Trainline Communication and TCMS

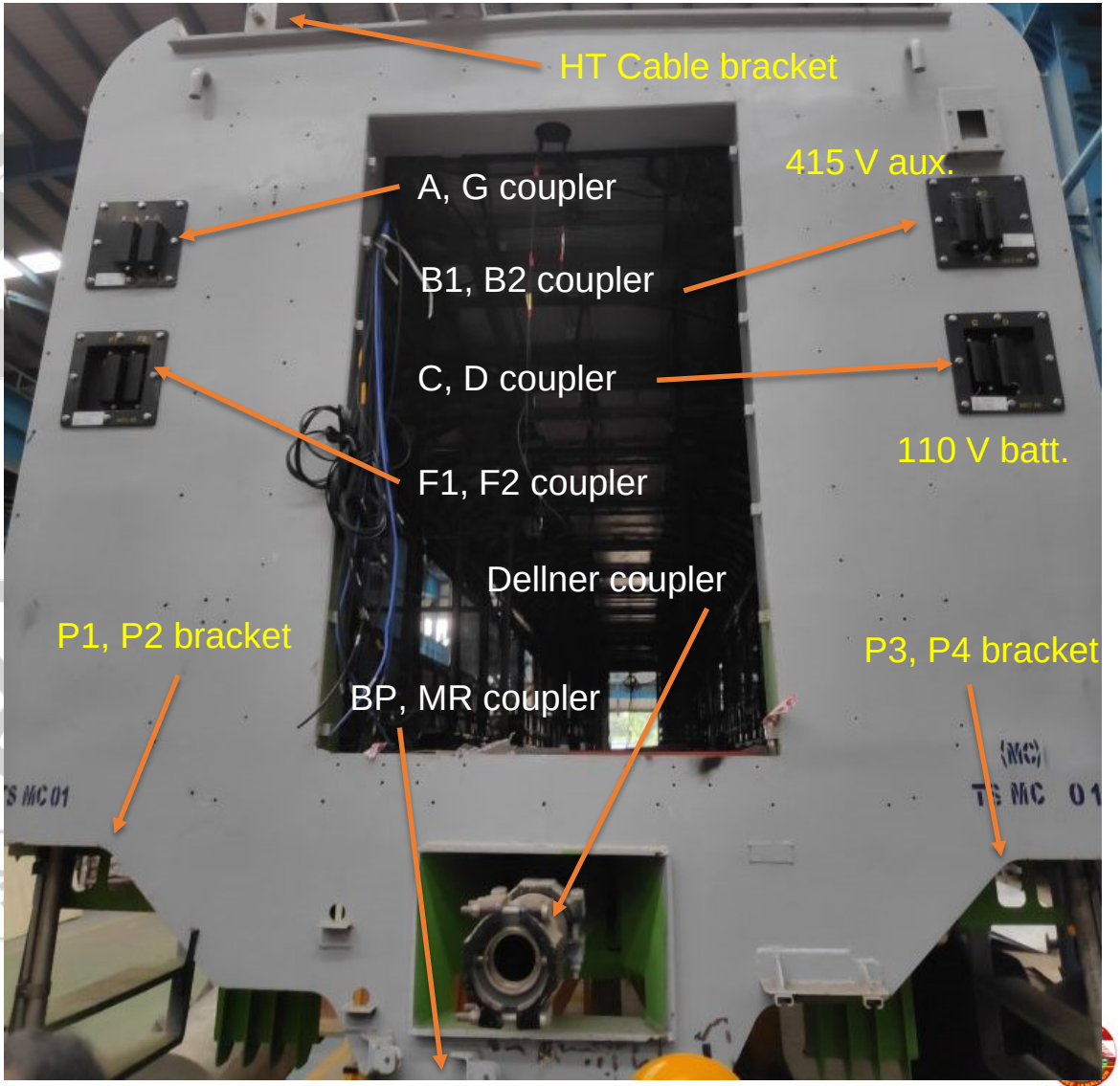
J. P. Singh, Prof. EnHM & IT

Trainset

- Trainline communication
- Connection between BU and inter-BU coaches
- Redundancy

How the coaches are connected

- Inter-BU coupling
- BU coupling



Electrical connectors

BU to BU

- Trainline couplers
  - F1, F2
- Ethernet, Audio, PIS, PECU, CCTV, Brake
  - AG1, AG2
- Aux Power (414 V)
  - B1, B2
- Battery Power (110 V)
  - D
- 25 KV (except DTC & MC1 of EBU)

Electrical connectors

Coaches of BU

- Trainline couplers
  - F1, F2
- Ethernet, Audio, PIS, PECU, CCTV, Brake
  - A, G
- Aux Power (414 V)
  - B1, B2
- Battery Power (110 V)
  - C, D
- 25 KV (except DTC & MC1 of EBU)

Electrical connectors

TC to MC

- Trainline couplers
  - F1, F2
- Ethernet, Audio, PIS, PECU, CCTV, Brake
  - A, G
- Aux Power (414 V)
  - B1, B2
- Battery Power (110 V)
  - C, D
- Power (1200 V)
  - P1, P2, P3, P4
- 25 KV (except DTC & MC1 of EBU)

Pneumatic connections

- Brake pipe (5 kg)
- MR pipe (10.5 kg)

TRAIN CONTROL & MANAGEMENT SYSTEM (TCMS)

- Control of Motoring/Braking/Direction
- Control of Door, AC
- Automatic Controls
  - Blended Brakes
  - Compressor rotation

Major functions of TCMS

- Interface with Driver Desk

Train settings from Driver Desk

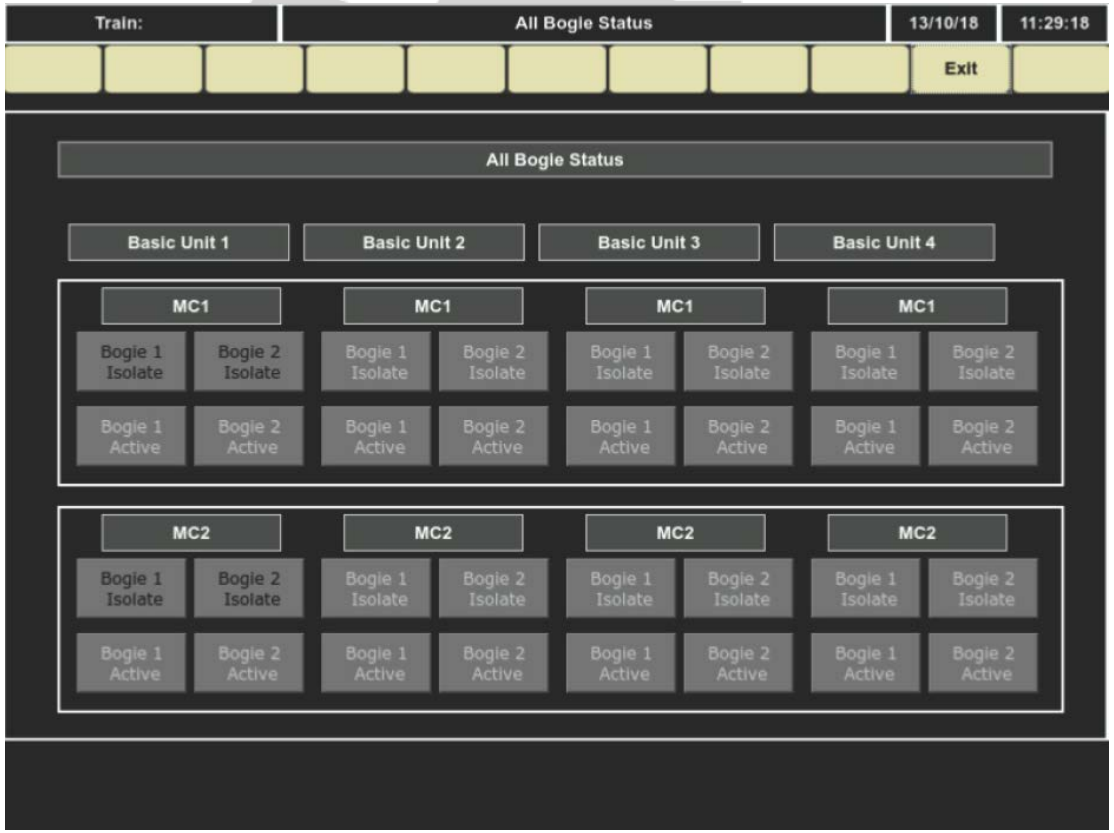
Panto and VCB setting

- 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.

Train settings from Driver Desk

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.



Train settings from Driver Desk

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..

Train settings from Driver Desk

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
- ‘ALL MAC ON’ is also available in the same setting (through Train selection)..

Train settings from Driver Desk

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.

Train settings from Driver Desk

- Parking Brake override
- Air spring override
- BP override

Train settings from Driver Desk

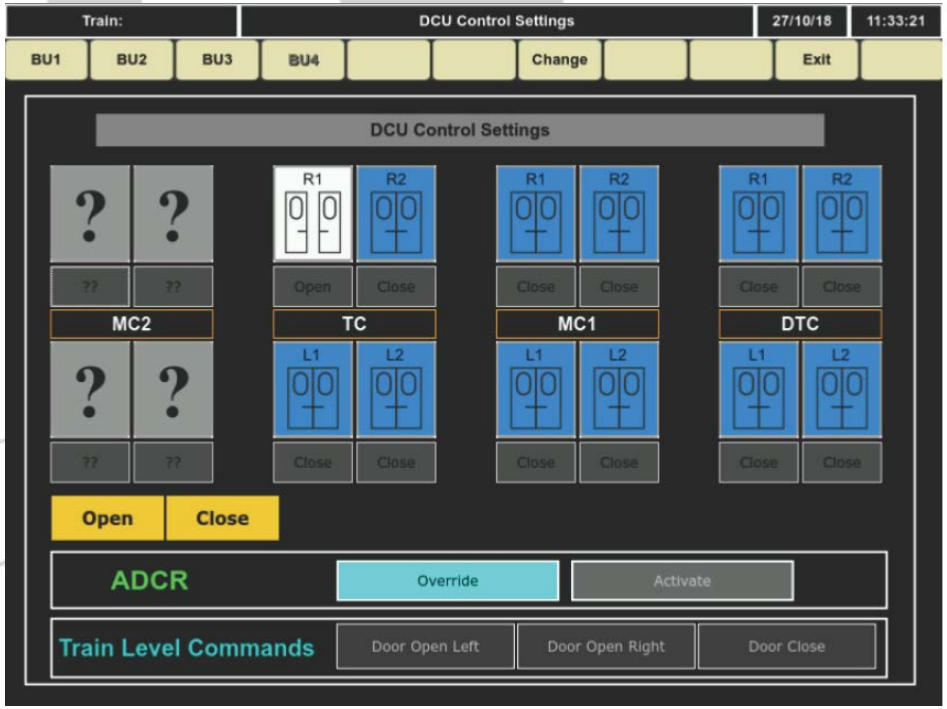
RMPU Control

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

Train settings from Driver Desk

Door control setting

- 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



Major functions of TCMS

- Pantograph Control
- VCB Control

Major functions of TCMS

Master Controller

- Traction Control
- Regenerative Brake Control and total brake calculation Brake Blending
- Interface with Brake control

Major functions of TCMS

- Interface with RMPU control
- Interface with Door control
- Compressor control
- Parking Brake control
- Light Control

Major functions of TCMS

Safety systems

- Rollback Detection
- Vigilance control
- All train level protection (Ex: EOL, EBL, Cab Occupy)

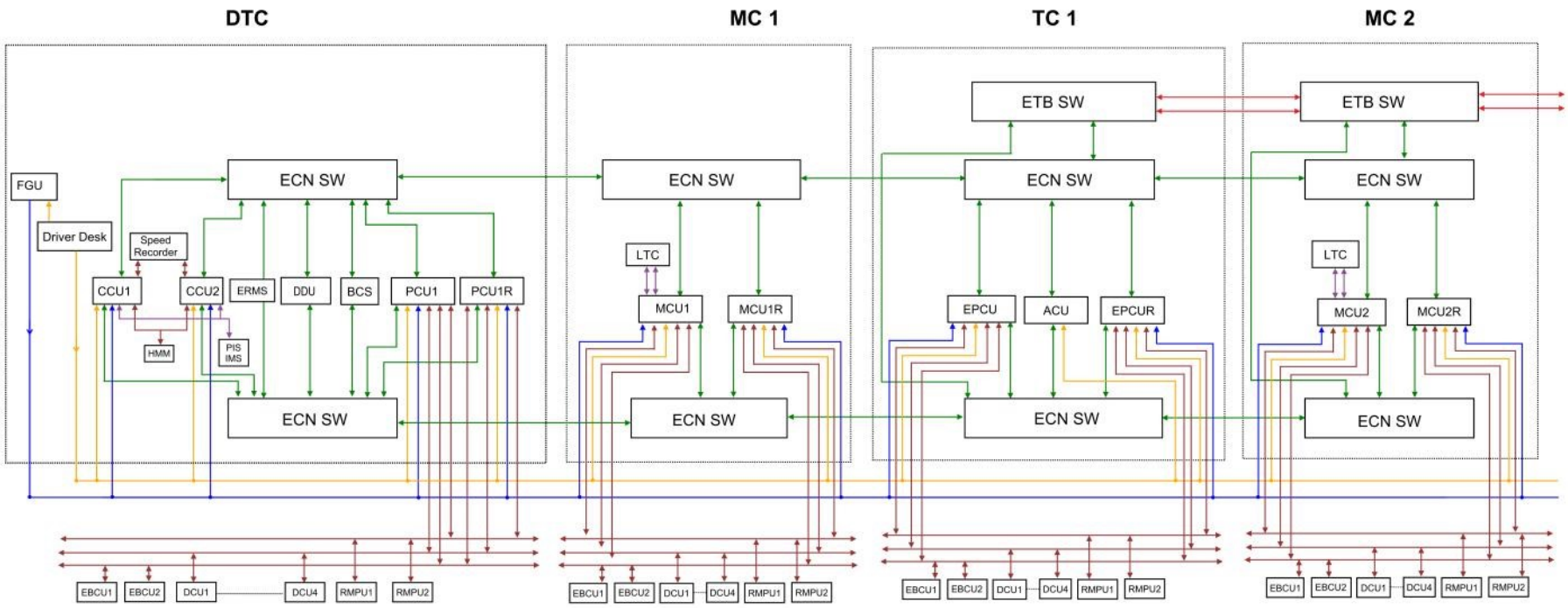
Automatic Train Controls

- Cruise Control
- Neutral Section Control

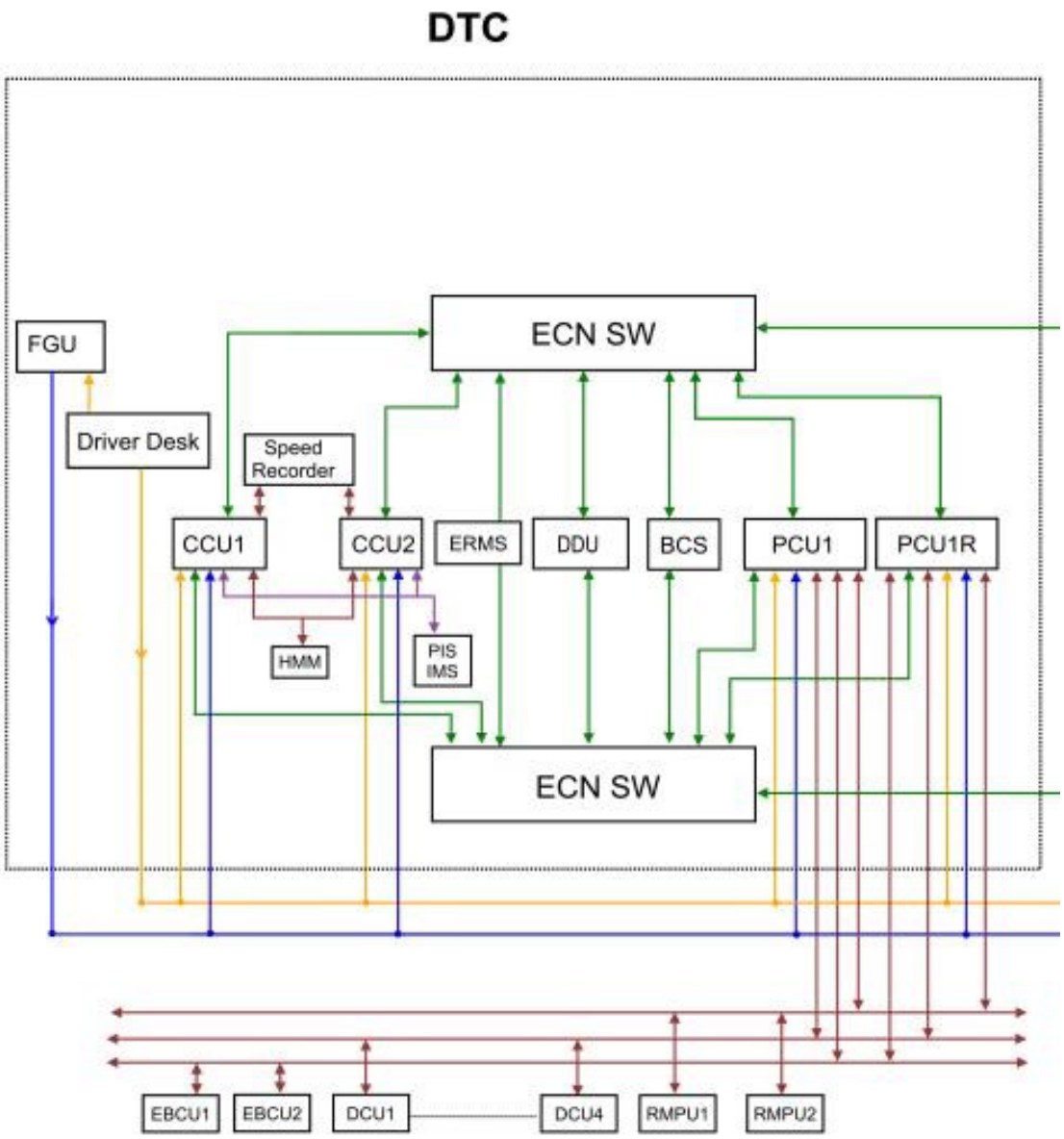
Centralized Controls

- Settings through DDU
- Event Recording
- Centralized coach RMPU monitoring system

Trainline communication



Control components of DTC

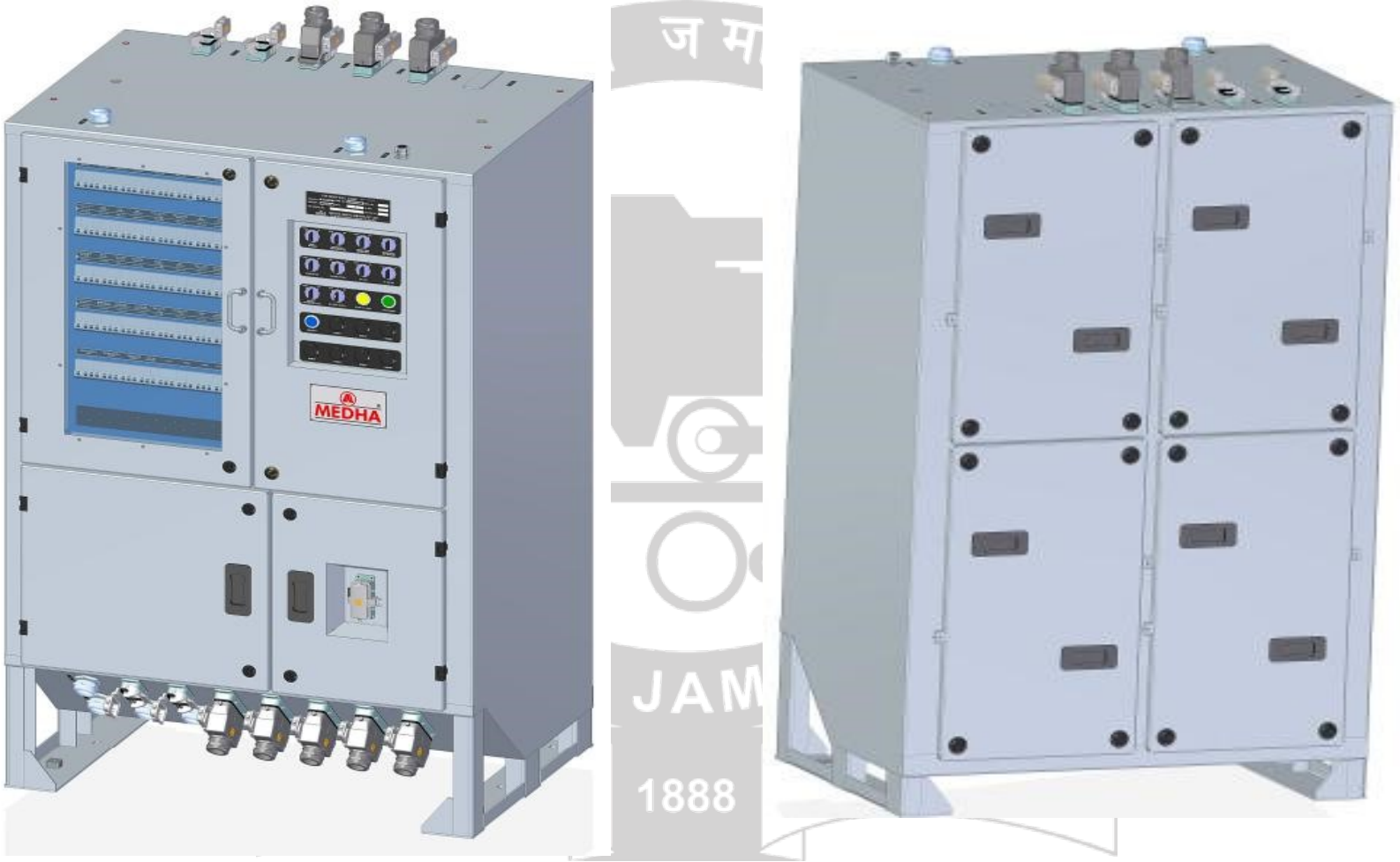


Major components

DTC

- Driver's Desk
- Human Machine Interface (HMI)
  - CCU1, CCU2
  - FGU
- **Digital Signal** through (two) ECN switch (A & G couplers)
  - 4 pin CAT5
- **Trainline Signal** through F1 & F2 couplers
- **Frequency Signal** for RDM through F1 & F2 couplers

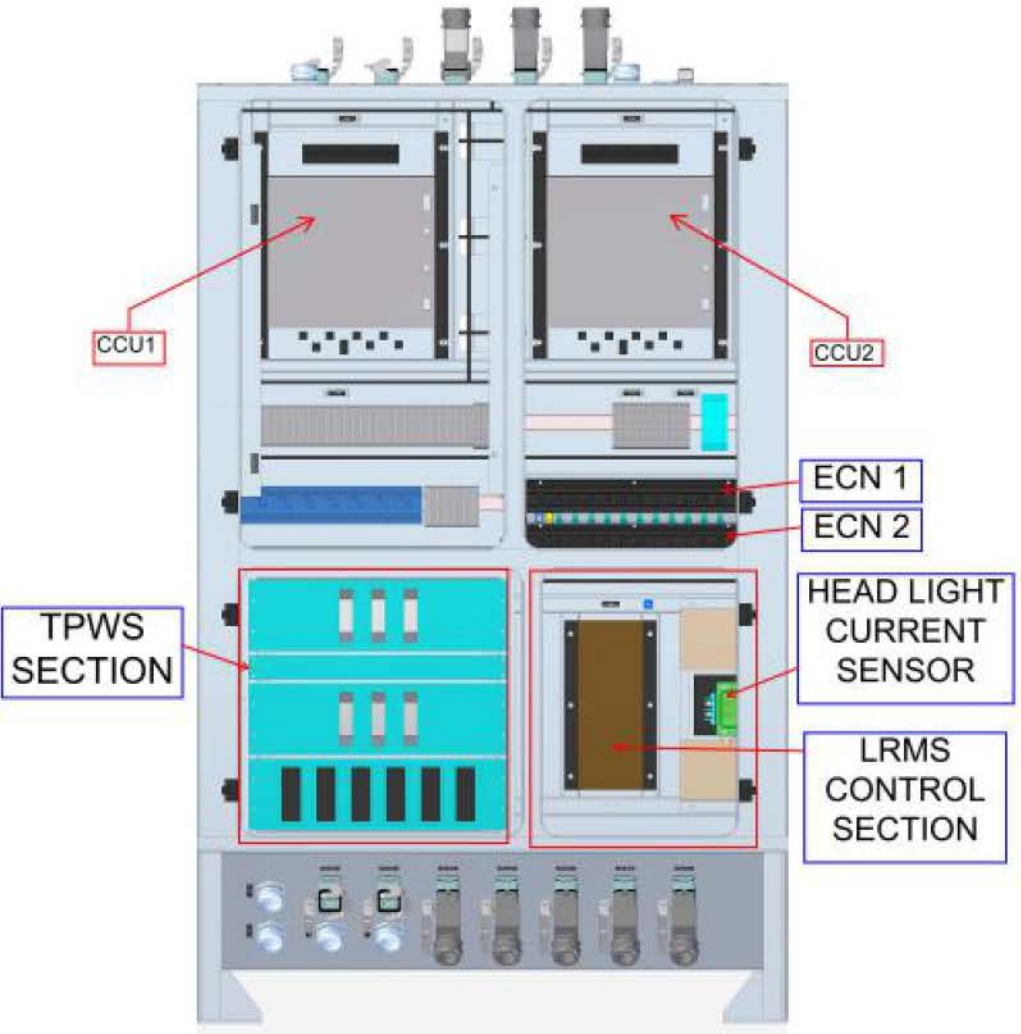
Control Panel in DTC



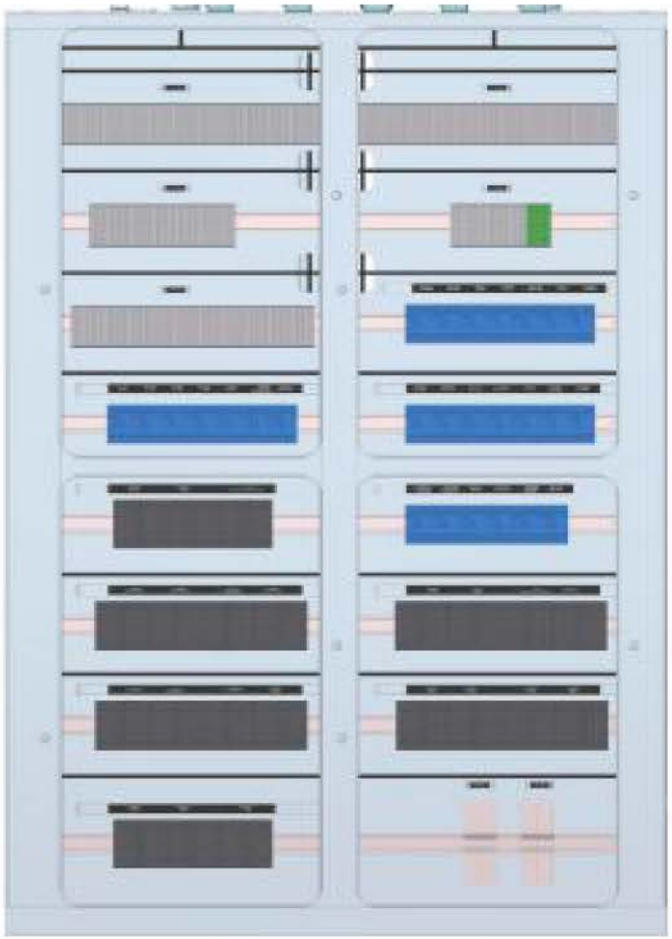
Provided at Rear side of Drivers cabin

Control Panel in DTC

Front View



Back View



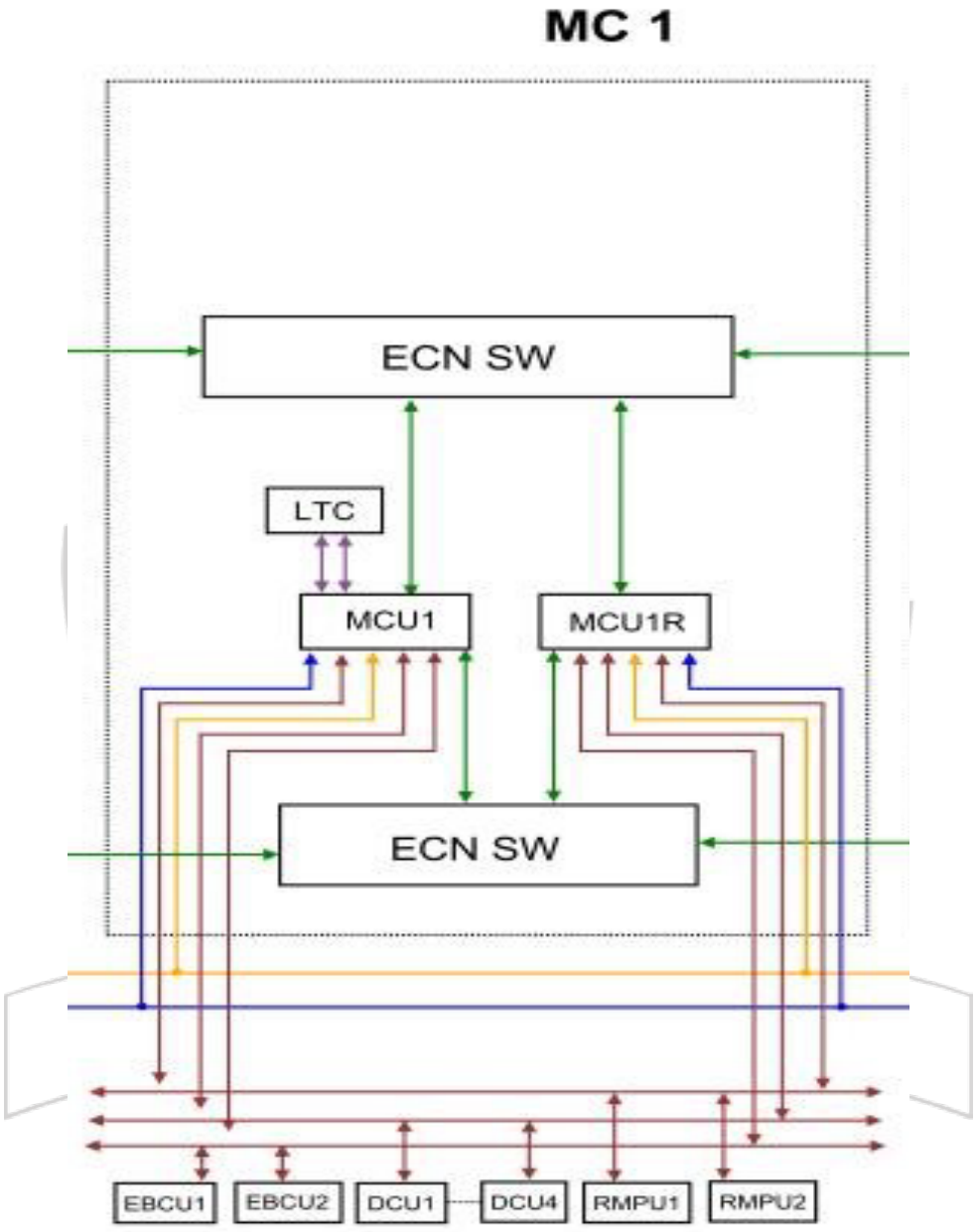
Provided at Rear side of Drivers cabin

In all Coaches

Connected to ECN switch

- System Control (through Control units – RS 485 Network)
  - Brake Control unit (EBCU1, EBCU2 network)
  - Door Control unit (DCU1, DCU2, DCU3, DCU4 network)
  - RMPU Control unit (RMPU1, RMPU2 network)

Control components of MC

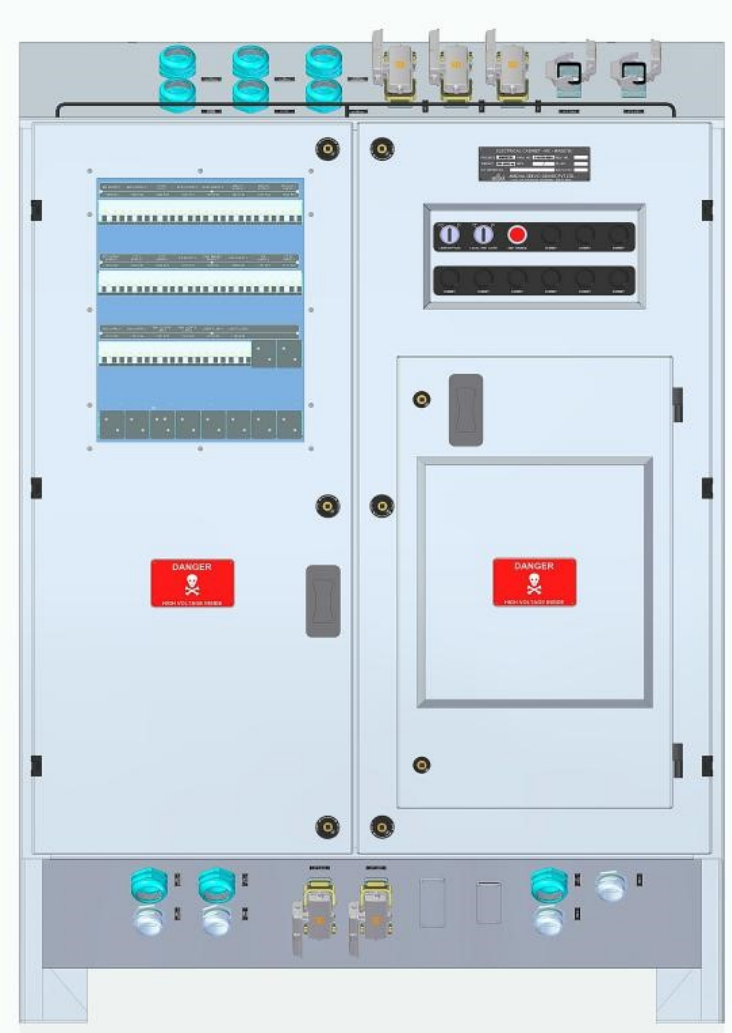


In Motor Coach

Connected to ECN switch

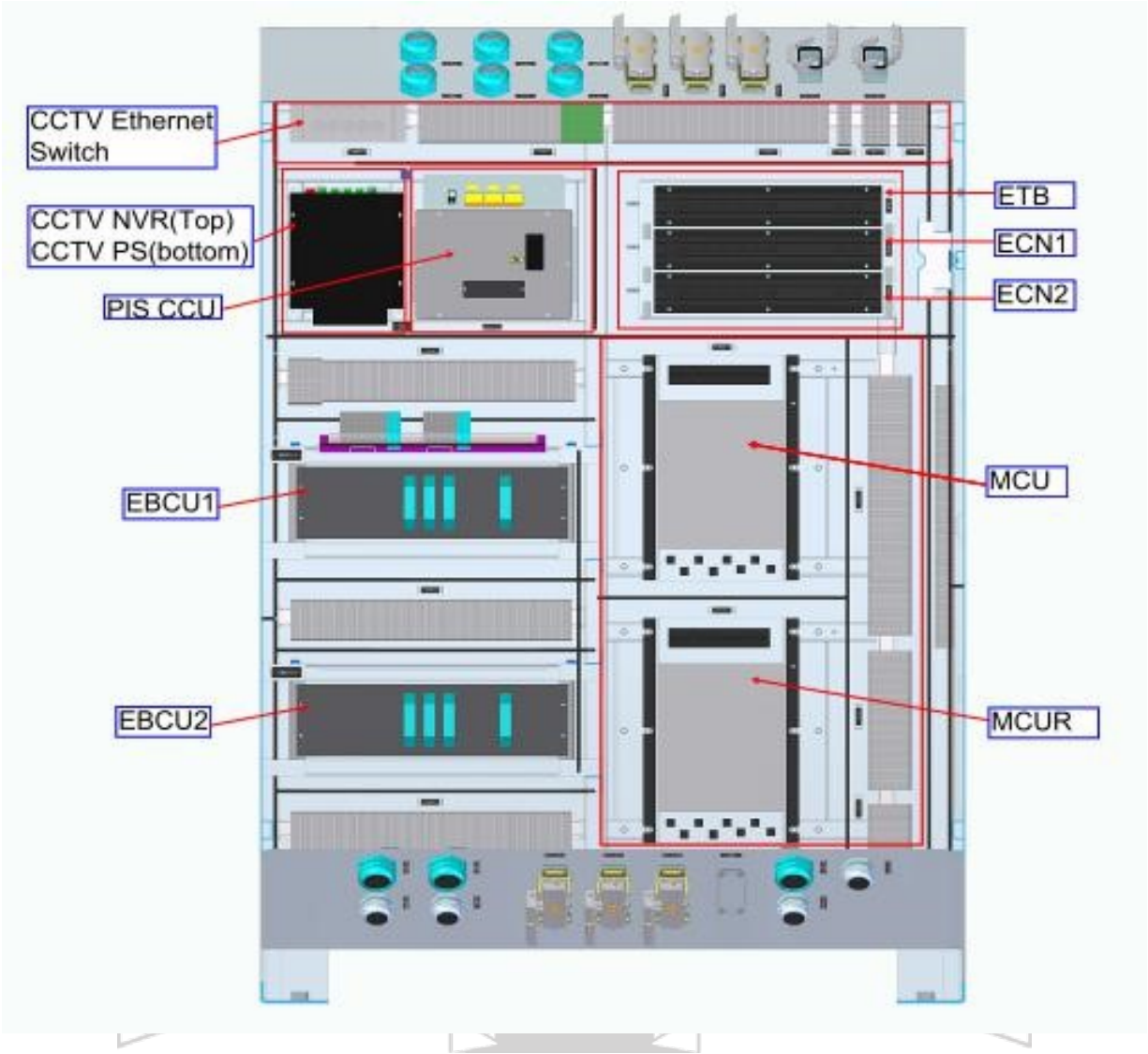
- System Control (through Control units – CAT5)
  - Line and Traction Convertor
  - Motoring
  - Braking

Control Panel in MC



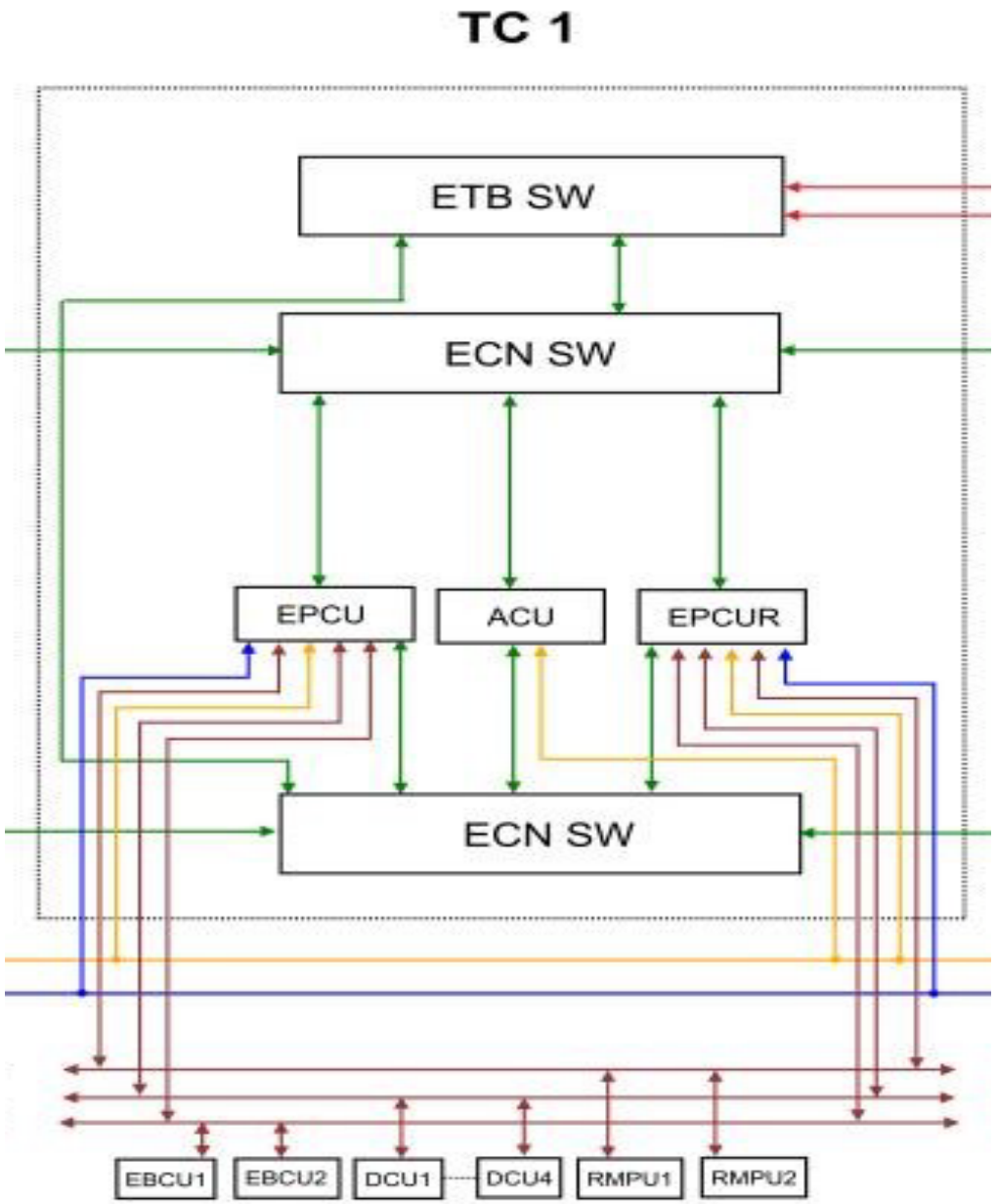
Provided at driving end of coach

Control Panel in MC



Provided at driving end of coach

Control components of TC

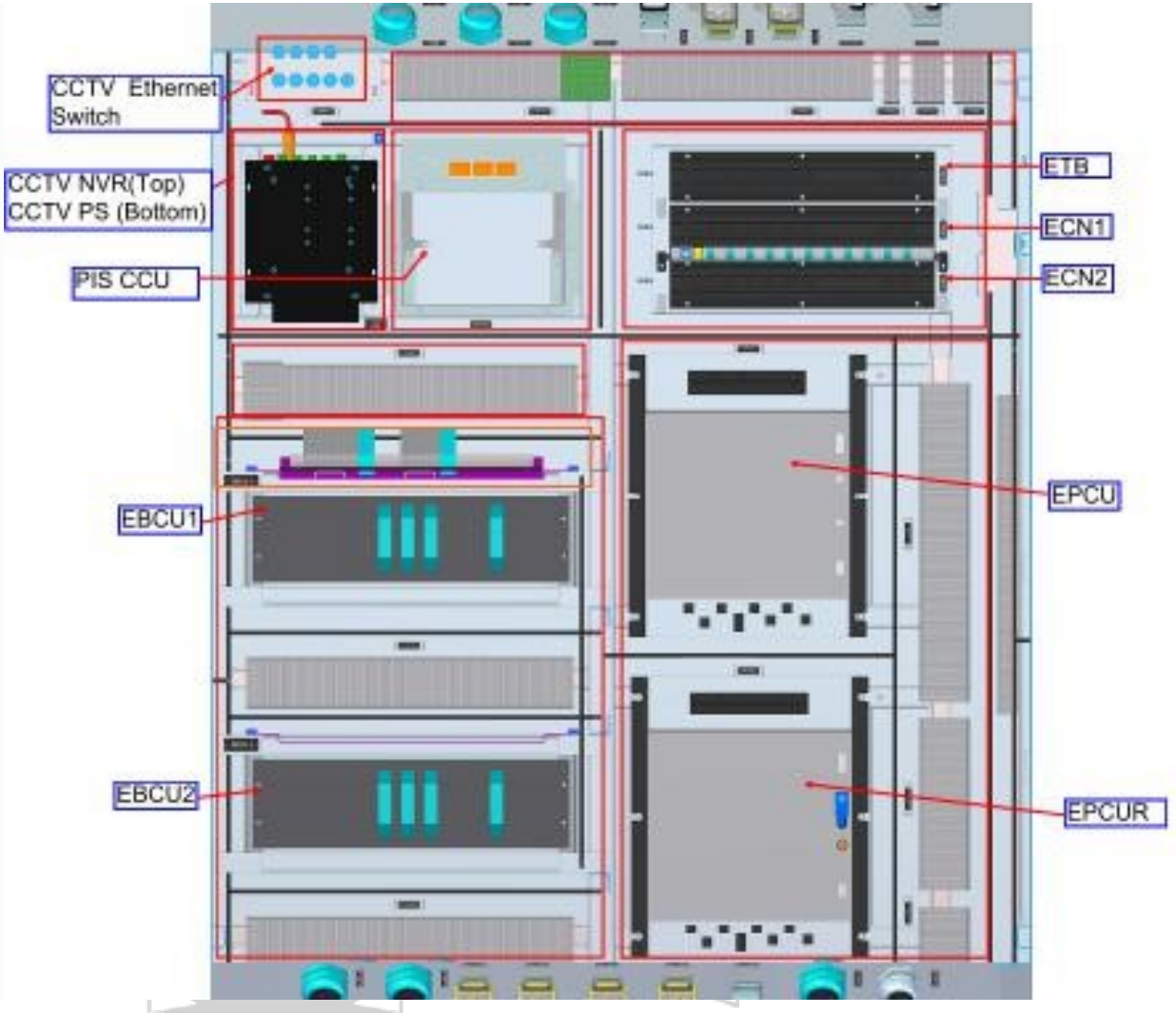


In Trailing Coach

Connected to ECN switch

- System Control (through Control units – CAT5)
  - Auxiliary Convertor Unit
  - Powering auxiliaries

Control Panel in TC



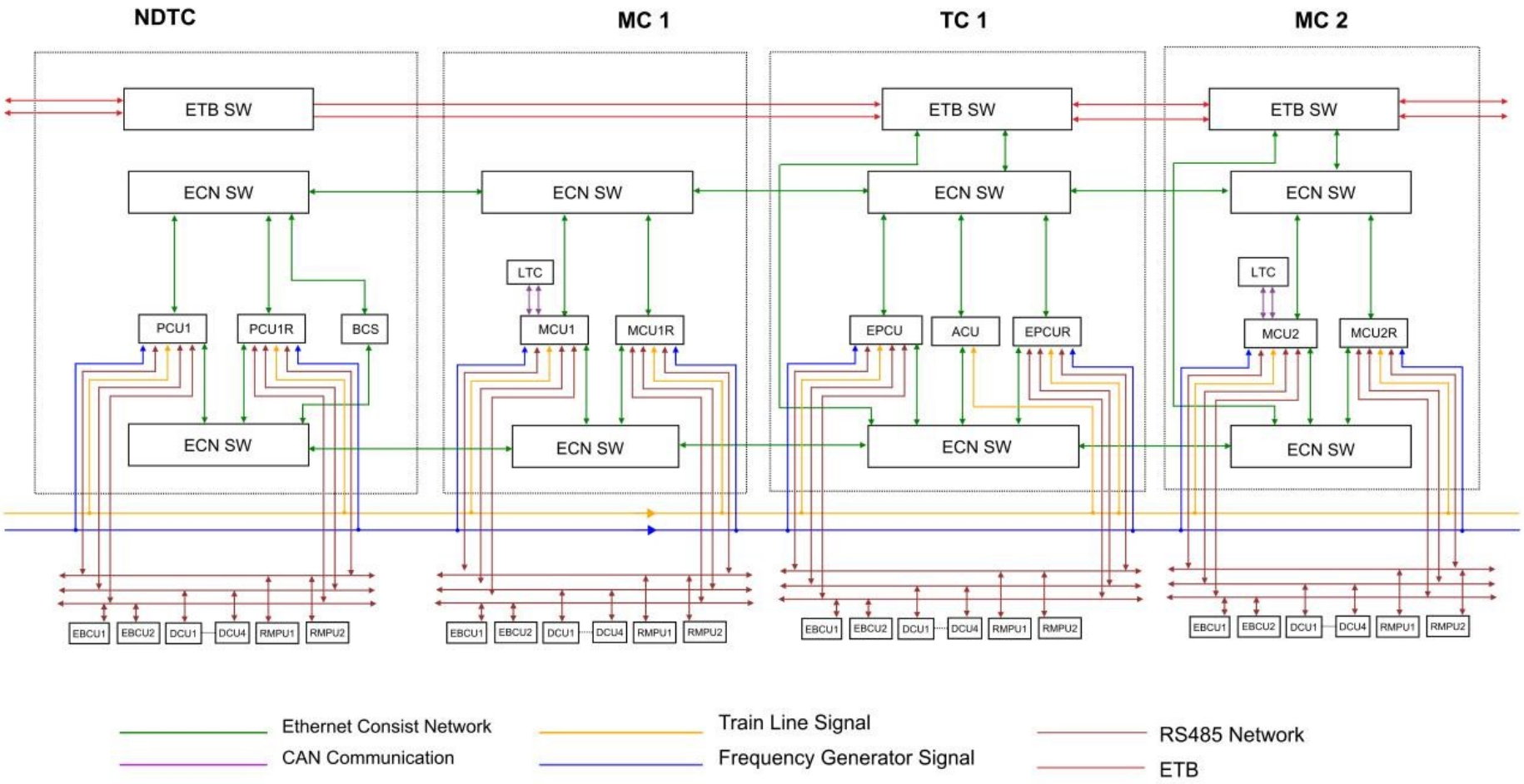
Provided at driving end of coach

In DTC & NDTC

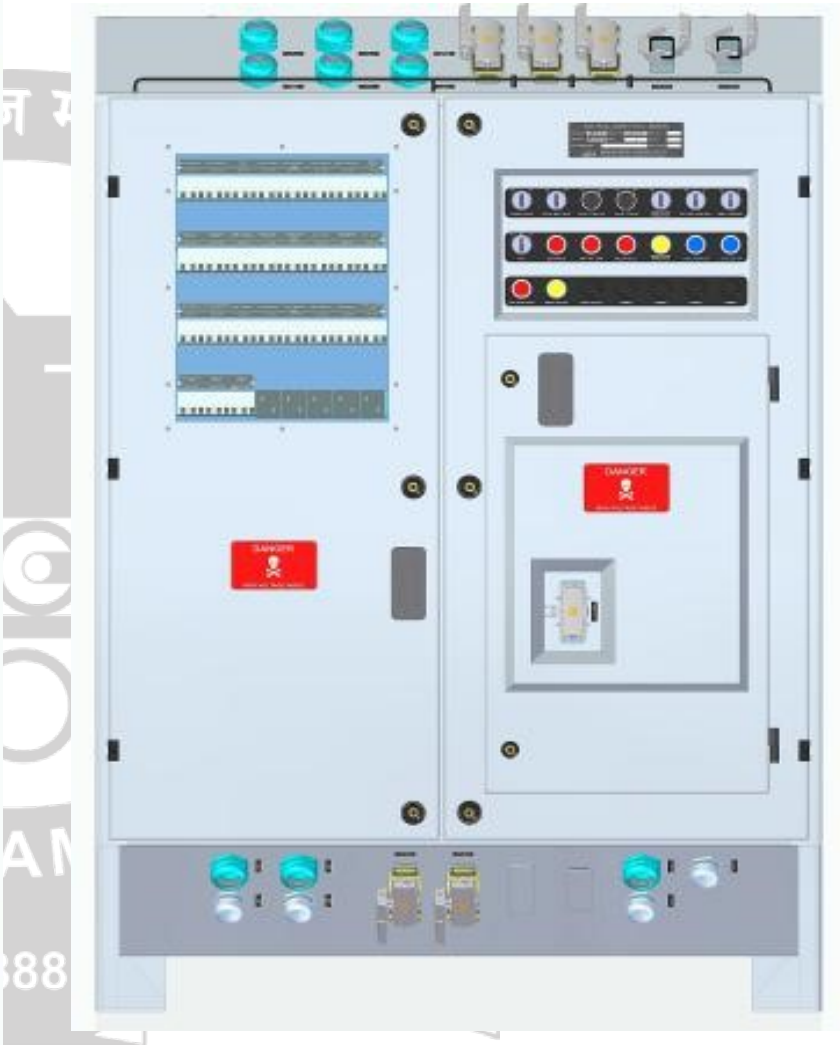
Connected to ECN switch

- System Control (through Control units – CAT5)
  - Controller for Battery Charger
  - Controller for Compressor

Trainline communication

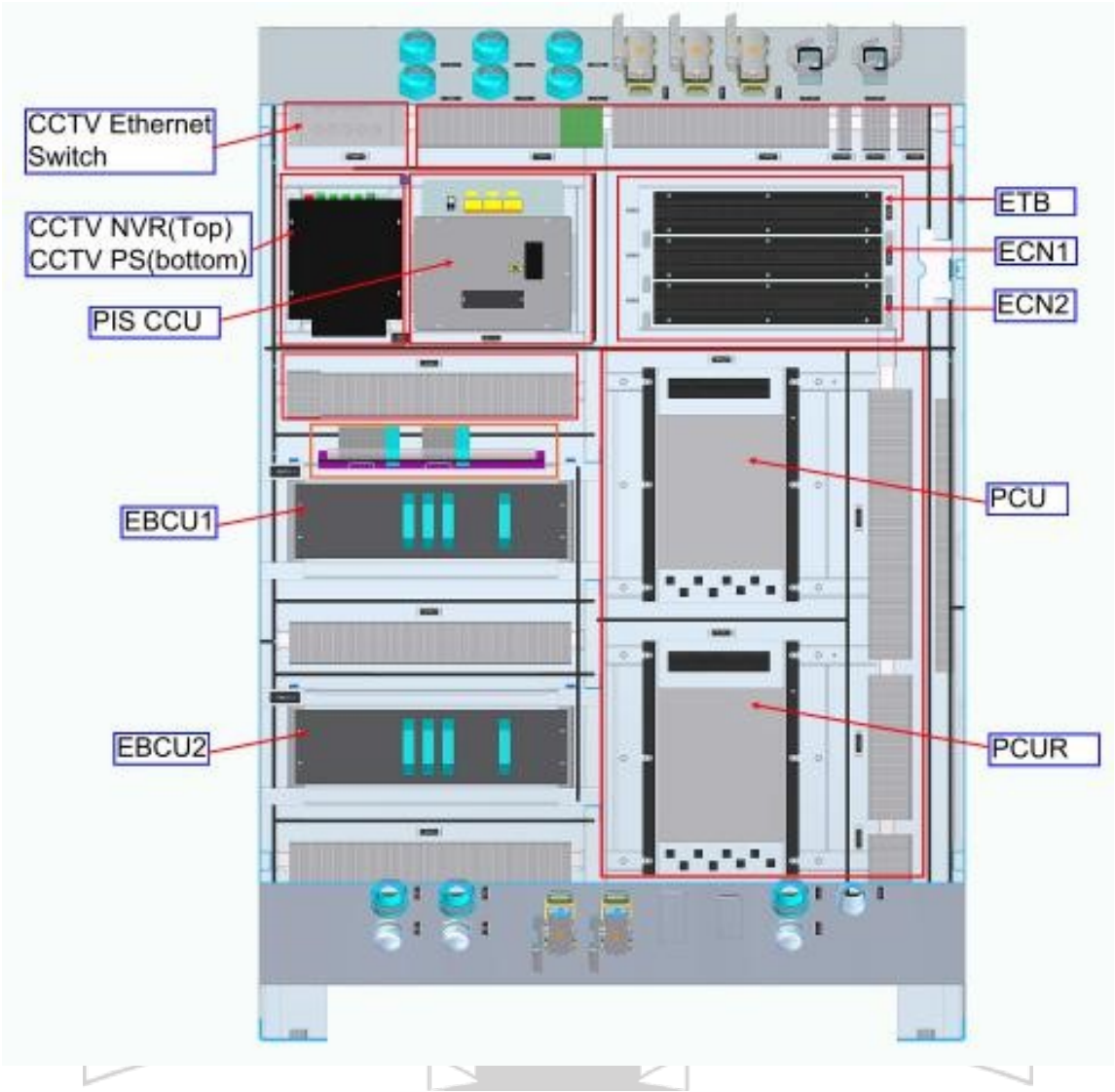


Control Panel in NDTC



Provided at driving end of coach

Control Panel in NDTC



Provided at driving end of coach