirmation message, MMI displays the following screen  MMI of Cab 2 shows: 
Rejecting PECU call during journey is explained in the below table		

STEP	ACTION	
7	Press PECU call button on the PECU of any coach. PECU indication LED glows continuously in RED color. PECU push button LED will be ON.	MMI of Cab 1 shows:  Once PECU call request is received, MMI displays CC number and PECU number. MMI of Cab 2 shows: 
8	Press 'F1' button on MMI keypad of Cab 1. PECU indication LED starts blinking and push button LED goes OFF.	MMI of Cab 1 shows:  After confirmation message, MMI displays default screen 

STEP	ACTION	
		The MMI of Cab 2 shows: 

NOTE

- PECU call can be enabled/ disabled only by guard (MMI-Master)
- At a time, only one call will be established.
- PECU call will be served based on first in-first out.
- During one PECU call, other call will be maintained in queue.

17.7.3 Route De-Selection

To deselect the train route, long press key 'ESC' on MMI keypad for 5 seconds. All the devices of PIS system gets reset.

After deselecting train route, MMI displays a screen as shown in Fig 17.25.

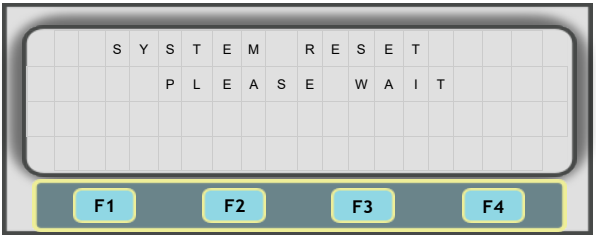


Fig 17.25

Cab 1 MMI Shows :

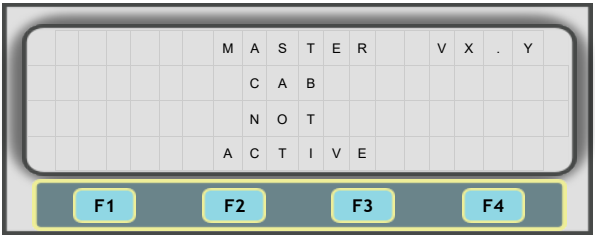


Fig 17.26

Cab 2 MMI Shows :

Fig 17.27

17.8 Menu Screen Operations

After inserting master key, other end of MMI becomes master and displays menu for accessing PA/ PIS system in offline.

17.8.1 Messages :

Messages option is used to display required message to all the passengers inside the coaches. It can be a welcome message, safety message, or wishes.

By selecting 'Messages' option, MMI displays a screen as shown in Fig 17.28.

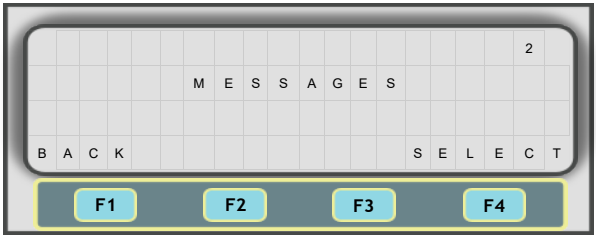


Fig 17.28

Press 'F4' to display the list of messages.

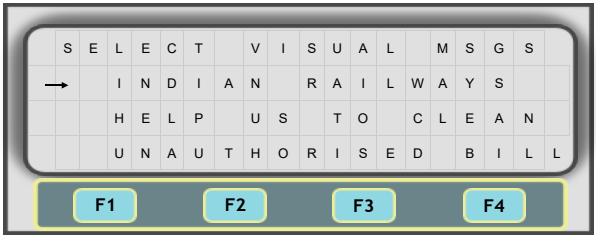


Fig 17.29

User can select the required message using up(🡅) and down(🡇) keys. Selected message will be sent to all CC units and is displayed on internal displays (SSD/ DSD).

Press 'F4' to select the required message.

17.8.2 Announcements :

Announcement option is used to make the audio announcements to all passengers inside the coach. It can be a welcome message, safety message, or wishes.

By selecting 'Announcements' option, MMI displays a screen as shown in Fig 17.30.

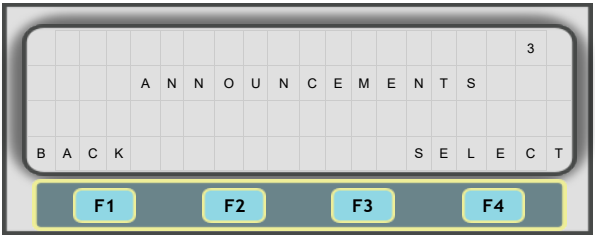


Fig 17.30

Press 'F4' to display the list of messages.

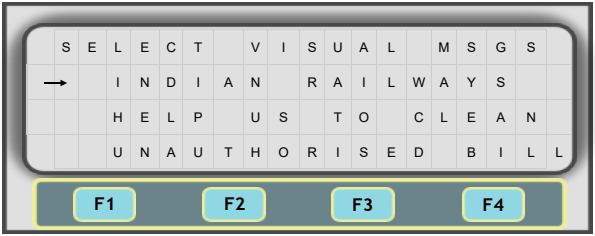


Fig 17.31

User can select the required audio messages using up(↑) and down(↓) keys. Selected audio message will be sent to all CC units and is then announced in the coach area through speakers.

Press 'F4' to select the required message.

17.8.3 Volume Level Selection :

Volume level selection is used to select various volume levels of audio. By selecting 'Volume SLS' option, MMI displays volume levels as shown below.

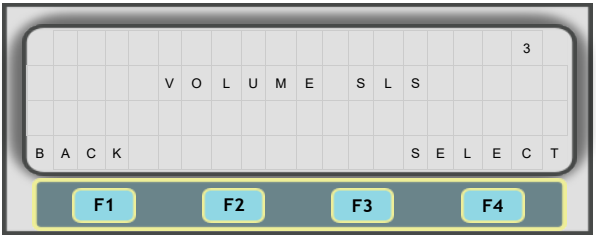


Fig 17.32

User can increase/ decrease the volume level through up (↑) and down (↓) keys. Selected volume level will be sent to all the CC units to configure the volume for journey announcements.

MMI provides volume levels from 1 to 3, where the volume min is '1' and max is '3'.

17.8.4 Platform Direction Selection :

Platform direction selection is used to enable/ disable platform direction. This can be done by selecting:

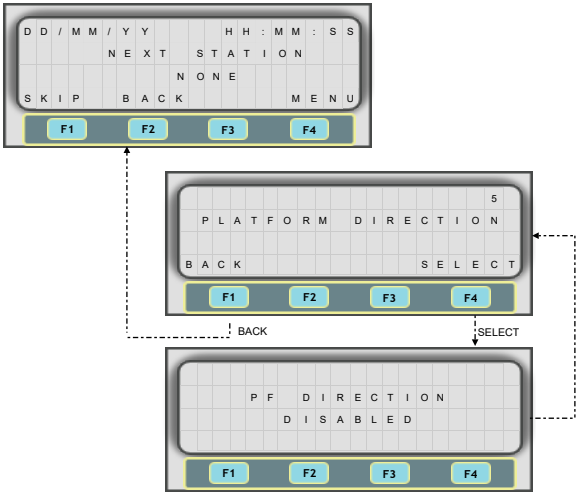


Fig 17.33

17.8.5 Diagnostics :

Diagnostics option is used to verify status of PA/ PIS system with display test, audio test, and CCTV test. By selecting 'Diagnostics' option, MMI displays following menu options.

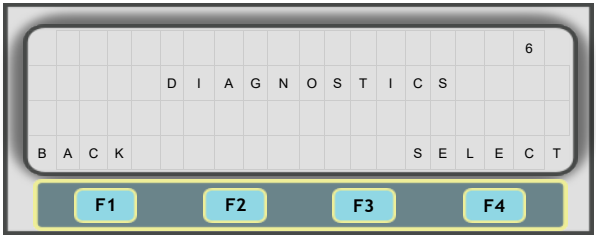


Fig 17.34

By pressing ‘F4’ (Select) button, MMI displays a screen with following options.

Fig 17.35

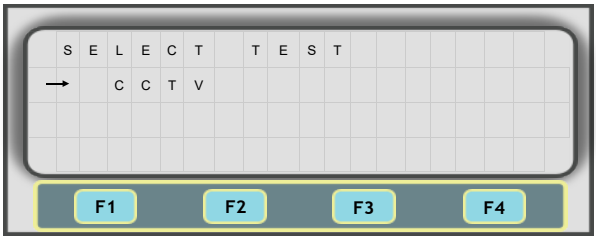


Fig 17.36

User can select the required test condition using up(↑) and down(↓) keys.

17.8.5/a Loud Speaker Test :

By selecting 'Loud Speaker Test', a jingle tone is announced continuously in all the coaches and MMI displays the screen as shown in Fig 17.37.

Fig 17.37

By selecting ‘F1’ (Back) button, MMI displays previous screen (Diagnostics Menu), followed by loudspeaker test. By selecting ‘F4’ (Stop), MMI displays the previous screen (Diagnostics Menu) by terminating the loudspeaker test.

17.8.5/b Display Test :

By selecting 'Display Test', all the LEDs of ICDs, side destination board display, and head code unit glows continuously in all coaches and MMI displays screen as shown in Fig 17.38.

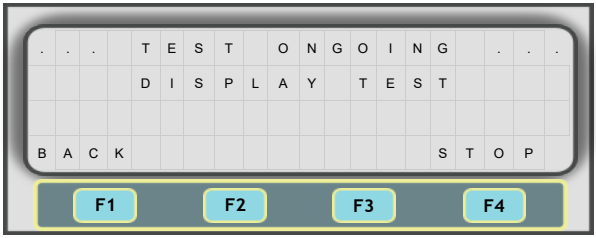


Fig 17.38

By selecting ‘F1’ (back), MMI displays previous screen (Diagnostics Menu), followed by display test. By selecting ‘F4’ (Stop), MMI displays previous screen (Diagnosis Menu), by terminating the display test.

17.8.5/c CCTV :

By pressing ‘F4’ (Select) button in Diagnostics menu (Fig 17.34), MMI displays following options, as shown in Fig 17.39.

Fig 17.39

By using down(🡻) key, CCTV option can be selected.

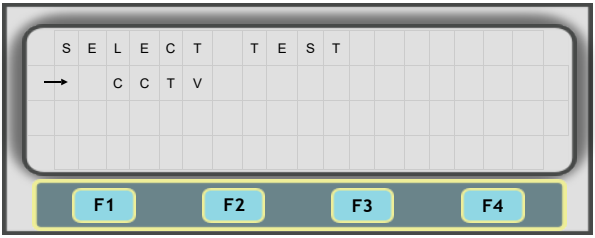


Fig 17.40

By selecting ‘F4’ (Select) button, MMI displays the screen, as shown in Fig 17.41.

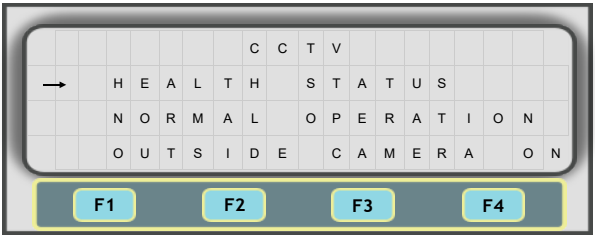


Fig 17.41

User can select the required test condition using up(🡅) and down(🡇) keys.

- **Health Status:**

By selecting the 'Health Status', user can know RS485 communication between MMI and CCTV.

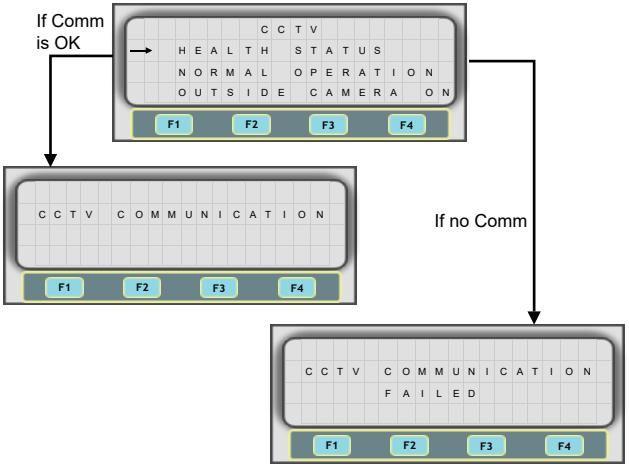


Fig 17.42

- **Normal Operation:**

By selecting 'Normal Operation', CCTV display shows normal camera views and MMI displays the screen as shown in Fig 17.43.

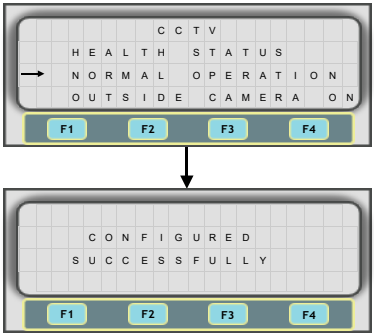


Fig 17.43

- **Outside Camera ON:**

By selecting 'Outside Camera ON', CCTV display shows platform camera views and MMI displays the screen as shown in Fig 17.44.

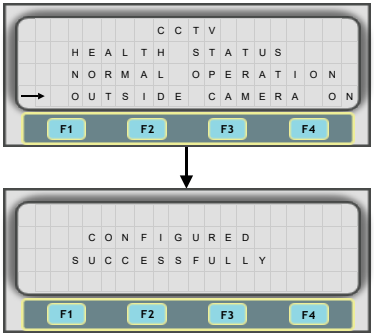


Fig 17.44

17.8.6 Factory Settings:

'Factory settings' option is used to verify the settings of PA/ PIS system with audio volume controlling and test mode operations. By selecting the 'Factory Settings' option, MMI displays the screen, shown in Fig 17.45.

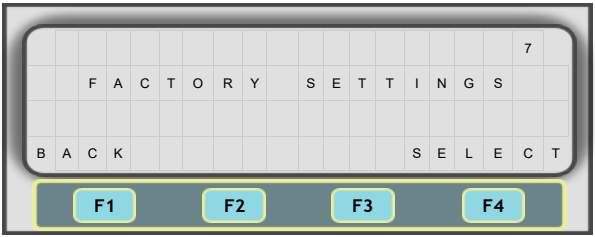


Fig 17.45

By selecting ‘F4’ (Select) button, MMI displays the following options :

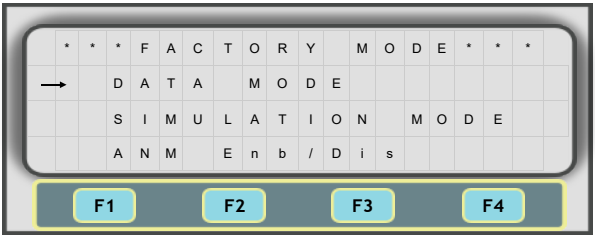


Fig 17.46

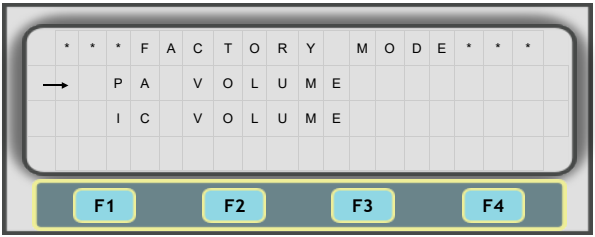


Fig 17.47

User can select the required test condition using up (↑) and down (↓) keys.

17.8.6/a Data Mode :

Data mode is used for communicating master data base and master/ slave configuration, uploading through CAN application tool. By selecting 'Data Mode', a screen appears as shown in Fig 17.48.

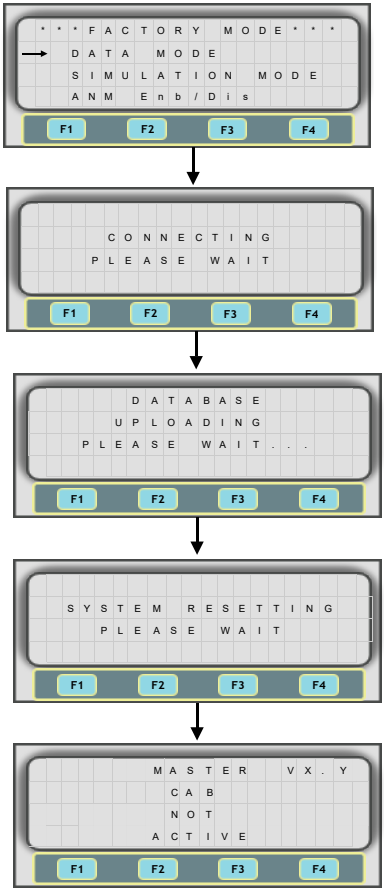

* * * FACTORY MODE * * *
DATA MODE
SIMULATION MODE
ANM Enb/Dis
F1
F2
F3
F4
CONNECTING
PLEASE WAIT
F1
F2
F3
F4
DATABASE
UPLOADING
PLEASE WAIT . . .
F1
F2
F3
F4
SYSTEM RESETTING
PLEASE WAIT
F1
F2
F3
F4
MASTER VX.Y
CAB
NOT
ACTIVE
F1
F2
F3
F4

Fig 17.48

17.8.6/b Simulation Mode :

For testing internally, simulate all route files without GPS by using TR RS485 comm channel with help of docklight. By selecting 'Simulation Mode', a screen appears as shown in Fig 17.49.

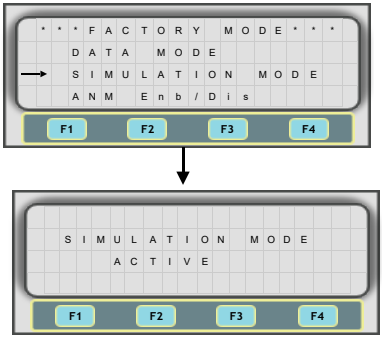


Fig 17.49

17.8.6/c ANM Enb/ Dis :

'ANM Enb/ Dis' option is used for enabling/ disabling ANM controlling with MMI. By selecting 'ANM Enb/Dis', a screen appears as shown in Fig 17.50.

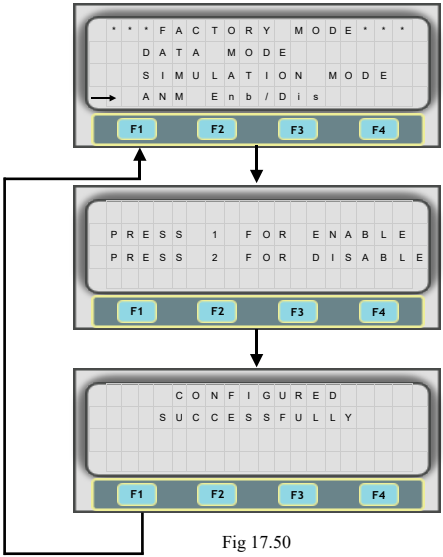


Fig 17.50

17.8.6/d PA Volume:

'PA volume' is used to select various volume levels of audio.

By selecting 'PA Volume', MMI displays the volume levels as follows.

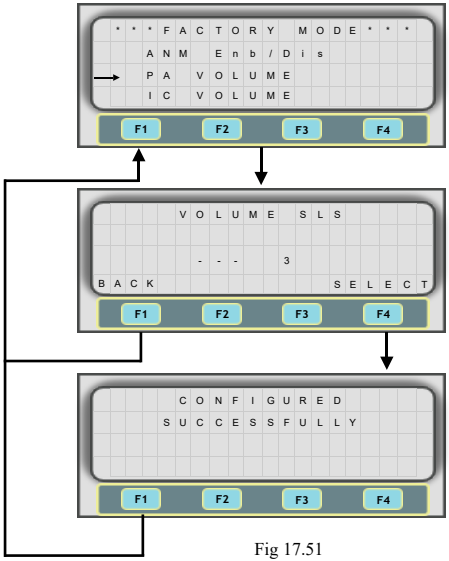


Fig 17.51

User can increase/ decrease the volume level using up(🡅) and down(🡇) keys. Selected volume level will be sent to all CC units to configure the volume for PA.

MMI provides volume levels from 1 to 3, where the volume min is '1' and max is '3'.

17.8.6/e IC Volume:

'IC Volume' option is used to select various volume levels of audio. By selecting 'IC Volume', MMI displays the volume levels as shown in Fig 17.52.

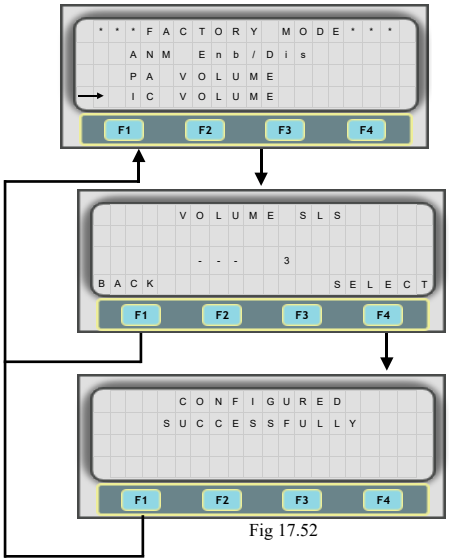


Fig 17.52

Driver's Manual

25 kV AC THREE PHASE PROPULSION & OTHER EQUIPMENT FOR TRAIN 18

TYPE MAE675U-TRAIN18

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