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## ABBREVIATIONS

ABBR.	Description
16CN	16 Control – CCB 2.0
16CP	16 Control Portion – CCB 2.0
20CN	20 Control – CCB 2.0
20CP	20 Control Portion – CCB 2.0
ACP	Alarm Chain Pulling
AD/ADZ	Analog Digital Card
ADA	Analog Digital Analog
ADB	Analog Distribution Box
AEB	Automatic Emergency Brake
AG	Auxiliary Generator
AGFB	Auxiliary Generator Field Breaker
ASC	Analog Signal Conditioner
ASG	TCC Computers (In German Language)
AUX GEN	Auxiliary Generator
B1 TO B4	Dynamic Braking Contactors 1 To 4
BB C/O	Blended Brake Cut Out
BC	Brake Cylinder
BE	Braking Effort
BL KEY	Box Lever Key
BP	Brake Pipe Pressure
BPCN	Brake Pipe Control
BPCP	Brake Pipe Control Portion
BPT	Brake Pipe Transducer
BVC	Brake Valve Controller
BVJ1	Brake Valve Connector
CB MAB	Circuit Breaker Micro Air Brake
CCB	Computer Control Brake
COM	Communication Card – EM 2000
CPZ	Central Processing Card
CRU	Computer Relay Unit
DB1	Supplies Power For Magnet Valves And Relay
DCL	Direct Current Link

ABBR.	Description
DIO	Digital Input Output
DIZ	Diagnostic Card The Fault Code - CCB 1.5
DVR	Digital Voltage Regulator
EBT	Electronic Blow Down Timer
EBV	Electronic Brake Valve
ECC-1	Electrical Control Cabinet – 1
ECC-2	Electrical Control Cabinet – 2
ECC-3	Electrical Control Cabinet – 3
ECC-4	Electrical Control Cabinet – 4
EFCO	Emergency Fuel Cut Off
EM2000	Electro Motive 2000
EMD	Electro Motive Division
EMER	Emergency
ECP	Engine Control Panel
EPA1	Equalizing Reservoir Control Card - CCB 1.5
EPA2	Brake Cylinder Pressure Control Card - CCB 1.5
EPA3	Brake Cylinder Equalizing Pressure Control Card - CCB 1.5
EPD	Engine Protective Device
EPU	Engine Pick Up
ER	Equalizing Reservoir
ERT	Equalizing Reservoir Transducer
ERCN	Equalizing Reservoir Control
ERCP	Equalizing Reservoir Control Portion
ERS	Engine Run Switch
ETP1 & 2	Engine Temperature Probe 1 & 2
FCF	Fan Contactor Full Speed
FCS	Fan Contactor Slow Speed
FDB	Frequency Distribution Box
FOR	Fiber Optic Receiver
FP & ES	Fuel Prime & Engine Start
FP	Feed Pipe
FP RLY	Fuel Pump Relay

ABBR.	Description
Control/FP SLIDE SWITCH	Control/Fuel Pump Slide Switch
FS	Full Service
GBC	Governor Booster Pump Contactor
GF	Generator Field
GFB	Generator Field Breaker
GFC	Generator Field Contactor
GFD	Generator Field Decay
GTO	Gate Turn Off Thyrister
GTOPS	Gate Turn Off Power Supply
HLPR	Helper
HOD	Hot Oil Detector
IGBT	Insulated Gate Bipolar Transistor
LON	Local Network
IPR	Inverter Protective Resistor
KE	Knorr Emergency
LCC	Locomotive Computer Control
LCU	Locomotive Control Unit
LLOB	Low Lube Oil Button
LT SWITCH	Lead/Trail Switch
LWP	Low Water Pressure
LWS TEST COCK	Low Water Switch Test Cock
MAB	Micro Air Breaker
MGV	Main Generator Voltage
MMC	Miss Management By Crew
MR	Main Reservoir
MRPT	Main Reservoir Pressure Transducer
MUSD	Multiple Unit Shut Down
MV16	Magnet Valve 16
MVCC	Magnet Valve For Compressor Control
MVEBT	Magnet Valve For Electronic Blow Timer
MVER	Magnet Valve Equalizing Reservoir
NYAB	New York Air Brake

ABBR.	Description
OPMODE	Operation Mode
OSTA	Over Speed Trip Assembly
PCS	Pneumatic Control Switch
PCU	Pneumatic Control Unit
PERCOS	Pneumatic Equalizing Reservoir Cut out Switch
PROP	Propulsion
PS5	Power Supply Module 5
PSJB	Power Supply Junction Box
PVBP	Piston Valve For Brake Pipe
PWR-A MODULE	Power A Module
QRV	Quick Release Valve
RCP	Relay Control Portion
REV	Reverser
RE	Relief Engine
RHSF	Reverser Handle Forward
RHSR	Reverser Handle Reverse
SS9A	Supplies Power To Short Hood Console- CCB 1.5
SS9B	Supplies Power To Long Hood Console- CCB 1.5
ST & STA	Starting and Starting Auxiliary
SV2	Supplies Power For Air Brake Computer - CCB 1.5
SVJ	Supplies Power To (MVER, MVEM, MVBP, MV53)- CCB 1.5
TCC	Traction Control Converter
TCCPS	Traction Control Converter Power Supply
TE	Tractive Effort
TH	Throttle Handle
TL24T	Trail Line 24T
TL	Train Line
TLPR	Turbo Lube Oil Pump Relay
TPU RPM	Turbo Pick Up RPM
VCD	Vigilance Control Device
VCU	Voltage Conditioning Unit
WW Gov.	Wood Ward Governor

<b>LOCOMOTIVES GENERAL DATA</b>			
<b>DESCRIPTION</b>	<b>WDG4</b>	<b>WDP4/WDP4B</b>	<b>WDG4D/WDP4D</b>
<b>Locomotive Model</b>	GT46 MAC	GT46 PAC	GT 46 MAC
<b>Bogie Type</b>	CO-CO	BO1-1BO (WDP4) CO-CO (WDP4B)	CO-CO
<b>Locomotive Power</b>	4000/4500 HP	4000/4500 HP	4500
<b>Power Pack</b>			
<b>Engine Type (with turbo)</b>	Two Stroke	Two Stroke	Two Stroke
<b>Model Name</b>	710G3B	710G3B	710G3B
<b>No. of Cylinders</b>	16	16	16
<b>Engine 8<sup>th</sup> notch RPM</b>	904/950 RPM	904/950 RPM	950 RPM
<b>Engine Idle RPM</b>	269 RPM	269 RPM	269 RPM
<b>Low Idle RPM</b>	200 RPM	200 RPM	200 RPM
<b>Main Generator Assembly Model</b>	TA17+CA6B	TA17+CA6B	TA17+CA6B
<b>Traction Alternator Rectified Output</b>			
<b>Maximum Voltage</b>	2600 VDC	2600 VDC	2600 VDC
<b>Maximum Continuous Current</b>	1250A	1250A	1250A
<b>Companion Alternator Output</b>	CA6B	CA6B	CA6B
<b>Nominal Voltage</b>	230V AC	230V AC	230V AC
<b>AC Auxiliary Generator Model</b>	5A-8147	5A-8147	5A-8147
<b>Nominal AC Voltage</b>	55 VAC	55 VAC	55 VAC
<b>Rectified Voltage</b>	74 VDC	74 VDC	74 VDC
<b>Maximum Power Output</b>	18KW	18KW	18KW
<b>Traction Motor</b>			
<b>Type</b>	3 PHASE AC Induction	3 PHASE AC Induction	3 PHASE AC Induction

DESCRIPTION	WDG4	WDP4/WDP4B	WDG4D/WDP4D
<b>Model</b>	1TB2622	1TB2622	1TB2622
<b>Numbers</b>	6 (3 Per Bogie)	4 (2 Per Bogie)/ 6 (3 Per Bogie) (WDP4B)	6 (3 Per Bogie)
<b>Gear ratio</b>	90:17	77:17	90:17 WDG4D 77:17 WDP4D
<b>Traction Inverter</b>			
<b>Name</b>	TCC1, TCC2	TCC1, TCC2	TCC1, TCC2
<b>Model</b>	1 GE 420	1 GE 420	1 GE 420
<b>Numbers</b>	2 (1 In Every Bogie) 6 (Medha System)	2 (1 In Every Bogie) 6 (Medha System)	2 (1 In Every Bogie) 6 (Medha System)
<b>Type</b>	Voltage Source Inverter (Based On IGBT Tech)	Voltage Source Inverter (Based On IGBT Tech)	Voltage Source Inverter (Based On IGBT Tech)
<b>Battery</b>			
<b>Numbers</b>	8	10	10
<b>Number of cells (individual battery)</b>	4	5	4
<b>Potential (individual cell)</b>	2.2	1.45	2.2
<b>VDC rating (8 hours)</b>	500 Amp. Hr.	150 Amp. Hr.	500 Amp. Hr.
<b>Air Brake System</b>			
<b>Model</b>	Knorr (NYAB) CCB	Knorr (NYAB) CCB	Knorr (NYAB) CCB
<b>Type</b>	Electro pneumatic	Electro pneumatic	Electro pneumatic
<b>Air Compressor</b>			
<b>Model</b>	WLNA49BB (G&D)/RR66101 (ELGI)	WLNA49BB (G&D)/RR66101 (ELGI)	WLNA49BB (G&D)/RR66101 (ELGI)
<b>Type</b>	2 STAGE	2 STAGE	2 STAGE
<b>Number of cylinders</b>	3	3	3

DESCRIPTION	WDG4	WDP4/WDP4B	WDG4D/WDP4D
<b>Delivery / 900 rpm</b>	7.19 M <sup>3</sup> /Minute	7.19 M <sup>3</sup> /Minute	7.19 M <sup>3</sup> /Minute
<b>Cooling medium</b>	Engine coolant	Engine coolant	Engine coolant
<b>Lube Oil Capacity</b>	11.63 ltr – G&D 12 ltr – ELGI	11.63 ltr – G&D 12 ltr – ELGI	11.63 ltr – G&D 12 ltr – ELGI
<b>Dynamic Brake Type</b>	8 Grid	8 Grid	8 Grid
<b>Capacities</b>			
<b>Lube Oil System</b>	1617 ltrs	1617 ltrs	1617 ltrs
<b>Engine Cooling Water System</b>	1045 ltrs	1045 ltrs	1045 ltrs
<b>Sand</b>	0.32 m <sup>3</sup>	0.32 m <sup>3</sup>	0.32 m <sup>3</sup>
<b>Fuel tank</b>	6000 ltr	6000 ltr	6000 ltr WDG4D 5000 ltr WDP4D
<b>Weight</b>	126 T	117 T/123T WDP4B	130.2 T
<b>Major Dimensions</b>			
<b>Height above horn</b>	4.22 mtr	4.22 mtr	4.22 mtr
<b>Maximum width</b>	3.07 mtr	3.07 mtr	3.07 mtr
<b>Length (coupler to coupler)</b>	21.24 mtr	21.24 mtr	22.512 mtr
<b>Locomotive Speed Limit</b>			
<b>Max. speed (as per RDSO Spec)</b>	105 kmph	160 kmph WDP4 135 kmph WDP4B	105 kmph WDG4D 135 kmph WDP4D
<b>Min continuous speed (at Max continuous tractive effort)</b>	22.5 kmph	44.7 kmph	22.5 kmph
<b>Tractive Effort</b>			
<b>Stall limit</b>	540 KN	270KN	540 KN
<b>Continuous limit</b>	400 KN	200KN	400 KN
<b>Dynamic braking effect Maximum</b>	270KN (from 40 to 0 kmph)	270KN (from 40 to 0 kmph)	270KN (From 40 To 0 Kmph)



**COMPARISON VARIOUS TYPES OF WDG4/WDP4 LOCOMOTIVES' CONTROL SYSTEMS**

<b>DESCRIPTION</b>	<b>EMD/MITSUBISHI</b>	<b>EMD/SIEMENS (S1)</b>	<b>SIEMENS (S3)</b>	<b>MEDHA</b>	<b>WDG4D/P4D SIEMENS</b>	<b>WDG4D/P4D (MEDHA)</b>
<b>Horse Power</b>	4500	4000	4500	4500	4500	4500
<b>Main Computer Make</b>	EM2000	EM2000	SIBAS 32	LCC-MAS	LCC-SIBAS	LCC-MAS
<b>TCC Make</b>	Mitsubishi	Siemens	Siemens	Medha	Siemens	Medha
<b>CCB Make</b>	Knorr	Knorr	Knorr	Knorr	Knorr	Knorr
<b>FP/ES Switch Position</b>	Engine Control Panel	Accessories Room/ECP (Mod)	Engine Control Panel	Engine Control Panel	Engine Control Panel	Engine Control Panel
<b>Blended Brake System</b>	Available	Not Available	Available	Available	Available	Available
<b>Blended Brake Disable Switch Location</b>	Engine Control Panel	Not Available	Engine Control Panel	Engine Control Panel	Engine Control Panel	Engine Control Panel
<b>AEB System</b>	Available	Not Available	Available	Not Available	Available	Not Available
<b>RAPB Switch Location</b>	Not Available	Engine Control Panel	Not Available	Engine Control panel	Not Available	Engine Control panel
<b>Governor Booster Pump Motor</b>	Accessories Room	Not Available	Accessories Room	Accessories Room	Accessories Room	Accessories Room
<b>DC Link Switch</b>	ECC1	ECC1	TCC	TCC	TCC	TCC
<b>Event Recorder Memory Freeze Switch</b>	ECC1 Right side down	ECC1 Right side down	ECC1 Right side down	Engine Control Panel	ECC1 Right side down	Engine Control Panel

**COMPARISON VARIOUS TYPES OF WDG4/WDP4 LOCOMOTIVES' CONTROL SYSTEMS**

<b>DESCRIPTION</b>	<b>EMD/MITSUBISHI</b>	<b>EMD/SIEMENS (S1)</b>	<b>SIEMENS (S3)</b>	<b>MEDHA</b>	<b>WDG4D/P4D SIEMENS</b>	<b>WDG4D/P4D (MEDHA)</b>
<b>SCR</b>	ECC1 Left side Down	ECC1 Left side Down	ECC1 Left side Down	ECC1 Right Side	ECC1 Left side Down	ECC1 Right Side
<b>Traction Motor Enable Disable System</b>	As per Truck	As per Truck	As per Truck	As per Traction Motor	As per Truck	As per Traction Motor
<b>VCD Bye Pass Switch</b>	Not Available	Not Available	Slide Switch on Engine Control Panel	Through Display	Not Available	Not Available
<b>MR Feedback</b>	Through MRPT Available in ECC3	Through MRPT Available in ECC3	Through MRPT Available in ECC3	Through MRPT Available in ECC3	Through MRPT Available in ECC3	Through MRPT Available in ECC3
<b>TCC Blower Motor</b>	2 No.s	2 No.s	2 No.s	6 No.s	2 No.s	6 No.s
<b>GF and GFD Location</b>	ECC1 Down Middle	ECC1 Down Middle	ECC1 Down Middle	ECC1 Left Downward	ECC1 Down Middle	ECC1 Left Downward
<b>MLRMS Antenna Assembly</b>	Not Available	Not Available	Provision available but not Provided	Above Drivers Cab	Above Drivers Cab	Above Drivers Cab

**COMPARISON OF VARIOUS RELAYS IN HHP LOCOMOTIVES**

Name of the Relay	WDG4/P4				WDG 4D/P4D	
	EMD	EMD+SIEMENS S1	SIEMENS S3	MEDHA	SIEMENS S3	MEDHA
<b>Dryer Control Relay (DCR)</b>	Available	Available	Available	Available	Available	Available
<b>Compressor Synchronization Relay</b>	Available	Available	Available	Available	Available	Available
<b>Flasher relay (FLSHR)</b>	Available	Available	Available	Available	Available	Available
<b>Alarm Relay (AR)</b>	Available	Available	Available	Available	Available	Available
<b>Computer control Relay (MCB)</b>	Available	Available	Available	Available	Available	Available
<b>Fuel Pump Relay (FPR)</b>	Available	Available	Available	Available	Available	Available
<b>Brake Warn Relay (BWR)</b>	Available	Available	Available	Available	Available	Available
<b>Pneumatic Control Relay (PCR)</b>	Available	Available	Available	Available	Available	Available
<b>Engine Fuel cut off switch (EFCO)</b>	Available	Available	Available	Available	Available	Available
<b>Turbo lube oil Pump Relay (TLPR)</b>	Available	Available	Available	Available	Available	Available

**COMPARISON OF VARIOUS RELAYS IN HHP LOCOMOTIVES**

	<b>WDG4/P4</b>				<b>WDG4D/P4D</b>	
	<b>EMD</b>	<b>EMD+SIEMENS S1</b>	<b>SIEMENS S3</b>	<b>MEDHA</b>	<b>SIEMENS S3</b>	<b>MEDHA</b>
<b>Gen. Field Decay Relay(GFDR)</b>	Not Available	Not Available	Available	Not Available	Available	Available
<b>Radar Test Relay (RDRTST)</b>	Not Available	Not Available	Available	Available	Available	Available
<b>Wheel Slip Relay (WSR)</b>	Not Available	Not Available	Not Available	Available	Not Available	Available
<b>Wheel Slip Light Relay (WL)</b>	Available	Available	Available	Not Available	Available	Not Available
<b>Start Relay (START)</b>	Not Available	Not Available	Available	Not Available	Available	Not Available
<b>Radiator Fan 1 Slow Relay (FCS1R)</b>	Not Available	Not Available	Available	Not Available	Available	Not Available
<b>Radiator Fan 1 Fast Relay (FCF1R)</b>	Not Available	Not Available	Available	Not Available	Available	Not Available
<b>Radiator Fan 2 Fast Relay (FCF2R)</b>	Not Available	Not Available	Available	Not Available	Available	Not Available
<b>Gov Booster Pump Contactor Relay (GBC)</b>	Available	Not Available	Available	Available	Available	Available

**COMPARISON OF VARIOUS RELAYS IN HHP LOCOMOTIVES**

	<b>WDG4/P4</b>				<b>WDG 4D/P4D</b>	
	<b>EMD</b>	<b>EMD+SIEMENS S1</b>	<b>SIEMENS S3</b>	<b>MEDHA</b>	<b>SIEMENS S3</b>	<b>MEDHA</b>
<b>TCC Blower Motor 1 Speed relay (TCC 1SR)</b>	Not Available	Not Available	Available	Not Available	Available	Not Available
<b>TCC Blower Motor 2 Speed relay (TCC 2 SR)</b>	Not Available	Not Available	Available	Not Available	Available	Not Available
<b>Dynamic Brake Ground Relay (DBG R)</b>	Available	Available	Not Available	Not Available	Not Available	Not Available
<b>Auxiliary Generator Trip Relay (AG Trip)</b>	Not Available	Not Available	Not Available	Available	Not Available	Not Available
<b>Power Supply Request Relay (PSRQ)</b>	Available	Not Available	Not Available	Not Available	Not Available	Not Available
<b>Auto Emergency Brake Relay (AEBR)</b>	Available	Not Available	Not Available	Not Available	Not Available	Not Available
<b>Voltage Protection Contractor Relay (VPC)</b>	Not Available	Available	Not Available	Not Available	Not Available	Not Available

**COMPARISON OF VARIOUS CIRCUIT BREAKERS IN HHP LOCOMOTIVES**

	WDG4/WDP4				WDG 4D/WDP4D	
	EMD	EMD+SIEMENS S1	SIEMENS S3	MEDHA	SIEMENS S3	MEDHA
<b>Light</b>	Available	Available	Available	Available	Available	Available
<b>Head Light</b>	Available	Available	Available	Available	Available	Available
<b>Radio</b>	Available	Available	Available	Available	Available	Available
<b>Cab fan</b>	Available	Available	Available	Available	Available	Available
<b>Air dryer</b>	Available	Available	Available	Available	Available	Available
<b>Local control</b>	Available	Available	Available	Available	Available	Available
<b>Control</b>	Available	Available	Available	Available	Available	Available
<b>Auxiliary generator field</b>	Available	Available	Available	Available	Available	Available
<b>Fuel pump</b>	Available	Available	Available	Available	Available	Available
<b>Micro air brake</b>	Available	Available	Available	Available	Available	Available
<b>Computer control</b>	Available	Available	Available	Available	Available	Available
<b>Generator field</b>	Available	Available	Available	Available	Available	Available
<b>Filter blower motor</b>	Available	Available	Available	Available	Available	Available
<b>Turbo</b>	Available	Available	Available	Available	Available	Available
<b>TCC 1 blower</b>	Available	Available	Available	Available	Available	Available
<b>Traction control converter 2 (TCC2) Blower</b>	Available	Available	Available	Available	Available	Available

**COMPARISON OF VARIOUS CIRCUIT BREAKERS IN HHP LOCOMOTIVES**

	<b>WDG4/WDP4</b>				<b>WDG 4D/WDP4D</b>	
	<b>EMD</b>	<b>EMD+SIEMENS S1</b>	<b>SIEMENS S3</b>	<b>MEDHA</b>	<b>SIEMENS S3</b>	<b>MEDHA</b>
<b>Traction control converter 3 to 6 blower</b>	Not Available	Not Available	Not Available	Available	Not Available	Available
<b>Event recorder</b>	Available	Available	Available	Not Available	Available	Not Available
<b>AC control</b>	Available	Available	Not Available	Available	Not Available	Not Available
<b>DC control</b>	Available	Available	Not Available	Not Available	Not Available	Available
<b>DC link1</b>	Not Available	Not Available	Not Available	Available	Not Available	Available
<b>DC link2</b>	Not Available	Not Available	Not Available	Available	Not Available	Available
<b>DC link3</b>	Not Available	Not Available	Not Available	Available	Not Available	Available
<b>DC link4</b>	Not Available	Not Available	Not Available	Available	Not Available	Available
<b>DC link5</b>	Not Available	Not Available	Not Available	Available	Not Available	Available
<b>DC link6</b>	Not Available	Not Available	Not Available	Available	Not Available	Available
<b>Governor booster pump</b>	Available	Not Available	Available	Available	Available	Available
<b>Traction control</b>	Available	Available	Not Available	Not Available	Not Available	Not Available
<b>Traction control 2 computer</b>	Not Available	Not Available	Not Available	Available	Not Available	Available
<b>Traction control 4 computer</b>	Not Available	Not Available	Not Available	Available	Not Available	Available

**COMPARISON OF VARIOUS CIRCUIT BREAKERS IN HHP LOCOMOTIVES**

	WDG4/WDP4			WDG 4D/WDP4D		
	EMD	EMD+SIEMENS S1	SIEMENS S3	MEDHA	SIEMENS S3	MEDHA
<b>Traction control 5 computer</b>	Not Available	Not Available	Not Available	Available	Not Available	Available
<b>Traction control 6 computer</b>	Not Available	Not Available	Not Available	Available	Not Available	Available
<b>Traction control converter power supply</b>	Not Available	Not Available	Available	Not Available	Available	Not Available
<b>Auxiliary generator field breaker</b>	Available	Available	Not Available	Not Available	Not Available	Not Available
<b>IGBT supply#1</b>	Available	Available	Not Available	Not Available	Not Available	Not Available
<b>IGBT supply#2</b>	Available	Available	Not Available	Not Available	Not Available	Not Available
<b>PCR Module</b>	Not Available	Not Available	Available	Not Available	Available	Not Available
<b>Display</b>	Not Available	Not Available	Available	Not Available	Available	Not Available
<b>PS5</b>	Not Available	Not Available	Available	Not Available	Available	Not Available
<b>PS4</b>	Not Available	Not Available	Available	Not Available	Available	Not Available
<b>TCC electric blower motor</b>	Available	Not Available	Not Available	Not Available	Not Available	Not Available



# **Chapter No. 1.0**

## **HHP**

### **Locomotive Compartments and Parts**



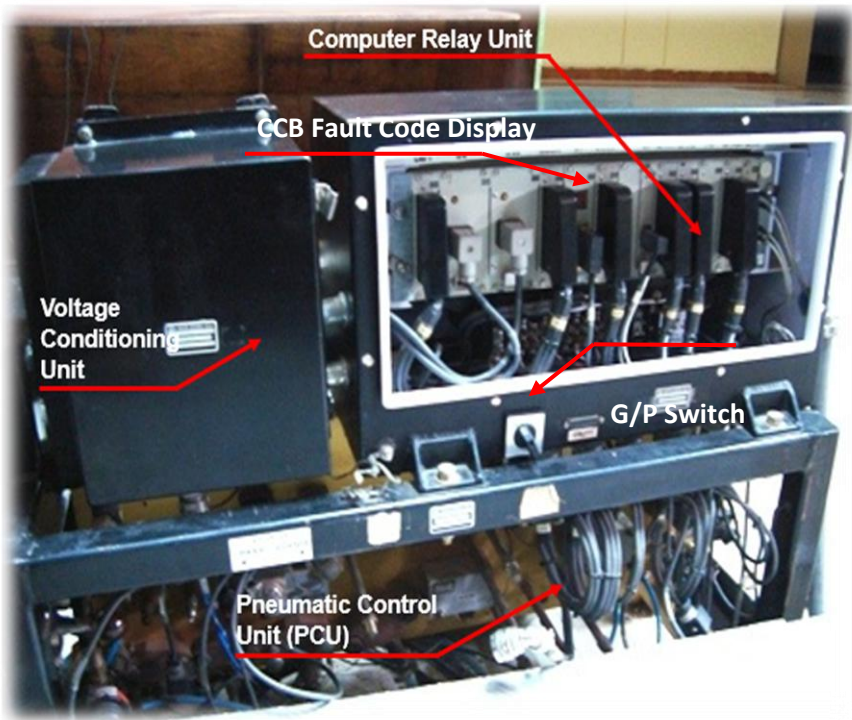
## 1.1 Compartments in Single Cab WDG4/WDP4/WDP4B Locomotive

S. No.	Compartment name	Components/ Parts available
1	<b>Nose Compartment</b>	CCB unit & Dead Engine COC
2	<b>Driver CAB / CAB1</b>	Control Consoles, CAB AC unit
3	<b>ECC-1</b>	Display, Circuit breakers, Engine Control Panel, Locomotive Control Computer, Relays, contactors, Event Recorder etc.
4	<b>ECC-1 Back Panel</b>	Interface module (EMD), Terminal boards and CPC connectors, etc.
5	<b>TCC &amp; DB grids hatch assembly</b>	Phase modules, TCC blower motors, sensors, contactors, DB grids, DB blower motors.
6	<b>Clean Air Compartment &amp; Battery knife switch box</b>	Baagi type fiber glass filter, Cyclonic filters, Dust bin blower motor, IPR, TM blower, Battery knife switch, Starting fuse.
7	<b>Main Alternator Room</b>	Companion Alternator, Traction Alternator, Turbo super charger, After cooler, Oil separator, Eductor tube, Ring gear.
8	<b>Engine Room</b>	16 cylinder Two stroke Diesel Engine, starting motors, Turbo pre/post lubrication motor, Exhaust manifold, soak back filter, lube oil dip stick gauge, turbo filter, .
9	<b>Engine Accessories Room</b>	WW governor, Gov. lay shaft, Fuel oil primary filter conditioning gauge, water pumps, lube oil strainer, fuel bypass sight glass, Main Lube oil pump, piston cooling oil pump, fuel return sight glass, scavenging pump, water glow rod gauge, pressure cap, pressure relief valve handle, EPD, HOD, LWS test cock, Main water drain COC, ETP1 & ETP2, water expansion tank, OSTA resetting handle, LLOB
10	<b>ECC-3 &amp; Hand Brake</b>	Radiator fan contactors, Fuses/ Circuit breakers, MRPT sensor, Hand brake.
11	<b>Compressor Room and Engine Equipment Room</b>	Compressor, L/H sanders magnet valves, L/H horn magnet valve, Electronic blower timer magnet valve, Magnet valve for compressor control (MVCC), MVCC test coc, MRPT COC & Quick connector, Fuel pump motor, lube oil filter drum, lube oil cooler, fuel primary filter, lube filter drum condition gauge

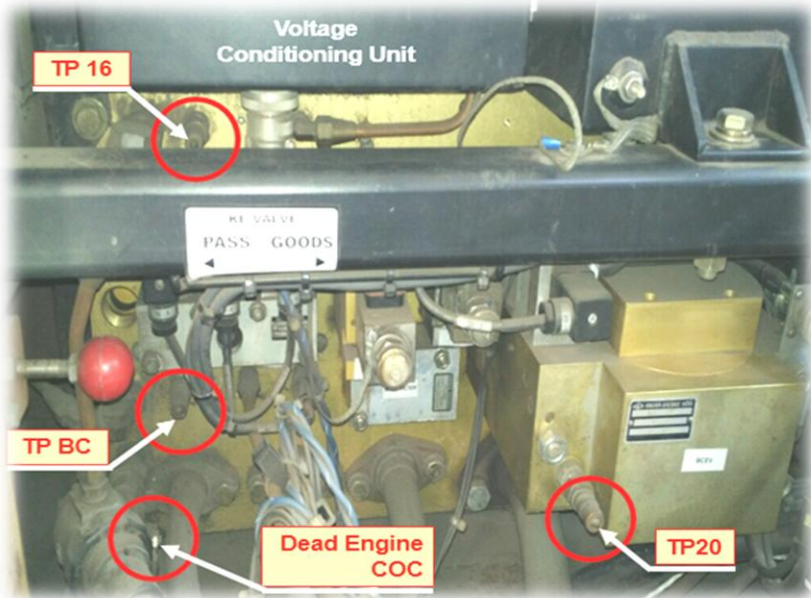
12	<b>Radiator Room</b>	Radiators, Radiator cooling fans, MR cooling coils, fibre glass filters
13	<b>ECC2 &amp; RADAR</b>	ST & STA contactors, Battery Charging Assembly, AG output breaker, RADAR
14	<b>Under Truck &amp; Traction Motors</b>	Traction motors, Fuel tank & Fuel pump motor (in new locos), air dryer, MR tanks, MR safety Valve and cut out coc's
<b>1.2 Additional Compartments in Dual CAB WDP4D/WDG4D locomotive</b>		
16	<b>ECC4</b>	Engine control panel, Circuit breaker panel (Computer control, MAB, GFB, Lighting breaker)
17	<b>CAB2</b>	Drivers Desk consisting of computer Displays, Control Drum, Brake control unit, switches and AC unit.

### 1.3 NOSE COMPARTMENT

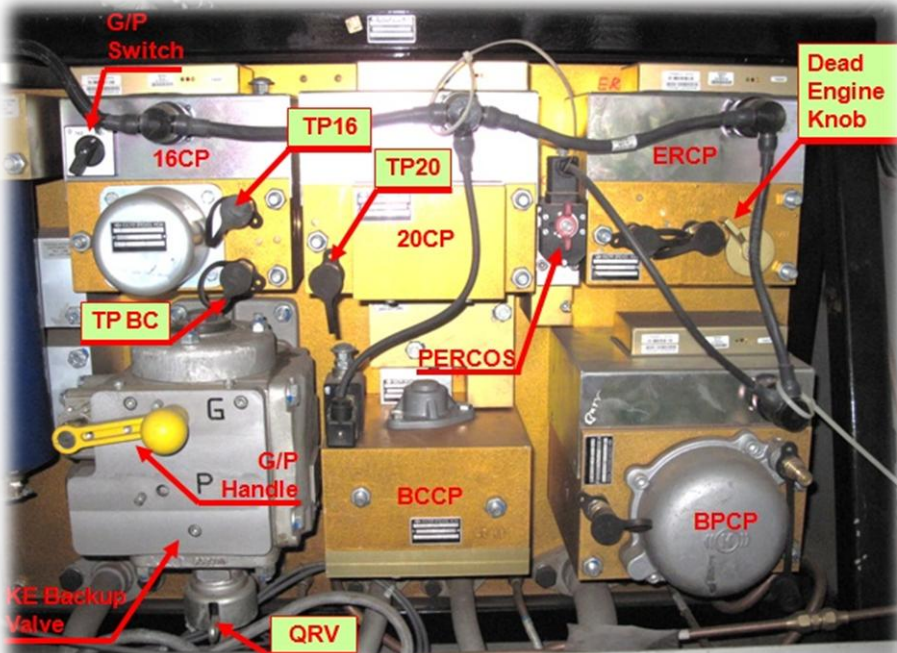
#### 1.3.1 CCB 1.5 – Fig.1.1



CCB 1.5 Fig.1.2



1.3.2 CCB II- Fig.1.3





## 1.4 DRIVER'S CAB - Fig.1.4 – Console components

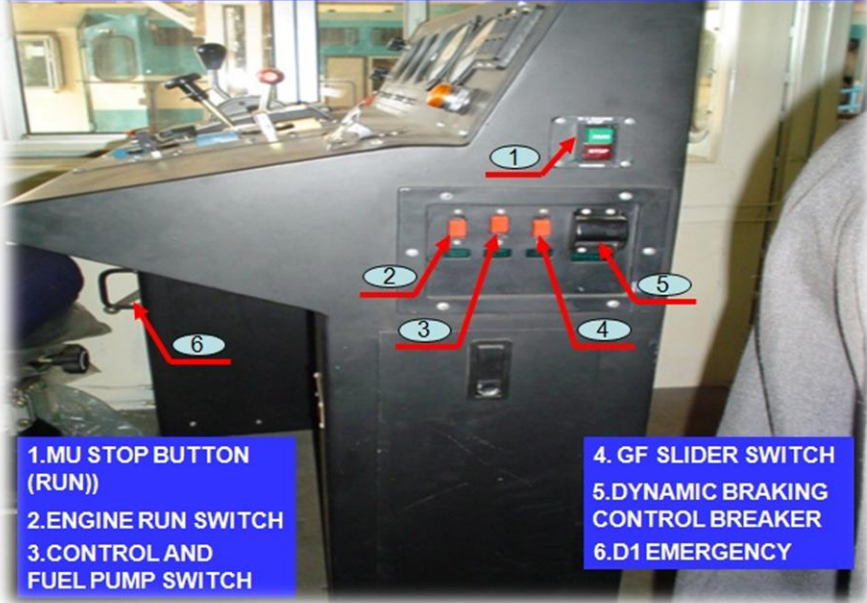


## Fig.1.5 – Console components



**Fig.1.6 – Console components**

**Additional Switches & CB in Long Hood Console**



**1.5 ELECTRICAL CONTROL CABINET 1 (ECC 1) – Fig.1.7**



**Fig. 1.8 BRAKERS PANEL**



**Fig. 1.9 COMPUTER DISPLAY**



**EMD Loco Display**



**Medha Loco Display**



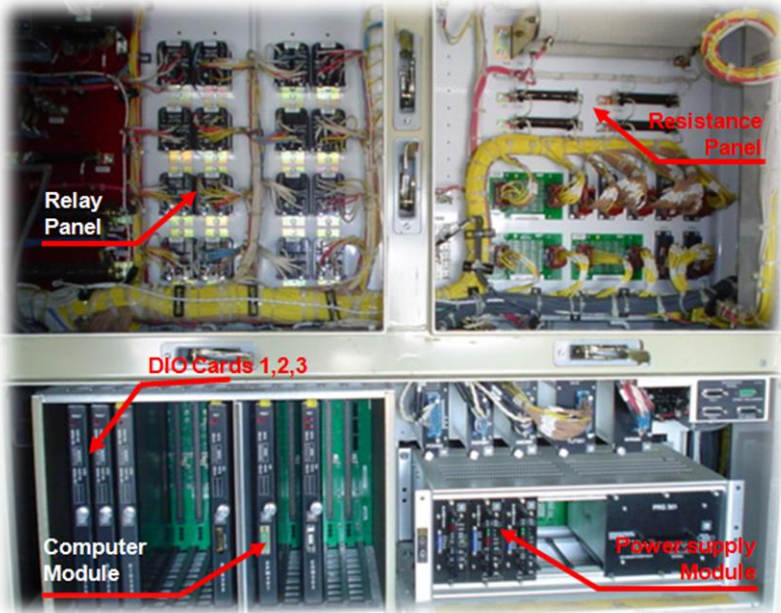
**Siemens Single Cab Loco Display**



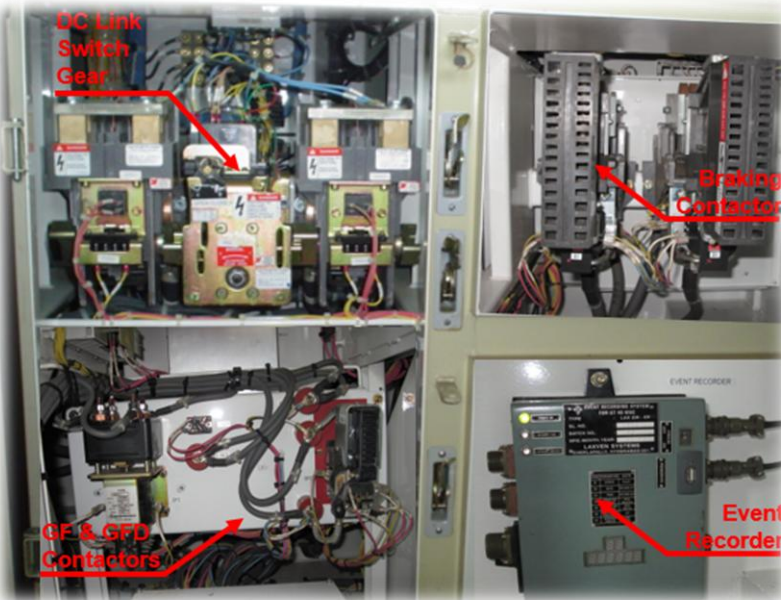
**Medha Dual Cab Loco Display**



**Fig. 1.10 RELAYS PANEL, COMPUTER MODULE AND POWER SUPPLY MODULE IN EMD LOCOMOTIVE**



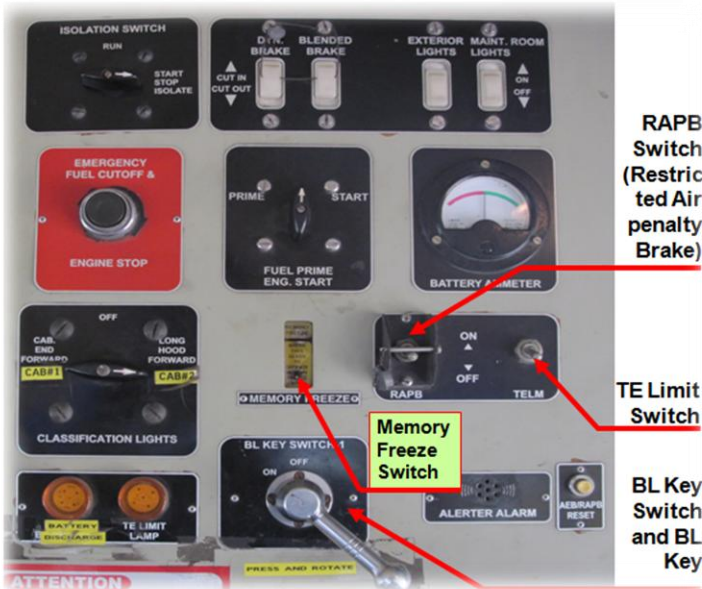
**Fig.1.11 DC LINK, GF CONTACTORS, BRAKING CONTACTORS AND EVENT RECORDER IN EMD LOCOMOTIVE**



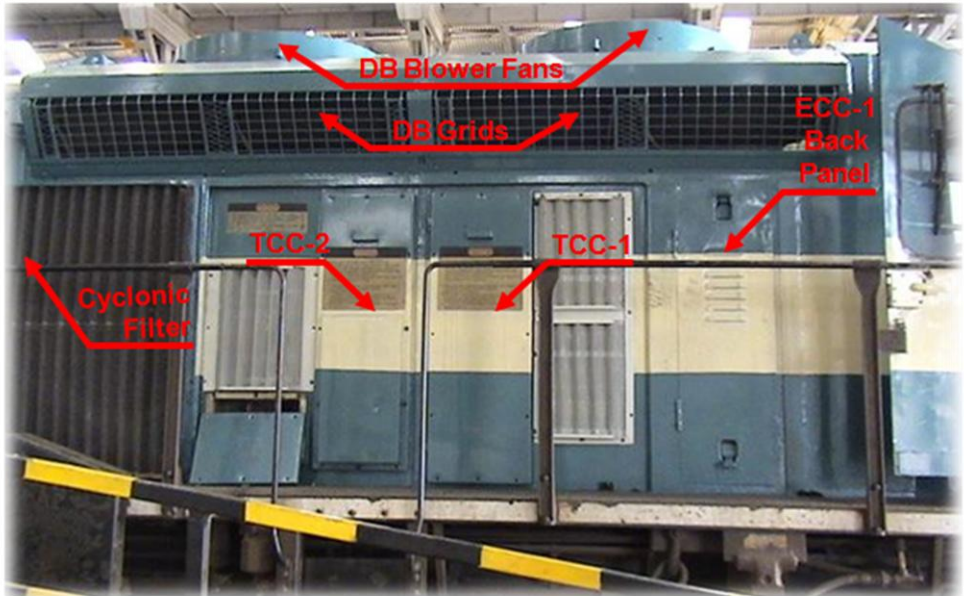
**Fig. 1.12 ENGINE CONTROL PANEL (ECP)**



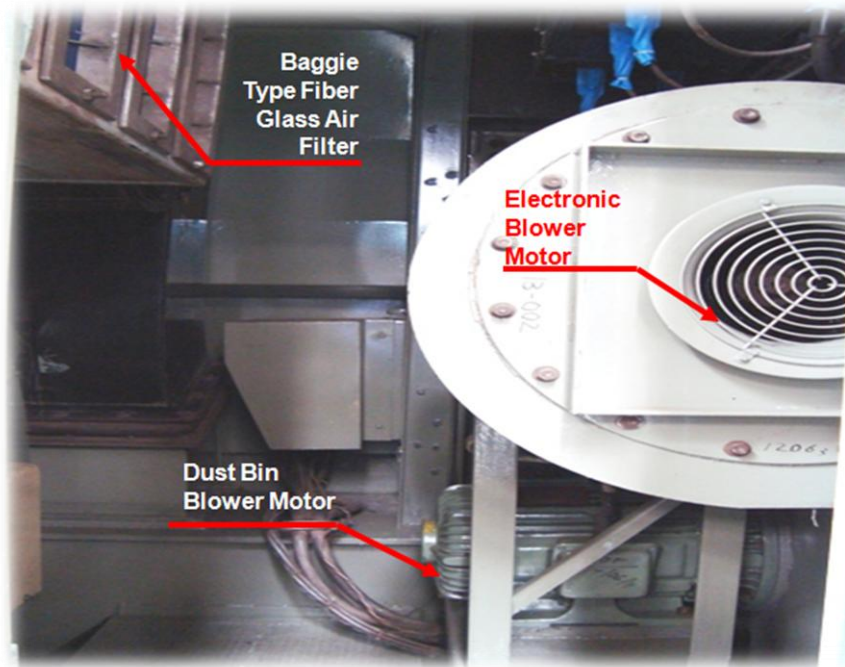
**Fig. 1.13 ENGINE CONTROL PANEL (ECP) IN MEDHA DUAL CAB LOCO**



**1.6 ECC BACK PANEL AND TCC1 & TCC2 Fig. 1.14**

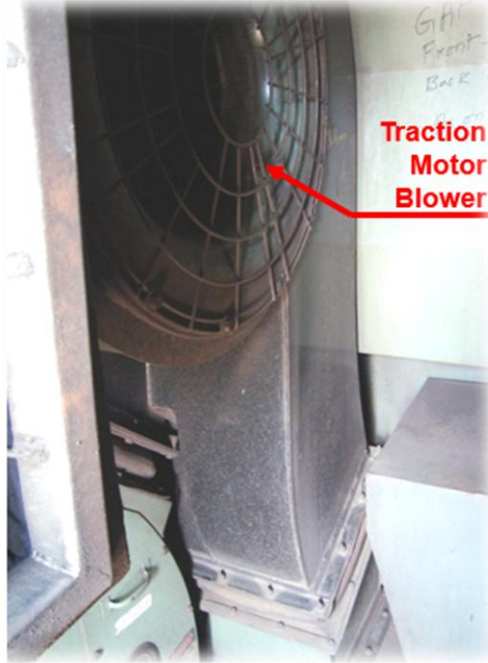


**1.7 CLEAN AIR COMPARTMENT Fig.1. 15**

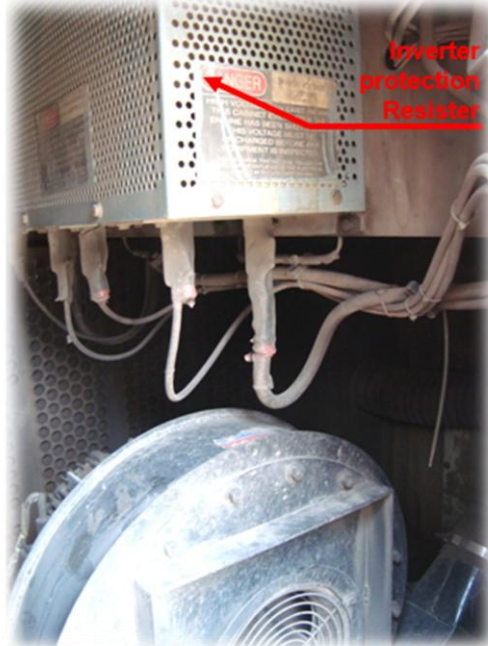




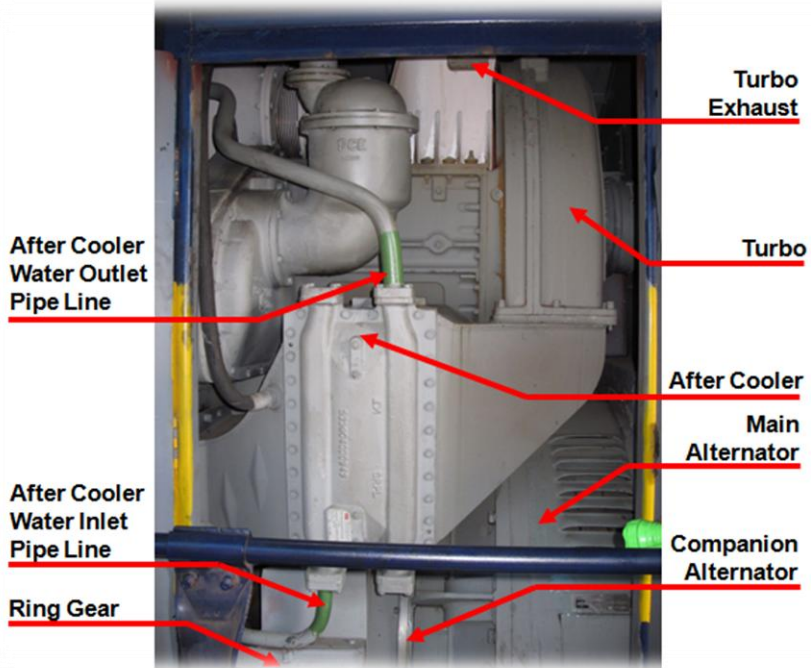
**Fig.1.16 CLEAN AIR COMPARTMENT**



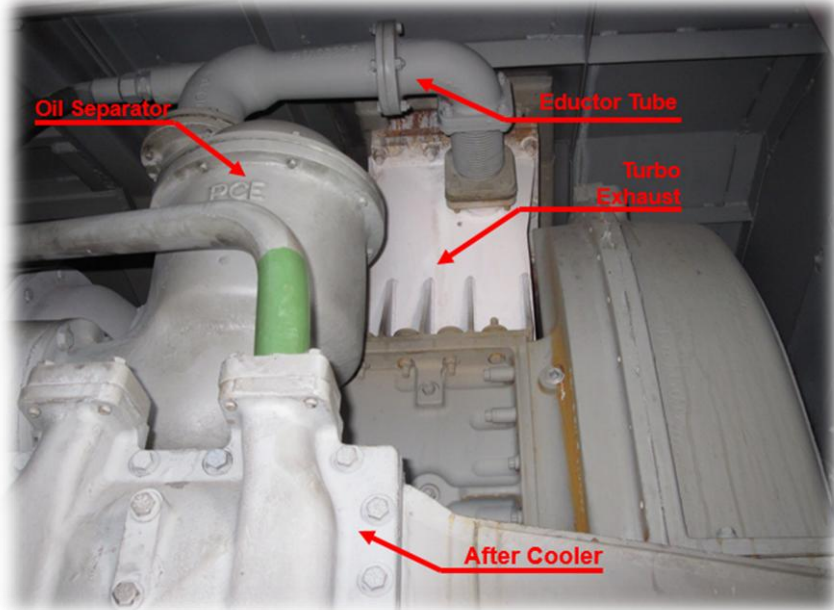
**Fig.1.17 CLEAN AIR COMPARTMENT**



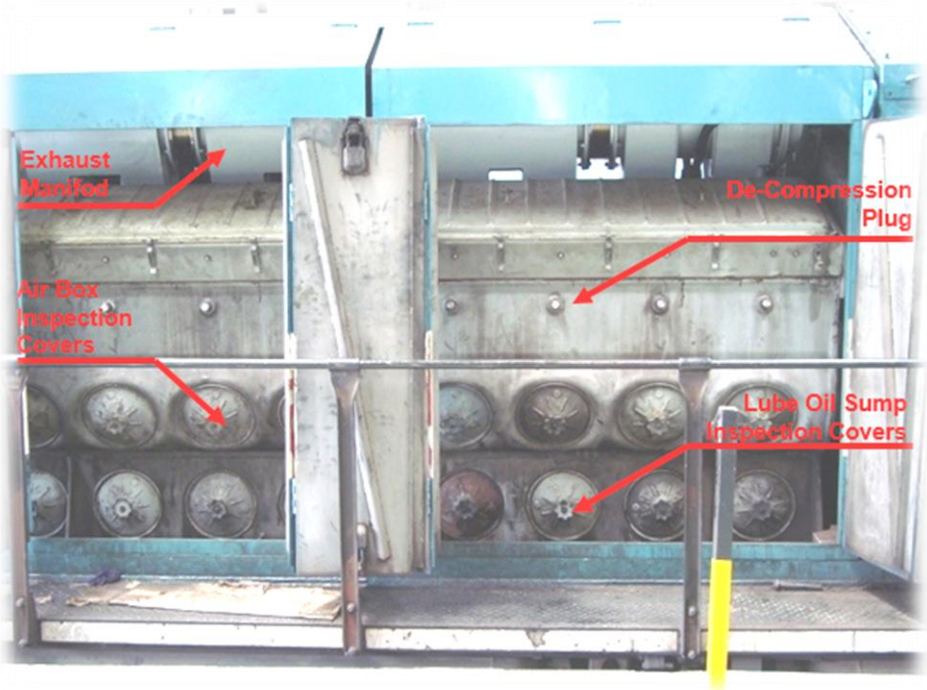
**1.8 MAIN ALTERNATOR ROOM Fig. 1.18**



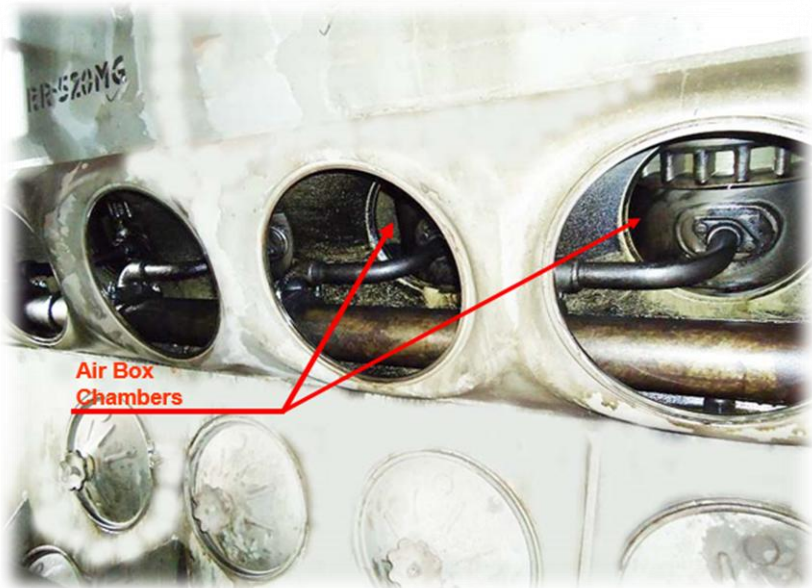
**Fig. 1.19 MAIN ALTERNATOR ROOM**



**1.9 ENGINE ROOM Fig. 1.20**

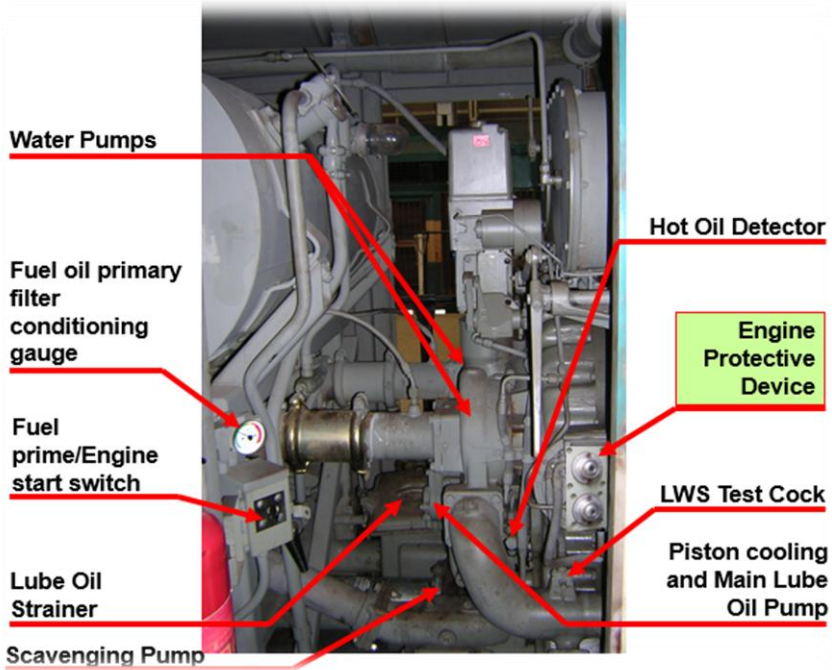


**Fig. 1.21 ENGINE ROOM**

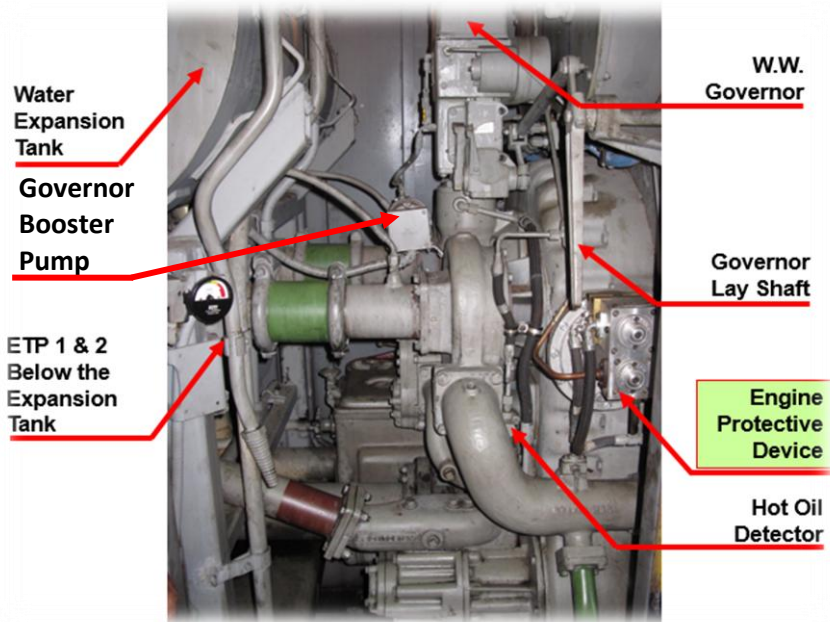




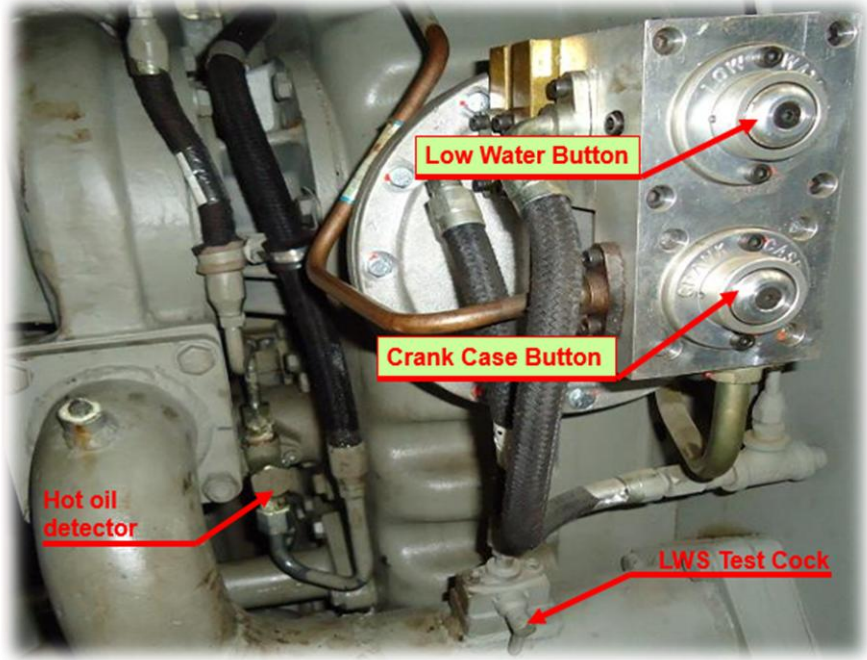
**1.10 ENGINE ACCESSORIES ROOM Fig. 1.22**



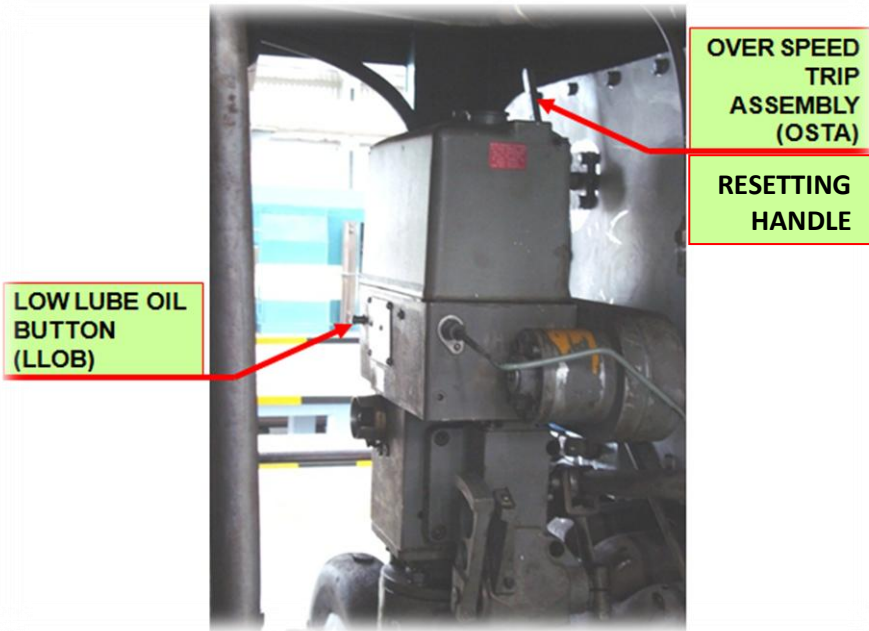
**Fig.1.23 ENGINE ACCESSORIES ROOM**



**Fig. 1.24 ENGINE ACCESSORIES ROOM**

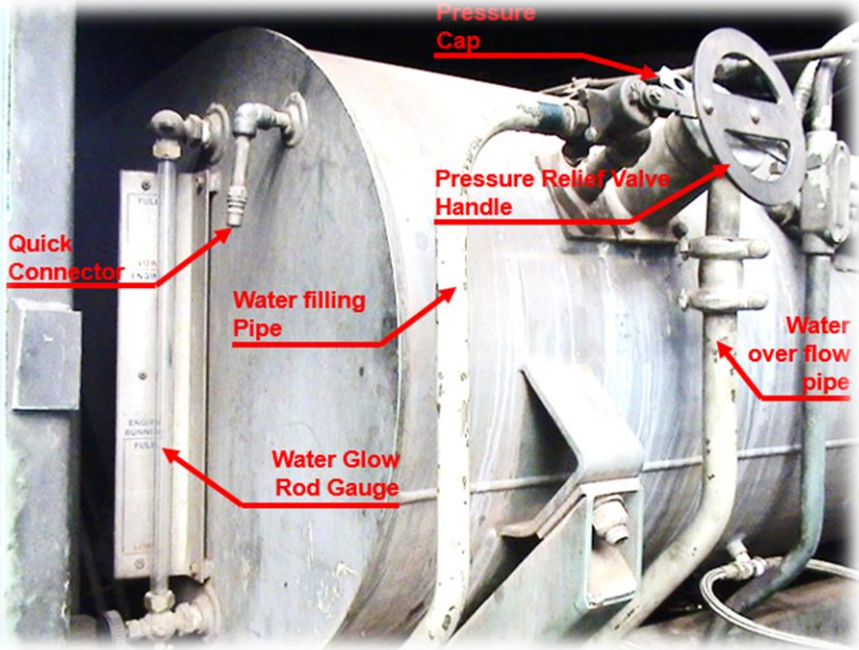


**Fig. 1.25 ENGINE ACCESSORIES ROOM**

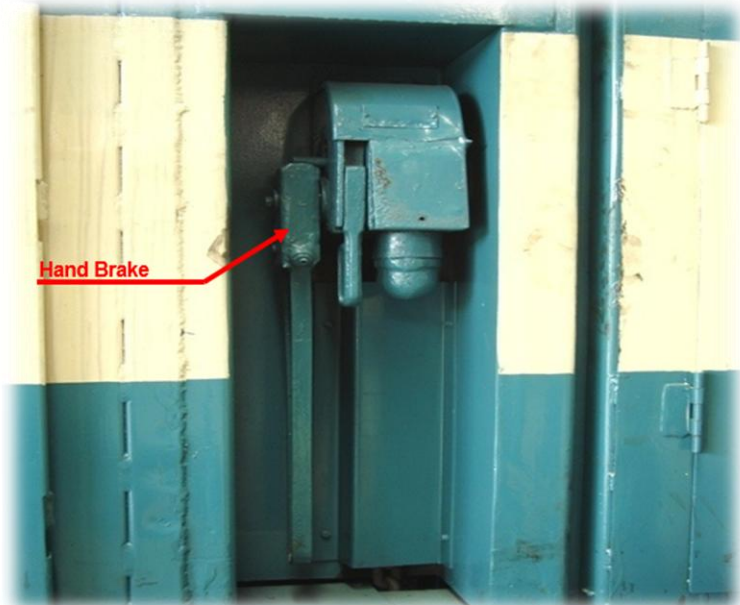




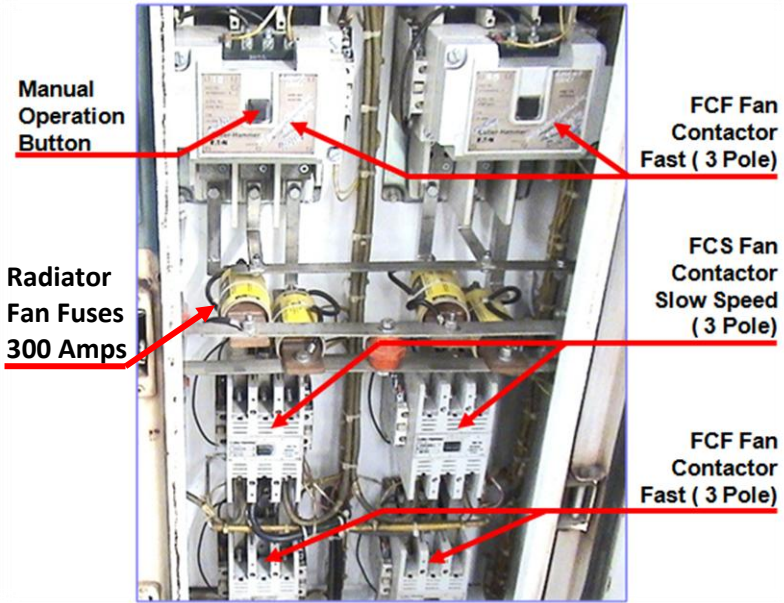
**Fig. 1.26 ENGINE ACCESSORIES ROOM**



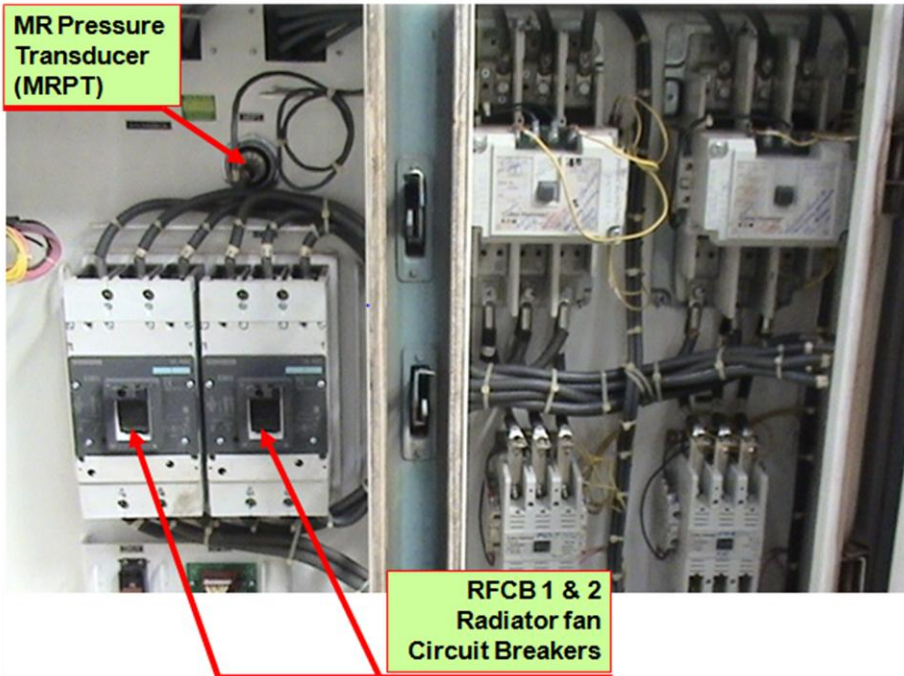
**1.11 HAND BRAKE Fig.1.27**



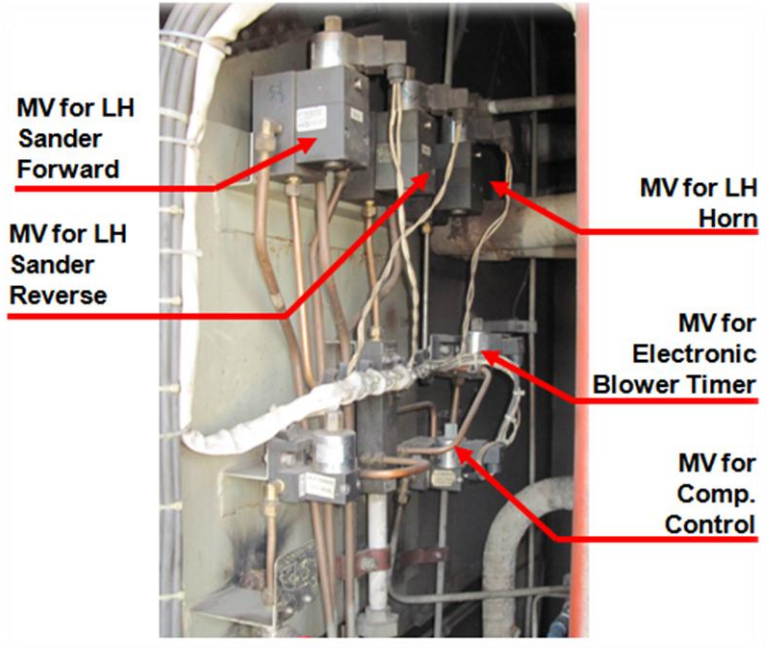
**1.12 ELECTRICAL CONTROL COMPARTMENT- 3 (ECC 3) Fig. 1.28**



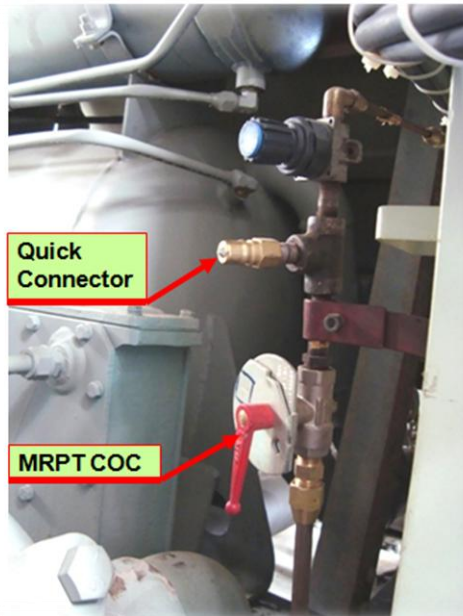
**Fig. 1.29 ELECTRICAL CONTROL COMPARTMENT 3 (ECC 3)**



**1.13 COMPRESSOR ROOM Fig. 1.30**

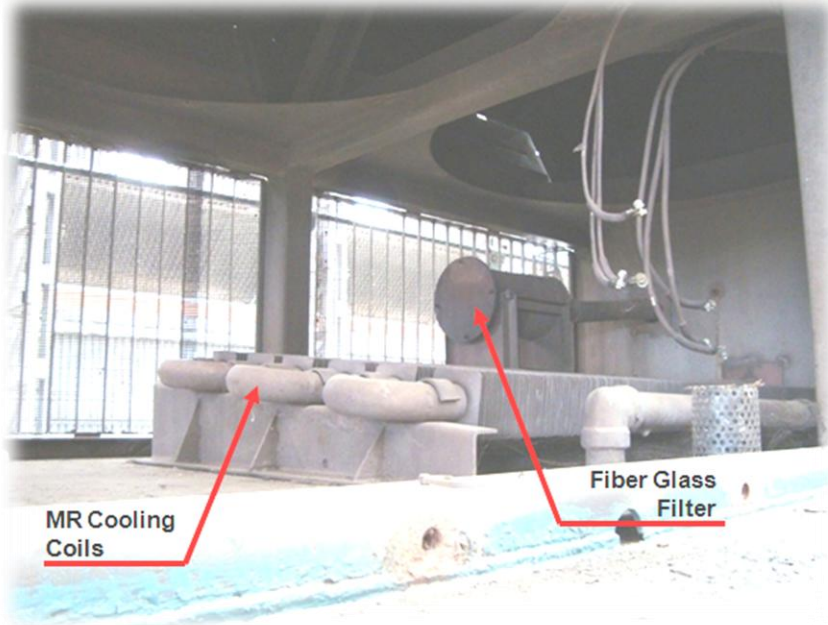


**Fig. 1.31 COMPRESSOR ROOM**

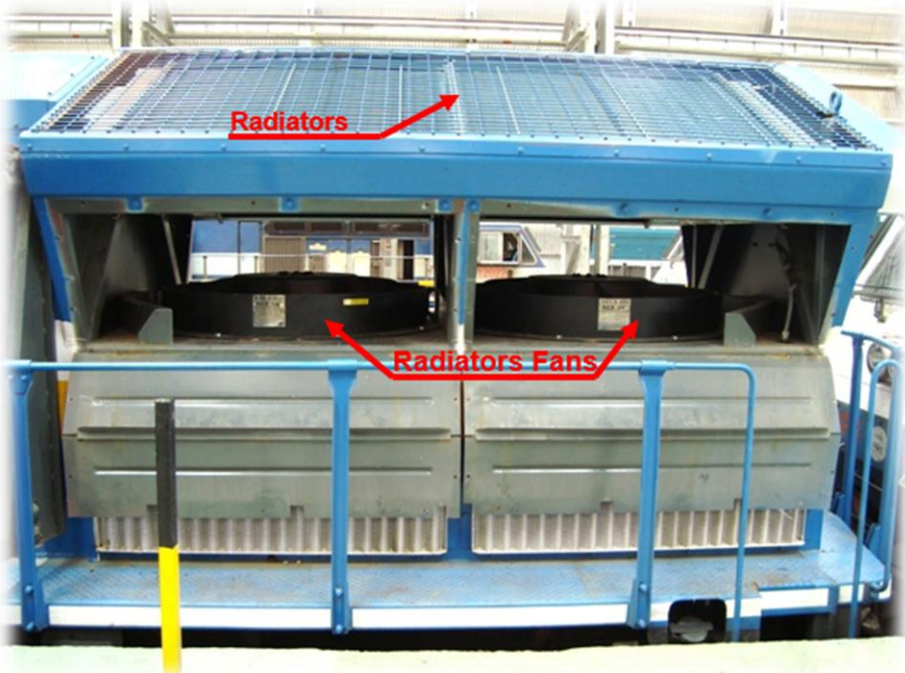




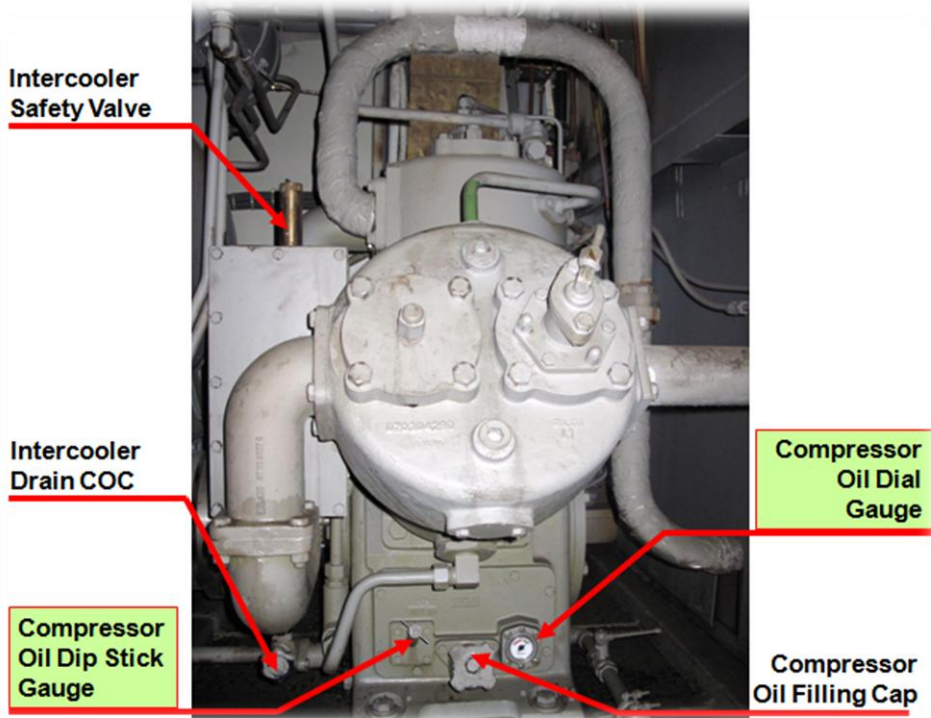
**1.14 RADIATOR ROOM Fig. 1.32**



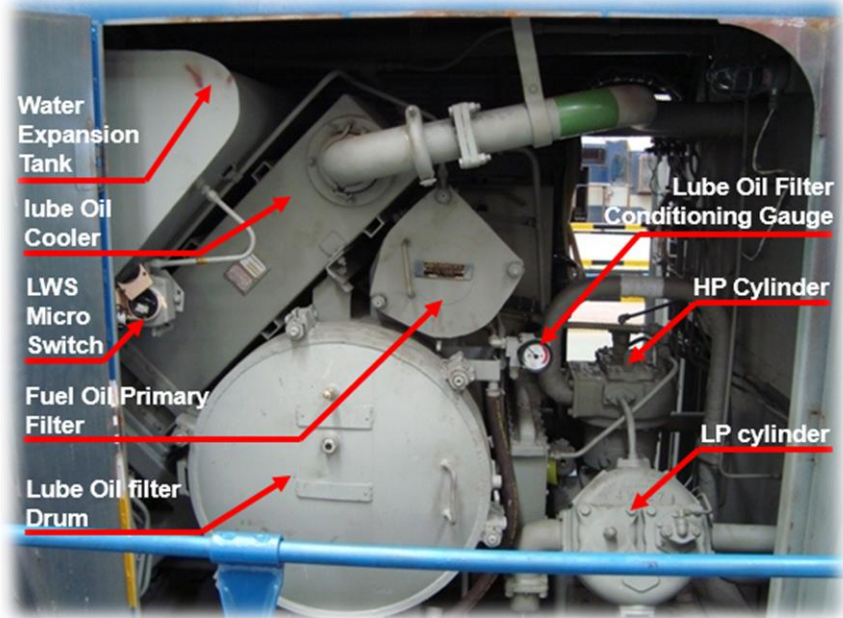
**Fig. 1.33 RADIATOR ROOM**



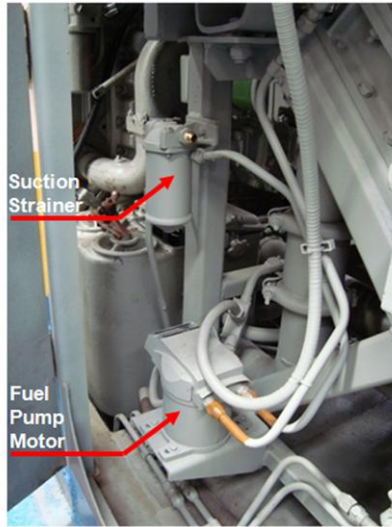
**1.15 LOCO LEFT SIDE COMPRESSOR & ENGINE EQUIPMENT ROOM Fig. 1.34**



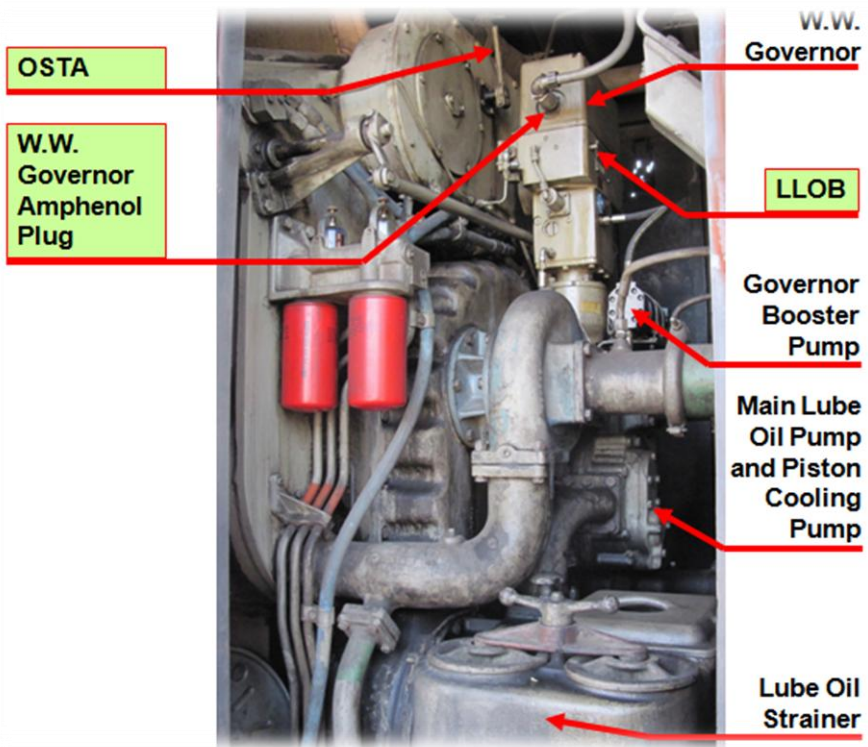
**Fig. 1.35 LOCO LEFT SIDE – COMPRESSOR & ENGINE EQUIPMENT ROOM**



**Fig.1.36 LOCO LEFT SIDE – COMPRESSOR & ENGINE EQUIPMENT ROOM**

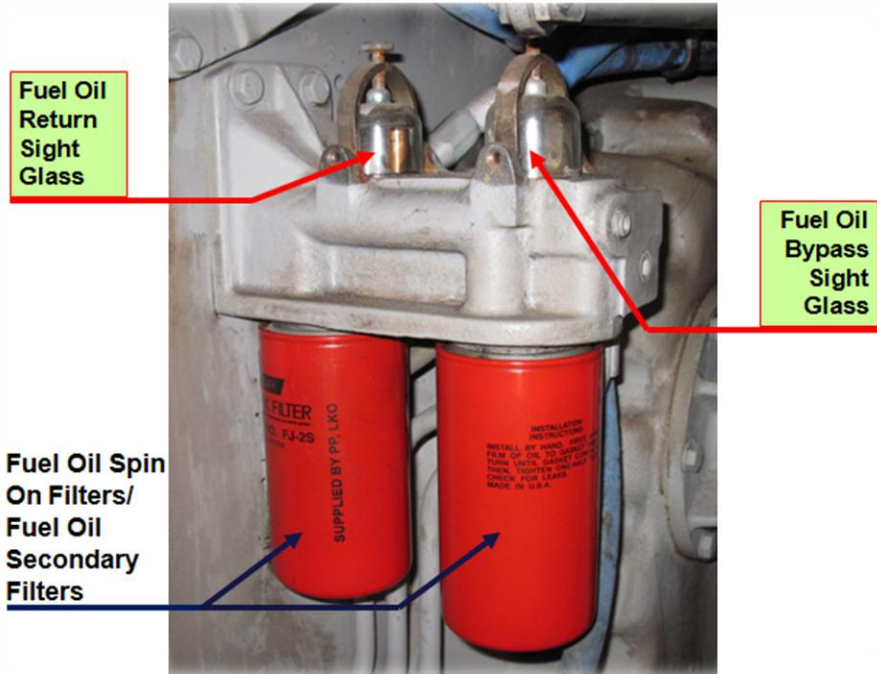


**1.16 LOCO LEFT SIDE – ENGINE ACCESSORIES ROOM Fig. 1.37**

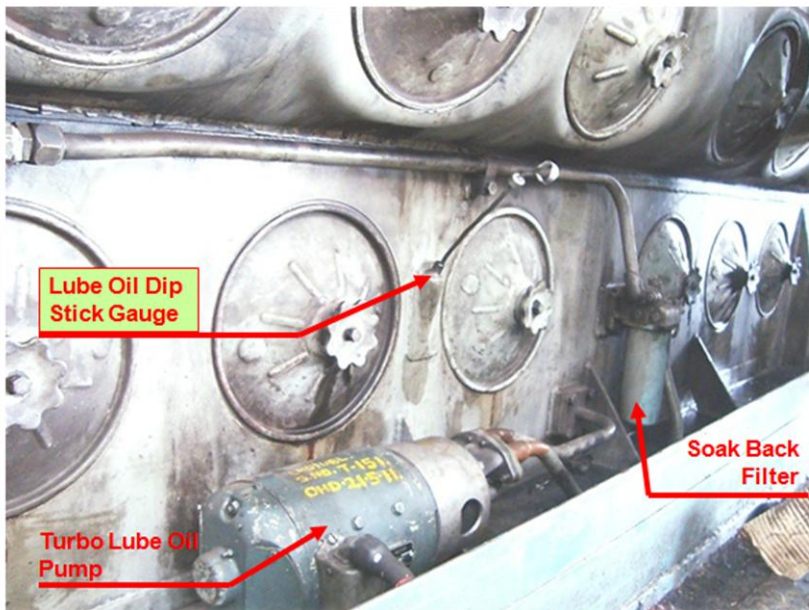




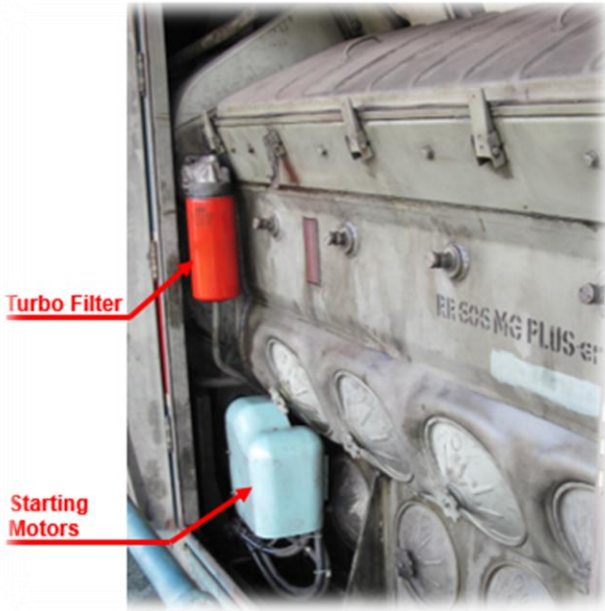
**Fig.1.38 LOCO LEFT SIDE – ENGINE ACCESSORIES ROOM**



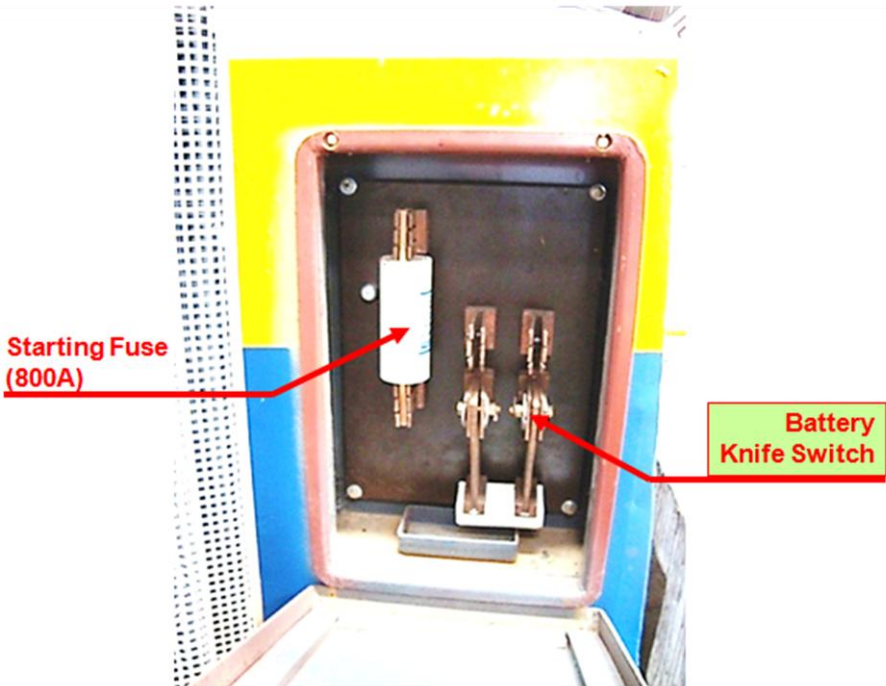
**1.17 LOCO LEFT SIDE - ENGINE ROOM Fig.1. 39**



**Fig. 1.40 LOCO LEFT SIDE - ENGINE ROOM**



**1.18 LOCO LEFT SIDE FOOT BOARD Fig.1.41**





**1.19 LOCO LEFT SIDE – MAIN ALTERNATOR ROOM Fig.1.42**

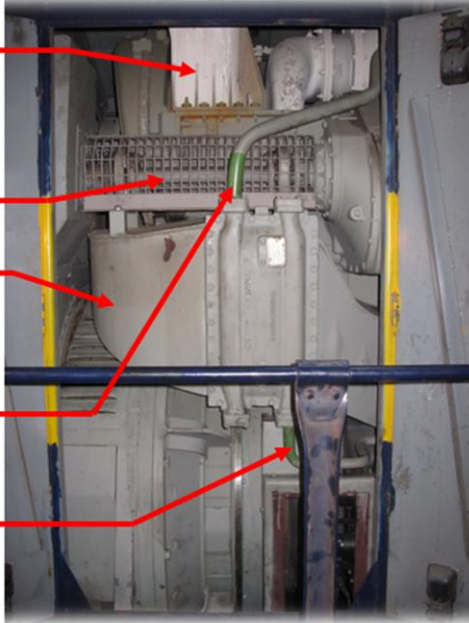
**Turbo  
Exhaust**

**Auxiliary  
Generator  
Drive Shaft**

**After  
Cooler**

**After Cooler  
Water Outlet  
Pipe**

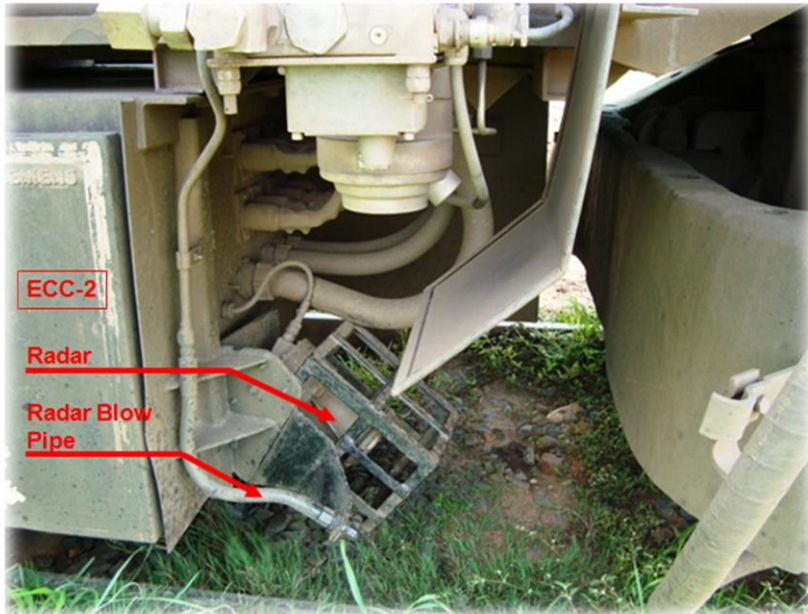
**After Cooler  
Water Inlet  
pipe**



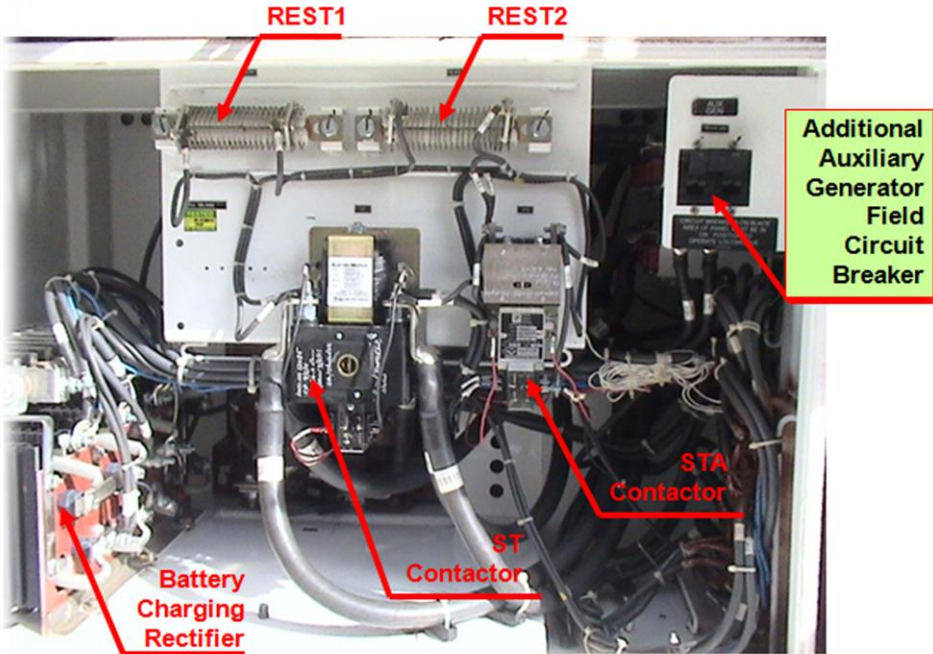
**1.20 BATTERY BOX Fig. 1.43**



**1.21 ELECTRICAL CONTROL COMPARTMENT 2 (ECC2) Fig. 1.44**

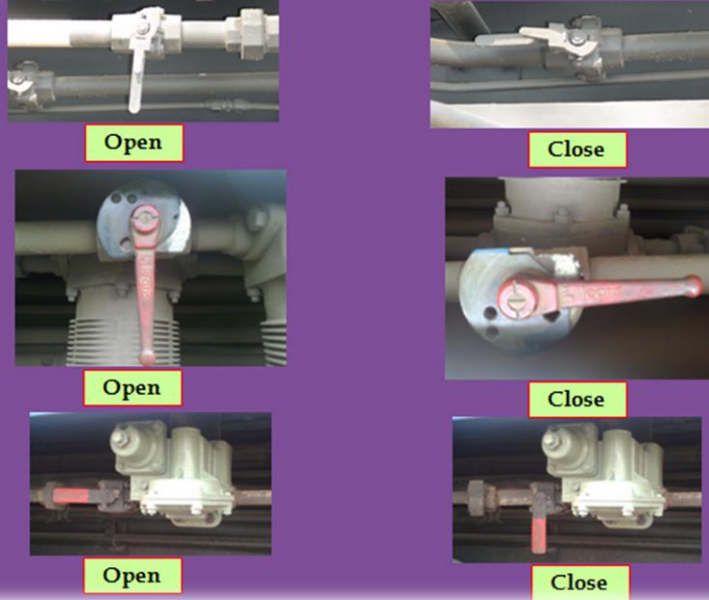


**1.22 ELECTRICAL CONTROL COMPARTMENT 2 (ECC2) Fig.1.45**

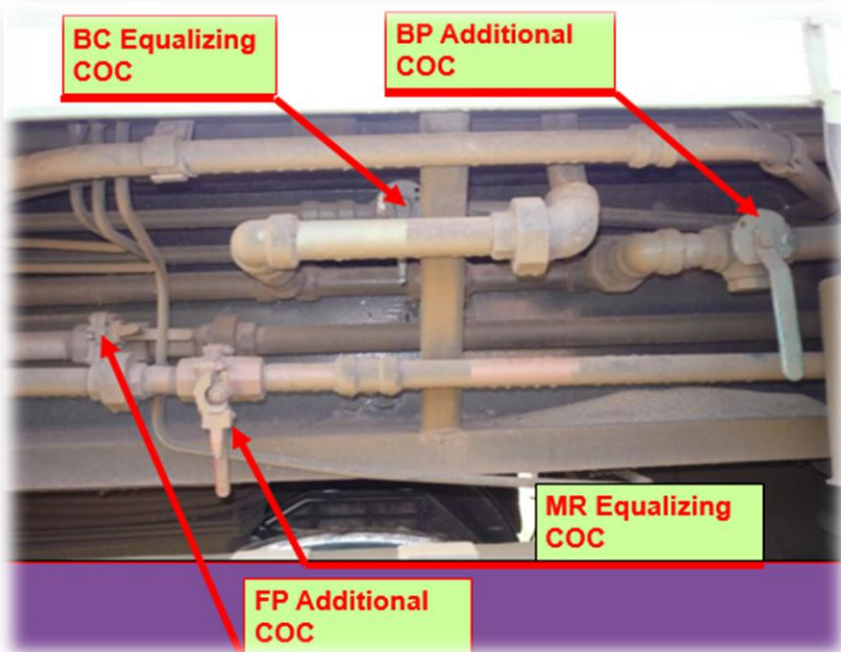


**1.23 DIFFERENT CUT OUT COCKS POSITIONS Fig. 1.46**

**DIFFERENT CUT OUT COC POSITION**



**Fig. 1.47 BC Equalizing, Additional, FP Additional and MR Equalizing COC**

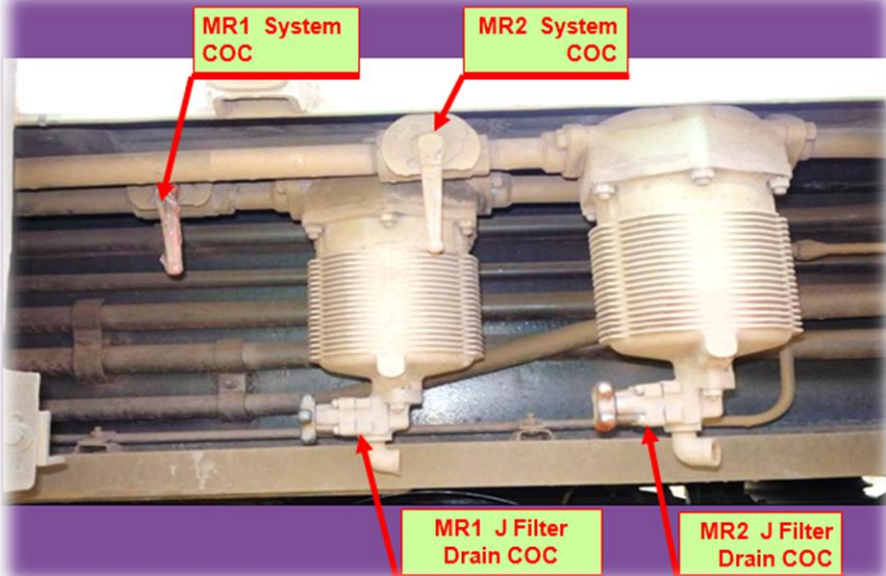




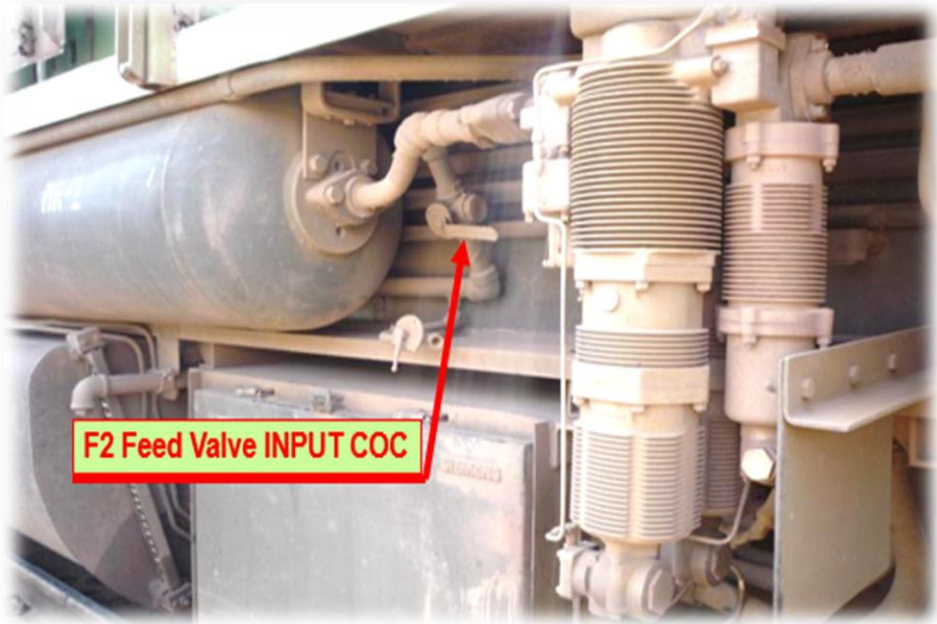
**Fig. 1.48 Bogie Isolation COC for Front Truck**



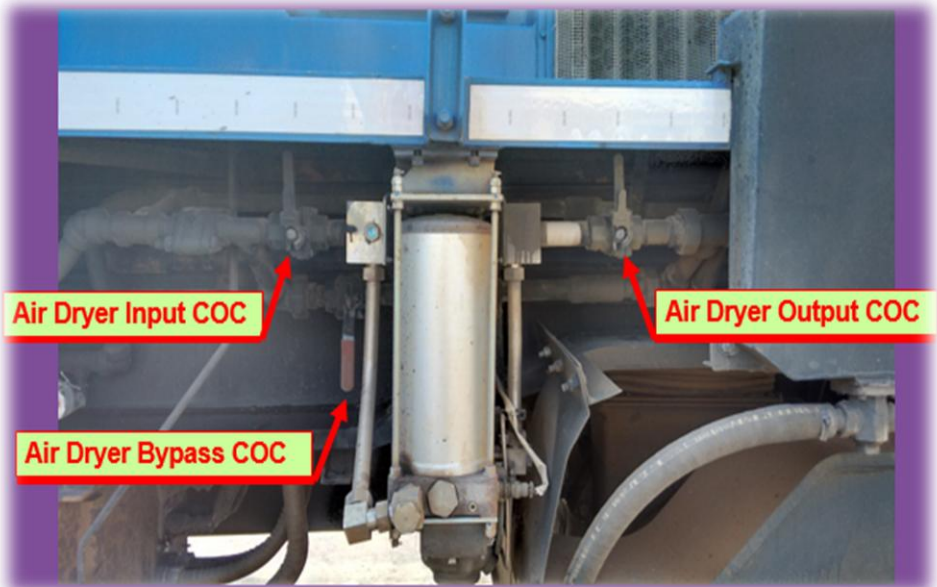
**Fig. 1.49 MR1 & MR2 System COCs and MR1 & MR2 J Filter Drain COCs**



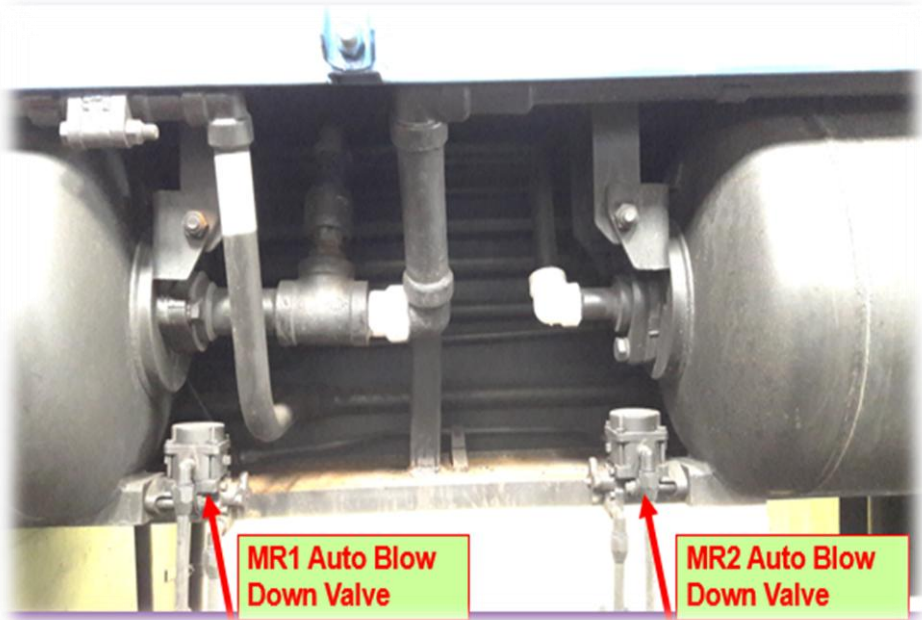
**Fig. 1.50 F2 Feed Valve Input COC**



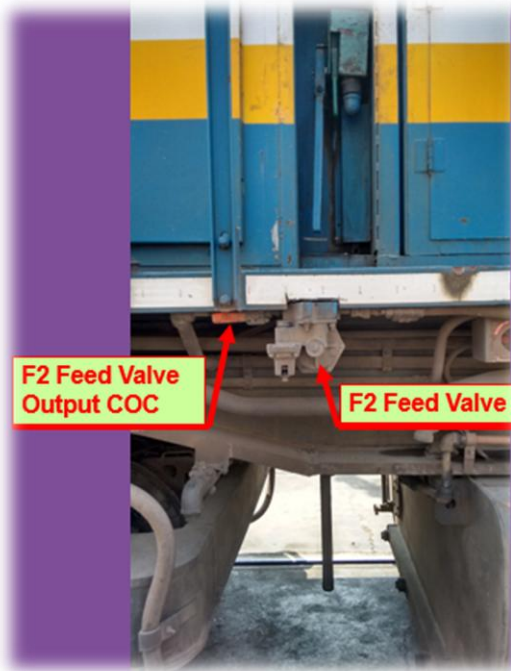
**Fig. 1.51 Air Dryer Input, Output and Bypass COC**



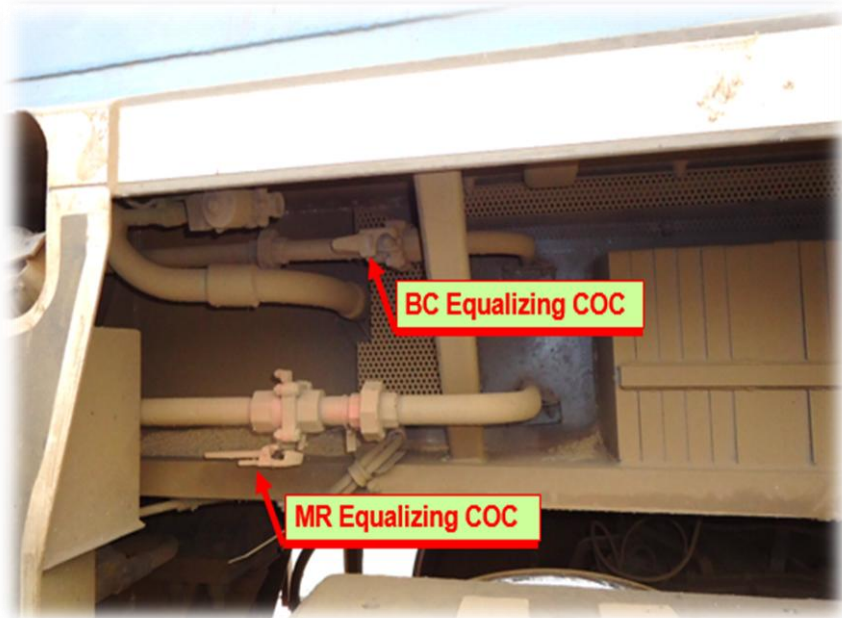
**Fig. 1.52 MR1 and MR2 Auto Blow Down Valve**



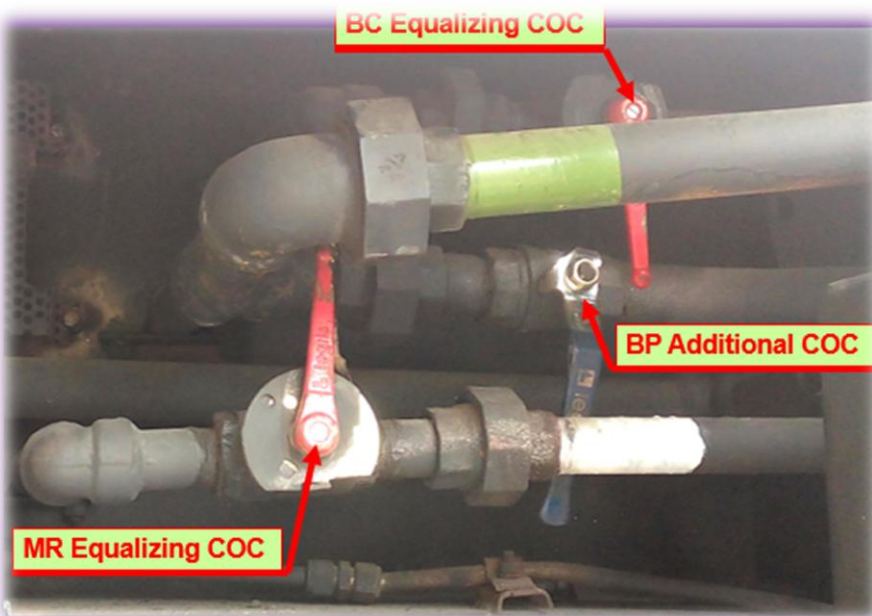
**Fig. 1.53 F2 Feed Valve and F2 Feed Valve Output COC**



**Fig. 1.54 Addl. COCs in WDP4 & Dual Cab Locos – Loco Left side – BC and MR Equalizing COC**

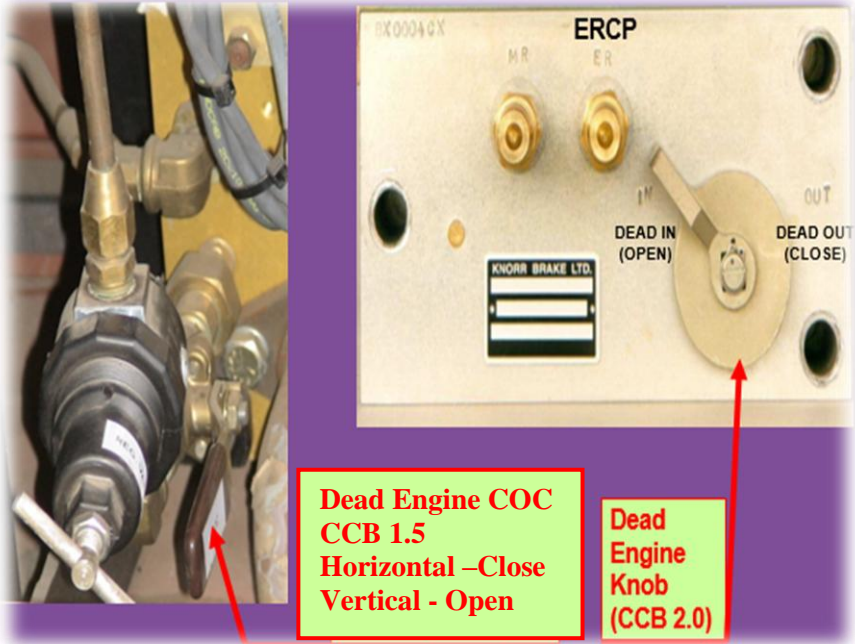


**Fig. 1.55 Dual Cab Locos – Cab 2 - Loco left side – BP Additional COC**

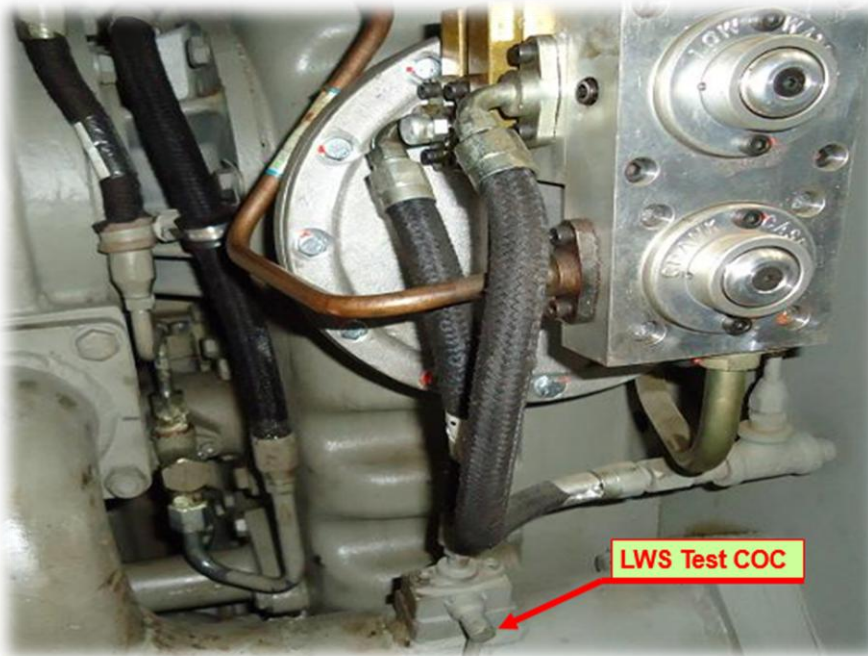




**Fig. 1.56 Dead Engine COC (CCB 1.5) and Dead Engine Knob (CCB 2.0)**



**Fig. 1.57 LWS Test COC**

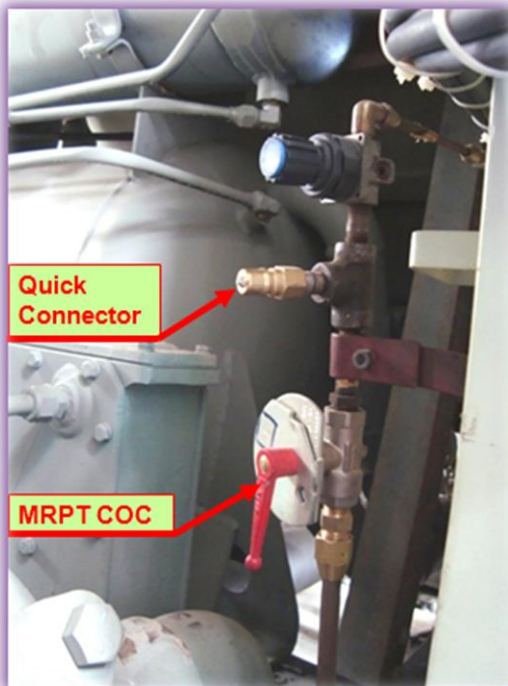




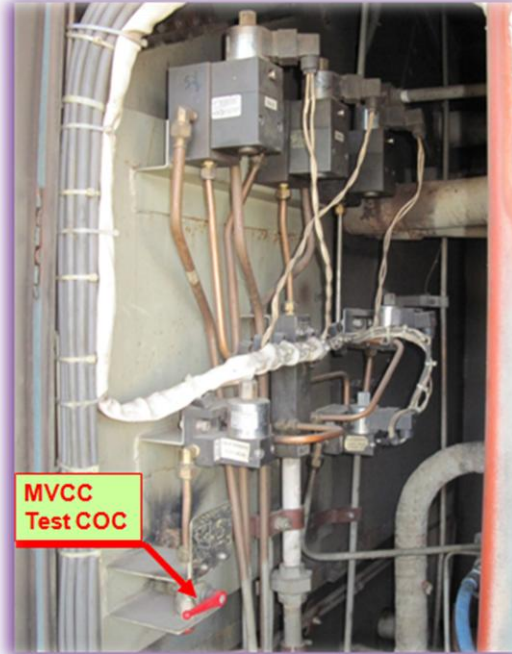
**Fig. 1.58 Main Water Drain Cock**



**Fig. 1.59 MRPT COC, Quick Connector**



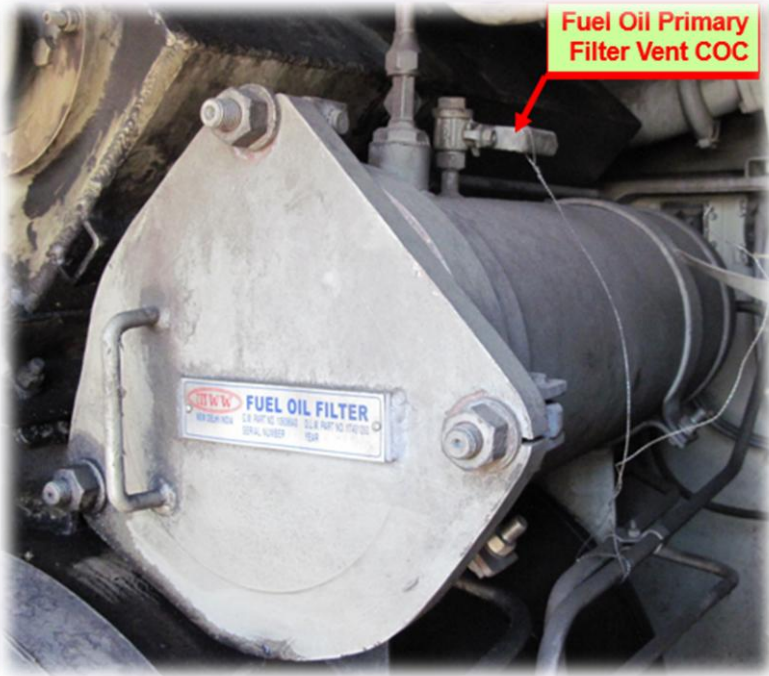
**Fig. 1.60 MVCC Test COC**



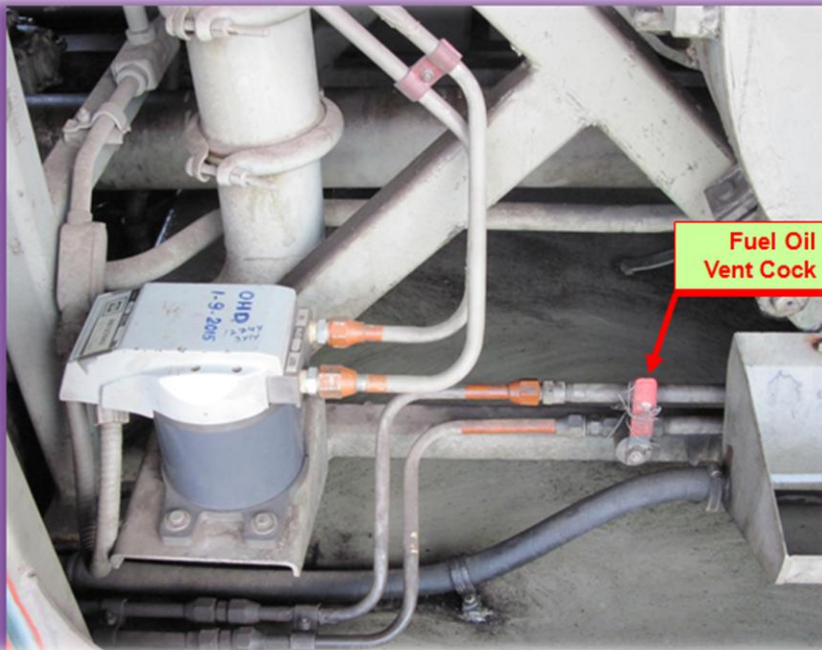
**Fig. 1.61 Compressor Oil Drain Cock**



**Fig. 1.62 Fuel oil Primary Filter Vent COC**

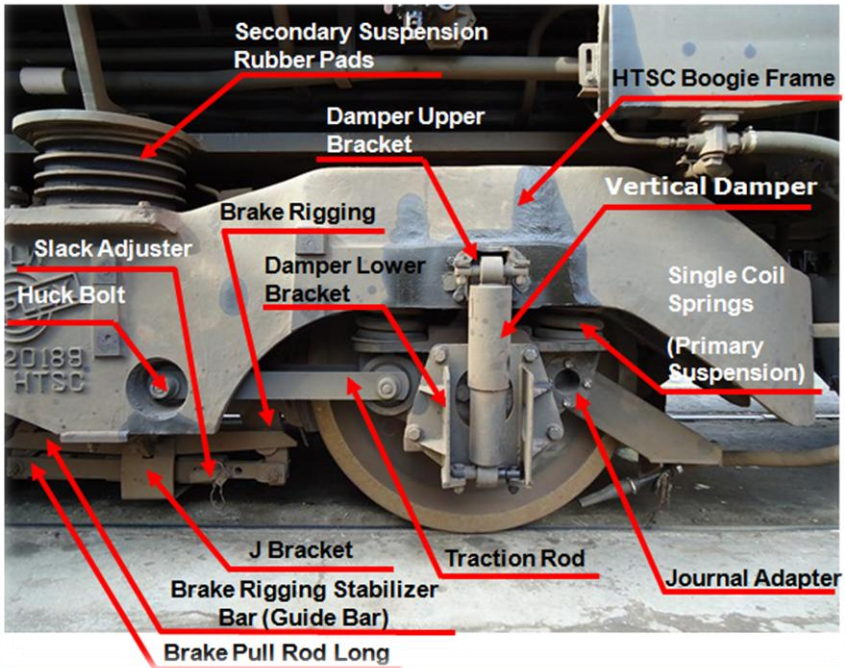


**Fig.1.63 Fuel Oil Vent Cock**

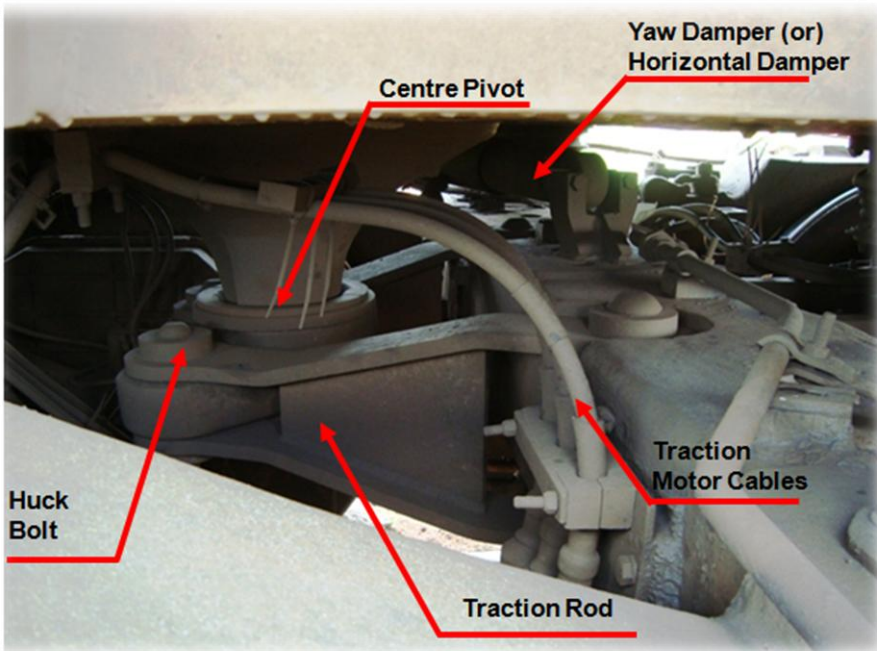




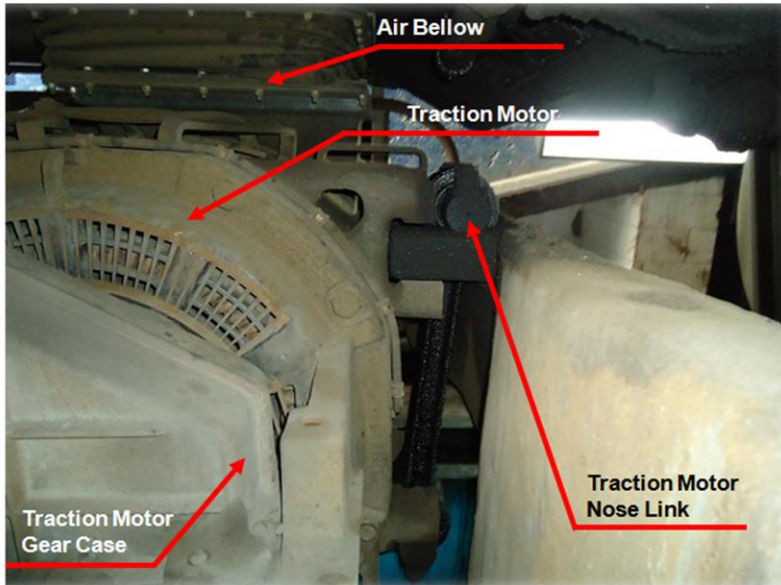
**1.24 Under Truck Fig 1.64 Under Truck**



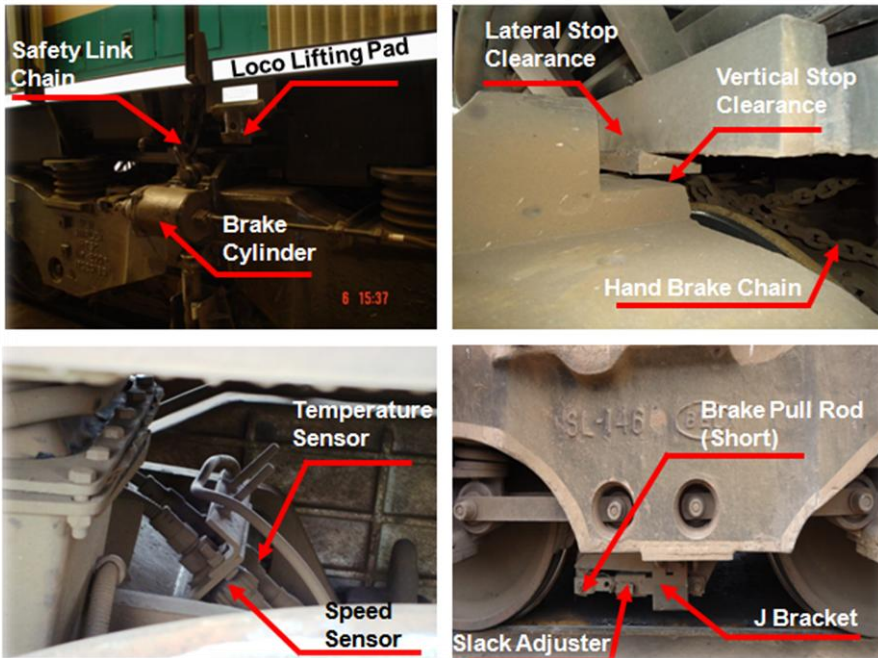
**Fig 1.65 Under Truck**



**Fig 1.66 Under Truck**



**Fig 1.67 Under Truck**





# **Chapter No. 2.0**

## **HHP Locomotive**

### **Mechanical &**

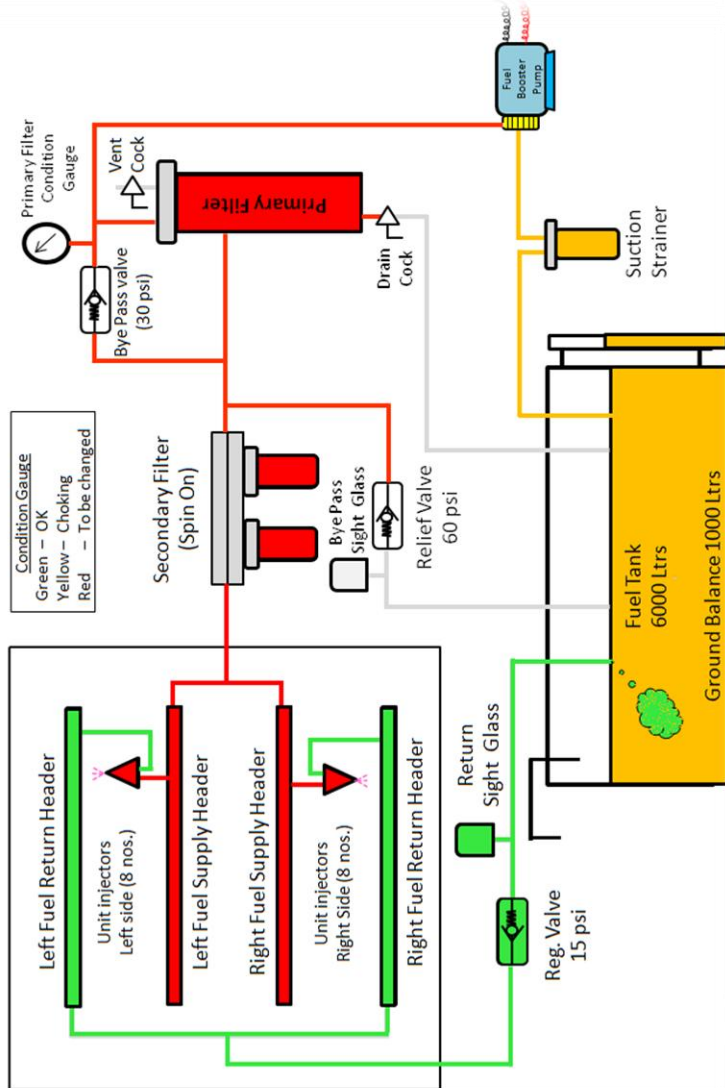
### **Electrical Systems**





## 2.1 FUEL OIL SYSTEM

### WDG4 AND WDP4 – FUEL OIL SYSTEM



**Fig. 2.1**

Fuel oil system consist of

- 1) Fuel feed system - Draws the fuel from the tank and feeds to the headers.
- 2) Fuel injection system - Supply correct quantity of fuel to the engine at right time according to the requirements.

### 2.1.1 Fuel feed system

Required amount of Fuel oil is stored in the Fuel tank, which is located in underneath of the chassis between two trucks. Maximum capacity of the tank is 6000

(In WDP4D – 5000) and minimum tank balance required is 1000 Lts. Glow rod gauge with scale is provided on both sides of the fuel tank to read the fuel balance. A wheel cock is provided in the bottom of the glow rod gauge, enable to dummy the glow rod gauge, if glow rod is damaged. When Fuel Pump motor starts working, fuel oil is sucked from the tank through strainer and delivered to primary filter. Oil filtered in the primary filter and flowing to secondary filters (spin on type filter), where filtered finely and fed to both side fuel headers. From header, oil is supplied to injectors through individual jumper pipes. Excess oil from the injectors is collected in the return headers and taken back to the fuel tank through a regulating valve, which is set at 15 PSI. In the return pipe a sight glass (Return sight glass) is provided to indicate the availability of oil in the header, which is located above the spin on filters near the engine block. Normally this sight glass is fully filled with oil without bubbles. Presence of bubbles in this glass indicates air drawing in the suction side and no oil indicates trouble in the Fuel system. A bye-pass valve set at 30 PSI is provided across the primary filter to bye-pass the primary filter, when choked. A condition gauge is provided to indicate the status of the primary filter and it is located at the right side of the loco in engine accessories room. The condition gauge shows Green color if the filters are good, yellow if it choked and red when blocked. A Relief valve, which is set at 60 PSI is provided between Primary and secondary spin on filter, enable to protect the Fuel pump from overloading when Spin on filters are clogged. It releases the excess oil to the tank through a sight glass (Bye-Pass sight glass). Normally this sight glass is to be empty. If fuel oil in this sight glass, shed has to be informed, since it indicates spin on filters are choked. To change the filter element in primary filter, a vent and drain cock is provided which enable to drain the accumulated oil from the filter to tank. Vent pipes are provided on both sides of the fuel tank, to maintain air pressure during system is working and expel the air from the tank to atmosphere during fueling.

### 2.1.2 Fuel injection system

The fuel oil available at each unit injector is pressurized by the centre cam lobe of the camshaft to very high pressure and will be injected in to the cylinder in atomized form in time. The quantity of fuel to be injected is regulated and controlled by engine governor according to the notch and load conditions. The governor operates fuel control shaft and controls the fuel racks.

#### **Mismanagement By Crew**

On 27.08.2014, LP of train no.22118 Exp while working with loco no. 12427 WDG4/GY caused late start 28” at KCG station due to Engine cranking but not firing with message “FP relay dropped out”. The shunter / LP failed to switch ON emergency Fuel pump circuit breaker or by using standby inverter switch, if fuel pump inverter was defective. In this case “Fuel pump circuit breaker was defective”.

This late start could have been avoided had the shunter / LP Switched ON emergency Fuel pump circuit breaker as soon as the message triggered on display and re-attempted for engine cranking.

## 2.2 LUBE OIL SYSTEM

# WDG4 AND WDP4 – LUBE OIL SYSTEM

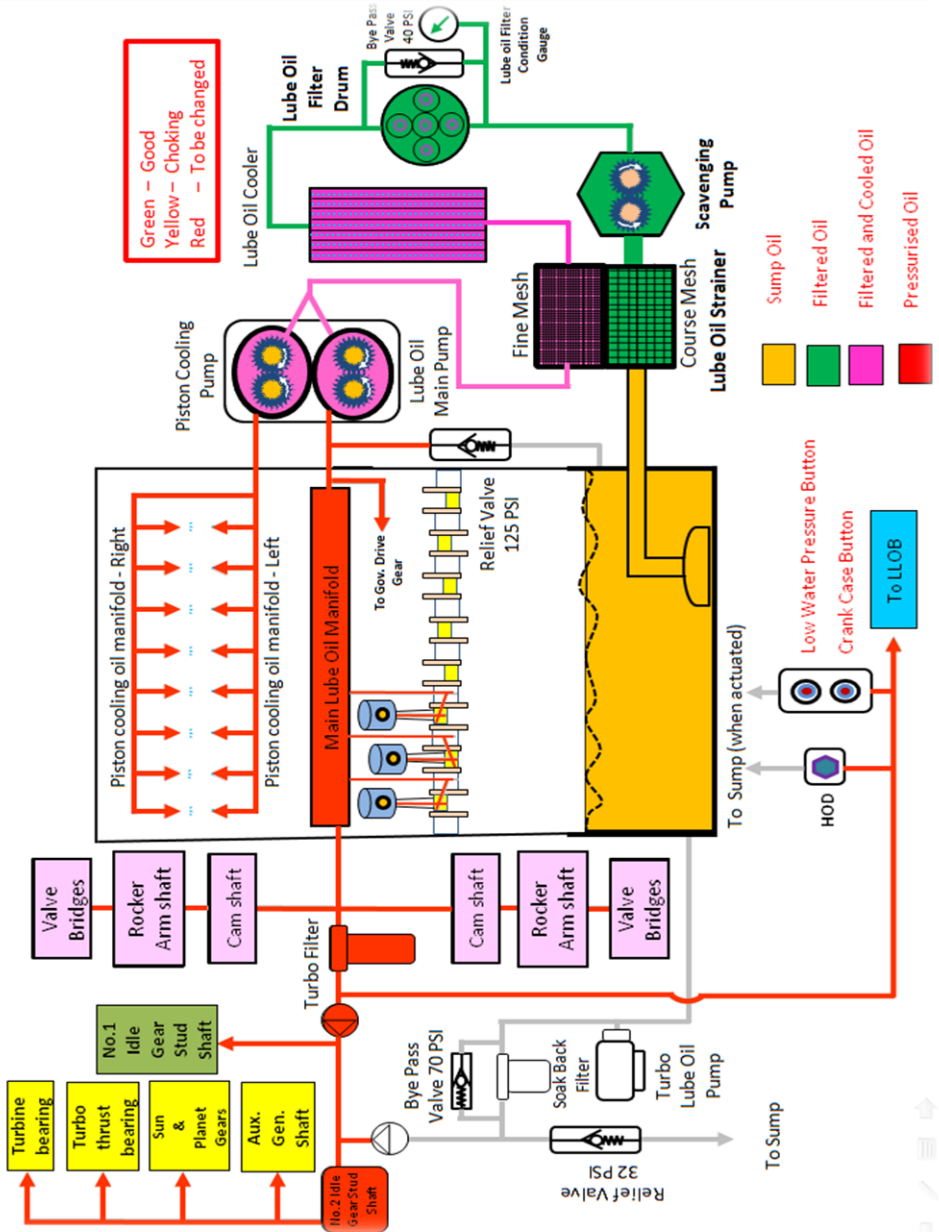


Fig. 2.2

The capacity of this system is 1457 liters and type of oil used is RR 520 MG. To read the oil level Dipstick is provided on both the sides of the Engine block. Dipstick has Full and Low marks. In between them 25 lines are provided and each line indicates 25 liters. When lube oil level reaches to 5 line from low mark shed has to be informed.

The lubricating oil system is a combination of four oil systems.

1. Scavenging oil system,
2. Piston cooling oil system
3. Main lubricating oil system
4. Soak back or turbo lube system

Each system has individual pump for its working. The main lube oil pump, piston cooling oil pump and scavenging oil pumps are gear driven by the engine crank shaft. The main lube oil pump and piston cooling oil pump is in single housing and driven by a common drive shaft but the delivery is separate. The soak back or turbo lube pump is driven by an electric motor.

### **2.2.1 Scavenging Oil System**

The scavenging oil pump is a positive displacement, helical gear type pump. This pump takes lube oil from the coarse filtration side of the lube oil strainer and delivered to the lube oil filter. After filtration oil goes to lube oil cooler where it is cooled by the cooling water. Then oil is taken to lube oil strainer fine mesh side, where it is filtered once again. A bye-pass valve set at 40 PSI is provided across the lube oil filter, gets open if the filter is clogged or pressure difference reaches above 40 PSI to protect the engine moving parts from dry start.

### **2.2.2 Piston Cooling Oil System**

The piston cooling oil pump receives oil from a common suction pipe from lube oil strainer fine mesh side and delivers to right and left side piston cooling oil manifold. From the piston cooling oil manifold through individual jet pipe oil directed as stream to each piston grooves for cooling the piston crown and lubricate the piston pin bearing, then drain back into the sump.

### **2.2.3 Main Lubricating Oil System**

The main lube oil pump receives oil from a common suction pipe from lube oil strainer fine mesh side and delivers to the main lube oil manifold, which is located above the crankshaft inside the engine block.

A pressure relief valve set at 125 PSI is provided between the main lube oil pump and main lube oil manifold to release excess oil back to the sump. From the

main lube oil manifold through individual oil tubes, main bearings receive oil on its upper portion.

After lubricate main bearings, through the drilled passage in the crankshaft, oil is supplied to the connecting rod big end bearings. From the front end of the crankshaft oil is taken to vibration damper and accessory drive gear.

From the rear end of the manifold oil enters Gear train through the idle gear stub shaft. Oil passes in the stub shaft base is distributed to various parts through various passages. One passage conducts oil to the left bank camshaft drive gear stub shaft bracket through a jumper. Second passage conducts oil to the Right Bank camshaft drive stub shaft bracket and also for turbo charger oil filter. From the camshaft through radial holes oil is conducted to each camshaft bearing. From each camshaft bearing through oil line, oil is supplied to the rocker arm shaft, rocker arm cam follower assemblies, hydraulic lash adjusters, rocker arm and then return to the sump. After filtration in the turbo charger oil filter, oil is send to No.1 Idle Gear Stub shaft gear. Low lube oil pressure shut down device in the Governor, which protects the engine from lack of lubrication by brings the engine to shut down when lube oil pressure is dropped below 8-12 PSI at idle and 25-29 PSI (1.7 to 2.0 Kg/cm<sup>2</sup>) at full speed. In the pipe line leading to the Low lube oil pressure shut down device, Safety devices Hot oil detector (HOD) and Engine protection devices (EPD) are provided.

The HOD brings the engine to shut down, when lube oil temperature reaches above 124<sup>0</sup> C (255.2<sup>0</sup>F) and EPD brings the engine to shut down when water pump is failed or positive pressure developed inside the crank case duly trips the Low water pressure or crank case button respectively. Turbo oil manifold for turbo charger cooling and lubricates turbo bearings, idler gear, planet gear assembly and auxiliary drive bore. The turbo charger oil filter heads contain 2 check valves. One to prevent the entry of lube oil to main system from the soak back system during soak back pump operation and the another to prevent lube oil from main system to the soak back system when the engine is running.

#### **2.2.4 Soak Back Oil System**

To remove the residual heat from the turbo super charger after engine shutdown and pre lubricate the turbo bearings before cranking, this system is provided and controlled automatically by the locomotive computer. A turbo soak back pump motor located at engine room right side is used to operate this system. The operation of the motor is controlled by LCC and run for 35 minutes (maximum) during starting and after shut down the diesel engine. When this motor starts to work, the turbo soak back pump draws oil from the sump, feed oil through a soak back filter and finally to the turbo. A 70-PSI bypass valve is provided inside the soak back filter housing to bypass filter whenever it clogs to protect Turbo-charger. A relief valve set at 32 PSI is provided in the filter head, will return the delivered oil from soak back pump, back to engine sump if turbo receives oil from main system.



## 2.2.5 Lube oil System – Points to be Remember

1. While TOC a loco, lube oil filter conditional gauge is to be checked for finding the healthiness of filter.
2. Lube oil level to be maintained, 5 Dots from low mark and to be checked in engine running in Idle.
3. Lube oil pressure will be maintained 30 – 120 PSI in the system.
4. Changing the Isolation Switch from Stop / Start / Isolate to Run Position immediately after cranking to avoid shut down of loco due to LLOB / Low Water Button Operation.
5. Never make attempt to re-crank the engine when crank case button in the EPD is tripped. (bottom Button EPD).
6. After shutting down the Engine do not switch off yellow labeled breakers.

### Mismanagement By Crew

On 26.05.16, LP/Shtg. While working out going loco of Train no. 10405, loco No. 40191/WDP4/GY/SCR, failed causing detention of 25 min., while cranking the loco, LLOB and EPD operated and loco shut down. Shunter unable to reset the EPD and LLOB. Hence whenever Engine shutdown automatically check all the safety devices viz. OSTA, LLOB, EPD.etc and know their proper resetting procedures and act as per the messages displayed in the computer display.

- Immediately after cranking don't keep the Isolation switch in Run position it may leads to Engine RPM automatically raises to 4th notch and may cause EPD and LLOB to operate.
- If EPD LWS projects check the water level. If it is sufficient then reset it by pressing it inside and also reset the LLOB . Hold the LWS on EPD for 2-3 minutes if it is tripping repeatedly due to malfunction.

### Mismanagement By Crew

On 08.08.16, LP of Train no BBSD goods ( 59/5118T) working with Loco No. 12800+12441 WDG4/GY stalled in MKL-ORH section (SBC div) on 1 in 100 gradient due to 12800 engine shutdown on 8<sup>th</sup> notch with message fault code 202 engine protection shut down, low oil pressure and “No Aux Gen output”& . LP tried to re-crank the engine after resetting EPDs & LLOB but not succeeded since OSTA not resetted (in Siemens locos Engine Shut Down with OSTA tripping the message “No Aux Gen output” will flag on display. The train caused 165” detention and subsequent nine trains’ lost punctuality indirectly.

This sectional failure could have been avoided had the LP reset OSTA apart from EPDs & LLOB duly checking the Aux Gen field circuit breaker.

## 2.3 COOLING WATER SYSTEM

The capacity of expansion tank is 625 Lts and total system is 1045 Lts. To read the water level, gauge is provided on the Expansion tank. It has two readings full and low with respect to the status of the engine when running or dead. If water level is less shed has to be informed. There are two numbers of gear driven centrifugal type water pumps available in this system and mounted on the engine block. The lube oil cooler outlet forms the suction for both the pumps. When crank shaft starts to rotate, both water pumps start their working, draws water from the suction and delivered to water inlet manifold. The outlet of the right side water pump is sent to right water inlet manifold and left side water pump is sent to left water inlet manifold. From the water inlet manifold water enter to all the cylinder liner jackets through individual water jumper pipes and cools the cylinder liners. After cooling the cylinder liners water enter the cylinder head through 12 circular passages and cool the combustion chamber of the cylinder head and then collected in the water outlet manifold. At the rear end of both water inlet manifolds, water is taken to after coolers to cool the booster air and then collected in the water outlet manifold.

The outlet of both the pumps are connected together and taken to compressor to cool the compressor cylinders and the compressed air inside the inter cooler. The collected water in the water outlet manifold is taken to radiators, which are located in a hatch at the top of the long hood of the loco.

A bye-pass line is provided between the inlet and outlet lines of the radiators in order to reduce velocity in the radiator tubes. To cool the water in the radiator, two electrical motor operated radiator fans are used and controlled by the Locomotive control computer (LCC). The LCC maintain the water temperature between 79<sup>0</sup>C to 85<sup>0</sup> C. Two Engine Temperature probes (ETP1 and ETP2) are provided to measure the water temperature.

Among the ETPs, the higher value is taken as reference by the LCC. To simulate water temperature (up to 52<sup>0</sup>C), LCC increases the engine speed automatically. If water temperature increases above 96<sup>0</sup> C, maximum loco power will restrict to sixth notch limit but RPM is according to the throttle position. If water temperature increases above 101<sup>0</sup> C, for 5 minutes engine RPM comes to idle.

To make up water level in the system, from the expansion tank, Equalizing pipes are provided to the inlet of compressor and both water pumps. To protect the engine from lack of cooling Low Water Switch (LWS) and Low water pressure button (LWP in EPD) is provided in this system. LWS Micro Switch is available in WDP4 Locos on the expansion tank. It brings the engine to shut down when water level is low. LWP is available in all locos in the EPD and connected with the system at the outlet of the left water pump through a three way cock. It brings the engine to shut down when water pressure is low in the system.

# WDG4 AND WDP4 – COOLING WATER SYSTEM

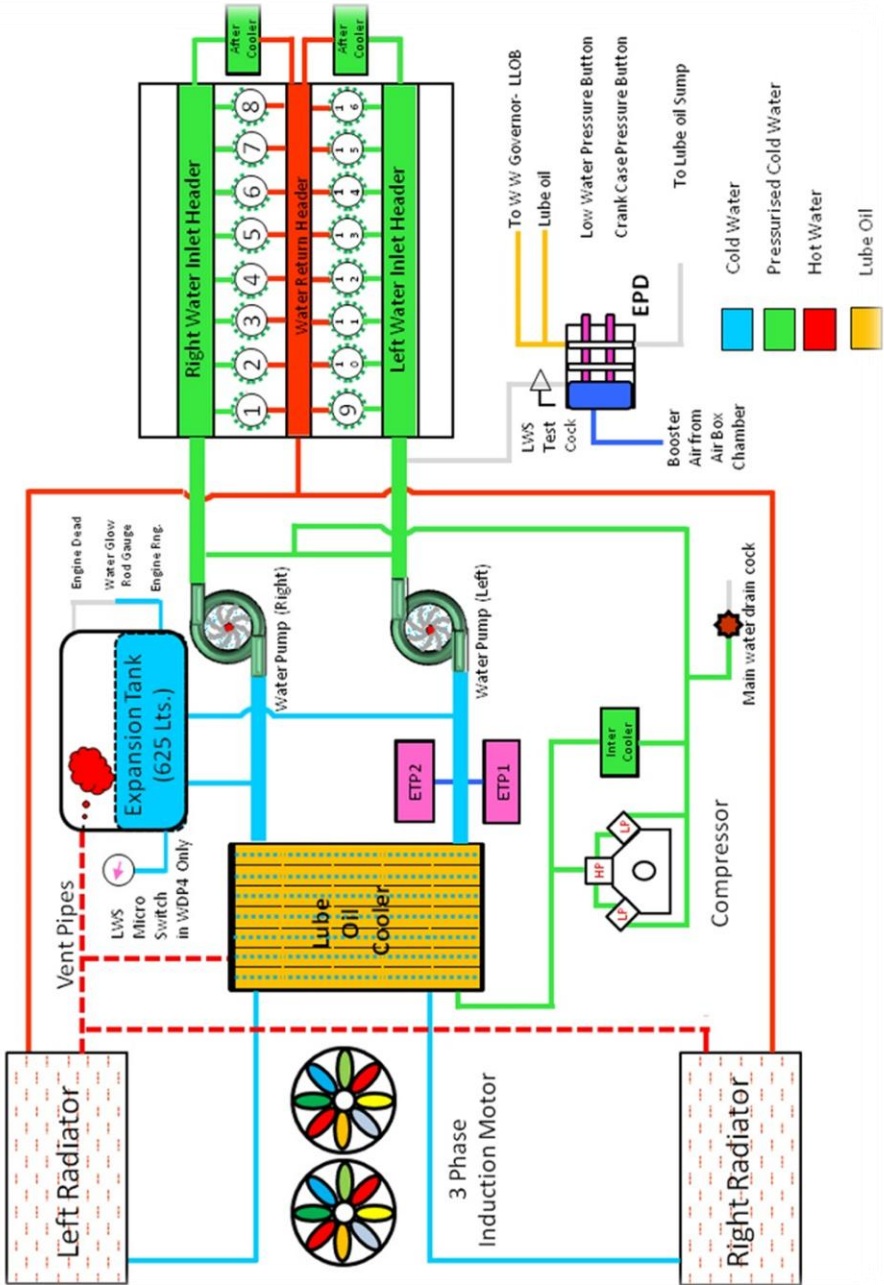


Fig. 2.3

### 2.3.1 Cooling Water System – Points to be Remember

1. Check the working of radiator fan physically even its status is “ON” in the display.
2. Operate the water filling cock lever handle in clockwise. Otherwise it may damage the filling cock lever.
3. Before and after cranking water level to be ensured as the limit prescribed in the glow rod gauge. However, in en-route while TOC if water level is below minimum in shutdown condition and after cranking if the level is above minimum mark in running position, work the train duly giving the information to shed.
4. If water level reducing, check for external leakages. If any leakage noticed, slack the spring loaded cap on the expansion tank to reduce the rate of leakage or operate the spring loaded water filling cock to open and tie it to the adjacent water filling pipe.
5. Check the engine lube oil and Compressor sump in case of water level is reducing.
6. If unable to reset low water button, ensure water level and LWP test cock is in open position and then press and hold LWP button for 2 to 3 minutes.
7. If engine shutdown with low water level in display, ensure water level. If water level is low inform shed. If sufficient water level is available, short the wires provided in LWS (WDP4) locos and crank.

### 2.3.2 ENGINE TEMPERATURE PROTECTION

The normal operating water temperature is 79 to 85° C and it is monitored by ETP1 and ETP2. Maximum of ETP1 or ETP2 is considered as engine water temperature.

### 2.3.3 Temperature System Action

**Water temperature > 85° C** One Fan will be made ON in slow speed.

- Within 20 seconds if water temperature not dropped second fan is switched ON in slow speed.
- Within next 20 seconds if water temperature not dropped First Fan will run at Fast and second one at slow speeds.
- Within next 20 seconds if water temperature not dropped, both Fans will run at Fast speed.
- Both Fans will stop when water temperature drops below 79° C.
- **Water > 96° C** Engine RPM remains high but Traction power limited to 6<sup>th</sup> Notch.
- Display shows message “High water temperature – TH 6 Limit”
- **Water - 101° C** Along with message “High water temperature - TH 6 Limit” Alarm Bell Rings, after 5 minutes Engine comes to Idle.
- **Lube oil above 124° C** Engine come to shut down by Hot Oil Detector operation It cannot be reset.

### **Mismanagement By Crew**

On 17.06.16, LP of Train no MBIV goods (59/5305T) working with Loco No.12745+12315 WDG4/GY stalled in KB-MGD section (UBL div) on 1 in 100 rising gradient due to 12745 (trailing loco) HP reduced due to HEA / RFCB tripped. Train cleared section with relief locos, caused 95" detention and indirect punctuality loss to train number 16590 Exp and 12630 Exp. LP failed to notice & check RFCB1 in tripped condition in time and reset. As a result engine temperature raised, HP reduced. Subsequently train unable to negotiate 1/100 gradient.

This train stalling could have been avoided had the LP monitored the engine temperature & HP parameter in display while negotiate on rising gradients

## **2.4 AIR INTAKE SYSTEM**

This system is used to increase air supply to engine to produce more HP. To achieve this, a turbo super charger working either by gear or exhaust gas is used. During engine starting and light load operation the sun-gear shaft of rotor shaft assembly receive drive from the main crank shaft through the planet gear system and a overriding clutch. When the engine works on full load (approximately in 6<sup>th</sup> notch) the overriding clutch in the drive gear is disengaged and the rotor shaft is driven by the velocity of exhaust gas. Clean air from the clean air compartment is drawn by the blower of the turbo super charger through Baggi filters. (Baggi filters are made by fiberglass material and coated with oil) and delivered to after cooler on both sides of the engine. Cooled air from the after cooler is collected in the respective air boxes and from there enters combustion chamber through inlet ports.

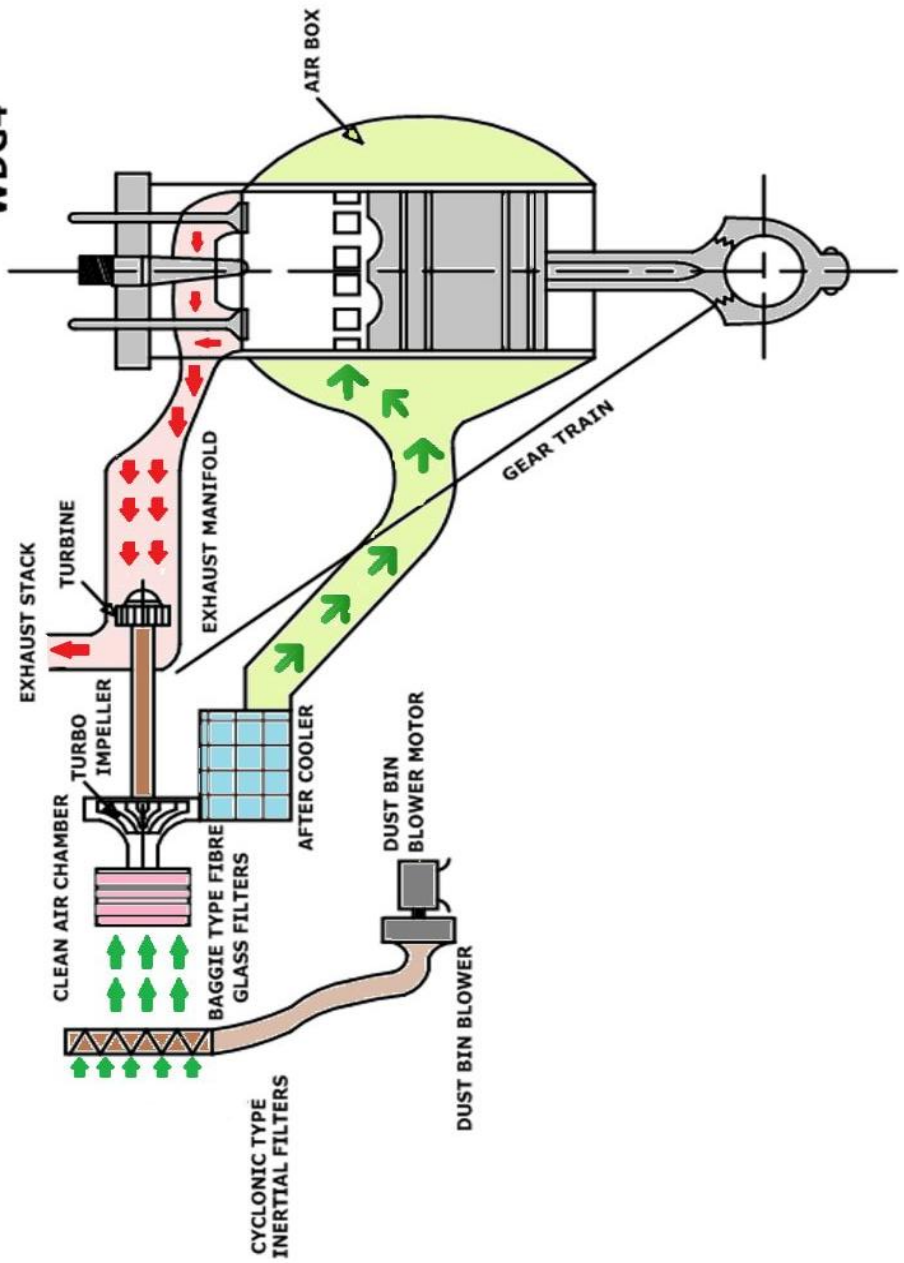
Traction motor Blowers, which is gear driven by the aux generator drive shaft creates partial vacuum in the clean air compartment. The reduction in pressure in the clean air compartment causes outside air to rush through the cyclonic filter tubes and stationary vanes in the intake throats, which imparts a spinning motion to the air. Due to the centrifugal force developed by spinning motion, dirt particles are thrown to the outer wall of the tube and carried to the dustbin (bleeds duct), where they are removed by dustbin blower and thrown out from the locomotive. The resulting clean air enters in the air compartment. In addition to clean the filters, the dust bin blower increases their efficiency by increasing the velocity of the air passing from the filter tubes. The Traction Generator blower draws air from the clean air compartment and used for cooling the Companion alternator and Traction Alternator. The Traction Motor blower draws air from the clean air compartment and Charge the air ducts which is in the loco chassis.

Charged air from the air ducts is utilized for various purposes

- 1) Cool the traction Motors
- 2) Pressurize the ECC1 and ECC3 to avoid dust accumulation
- 3) Compressor air system



**AIR INTAKE SYSTEM OF GT46 MAC LOCO**  
**WDG4**



**Fig. 2.4**



Compressor crankshaft is coupled with main crank shaft through flexible coupling. It has two low pressure and one high pressure cylinder. It is a two stage (low-pressure and high-pressure) water-cooled reciprocating type compressor. The compressor has its own internal gear driven oil pump and pressure lubricating system for its lubrication. A dipstick is provided in the compressor crankcase to check oil level. It has Full and Low mark. Normally it should be at full mark or between Full and Low mark, when engine is in Idle. When it reaches to Low mark, inform shed. The two low pressure cylinders draw air from Air duct through panic air filters and compress it. After compression air passes through an intercooler, where it is cooled by cooling water. After cooled in intercooler air passes to high pressure cylinder, where it is again compressed to main reservoir pressure, cooled in MR cooling coils and then charged in Main reservoir-1(MR1). A safety valve set at 4.2 Kg/cm<sup>2</sup> is provided on the intercooler to protect its cooling tubes from burst, when HP cylinder inlet port is stuck up. From MR1 air is sent to

1) MR Equalizing Pipe

2) Air drier unit to remove oil particles and moisture.

3) Through a MRPT COC and a quick connector to Main reservoir pressure transducer (MRPT), which converts pneumatic pressure in to electrical signal and feed to the LCC to control the compressor loading and unloading for maintaining the MR between 8.4 to 9.8 kg/cm<sup>2</sup>.

A safety valve is set at 10.5 kg/cm<sup>2</sup> is provided between the MR1 and Air drier, to protect the system components from high pressure when compressor is failed during loading. From Air Dryer air is sent through a non return valve to

1) Main reservoir - 2 (MR2)

2) Through a Feed valve Input COC and a feed valve to FP Pipe

3) Through a MR1 System COC and a J-Filter for various magnetic valves (Horn, Wiper, Sander, Radar cleaning, Electronic blow down (EBT) timer and Compressor controller (MVCC). From MR2 air is supplied to CCB unit through a MR2 System COC and a J-Filter. The MR Equalizer pressure is sensed by the Main reservoir equalizer pressure transducer and feedback is given to CCB unit, which is displayed in the Display unit.

## 2.5.1 AIR SYSTEM MAIN CONCEPTS

Unloading : 9.8 Kg/cm<sup>2</sup>

Loading : 8.4 Kg/cm<sup>2</sup>

MR Safety valve : 10.5 Kg/cm<sup>2</sup>

Computer breaker OFF position : Continuous loading Every 60 Seconds Auto blow down valve will blow by the operation of Electronic Blow down Timer (EBT).

a) If MR pressure is less than 8.2 Kg/cm<sup>2</sup> – In WDG4 RPM raises to third notch and in WDP4 RPM raise to second notch

b) If MR is less than 7.0 Kg/cm<sup>2</sup>, RPM raise to 4th notch.

c) If MR is less than 6.8 Kg/cm<sup>2</sup>, Display shows “Low MR Eq. Pressure”.

d) Display shows MR Equaliser pressure (MR1) and Console gauge indicates MR2 Pressure.

## 2.5.2 AIR SYSTEM TROUBLE SHOOTING

### 2.5.2.1 MR1 indication in display is low and safety valve is blowing

REASON	REMEDY
MRPT COC is closed	Keep MRPT COC in open.
Moisture in MR1 Pressure sensing system	Close MRPT COC and drain moisture by pressing the pressure relief valve (quick connector stem) then open the MRPT COC.

### 2.5.2.2 MR1 Pressure is low with PCS open indication.

Compressor is defective in unloading. (MVCC – Trouble)	Close MR1 System COC and open MR1 J- Filter drain COC. Allow to drain the total pressure. Then close MR1 J filter drain cock. Then open the MR1 System COC, when MR safety valve starts bowing.
MR1 – Auto blow down valve blowing continuously.	Close to shut OFF position (manual position -spindle inside).
Feed pipe leakage	Close additional FP COC.
MR Equalizer leakage	Close both end MR Equalizer COC.
Leakage in Air Drier	Put off Air drier breaker and disconnect electrical coupler. If not rectified shut down the engine, drain out MR1 completely and dummy the purge valve.
Sander or horn valves blowing continuously	Close MR1 System COC and open MR1 J- Filter drain COC. Allow to drain the total pressure. Then close MR1 J filter drain cock. Then open the MR1 System COC, when MR safety valve starts bowing.

### 2.5.2.3 MR1 Pressure is available and MR safety valve blowing

If computer breaker is tripped	Reset the same.
Compressor is defective during loading	Inform shed & work onwards
MR1 System COC is closed (sanders, wipers, horns, Auto drain and Radar blow down are not working.	Kept MR1 System COC in open.

### 2.5.2.4 MR2 Pressure is low with PCS open indication.

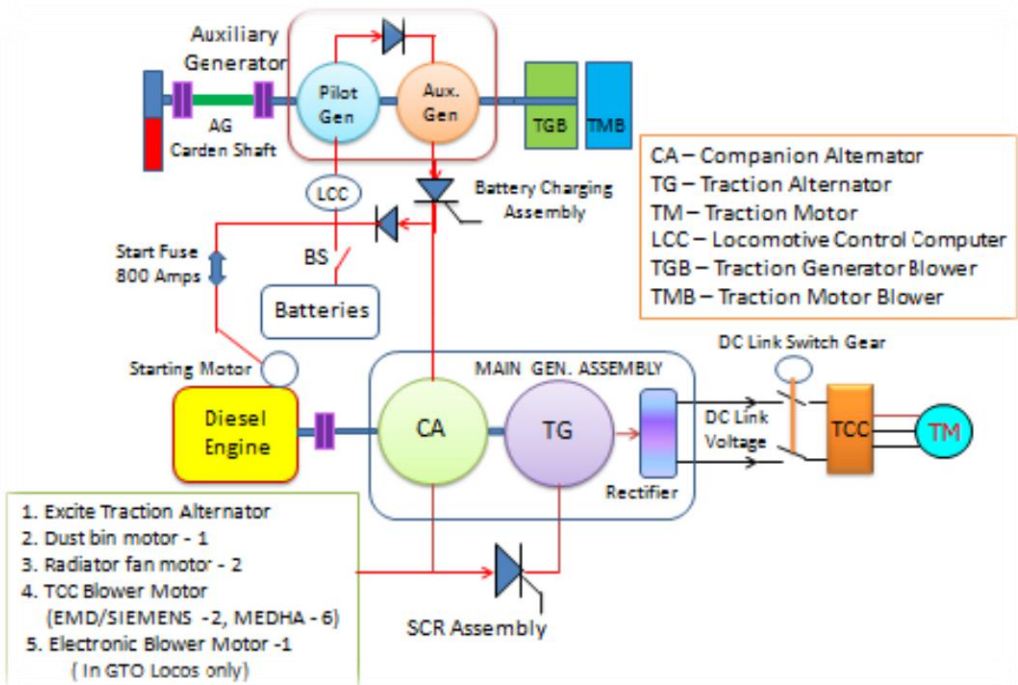
Ensure MR1 pressure	Trouble shoot and create
MR2 – Auto blow down valve blowing continuously.	Close to shut off position (manual position - spindle inside. Rotate clock wise direction).
Leakage in BP Pipe	Check and arrest the leakage
Leakage in BC Pipe	Check and arrest the leakage, if unsuccessful isolate the truck by closing Bogie isolation COC.
Leakage in BC Eq. Pipe	Ensure BC Eq. Cocks are closed.
Compressor Defect	Check oil level or unusual sound.

## 2.6 ELECTRICAL SYSTEM OF WDP4 / WDG4 LOCOS

Diesel Engine is cranked by two DC Series Motors with Battery Power. Once the engine started, it runs on its own, rotating the Main Generator and its Auxiliaries. Due to the residual magnetism, if AG produces phase to phase output of 1.5 Volt, (DVR in EM 2000 or LCC in Medha) allows battery supply to excite the Pilot Generator. Now Pilot Gen. Produces power, converted into DC by inbuilt rectifier and fed to AG Field. As soon as AG is excited it produces 55 Volt, 3 Phase AC Supply and it is used for the following purpose.

a) Converted into 24 volt DC and used to trigger the GTO/IGBT in the TCC.

b) Converted into 74 volt DC in Battery Charging Assembly and used to excite the Companion alternator and charging the batteries. Since companion Alternator is being excited, it starts to produce 3 Phase AC supply and helps to run TCC electronic Blower Motor, TCC-1 Blower Motor, TCC-2 Blower Motor, Radiator Fan Motor-1, Radiator Fan Motor -2 and to excite the Traction Alternator after converted into DC in SCR Assembly. Now the Main Alternator starts to produce 3 Phase output, then rectified into DC (DC Link Voltage) by the rotary inbuilt rectifiers and fed to the Traction Control Converters (TCC) through DC Link Switch Gears. The TCC converts the DC Link DC Voltage into 3 Phase variable frequency, variable voltage according to the LCC command and given to the 3 Phase squirrel cage induction Motors which are provided on the axles. Now Traction Motors start working and rotate the axles result loco get move.



**Fig 2.6**



## 2.6.1 ELECTRICAL CONTROL CABINET -1 (ECC-1)

This known as high voltage cabinet. It consisting of all electronic modules, sensors, breakers, switches and contactors. The generated DC output is distributed to Traction converter cabinet through this ECC-1. Before opening the Panel Doors Isolation Switch is to be kept in Isolation position. Static current discharge belt is provided to protect high sensitive electronic components before intervene.

SNO	MODULE	PURPOSE
1	FCD (Firing control Driver)	Control SCR Assembly gate supply
2	FCF (Firing Control Feedback)	Provided information to Computer that how many times CA output cross zero for a interval.
3	ASC (Analog Signal Conditioner)	Conditions analog feed back into DC signal and send to ADA module.
4	TLF (Train Line Filter)	Prevents interference of other signals into the MU jumper.
5	DVR (Digital Voltage Regulator)	Controls the AG output.
6	ADA (Analog to Digital to Analog)	In converts analog signal into digital signal for processing and converts digital signal into analog signal for controlling.
7	CPU (Main processing unit)	Brain of the computer. Various data are programmed for processing and controls all the functions of loco.
8	DIO (Digital Input and Output)	Converts input signals to digital signals for processing and converts digital signal into output signal for controlling. There are three DIO cards available, having 24 input and 26 output channels. During “Mux failure” message after obtained permission from shed, these cards may be swapped after (1) secure the loco (2) switch off Computer breaker (3) Discharge static potential by using anti static strap.
9	MEM (Computer working memory)	Stores fault and operational data’s for locomotive operation.
10	COM - Computer	Communication interface between Main and other computers.
11	PRG - Power Regulator	Responsible for regulating DC supply from battery.

12	PSM-300 (Power Supply Module)	Responsible to produce $\pm 15$ V DC for sensors.
13	PSM-301 (Power Supply Module)	Responsible to produce +12 V DC for EM 2000 chassis.
14	PSM-302 (Power Supply Module)	Responsible to produce +5 V DC for digital circuit

## 2.6.2 CIRCUIT BREAKER

### 2.6.2.1 Black Labeled Breakers

1. **AC CONTROL** - Protects companion alternator output & including Traction Alternator excitation and G.R. hardware.
2. **CONTROL** – Sets up the fuel pump and control circuits used for engine starting. The control circuits are fed from battery through the battery knife switch, before an engine start and through AG when engine is running
3. **LOCAL CONTROL** - Operates heavy duty switch gear, magnet valves, contactors, blowers and miscellaneous relays operated by locomotive battery/Auxiliary Generator.
4. **FILTER BLOWER** - Provides power and protection Air Inertial filter blower motor circuit.
5. **AUX. GEN. FIELD** - Provides power and protection to the Auxiliary Generator field circuit.
6. **FUEL PUMP** - Provides power and protection to Fuel Pump Motor circuit.
7. **GOV. BOOSTER PUMP** - Provides power and protection Gov. Booster Pump circuit.
8. **MICRO AIR BRAKE** - Provides power and protection Air Brake system.
9. **GEN. FIELD** - Protects the traction alternator field circuit, also protects SCR and the Companion Alternator
10. **AUX. GEN. F.B-** Provides power and protection to the firing control driver (FCD) module (EMD LOCOS).
11. **DCL CONTROL** - protects the DC Link (DCL) transfer switch motor and control circuits (EMD LOCOS).
12. **TCC1 COMPUTER Breaker** : Provides power and protection to the TCC1 Computer (EMD LOCOS).
13. **TCC2 COMPUTER Breaker** : Provides power and protection to the TCC2 Computer (EMD LOCOS).

14. **TCC ELECT BLW MTR Breaker** : Protects the TCC Electronics blower motor circuit. This blower cools TCC Cabinet electronics equipment (EMD LOCOS).
15. **TCC1 BLOWER Breaker** : Protects the traction control converter #1 blower motor (EMD/SIEMENS LOCOS).
16. **TCC2 BLOWER Breaker** : Protects the traction control converter #2 blower motor (EMD/SIEMENS LOCOS).
17. **AC GTO #1 PWR SUPPLY BREAKER:** Protects GTO #1 power supply, DC supply input to TCC1 Inverter (EMD LOCOS).
18. **AC GTO #2 PWR SUPPLY BREAKER** : Protects GTO #1 power supply, DC supply input to TCC2 Inverter (EMD LOCOS).
19. **SCR Module-** It provides power and protection to Main Generator Field Excitation Controller (SIEMENS LOCOS).
20. **TCC PS-** Provides power (74VDC) and protection to traction control computer and associated circuits (SIEMENS LOCOS).
21. **DISP-** Provides power and protection to Display Unit (SIEMENS LOCOS).
22. **PS 05** - Power and protection to PRG 05 responsible for providing +24V DC power supply to SIBAS Klips (SIEMENS LOCOS).
23. **PS 04** - Provides power and protection to PRG 04, which supplies  $\pm 15V$  DC to RADAR system through TB RA. (SIEMENS LOCOS).
24. **DCL-1 to 6** - Protects DC Link transfer switch motor circuit (MEDHA LOCOS).
25. **TC-1 to 6** - Provides power to concerned Traction Computer (MEDHA LOCOS).
26. **TCC Blower -1 to 6-** Protects the concerned Traction converter Blower Motor (MEDHA LOCOS).
27. **GRNTCO TOGGLE SWITCH** - This double pole toggle switch disconnects the ground protection from the locomotive high voltage electrical circuits for maintenance inspections or troubleshooting. When this switch is in ON position then only LCC receives an ON command. This switch is normally locked in the closed (lever up) position by a pin.

### 2.6.2.2 Yellow Labeled Breakers

1. **Turbo** - Provides power and protect Turbo lube pump
2. **Computer Control** - Protects the Main Computer Circuits.

### 2.6.2.3 White Labeled Breakers

1. **LIGHTS** - Controls all lighting inclusive Flasher

2. **HEAD LIGHT** - Controls both Head Lights
3. **CAB FAN** - Controls cab fan motors.
4. **AIR DRYER** – Controls Air Dryer and its associated circuit
5. **GOV. BOOSTER PUMP** - Protects Gov. Booster Pump circuit
6. **RADIO** - It protects the radio communication equipment.
7. **EVENT RECORDER** -Protection to the event recorder circuit

### 2.6.3 BREAKER IN ECC2

1. **AUX GEN Circuit Breaker** - The circuit breaker is provided at the input side of the battery charger for charging the battery bank of the Locomotive. This circuit breaker is used for protection and switching ON/OFF the input supply to the battery charger from Aux. Generator.

### 2.6.4 BREAKERS IN ECC3

1. **RFCB 1 & 2** This Breaker makes And breaks the connection across the Companion Alternator and radiator fan contactors. This CB will trip to protect against locked motor rotor due to bearing seizure or jammed fan blades. Single phased motor winding, Faulty fan contactors and Phase faults

### 2.6.5 RELAYS

- Relays are provided in the Relay panel except Cut out Relay, which is in CCB unit.
- Relays are provided with Green and Red Flaps to identify its status.
- Green Flap indicates that the Relay is in de-energized and Red Flap indicates that the Relay is in energized condition.



#### 2.6.5.1 AG Trip – AG Trip Relay

- The status of this Relay is de-energise for normal operation of the loco.
- LCC energises this relay when AG is unable to maintain the demand.
- When it energises AG Field breaker gets trip and BCA shows discharge with message.

#### 2.6.5.2 AR - Alarm Relay

- The status of this Relay is energise for normal operation of the loco.
- This relay de-energises, whenever the attendant call push-button is pressed, or through software by LCC Command.
- If this Relay de-energises, the alarm bell rings to alert the operator that operating condition is abnormal or protective devices are operated.

### **2.6.5.3 BWR - Brake warning Relay**

- The status of this Relay is de-energise for normal operation of the loco.
- This relay picks up when over current flows through DB Grids.
- When BWR picks up, BRAKE WARN - Indication glows in the consoles.

### **2.6.5.4 CMPSYN - Compressor synchronization Relay**

- This relay is energised or de-energised according to the LCC command.
- When this Relay is energized, LCC command for compressor loading signal is sent to train line (25T) to synchronize all the units in the consists.

### **2.6.5.5 DCR - Dryer control Relay**

- The DCR relay controls the electronic timer “memory” of the air filter/ dryer.
- It permits the unit to regenerate only when the locomotive is working or when an air compressor is “ON” in any locomotive in a multiple unit consist is loading (pumping), in order to conserve additional air.

### **2.6.5.6 EFCO - Emergency fuel cutoff and engine stop Relay**

- The status of this Relay is energise for normal operation of the loco.
- This Relay will de-energises, when emergency fuel cutoff is requested.
- When EFCO/STOP is operated, computer dropout of the EFCO relay and energise DV- Solenoid in the governor to shut down the engine.

### **2.6.5.7 FLSHR – Flasher light Relay (In MEDHA Locos only)**

- The status of this Relay is de-energise.
- This relay energises, during PCR operation.
- Its status alters automatically to get flasher operation.

### **2.6.5.8 FPR - Fuel pump Relay**

- The status of this Relay is energise during and after priming.
- LCC will de-energise this relay, whenever Control / FP switch in the console is kept in off both in Lead and Trail Loco after predetermined time.

### **2.6.5.9 GBC – Governor booster Relay**

- The status of this Relay is de-energise for normal operation of the loco.
- This relay energises, to achieve quick movement of fuel rack during cranking.

### **2.6.5.10 MCB - Module Control Relay (computer control relay)**

- This relay is controlled by the Computer Control circuit breaker.
- MCB picks up when the Computer Control breaker is switched “On”, if the battery knife switch is closed or the turbo lube pump relay (TLPR) is picked up.
- MCB drops out if the Computer Control breaker is tripped or switched off.



- When MCB drops out, through its NC IL(Bypass the FP Relay output channel) FPR kept energized, provided that all four following conditions are met:
  - a) Battery knife switch is closed.
  - b) Local Control breaker is closed.
  - c) Emergency fuel cutoff (EFCO) switch is not operated.
  - d) Shutdown relay SDR is not picked up.

#### **2.6.5.11 PCR - Pneumatic Control Relay**

- The status of this Relay is energise for normal operation of the loco.
- If it de-energises “PCS OPEN” light glows on the control consoles according to the LCC command during
  - a) MR Equaliser pressure is dropped below 6.8 kg/cm<sup>2</sup>
  - b) BP Pressure is dropped below 2.8 kg/cm<sup>2</sup>

#### **2.6.5.12 SDR - Shut Down Relay**

- The status of this Relay is de-energise for normal operation of the loco. relay energises, if stop command is requested through MU Stop button.
- When it energises, all locomotives coupled in MU consist are shutdown immediately.

#### **2.6.5.13 TEL - Tractive Effort Limiting Relay**

- This relay is energized by LCC when the operator selects the traction effort limit function. (T.E. Limit can be reduced to 294 KN (66 140 Lbs).
- When this relay is energized,
  - a) First contact provides TEL relay status feedback to LCC.
  - b) Second contact provides feed to M.U. receptacles to reduce tractive effort in other locos in a consist..
  - c) Third contact provides supply to the traction effort limit indicator lights on both control consoles.

#### **2.6.5.14 TLPR - Turbo Lube Pump Relay**

- This Relay energises during engine start and shutdown
- This relay controls the Turbo lube oil pump to achieve post and pre lubrication.

#### **2.6.5.15 WL or WSR - Wheel Slip Light Relay**

- Status of this Relay is de-energise for normal operation of the loco.
- This relay energises, during wheel slip, wheel over speed, or locked wheel.
- When it energises “Wheel Slip” light glows on the control consoles.

#### **2.6.5.16 COR – Cutout Relay**

- This relay is provided in the CCB unit.
- This relay controls PCR status according to MR1 and BP Pressure.

#### **2.6.5.17 RDR TST – Radar test Relay (In MEDHA Locos only)**

- The status of this Relay is de-energise for normal operation of the loco.
- This relay energises, during Radar test.

#### **2.6.5.18 DBGR - Dynamic braking ground Relay (In EMD Locos only)**

- During normal operation, (both TCC's are cut-in), DBGR coil is not energized and its contacts connect grid path - 2 to the ground relay system.
- In dynamic braking, when both trucks are CUT-IN, the two grid paths are connected in parallel so that the ground relay (GR) will pick up if there is a high voltage ground on either grid path.
- In the case where a TCC (TCC1 or TCC2) needs to be cut out, EM2000 disconnects grid path -2 and uses grid path -1 to connect the remaining TCC during dynamic braking operation. When this event occurs, DBGR coil is energized through B2 and B4 contactor interlocks and DBGR contacts move to connect grid path -1 only to the ground relay circuit.

#### **2.6.5.19 GR - Ground Relay (In EMD Locos only)**

- The ground relay prevents the main generator to produce power, when the Rectifying diodes are failed or Positive or negative high voltage path to ground.
- GR is normally in de-energized condition. It picks up when its operating coil current exceeds 750 - 875 milli ampere.
- The ground relay is held in its tripped position by a mechanical latch in the relay and is reset by the LCC.
- The LCC provides specific number of resets only. (3 times within 10 minutes).
- After that the ground relay will lockout. It can be reset through LCC display after eliminate the cause of fault.

#### **2.6.5.20 SPR1, SPR2 - Siemens protection Relays (In EMD Locos only)**

- This relay is used to temporarily disconnect the traction computers from the battery voltage during engine startup when the battery voltage drops.
- The operating coil is connected into the Siemens computer starting circuit module.
- These Relays will pick up after completion of starting sequence and provide power through its interlock to Traction Computer.

### **2.6.6 ELECTRICAL CONTROL CABINET-2 (ECC-2)**

- This cabinet is mounted on the right side of the locomotive, under the locomotive under frame, between the No.1 bogie and the fuel tank.
- This compartment should not be opened except to reset Aux. Gen. Circuit breaker (250 A).
- It houses:

SNo	Component	Purpose
1	Aux. Gen. Circuit breaker (250 A)	Controls supply from AG to the BCA
2	Battery charging assembly (BCA)	Rectify the AG three phase output into 74 V DC
3	Starting Resistors (REST-1 and REST-2)	Limit the current flow to the pickup and hold on coil of the starting motor before cranking.
4	Starting Contactor (ST)	Feed supply to the starting motors for cranking the diesel engine
5	Starting Auxiliary Contactor (STA)	Feed supply to the starting motor pickup and hold on coil, to engage and hold the starting motor pinion with starting gear
6	Auxiliary Generator Armature Voltage Sensor (AGAV)	Sense AG Armature voltage
7	Auxiliary Generator Armature Current Sensor (AGAI)	Sense AG Armature current
8	Battery Temperature Sensor	Sense the ECC-2 temperature.
9	Terminal Board	Connecting ECC-2 components to external system

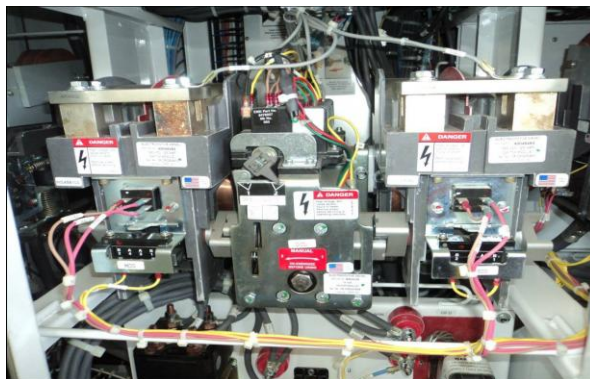
### 2.6.7 ELECTRICAL CONTROL CABINET-3(ECC-3)

- This cabinet is mounted on the right side of the locomotive in compressor Room.
- This compartment should not be opened, except to reset Radiator Fan Circuit Breakers
- It houses:

SNo	Component	Purpose
1	Slow speed Radiator fans contractors ( FCS-1 and FCS-2)	Run the radiator fans at slow speed
2	Fast speed Radiator fans contractors ( FCF-1B, FCF-2B, FCF-1A and FCF-2A)	Run the radiator fans at faster speed
3	Circuit breakers(300 A)-2 Numbers (RFCB-1 and RFCB-2) or Radiator Fan Fuses 300A (2 No.s)	Control supply to the Radiator fan blower motors.
4	Main reservoir pressure transducer (MRPT)	Sense MR1 Pressure and gives feed back to LCC for control the compressor loading and unloading process.
5	Terminal Boards and CPC Connectors	Connecting ECC-3 components to external system

## 2.6.8 DC LINK SWITCH GEAR

- The switch gear connects the DC Link power to converter is called as DC Link switchgear.
- This switchgear is driven by DC motor with battery power and controlled by locomotive control computer.
- It is located in Electrical control cabinet-1 in EMD Locos and in the Traction converter cabinet in Medha locos.
- The normal position of the switchgear is closed as soon as DC Link Breaker is switched on.
- A few reasons will cause the switchgear to open:
  - a) Inverter cutout is requested.
  - b) The engine is not running (based on CA frequency) and DC Link capacitor is discharged.
  - c) If experiences converter and RS-485 serial link faults.
  - d) Unit is placed in isolate for more than 20 seconds.
  - e) Battery knife switch is opened.
  - f) During DCL shorting, Load and Excitation self test.
- In EMD locos one DC Link switch gear is provided to control both trucks.
- In Medha locos (for both WDG4 and WDP4) 6 DC Link switch gears one for each converter is provided.
- If DC Link switch gears are in open position, discharging of DC Link capacitors is not possible by normal discharging method by moving the Reverser handle to center or Isolation switch to isolate position.
- DCL Switch gear place a short circuit across the TCC DC input when opened.



**NOTE:** If DCL Switch gear gets opened forcibly before the condition to be full filled, (such as BS open) leads no propulsion with message “hard crow bar fires”.

### Mismanagement By Crew

On 09.11.13, Loco No. 40150/WDP4/GY/SCR, while working Train No. 12798 express detained for 120 min., since loco shut down with message low lube oil pressure. It was found that technicians were accompanying in cab 2 and technician leaned back to the engine control panel of cab 2 resulting in EFCO get pressed as the button is of mushroom head type. Hence give instructions to the inspecting officials not to lean back towards EFCO which may cause unnecessary shutting down of locomotive.

### **2.6.9 TRACTION CONTROL CONVERTER (TCC)**

- Loco Pilot's entry and intervene with components is restricted and this compartment is Locked with separate lock key.
- It is equipped with
  - a) 2 TCCs, each TCC is responsible to control individual bogie. TCC-1 is for Bogie-1 and TCC - 2 is for Bogie-2 in EMD /Siemens Locos.
  - b) 6 TCCs, each TCC is responsible to control individual Traction Motors. TCC-1 is for TM-1, TCC-2 is for TM-2, TCC-3 is for TM-3, TCC-4 is for TM-4, TCC-5 is for TM-5 and TCC -6 is for TM-6 in Medha Locos.
- This cabinet houses
  - a) Traction Control Computer - TCC (SIBAS-16)
  - b) GTO (Gate turn off Thyristor) / IGBT (Insulated gate bipolar transistor) Modules
  - c) DC Link Capacitor
  - d) Inverter Protection Module

### **2.6.10 TRACTION CONTROL COMPUTER**

- It is used to control and monitors the electrical components of Traction converter.
- It starts to function as soon as Master handle is operated.
- It determines the phase sequence commanded by the LCC according to the Reverser handle position to achieve locomotive direction.
- TCC de-rates the torque of TM if TM Stator temperature is  $> 200^{\circ}\text{C}$ .
- TCC cutoff the Traction converter if TM Stator temperature is  $> 200^{\circ}\text{C}$ .

### **2.6.11 GTO THYRISTER / IGBT Module**

- It is the central element of the converter and converts the DC link voltage into variable frequency and variable 3 phase AC voltage during motoring and converts the 3 phase AC voltage developed by Traction motors during braking into DC voltage.
- It is cooled by TC Blower. The speed of this blower is according to the CA output in EMD Locos.
- The speed of TC Blower is according to the CA output and Phase module heat sink temperature in Medha Locos.
  - a) If Heat Sink Temp  $> 41^{\circ}\text{C}$  – TC Blower will work at slow speed.
  - b) If Heat Sink Temp  $> 48^{\circ}\text{C}$  – TC Blower will work at medium speed.
  - c) If Heat Sink Temp  $> 55^{\circ}\text{C}$  – TC Blower will work at fast speed.
- Each Phase module has temperature sensors to monitor the heat sink temperatures of GTO / IGBTs individually.
- When the temperature rises above  $80^{\circ}\text{C}$  – torque of the Traction Motor will be de-rated.
- When the temperature further raises above  $85^{\circ}\text{C}$  – respective converter will be cutoff.

## 2.6.12 DC LINK CAPACITOR

- Its purpose is to stabilise the DC Link voltage during loading.
- Temperature of each DC link capacitor is monitored by respective Traction Computer (TC) through temperature sensors (PT100).
- If temperature rises above 68° C, TC will reduce the torque of the particular traction motor.
- If temperature still rises beyond 75° C, Traction will cut off by TC.

## 2.6.13 DISCHARGING OF DC LINK CAPACITORS

- There are three general ways are used to discharge the DC link capacitors before shutting down and then short circuit. is to be maintained.
- When Run / Isolation switch is kept in Isolate Position, the Braking Contactors are picking up and stored energy in the DC Link capacitor is discharged through DB Grid Resistors. This method discharges the DC Link capacitors in less than one second (100 milliseconds).
- When Reverser Handle is moved to centered, Main Generator Excitation stops, if no further action is taken the Bleeder resistors, which are provided across each Traction Inverter will discharge the DC Link voltage below 50 volts in 50 minutes.
  - a) If for any reason, one truck / Traction Motor is kept in disabled, it is not possible to discharge the isolated truck / TM. During this time enable the truck / TM and then discharge the DC Link Capacitors.
  - b) If unable to bring back the truck / TM into service, shut down the loco and allow 40 minutes time. Then DC Link shall be treated as discharged if the MG voltage shows below 20 volts and is ensured through display in MG (volt) as follows.

**In EMD** - From Main Menu select -Power Data, then go to MG (volt)

**In Medha**- From Main Menu select -Data Meter, then Motoring, then go to MG (volt)

- Through crowbar as provided by the inverter equipment, discharge time less than 10 microseconds.

## 2.6.14 ROTATING MACHINES

### 2.6.14.1 MAIN GENERATOR ASSEMBLY

- It is located in main generator room.
- It is coupled with engine crank shaft through a flexible coupling.
- It converts the mechanical energy produced by the diesel engine into electrical power.
- It is cooled by Traction Generator blower which is gear driven by main crank shaft.
- It consists three unit and they are,
  - a) Traction Alternator
  - b) Companion Alternator
  - c) Rectifier Bank



#### **2.6.14.1 TRACTION ALTERNATOR**

- It is located inside the main Gen. Assembly and adjacent to Companion Alternator.
- Its field is excited by companion alternator and controlled by SCR assembly.
- Its output voltage is - 600 to 2600 V and Maximum continuous current – 1250 A.
- When it fails TE/BE Meter will not respond.

#### **2.6.14.2 COMPANION ALTERNATOR**

- It is located inside the main Gen. Assembly and adjacent towards diesel engine side.
- It is physically connected but electrically separated from Traction Alternator.
- It is excited by Auxiliary Generator and has no control in the field. Hence its output varies according to the diesel engine speed.
- Its output is
  - a) Power - 250 KVA at 0.8 power factor
  - b) Volt - 40 to 220 volt, 3 phase AC
  - c) Frequency - 60 to 120 HZ
  - d) Maximum current - 600 Amperes
- The Companion Alternator provides power to
  - a) Inertial filter blower motor
  - b) Radiator blower motors
  - c) TCC Blower motors
  - d) TCC Electronic Blower motor (GTO Locos)
  - e) Excite the Main Generator field
- If Companion Alternator fails, propulsion is not possible and TE/BE Meter will not respond.

#### **2.6.14.3 RECTIFIER BANK**

- It is located inside the main Generator Assembly and adjacent to Traction Alternator.
- There are two banks,
  - a) Positive Diode bank (white in colour)
  - b) Negative Diode bank (Pink in colour)
- The diodes are provide with fuse and pin in the fuse protrudes when the fuse blown.
- The maximum permissible blown fuse permitted is SIX.

#### **2.6.14.4 RADIATOR BLOWER MOTOR**

- It is located in the Radiator room.
- Two motors are available and its purpose is to cool the cooling water in the radiators.
- It is a 36 HP three phase Induction motor working on the output developed by Companion Alternator.
- If fails continuous hot engine will be experienced.

### 2.6.14.5 FILTER (DUST BIN) BLOWER MOTOR

- This is located in the clean air compartment.
- Its purpose is to remove the collected dirt in the cyclonic filter.
- It is 7.5 HP, three phase Induction motor working on the output developed by CA.
- If this motor fails and
  - a) If the pressure drop across the inertial filter plus the engine air filter reaches 14 inches of water, message “Engine Air Filter Dirty” – Indicates excessive restriction of air to the engine.
  - b) If the pressure drop across the inertial filter plus the engine air filter reaches 24 inches of water, message “EFS : Plugged Engine Filters : TH 6 Limit” - Speed and loading will be reduced to TH 6 Limit.

### 2.6.14.6 TCC BLOWER MOTOR

- It is located in the TCC Room and its purpose is to cool TCC components.
- There are two motors in EMD and six in Medha locos.
- TCC Blower breaker in the ECC-1 controls the supply to this motor.
- These motors are three phase Induction motor and working on the output developed by the Companion Alternator.
- Its speed is controlled by the traction computer according to heat sink temperature.

#### In EMD locos

- a) Starts to work at 41° C
- b) Slow Speed – Up to third notch
- c) High Speed – Above third notch
- d) Stop at 36° C.

#### In Medha locos

During temperature increase		During temperature drop	
1.	Slow Speed - above 41° C	1.	Medium Speed- reaches 50° C
2.	Medium Speed - above 48° C	2.	Slow Speed - reaches 43° C
3.	Fast Speed - above 55° C	3.	Come to stop - reaches 36° C.

### 2.6.14.7 TCC ELECTRONIC BLOWER MOTOR

- It is provided in EMD GTO locos only.
- It is located in the clean air compartment and supplies cooling air to the electronics components in both TCC -1 & 2 cabinets.
- It is a three phase Induction motor working on the output developed by Companion Alternator.

### 2.6.14.8 TRACTION MOTOR

- It is provided in the axles except in WDP4 – EMD Locos, where TMs are provided in 1, 2, 5 and 6 th axles.
- Its purpose is to convert the electrical power developed by the Traction control converter unit into mechanical power.
- It is a three phase cage induction motor and hung in the axles.

- Its output is 630/670 HP in WDG4 and 940/1000 HP in WDP4
- It will work as AC Generator during Dynamic Brake.
- It is a forced air cooling machine and is achieved through Traction motor Blower.
- During failure - in EMD locos truck is to be isolated and in Medha locos TM is to be isolated.

#### **2.6.14.9 DYNAMIC BRAKE BLOWER MOTOR**

- It is located in the top of traction controller converter cabinet.
- Two motors are available and its purpose is to cool the dynamic brake grid.
- It is a 36 HP DC Series motor, working on the output developed by Traction Motor when working as generator during dynamic brake.
- If it fails Dynamic Brake should not be used.

#### **2.6.14.10 DC LINK MOTOR**

- Its purpose is to operate the DC Link switch gear.
- It is located in ECC-1 in EMD Locos and TCC in Medha Locos.
- The number of DC Link motor available is one in EMD and six in Medha.
- If DC Link motor fails, the DC Link supply to the Traction Control Converter will be cut off.

### **2.6.15 SPECIAL FEATURES**

#### **2.6.15.1 TRACTIVE EFFORT LIMIT SWITCH (TELM)**

- It is provided in ECP and it is a train lined (MU) switch.
- The normal position of this switch is “OFF” position.
- This switch is to be kept ‘ON” while approaching a weak bridge or a spot, where tractive effort is limited to 30 Tons and should be kept “OFF” after the loco crossed the spot.
- If this switch is in ‘ON’ TEL Light will glow in the indication panel.
- When this switch is in “ON” the tractive effort of the loco is reduced to 30 Tons (294 KN) irrespective of notch position.

#### **2.6.15.2 AUTO FLASHER**

- It is controlled by the Lights breaker.
- It will be made “ON” automatically, when PCS is dropped.
- LCC may apply Penalty brake if BP Pressure drops below 2.8 kg/cm<sup>2</sup>.
- Auto flasher working is indicated by the flashing of “FLSHR lights” in the indication panel.
- When auto flasher starts to work, the operator should immediately switch ‘ON” Flasher light manually, create BP and MR, then Penalty to be recovered as per LCC instructions.

### 2.6.15.3 BLENDED BRAKE

- Blended brake means when Auto brake handle is moved to service application zone, automatically the proportionate application of Dynamic brake comes into action along with formation brake and conjunction of loco brake.
- This feature is not available in Emergency application of the Auto brake.
- This feature is available for lead loco only and to achieve this brake DB and BB slide switch in the ECP should be in “Cut in” position.
- In case of malfunction, it can be isolated by keeping the BB Slider switch in “Cutout” position.
- If this switch is in “Cutout” position BBCO light will glow in the indication panel.

### 2.6.15.4 AUTO EMERGENCY BRAKE (AEB) / RESTRICTED AIR PENALTY BRAKE SWITCH (RAPB)

- This switch is provided in ECP with locking mechanism.
- AEB / RAPB is being pre-setted to operate at a speed by the shed.
- This switch is to be used while working a train in Ghat section's which has permanent speed restriction of 30 kmph.
- The normal position of this switch is “OFF” position.
- When this switch is in “ON” position, Penalty brake will apply, when the loco speed exceeds 30Kmph.
- AEB-Penalty can be resetted, by pressing the AEB Reset Switch after bring the Throttle handle to Idle and after train comes to stop only.
- RAPB-Penalty can be resetted, by pressing the RAPB Reset Switch after bring the Throttle to Idle and after train speed falls below 10 kmph.

#### Mismanagement By Crew

On 26.05.14, LP of train no. 17256 exp working with Loco No.12084 +12092 WDG4/UBL detained 60” between HYB-SC due to BP dropped with message code number 3832 in leading 12092. After recovered penalty, again penalty taken place after crossing 30 KMPH and penalty taken place repeatedly. LP cleared the section below 30 KMPH. The trailing locomotive is equipped with AEB/RAPB switch & it was in ON position but LP could not notice it and failed to switch off the AEB switch before starting and even after penalty.

This train detention could have been avoided had the LP switched OFF the AEB/RAPB switch. Hence ensure AEB/RAPB switch should be in disabled (OFF) position and it should be enabled only in the GHAT section, where required.

## 2.6.16 PROTECTION

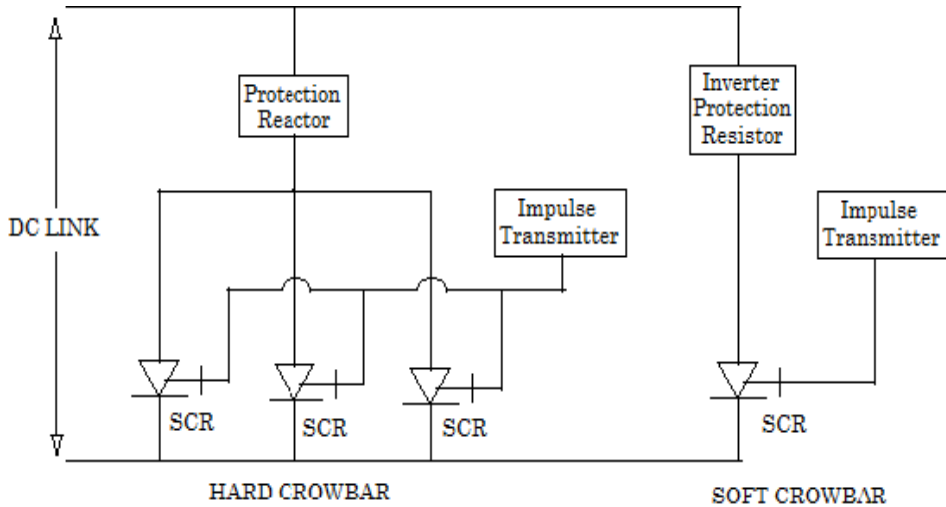
### 2.6.16.1 INVERTER PROTECTION MODULE

- It is a Firing protection for the Thyristers / IGBT to shutdown TCC or limit the DC Link voltage in case of TCC being damaged.
- It protects DC Link through crowbar firing during overvoltage..
- The over voltage may occurs, if 24 volt DC supply to the GTO / IGBT or 74 volt DC Supply to the TCC is interrupted.

## EMD LOCOS

Two levels of over voltage protection is provided for DC link and they are

- a) Soft Crow Bar (Pulse blockage of GTO)
- b) Hard Crow Bar (Short circuit by SIBAS).



### First stage - Soft Crow Bar (Pulse blockage of GTO).

- Whenever the DC Link voltage exceeds 3000 volt (surge voltage) TCC commands the Soft crowbar SCR to fires.
- The DC Link voltage is discharged through Inverter Protection Resistor (IPR) having a resistance value of 3 ohms.
- The system corrects automatically When DC Link voltage drops below 2600 volts within one second.
- Operators intervene is not required.

### Second stage - Hard Crow Bar (Short circuit by SIBAS).

- Whenever Soft crow bar fails to discharge DC Link voltage within 1 second, on completion of 1.1 seconds hard Crowbar will fires.
- Whenever the DC Link voltage exceeds 3200 volt TCC Computer commands the Hard crowbar SCRs to fire.
- The DC Link voltage is short circuited through a reactor.
- For this trouble, message will be displayed and to reset this operator has to recycle the TCC.

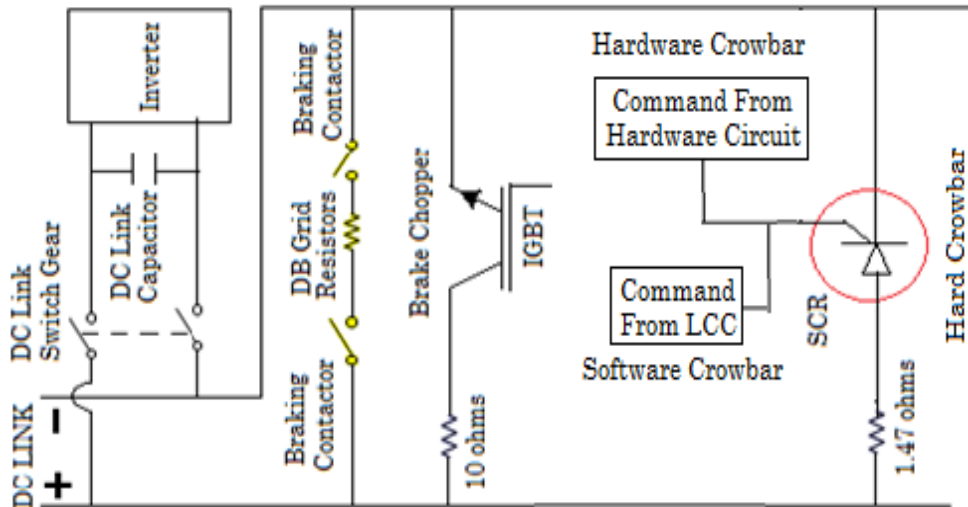
## MEDHA LOCOS

Three levels of over voltage protection is provided for DC link and they are

- a) Brake chopper
- b) Hard Crowbar fired through software
- c) Hard Crowbar fired through hardware

## Brake chopper

- Whenever the DC Link voltage exceeds 2800 volt LCC commands the Brake Chopper IGBT to fires and add resistance of 10 ohms across the DC Link.
- Due to additional load DC Link voltage drops. If DC Link voltage is dropped below 2600 volt LCC cutoff the Brake Chopper IGBT firing.
- If not drops within 12 seconds, LCC with draws firing command to IGBT, drop GF and energies Braking contactors to ground the DC Link with message in the display.
- To recover from this trouble, throttle to be brought to Idle and Reverser to be kept in neutral as per Display command.



## Hard crow bar fired by software

- Whenever the DC Link voltage exceeds 3400 volt LCC commands the SCR to fires.
- When SCR fires, DC Link is shorted through a 1.47 ohm resistance and message “Crow Bar” will be displayed in the panel.
- Shut down and re-crank the loco is remedy.

## Hard crow bar fired by hardware.

- At times the DC Link voltage exceeds 3600 volts, due to any reason such as OFC Cable from LCC to SCR is broken or LCC unable to measure high voltage.
- At this circumstance hardware circuits fires the SCR with message “Crow Bar” in the display.
- Shut down and re-crank the loco is remedy

## 2.6.17 VIGILANCE CONTROL DEVICE

- VCD is monitoring the alertness of the operator by checking the movement of the following for every 60 seconds.
  - a) Movement of Throttle Handle



- b) Application and Release of Dynamic Brake
- c) Variation of Dynamic Brake position by 20%
- d) Auto Brake operation
- e) Horn Push Button operation
- f) Manual Sanding Button operation
- g) Operation of VCD-Reset Switch
- If the status of any one mentioned above is not changed within 60 seconds, VCD lamp will glow for eight seconds. During this time, the operator has to do any one of the above actions.
- If the operator failed to operate any one of the above actions, VCD lamp indication with buzzer sound generated for eight seconds. During this time, the operator has to operate VCD Reset switch.
- If the operator failed to operate VCD Reset Switch, VCD penalty brake will be applied with the following indications.
  - a) VCD Light glows with buzzer sound for 35 seconds
  - b) Engine speed comes to Idle
  - c) TE meter drops to zero
  - d) BP Drops in service rate.
- Resetting procedure of VCD Penalty brake
  - a) Bring the Throttle to Idle.
  - b) Loco speed zero.
  - c) VCD lamp to glow "off".
  - d) Operator has to keep Auto brake handle in Full Service for 10 sec.

#### **Mismanagement By Crew**

On 16.11.16, LP of Train no 16351 Exp working with Loco No. 40313 WDP4D/KYN detained train at RU for 70" stating brake binding on formation. In this case LP confused and failed to notice Load meter (TE) not responding and not observed the gauges on control console and subsequently noticed that the GF switch at off position, caused punctuality loss of the train.

This late start / detention could have been avoided had the LP alert and observing TE meter on control console and switch ON requisite circuit breakers and switches.

#### **Mismanagement By Crew**

On 21.08.16, LP of Train no 17641 Exp working with Loco No. 40188 WDP4D/GY detained 45" at KMC (HYB div) due to CBC coupling between loco and formation was opened and same was coupled properly by LP & ALP after detaching. Due to the detention train had lost punctuality. This train detention could have been avoided had the LP ensured (GR 4.32 (b) proper coupling locking of CBC while EOT at KCG before starting.

## 2.6.18 SALIENT FEATURES AND GENERAL INFORMATION OF WDP4D LOCO

- It is a 4500 HP Locomotive for Passenger operation.
- It has two Loco pilot cabins with one control console in each cabin.
- Each cab will have a provision to insert the BL Key. Existing cab (SH side) is named as CAB-1 and new cab (LH side) is named as CAB-2.
- In which cab BL key is inserted and turned to 'ON', is called Active cab and other one is Inactive cab. Locomotive operation can be performed from Active cab only.
- All necessary switches and breakers are duplicated in CAB -2 also.
- 4 /6 TFT displays are provided; two/three in each cabs and replaces Speedometer, TE Meter.
- Parameters of loco can be seen in displays of both cabs.
- Recycling feature of LCC and CCB is given in both cabs.
- Isolation feature is given in both the cabs and necessary switches are duplicated for ALP.
- EFCO and MUSD switch provided in both the cabs to shutdown the engine.
- TE/BE meter, Speedo Meter and Lights (Sand, PCS Open, Flasher, Wheel Slip, Brake Warn, TE Limit etc.) were shifted from control console to TFT display.
- Locomotive weight is 123 Tons and axle load is 20.5 Tons.
- Loco Dimensions in metres - Height- 4.201, width- 3.127 and length- 23.00
- Capacity of Fuel Tank is 5000 Litres.
- Axle Configuration is CO-CO.
- Maximum starting torque is 460 KN and DB Effort is 230 KN.
- Maximum operating speed is 130 Kmph and minimum continuous speed is 22.5 Kmph
- Head Light Circuit Breaker is provided in CAB-1 only.
- There is no separate circuit breaker for fans in the CAB-2 only one circuit breaker named Lights & Fans circuit breaker which provides supply for both lights & fans in CAB-2.
- Battery Ammeter is not duplicated in Cab -2 as this information is available on TFT display.
- Fuel Prime/Engine Start switch (FP/ES) It is provided in both the cabs and is in parallel and enables to start the engine from any cab.
- Classification lights switch is provided in both the Cabs to control classification lights. If this switch is kept in Cab end position then White light glows on Cab-1 side and Red light glows on Cab-2 side. If this switch is kept in Hood end position then White light glows on Cab-2 side and Red light glows on Cab-1 side.
- **BL Key** If it is inserted in any one cab that is treated as active cab.
- BL key is not inserted in both the cabs then system will be isolated and LCC will give crew Message “BL Key removed in both cabs”.
- BL key is inserted in both the cabs then system will be isolated and LCC will give crew Message “BL Key inserted in both cabs”.

- BL Key is interlocked with
  - a) TE Limit
  - b) RAPB
  - c) GF Request Switch
  - d) Alerter Reset
  - e) Horn
  - f) Fuel Pump Switch,
  - g) Manual sand switch
  - h) Master Controller

#### **Mismanagement By Crew**

On 17.04.2014 LP of Train no. 11028 Exp working with loco No. 12592/WDG4/GY failed loco in section between DD-PAA (PA div) due to BP Pressure dropped with message “No load, PCS opened, recover air brake” caused 128”detention. LP of the train could not reset PCS, train cleared section with relief loco. Failed loco 12592 examined jointly by SSE & CLI at PA and reported that no trouble with loco. This sectional failure could have been avoided had the LP reset/recover PCS to close by placing Rev at neutral position & Auto brake at FS for 10 seconds or at Emergency for 60 seconds (as the case may be) for normal function of air brake.

#### **Mismanagement By Crew**

On 02.07.16, LP of Train no 07418 Exp working with Loco No.12567 WDG4/PA could not started from NSL (NED div) after halting due to brakes not releasing on loco. Conducted air brake self-test but not succeeded and asked for relief loco, caused 150” detention at NSL. Train worked with relief loco. Dead loco on arrival at PA, Air brake self-test conducted and found successful without any faults. This failure could have been avoided had the LP conducted Air brake self-test as per procedure.

#### **Mismanagement By Crew**

On 11.01.2017 Shunting LP of Train no. 12765 Exp while reversing /making EOT at PAU with loco No. 40228+40115/WDP4D/GY failed to ensure proper changing of control consoles of MU, resulted in non-creation of BP pressure from lead loco 40228 (after EOT) caused 105” detention to train at PAU and train started with relief locos after detaching failed MU. Initially, CLI / PAU also tried but could not restored BP pressure and the CLI was able done it successfully after detaching locos LP/Shg made loco reversal and EOT did not changed the control console / MU cab properly and CLI was also failed to do so during Ist attempt but done it on later stage where locos have detached from train by draining the entire MR pressure. This failure / detention could have been avoided had the Shunting LP & CLI by following correct procedure to change the control console / MU cab normal function of air brake.

# Notes

# **Chapter No. 3.0**

# **Computer Controlled**

# **Brake System**





### 3.0 COMPUTER CONTROLLED BRAKE SYSTEM

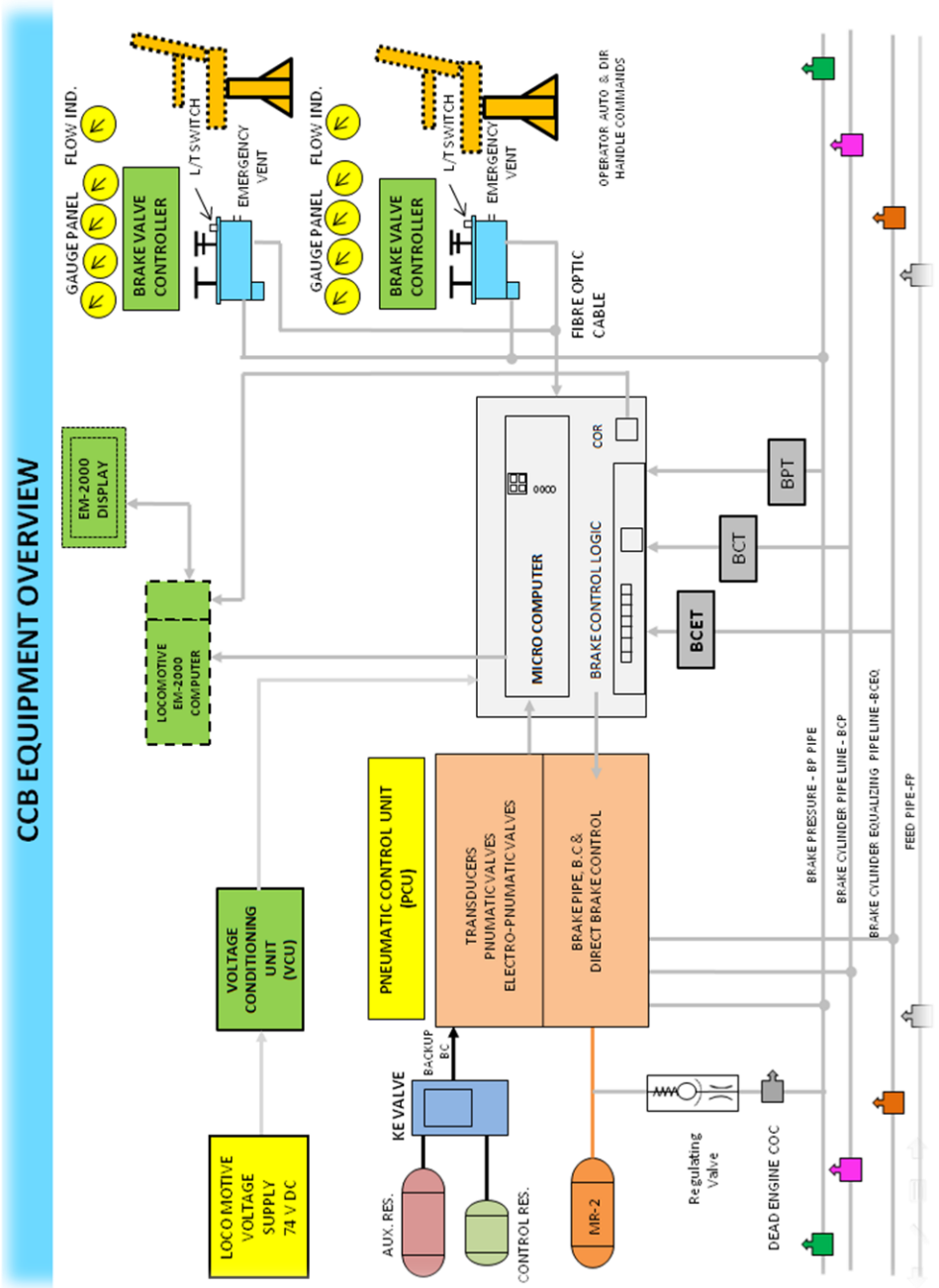


Fig. 3.1

### 3.1 MAIN CONCEPTS

This is an Electro Pneumatic Brake system. Since the brake equipments are controlled by electro pneumatic operation, for the working of the system

- 1) Always Electrical power is required.
- 2) A minimum main reservoir pressure of 4 kg/cm<sup>2</sup> is required.

The CCB system is equipped with a pneumatic back up (KE Valve) that operates in parallel to the microprocessor control and is always in operation. This brake system automatically effect the blended brake (Auto brake and Dynamic brake), when Auto brake handle is in service zone. When MR Equaliser pressure is dropped below 6.8 kg/cm<sup>2</sup>, according to the CCB feedback EM 2000 raises the engine speed up to fourth notch, enable to builds up or to maintain it with message in display. CCB makes emergency application of loco brake, without charging BC Equaliser, if MR Equaliser pressure is dropped below 3.2 kg/cm<sup>2</sup>. Even the BP leakage rate is below insensitivity, the system applies emergency brake, if Brake Pipe pressure (Train line) is dropped below 2.8 kg/cm<sup>2</sup>. While power up this system, until the microprocessor system gains control of the brake system, the locomotive brakes are under control of the pneumatic backup system.

If the CCB system set up is for Lead mode, during power up, the computer will not take control of the brake system untill

- 1) The automatic brake handle is moved to the Full Service position for a minimum of 10 seconds and returned to the Running position
- 2) The brake cylinder pressure is dropped zero kg/cm<sup>2</sup>.
- 3) If the Automatic brake valve handle had previously been placed in Emergency position, then the handle must remain in the emergency position for 60 seconds.

If the CCB system is set up for Trail or Helper (Banker) mode on power up, the computer will not take control of the brake system until brake cylinder pressure is dropped to zero kg/cm<sup>2</sup>.

The system includes the following main components:

- a) Brake Valve Controller (BVC)
- b) Computer Relay Unit (CRU)
- c) Pneumatic Control Unit (PCU)
- d) Voltage Conditioning Unit (VCU)
- e) Pneumatic back up (KE valve)
- f) Diagnostic

#### 3.1.1 BRAKE VALVE CONTROLLER

- a) It is an interface device of the operator with CCB.
- b) It is located in the Control consoles and consists of an



**Fig. 3.2**

Auto Brake Valve, Direct Brake Valve with a Bail OFF ring and a Lead /Trail Switch.

## i. AUTO BRAKE

This valve controls the BP Pressure and has five positions and they are :

**a. Release** - It is a spring loaded position and start to function if the handle is hold for 3 seconds in release position to facilitates quick and over charging of BP Pressure up to 5.7 Kg/cm<sup>2</sup> at a constant rate of 0.05 kg/cm<sup>2</sup> per second and will remain at that level for a period of 60 seconds. After 60 seconds, BP Pr. will slowly bleed off (for 240 Sec) at the rate of 0.002 kg/ cm<sup>2</sup> per second and stopped when BP Pr. reaches 5.2Kg/cm<sup>2</sup>.

**b. Run** - It is the normal working position, and creates BP pressure of 5.2 Kg/cm<sup>2</sup>

**c. Minimum Reduction** - To drop BP Pressure from 5.2 to 4.7 Kg/cm<sup>2</sup>

**d. Full Service** - To vary BP Pressure from 4.7 to 3.7 Kg/cm<sup>2</sup>

**e. Emergency** - To drop BP Pressure Rapidly to zero

## ii. DIRECT BRAKE

This controls the BC Pressure and has two positions and they are :

**a. Release** – It is a normal working position in which the Brake cylinder pressure is zero Kg/cm<sup>2</sup>

**b. Application** – In this position, the BC pressure creates to 5.2 Kg/cm<sup>2</sup>.

## iii. LEAD / TRAIL SWITCH

Position	Function and Purpose
<b>LEAD</b>	1) Set up air brake system for locomotive to lead 2) To select the console from which operations to be carried. 3) Auto and Direct brake handles will function normally
<b>TRAIL</b>	1) Set up air brake system for locomotives in trail. 2) Disable the Auto brake handle except Emergency position. 3) Disable the Direct Brake handle operation.
<b>TEST</b>	1) Cut off BP Charging, Holds BP and ER Pressure for BP leakage test 2) Full application of direct brake will be done automatically irrespective of Direct brakes handle position to secure the loco.
<b>HELPER</b>	1) Brings ER Pressure to zero to avoid system Penalty. 2) Cut off BP Pipe to avoid charging/ destroying. 3) Disable the Auto brake handle except Emergency position and allows the Direct Brake handle operation

CCB will accept the position of the L/T Switch in the working console if in non working console it is placed in “Trail”. Otherwise EM 2000 will display “Air Brake failure, Check for proper Lead Trail set up” message and applies penalty brake.

### 3.1.2 VOLTAGE CONDITIONING UNIT

It is located in the nose compartment near air brake equipment rake. It receives 74 Volt DC supply from locomotive battery and gives 24 volt filtered DC output. Supplies power for the operation of the brake valves and air brake computer.



Fig. 3.3

### 3.1.3 PNEUMATIC CONTROL UNIT

It is located in the nose compartment near air brake equipment rake. It is a laminated aluminum panel and most of the pneumatic and electro-pneumatic valves are mounted on it. It responds to the CCB Computer to develop ER, BP, BC and BC Eq. Pressure. During power failure or critical diagnostic detection, it arranges

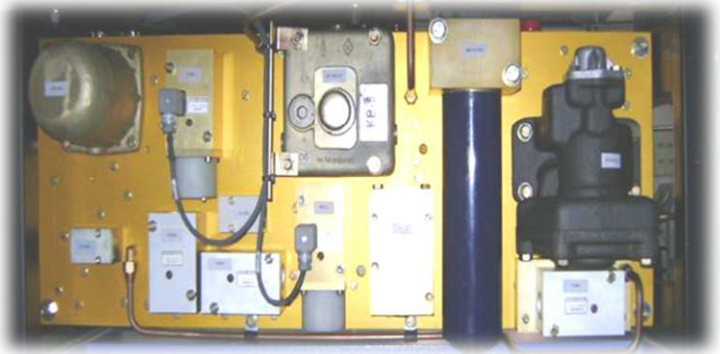


Fig. 3.4

- a) Exhaust the BP pressure at service rate
- b) Automatic LAP of BP, BC and BC Equaliser pressure for Trail operation.
- c) Pneumatic control of Brake Cylinder pressure instead of electronic control.

### 3.1.4 COMPUTER RELAY UNIT

It is located in the nose compartment near air brake equipment rake. It comprises of a computer and an input / output unit and provided electronic control for brake system.

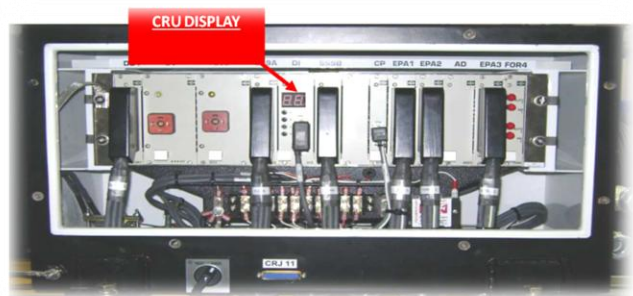


Fig. 3.5

It receives brake commands from operator and dictates logically the PCU to control and develop pressures. It monitors the train line pressure and commands the

development of BC Pressure. According to the signals from locomotive control system it initiates penalty brake application at service rate.

This unit has a Pass / Goods selection switch and 12 printed circuit boards for processing and a mother board to feed memory for the CCB working.

1. DB1 - Supplies power for magnet valves and relay
2. SV - Supplies power for Air Brake Computer
3. SVJ - Supplies power to (MVER, MVEM, MVBP, MV53)
4. SS9A - Supplies power to Short Hood Console
5. SS9B - Supplies power to Long Hood Console
6. DIZ - Displays the fault code
7. CPZ - Central processing unit
8. EPA1 - Equalizing Reservoir Control
9. EPA2 - Brake Cylinder Control
10. AD / ADZ - Analog /Digital converter
11. EPA3 - Direct Brake Control (BC-Equaliser)
12. FOR - Fiber Optic Receiver

### 3.1.5 BACK UP (KE VALVE)

It is located in the nose compartment near air brake equipment rack. A manual operating handle Goods / Pass) is provided in this valve to control the rate of application / release. When the handle is in goods, the application rate is slow and faster if it is in passenger. This valves provide loco brake application.

- a) If the power supply to the system is cutoff
- b) In dead loco, when BP Pipe only connected and if dead engine cock is opened.



Fig. 3.6

### 3.1.6 DIAGNOSTIC

- a) It identifies the probable device, which cause the fault and displays the information to the operator and send to main loco computer.
- b) Monitor the braking system and applies penalty brake if critical fault is detected.
- c) Allows the operator to scrutinize the brake system by conducting self test to restore itself or to confirm the working status of the loco.

## 3.2 PENALTY BRAKE

It is a brake applied automatically by the system to ensure safety and It is two types.

- a) Emergency Penalty
- b) Full service penalty

## EFFECT

- a) BP and ER pressure drops to **'Zero'**
- b) TE Meter drops to zero
- c) Message will be displayed in the Display

## OCCASION

Emergency Penalty		Full Service Penalty	
1.	After self test	1.	After recycling <b>'LCC'</b> or <b>'MAB'</b>
2.	Auto brake emergency	2.	VCD / Alerter operation
3.	BP Drops below 2.8 kg/cm <sup>2</sup> due to Train parting or ACP Pulling or Emergency brake valve application	3.	Wrong Set Up of L/T Switch
4.	BP pipe cut, D1 Emergency application	4.	Applied by <b>'CCB'</b> for safety

## 3.2.1 PENALTY RESET PROCEDURE

- a) Bring throttle handle to **'Idle'**
- b) Follow the message in **'LCC screen'** i.e. in working console.
- c) Keep auto brake handle in **'Emergency'** or **'Full Service'** according to the display.
- d) Give time pause according to the display message.( i.e. 10 seconds for Full service and 60 seconds for emergency penalty).
- e) Bring Auto brake handle to **'RUN POSITION'** (When displayed in LCC to do so)
- f) If penalty is not resetting change the Console/Cab and recover the penalty from the other Console/Cab.
- g) In case of Emergency Penalty keep the auto brake to the extreme end of BCU.
- g) Ensure BP and ER Pressure starts charging up to **5.2 kg/cm<sup>2</sup>**.

## 3.2.2 DIFFERENT PENALTY BRAKE MESSAGES

S. No.	Cause	Message in the Display
1	Alerter / VCD Penalty / RAPB / Computer breaker Off	Air brake penalty keep handle in Full Service for 10 seconds
2	MAB Off / Power Failure in CCB Unit	Air brake power interruption keep handle in Full Service for 10 seconds
3	Wrong position of LT Switch in working Loco (Single Loco)	Lead Trail mode selection failure or Improper set up of LT Switch
4	Wrong position of LT Switch in Lead and Trail Locos. (MU)	Air brake failure
5	Auto brake moved to emergency	Air brake Emergency keep handle in Emergency for 60 seconds
6	BP Dropped below 2.8 kg/cm <sup>2</sup> .	Loss of Train line pressure emergency keep handle in Emergency for 60 seconds



### 3.3 CCB 1.5 FAULT CODES

Fault Code starting Number in CCB 1.5	Area of Trouble	Fault Code starting Number in CCB 1.5	Area of Trouble
0	Communication faults reset automatically	5	MR Transducer problem
1	Self-test – No problem	6	BP System problem
2	Controller No.1 faults (SH)	7	BC EQ system problem
3	Controller No.2 faults (LH)	8	BC System problem
4	LT Switch problem	9	ADA System problem

#### 3.3.1 Software/CPZ/Communication faults

Fault Code	Description	Action Required
02	Messaging Crash	No problem, no effect in working of loco
04	Message Checksum Error	No problem, no effect in working of loco
05	Buss Access Error	CPZ failure, loco failure
06	Message Overrun Error	No problem, no effect in working of loco
07	Message Loop back Error	CPZ failure, loco failure
08	Message Framing Error	No problem, no effect in working of loco
09	Communication Break Received	No problem, no effect in working of loco
10	Air Brake Self-Test	Conduct Air Brake Self-Test
11	Air Brake Watchdog Time-out	No chance to log, till date not logged in the locos

### 3.3.2 Brake Controller Faults - Do Not Conduct Self-Test for this Fault.

Fault Code	Description	Action Required
20	C1 Controller Missing	❖ <b>Action to be taken for Fault code from 20 to 3D</b>
21	C1 Automatic Handle Frequency Low	❖ If the fault is coming intermittently ignore this faults.
22	C1 Automatic Handle Frequency High	❖ If permanent, apply Auto Brake handle to emergency and recover BP.
23	C1 Automatic Release Switch Stuck Open	❖ If BP not recreating change to other console by changing LT switch position. Check for BP creating. If not remove the BVJ1 (a big round connector inside the console which is connected to the controller from the bottom back. It can be accessed by opening the console cover near the foot step)
24	C1 Automatic Release Switch Stuck Closed	Connector from the defective controller.
25	C1 Automatic Emergency Switch Stuck Open	❖ Put Auto Brake handle to emergency and recreate BP and work from other console.
26	C1 Automatic Emergency Switch Stuck Closed	❖ If BP not creating Recycle the Micro Air Breaker. Even after recycling BP not creating, fail the loco.
27	C1 Independent Handle Frequency Low	❖ When these faults logged, air brake self test not pass. If self test conducted the test will fail and air brake failure message will log.
28	C1 Independent Handle Frequency High	
29	C1 Independent Release Switch Stuck Open	
2A	C1 Independent Release Switch Stuck Closed	
2B	C1 Independent Max Switch Stuck Open	

Fault Code	Description	Action Required
2C	C1 Independent Max Switch Stuck Closed	<ul style="list-style-type: none"> <li>❖ Whenever controller fault came along with system fault (fault start with 6, 7, 8) apply Auto Brake handle to emergency and recover BP.</li> <li>❖ If BP not recreating, conduct self-test by keeping both handles at middle position. Still problem exists fail the loco.</li> <li>❖ Do not try to conduct self test when this faults are active.</li> </ul>
2D	C1 Bail-Off Switch Stuck Closed	
30	C2 Controller Missing	
31	C2 Automatic Handle Frequency Low	
32	C2 Automatic Handle Frequency High	
33	C2 Automatic Release Switch Stuck Open	
34	C2 Automatic Release Switch Stuck Closed	
35	C2 Automatic Emergency Switch Stuck Open	
36	C2 Automatic Emergency Switch Stuck Closed	
37	C2 Independent Handle Frequency Low	
38	C2 Independent Handle Frequency High	
39	C2 Independent Release Switch Stuck Open	
3A	C2 Independent Release Switch Stuck Closed	
3B	C2 Independent Max Switch Stuck Open	
3C	C2 Independent Max Switch Stuck Closed	
3D	C2 Bail Off Switch Stuck Closed	

Fault Code	Description	Action Required
40	Both Controllers Selected	If fault is permanent, remove the BVJ1 connector from the non-working controller.
41	C1 Operating Mode Switch Change at Speed	This fault will come when LT switch changed when loco is moving. BP will drop and loco comes to stop. then fault will also go automatically
40	Both Controllers Selected	
4A	Service Mode Switch Stuck Open	No system effect.
4B	Service Mode Switch Stuck Closed	
4C	Service Mode Switch Change at Speed	Fault will also go automatically when loco speed comes to zero.

### 3.3.3 MR Transducer Problem

50	Defective MR Transducer	Check MRPT sensor connector. If BP not creating Recycle the air brake computer breaker. If not fail the loco.
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## REMOVAL OF THE BRAKE CONTROLLER CONNECTOR WHEN CONTROLLER FAILURE.



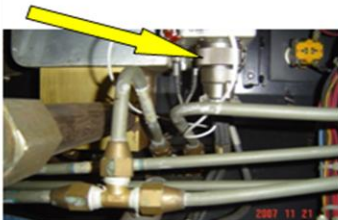
Defective brake controller



Open cover below the controller



Opened console



**Switch off air brake circuit breaker. Remove this connector from the defective controller**

1. Keep the LT switch in trail position. Change to other controller
2. Put LT switch in lead position. Put the controller No.2 A9 handle to emergency. After 60 sec,
3. Release the handle to run position.
4. Check BP is recovering. Work further in that controller.

**Fig.3.7**

### 3.3.4 System faults - To clear these faults, conduct Air Brake Self-Test

Fault Code	Description	Action Required
60	Defective ER Transducer	Do self-test and recover BP. If not recover, fail the loco.
61	No ER Supply Control	
62	No ER Exhaust Control	
64	Brake Pipe Cut-Off Valve Stuck Open	No system effect.
65	Brake Pipe Cut-Off Valve Stuck Closed	Do self-test and recover BP. if not recover, fail the loco.
66	Brake Pipe Cut-Off Magnet Valve Stuck Off	No system effect. Recover BP by putting Auto brake handle in emergency. Loco work only in lead.
69	Defective BP Transducer	Check sensor connector. Fail the loco
6A	Brake Pipe Control Self-Test Failure	Do self-test. Put Auto Brake Handle in emergency and recover. If not fail the loco. Ensure BP COC to be closed while self-test.
6B	Brake Pipe Leakage Self-Test Failure	Put Auto Brake handle in emergency and recover.
6C	PVBP Stuck Open	No system effect.
6D	PVBP Stuck Closed	
6E	Emergency Magnet Valve Self-Test Failure	Self-test failure. Recover BP by keeping Auto brake handle in emergency. Still not recover, fail loco.
70	Defective 20 Transducer	Mostly fault occur in MU operation. Do self-test, if fails, fail the loco.
71	No 20 Supply Control	
72	No 20 Exhaust Control	

Fault Code	Description	Action Required
74	20 Control Magnet Valve Stuck Off Self-Test Failure	Self-test fault. Try to recover by keeping Auto brake handle in emergency position. If not recover, fail the loco.
75	20 Control Magnet Valve Stuck On Self-Test Failure	Loco work in lead only. No system affected in lead operation. Put Auto brake handle in emergency and recover. Problem due to BCEQ pipe leak.
80	Defective 16 Transducer	No problem in loco, put Auto brake handle to emergency and recover BP. But BC will be 3.8 only
81	No 16 Supply Control	
82	No 16 Exhaust Control	
83	No Electronic BC Control Self-Test Failure	Self-test will fail. Recover BP, check BC COC closed. No problem in loco working
89	Defective BC Transducer	No problem, no action
8E	KE Distributor Valve Application Self-Test Failure	No effect on loco working, but self-test fail, recover BP.
90	Defective ADZ Board	Fail the loco

- ❖ Open Air brake computer (CRU) cover and check the front cable connectors (black coloured - 6 no) are seated properly. Just press inside. Check any couplers are slack below the airbrake rack.
- ❖ Whenever Airbrake or EM2000 is recycled, keep Auto brake handle in FS position for 10 Seconds and to RUN position. This will restore BP.
- ❖ Keep LT switch in Test position while attaching to formation.
- ❖ When BP is dropping automatically, check air flow indication is shooting UP. This shows BP is leaking



### 3.4 CCB 2.0 EBV CREW MESSAGE FAULT CODES

Fault Code	Description	Detected By	Reason for Fault	Corrective Action	If Still Bad, Try:
001	ERCN Fault	RCP, BP, 20	Loss of ERCN heartbeat for 5 sec.	Ensure LON cable is positively seated at ERCP. Recycle AB circuit breaker.	If not corrected, must be used in Trail Mode until repair. Replace ERCP at Shed.
002	ERCP AW4 Fault	ER	ER > 120 or pressure not within $\pm 0.35 \text{ Kg/cm}^2$ (5 psi) in 10 sec.	Place L/T switch in TRAIL, Automatic handle in EMER, and Independent handle in FULL to clear fault.	If not corrected, must be used in Trail Mode until repair. Replace ERCP at Shed.
006	MVER Fault	ER	Output feedback indicates MV fault	Must be used in Trail Mode until repair. Replace ERCP.	
010	BPT Fault	BP	Xdcr output voltage > 4.5 or < 0.5.	If fault remains after recycling AB circuit breaker, replace BPCP at next Shed. Set power off and use in trail in pneumatic backup until repair.	
014	MV53 Fault	BP	Output feedback indicates MV fault	Must be used in Trail Mode until repair. Replace BPCP.	

<b>Fault Code</b>	<b>Description</b>	<b>Detected By</b>	<b>Reason for Fault</b>	<b>Corrective Action</b>	<b>If Still Bad, Try:</b>
016	BPCN Fault	RCP, ER, 20, EBV	Loss of BPCN heart beat for 5 sec.	Inspect LON cable connection to BPCP on the EPCU and tighten as needed. Recycle AB circuit breaker.	Check for yellow light on BP control node. If steady or blinking, reprogram or replace BPCP. If red light remains on after power cycle, replace BPCP. Must be used in Trail Mode until repair.
036	16CP AW4 Fault	16	Pressure not within +/- 0.35 Kg/ cm <sup>2</sup> (5 psi) in 10 sec	Place L/T switch to TRAIL, Automatic handle in EMER, and Independent handle in FULL to clear fault.	If not corrected, automatic BC pressure may be direct release only. No blending or other special BC controls will be active. Replace 16CP at Shed.
039	MV16 Fault	16	Output feedback indicates MV fault.	Automatic BC pressure may be direct release only. No blending or other special BC controls will be active. Replace 16CP at Shed.	

<b>Fault Code</b>	<b>Description</b>	<b>Detected By</b>	<b>Reason for Fault</b>	<b>Corrective Action</b>	<b>If Still Bad, Try:</b>
052	16CN Fault	RCP, 20	Loss of 16 heartbeat for 5 seconds	Inspect LON cable is positively seated at 16CP. Recycle AB circuit breaker.	If not corrected, automatic BC pressure may be direct release only. No blending or other special BC controls will be active. Replace 16CP at Shed.
055	20CP AW4 FAULT	20	Pressure not within $\pm 0.35 \text{ Kg/cm}^2$ (5 psi) in 10 seconds	Place L/T switch to TRAIL, Automatic handle in EMER, and Independent handle in FULL to clear fault.	If fault remains, use in Trail Mode until repair. Replace 20 CP.
062	20CN Fault	EBV, ER, BP, RCP	Loss of 20CN heart beat for 5 sec.	Insure LON cable is positively seated at 20CP. Re Cycle AB circuit breaker. If fault remains, set ABCB off and use in trail on pneumatic backup.	Check for yellow light on 20 control mode. If steady or blinking, reprogram or replace 20CP. If red light remains on after power cycle, replace 20CP.

<b>Fault Code</b>	<b>Description</b>	<b>Detected By</b>	<b>Reason for Fault</b>	<b>Corrective Action</b>	<b>If Still Bad, Try:</b>
075	AUTO HANDLE OPEN	EBV	Potentiometer output voltage < minimum	Set to TRAIL. Replace EBV. May result in Emergency. If faults results in stuck in emergency, set power off and use in trailing pneumatic back-up until repair.	
076	Independent handle open	EBV	Potentiometer output voltage < minimum	Set to TRAIL. Replace EBV.	
085	EBV CN Fault	ER, BP. 20, RCP	Loss of EBV CN heartbeat for 5 seconds	Insure LON cable is positively seated at EBV connector and PSJB J100. Recycle AB circuit breaker.	Check for yellow light on EBV control node. if steady or blinking, reprogram or replace EBV. If red light remains on after power cycle, replace EBV.

<b>Fault Code</b>	<b>Description</b>	<b>Detected By</b>	<b>Reason for Fault</b>	<b>Corrective Action</b>	<b>If Still Bad, Try:</b>
108	Cab Mismatch Fault	RCP	Both cab switches are set to switch position and one of them is not in the "TRAIL" position	Correct setup, recover penalty.	If not corrected, must be used in Trail mode until repair. Replace EBV at Shed.
118	RCP CN Fault	BP, 20, EBV	Loss of RCP heartbeat for 5 sec	Must be used in Trail Mode until repair. Replace RCP.	
125	MV26 De-energized	ER	Output feedback indicates MV fault	Must be used in Trail Mode until repair. Replace ERCP	
136	16CP BPT Fault	16	Xdcr output voltage > 4.5 or < 0.5	Automatic BC pressure may be direct release only. No blending or other special BC controls will be active. Replace 16CP at Shed.	
140	MR/FL Dual Transducer Fault	BP	Xdcr output voltage > 4.5 or < 0.5 for both MRT and FLT	AW4 diagnostics are disabled. Loss of MR pressure indication for display (if equipped). Replace BPCP at Shed.	

### 3.5 AIR BRAKE SELF TEST

This test is to be conducted when Air Brake Failure Message displayed in the LCC or EM2000 display and it is not possible to recover the penalty brake by placing the Auto brake handle to Full Service for 10 seconds or 60 seconds in Emergency. BC Pressure is not dropping to zero when direct brake handle is released.

#### 3.5.1 Procedure to conduct self-test

- a) Stop the train/loco and secure as per the instructions.
- b) Recycle the MAB and recover the penalty as per LCC Display.
- c) If unable to recover the penalty then only Air brake self-test is to be done.
- d) Ensure the following up to the completion of the self test otherwise the test will be failed
  1. MR Pressure should be above 8.0 Kg/cm<sup>2</sup> and no external leakages.
  2. Front truck Brake cylinder COC is in open position.
  3. Loco is fully secured to prevent rolling of the loco during the test.  
**(Apply hand brake and place wooden wedges)**
  4. Loco is isolated from the formation.  
**(Close all BCEQ, MREQ COCs, BP, FP COC)**
  5. Keep the isolation Switch in Isolate position.
  6. Keep the Throttle in Idle position, Rev Handle neutral, Micro Air Brake CB ON, switch off ERS and GF and set the consoles as follows:

	WORKING CONSOLE	NON WORKING CONSOLE
L/T Switch	Lead	Trail
Auto brake	Run	Full service
Direct brake	Application	Release

7. If Air brake self test is failed, then note down the fault code on CRU display in case of CCB 1.5 and in case CCB 2.0 fault code in EBV (Brake Control Unit). and make working console to non-working and non-working console into working console. Again conducts Air brake self to that console. If succeeds, then work with that console and if fails, note down the fault code and inform to the PRC/Concerned Shed.



Fig.3.8



Fig.3.9

**8. After successful completion of Air brake self test conduct BP continuity Test.**



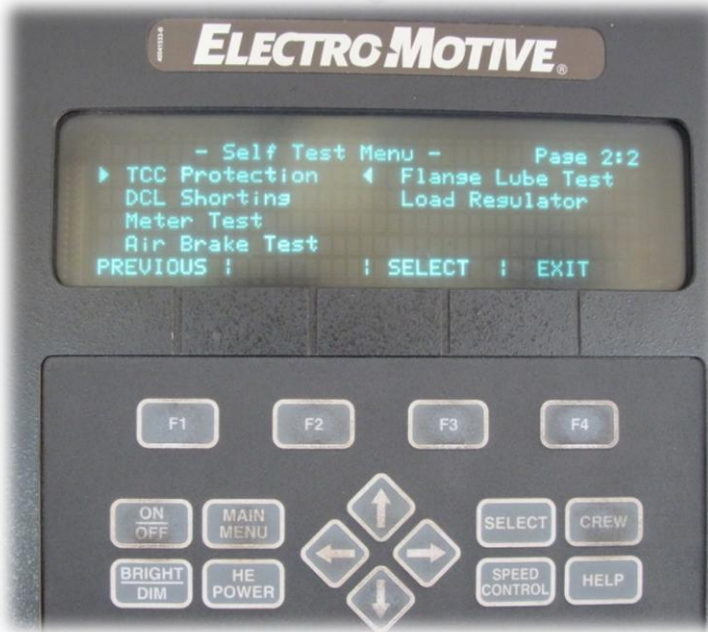
3.5.2 EMD LOCOS - AIR BRAKE SELF TEST: Fig. 3.10



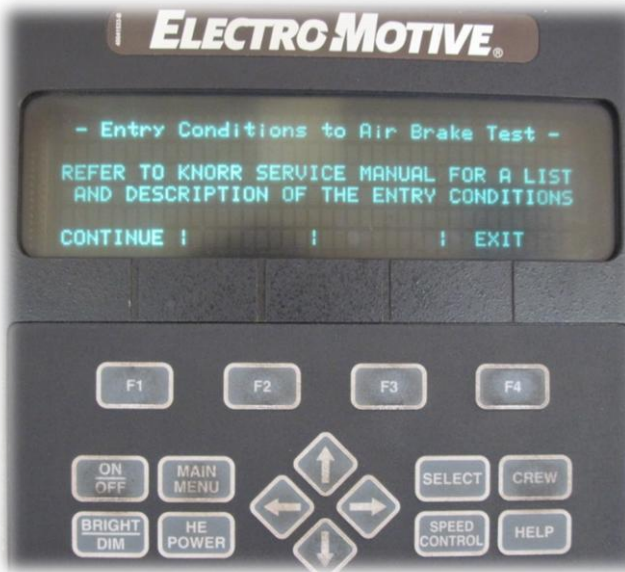
Press “MAIN MENU” use navigation keys, bring cursor to “SELF TESTS” and press ‘F3 or ’ press SELECT key.



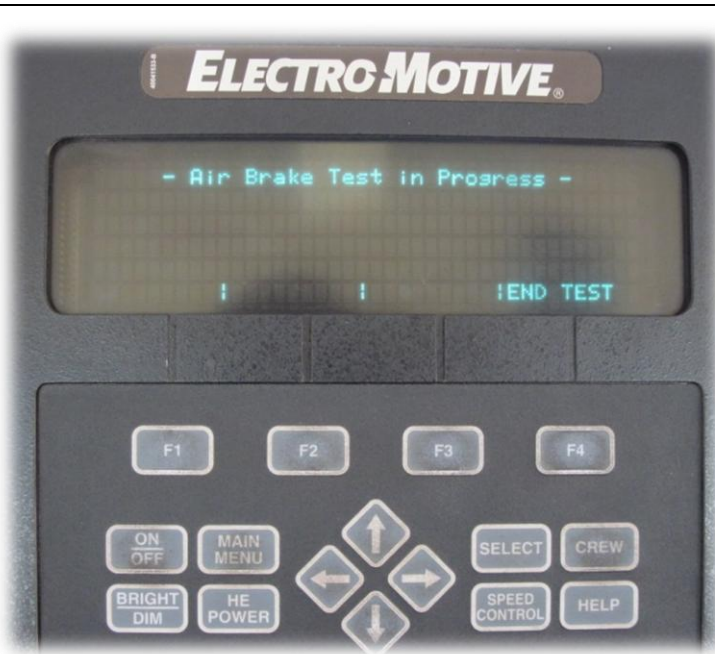
Go to Page 2 (Next Page) by pressing F2 - Fig. 3.11



Using navigation keys, bring cursor to “Air Brake Test” and press F3 or press SELECT key. **Fig. 3.12**



Entry Conditions To Air Brake Test has to fulfill as per the knorr service manual and press “F1” key TO CONTINUE test. **Fig. 3.13**



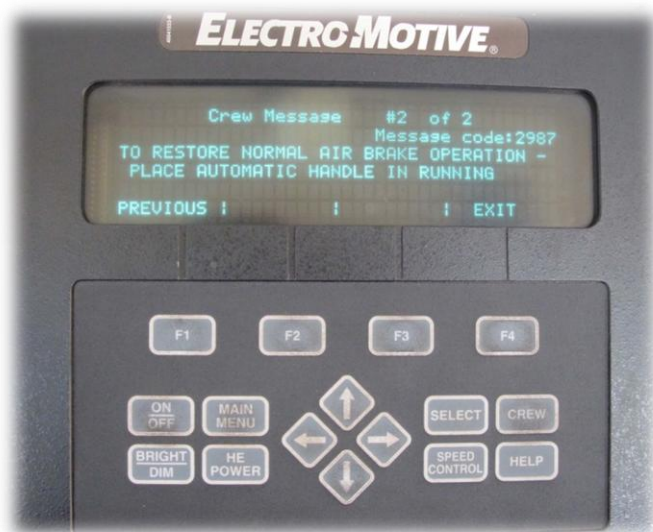
'Air Brake Test In Progress' will be displayed. EM-2000 initiates Air Brake Self Test. **Fig. 3.14** (Do not disturb any handle positions).



On completion of test, 'Successful test, no defects found' will be displayed on EM – 2000 screen. then press F4 key to 'END TEST'. **Fig. 3.15**



In crew message `LOSS OF TRAIN LINE PRESSURE, EMERGENCY-PLACE HANDLE IN EMERGENCY FOR 60 SEC` will be displayed. Keep the Auto brake handle in Emergency for 60 Sec **Fig. 3.16**



After keeping the Auto Brake handle in Emergency position for 60 sec. A message `TO RESTORE NORMAL AIR BRAKE OPERATION PLACE AUTOMATIC HANDLE IN RUNNING` is displayed. keep the Auto Brake handle in RUN position to restore the BP pressure then press F4 to EXIT. **Fig. 3.17**



**3.5.3 MEDHA LOCOS- AIR BRAKE SELF TEST: Fig. 3.18**



Press MAIN MENU bring cursor to SELF TESTS by navigation keys and press F3 or numeric key 2. **Fig. 3.19**



Enter password **12345** by numeric keypad and press F3 or ENTER key. **Fig. 3.20**



Bring cursor to AUTO TEST and press F3 or press numeric key 1. **Fig. 3.21**



Full fill the Air Brake Test Conditions and press F3 **Fig. 3.22**





Bring cursor to START AIR BRAKE TEST and press F3 or press numeric key 1.  
**Fig. 3.23**



Air Brake Test is in Progress. **Fig. 3.24** (Do not disturb any handle positions).



AIR BRAKE TEST ENDED. Press F4 to exit test. **Fig. 3.25**

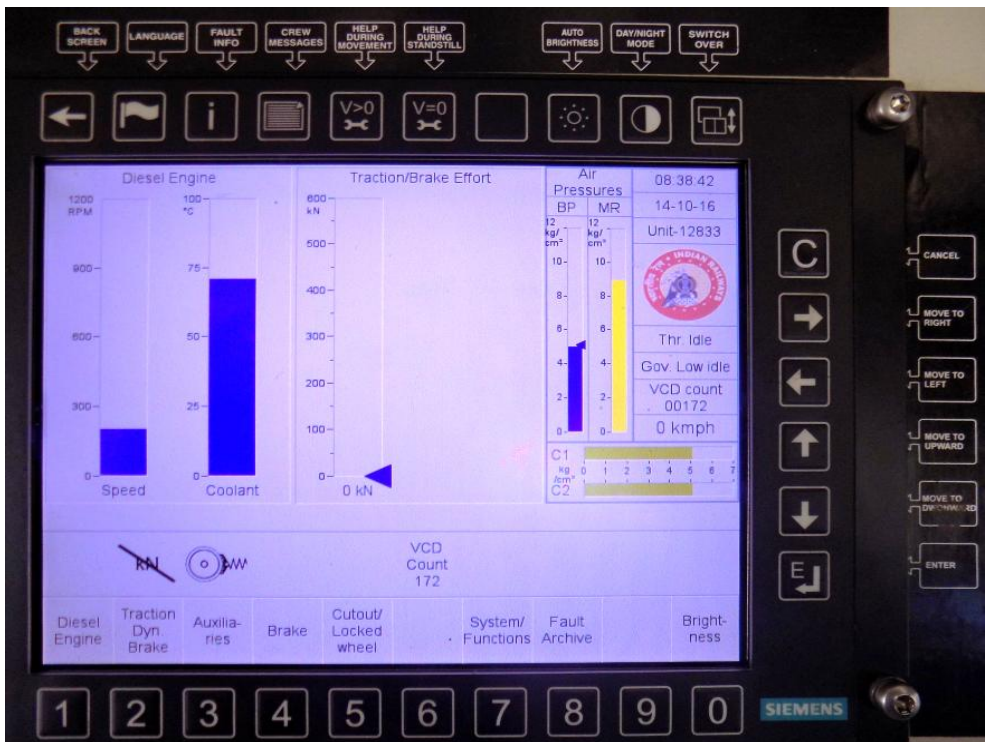


In Crew Message, 'LOSS OF TRAIN LINE PRESSURE EMERGENCY, PLACE AUTO BRAKE IN EMERGENCY FOR 60 SEC'. Keep Auto Brake in emergency for 60 seconds. **Fig. 3.26**

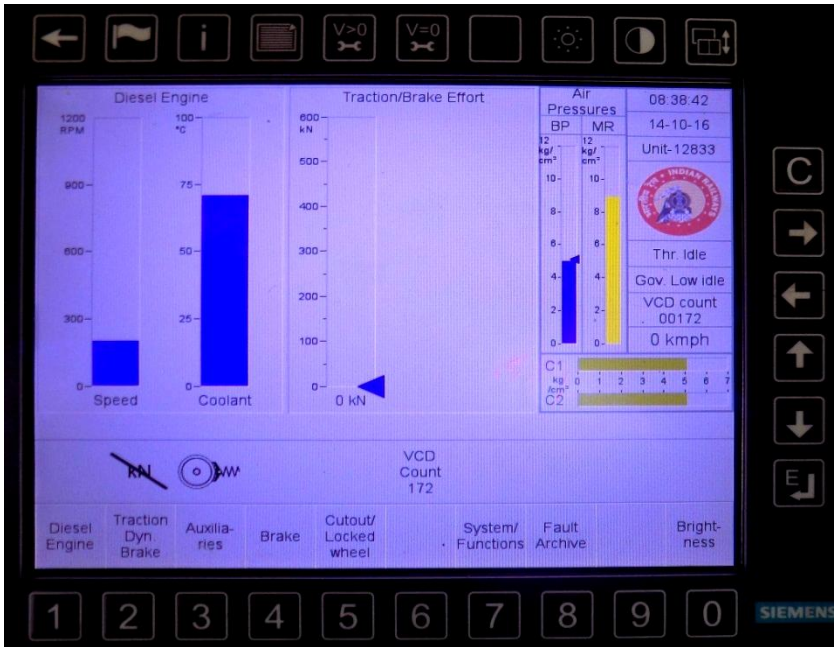


After 60 Seconds, CREW MESSAGE `TO RESTORE NORMAL AIR BRAKE OPERATION, PLACE AUTOMATIC HANDLE IN RUNNING`. Keep Auto Brake handle in RUN and Restore BP pressure. **Fig. 3.27**

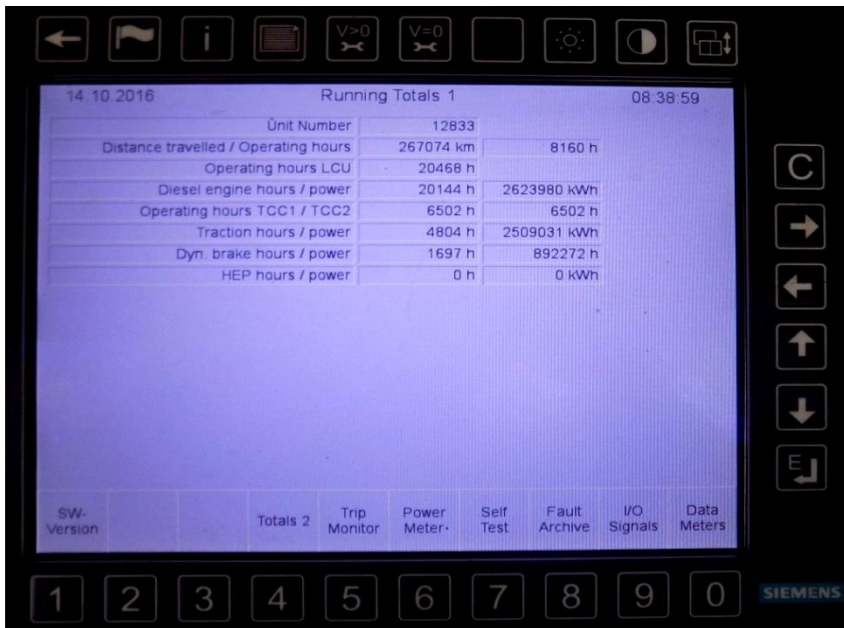
**3.5.4 Siemens LOCO Display Description Fig. 3.28**



### 3.5.5 SIEMENS SINGLE CAB LOCOS AIR BRAKE TEST

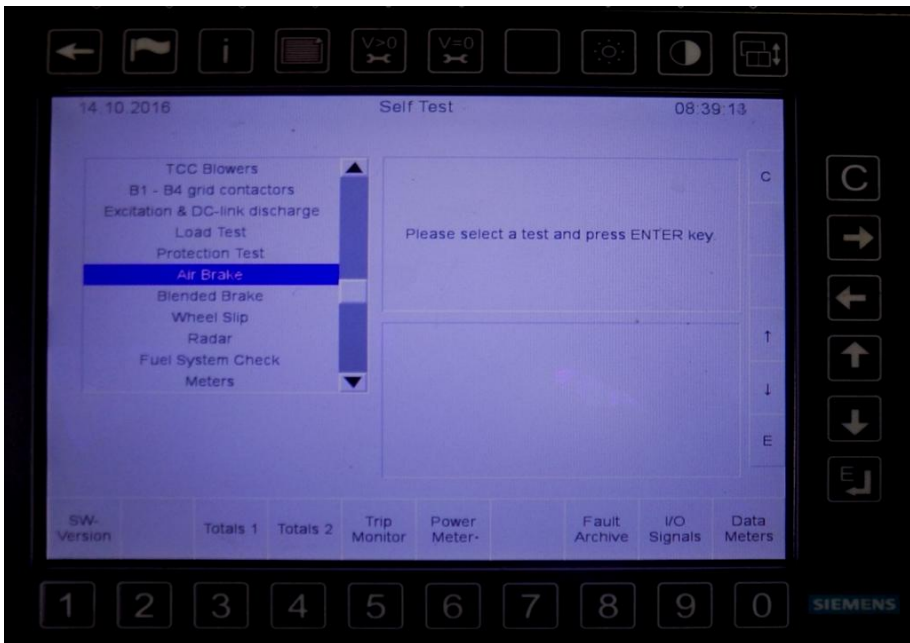


On Main Screen Press Key No : 7 (Below System/Funtions) **Fig. 3.29**

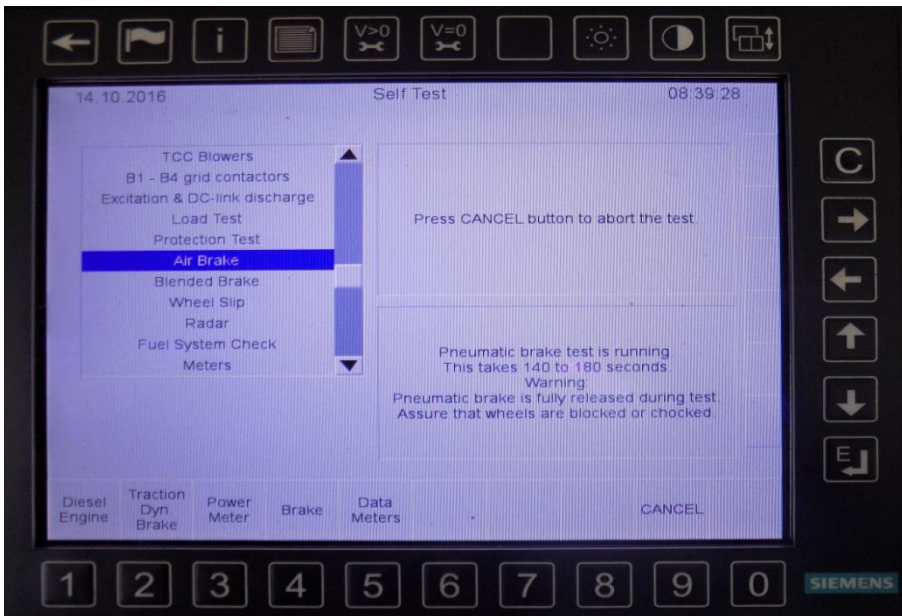


Screen Running Totals will display, Press Key No : 7 (Below Self Test) **Fig. 3.30**

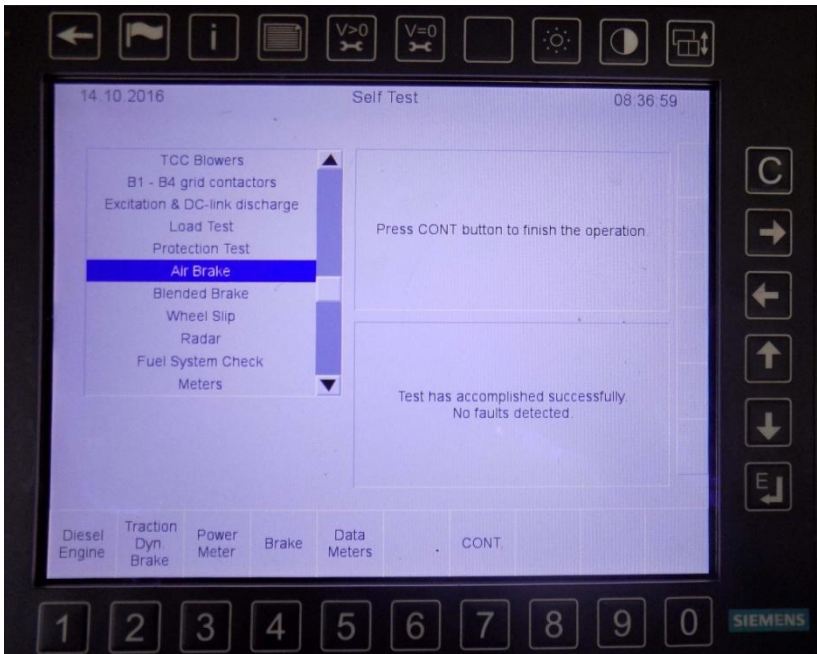




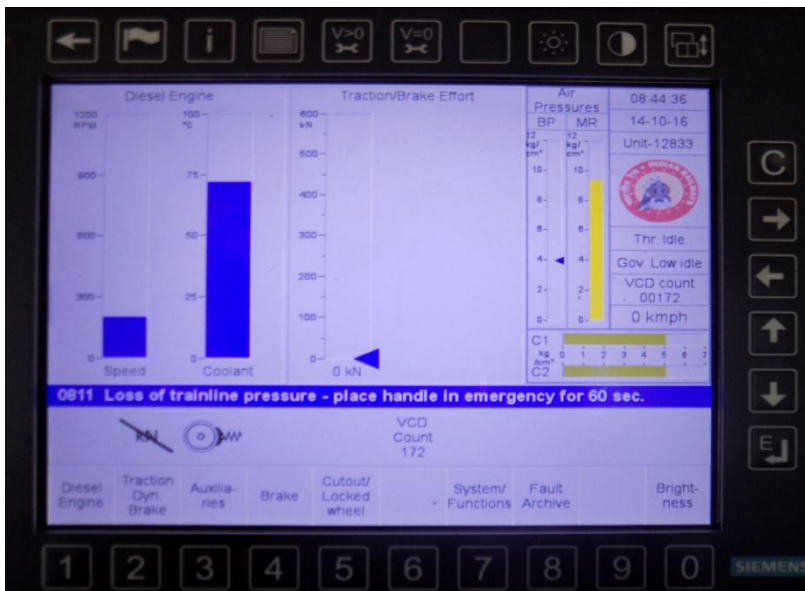
Self Test Screen appears : Select AIR BRAKE by using Down Arrow Key Press ENTER Key “ E “ Key ” to conduct AIR BRAKE Self Test **Fig. 3.31**



Air Brake Self Test is in progress message on screen : Pneumatic brake test is running this take 140 to 180 seconds displayed on Screen **Fig. 3.32**

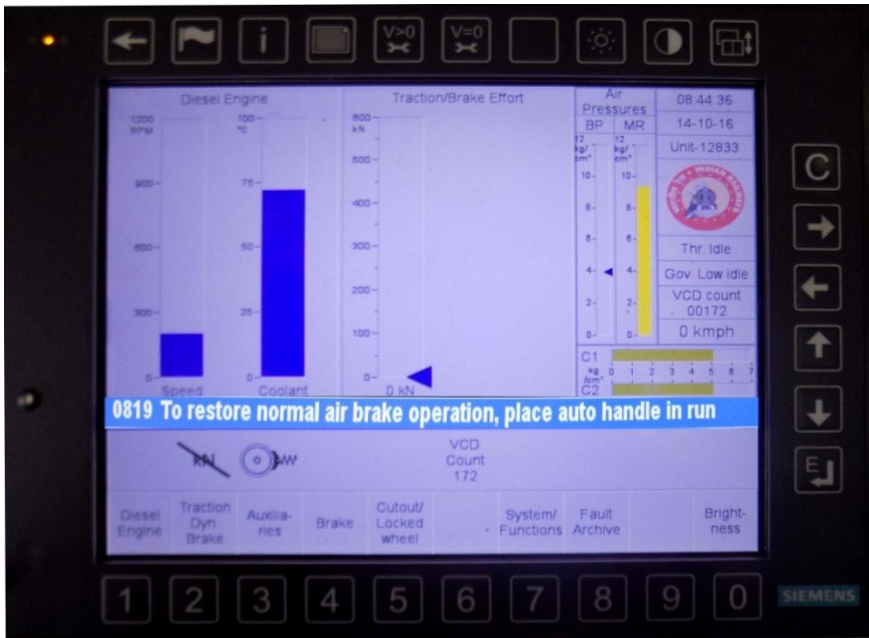


After successful completion of Air Brake Self Test a message: “Test has accomplished Successfully No Faults detected” will be displayed on Screen. Press Key No. 7 below CONT to finish Air Brake Self Test **Fig. 3.33**



In Crew Message, 'LOSS OF TRAIN LINE PRESSURE. PLACE HANDLE IN EMERGENCY FOR 60 SEC'. Keep Auto Brake in emergency for 60 seconds. **Fig. 3.34**





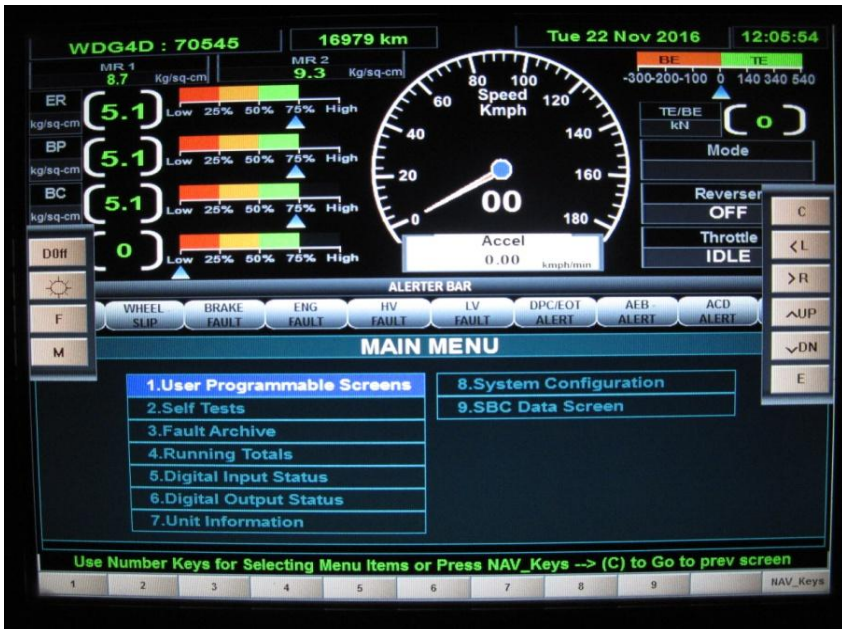
After 60 Seconds CREW MESSAGE: `TO RESTORE NORMAL AIR BRAKE OPERATION, PLACE AUTO HANDLE IN RUN'. Keep Auto Brake handle in RUN and Restore BP pressure. **Fig. 3.35**

### 3.5.6 WDG4D – DUAL CAB MEDHA AIR BRAKE SELF TEST (Touch Screen)

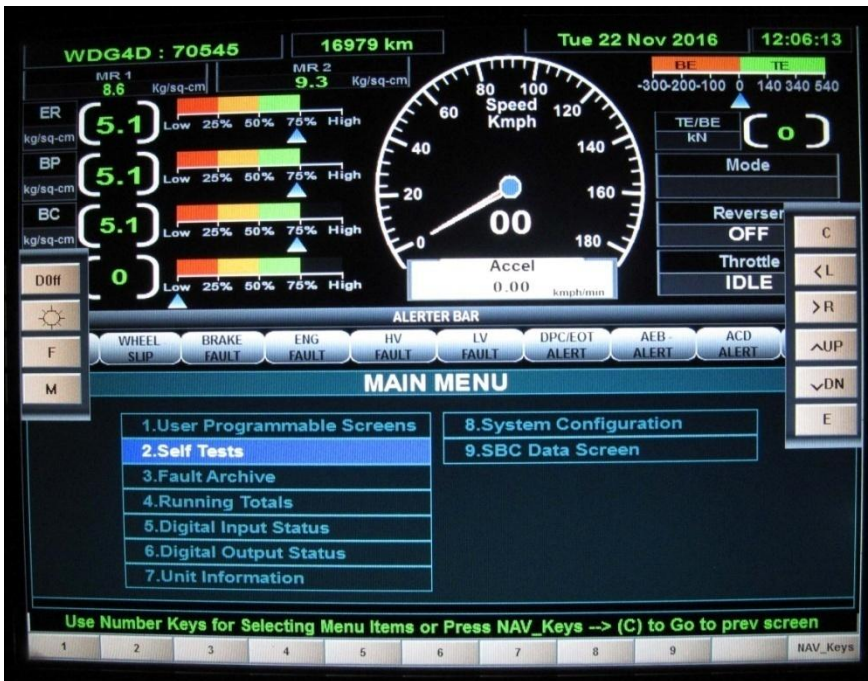




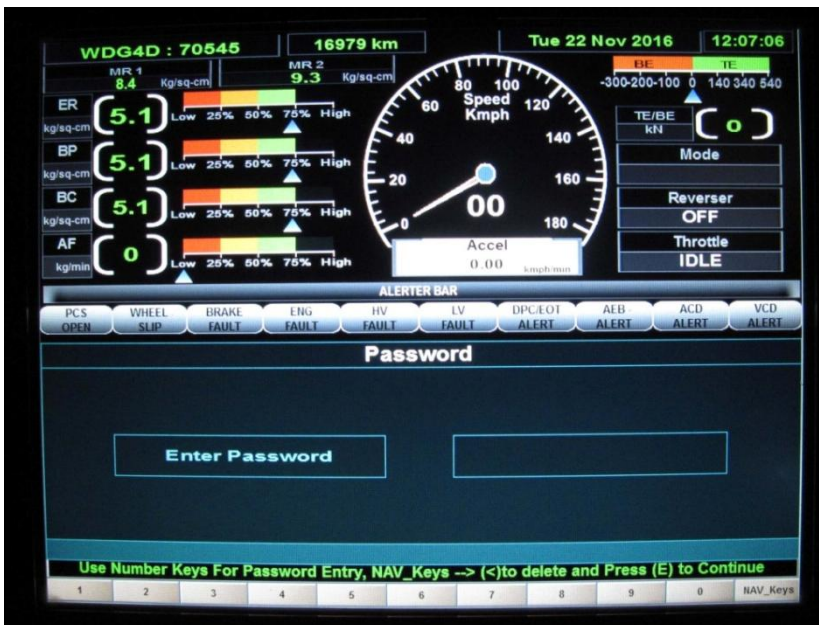
Touch 'Main Menu' Fig. 3.37



Main Menu will display. Touch 'NAV\_Keys' (at right corner). Fig. 3.38

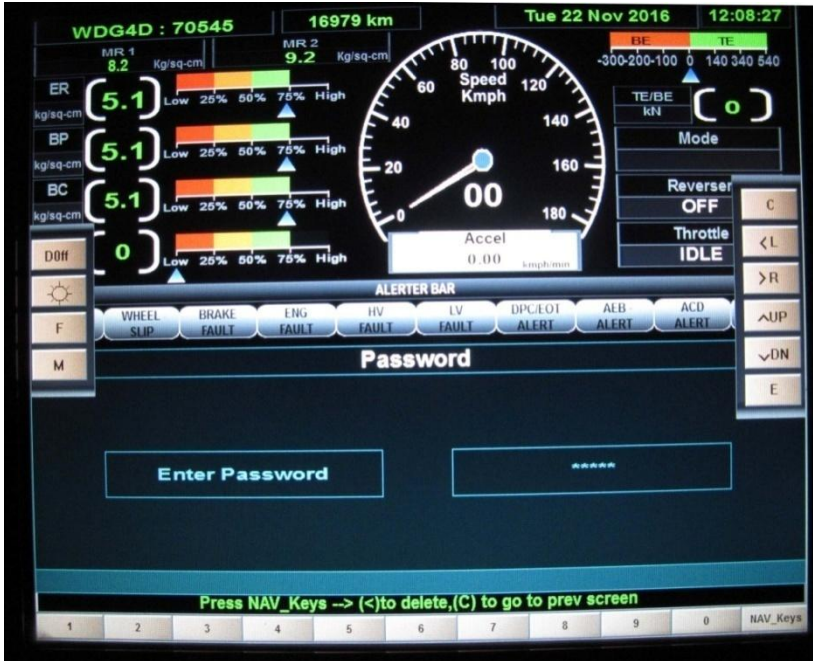


On right side pop up menu will display. Touch UP/DN keys to select **Self Tests** and Touch 'E' Key or Touch No. '2' Key **Fig. 3.39**

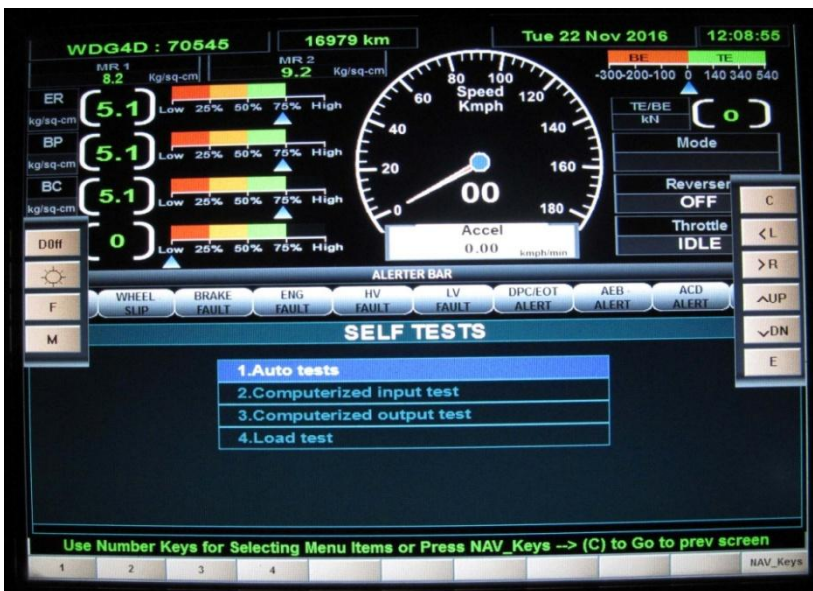


Enter password **12345** by using number keys **Fig. 3.40**





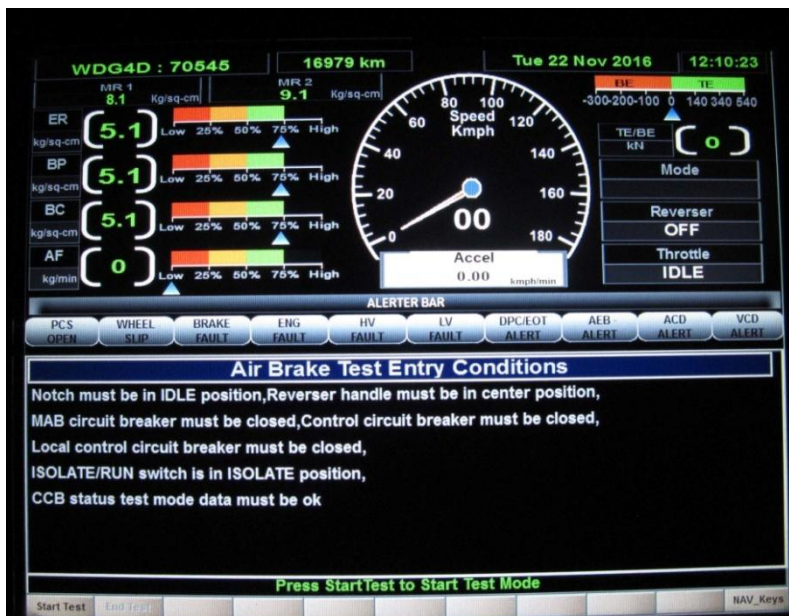
Touch NAV\_Keys and Touch 'E' Key on right side pop up menu Fig. 3.41



Self Tests screen display. On right side pop up menu touch UP/DN keys to select Auto Tests and Touch 'E' Key or Touch No. '1' Key Fig. 3.42



Auto Tests Screen appears. On right side pop up menu touch **UP/DN** keys to select **Air Brake Tests** and Touch '**E**' Key or Touch No. '**1**' Key. **Fig. 3.43**



Full fill the Air Brake Test Entry Conditions. Touch '**Start Test**' Key **Fig. 3.44**



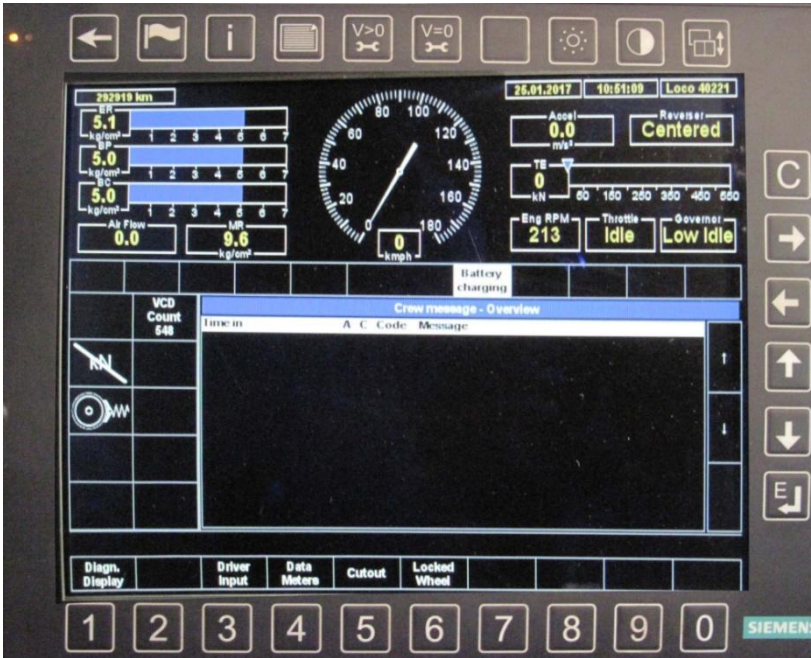
Air brake Self test starts and it is in progress **Fig. 3.45**



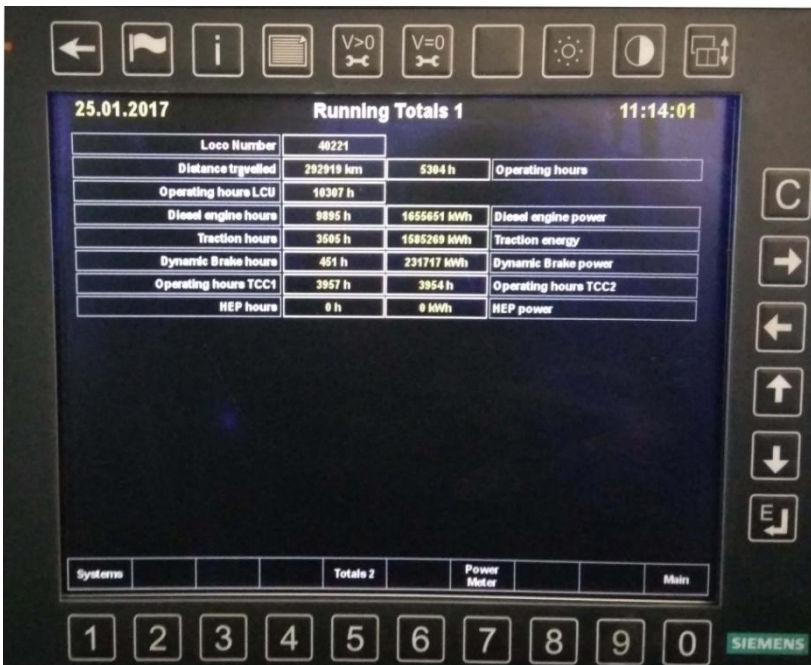
After successful completion of Air Brake self test. Touch **End Test** key. Revoke emergency penalty by keeping auto brake handle in emergency for 60 sec and After 60 seconds Restore Normal Air Brake Operation by Keeping Auto Brake In Run. and recover the BP. **Fig. 3.46**



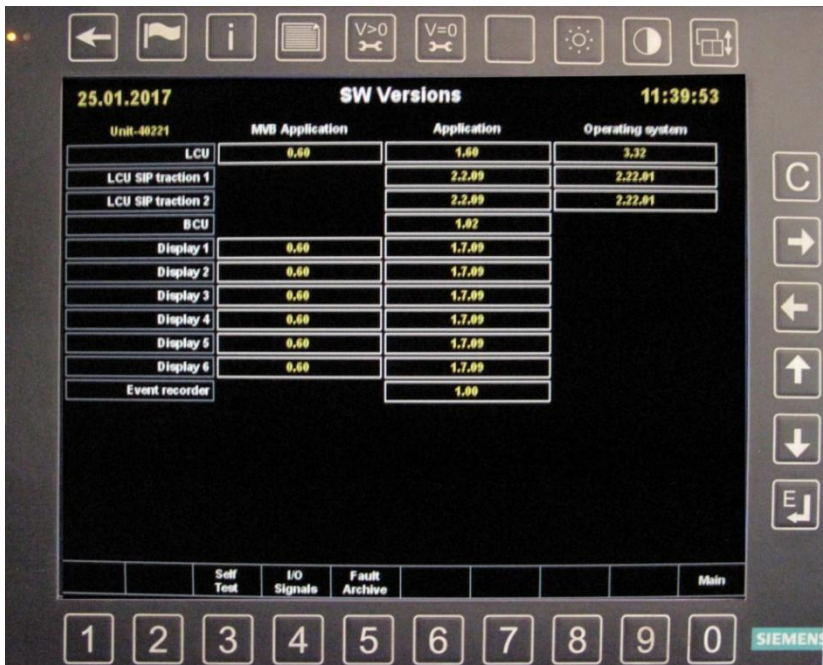
### 3.5.7 WDP4D – DUAL CAB – SIEMENS – AIR BRAKE SELF TEST



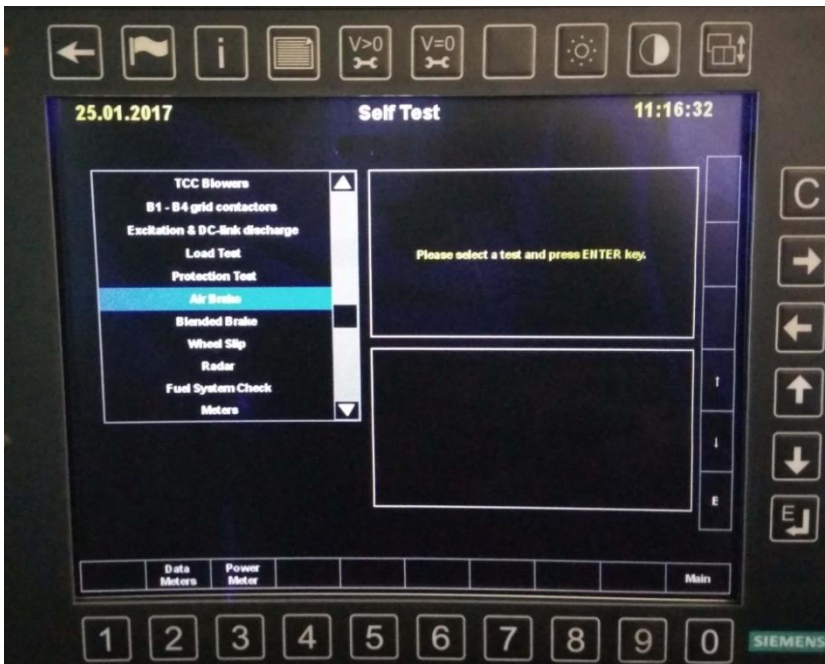
On Main Screen Press key number 1. (Diagn. Display key) **Fig. 3.47**



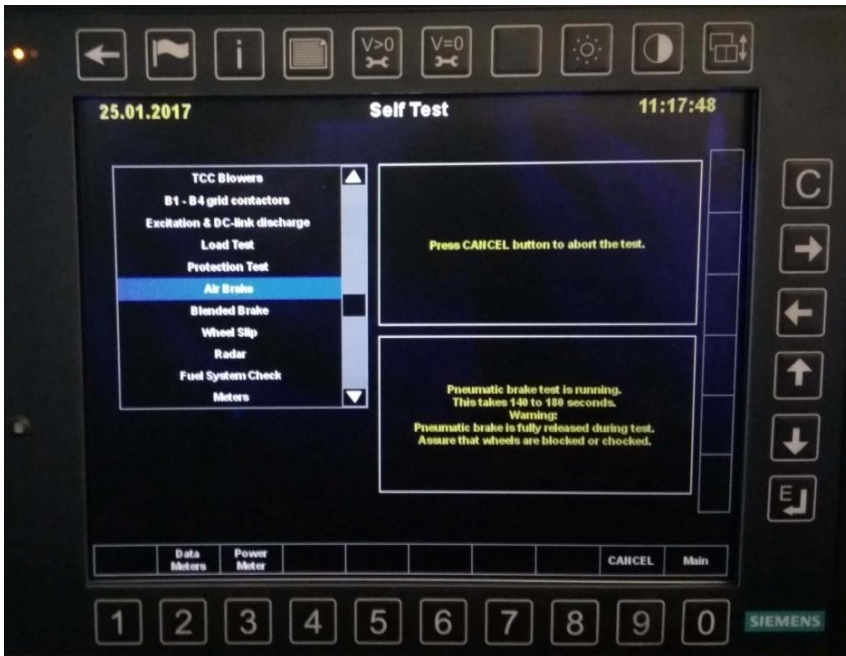
Running Totals Screen appears Press key number 1. (Systems key) **Fig. 3.48**



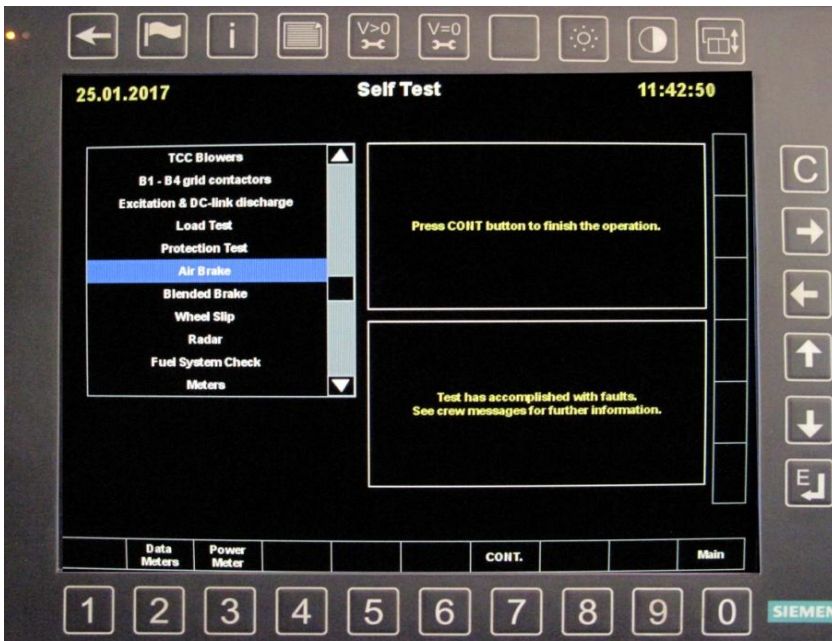
SW versions screen appears, Press key number 3. (Self Test key) **Fig. 3.49**



Self Test screen appears. Select Air Brake by using down arrow key. press 'E' (Enter key) **Fig. 3.50**



Air brake Self Test will progress **Fig. 3.51**

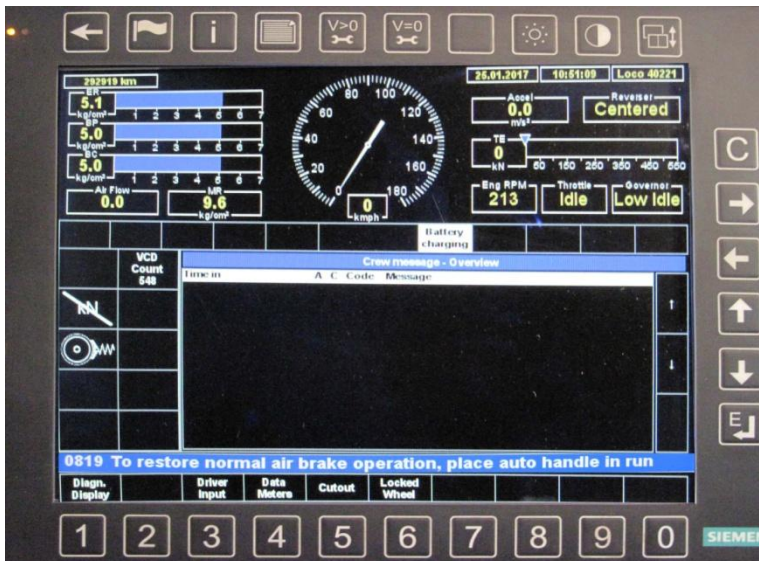


After completion of Air Brake Self Test successfully, result will display as 'Test has accomplished successfully. no faults detected'. **Fig. 3.52**





In Crew Message, 'LOSS OF TRAIN LINE PRESSURE. PLACE HANDLE IN EMERGENCY FOR 60 SEC'. Keep Auto Brake handle in emergency for 60 seconds. **Fig. 3.53**



After 60 Seconds, CREW MESSAGE 'TO RESTORE NORMAL AIR BRAKE OPERATION, PLACE AUTO HANDLE IN RUN'. Keep Auto Brake handle in RUN and Restore BP pressure. **Fig. 3.54**

### 3.5.8 Air Brake Self Test in EMD Dual Cab

As per the RDSO instructions, In EMD Dual Cab locos there is a conflicting message between EM 2000 display and on CCB- II EBV display, after the Air Brake self-test successfully passes.

The EBV display of CCB-II brake system displays the message "**Self Test passed**". However at the same time the EM 2000 displays the message "**Air brake self-test failed - Check archive for Results**".

Hence the conflicting message on EM 2000 display with regard to Air brake self-test may be **Ignored** and if Air brake self-test has been performed and EBV display of CCB-II brake system displays "**Self-Test Passed**", then the locomotive to be considered as successfully passed the air brake self-test and is ready for service. This will be corrected in EM2000 software release 30.21.01 by the early-March 2017 timeframe.

#### **Mismanagement By Crew**

On 06.05.16, LP while working LocoNo.12752/WDG4/KZJ/SCR Train no. goods, failed due to air brake failure with CCB fault code 72 and 60. Since LP failed to conduct air brake self test. Hence know the proper procedure of conducting air brake self test and follow the following precautions.

- Secure the Loco and formation.
- Close BP, FP, MREQ, BCEQ COC there should not be any air leakages.
- Ensure MR pressure 8-10 Kg/Sq.Cm before conducting Air brake self test.
- Ensure Isolation switch is in Isolate, Throttle in Idle and Reverser in Neutral.
- Working console BCU in Working mode
- Non Working console BCU in Non Working mode.
- While changing the MU Lead Loco into Trail and Trail loco into lead always convert FIRST leading LOCO into Trailing LOCO then Trailing LOCO into Lead LOCO.
- Don't keep two L/T switches in Lead position.

#### **Mismanagement By Crew**

On 11.03.2017, LP of Train no SGWF goods working with Loco No. 12600+12572 WDG4/GY stopped at home signal of BSPL station in DMM-SGT section of SBC division due to BP pressure dropped to zero with message " brake controller-1 failed. Train cleared section with relief locos. On examination of the loco by LP with SSE, it found that liquid food material entered & fallen in to brake control unit, caused malfunctioning of brake valve. The detention of the goods train caused indirect punctuality loss of train no. 11013 Exp.

This Failure/ detention could have been avoided had the crew taken care while taking food and not on / near brake control unit.

# Notes



# Chapter No. 4.0

# Operations



## 4.1 WDP4 / WDG4 LOCOMOTIVE CRANKING PROCEDURE

### 4.1.1 Ensure the following Conditions before Cranking:

1. Put on the hand brake.
2. Check oil and water coolant levels.
3. Make sure that LLOB on Governor, Low water and crank case pressure reset buttons are pressed in.
4. Make sure that Engine Over Speed Trip Reset Lever (OSTA) is in Reset Position (Handle should be tilted towards left side of locomotive in Reset position i.e. towards Fuel Spin On filter).
5. Ensure MREQ COC and BCEQ COC are closed condition
6. Make sure that the Isolate / Run switch is in 'Isolate' position.
7. On the Long hood control stand – Ensure
  - a) Engine Run switch is down (OFF)
  - b) Control & FP breaker is up (ON)
  - c) Generator field switch is down (OFF)
  - d) MU shut down RUN button is pressed –IN.
8. On working control stand –
  - a) Ensure Reverser handle in Neutral
  - b) Throttle handle in idle.
  - c) Keep Auto brake (A9) handle in RUN position.
  - d) Keep Direct brake (SA9) handle in Full application position
  - e) Keep Lead / Trail switch in Lead position.
9. On Non – Working control stand –
  - a) Ensure Reverser handle is removed.
  - b) Throttle handle in idle.
  - c) Auto brake (A9) handle is FS (Full service) position.
  - d) Direct brake (SA9) handle in released position.
  - e) Lead / Trail switch is in Trail Position.
10. Ensure all circuit breakers on circuit breaker panel are in OFF position (Before cranking).

### 4.1.2 Cranking Procedure

1. Ensure that start Fuse is in position and close the battery knife switch (ON)
2. In the circuit breaker panel, put ON all BLACK labeled circuit breakers. Yellow labeled circuit breakers (Turbo & Computer) at ON. White labeled circuit breakers as

applicable. (In case of Dual cab Locos Ensure Switch ON of Computer Control and MAB Breakers in ECC – 4)

3. On computer select starting system > Main Menu > Data Meter > Starting system
4. TLPR shows ON (Turbo Cooling Cycle Starts) Now engine is ready for cranking.
5. Go to the FUEL PRIME / ENGINE START switch (Locomotives provided with Governor booster pump FUEL PRIME / ENGINE START switch is provided on Engine Control panel (Drivers cab) otherwise FUEL PRIME / ENGINE START switch is provided at loco right side Engine accessories room below fuel oil primary filter condition gauge) turn the switch to FUEL PRIME side (left side) if the shut down procedure was followed properly earlier, the fuel pump motor will start (the motor sound can be heard). If the fuel pump motor does not start, wait for 15-20 minutes and try again.
6. Keep holding the FUEL PRIME / ENGINE START switch to PRIME side (Normally 10-20 sec) and see that the fuel oil return sight glass is full of fuel and shows no bubbles. Out of the two sight glasses, the one closest to engine block should be full without any air bubbles and one away from the engine block (Bye pass sight glass) should be empty.
7. Turn the FUEL PRIME / ENGINE START switch to START side and (press the lay shaft gently 1.72 when you are cranking from the Engine accessories room. Release the lay shaft and the switch when you feel the lay shaft being pulled from your hand) In case FUEL PRIME / ENGINE START switch is available in drivers cab, start switch can be released when engine RPM goes above 160-180, which can be readily seen on the starting system screen on EM 2000 (EPU RPM). Do not hold FUEL PRIME / ENGINE START Switch at START mode for more than 20 seconds. If cranking fails next attempt shall be made after two minutes only.
8. **Caution:** Excessive pressing of the lay shaft will over speed the engine and OSTA will trip causing the engine to shut down.  
If post lubrication is interrupted, (Due to improper Shut down procedure ) while cranking display shows the following message.
  - a) In EMD - “ No Engine start - Run TLPR for 15 Mts ” – wait for 15 mts and then crank.
  - b) In Medha - “ No Engine start - Turbo pre lube pump is on – wait till Lube time comes to zero then crank.

### 4.1.3 Engine Cranking - Points to be Remember

#### Starting Auxiliary Contactor (STA) will picking up if:

- a) Engine is not running –Engine speed is less than 55 RPM or Companion Alternator output voltage is below 25 volt.
- b) Isolation switch is in Start/Stop/Isolate.
- c) Post lubrication is not interrupted during shutdown.
- d) EFCO Relay energized (EFCO switches not in off).
- e) SD Relay dropped (MU Stop button is in Run position)
- f) LLOB is in set.
- g) Start Fuse is OK.
- h) FPR is energized.

#### Starting Contactor (ST) will picking up if:

- a) STA Contactor picking up.
- b) Starting motor pinions are engaged with ring gear. (Feedback received from SM Contacts within 3 seconds after picking up of STA Contactor).

### 4.1.4 ENGINE STARTING TROUBLES

S.No	Reason	Indication	Remedy
<b>ENGINE NOT CRANKING</b>			
1	Isolation switch in Run	Message will be generated	Keep it in start/Stop/isolate/
2	Control / FP Switch in off	Message will be generated	Keep it in ON
3	Emergency fuel cutoff and Shut down switch is not in release position.	Message will be generated	Keep it in release position
4	MUSD is in stop position	Message will be generated	Keep it in Run position
5	LLOB Tripped	Message in the display In EMD - “Engine protection shut down” In Medha – “Engine shut down Low Engine oil pressure”	Reset LLOB.
6	Start fuse blown	Message will be generated	Inform shed

7	During shut down Post lubrication not completed	Message will be generated “No Engine start – Run TLPR for 15 Mts”	In EMD - Wait “TLPR” comes to off then re-crank In Medha - Wait till lube time comes to zero and then crank. If still not crank wait up to TLPR comes to off, then re-crank.
8	Relay FPR not picks up	Status is OFF in starting screen	In form shed. Switch ‘ON’ emergency EFCO / FP Switch if available then crank.
9	If STA is “ON” and ST is “OFF”	Status is OFF in starting screen	Release FP/ES switch and try. If not check the starting motor pinion is protrudes or not and inform shed.
NOT FIRING ( EPU RPM not reaches 100 within 10 seconds)			
1	OSTA Tripped	Message in the display	Reset and crank. Message will be extinguished after engine RPM stabilized.
2	FPM is not working	-	Change the stand by inverter Switch from Normal to Stand by
3	If FPM is working		
a	Spin on filter chocked	No oil in the fuel return sight glass and oil in the bye pass sight glass.	Inform shed.
b	System blockage	No oil in the fuel return and bye pass sight glass.	Inform shed.
4	Low oil in the Governor	-	Inform shed
NOT HOLDING ( Loco Shut Down within 3 minutes)			
1	In EPD - Low water pressure / Crank case button is not in set position.	After time lag LLOB will Trip and message will be generated for LLOB Trip.	<b>For LWP</b> - Ensure test cock is in open, reset LLOB then re-crank. If repeats inform shed. <b>For Crank case</b> - Do not re-crank. Inform shed

#### 4.1.5 LOCO MOVING

- Ensure water temperature is above 52<sup>0</sup> C. If the temperature is below 52<sup>0</sup> C, the locomotive power is limited to second notch.
- No active messages in the Crew.
- Keep Isolation Switch is in Run.
- GF and ER Switch in the long hood console are in “ON”.
- Keep Reverser handle in the required direction.



- f. Apply loco brake fully, open Throttle handle to the required notch position according to the terrain and then release loco brakes after TE Meter shoots up.
- g. If both trucks are enabled in EMD loco or all Traction Motors are in service in Medha loco. While moving if loco gets rolled back (Direction of the loco is against to the reverser handle), Dynamic brake would effect for two times and third time Penalty brake will be applied.

#### 4.1.6 CONDITIONS FOR LOCO MOVING

- a. PCS Open light should not glows.
- b. Isolation switch should be in Run position.
- c. Reverser handle is in any one direction.
- d. ER and GF Switches are in ON position.
- e. No Earth fault.
- f. No locked axle.
- g. Both Trucks in EMD/Siemens or All TM's in Medha are not in cutout condition.
- h. Communication link failure is not prevailing.
- i. Water temperature is below 101°C.
- j. TCC is not having Problems such as
  - i. DC Link capacitor temperature is below 75°C.
  - ii. TM Stator temperature is below 220°C.
  - iii. Phase module temperature is below 85°C.
  - iv. Crow bar

#### 4.1.7 TROUBLE SHOOTING – LOCO NOT MOVING

S.No	Reason	Indication	Remedy
1	Reverser handle is in center.	---	Keep it in required direction.
2	Isolation switch is in Start/ Stop/ /isolate	Message will be generated	Keep it in Run
3	ER and GF Switch is in Off	Message will be generated	Keep it in ON
4	BP drops below 2.8 Kg/cm <sup>2</sup> or MR Eq. Pr. Drops below 6.8 Kg/cm <sup>2</sup>	PCS Open lights glows in the control stand with Alarm.	Create MR EQ Pressure or BP Pressure and reset the Penalty according to the display command

5	Power Ground	Message in the Display with Alarm	Stop the Train and reset the power ground. If Power ground lock out then In EMD/Siemens Isolate the truck and In Medha isolate the Traction motor.
6	Communication Link Failure	Message in the Display with Alarm	Stop the train and recycle the concerned unit.
7	TCC Problems	Message in the Display with Alarm	Stop the train and recycle the concerned TCC.
8	Locked axle	Message in the Display with Alarm	Inform shed. If defective Speed sensor Speed sensor disabling is to be done
9	Water temperature is above 101°C	High water temperature – TH 6 <sup>th</sup> limit message in the display.	Allow engine to cool, ascertain the reason, inform shed.
10	Crow bar action	Message in the Display with Alarm	In EMD – Recycle the concerned TCC. In Medha – Shut down and re-crank the loco.
11	On Run if Reverser is disturbed	-	Stop the train, move Reverser handle to center then move to the required direction
12	Without apparent cause	-	Stop the train, move Reverser handle to center then move to the required direction. If not restored – Recycle the Computer control Breaker.

## 4.2 WDP4/WDG4 LOCOMOTIVE SHUT DOWN PROCEDURE

### 4.1.1 Ensure the following Conditions before Shut Down

1. Put on the hand brake and secure the loco with wooden wedges.
2. Turn Isolate / Run switch to Start / Stop /Isolation position.
3. Ensure loco has no remarks for shutdown and Battery Charging Ammeter shows normal charge.
4. On the long hood control stand, keep
  - a) Engine Run Switch down (OFF)
  - b) Control & FP breaker up (ON)
  - c) Generator field switch down (OFF)
5. On the working control stand –
  - a) Keep Throttle handle in Idle.
  - b) Keep reverser handle in neutral and remove the handle.
  - c) Auto brake handle in released position.
  - d) Apply Direct brake to Full application position.
  - e) Ensure Lead/ Trail switch is in Lead.
6. On the non-working control stand – Ensure
  - a) Auto Brake is in full service position.
  - b) Direct brake is released.
  - c) Lead / Trail switch is in Trail Position.

### 4.2.2 Shut Down Procedure

1. Select Starting system of computer to watch the status of TLPR. (Shows OFF)
2. Press EFCO (Red) button on the Engine Control panel till the engine stops. (TLPR shows ON)
3. Make sure that the Turbo lube pump motor is running
4. Switch off all circuit breaker on the circuit breaker panel except Turbo Lube Pump circuit breaker and Computer circuit breaker (yellow labeled breakers). (In case of Dual cab locos Ensure MAB and Computer control breakers in “ON” in ECC – 4)
5. Switch off Control / FP switch in long hood console
6. Open battery knife switch.
7. Remove the Reverser (and Remove BL Key In case of Medha Dual Cab locos) make entry of shutdown time and date in the log book.
8. Hand over the reverser (and BL Key In case of Medha Dual Cab locos) to the concerned staff.

#### Mismanagement By Crew

On 21.07.14, LP/Shtg., while working Loco No.40112/WDP4/GY/SCR of Train No. 12769 express failed causing detention of 60 min., since LP/Shtg not ensured to keep Battery knife switch in open condition after shutting down the engine. Hence follow the right procedure of shutting down and don't forget to open the battery knife switch after shutting down the engine. Otherwise it may cause run down of Batteries.

### 4.3 CONROL STAND SETUP

S. No.	Mode of Operation	BVC	Working Console	Non Working Console
1	<b>Single Loco Working and MU Lead Loco</b>	<b>L/T Switch</b>	Lead	Trail
		<b>Auto brake</b>	Run	Full Service
		<b>Direct brake</b>	Full (For stopping) and Release (For moving)	Release
2	<b>MU Trail Loco (Both control stands are Non Working Only)</b>	<b>L/T Switch</b>	- No working control stand -	Trail
		<b>Auto brake</b>		Full Service
		<b>Direct Brake</b>		Release
3	<b>Banker / Assisting (Single Loco)</b>	<b>L/T Switch</b>	HLPR	Trail
		<b>Auto Brake</b>	Full Service	Full Service
		<b>Direct brake</b>	Full (For stopping) and Release (For moving)	Release
4	<b>MU-Banker / Assisting (Lead Loco)</b>	<b>L/T Switch</b>	HLPR	Trail
		<b>Auto brake</b>	Full service	Full Service
		<b>Direct brake</b>	Full (For stopping) and Release (For moving)	Release
	<b>MU-Banker/ Assisting (Trail Loco) (Both control stands are Non Working Only)</b>	<b>L/T Switch</b>	- No working control stand -	Trail
		<b>Auto brake</b>		Full Service
		<b>Direct brake</b>		Release

#### 4.4 MU SETUP FOR SINGLE CAB LOCOS

<b>DESCRIPTION</b>	<b>LEADING LOCO</b>		<b>TRAILING LOCO</b>
	<b>WORKING CONSOLE</b>	<b>NON-WORKING CONSOLE</b>	<b>BOTH CONSOLES</b>
<b>Reverser handle</b>	Neutral	Neutral	Neutral
<b>Throttle</b>	Idle	Idle	Idle
<b>Automatic brake (A9) handle</b>	Run	Full service	Full service
<b>Direct brake (SA9) handle</b>	Full application	Release	Release
<b>Lead/Trail selector switch</b>	Lead	Trail	Trail
	<b>L/H CONSOLE</b>		<b>L/H CONSOLE</b>
<b>Engine Run (ER) switch</b>	ON		OFF
<b>Generator Field (GF) switch</b>	ON		OFF
<b>FP &amp; Control switch</b>	ON		ON
	<b>ENGINE CONTROL PANEL</b>		<b>ENGINE CONTROL PANEL</b>
<b>ISOLATION SWITCH</b>	ON		ON

#### 4.5 MU SETUP FOR SINGLE CAB (LEAD) & DUAL CAB (TRAIL) LOCOS

DESCRIPTION	LEADING LOCO (SINGLE CAB)		TRAILING LOCO (DUAL CAB)	
	WORKING CONSOLE	NON-WORKING CONSOLE	CAB ATTACHED TO LEAD LOCO	CAB ATTACHED TO FORMATION
<b>Reverser handle</b>	Neutral	Neutral	Neutral	Neutral
<b>Throttle</b>	Idle	Idle	Idle	Idle
<b>Automatic brake (A9) handle</b>	Run	Full service	Full service	Full service
<b>Direct brake (SA9) handle</b>	Full application	Release	Release	Release
<b>Lead/trail selector switch</b>	Lead	Trail	Trail	Trail
	<b>L/H CONSOLE</b>		--	--
<b>Engine Run (ER) switch</b>	ON		OFF	ON
<b>Generator Field (GF) switch</b>	ON		OFF	ON
<b>FP &amp; Control switch</b>	ON		ON	ON
	<b>ENGINE CONTROL PANEL</b>		<b>ENGINE CONTROL PANEL</b>	<b>ENGINE CONTROL PANEL</b>
<b>Isolation Switch</b>	RUN		RUN	RUN
<b>BL KEY</b>	--		OFF	ON
	<b>CIRCUIT BREAKER PANEL</b>		<b>CIRCUIT BREAKER PANEL</b>	<b>CIRCUIT BREAKER PANEL</b>
<b>Generator Field circuit Breaker</b>	ON		OFF	ON



#### 4.6 MU SETUP FOR DUAL CAB (LEAD) & SINGLE CAB (TRAIL) LOCOS

DESCRIPTION	LEADING LOCO (DUAL CAB)		TRAILING LOCO (SINGLE CAB)
	WORKING CAB	CAB ATTACHED TO TRAIL LOCO	BOTH CONSOLES
Reverser handle	Neutral	Neutral	Neutral
Throttle	Idle	Idle	Idle
Automatic brake (A9) handle	Run	Full service	Full service
Direct brake (SA9) handle	Full application	Release	Release
Lead/trail selector switch	Lead	Trail	Trail
			L/H CONSOLE
Engine Run (ER) switch	ON	OFF	OFF
Generator Field (GF) switch	ON	OFF	OFF
FP & Control switch	ON	ON	ON
	ENGINE CONTROL PANEL (ECP)		ECP
Isolation Switch	RUN	RUN	RUN
BL KEY	ON	OFF	--
	CIRCUIT BREAKER PANEL		CIRCUIT BREAKER PANEL
Generator Field circuit Breaker	ON	OFF	ON
Remaining circuit Breaker	ON	ON	ON

### 4.7 MU SETUP FOR DUAL CAB LOCOS

DESCRIPTION	LEADING LOCO(DUAL CAB)		TRAILING LOCO(DUAL CAB)	
	WORK-ING CAB	CAB ATTACHED TO TRAIL LOCO	CAB ATTACHED TO LEAD LOCO	CAB ATTACHED TO FORMATION
<b>Reverser handle</b>	Neutral	Neutral	Neutral	Neutral
<b>Throttle</b>	Idle	Idle	Idle	Idle
<b>Automatic brake (A9) handle</b>	Run	Full service	Full service	Full service
<b>Direct brake (SA9) handle</b>	Full application	Release	Release	Release
<b>Lead/trail selector switch</b>	Lead	Trail	Trail	Trail
<b>Engine Run (ER) switch</b>	ON	OFF	OFF	ON
<b>Generator Field (GF) switch</b>	ON	OFF	OFF	ON
<b>FP &amp; Control switch</b>	ON	ON	ON	ON
	<b>ENGINE CONTROL PANEL</b>		<b>ENGINE CONTROL PANEL</b>	
<b>Isolation Switch</b>	RUN	RUN	RUN	RUN
<b>BL KEY</b>	ON	OFF	OFF	ON
	<b>CIRCUIT BREAKER PANEL</b>		<b>CIRCUIT BREAKER PANEL</b>	
<b>Generator Field circuit Breaker</b>	ON	OFF	OFF	ON
<b>Remaining circuit breakers</b>	ON	ON	ON	ON

## 4.8 INSTRUCTIONS REGARDING BANKER LOCO

- a) As per the Control Stand setup mentioned in 4.3 made the setup in Banker loco, attach BP hoses between Leading and Banker Loco and open BP angle COCs to charge BP.
- b) BP in the Banker Loco may drop immediately once angle COC is opened and PCS will knock-out without message in LCC screen.
- c) Once, BP is charged from leading loco, PCS in the Banker loco will reset automatically and loco is ready for operation.
- d) Do not change any settings in banker loco control stands except releasing direct brake handle to release position for movement
- e) If the Auto brake handle in the Banker Loco is left in Run will leads to :
  - i) When the train speed reaches 3 kmph, PCS will knock out (BC pressure will not develop), But message “No load –PCS open, recover the Air brake system to reset PCS” will appear in the display.
  - ii) Stop the Train and Bring Throttle Handle to IDLE, message will change as: “Air brake penalty – Place handle in Full service for 10 seconds”.
  - iii) Place Auto handle in FS for 10 Sec., PCS will reset and message change as “To restore normal air brake operation-place auto handle in Run”.
  - iv) Bring the Auto handle to Run once and immediately move the Auto handle to FS which is the correct position for Banker operation.

## 4.9 CONSOLE CHANGING PROCEDURE

### 4.9.1 Single Cab

1. Stop and secure the Loco.
2. Throttle Handle - Idle
3. Reverser Handle - Neutral (Centered)
4. Auto Brake - Run
5. Direct Brake - Apply (Br. Cyl. Pressure - 5.2 kg/cm<sup>2</sup>)

### First Working Console is to be made as Non Working

- a) Move Auto Brake Handle to FS (ER & BP Pressure drops to 3.4 kg/cm<sup>2</sup>)
- b) Wait till BP Exhaust sound stops.
- c) Move Lead / Trail Switch from Lead to Trail (ER Pressure drops to Zero)
- d) Release Direct Brake without touching Bail off ring.
- e) Remove the Reverser Handle



## Then Non Working Console is to be made as Working

- a) Move Direct Brake Handle to Full Application
- b) Move Lead / Trail Switch from Trail to Lead (ER Pr. builds to 3.4 kg/cm<sup>2</sup>)
- c) Move Auto Brake Handle from FS to Run (ER and BP Pr. builds to 5.2 kg/cm<sup>2</sup>)
- d) Insert Reverser Handle.

### 4.9.2 Dual Cab Changing Procedure – WDP4D

- a) Stop and secure the Loco. Apply Direct brake to Full (Br. Cyl. Pr.- 5.2 kg/cm<sup>2</sup>).
- c) Bring Throttle to Idle.
- b) Bring the Reverser Handle to Centre.
- c) Keep Isolation switch in Run Position.

#### I. First Working Cab is to be made as Non Working

- a) Move Auto Brake to Full Service.
- b) Wait till BP Exhaust sound stops.
- c) Move L/T Switch from Lead to Trail (Ensure ER Pressure drops to zero)
- d) Release Direct Brake (without touching Bail OFF ring)
- e) Switch off ERS, GF Slider Switches and Dynamic control CB
- f) Switch off GF CB in the Breaker panel.
- g) Switch off BL Key and remove the BL Key in Medha Locos and it is Non Removable in Siemens Locos.
- h) Remove the Reverser Handle

#### II. Then Non-Working cab is to be made as Working

- a) Move Direct Brake Handle to Full Application
- b) Move L/T Switch from Trail to Lead (ER Pr. builds to 3.4 kg/cm<sup>2</sup>)
- c) Move Auto Brake from Full Service to Run (ER and BP Pr. builds to 5.2 kg/cm<sup>2</sup>)
- d) In Medha Locos, insert BL Key and turn it to ON.  
In Siemens Loco, turn BL Key to ON.
- e) Insert Reverser Handle
- f) Switch ON GF CB in the Breaker panel
- g) Switch “ON” ERS, GF Slider switches and Dynamic Control CB.

**\*Note:** 1. In Siemens Locos Switch Off only GF slider switch on Drivers desk and GF CB in breakers panel/ECC4 in Non-Working Cab(ERS, Control/FP Slider switches and Dynamic Control CB are ON in both cabs) and Switch ON GF slider switch and GF CB in the working Cab.

2. Classification Light Switch: Leading CAB: ON Trailing CAB: OFF

3. CAB FANS & Light Switch: Leading CAB: ON Trailing CAB: OFF.

#### 4.10 PROCEDURE TO ATTACH THE LOCO WITH FORMATION

- a) First attach the loco with formation and ensure CBC is properly locked.
- b) In the working control stand keep Auto brake in Run and Direct brake in Full application position.
- c) Press down and move the Lead/Trail switch to “TEST “ position.
- d) Connect Loco and Formation BP hose pipes.
- e) Open BP Angle cocks (First formation then Loco side).
- f) Change Lead /Trail switch to “LEAD“ position.
- g) Charge BP pressure to 5.2 Kg/cm<sup>2</sup>
- h) In case of Twin pipe, before opening BP angle COC first open FP angle cock.

#### 4.11 LEAKAGE TEST PROCEDURE (Formation)

- a) Create 5.2 kg/cm<sup>2</sup> of BP with formation.
- b) Drop BP to 4.0 kg/cm<sup>2</sup> and move the Lead /Trail switch from LEAD to TEST.
- c) Wait for 5 minutes if the BP is maintaining above 2.75 kg/cm<sup>2</sup>, indicates that the leakage is within the permissible limit.
- d) If the leakage rate is more than 1.25 kg/cm<sup>2</sup> for 5 minutes, then the formation is to be checked.

#### 4.12 LEAKAGE TEST PROCEDURE (Locomotive)

- a) Set Working Console Brake Controller – Auto brake – Min Reduction
  - i) ER reduces to approximately  $4.7 \pm 0.14$  kg/cm<sup>2</sup>.
  - ii) BP reduces to approximately  $4.7 \pm 0.14$  kg/cm<sup>2</sup>.
- b) Set Working Console Brake Controller Lead/Trail Switch to TEST
- c) Set Working Console Brake Controller Auto Brake to FS
  - i) ER reduces to approximately  $3.5 \pm 0.14$  kg/cm<sup>2</sup>.
  - ii) BP remains approximate  $4.7 \pm 0.14$  kg/cm<sup>2</sup>.
- d) Wait one minute.
  - i) Monitor Brake pipe pressure for two minutes  
Leakage not to exceed **0.07 kg/cm<sup>2</sup>/Min.**

#### 4.13 BRAKE PIPE MAINTAINING TEST PROCEDURE

- a) Install a 3/16” Test Orifice at the Front end brake pipe end connection hose.
- b) Move the automatic brake handle into the service range.
- c) slowly open the brake pipe angle cock with the test orifice and note the following.
  - i) That BP does not decrease by more than 0.2 to 0.3 kg/sq.cm. (3 to 4 PSI)
  - ii) That BC does not increase by more than 0.5 to 0.6 kg/sq.cm. (7 to 9 PSI)
- d) Close the brake pipe angle cock.
- e) Move the automatic brake handle to RUN.
- f) Remove the 3/16” test orifice from the brake pipe end connection hose.
- g) Wait three minutes to allow system to fully charge.

## 4.14 DEAD LOCO MOVEMENT OF WDP4 / WDG4

- a) Shut down the Engine as per procedure and attach with the working loco.
- b) If MREQ, BCEQ pipes are connected work the loco without any changes.
- c) If BP pipe only connected the following procedure to be carried out.
- d) Drain MR1 and MR2 completely, then close the drain cocks.
- e) At any one end open BC Equaliser and MR Equaliser COC to atmosphere.
- f) Connect BP Pipe and open BP Angle cocks.
- g) Open Dead Engine cock (in CCB 1.5 cock upward) or Turn Dead Engine knob in “Dead In” position (in CCB 2.0) located in the nose compartment.
- h) Ensure MR pressure is builds to 1.8 kg/cm<sup>2</sup> in the dead loco.
- i) Destruct the BP and ascertained loco brakes is getting applied in the dead loco and BC Pressure is building up to 1.8 kg/cm<sup>2</sup>.
- j) Create BP Pressure to 5.2 kg/ cm<sup>2</sup> and ascertained loco brakes are getting released.
- k) Ensure air is leaking through the dead loco BC Equaliser pipe during application and releasing of brakes. If not the BC Equaliser COC Position is to be ascertained for proper position or BC Equaliser metal pipe may be provided with dummy.
- l) If FP pipe is connected and C2N or F2 valve is used for FP Charging ensure the inlet and outlet COC of C2N valve is kept closed in Dead loco.

**Note:** 1) If air is trapped inside the MR Equaliser of dead loco, loco brake will not get apply. Ensure MR Equaliser COC position in open or MR Equaliser metal pipe may be provided with dummy.

2) If air is trapped inside the BC Equaliser of dead loco, loco brake will not get released. Release the Loco brakes by pressing TP16, TP20, TPBC, KE back up valve QRV and ensure brakes are fully released before moving the dead loco. Often and Often check the condition of loco brakes are released in dead loco in enroute.

### Mismanagement By Crew

On 20.01.2017 Shunting LP attached 40313 KYN as dead on Train no. 18519 Exp with leading ALCO MU working at BZA and Shunting LP & O/G crew of the train not followed correct procedure while making EOT at BZA, caused brake binding on dead loco, LP stopped train on through signals at bulb cabin and isolated both trucks. Further train on arrival at KZJ leading / working ALCO MU detached and 40313 made working but LP failed ensure releasing of independent brakes ( not followed correct procedure ) after making dead loco to live & attached to train. This resulted in scabbing of loco wheels due to brake application between KZJ-PQL and loco 40313 changed at SC, caused punctuality loss of the train on loco account. This failure / detention could have been avoided had the Shunting LP & crew of 18519 Exp followed the correct procedure for attaching dead HHP loco on train and making dead HHP loco live on train.

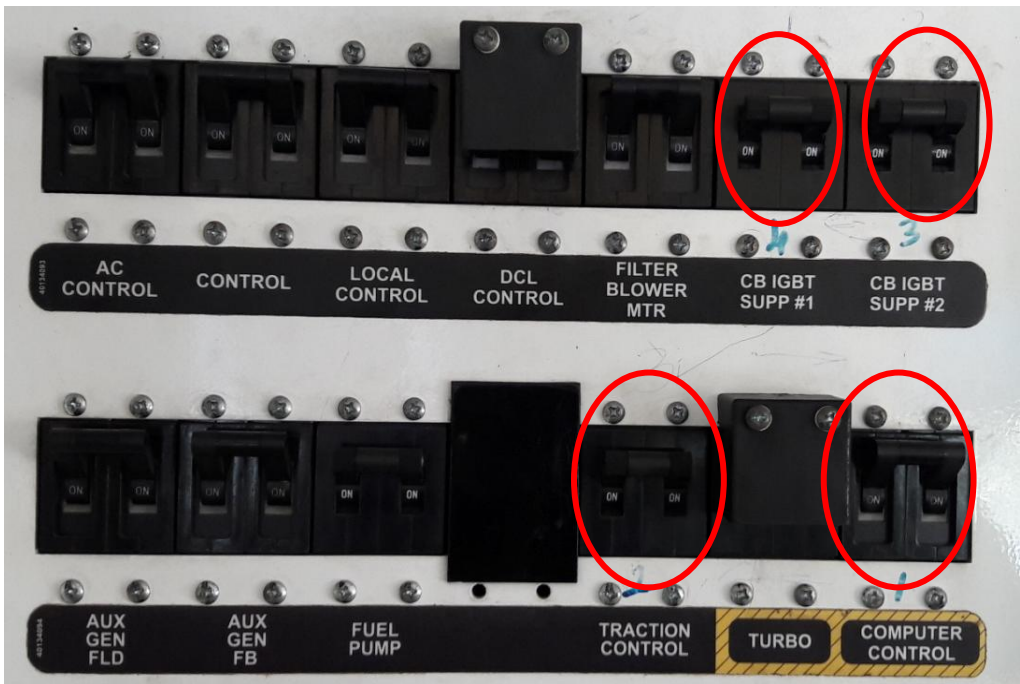


## 4.15 RECYCLING PROCEDURE IN HHP LOCOS

### 4.15.1 Recycling procedure: GTO LOCOS

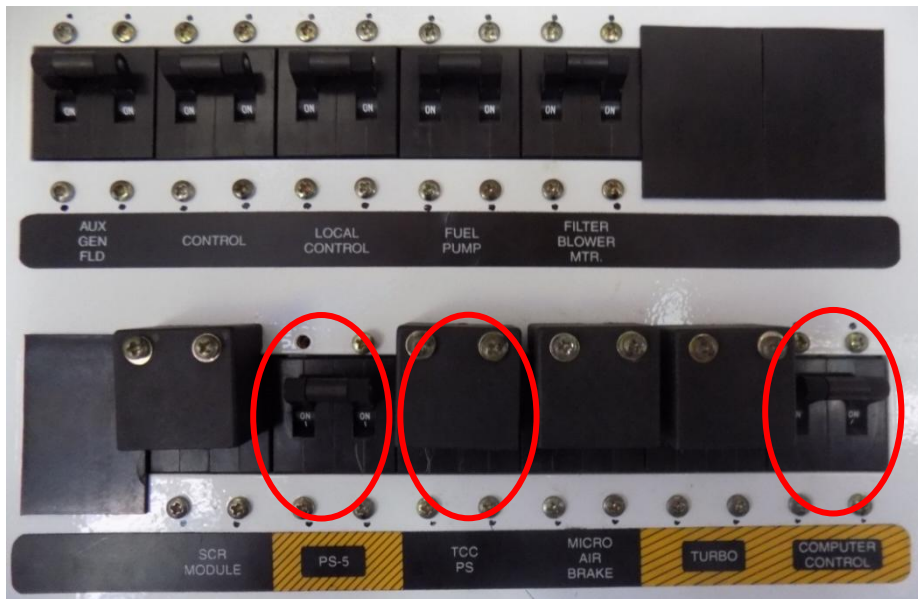
1. Keep Throttle Handle in Idle
2. Keep the Reverser handle in Neutral
3. Keep the isolation switch in Isolate position
4. Switch OFF the Computer Control Breaker
5. Switch OFF Circuit Breaker TCC1 Computer
6. Switch OFF Circuit Breaker TCC2 Computer
7. Switch OFF Circuit Breaker AC GTO 1 PWR Supply
8. Switch OFF Circuit Breaker AC GTO 2 PWR Supply
9. Wait for 20-30 seconds.
10. Switch ON Circuit Breaker AC GTO 2 PWR Supply
11. Switch ON Circuit Breaker AC GTO 1 PWR Supply
12. Switch ON Circuit Breaker TCC2 Computer
13. Switch ON Circuit Breaker TCC1 Computer
14. Switch ON the Computer Control Breaker
15. Recover the BP by keeping the Auto Brake in FS for 10 sec

### 4.15.2 Recycling procedure: IGBT LOCO'S



1. Keep Throttle Handle in Idle
2. Keep the Reverser handle in Neutral
3. Keep the isolation switch in Isolate position
4. Switch OFF the Computer Control Breaker
5. Switch OFF TRACTION CONTROL Circuit Breaker
6. Switch OFF Circuit Breaker IGBT SUPP # 1
7. Switch OFF Circuit Breaker IGBT SUPP # 2
8. Wait for 20 seconds
9. Switch ON Circuit Breaker IGBT SUPP # 2
10. Switch ON Circuit Breaker IGBT SUPP # 1
11. Switch ON TRACTION CONTROL Circuit Breaker
12. Switch ON the Computer Control Breaker
13. Recover the BP by keeping the Auto brake in FS for 10 sec
14. After recovering BP ensure Reverser in Neutral for Min 20s

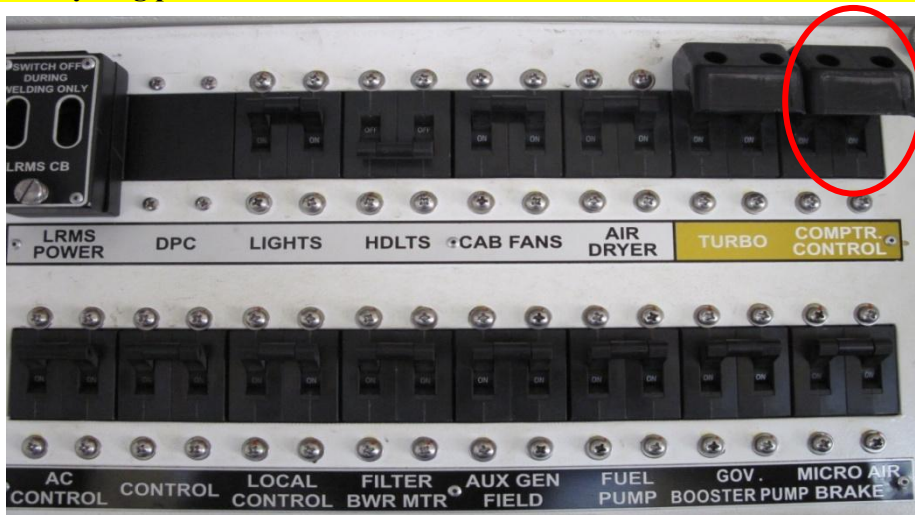
#### 4.15.3 Recycling procedure: SIEMENS LOCO'S



1. Keep Throttle Handle in Idle
2. Keep the Reverser handle in Neutral
3. Keep the isolation switch in Isolate position
4. Switch OFF the Computer Control Breaker
5. Switch OFF Circuit Breaker TCC PS
6. Switch OFF Circuit Breaker PS -5
7. Wait for 20- 30 seconds
8. Switch ON Circuit Breaker PS -5
9. Switch ON Circuit Breaker TCC PS

10. Switch ON the Computer Control Breaker
11. If problem related to **DISPLAY** not coming, put OFF '**DISP**'& '**PS-5**' circuit breakers
12. If problem related to communication failures, put OFF only '**COMPUTER CONTROL**' circuit breakers
13. Recover the BP by keeping the Auto brake in FS for 10 sec
14. After recovering BP ensure Reverser in Neutral for Min 20Sec.

#### 4.15.4 Recycling procedure: Medha LOCO'S

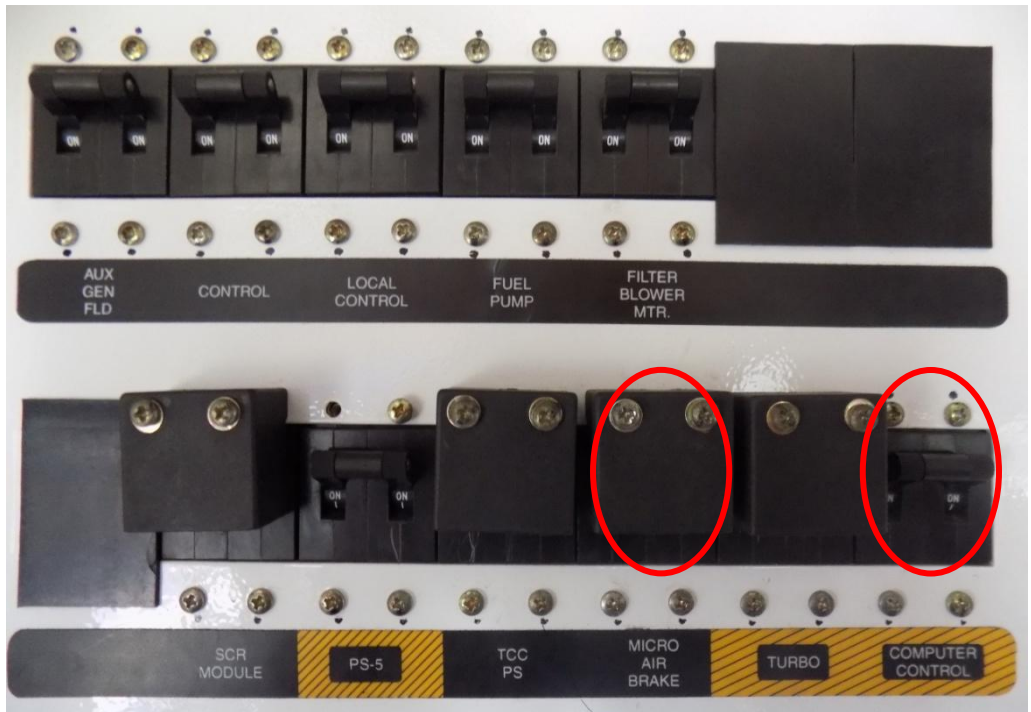


1. Keep Throttle Handle in Idle
2. Keep the Reverser handle in Neutral
3. Keep the isolation switch in isolate position
4. Switch OFF the Computer Control Breaker
5. Wait for 20- 30 seconds
6. Switch ON the Computer Control Breaker
7. Recover the BP by keeping the Auto brake in FS for 10 sec
8. After recovering BP ensure Reverser in Neutral for Min 20Sec.
- 9.

#### Mismanagement By Crew

On 11.03.2017, LP of Train no NGSM goods working with Loco No.70537+12791WDG4/KZJ stalled in BUD-AMB section (BB div) on 1 in 150 rising gradient while negotiating SR 30 Kmph due to trailing loco 12791 was not responding (GF was at off position). Train cleared block section with relief loco after 100" detention. The stalling/detention of the train caused indirect punctuality loss of train no. 12128 Exp, 95136 Exp, 95228 Exp, 22106 Exp, and 95138 Exp & 16532 Exp. This stalling / detention could have been avoided had the LP & ALP checked locos thoroughly before starting at crew change point.

#### 4.15.5 Recycling procedure: for Air Brake Problems






1. Keep Throttle Handle in Idle
2. Keep the Reverser handle in Neutral
3. Keep the isolation switch in isolate position
4. Switch OFF the Computer Control Breaker
5. Switch OFF Circuit Breaker Micro Air Brake
6. Do not switch OFF TCC for Air Brake related Problems
7. Wait for 20- 30 seconds
8. Switch ON Circuit Breaker Micro Air Brake
9. Switch ON the Computer Control Breaker
10. Recover the BP by keeping the Auto brake in FS for 10 sec




#### Mismanagement By Crew

On 17.03.2017, LP of Train no KPCC goods working with Loco No. 12842+70468 WDG4/BNDM stopped in BEY-BMH section (GTL div) on 1 in 100 rising gradient due to trailing loco 12842 Engine shutdown, LP tried thrice duly contacting PRC & LI but not succeeded to re-crank as he ignored EPD resetting apart from LLOB. Train cleared block section with relief loco after 48" detention. CLI arrived BMH with relief loco could crank 12842 engine after resetting EPD. This failure/detention could have been avoided had the LP aware of cranking procedure of HHP locos.

## 4.16 ENGINE SAFETY DEVICES

S. No	DEVICE	REPERCUSSION AND REMEDIAL ACTION
1	<p>OSTA</p> 	<p><b>If Tripped</b>                      During cranking engine will not fire                      During running engine will shut down.  <b>Message in the display</b>                      “No start – Mechanical OSTA Tripped, Reset before Start”.  <b>Remedy</b> - Reset and crank the loco. Message will go off automatically after engine gets hold.  <b>Message in the display Siemens loco</b>                      “No Aux. gen. output/check all breakers”.</p>
2	<p>LLOB</p> 	<p><b>If Tripped</b>                      During cranking engine will not crank                      During running engine will shut down.  <b>Message in the display</b>                      In EMD - “Engine protection shut down – Low Oil Pressure”.                      In Medha - “Engine protection shut down – Low Oil Pressure”.                      In Siemens - “Engine protection shut down – Low Oil Pressure”.  <b>Remedy</b> - Ascertain the reason, reset LLOB, ensure Low Water Button is in normal position then re-crank the loco.</p>
3	<p>Low Water Button in EPD</p> 	<p><b>If Tripped</b>                      During cranking engine gets hold and shut down automatically within 180 seconds.                      During running engine will shut down immediately if the engine speed is above third notch. If engine speed is below third notch engine will shut down automatically within 180 seconds.  <b>Message in the display</b>                      Normally no separate message. When it trips engine lube oil going to the LLOB are drained to lube oil sump, leads to LLOB tripping and message generated for LLOB Trip.  <b>Remedy</b> - Ascertain the reason, reset LLOB and Low Water Button duly ensure Low Water Button test COC is in open then re-crank the loco. If repeats inform shed.</p>



4	<p>Crank case in EPD</p> 	<p><b>If Tripped</b>  During cranking engine gets hold and shut down automatically within 180 seconds.  During running engine will shut down immediately if the engine speed is above third notch. If engine speed is below third notch will shut down automatically within 180 seconds..</p> <p><b>Message in the display</b>  Normally no separate message. When it trips engine lube oil going to the LLOB are drained, leads LLOB tripping and message generated for LLOB Trip.</p> <p><b>Remedy</b> – Do not crank the loco, immediately Inform to shed.</p>
5	<p>Hot Oil Detector</p> 	<p>It will get operated when engine lube oil temperature reaches above 124 °C and engine come to shut down.  It will happen after experience high water temperature and extended time. <b>Remedy</b> - Fail the Loco and inform shed.</p>
6	<p>LWS</p> 	<p>It is available in WDP4 locos only. While on run, if the water level is dropped below the safety level, this switch will operate and “low water level” message will come and there will not be any restriction on loco operation. However, if Hot engine is experienced along with this switch operation, then engine will get shut down with the message “Low Water level”. During cranking <b>if this switch operates, then Engine will not crank.</b></p> <p><b>Remedy</b> - Inform shed.</p>

#### 4.17 DO'S AND DONT'S

- 1) Before cranking a loco ensure Br. cylinder COCs are in open
- 2) Wedges from the wheels are to be removed only after brake cylinder pressure builds up to 5.2 kg/cm<sup>2</sup> (Loco holding) & power up penalty is recovered.
- 3) When a loco is arrived as dead, before cranking the loco ensure MR Eq and BC Eq COC are closed.
  - a) If MR Eq COC is open, “Low MR Eq Pr. “Message will be displayed.
  - b) If BC Eq COC is open, “Air brake failure use loco in trail only” Message will be displayed.
- 4) Always ensure LT Switch in non working control console is in Trail only.



- 5) In CCB 1.5 L/T switch is provided with push and rotate mechanism. Hence to change the status first press and then rotate .
- 6) Do not Change Lead/Trail switch on running Locomotive.
- 7) Do not Re-cycle MAB or Computer Control Circuit Breakers on a running loco.
- 8) Never select both Consoles Lead/Trail Switches to HLPR or keep one in LEAD and the other in HLPR/TEST.
- 9) Give proper time pause between two self-tests (at least five minutes).
- 10) Ensure Loco is isolated before performing Air Brake self-test. (BP/FP angle cocks closed between loco and formation, MREQ and BCEQ cocs' are closed)
- 11) Ensure MR Pr. is more than 8 kg/cm<sup>2</sup> and has no leakage before starting self-test.
- 12) Do not hold bail off switch for long time, since it leads failure of bail off feature.
- 13) While changing the console Auto Brake is applied and Direct Brake Handle is moved to Release position, please be careful not to lift bail off ring. Otherwise it will result into release of conjunction brakes on Loco and Loco may roll down.
- 14) Before attaching locomotive to formation, please blow the air through hoses by opening BP angle cock and also clean end connection of wagon /coaches. At times it is found that small stone or plastic pieces flow back to Emergency vent valve.
- 15) Clear fault codes of Controller Failure i.e. 40, 41, 42 etc. before banker operation.
- 16) When experienced Crow bar firing or Radiator fan breaker trips stop the train and immediately take corrective action, since it may cause shutting down of loco.
- 17) Water filling cock is to be operated in clock wise only.
- 18) Do not carry out any operation inside the ECC-1 unless Isolation Switch is moved to Start/Stop/Isolate/ position.
- 19) While starting if automatic DB comes, stop the train, move reverser to centre then moved to the required direction. During restart, apply Direct brake(SA9) fully, move Throttle to the required notch, ensure TE/BE Meter shoots up then gradually release the (SA9) Direct brake.
- 20) Ensure pre-lubrication of the engine (to be done by maintenance staff) if the engine has not been cranked for more than 48 hours.
- 21) Follow correct cranking and shutdown procedure to enhance engine and turbo life.
- 22) DO - Ensure all brakes are released properly before moving the locomotive.
- 23) DON'T- Spill tea / coffee or other eatables on control stand or cab. (The sensitive air brake equipment in control stand and air brake compartment may malfunction)
- 24) DON'T- Permit bad quality sand or wet sand to be added in the sand boxes.
- 25) DON'T- Stable the locomotive without applying the hand brake
- 26) In Dual cab locos a) Do not keep ER and GF Switches in both cabs in "ON" position. It will lead no propulsion without message in Medha locos.  
b) Do not switch off Turbo breaker in ECC-I, and Computer control breakers in ECC-1 and ECC- 4 after shut down.  
c) While operating from CAB -1, Flasher lights are controlled through LIGHTS Breaker.  
d) While operating from CAB -2, Flasher lights are controlled through LIGHTS Breaker in ECC-1 and Cab Fan//Lights Breaker of CAB 2.

## 4.18 INDICATOR LIGHT MESSAGES

The control consoles each incorporate a six-indicator light assembly. Each indicator is imprinted with a word or phrase that conveys a message for the locomotive driver.



a) **TE LIMIT** : This light will glow when TE limit switch on ECP made in On condition or Limit position and restrict the Tractive Effort to 294KN or 29.4T.

b) **SAND** : It indicates the sander operation during manual and automatic actuation by the locomotive Computer due to Manual Sand switch is actuated on working (Leading) Locomotive or any Train line

(MU) Locomotive. (Manual sanding will be allowed up to the speed of 19.6 Km/h). Other Sanding request made by the Automatic function (to help wheel creep or wheel slip control), Emergency Air Brake application on run.

c) **WHEEL SLIP** : Locked wheel due to mechanically locked Pinion. Wheel Slipping momentarily due to Rail conditions. Wheel Slip Light due to other loco's wheel slip in Train line (MU). Wheel Over speed due to Mismatching of wheel diameter.

d) **FLASHER LAMP** : If flasher light is switched on or Auto flasher operation is initiated.

e) **PCS** : Opens, if BP Pressure is dropped below 2.8 kg/cm<sup>2</sup>

f) **BRAKE WARN** : DB limit is exceeded

g) **BB C/O** : Blended Brake Switch in Engine control panel is in Cut out Position.

### Mismanagement By Crew

On 15.03.14, Loco No.12814/WDG4/KZJ/SCR while working train number TPND detained for 210 min., since LP reported that while changing control stand experienced air brake failure with message "Use Locomotive Trail Only". Conducted air brake self test for 3 to 4 times., but unable to rectify since LP not closed BP angle cock properly and also failed to conduct air brake self test properly.


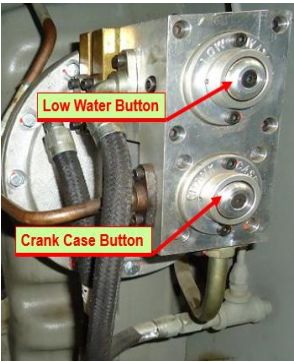

# **Chapter No. 5.0**

## **Trouble Shooting & Frequent Occurring Fault Messages**



## 5.1 TROUBLE SHOOTING

### 5.1.1 ENGINE SHUTS DOWN AUTOMATICALLY

Items to be checked	Action to be taken by Loco Pilot
 <p>Check for LLOB tripping</p>	<p>RESET LLOB</p>
<p>Check for EPD tripping</p> 	<p>a. If EPD found tripped, RESET EPD button and also RESET LLOB button.</p> <p>b. If Bottom button (crank case button) tripped don't reset, inform shed, do not try to re-crank.</p> <p><i>Note: Whenever EPD button trips, it will always be accompanied with the tripping of LLOB button.</i></p>
<p>OSTA tripping</p> 	<p>RESET OSTA</p> <p><i>Note: If OSTA tripping, LLOB &amp; EPD may also trip. Check LLOB &amp; EPD buttons for tripping if found trip. RESET them.</i></p>



Checks throttle position in the EM 2000 display. If it shows "OFF", change Console and work.

If the problem is not rectified, check for tightness of the couplers 543A, B, C in SH console.



Check for malfunctioning of master controller

Check MU stop button

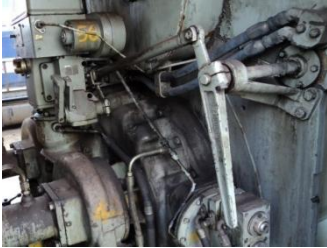


If found pressed in STOP, RESET it. By pressing it in RUN.

*Note: In this case, computer shall display "MU STOP REQUEST"*



Check tightness of rack by physically moving lay shaft



If the lay shaft is not moving at all, or is tight. Try to re-crank the loco and Clear the section.

Note: If rack stuck up, EM 2000 shall display the message "GTO POWER SUPPLY1 UNDER VOLTAGE" & "GTO POWER SUPPLY2 UNDER VOLTAGE", "ENGINE SPEED FAILURE" AND "DC LINK " UNDER VOLTAGE"

Check for Bubbles in return sight glass, i.e., fuel sight glass nearer to the engine block while priming. Also check for oil in bypass sight glass.





If return sight glass Is Having bubbles, tighten the spin-on-filter and suction strainer and re-crank the loco. If the bubbles are still present, try to clear section and ask relief loco. If by pass sight glass is full of oil & return sight glass has no oil, nothing can done. Inform shed demand for relief loco.

Check for Red LED indication in PRG, PSM modules




Inform Shed and seek advice.

<p>Check for Red indication in any of the EM2000</p> 	<p>Inform Shed and seek advise.</p>
<p>Check slide switch of Fuel pump and Breaker</p> 	<p>RESET slide switch and Breaker of Fuel pump. Then re-crank the locomotive.</p>

*Note: if any of the above problems are noticed and engine is shutting down with speed bogging down, disconnect the AMPHENOL plug and try to re-crank, if loco is not cranked after removal of AMPHENOL plug, nothing can be done and consult shed.*

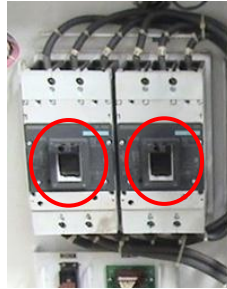
**5.1.2 REDUCED POWER/ POWER NOT COMING AS PER NOTCH**

Items to be checked	Action to be taken by Loco Pilot
<p>Check for bubbles in return sight glass, i.e., fuel sight glass nearer to the engine</p> 	<p>Ensure tightness of fuel filter, suction Strainer &amp; fuel primary drain cock should be in closed condition.</p> <p>Ensure that minimum 1500 litres of diesel is available in tank.</p>

Check for Radiator fans are not working



RESET radiator fan breaker *if* provided.



Check for any visible loose connection in radiator fan circuit in ECC3.





Swap DIO1 and 3.





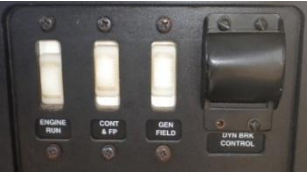

Radiator fan fuse might have blown, nothing can be done, work in lower notches if the train load permits, Inform Shed






**Note:** If radiator fans are not working, EM2000 shall display "REDUCED POWER – THROTTLE 6 LIMIT"

<p>Check for TCC over temperature</p>	<p>Work in lower notches if possible; else wait for a while and allow T C C temp. To come down, and then work further. If the message appears only in one TCC, that particular TCC can be isolated, if the train load permit</p>
<p>Check for Traction Motor over temperature</p>	<p>Work in lower notches if possible; wait to cool down Traction Motors, and then start again.  <i>Note: In case of TCC over temperature and TM over temperature, message shall be logged in EM 2000 showing "REDUCED POWER TCC OVER TEMPERATURE" or REDUCED POWER HOT TRACTION MOTOR"</i></p>
<p>Check for throttle position in EM 2000</p>	<p>If E M 2000 does not display the same throttle position as actual throttle position, change the console and work further.</p> 
<p>Check for speed and power fluctuation.</p>	<p>Ensure tightness of AMPHENOL plug of Governor. If the problem persists, seek advice from shed.</p> <p><i>Note: Full ENG HP will not be achieved at Lower speeds since load regulation is based on Tractive Effort. Full HP will be achieved at about 25 KMPH.</i></p> 

### 5.1.3 TRACTIVE EFFORT METER NOT RESPONDING (LOAD METER NOT RESPONDING)

Items to be Checked	Action to be taken by Loco pilot
<p>Check PCS knocked out</p> 	<p>Recover PCS as per the message displayed in EM 2000</p>
<p>Check for governor AMPHENOL plug tightness</p> 	<p>Tighten the AMPHENOL plug</p>
<p>Check Engine Run Switch position</p> 	<p>Switch ON the engine run switch (It should be UP)</p>
<p>Check for Throttle position in EM2000 display</p> 	<p>If TH position is not in actual throttle position, change the control stand and work further.</p>

<p>Check couplers 543A, B &amp; C tightness</p> 	<p>Tighten the couplers in SH console.</p>
<p>Check for DIO card failure (there will be no indication in EM 2000)</p> 	<p>Swap DIO cards 1, &amp; 3 or 2 &amp; 3. If the problem sets right work further; else seek advice from the shed.</p>
<p>Check for locked axle message in EM 2000 display</p>	<p>Ensure free movement of that particular axle physically. If the wheel is rotating freely, disable the speed sensor through EM 2000 and work further.</p>
<p>Check for message "NO COMPANION ALTERNATOR OUTPUT- NO AUXILIARY GENERATOR OUTPUT"</p>	<p>Check AG drive shaft is intact. If shaft is broken, inform Shed. DVR may be defective, nothing can be done and ask for relief l o c o motive &amp; INFORM SHED.</p>
<p>Check for AG field/feedback breaker Tripping in panel.</p> 	<p>If tripped, RESET and work further.</p>



Check for AG circuit breaker in ECC2.



If tripped RESET and work further.

Check for position of isolation switch



Keep it in RUN position

Check for position of GF switch.



Put in ON Position (UP)


Check for GF breaker




Put in ON Position (UP)

Check for crew message

Act according to the crew message

<p>Check for reverser Input in power data in data meters. This will be shown "PROP" in OPMODE'.</p>	<p>If OPMODE does not Show PROP, change control stand</p>  <p>The image shows a digital display with the 'ELECTRO MOTIVE' logo at the top. Below the logo, there is a grid of data. The 'Op Mode' field shows 'IDLE', which is circled in red. Other fields include 'Thr Pos', 'Gov Req', 'LR %Max', 'KU Ref', 'KU Fbk', 'PRINT', 'TI Tor R', 'TI Tor F', 'MG U', 'MG Fld A', 'T2 Tor R', 'T2 Tor F', 'MG A', 'Ens RPM', 'Radar Kr', and 'EXIT'.</p>
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### 5.1.4 Ground Relay Tripping

Items to be Checked	Action to be taken by Loco pilot
<p>Check crew message. If it shows "GR-POWER"</p>	<p>Isolate TM's/Truck one by one &amp; locate in which TM/Truck GR is tripping. TM causing GR tripping may be isolated &amp; work further.</p>
<p>If the crew message shows "GR-DB, Load Test"</p>	<p>Isolate DB by DB slide switch provided in Engine control panel and work further.</p>  <p>The image shows a close-up of an engine control panel. A slide switch labeled 'DB' is circled in red. Other components include a 'START STOP ISOLATE' button, 'ISOLATION SWITCH', 'EMERGENCY STOP' button, 'DANGER HIGH VOLTAGE WITHIN' warning sign, 'EXTENSION LIGHTS', 'LIGHTS', and 'ALERTER ALARM'.</p>

### 5.1.5 TCC related problems

Items to be checked	Action to be taken by Loco Pilot
<p>Check crew message. TCC internal RESET...</p>	<p>It causes automatic reset of TCC &amp; Loco Pilot need not do anything. Loco can work further without any problem.</p>
<p>"TCC communication link failure" "TCC failed to acknowledge"</p>	<p>Recycle that particular TCC computer breaker along with computer breaker.</p>

DB request”. TCC failed to acknowledge LOAD request. TCC failed to acknowledge DIRECTION request.	
TCC internal RESET-No Speed detectable TCC # lock out.....	Nothing is required to be done and train will work normally. Recycle the TCC computer breaker. If the message disappears, work further. If the message continues to appear, isolate the particular truck, if the train loads permits.

### 5.1.6 Locked Wheel- Speed Sensor Fault

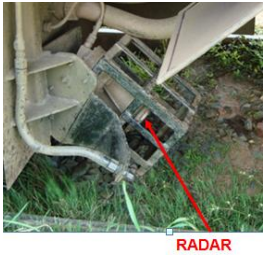
Items to be checked	Action to be taken by Loco Pilot
Verify free rotation of the wheel by moving loco.	If it freely rotates, disable that particular speed sensor and work further Note: If the message does not disappear even after disabling the speed sensor, dis-engage the speed sensor connector on the TM. After disabling the speed sensor computer will show "TCC# n speed sensor disabled for locked wheel detection. Ignore the message & work further. In case for any reasons, recycling of computers is done, speed sensor becomes enabled automatically. Hence it is required to be disabled again after recycling. Also the speeds of Traction Motors in terms of RPM can be checked in” Speed Meter” screen in data meters. There should not be any abnormal variation.

### 5.1.7 TCC Blower Contactor Problem


Items to be checked	Action to be taken by Loco Pilot
Check crew message- Reduced Load TCC#n blower breaker/ computer breaker is not closed.	Check for tripping of TCC computer breaker or TCC blower breaker. If tripped, RESET.
If blower breaker is repeatedly tripping	Open the circuit breaker panel and by pass the feedback interlock wires (Wire Nos. MULA7 & MULAX for TCC1, MULB7 & MULBX for TCC2). The wires are to be removed from the interlock terminals and joined together & insulated. Inform shed.

TCC#n blower contactor failed to pick up	Isolate that particular truck and work further. If the load does not permit to work on single truck, contact the shed.
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**5.1.8 Experiencing Jerks In under- truck**





Items to be checked	Action to be taken by Loco Pilot
Check for speed sensor fault on EM 2000 display	Isolate defective speed sensor duly ensuring free rotation of the wheel and work further.
TCC- problem, indicated in EM2000 screen.	Isolate that particular truck as indicated in EM 2000 display screen & work further.
Select creep control in data meters and check for the value of N+dN during run. It indicates 3600 on free run.	<p>Check for cleanliness of Radar face plate. If it is dirty clean it. Also check for tightness and intactness of the Radar cable and plug.</p> 
Check for proper working of sanders	If sand is not coming, Check for availability of sand in sand boxes. If sand is available in the boxes, close the nozzle by hand' and operate the sander manually to clear any blockage and ensure free flow of sand.
Check for Traction Motor cables in the under gear.	If any of the cable is Found cut or disconnected, disable that particular truck and work further - INFORM SHED.
Jerk during DB.	Stop the locomotive, select Dynamic Brk in data meters and check uniform increase of TL24T voltage from 0 to 74. Volt, as the throttle handle is moved in DB zone from set up to 8 notch. If it is not uniform & it suddenly increases to maximum voltage, isolate DB and work.

### 5.1.9 Digital input system failure



Items to be checked	Action to be taken by Loco Pilot
<p>Check for crew message - Digital Input System failure. check mux circuit.</p>	<p>Swap DIOs 1 or 2 with 3 duly putting OFF computer breaker and ensure usage of anti-static wrist band.</p> 

### 5.1.10 Engine is not cranking


Items to be checked	Action to be taken by Loco Pilot
<p>No Fuel oil</p> 	<p>Check fuel oil level</p>
<p>No Lube oil</p> 	<p>Check lube oil level</p>
<p>No water</p> 	<p>Check water level</p>




<p>Gov. LLOB may be in tripped condition</p> 	<p>Reset it if tripped</p>
<p>OSTA may be tripped</p> 	<p>Reset it if tripped</p>
<p>Fuel pump and switch may be in off condition</p> 	<p>Check fuel pump and switch</p>
<p>Circuit breaker on breakers panel may be in off position.</p> 	<p>Check circuit breakers</p>




	<p>Engine isolation switch may be in RUN position</p>	<p>Put isolation switch on to START/STOP/Isolate mode</p>
<p>Improper sequence of switches in working &amp; non-working control stand</p>	<p>Check sequence</p>	
<p>Check starting motor, gears may be not engaging properly.</p>		<p>Check starting motors gears.</p>
<p>Remove Gov. amphenol plug and crank the loco</p>	<p>Otherwise Contact shed.</p>	

**5.1.11 Throttle not responding**


Items to be checked	Action to be taken by Loco Pilot
<p>Check isolation switch should be in run position</p>	<p>Keep it on RUN</p>
	

<p>Any one control circuit breaker may be tripped</p> 	<p>Reset it if tripped</p>
<p>Check PCS may be knocked OFF</p> 	<p>Check it</p>
<p>Check WW Gov. LLOB</p> 	<p>Reset LLOB if tripped</p>

**5.1.12 Engine cranking but not starting (Firing)**

Items to be checked	Action to be taken by Loco Pilot
<p>Check starting motor, gear may be slipped</p>	<p>Check starting motors.</p> 
<p>TLPR in ON condition</p>	<p>Check TLPR</p>

### 5.1.13 Continuous wheel slip

Items to be checked	Action to be taken by Loco Pilot
 <p data-bbox="132 547 492 580">Recycle TCC1 or TCC2 CB</p>	<p data-bbox="530 402 861 434">Follow recycling procedure</p>
<p data-bbox="132 587 500 653">If required isolate TCC1 or TCC2</p>	<p data-bbox="530 602 975 635">Isolate TCC1 or TCC2 if required</p>
<p data-bbox="132 660 505 728">After isolation for goods train work with 50% load</p>	<p data-bbox="530 675 820 707">Follow the instructions</p>
<p data-bbox="132 735 505 910">If wheel slip indication flashing, it means there is a possibility of slipped pinion, Computer will detect concerned traction motor</p>	<p data-bbox="530 808 1101 840">Check wheel slip indication and act accordingly</p>

### 5.1.14 Simultaneous Forward / Reverse request

<p data-bbox="132 1239 502 1375">Check for crew message – “No load simultaneous Forward / Reverse request” with alarm</p>	<p data-bbox="530 1006 1147 1179">Check for position of Reverse handle in control stand. Also check for reverser input in program meter or in power data. In power data, the reverser input is indicated as OPMODE - PROP</p> <p data-bbox="530 1186 1147 1397">When it is in Forward or Reverse. Keep the reverser in neutral and see that reverser input will show Idle and in program meter RHSF &amp; RHSR shall show OFF. If it is not so, operate the reverser handle in Forward/Reverse directions till such time it correctly shows.</p> <p data-bbox="530 1405 1147 1608"><i>Note: When Reverser is in center, RHSF &amp; RHSR will show "OFF" in program meter as soon as it is in Forward RHSF will be "ON" &amp; RHSR will be "OFF". If reverse is kept in Reverse, then "RHSF will be "OFF" and RHSR will show "ON".</i></p>
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### 5.1.15 Simultaneously Power/DB Request

Items to be checked	Action to be taken by Loco Pilot
Check for crew message – No load simultaneous Power/DB request.	Check throttle position in EM 2000. It should show Idle whenever throttle is kept in Idle. If it is not so, operate the throttle in both the control stands and see that throttle position comes to idle. If it does not set take throttle in DB zone and again bring to Idle. Check throttle position on both the consoles In Idle.

### 5.1.16 Head light not working

Items to be checked	Action to be taken by Loco Pilot
Check for working of both the bulbs.	If one bulb is fused. INFORM SHED and work If both the bulbs are not glowing in Long hood side, check the tightness of 823C, 823D plugs in ECC3. If both the bulbs on Short hood side are not working, check for any loose cable connection in head light dim resistance inside ECC1 top right corner.

### 5.1.17 Flasher light not working

Check for flasher light switch position. It should be ON. Also all the breakers in breaker panel should be ON	If the breakers are ON, and problem persists, Swap DIO 1 & 3 and check for the entire flasher switches in 'ON' position In both the control stands. Check for flasher working by applying emergency brake. If flashers are working, start train.
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### 5.1.18 Flasher light working continuously

Check for the flasher switch position in both the control stands.	If they are in ON position, put OFF the switches. If the switches are in OFF & problem persists, Swap DIO3 with 1
Check for PCS knocked out.	Recover PCS


### 5.1.19 White smoke in exhaust

Check lube oil level.	If lube oil level is increased, consult shed.
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## 5.1.20 Water level reducing

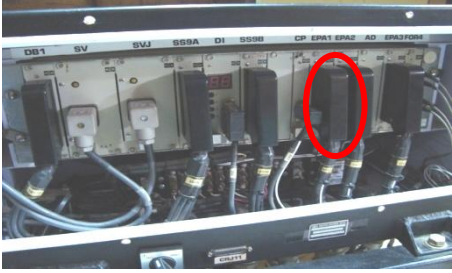


Check for any external leakages.	Open Pressure relief valve by pulling the handle and tie it. Clear the section and consult shed.
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## 5.1.21 Air brake system problems

Items to be checked	Action to be taken by Loco Pilot
Crew Message-Communication link failure MAB.	Recycle micro air brake & Computer control breakers. Check for tightness of COM card of EM2000
	
	Check for tightness of CPZ card in CCB system Check for tightness of VCU connectors and CRJ Connector.
Air brake failure-use loco in LEAD only.	INFORM SHED and work further.
Air brake failure - use loco in TRAIL only	Check for availability of MR pressure. If available, recycle micro air brake and computer control breakers-Conduct air brake self-test. If MR pressure is not available, consult shed.

### Mismanagement By Crew

On 12.04.2017, Train no 18519 Exp suffered 65” detention (late start) at BZA since nominated (as per link) / outgoing loco 12762 WDG4/KYN could not be made EOT due to airbrake fault and 40150 WDP4D/GY incoming loco of 17226 worked the train as relief. Loco no.12762 WDG4/KYN arrived BZA as dead from KZJ with leading loco 13413+14021 KZJ working 18520 Exp. On arrival at BZA with Locos detached and given shunt movement to attach 12762 WDG4/KYN on 18519 exp but while reversing & energising 12762, Air brake failure triggered with BCEQ control failure due to improper procedure (failed to ensure complete closure of BCEQ COC). This failure / detention could have been avoided had the Shunter, LP & ALP adopted proper sequence of procedure to energise/crank 12762 engine, as it has come dead with train 18520 Exp from KZJ.

<p>Air brake fault – BP control failure. (Fault code starting with “6” in CCB1.5)</p>	<p>Check for tightness of EPA1 front connector and conduct air brake self-test.</p> 
<p>Air brake fault – BC control failure. (Fault code starting with “8” in CCB 1.5)</p>	<p>Check for tightness of EPA2 front connector and conduct air brake self-test.</p> 
<p>Air brake fault –BC equalizing control failure. (Fault code starting with “7” in CCB1.5)</p>	<p>Check for tightness of EPA3 front connector and conduct Air Brake Self-Test. Check for tightness of BC equalizing valve connector.</p> 
<p>No blended brake – Lock out.</p>	<p>Conduct blended brake Self-test. Even if it does not pass, work further and INFORM SHED.</p>
<p>Loco Brake not releasing</p>	<p>Conduct Air Brake self-test</p>



### Mismanagement By Crew

On 11.01.17 Loco No. 40150/WDP4D/GY Train No. 12765 Exp failed causing detention of 105 min due to Air brake failure with fault code 65. As LP didn't correctly trouble shooted in time. Further the trouble was rectified by following the correct procedure of trouble shooting i.e

- Switch OFF Computer Control breaker.
- Switch OFF Micro Air breaker (MAB)
- Close the MR2 System COC.
- Open the MR2 J filter Drain COC after completely venting out the air pressure.
- Close the MR2 J filter Drain COC.
- Open the MR2 System COC.
- Switch ON the Micro Air breaker.
- Switch ON Computer control breaker. Conduct Air Brake Self Test

### 5.1.22 PCS Knocking off

Items to be checked	Action to be taken by Loco Pilot
L/T switch may be in wrong position.	Check position
Console, Auto brake and Direct brake, Reverser & throttle may not be in correct position	Put them in correct position


### Mismanagement By Crew

On 27.03.15, LocoNo. 40117/WDP4D/GY/SCR of Train No. 12086 detained for 10 min., late start because while EOT LP/Shtg., opened and closed the BP Angle cock without keeping the L/T switch in TEST resulting in CCB fault code 6A with air brake failure. Hence always keep L/T switch in TEST mode while EOT before opening BP angle cock of locomotive with formation to avoid emergency and subsequent air brake failure.

### Mismanagement By Crew




On 19.12.16, LP of Train no JCL goods ( 59/4716T) working with Loco No. 12304+12257 WDG4/GY stalled in SCP-UPW section (HYB div) on 1 in 133 rising gradient due to trailing loco 12304 was not responding. Train cleared block section with relief loco after 95" detention. It was checked and found that trailing loco 12304 GFCB was at off position. The detention of the train caused indirect punctuality loss of train no. 19714 Exp, 17405 Exp & 12720 Exp. This stalling / detention could have been avoided had the LP & ALP checked locos thoroughly before starting at NZB.

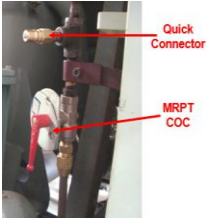

### 5.1.23 MR Pressure dropping on Run

Items to be checked	Action to be taken by Loco Pilot
<p>Check for any external leakage</p>	<p>Check for air leakages from FP,BP,BC, Auto Blow down valve, Air Dryer, Radar Blow, Sanders, compressor pipes joints and Cooling coils. After attending ensure engine RPM coming to idle (During air leakages, engine RPM will increase due to AIR Compressor operation)</p>
<p>Check for unusual sound from compressor valves</p> 	<ol style="list-style-type: none"> <li>1. Check for correct compressor oil level if found less than low mark shut down the Engine and inform shed.</li> <li>2. If any unusual sound from LP and HP cylinder, inter coolers and safety valve or any air leakage inform shed to inform whether to continue working or not.</li> </ol>
<p>Improper loading and unloading of air compressor</p>	<ol style="list-style-type: none"> <li>1. Close MR1 System COC and drain out the trapped moisture from MR1 J filter drain COC when MR safety valve starts blowing keep MR1 System COC to normal open condition.</li> <li>2. Close MRPT COC and drain trapped moisture by pressing the spring loaded MRPT quick connector stem, ensure increase in ENG RPM with blowing of MR safety valve and then open MRPT COC</li> <li>3. If the trouble still continues close MRPT COC and clear section take advise from shed for further movement.</li> <li>4. Recycle computer control circuit breaker then trouble will set right.</li> <li>5. MVCC struck up, improper loading press and release the 'T' handle on the MVCC unit.</li> </ol>

#### Mismanagement By Crew

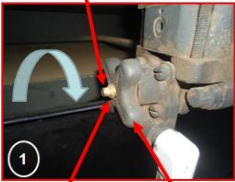


On 28.09.16, Shunting LP of Train no 17652 Exp, made EOT with Loco No. 40239 WDP4D/GY and handed over charge to outgoing LP without ensuring the availability of sand in loco sand boxes and spare bags in loco cab, thus train detained / late start of 30" from originating station "KCG" (HYB div) for loading of sand. Due to the detention train had lost punctuality. This train detention could have been avoided had the Shunting LP ensured loading of sand in loco before EOT or immediately on EOT at KCG station.

<p>BP dropping and PCS knocking out</p>	<ol style="list-style-type: none"> <li>1. Check AIR FLOW indication for needle shooting</li> <li>2. Check the leakages on the formation and arrest the same</li> <li>3. Check for any air leakage from both consoles. This may be due to stuck up Auto brake or D1 Emergency valves.</li> <li>4. If Auto brake Emergency valve is stuck up in open position, throw Auto brake handle to emergency sharply 2 or 3 times and then bring to Run position to RESET.</li> <li>5. If Auto brake emergency valve air leakage continues, Dummy the air passage with dummy cap of BC equalizing pipe.</li> </ol>  <ol style="list-style-type: none"> <li>6. Check if AEB circuit breaker input ON</li> </ol>
<p>Check for normal operation of air dryer.</p> 	<p>If it is continuously purging – Put OFF air dryer breaker and work further -INFORM SHED.</p> <p>even after putting OFF Air Dryer breaker also, it is continuously purging, shutdown the loco.</p> <p>Drain MR1 and plug the defective purge valve using a coin and then re- crank the loco. don't switch ON the Air dryer breaker.</p>
<p>Check ABD valve working continuously.</p>	<p>Turn to Manual side in such a manner that the stem should be totally IN (Stem should Not be projected)</p> 
<p>Any sanders working continuously</p>	<p>Close MR1 System COC and drain out trapped pressure through MR1 J filter drain COC. Open MR1 System COC and work further.</p>

<p>Pneumatic pipe connecting MRPT in compressor compartment may be clogged with moisture.</p>	<p>Close the MRPT cut out cock and drain the moisture from quick connector. After draining out open the cut out cock.</p> 
<p>Any horns working continuously</p>	<p>Close MR1 system cut out cock and drain out trapped pressure through MR1 J filter drain coc. Open MR1 cut out cock and work further.</p> 
<p>Air brake failure with crew message 'Air brake failure use locomotive in TRAIL only'</p>	<ol style="list-style-type: none"> <li>1. Recycle MAB (MICRO AIR BRAKE ) as per recycling procedure</li> <li>2. Conduct Air Brake self-test</li> <li>3. If problem still continues Inform Shed</li> </ol>

### Mismanagement By Crew

On 25.02.17 Train No. 11303 detained for 60 Min at HYB station due to air pressure leakage from ABD valve. LP unable to close/Change the ABD valve into Manual mode to arrest the leakage.

<p>1. Auto Mode</p>  <p>Stem COC</p>	<p>To convert <b>AUTO MODE</b> to <b>MANUAL MODE</b> Turn the COC in Clock wise direction till the stem should go totally Inside as shown in No. 3</p>	<p>2. Drain Mode</p> 	<p>3. Manual Mode</p> 
<p>In between <b>Auto Mode</b> and <b>Manual Mode</b> there is a <b>Drain Mode</b> which has to drain when ever time permits as shown in No. 2</p>			

## 5.2 TROUBLE SHOOTING FOR FREQUENTLY OCCURRING MESSAGES

### EARTH FAULT

#### 5.2.1 EARTH FAULT DURING MOTORING

Indication	Action by the crew
1. Alarm 2. TE Meter drops to Zero 3. Message on Display “Ground Relay Power” Reset	Stop the train and secure control stand (TH - Idle, ER and GF – Off, RH - Center, Isolation switch - Isolate) Press Reset key (F3) to reset. Tripping permitted for Reset EMD - 3 per 10 minutes and Medha - 3 per one hour
If more than three experienced further the fault cannot be reset. Display shows “Ground Relay Power” Lock Out.	In EMD Loco - Isolate the defective truck In Medha Loco - Isolate the defective TM.

#### 5.2.2 EARTH FAULT DURING DYNAMIC BRAKE

1. Alarm 2. TE Meter drops to Zero 3. Message on Display “Ground Relay Dynamic Brake” Reset	Stop the train and secure control stand (TH - Idle, ER and GF – Off, RH - Center, Isolation switch - Isolate) Press Reset key (F3) to reset. Trippings permitted for Reset EMD - 3 per 10 minutes and Medha - 3 per one hour
If more than three experienced further the fault cannot be reset. Display shows “Ground Relay Dynamic Brake” Lock Out.	Cut out DB through the DB Slider Switch to CUTOFF position in the ECP.

#### Mismanagement By Crew

On 28.02.2017 Shunting LP of Train no. 17410 Exp while reversing /making EOT at NED with loco No. 40192/WDP4D/GY failed to ensure proper changing of control consoles / cab of loco, resulted in non-creation of BP pressure from lead cab & asked for Relief loco. CLI/NED checked loco and rectified by adopting proper procedure. This has resulted 50” late start of train at NED.

This failure / late start could have been avoided had the Shunting LP followed correct procedure to change the control console / cab.

## CROW BAR

TYPE	EMD	MEDHA
<b>5.2.3 Soft Crow Bar in EMD or Brake Chopper in Medha</b>	No indication. System corrects automatically.	No indication. System corrects automatically. If system unable to correct within 12 seconds system displays message. Remedy - <i>Bring TH to Idle and RH to center.</i>
<b>5.2.4 Hard Crow Bar</b>	Indication Alarm TE Meter drops to zero Message in the Display No Load <i>Crow Bar – TCC1</i> Remedy - <i>TCC Recycling</i>	Indication Alarm TE Meter drops to zero Message in the Display No Load <i>Crow Bar – TC1</i> Remedy - <i>Shut down and re-crank the loco</i>

### 5.2.5 MESSAGE: NO LOAD -- NO COMPANION ALTERNATOR OUTPUT CHECK AUX-GEN FIELD BREAKER. (or) NO AUX-GEN OUT PUT - CHECK AUX-GEN FIELD BREAKER

- Keep Throttle in ----- Idle
- Keep Reverser Handle----- neutral
- Keep Isolation switch ----- Isolation
- Put OFF Computer Control breaker
- Put OFF AUX-GEN FB breaker
- Wait for 20 sec then put ON the breakers in reverse order, keep Isolation Switch on RUN and Auto Brake in FS for 10 sec then bring it to RUN

### 5.2.6 MESSAGE: AUXLLIARY GENERATOR FAILURE

- Keep Throttle in ----- Idle
- Keep Reverser Handle----- neutral
- Put off ER and GF
- Keep Isolation switch ----- Isolation
- Put ON AUX-GEN FB breaker if tripped
- Put ON AUX-GEN FLD breaker if tripped
- Put ON AUX-GEN breaker in ECC-2 if tripped
- Check Auxiliary Generator drive shaft broken
- If non of the above observed
- Put OFF Computer Control breaker



- Put OFF AUX-GEN FLD breaker
- Put OFF AUX-GEN FB breaker
- Wait for 20 sec then put ON the breakers in reverse order, keep Isolation Switch on RUN and A9 in FS for 10 sec then bring it to RUN

### **5.2.7 MESSAGE: NO LOAD TCC#1 COMMUNICATION LINK FAILURE (or) NO LOAD TCC#2 COMMUNICATION LINK FAILURE**

- Keep Throttle in ----- Idle
- Keep Reverser Handle----- neutral
- Put off ER and GF
- Keep Isolation switch ----- Isolation
- Put OFF Computer Control breaker
- Put OFF TCC#1 AND TCC#2 breaker
- Put OFF ACGTO-1 and ACGTO-2 breaker
- Put OFF Micro Air breaker
- Wait for 20sec then put on made breakers in reverse order, keep ECS run and A9 in FS for 10sec then bring it to RUN.

### **5.2.8 MESSAGE: COMMUNICATION LINK FAILURE-MAB (BP DROPPED TO ZERO)**

#### **Action to be taken**

- Keep Throttle in ----- Idle
- Keep Reverser Handle----- neutral
- Keep Isolation switch ----- Isolation
- Put OFF Computer Control breaker
- Put OFF Micro Air breaker
- Wait for 20sec then put on made breakers in reverse order, keep Isolation switch in run and A9 in FS for 10sec then bring it to RUN .

#### **If Not Succeed**

Check the power coupler of “VCU” (voltage condition unit/Mulcher circuit) available in airbrake rake just above the dead COC if still trouble occurred conduct airbrake self test.

### **5.2.9 MESSAGE: NO-LOAD PCS OPEN AND PENALTY COULD NOT RESET**

- “CRU” unit coupler may be slacked
- Couple properly “CRU” near (voltage condition unit/mulcher circuit) in airbrake rake just above the dead COC.

## 5.2.10 MESSAGE: NO ENGINE START –TURBO PUMP NOT RUNNING RUN PUMP FOR 15MIN TO COOL TURBO

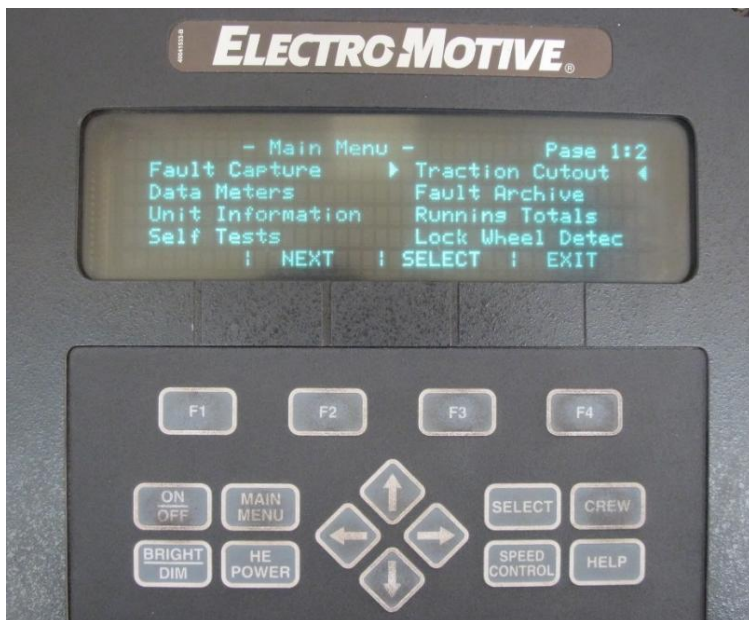
### Action to be taken

- Put OFF Computer Control breaker
- Wait for 20sec
- Put ON Computer Control breaker
- Turbo lube pump will run wait 15MIN then crank the loco

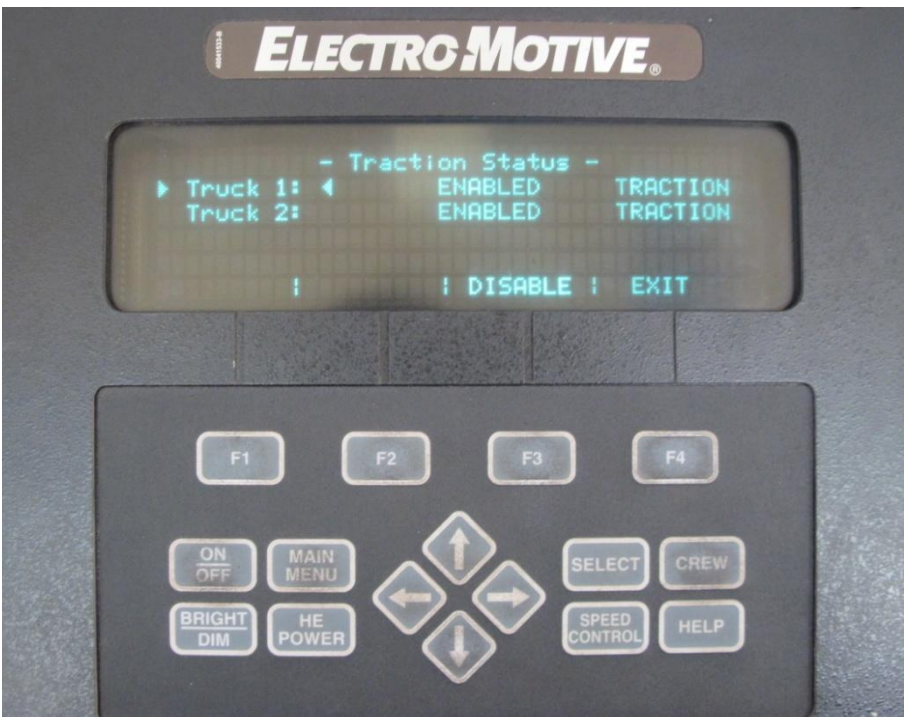
## 5.3 Truck isolation/ TM isolation

- Stop the train
- Check the concerned wheel rotation
- If wheel is rotating suspect speed sensor fault
- Keep Throttle in Idle
- Keep Reverser Handle Center
- Put off Engine Run Switch and GF Slider switch
- Keep Isolation switch in Isolate

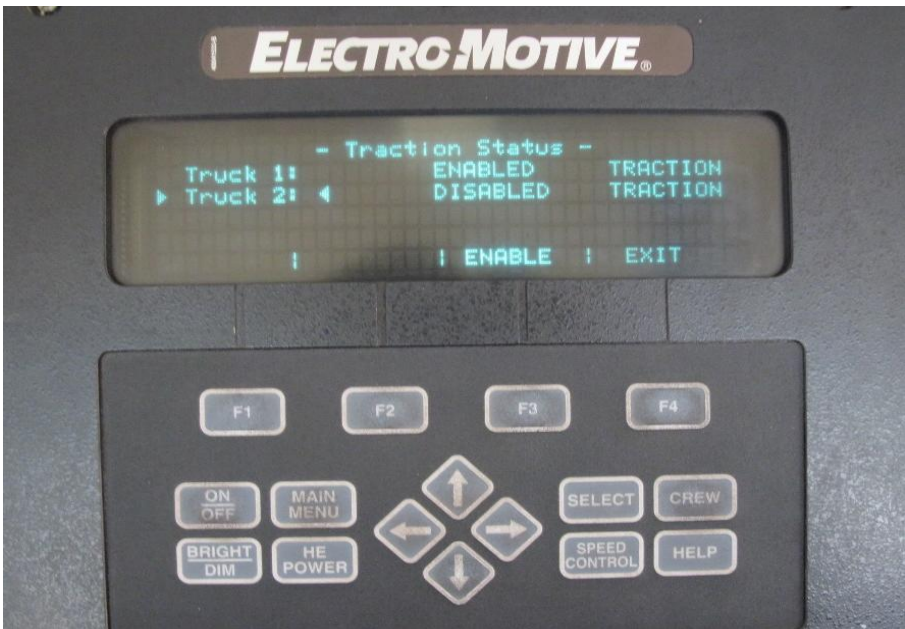
### 5.3.1 EMD LOCOS TRUCK CUT OUT



Press MAIN MENU. Bring cursor to TRACTION CUT OUT and press F3. Fig. 5.1



Bring cursor to required truck to be isolate and press F3 to disable. Fig. 5.2



Required truck is disabled. Press F4 to Exit. Fig. 5.3

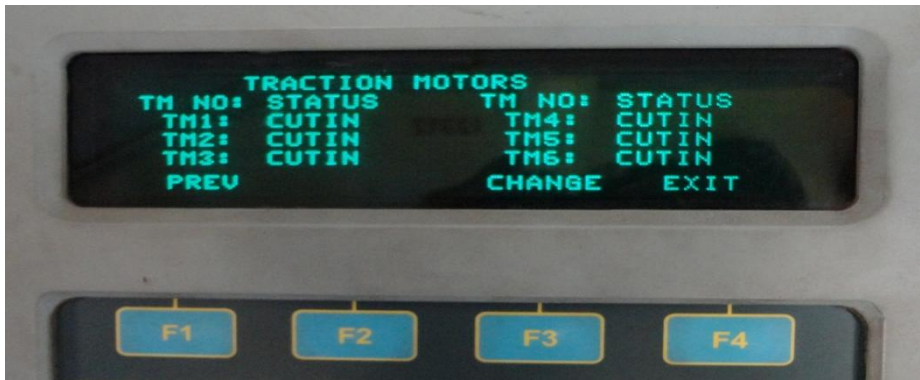
### 5.3.2 MEDHA LOCOS TM CUT OUT



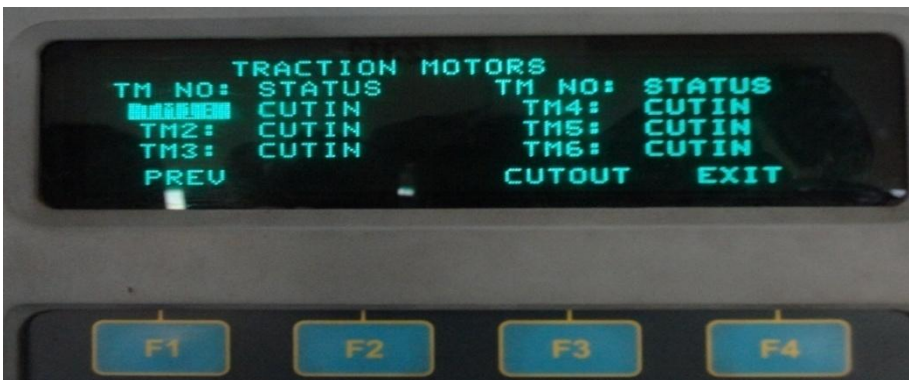
Press MAIN MENU Fig. 5.4



Bring cursor to TM CUT OUT & press F3 or numeric key no.4. Fig. 5.5



Press F3 to change the status of defective TM Fig. 5.6



Bring cursor to defective TM by using arrow keys and press F3 to cut out. Fig. 5.7



Bring cursor to defective TM by using arrow keys and press F3 to cut out. Fig. 5.8

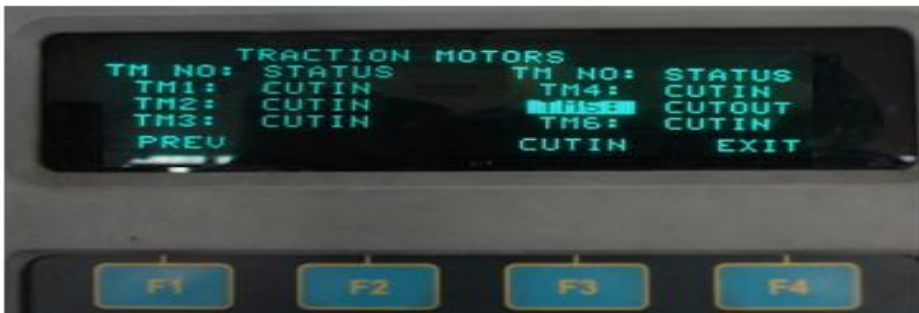




Enter Password **12345** & Press F3 Fig. 5.9



Full fill the TM CUTOUT CONDITIONS & press F3. Fig. 5.10



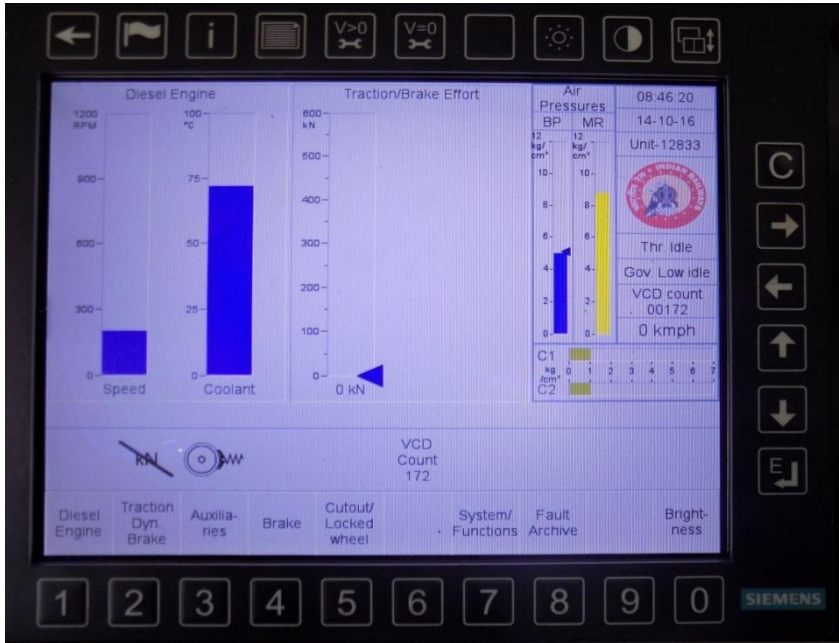
TM status will change from CUT IN to CUT OUT. Press F4 to Exit. Fig. 5.11

**ANOTHER WAY TO ISOLATE A TRACTION MOTOR**

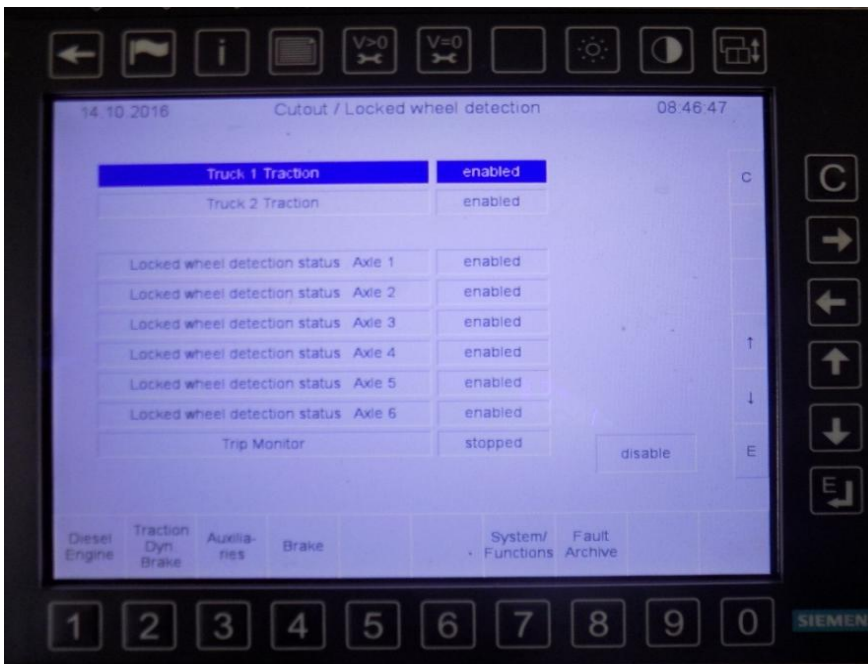
- a) Stop and secure the loco (REV – Center, ER & GF – Off, Isolation switch – Isolate)
- b) Switch off the concerned TC, DCL and TCC Blower Breakers.



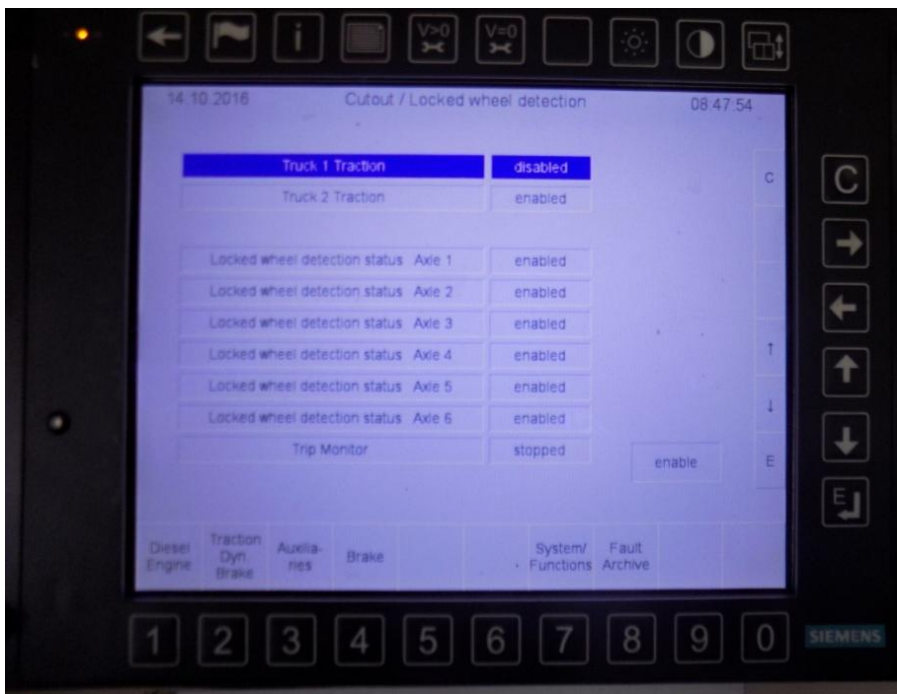
### 5.3.3 SIEMENS SINGLE CAB LOCOS TRUCK CUT OUT



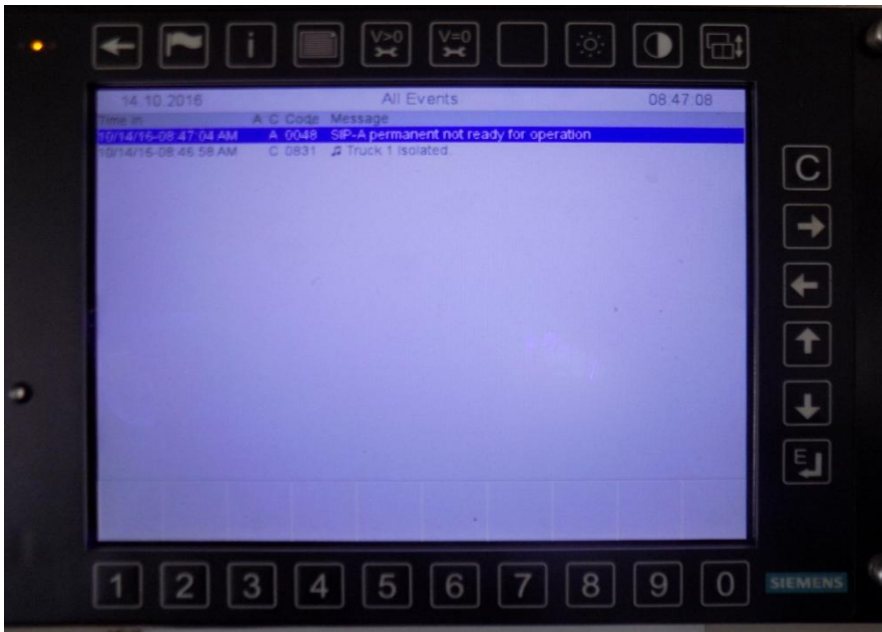
Press key 5 Cut out/Locked Wheel. Fig. 5.12



Select required TRUCK to disable by arrow key. Fig. 5.13



Press Key 'E' (Enter Key) to disable the required truck Fig. 5.14



Crew Message displays Truck isolated. Fig. 5.15

### 5.3.4 WDG 4D DUAL CAB – MEDHA LOCOS – TOUCH SCREEN TM CUT OUT

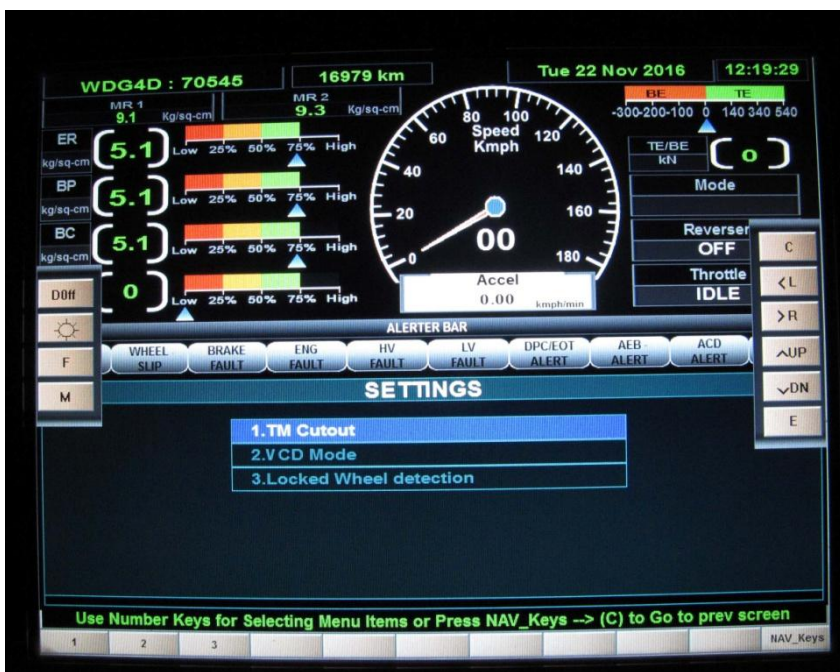


Touch NAV\_Keys. Pop up menu will display at left and right side of the screen. Touch 'M' on the left side pop up menu. Fig. 5.16

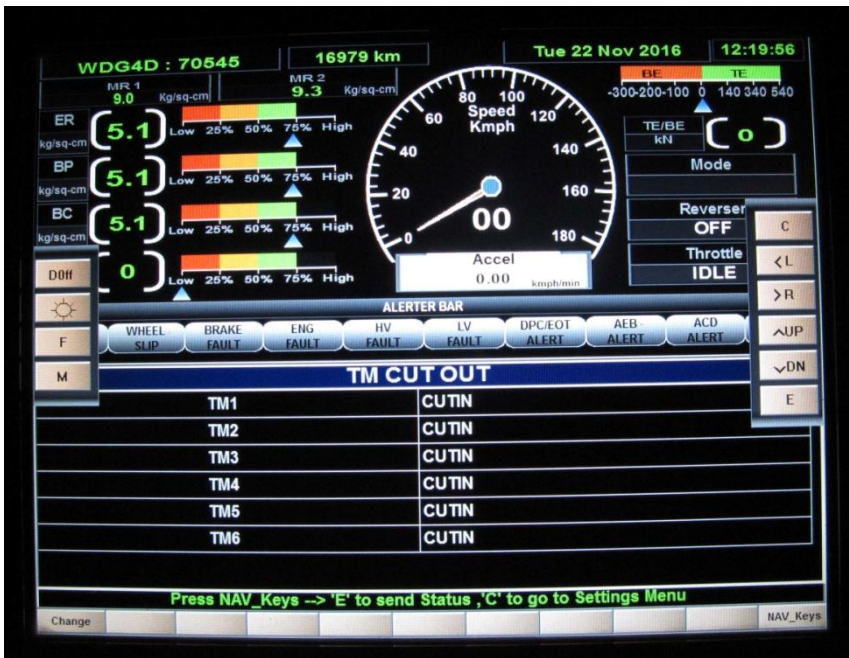


Touch Settings Key Fig. 5.17

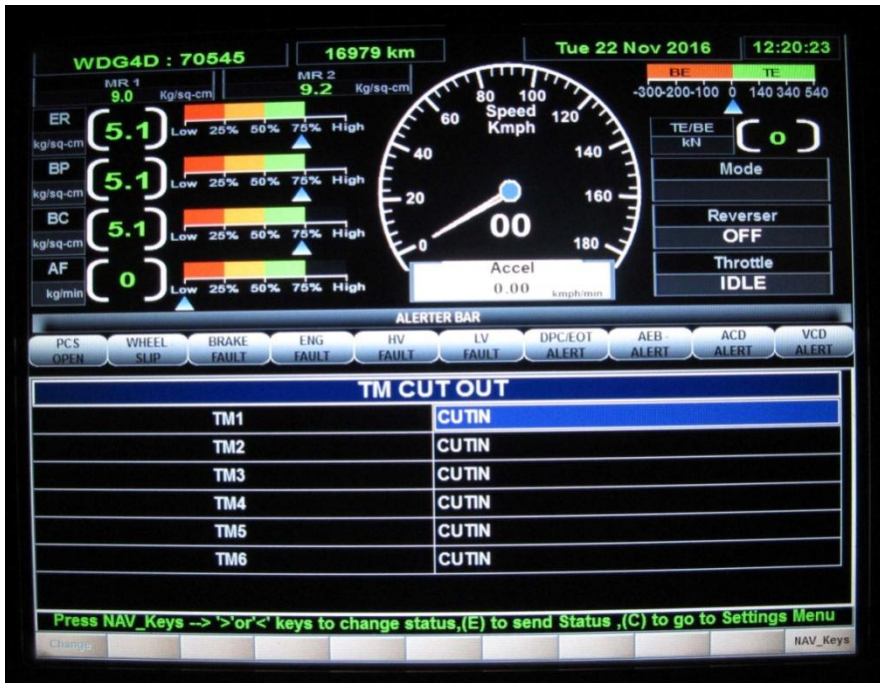




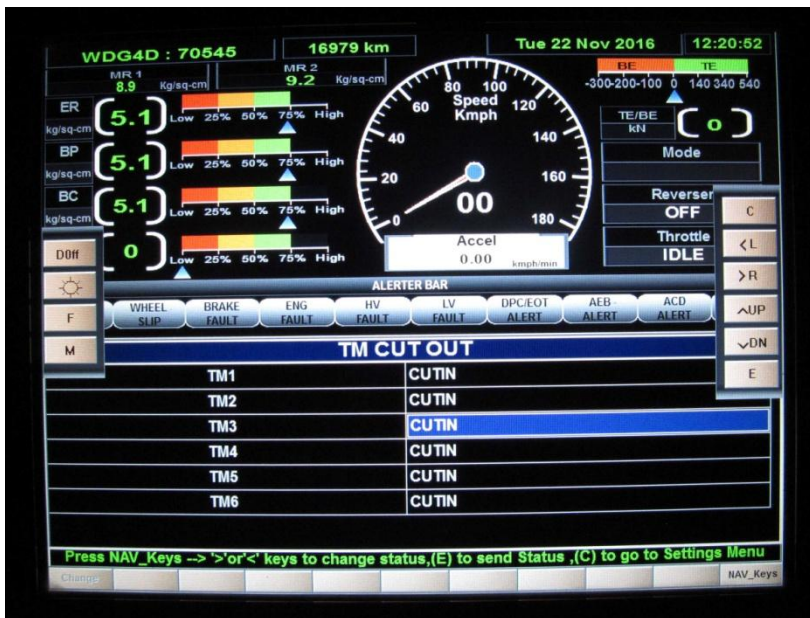
Setting screen will appears. On right side pop up menu touch UP/DN keys to select **TM Cut Out** and Touch 'E' Key or Touch No. '1' Key. Fig. 5.18



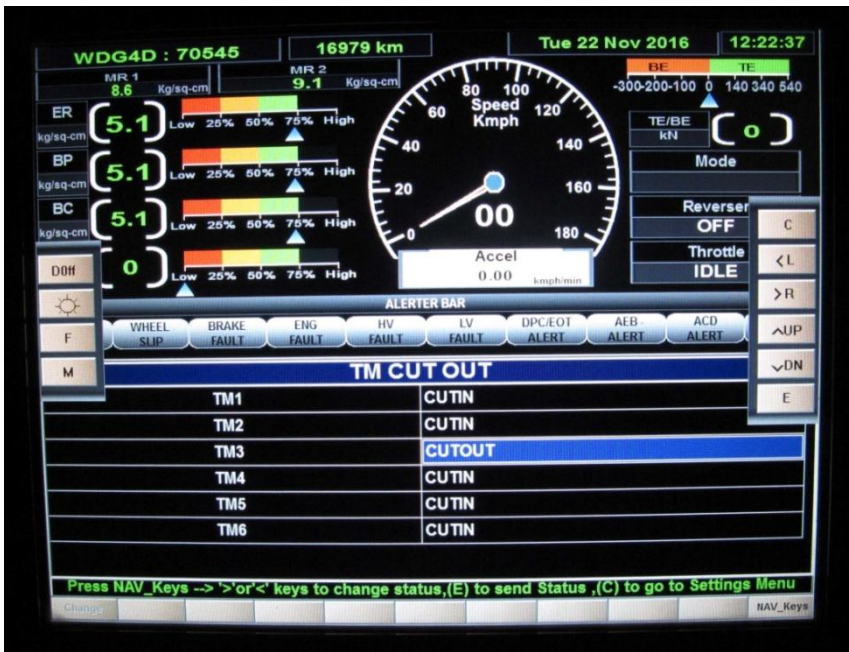
TM Cut Out screen appears. Touch **Change** key. Fig. 5.19



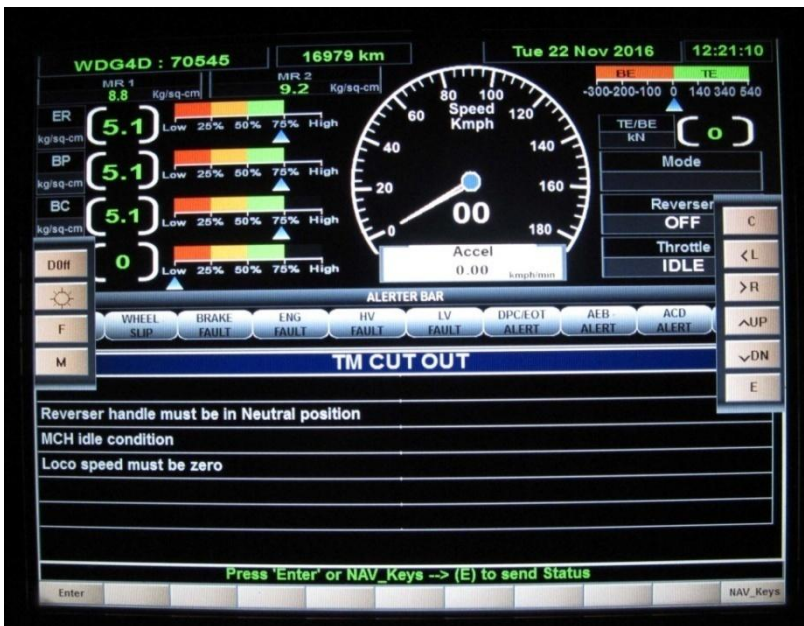
Touch NAV\_Keys. Fig. 5.20



Touch UP/DN keys to select defective TM. Fig. 5.21

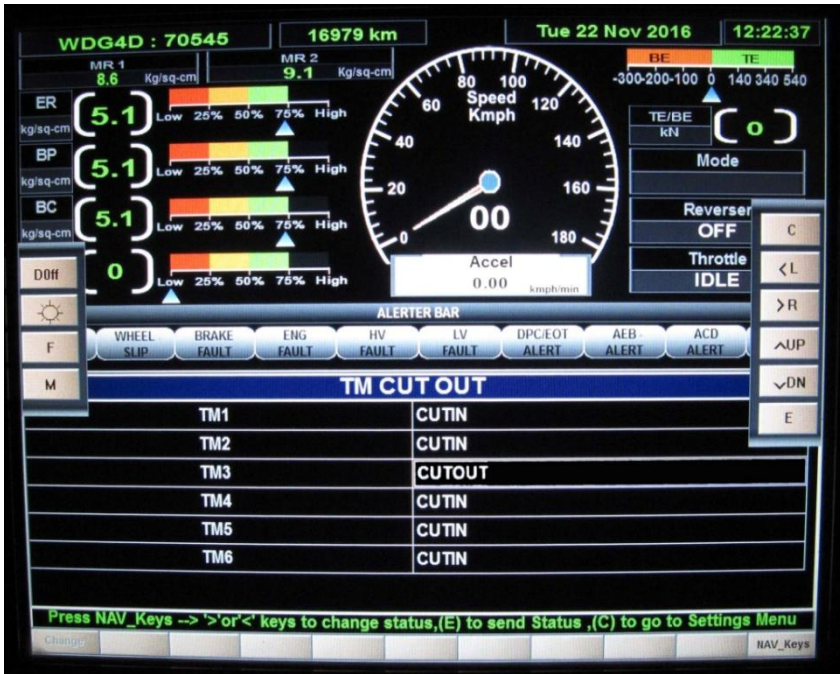


Use <L or >R keys to change the status from CUTIN to CUT OUT and vice-versa. Touch E Key to send status. Fig. 5.22



Full fill the conditions. Touch "Enter" Key or Touch 'E' Key. Fig. 5.23

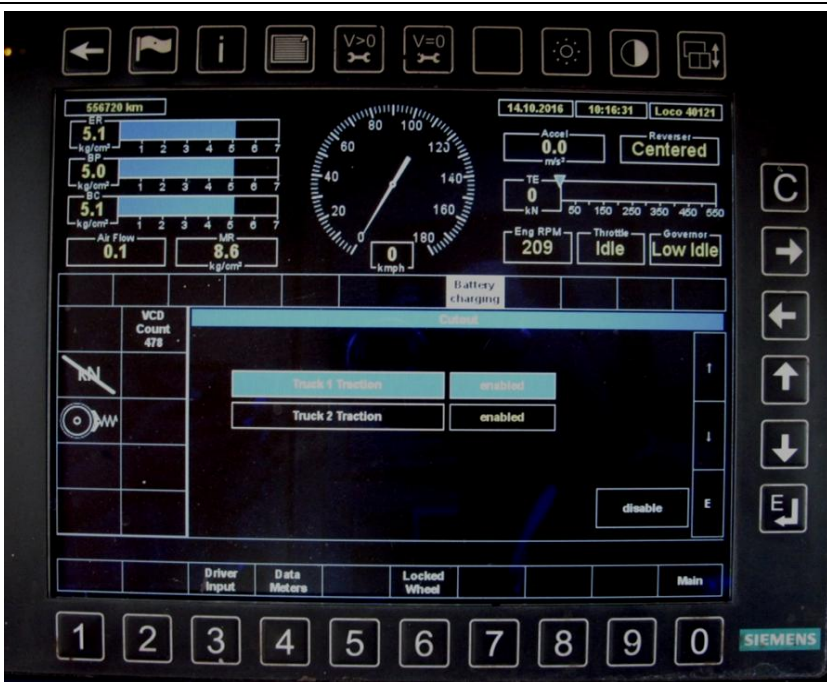




Required TM is CUT OUT. Touch 'C' Key to go Setting Menu. Fig. 5.24  
**5.3.5 DUAL CAB – SIEMENS LOCOS TRUCK CUT OUT**



Press key 5 (Cut out). Fig. 5.25



Select defective truck by arrow keys. Press `E` key to disable the truck. Fig. 5.26



Press numeric key 0 (Main) to go to default screen. Fig. 5.27

## 5.4 TM SPEED SENSOR ISOLATION

- Check the concerned wheel rotation
- If wheel is rotating suspect that speed sensor fault
- Stop the train
- Keep Throttle in Idle
- Keep Reverser Handle Centre
- Put off Engine Run Switch and GF Slider switch
- Keep Isolation switch in Isolate

### 5.4.1 EMD -TM SPEED SENSOR ISOLATION

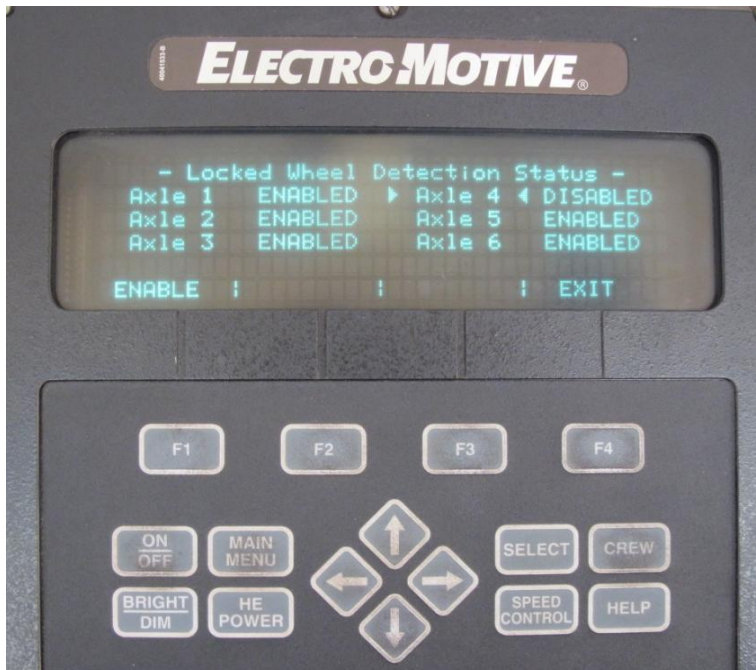


Press MAIN MENU and bring cursor to 'LOCKED WHEEL DETECTION' and press F3 or Press Select Fig. 5.28

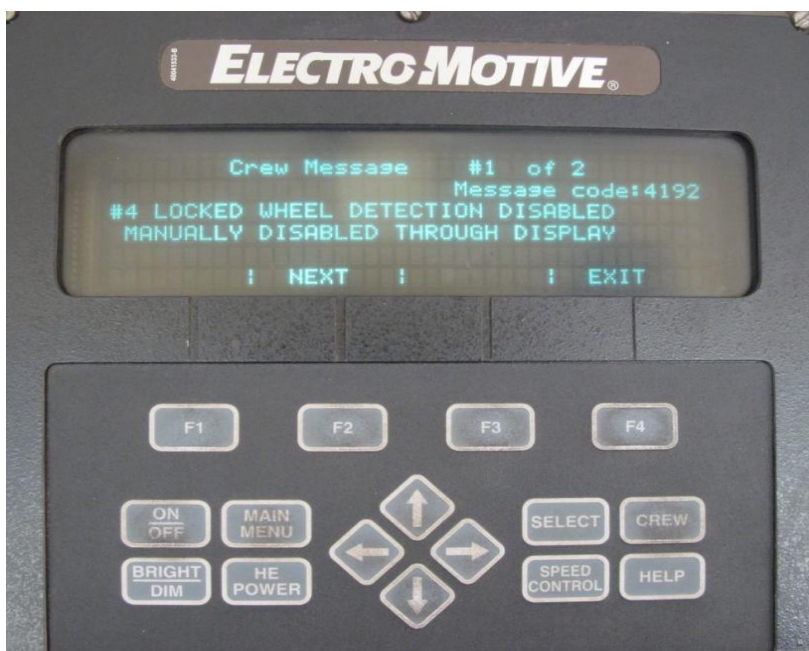




Move cursor by navigation keys to defective sensor axle and press F1. Fig. 5.29



Concerned defective sensor will be disabled. Press F4 to Exit. Fig. 5.30



In crew message, defective speed sensor is disabled message will displayed. Fig. 5.31

**5.4.2 MEDHA -TM SPEED SENSOR ISOLATION**



Press MAIN MENU. Fig. 5.32



Press F2 to go to next page. Fig. 5.33

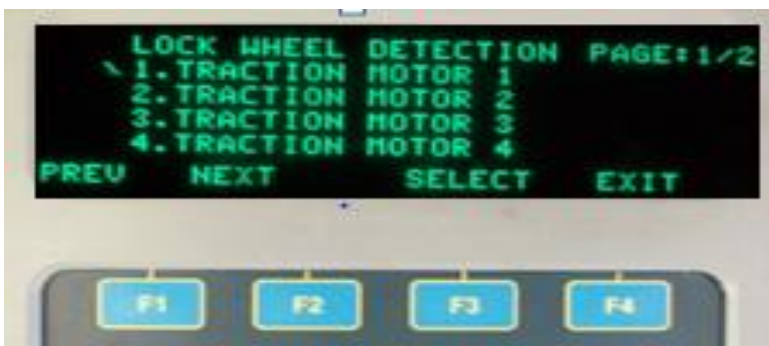


Bring Cursor To Settings and Press F3 or press Numeric Key 6 Fig. 5.34



Bring cursor to 1 and press F3 or numeric key 1. Fig. 5.35



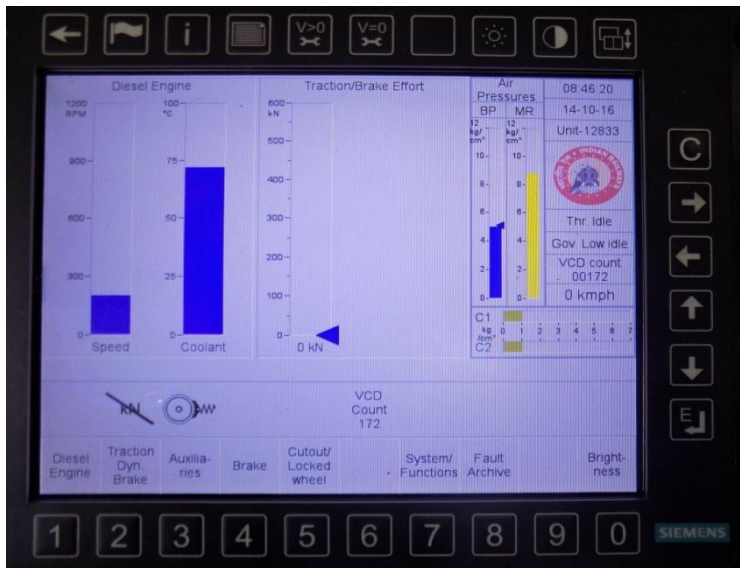


Bring cursor at the defective TM sensor and press F3 for TM 5 & 6 go to next page Fig. 5.36

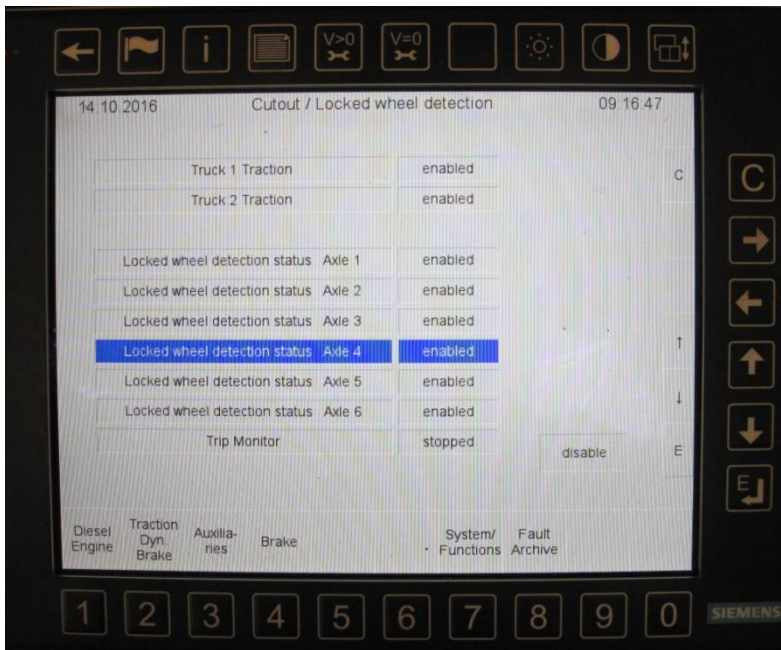


Locked wheel detection status is enabled. Press F4 to EXIT. Fig. 5.37

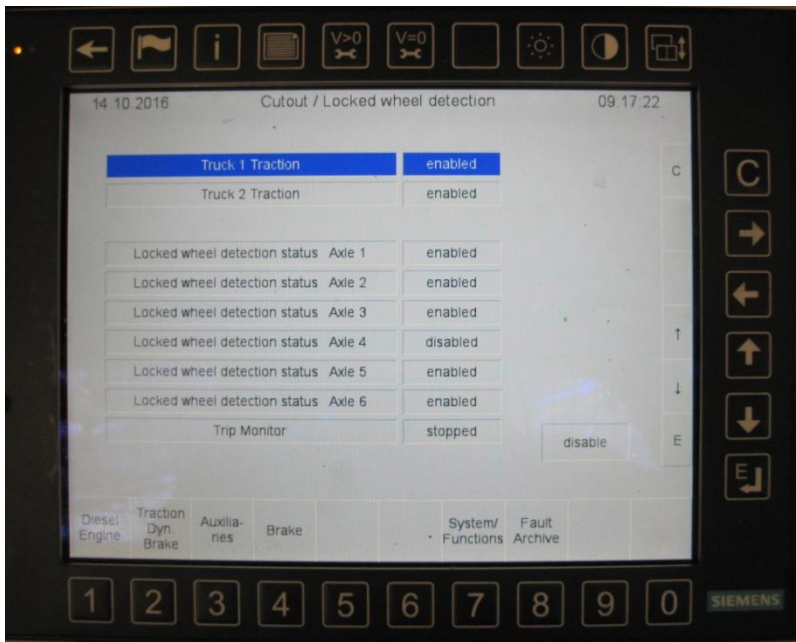
**5.4.3 SIEMENS -TM SPEED SENSOR ISOLATION**



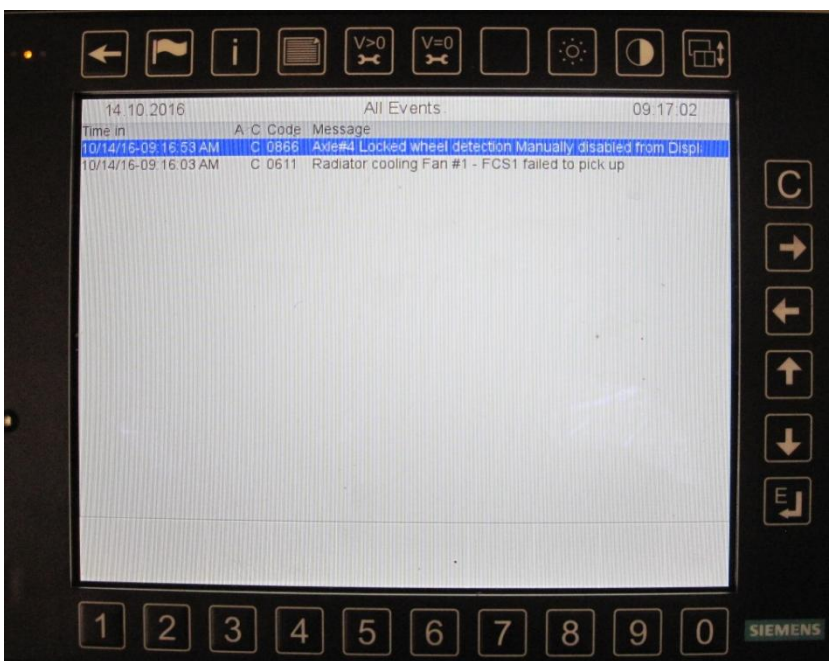
Press key 5 Cut out/Locked Wheel. Fig. 5.38



Bring the cursor by UP/DN keys to the required defective Axle speed sensor. Press 'E' key to disable it. Fig. 5.39

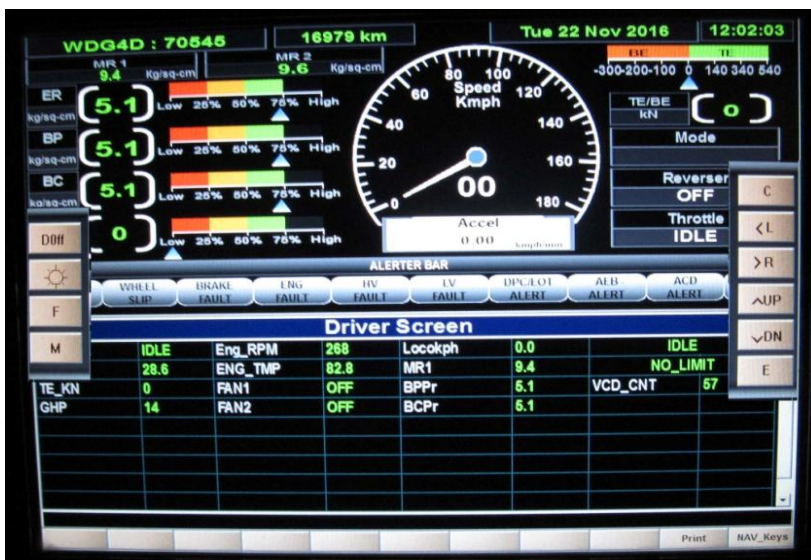


Required Axle speed sensor is disabled. Fig. 5.40



Message will display in crew messages that “Axle# Locked wheel detection manually disabled from display”. Fig. 5.41

#### 5.4.4 TM SPEED SENSOR ISOLATION – WDG4D – MEDHA Touch Screen

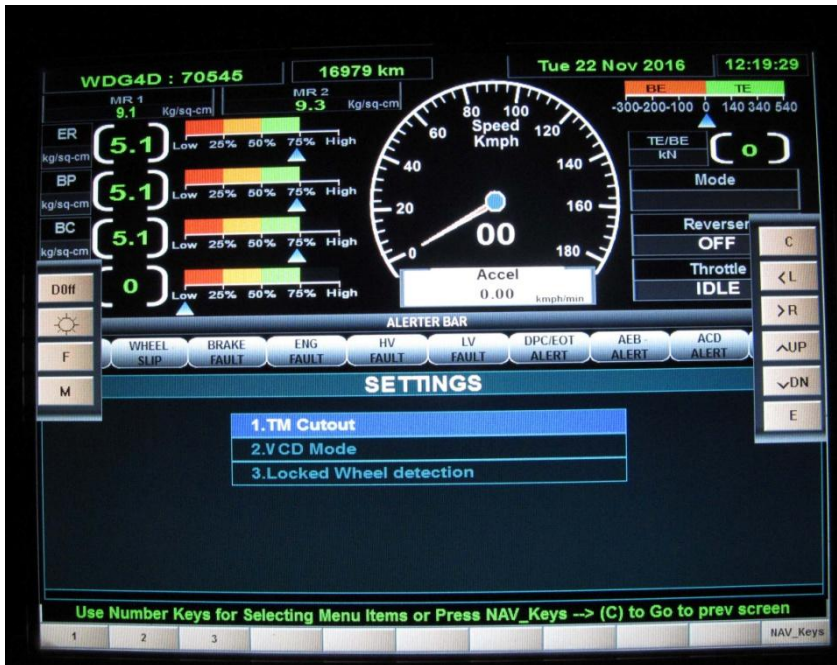


Touch NAV\_Keys. Pop up menu will display at left and right side of the screen. Touch ‘M’ on the left side pop up menu. Fig. 5.42





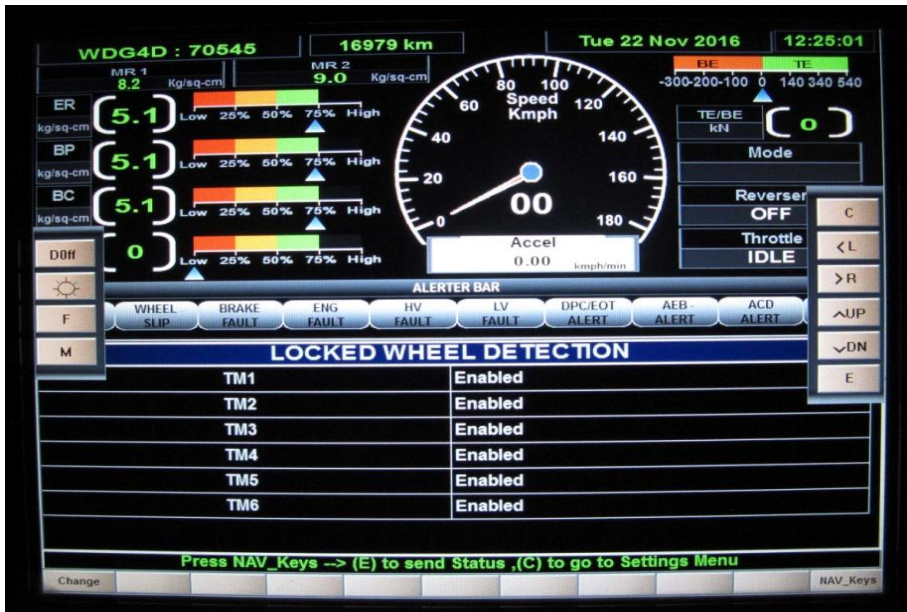
Touch Settings Key. Fig. 5.43



Setting screen will appears. Fig. 5.44

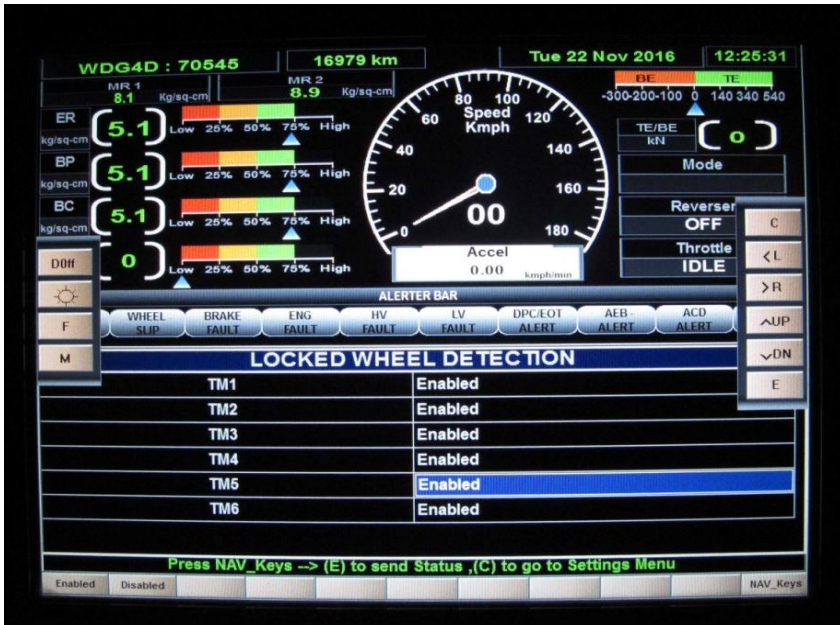


On right side pop up menu touch UP/DN keys to select **Locked Wheel detection** and Touch 'E' Key or Touch No. '3' Key. Fig. 5.45

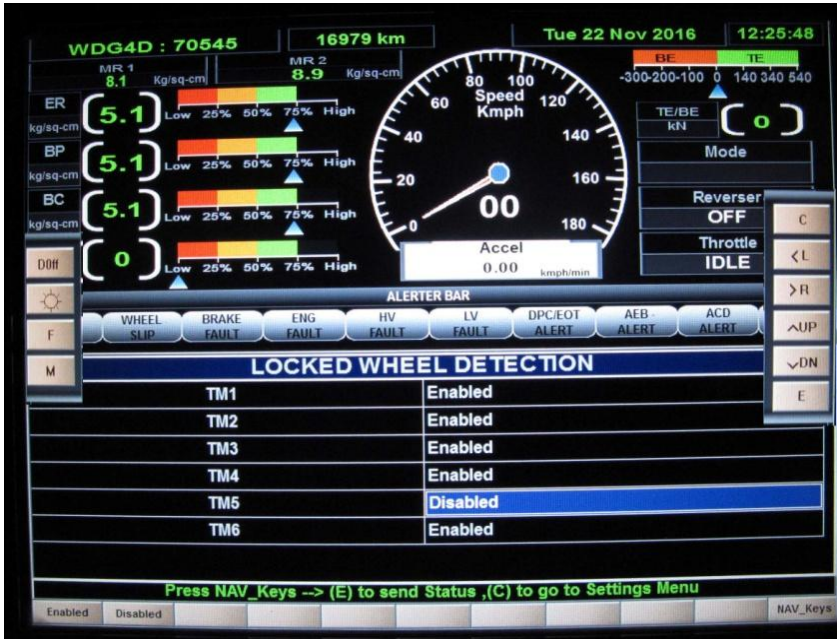


Touch **Change** key. Fig. 5.46





Touch UP/DN keys to select the defective Speed Sensor. Fig. 5.47



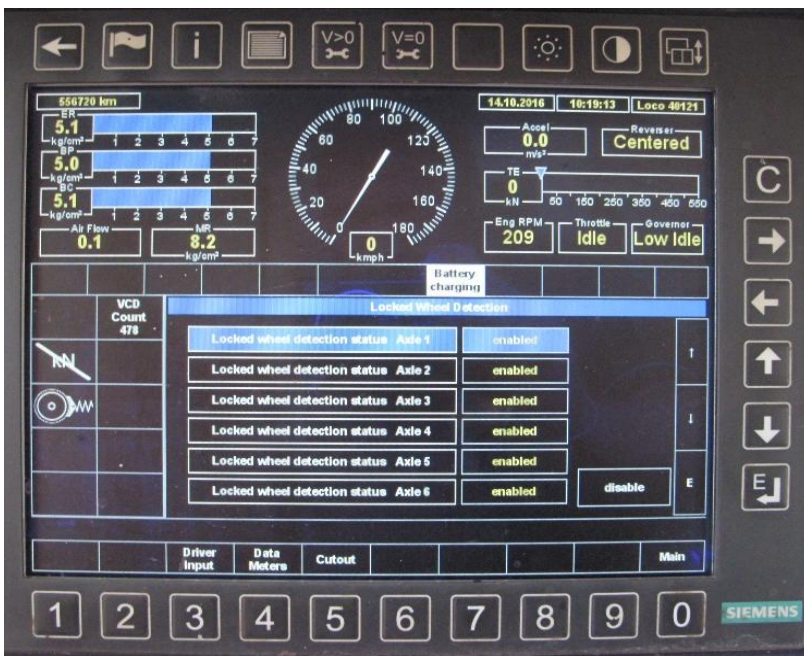
Touch Disabled key to change the status and Touch 'E' Key to save the status and Touch 'C' key to goto setting menu. Fig. 5.48



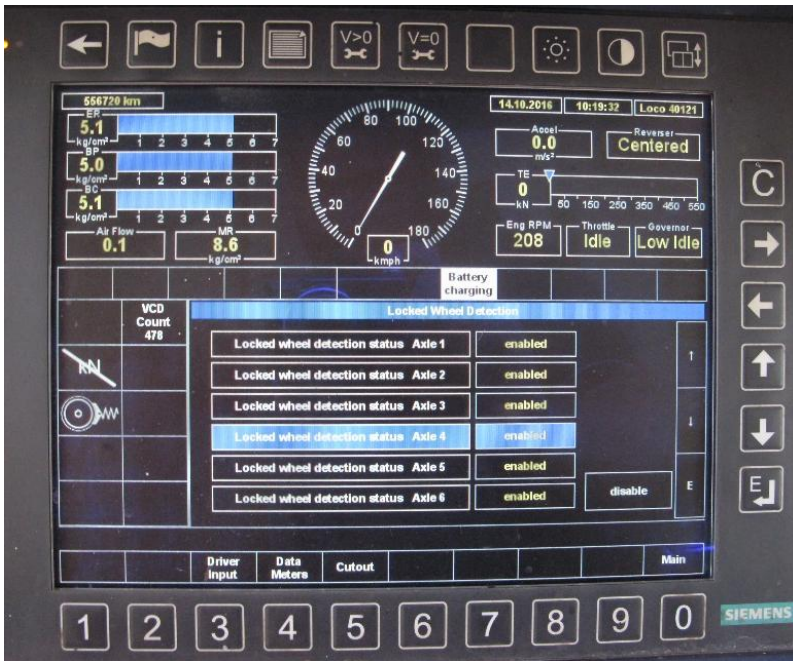
## 5.4.5 TM SPEED SENSOR ISOLATION – SIEMENS - WDP4D



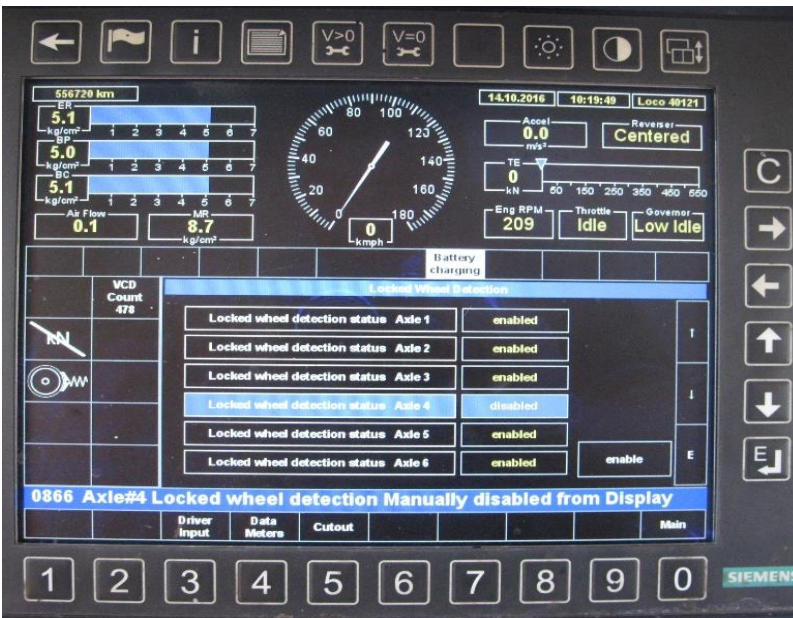
Press key 6 to go to locked wheel status. Fig. 5.49



Select defective Axle Speed Sensor by Arrow Keys. Fig. 5.50



Press 'E' key to disable the defective TM speed sensor. Fig. 5.51



Crew message: 'Axle# Locked Wheel detection manually disabled from Display'. Press '0' to go to Main Menu. Fig. 5.52

# Chapter No. 6.0

## Faults Messages



## 6.1 EMD LOCOMOTIVE FAULT CODE AND REMEDIAL ACTIONS

**Note:** Before opening any ECC cabin ensure that isolation switch in isolate, TH in idle, RH in neutral and MGVS is below 20 volts (open power data in data meters and check)

FC	Fault Message	Remedial Action
1	FP RLY FAILED TO DROP OUT	No problem, this message will log in all locos during cranking. Can be ignored
14	ENGINE AIR FILTERS ARE DIRTY - CHANGEOUT REQUIRED, POWER MAY BE LIMITED TO THR 6	This may be due to defective DIO card. Replace DIO;2 with DIO;3 and check. Switch off EM2000 breaker before card removal.
15	#1 LOCKED WHEEL OR SPEED SENSOR FAULT STOP TRAIN AND VERIFY THAT AXLE ROTATES	Disable the speed sensor ensuring there is no physical locked axle. Remove the sensor coupler from the motor.
16	#2 LOCKED WHEEL OR SPEED SENSOR FAULT STOP TRAIN AND VERIFY THAT AXLE ROTATES	Disable the speed sensor ensuring there is no physical locked axle. Remove the sensor coupler from the motor.
17	LOSS OF TRAIN LINE PRESSURE, EMERGENCY - PLACE HANDLE IN EMERGENCY FOR 60 SEC	Crew message to recreate BP. Keep A9 handle for 60 sec and release. Check BP creating.
61	GROUND RELAY - DYNAMIC BRAKE, LOAD TEST	Avoid dynamic brake. Check any foreign body struck to the grids
149	TRAIN LINE ALARM	Check any fault is active in crew message. If no message and loco working normal. Recycle computer control breaker.
151	#1 MOTOR SPEED SENSOR DISABLED FOR LOCKED WHEEL DETECTION	Indicative message that speed sensor already disabled. No problem in loco working
152	#2 MOTOR SPEED SENSOR DISABLED FOR LOCKED WHEEL DETECTION	Indicative message that speed sensor is already disabled. No problem in loco working
157	#1 MOTOR SPEED SENSOR ENABLED FOR LOCKED WHEEL DETECTION	Indicative message. No problem
158	#2 MOTOR SPEED SENSOR ENABLED FOR LOCKED WHEEL DETECTION	Indicative message. No problem

FC	Fault Message	Remedial Action
228	NO LOAD - SIMULTANEOUS FORWARD/REVERSE REQUEST	This fault will log normally in MU operation with both loco having RH handles. If happen in single loco check master controller in non working stand is thrown to any direction or struck up. If loco working in SH direction open LH console cover near foot step and locate 43A terminal board. In this, in L6 location wire no 9T5 remove and work further. If working LH side, remove wire no 8T5 from TB 43A-L5 location.
321	ARCHIVE RESET	The fault memory in EM2000 is reset by shed, no problem
322	NO LOAD - DC LINK OVERCURRENT	Mostly come when some other TCC faults logged, reset automatically.
324	DC LINK OVERVOLTAGE	Mostly logged when some other TCC faults logged or speed sensor or temp sensor fault etc, reset automatically.
331	ENGINE AIR FILTERS DIRTY	This may be due to defective DIO card. Replace DIO;2 with DIO;3 and check. Switch off EM2000 breaker before card removal.
359	GROUND RELAY POWER	This will automatically reset when voltage came below 20. If continues 3 times GR will lock out. Disable truck 1 and check. If coming disable truck 2...still coming, conduct Excitation test and load test from self test menu. Check water leakages inside TA room in IPR resistance or TA cables rubbing with body or chocked in water.
361	ENGINE PROTECTION SHUTDOWN - LOW OIL PRESSURE	Check LLOB tripped in governor. If so reset and crank. Check EPD/OST is also in tripped condition. Check both radiator fans are working.
367	TCC #1 FAILED TO ACKNOWLEDGE - DYNAMIC BRAKE REQUEST	Recycle TCC, EM2000 circuit breakers; check COM card is seated properly in EM2000.
368	TCC #1 FAILED TO ACKNOWLEDGE - DIRECTION REQUEST	Recycle TCC,EM2000 circuit breakers ,check COM card is seated properly in EM2000



<b>FC</b>	<b>Fault Message</b>	<b>Remedial Action</b>
370	TCC #1 FAILED TO ACKNOWLEDGE - POWER MODE REQUEST	Recycle TCC,EM2000 circuit breakers, check COM card is seated properly in EM2000
371	TCC #1 INTERNAL RESET - A TO D CONVERSION TIME EXCEEDED	Recycle TCC ,still continue, disable truck
376	TCC #1 INTERNAL RESET - UNBALANCED AC CURRENT SYSTEM	Reset automatically. If Fault log again disable the TCC 1
383	TCC #1 INTERNAL RESET - PULSE FREQUENCY IS TOO HIGH (SHORT TIME)	Reset automatically.
388	TCC #1 INTERNAL RESET - DC LINK UNDERVOLTAGE	Fault will reset automatically. check engine RPM hunting
392	TCC #1 RESET - PROTECTION TRIGGERED: REASON UNDEFINED	Recycle the TCC.
393	TCC #1 RESET - GTO MONITORING	If the Fault log frequently, disable the relevant TCC
396	TCC #1 RESET - TCC PROTECTION TRIGGERED: REASON UNDEFINED	This fault will be come along with some other TCC fault or if loco shut down in power mode. Try to locate other faults.
408	TCC #1 LOCKOUT - CUT OUT TRUCK #1 GTO MONITORING	Disable TCC1
410	TCC #1 LOCKOUT - CUT OUT TRUCK #1 WRONG HARDWARE CODING OR HARDWARE LIMIT	Recycle the TCC breaker. If message is still active, isolate TCC 2 and switch of the TCC breaker.
428	TCC #1 LOCKOUT - CUT OUT TRUCK #1 SUBPROCESSOR HEAVY FAULT	Recycle the TCC. Fault still log, disable the relevant TCC and switch off relevant breakers.
436	TCC #1 TORQUE REDUCTION - BRAKING MODE DENIED	This fault will reset automatically. If not recycle TCC.
444	TCC #1 TEMPORARY TORQUE REDUCTION - TCC TEMPERATURE LIMIT EXCEEDED	check for TCC2 is disabled.

<b>FC</b>	<b>Fault Message</b>	<b>Remedial Action</b>
467	TCC #1 WARNING - SPEED SENSOR FAULT	Disable the defective speed sensor and recycle the EM2000 breaker
473	TCC #2 FAILED TO ACKNOWLEDGE - DYNAMIC BRAKE REQUEST	Recycle TCC,EM2000 circuit breakers, check COM card is seated properly in EM2000
474	TCC #2 FAILED TO ACKNOWLEDGE - DIRECTION REQUEST	Recycle TCC,EM2000 circuit breakers, check COM card is seated properly in EM2000
476	TCC #2 FAILED TO ACKNOWLEDGE - POWER MODE REQUEST	Recycle TCC,EM2000 circuit breakers, check COM card is seated properly in EM2000
477	TCC #2 INTERNAL RESET - A TO D CONVERSION TIME EXCEEDED	Recycle TCC ,still continue disable truck
482	TCC #2 INTERNAL RESET - UNBALANCED AC CURRENT SYSTEM	Reset automatically. If Fault log again disable the TCC 2
489	TCC #2 INTERNAL RESET - PULSE FREQUENCY IS TOO HIGH (SHORT TIME)	Reset automatically
494	TCC #2 INTERNAL RESET - DC LINK UNDERVOLTAGE	Fault will reset automatically. Check for engine rpm hunting.
499	TCC #2 RESET - GTO MONITORING	If the Fault log frequently, cutout the relevant TCC
502	TCC #2 RESET - PROTECTION TRIGGERED: REASON UNDEFINED	Recycle the TCC.
507	TCC #2 RESET - GTO POWER SUPPLY UNDERVOLTAGE	If fault logged during cranking ignore.
514	TCC #2 LOCKOUT - CUT OUT TRUCK #2 GTO MONITORING	Disable TCC2
516	TCC2 - LOCKOUT, WRONG HARDWARE CODING/HARDWARE LIMIT	Recycle the TCC breaker. If message is still active, disable TCC 2 and switch of the TCC breaker.
534	TCC #2 LOCKOUT - CUT OUT TRUCK #2 SUBPROCESSOR HEAVY FAULT.	Recycle the TCC. If Fault still logged, disable TCC2 and switch off relevant breakers

<b>FC</b>	<b>Fault Message</b>	<b>Remedial Action</b>
541	TCC #2 TORQUE REDUCTION - UNDEFINED FAULT CODE	Mostly related to IGBT locos. But check any hauling power, low engine HP like problems.
542	TCC #2 TORQUE REDUCTION - BRAKING MODE DENIED	This fault will reset automatically. If not recycle TCC.
573	TCC #2 WARNING - SPEED SENSOR FAULT	Disable the sensor and recycle EM2000 breaker.
587	MU ENGINE STOP REQUEST	Release the MU STOP switch if pressed; remove wireno-13X6 from SDR relay interlock.
620	NO LOAD - TCC #1 COMMUNICATION FAILURE	Recycle TCC, EM2000 circuit breakers. check COM card seated properly
626	NO LOAD - TCC #2 COMMUNICATION FAILURE	Recycle TCC, EM2000 circuit breakers. check COM card seated properly
637	NO LOAD - NO COMPANION ALTERNATOR OUTPUT CHECK AUX GEN FIELD CIRCUIT BREAKER.	If this fault log during cranking ignore. Check EPU RPM, if this is below 150 this fault will log. If not check AUX GEN coupling, AUX GEN breaker in ECC2, AGFB breaker tripped any loose connection in DVR connector, loose connection in 3G2A connector in ECC1 back panel.
638	NO LOAD - ALL ONLINE TCC COMPUTERS HAVE CEASED OPERATION OF INVERTERS	Auto recovery fault. If not Recycle the TCC.
668	REDUCED LOAD - TCC #1 COMPUTER HAS CEASED OPERATION OF INVERTER	Auto recovery fault. If not Recycle the TCC
672	REDUCED LOAD - TCC #2 COMPUTER HAS CEASED OPERATION OF INVERTER	Auto recovery fault. If not Recycle the TCC
700	TCC COMMUNICATIONS FAILED - TRUCK#2 MOTOR SPEED SENSORS DISABLED	Recycle TCC,EM2000 circuit breakers
726	ENGINE SPEED FAILURE	check AUX GEN coupling failure, Aux GEN circuit breaker tripped in ECC2 cabin, check AGFB breaker tripped, all connections to DVR, FCF are intact. Check 3G2A connector intact in the ECC1 back panel.

<b>FC</b>	<b>Fault Message</b>	<b>Remedial Action</b>
727	REDUCED POWER - ENGINE SPEED FAILURE	same as FC 726
732	TCC #1 INTERNAL RESET - NO SPEED DETECTABLE	No problem
733	TCC #2 INTERNAL RESET - NO SPEED DETECTABLE	No problem
742	TCC #1 WARNING - PHASE MODULE TEMPERATURE SENSOR FAULT	No problem in loco working.
743	TCC #2 WARNING - PHASE MODULE TEMPERATURE SENSOR FAULT	No problem in loco working.
753	TCC #1 RESET - OPEN CIRCUIT BETWEEN ASG AND GATE DRIVER T OR CROWBAR	Recycle the TCC
757	TCC #1 RESET - ASG HARDWARE WATCHDOG	Recycle the TCC 1.
758	TCC #2 RESET - ASG HARDWARE WATCHDOG	Recycle the TCC 2.
766	TCC #2 TORQUE REDUCTION - WHEEL DIAMETER MISMATCH	Rare case of fault. If logged, recycle TCC, EM2000 Circuit breakers
767	TCC #1 TORQUE REDUCTION - SUBPROCESSOR FAULT	Recycle TCC, isolate truck
768	TCC #2 TORQUE REDUCTION - SUBPROCESSOR FAULT	Recycle TCC, isolate truck
771	TCC #1 WARNING - SNUBBER RESISTOR TEMPERATURE SENSOR FAILURE	No effect in loco working.
781	NO LOAD - TCC #1 CROWBAR FIRED - GFD DELAY TIMER INITIATED	Mostly this fault log in both TCC and reset automatically. If not recycle TCC, EM2000 circuit breakers. check engine rpm hunting
783	NO LOAD - TCC #1 RESISTIVE CROWBAR FIRED	Mostly this fault log in both TCC and reset automatically. If not recycle TCC, EM2000 circuit breakers. check engine rpm hunting
784	NO LOAD - TCC #2 RESISTIVE CROWBAR FIRED	Mostly this fault log in both TCC and reset automatically. If not recycle TCC, EM2000 circuit breakers. check engine RPM hunting

<b>FC</b>	<b>Fault Message</b>	<b>Remedial Action</b>
801	TCC #1 RESET - DC LINK OVERVOLTAGE	Mostly this fault log in both TCC and reset automatically. If not recycle TCC, EM2000 circuit breakers. check engine rpm hunting
802	TCC #2 RESET - DC LINK OVERVOLTAGE	Mostly this fault log in both TCC and reset automatically. If not recycle TCC, EM2000 circuit breakers. check engine rpm hunting
811	TCC #2 WARNING - WHEEL MISMATCH WARNING	Rare case of fault. If logged, recycle TCC, EM2000 Circuit breakers.
819	NO DYNAMIC BRAKE, LOAD TEST - GROUND RELAY LOCKOUT	Keeps in idle, RH in neutral, isolation switch in isolate, check GR reset, work further without Dynamic Brake.
820	NO POWER - GROUND RELAY LOCKOUT	Reset by pressing the" F" button in display below the reset, when voltage came below 20. Disable truck 1 and check. If GR trip again disable truck 2.Still coming, conduct Excitation test and load test from self test menu. Check water leakages inside TA room in IPR resistance or TA cables rubbing with body or chocked in water.
872	NO LOAD - DC LINK SHORT CIRCUIT	Mostly came with other faults and reset automatically. If not recycle TCC, EM2000 circuit breakers.
873	NO LOAD - DC LINK SHORT CIRCUIT LOCKOUT	Mostly came with other faults and reset automatically. If not recycle TCC, EM2000 circuit breakers.
874	DC LINK UNANNOUNCED CROWBAR LOCKOUT	This fault mostly related in IGBT locos. Can ignore .automatically reset. If not Recycle the TCC
878	TCC #1 LOCKOUT - CUT OUT TRUCK #1 DC LINK OVERVOLTAGE	Disable truck and work further
879	TCC #2 LOCKOUT - CUT OUT TRUCK #2 DC LINK OVERVOLTAGE	Disable truck and work further
880	TCC #1 RESET - GTO POWER SUPPLY OVERVOLTAGE	If the Fault is active, cut out the TCC 1
881	TCC #2 RESET - GTO POWER SUPPLY OVERVOLTAGE	If the Fault is active, cut out the TCC 2

<b>FC</b>	<b>Fault Message</b>	<b>Remedial Action</b>
918	NO BLENDED BRAKE - LOCKOUT, FAILED TO CHARGE AIR	No effect in working of loco
919	NO BLENDED BRAKE - LOCKOUT, FAILED TO RELEASE AIR	No effect in working of loco
974	REDUCED POWER - TCC #2 OVERTEMPERATURE TEMPORARY CONDITION	Happen due to truck 1 disabled, work in 7th notch so engine rpm goes to 8th notch and cool the motors. Check any TCC temp sensor fault also logging. Recycle the TCC.
975	REDUCED POWER - TCC #1 OVERTEMPERATURE TEMPORARY CONDITION	Happen due to truck 2 disabled, work in 7th notch so engine rpm goes to 8th notch and cool the motors. Check any TCC temp sensor fault also logging. Recycle the TCC.
1007	TCC #1 INTERNAL RESET - RIPPLE ON FLUX FEEDBACK PRESENT	Reset automatically ,no action required
1008	TCC #2 INTERNAL RESET - RIPPLE ON FLUX FEEDBACK PRESENT	Reset automatically ,no action required
1080	NO START - START FUSE IS OPEN OR MISSING	Check the start fuse if missing or fused short with thick copper conductor and crank or battery knife switch burnt, battery terminal burnt. interchange DIO1 and DIO3
1081	NO ENGINE START - TURBO PUMP NOT RUNNING RUN PUMP FOR 15 MINUTES TO COOL TURBO.	This due to TLPR breaker switched off before cooling cycle. Wait till cooling cycle completed.
1126	NO LOAD - GENERATOR FIELD OVEREXCITATION	This mostly came with some other fault. Check for other faults. Conduct self test-Excitation,
1153	DC LINK UNANNOUNCED CROWBAR	This mostly came in IGBT locos. Automatically reset.
1164	FAILED FEEDBACK - DCL V FEEDBACK IS OUT OF RANGE	Mostly related to ADA card in EM2000 problem. Check up card seated properly
1170	FAILED FEEDBACK - TCC2 A FEEDBACK IS OUT OF RANGE	Mostly related to ADA card in EM2000 problem. Check up card seated properly



<b>FC</b>	<b>Fault Message</b>	<b>Remedial Action</b>
1182	FAILED FEEDBACK - CA VOLTAGE FEEDBACK IS OUT OF RANGE	Mostly related to ADA card in EM2000 problem. Check up card seated properly
1183	FAILED FEEDBACK - MR PRES FEEDBACK IS OUT OF RANGE	Mostly related to ADA card in EM2000 problem. Check up card seated properly. Check MRPT sensor connector intact.
1189	FAILED FEEDBACK - TM #1 TEMPERATURE FEEDBACK IS OUT OF RANGE	No problem
1190	FAILED FEEDBACK - TM #2 TEMPERATURE FEEDBACK IS OUT OF RANGE	No problem
1191	FAILED FEEDBACK - TM #3 TEMPERATURE FEEDBACK IS OUT OF RANGE	No problem
1192	FAILED FEEDBACK - TM #4 TEMPERATURE FEEDBACK IS OUT OF RANGE	No problem
1201	TRUCK #1 DISABLED - MULTIPLE FAILED TRACTION MOTOR TEMPERATURE SENSORS	Disable truck 1
1305	TCC #1 TEMPORARY TORQUE REDUCTION - HOT TRACTION MOTORS	If truck 2 is disabled this condition will come after a long time of working. Try to keep notch in 7th notch there by engine rpm goes to 8th notch. Or cool the traction motors. By fast pumping.
1306	TCC #1 WARNING - MOTOR TEMPERATURE SENSOR FAULT	No problem
1308	TCC #2 TEMPORARY TORQUE REDUCTION - HOT TRACTION MOTORS	If truck 1 is disabled this condition will come after a long time of working. Try to keep notch in 7th notch there by engine rpm goes to 8th notch. Or cool the traction motors. By fast pumping.
1309	TCC #2 WARNING - MOTOR TEMPERATURE SENSOR FAULT	No problem

<b>FC</b>	<b>Fault Message</b>	<b>Remedial Action</b>
1310	ENGINE DEAD WITH COLD WATER TEMPERATURE	No problem in cranking or working.
1314	NO LOAD - ENGINE TEMPERATURE FEEDBACK FAILURE	Check both ETP1 and ETP2 sensor cable coupler intact. Check ADA in EM2000 is seated properly.
1315	HOT ENGINE - THROTTLE 6 LIMIT EXTENDED TIME	Check radiator fans working. Check radiator fan fuse blown or breaker tripped.
1688	FAILED FEEDBACK - ETP1 FEEDBACK IS OUT OF RANGE	Check ETP1 sensor coupler intact. Loco work normally if ETP2 working normal. Sensor available below water tank
1689	FAILED FEEDBACK - ETP2 FEEDBACK IS OUT OF RANGE	Check ETP1 sensor coupler intact. Loco work normally if ETP2 working normal. Sensor available below water tank
1692	FAILED FEEDBACK - GBLW1 A FEEDBACK IS OUT OF RANGE	Avoid Dynamic brake and work further.
1694	FAILED FEEDBACK - GBLW2 A FEEDBACK IS OUT OF RANGE	Avoid Dynamic brake and work further.
1696	FAILED FEEDBACK - GRID1 A FEEDBACK IS OUT OF RANGE	Avoid Dynamic brake and work further
1698	FAILED FEEDBACK - GRID2 A FEEDBACK IS OUT OF RANGE	Avoid Dynamic brake and work further.
1702	FAILED FEEDBACK - LR FEEDBACK IS OUT OF RANGE	Check WW governor Amphenol plug intact. Check ASC front connectors intact, check ADFA seated properly. Conduct Load regulator self test.
1703	FAILED FEEDBACK - LR FEEDBACK HAS AN OFFSET	Check WW governor Amphenol plug intact. Check ASC front connectors intact, check ADFA seated properly. Conduct Load regulator self test.
1704	FAILED FEEDBACK - MG CTA FEEDBACK IS OUT OF RANGE	Check ASC front connector intact
1710	FAILED FEEDBACK - MGFLD A FEEDBACK IS OUT OF RANGE	Check ADA seated properly
1717	FAILED FEEDBACK - TL 24T FEEDBACK IS OUT OF RANGE	Avoid Dynamic Brake and work further.

<b>FC</b>	<b>Fault Message</b>	<b>Remedial Action</b>
1718	FAILED FEEDBACK - TM AIR FEEDBACK IS OUT OF RANGE	No problem
1764	FAILED FEEDBACK - TPU RPM	No problem, loco work normally
1776	FAILED FEEDBACK - PHASE MODULE 1 TEMP FEEDBACK IS OUT OF RANGE	No problem in working. No effect in loco working. If require recycle TCC
1777	FAILED FEEDBACK - PHASE MODULE 2 TEMP FEEDBACK IS OUT OF RANGE	No problem in working. No effect in loco working. If require recycle TCC
1778	FAILED FEEDBACK - PHASE MODULE 3 TEMP FEEDBACK IS OUT OF RANGE	No problem in working. No effect in loco working. If require recycle TCC
1779	FAILED FEEDBACK - PHASE MODULE 4 TEMP FEEDBACK IS OUT OF RANGE	No problem in working. No effect in loco working. If require recycle TCC
1780	FAILED FEEDBACK - PHASE MODULE 5 TEMP FEEDBACK IS OUT OF RANGE	No problem in working. No effect in loco working. If require recycle TCC
1781	FAILED FEEDBACK - PHASE MODULE 6 TEMP FEEDBACK IS OUT OF RANGE	No problem in working. No effect in loco working. If require recycle TCC
1782	FAILED FEEDBACK - SIBAS TEMPERATURE 1 FEEDBACK IS OUT OF RANGE	No problem in working. No effect in loco working. If require recycle TCC
1783	FAILED FEEDBACK - SIBAS TEMPERATURE 2 FEEDBACK IS OUT OF RANGE	No problem in working. No effect in loco working. If require recycle TCC
1785	FAILED FEEDBACK - SNUBBER TEMPERATURE 2 FEEDBACK IS OUT OF RANGE	No problem in working. No effect in loco working. If require recycle TCC

<b>FC</b>	<b>Fault Message</b>	<b>Remedial Action</b>
1788	FAILED FEEDBACK - TCC TEMPERATURE 1 FEEDBACK IS OUT OF RANGE	No problem in working. No effect in loco working. If require recycle TCC
1789	FAILED FEEDBACK - TCC TEMPERATURE 2 FEEDBACK IS OUT OF RANGE	No problem in working. No effect in loco working. If require recycle TCC
1804	FAILED FEEDBACK - TRUCK #1 TM TEMPERATURES ARE INCONSISTENT	Mostly no problem
1805	FAILED FEEDBACK - TRUCK #2 TM TEMPERATURES ARE INCONSISTENT	Mostly no problem in loco working
1861	REDUCED POWER, DYNAMIC BRAKE - TCC BLOWER LOCKOUT	Disable the truck
1874	TCC #1 BLOWER CONTACTOR FAULT - SLOW SPEED FAILED TO DROP OUT	No problem, ignore the fault
1875	TCC #1 BLOWER CONTACTOR FAULT - SLOW SPEED FAILED TO PICK UP	Disable truck No.1.
1878	TCC #2 BLOWER CONTACTOR FAULT - SLOW SPEED FAILED TO DROP OUT	No problem, ignore the fault
1879	TCC #2 BLOWER CONTACTOR FAULT - SLOW SPEED FAILED TO PICK UP	Disable truck No.2.
1885	LOW ENGINE WATER LEVEL DETECTED	Check the water level in the glow rod, if it is low inform Diesel shed for further action. If water is full and message logging ignore the fault
1893	FAILED FEEDBACK - EPU RPM FEEDBACK IS INCONSISTENT WITH ENGINE RPM	No problem in loco working.

<b>FC</b>	<b>Fault Message</b>	<b>Remedial Action</b>
1917	FAILED FEEDBACK ; RADAR	Remove radar coupler and work further
1919	NO LOAD - TCC #1 BLOWER CIRCUIT BREAKER IS NOT CLOSED	Switch on the breaker if OFF condition. open breaker panel cover and short the small 2 wires connected to the TCC blower circuit breaker (pin type shoe) and work further
1920	NO LOAD - TCC #2 BLOWER CIRCUIT BREAKER IS NOT CLOSED	Switch on the breaker if OFF condition. open breaker panel cover and short the small 2 wires connected to the TCC blower circuit breaker (pin type shoe wire connected to interlocks) and work further
1960	GFD FAILED TO PICK UP	Check the contactor picked up physically. Swap DIO1 with DIO3. check any digital MUX failure also logged. Move isolation switch to isolate and run and check the contactor drops and pick up .remove the arc chutes assembly and see any obstructions. Short with a wire the PA27 in the coil to the coil wire no GFBC in GFC contactor.
1961	GFD FAILED TO DROP OUT	No problem, Interchange DIO1 and DIO3
1962	GFC FAILED TO PICK UP	Check isolation switch in run, GF switch in ON. Check GFD pick up condition, interchange DIO1 and DIO3, Short with a wire the PA27 in the GFD coil to the coil wire no GFBC in GFC contactor. Change control stand and check.
1963	GFC FAILED TO DROP OUT	Interchange DIO1 and DIO3
1964	FP RLY FAILED TO PICK UP	Interchange DIO2 and DIO3. if not working, SWITCH OFF FUEL PUMP CIRCUIT BREAKER and remove the following wire from FPR relay and short them all. PA 63, PA 62, SRX8, SRA6, SRX6, SRY6.
1965	FP RLY FAILED TO DROP OUT	No problem. Ignore the fault
1967	WH SLP FAILED TO DROP OUT	Check real wheel slip in the loco. Remove wire no WAL6, 13T61 and MUD4 from WR RELAY.

<b>FC</b>	<b>Fault Message</b>	<b>Remedial Action</b>
1968	TLPR FAILED TO PICK UP	Check battery knife switch, computer control breaker, TLPR circuit breaker is in ON. Interchange DIO1 and DIO3. SHORT the following wires TLD8, TLD6, TLX6 and TLA6 in TLPR relay.
1969	TLPR FAILED TO DROP OUT	If this message coming when loco is in dead condition then Switch off TPLM circuit breaker.
2002	FCS1 FAILED TO PICK UP	Recycle computer control breaker. Interchange DIO2 and DIO3.check FCF1A contactor dropped. Short wire no PA82, PA83 and CFK in FCF1A CONTACOTR or Short CFX and CFL WIRE in FCF1A.
2003	FCS1 FAILED TO DROP OUT	Contact Shed
2004	FCS2 FAILED TO PICK UP	Contact Shed
2005	FCS2 FAILED TO DROP OUT	Contact Shed
2008	FCF1A or FCF1B FAILED TO PICK UP	Contact Shed
2009	FCF1A or FCF1B FAILED TO DROP OUT	Contact Shed
2010	FCF2A or FCF2B FAILED TO PICK UP	Contact Shed
2011	FCF2A or FCF2B FAILED TO DROP OUT	Contact Shed
2064	B1 FAILED TO PICK UP-CONTACT SHED	Interchange DIO2 and DIO3
2065	B1 FAILED TO DROP OUT-CONTACT SHED	Interchange DIO2 and DIO3
2066	B2 FAILED TO PICK UP-CONTACT SHED	Interchange DIO2 and DIO3
2067	B2 FAILED TO DROP OUT-CONTACT SHED	Interchange DIO2 and DIO3
2069	BWR FAILED TO DROP OUT-CONTACT SHED	Interchange DIO1 and DIO3
2081	DCC1 FAILED TO DROP OUT-CONTACT SHED	Interchange DIO2 and DIO3
2083	DCOP FAILED TO DROP OUT-CONTACT SHED	Interchange DIO2 and DIO3



<b>FC</b>	<b>Fault Message</b>	<b>Remedial Action</b>
2160	CMPSYN FAILED TO PICK UP	If MR pressure reducing close the coc of MRPT sensor o in the back side of ECC3 cabin or remove the cable to MRPT sensor .close MVCC COC
2161	CMPSYN FAILED TO DROP OUT	If MR pressure reducing close the coc of MRPT sensor o in the back side of ECC3 cabin or remove the cable to MRPT sensor .Close MVCC COC
2182	TCC1SC FAILED TO PICK UP-CONTACT SHED	Interchange DIO2 and DIO3
2183	TCC1SC FAILED TO DROP OUT-CONTACT SHED	No problem, ignore the fault
2186	TCC2SC FAILED TO PICK UP-CONTACT SHED	Interchange DIO2 and DIO3
2187	TCC2SC FAILED TO DROP OUT-CONTACT SHED	No problem, ignore the fault
2188	TI1CO FAILED TO PICK UP-CONTACT SHED	Interchange DIO2 and DIO3
2189	TI1CO FAILED TO DROP OUT-CONTACT SHED	Interchange DIO2 and DIO3
2191	TI2CO FAILED TO DROP OUT-CONTACT SHED	Interchange DIO2 and DIO3
2210	VPC FAILED TO PICK UP	Check battery voltage low if fault logged before crank. Interchange DIO1 and DIO3.
2240	ST FAILED TO DROP OUT	Contact shed. Interchange DIO1 and DIO3
2250	B4 FAILED TO DROP OUT-CONTACT SHED	Interchange DIO1 and DIO3 ,avoid dynamic brake,
2251	B3 FAILED TO PICK UP-CONTACT SHED	Interchange DIO1/DIO2 and DIO3
2256	B3 FAILED TO DROP OUT	Avoid dynamic brake CONTACT SHED. Interchange DIO1/DIO2 and DIO3
2257	B4 FAILED TO PICK UP	Avoid dynamic brake CONTACT SHED. Interchange DIO1 and DIO3
2332	#1 MOTOR SPEED SENSOR DISABLED FOR LOCKED WHEEL DETECTION	No problem
2345	COMMUNICATIONS LINK FAILURE MAB	Recycle EM2000 and Air brake computer breaker. Check the fault code in air brake and act accordingly

<b>FC</b>	<b>Fault Message</b>	<b>Remedial Action</b>
2348	NO BLENDED BRAKE - LOCKOUT, AIR BRAKE COMMUNICATION LINK FAILURE	No problem in loco working
2422	NO BLENDED BRAKE - LOCKOUT, INVALID CALL PRESSURE	No problem in loco working
2423	NO BLENDED BRAKE - LOCKOUT, INVALID BRAKE CYLINDER PRESSURE	No problem in loco working
2438	TCC COMMUNICATIONS FAILED - TRUCK#1 MOTOR SPEED SENSORS DISABLED	Recycle TCC,EM2000 circuit breakers
2612	GTOPS2 FAILED TO PICK UP	Check GTO power supply breaker is closed. CONTACT SHED
2613	GTOPS2 FAILED TO DROP OUT	CONTACT SHED. If IGBT loco ignore.
2614	GTOPS1 FAILED TO PICK UP	Check GTO power supply breaker is closed. CONTACT SHED
2615	GTOPS1 FAILED TO DROP OUT	CONTACT SHED. If IGBT loco ignore
2655	REDUCED DYNAMIC BRAKE, NO LOAD TEST - NO GRID BLOWER #2 CURRENT	Avoid dynamic brake and work further
2656	REDUCED DYNAMIC BRAKE, NO LOAD TEST - HIGH GRID BLOWER #1 CURRENT	Avoid dynamic brake and work further
2657	REDUCED DYNAMIC BRAKE, NO LOAD TEST - HIGH GRID BLOWER #2 CURRENT	Avoid dynamic brake and work further.
2924	COMMUNICATIONS LINK FAILURE - EVENT RECORDER	Recycle event recorder breaker and EM2000 breaker.

<b>FC</b>	<b>Fault Message</b>	<b>Remedial Action</b>
2926	EVENT RECORDER CIRCUIT BREAKER IS NOT CLOSED	check breaker is not closed, if so switch on. Check event recorder LED's are glowing. If so ignore this message.
2955	DIGITAL INPUT SYSTEM FAILURE (CHECK MUX CIRCUIT)	Check other faults logged, switch off EM2000 breaker and check DIO cards seated properly, CMU1,2,3,4 connectors above DVR ,DIP30, 31,32,80 panel connectors in ECC1 and ECC3. SWITCH ON EM2000 breaker and still fault logging fail the loco. if this fault log during cranking recycle computer control breaker and wait for 20 sec. before doing priming.
2967	AIR BRAKE FAULT - BRAKE CONTROLLER NUMBER 1 FAILURE	check relevant air brake fault and act accordingly
2968	AIR BRAKE FAULT - BRAKE CONTROLLER NUMBER 2 FAILURE	check relevant air brake fault and act accordingly
2969	AIR BRAKE FAULT - LEAD/TRAIL MODE SELECTION FAILURE	check relevant air brake fault and act accordingly
2970	AIR BRAKE FAULT - MREQ-PIPE/FLOW MODULE FAILURE	check relevant air brake fault and act accordingly. Check MR pressure is above 7 kg in both console gauges and EM2000 display. If it is less check MR leakage and attend.
2971	AIR BRAKE FAULT - BRAKE PIPE CONTROL FAILURE	check relevant air brake fault and act accordingly
2972	AIR BRAKE FAULT - INDEPENDENT/BCEQ-PIPE CONTROL FAILURE	check relevant air brake fault and act accordingly
2973	AIR BRAKE FAULT - BRAKE CYLINDER CONTROL FAILURE	check relevant air brake fault and act accordingly
2984	LOSS OF TRAIN LINE PRESSURE, EMERGENCY - PLACE HANDLE IN EMERGENCY FOR 60 SEC	Crew message to recreate BP. Keep A9 handle for 60 sec and release. Check BP creating.
3261	TCC #1 LOCKOUT - CUT OUT TRUCK #1 INVERTER OUTPUT OVERCURRENT	If Fault log frequently, Cut out the TCC 1 and switch off TCC breaker.

FC	Fault Message	Remedial Action
3262	TCC #2 LOCKOUT - CUT OUT TRUCK #1 INVERTER OUTPUT OVERCURRENT	If Fault log frequently, Cut out the TCC 2 and switch off TCC breaker.
3263	TCC #1 RESET - INVERTER OUTPUT OVERCURRENT	If Fault log frequently, Cut out the TCC 1 and switch off TCC breaker.
3264	TCC #2 RESET - INVERTER OUTPUT OVERCURRENT	If Fault log frequently, Cut out the TCC 2 and switch off TCC breaker.
3288	AIR BRAKE SELF TEST - SUCCESSFUL COMPLETION	No action
3289	COMPUTER TURNED OFF OR RESET WHILE REVERSER NOT CENTERED	This will come normally when recycling EM2000 breaker without RH in neutral position.
3326	NO BLENDED BRAKE - BACKUP BRAKE SYSTEM ACTIVE - PERFORM AIR BRAKE SYSTEM TEST	No effect in working of loco
3473	EVENT RECORDER HARDWARE FAULT	No problem work further
3511	#5 LOCKED WHEEL OR SPEED SENSOR FAULT STOP TRAIN AND VERIFY THAT AXLE ROTATES	Disables the speed sensor ensuring there is no physical locked axle. Recycle the EM 2000 breaker after disable. Remove the sensor coupler from the motor
3512	#6 LOCKED WHEEL OR SPEED SENSOR FAULT STOP TRAIN AND VERIFY THAT AXLE ROTATES	Disables the speed sensor ensuring there is no physical locked axle. Recycle the EM 2000 breaker after disable. Remove the sensor coupler from the motor.
3513	#5 MOTOR SPEED SENSOR DISABLED FOR LOCKED WHEEL DETECTION	Indicative message that speed sensor already disabled. No problem in loco working
3514	#6 MOTOR SPEED SENSOR DISABLED FOR LOCKED WHEEL DETECTION	Indicative message that speed sensor already disabled. No problem in loco working
3515	#5 MOTOR SPEED SENSOR ENABLED FOR LOCKED WHEEL DETECTION	Indicative message .No problem
3516	#6 MOTOR SPEED SENSOR ENABLED FOR LOCKED WHEEL DETECTION	Indicative message .No problem
3548	FAILED FEEDBACK - JACKET WATER TEMPERATURE PROBE	Check the ETP1 and ETP2 connectors below cooling water tank are intact. check ADA card seated properly

## 6.2 WDG4/4D SIEMENS (S3) LOCOMOTIVE COMMON FAULT MESSAGES

Fault code	Fault message	Action to be taken by LP
--	No connection to CCU	a. Check the TCCPS circuit breaker, reset if tripped. b. Bypass the <b>TCCPS circuit breaker</b> .
33	MVB : Communication error Display (Sink Time Supervision)	Reboot Display i.e. recycle computer control circuit breaker
34	MVB : Communication error Sibas KLIP Station 1 (Sink Time Supervision)	a. Recycle Computer Control circuit breaker. b. check if any RED LED glowing on klips of MVB1. c. Inform to shed
35	MVB : Communication error Sibas KLIP Station 2 (Sink Time Supervision)	a. Recycle Computer Control circuit breaker. b. check if any RED LED glowing on klips of MVB2. c. Inform to shed
39	MVB: collective fault Ext.1	a. Recycle Computer Control circuit breaker. b. check any water on MVB 1 module, clean. c. Inform to shed
41	MVB: collective fault Ext.2	a. Recycle Computer Control circuit breaker. b. check any water on MVB 2 module, clean. c. Inform to shed
42	SIBAS Klip: Module Group Alarm	a. Recycle Computer Control circuit breaker. b. check any water on MVB 1/ 2 module, clean. c. Inform to shed
45	CB Event Recorder is not closed or Trip.	a. check if circuit breaker for Event Recorder not in ON position.
47	SIP-B permanent not ready for operation	a. Check if TRUCK 2 is cut out. b. Inform to shed
48	SIP-A permanent not ready for operation	a. Check if TRUCK 1 is cut out. b. Inform to shed
49	No communication between LCU and Event recorder	a. Check if circuit breaker for Event Recorder not in ON position. b. Check Event Recorder is Power ON (Orange LED should glow). c. Inform to shed.

Fault code	Fault message	Action to be taken by LP
85	SCR: External fault	a. Check for SCR module Circuit breaker ON position. b. By pass the <b>SCR module</b> Circuit breaker . c. Inform to shed
151	Generator Field Circuit breaker closed on both CAB's	Switch OFF Generator Field Circuit breaker in inactive cab.
161	SIP-A has SW-Traco data	Ignore the message
162	SIP-B has SW-Traco data	Ignore the message
190	DC-Link current > hardware limit	a. Recycle Computer Control circuit breaker. b. Inform to shed.
200	Hot engine, throttle 6 limit	a. check Radiator fans working. b. check for any RFCB tripping. c.. check the faults related to fan contactors and do self tests of fan contactors. d. inform to shed.
202	Engine protection shutdown, low oil pressure	a. Check for LLOB tripping. b. Check for EPD operation. c. Check for Governor oil.
204	Engine air filters dirty, change out required (FVS and EFS tripped), TH6 limit.	a. Bypass FVS and EFS filters (Open one wire each in FVS & EFS switches) as per the shed advise.
209	No start, starter motor overload	a. Check the starter motor pinions engagement to main gear. b. Push & pull the pinions of Both starter motors manually. c. Switch off the all circuit breakers and open battery knife switch and wait for 5 to 10 minutes and try again.
211	Starting abutment- time up start relay ST to switch on	a. check the starter motor pinions engagement to main gear. b. push & pull the pinions of Both starter motors manually. c. switch off the all circuit breakers and open battery knife switch and wait for 5 to 10 minutes and try again.



<b>Fault code</b>	<b>Fault message</b>	<b>Action to be taken by LP</b>
212	Governor speed setting not accurate	a. check the gov. Amphenol plug tightness. b. Check the fuel oil in return sight glass for air bubbles.
213	Engine protection shutdown, low water level	a. check the water level. check the low water level switch press the switch and try to again crank the engine. b. Bypass (short the wires in switch) the switch. c. switch off the all circuit breakers and open battery knife switch and wait for 5 to 10 minutes and try again.
225	Fuse starter motor failed during start.	a. Check for loose connection of start fuse. b. starting fuse defective, replace the fuse.
226	Governor booster pump relay failure, time up GBC close at time	a. check for GBC relay pickup, if relay not picking up during cranking, press lay shaft.
227	Engine shutdown EFCO pressed	a. Check EFCO switch for stuck-up. b. Check EFCO wiring.
234	TL8 & TL9 are high.! Check control stands	a. Change control stand and check-up. b. Check MU cable for any rubbing, secure if any rubbing. c. Ensure no water entry in to control drum.
301	No communication between NYAB and LCU	a. Ensure MAB circuit breaker is in ON position. b. Bypass MAB circuit breaker if breaker defective. c. Check for fault code on NYAB computer and contact shed.
302	Failed feedback LCU - MR sensor	Check for fault code on Air brake Computer with RED LED and contact shed.
304	Air Brake Penalty - Low MR Pressure	a. Check the MR pressure and find out any leakage. b. Check the fault code in Air brake computer and perform Air brake self test. c. Inform to shed.
305	MR Pressure < 6 Bar	a. Check the MR pressure and find out any leakage. b. Check the fault code in Air brake computer and perform Air brake self test. c. Bypass the MRPT sensor by closing MRPT COC. d. Inform to shed.

<b>Fault code</b>	<b>Fault message</b>	<b>Action to be taken by LP</b>
310	CB MAB off	a. Ensure MAB circuit breaker is in ON position. b. Bypass MAB circuit breaker if breaker defective.
350	DC-Link too low during pre charging.	a. Recycle the Computer breaker. b. Move the reverser handle to required direction and Wait for 20-30 seconds, and then move the sector handle to 1st notch. c. Inform to shed.
369	GFC contactor does not open	a. check for GFC stuck-up and press the Plunger inside. b. contact shed.
371	SIP-A card faulty	a. Recycle the Computer breaker. b. Inform to shed.
372, 373, 374	PWR-A module A11 phase L 1 faulty. PWR-A module A12 phase L 2 faulty PWR-A module A13 phase L 3 faulty	a. Recycle the Computer breaker. b. Isolate Truck 1 and inform to shed.
381	PWR-A over current	a. Check Truck 1 traction motors for any cable cut in under truck. b. Isolate TRUCK 1 and inform shed.
382	Soft crowbar DC-Link A fired because of over voltage.	a. Observe any TM speed showing different speed compared to other motors speeds. b. Recycle Computer Control breaker. c. Observe 8 th notch Engine RPM on load, inform to shed in case of any abnormality.
394	Short circuit in DC-Link B detected	Check the condition of Crow bar in TA room and inform shed in case of abnormality
395	PWR-B over current	a. Check Truck 2 traction motors for any cable cut in under truck. b. Isolate TRUCK 2 and inform shed.
396	Soft crowbar DC-Link B fired because of over voltage.	a. Observe any TM speed showing different speed compared to other motors speeds. b. Recycle Computer Control breaker. c. Observe 8 th notch Engine RPM on load, inform to shed in case of any abnormality.

<b>Fault code</b>	<b>Fault message</b>	<b>Action to be taken by LP</b>
400, 401	Bogie 1: Torque reduction because of TM over temperature Bogie 2: Torque reduction because of TM over temperature	a. check for any over load on the locomotive. b. Check for any formation brake binding. c. check for TM air bellow puncture.
412 - 417	speed value traction motor 1 -6 faulty	a. Recycle the Computer breaker. b. Check the tightness of X-plug X11, X12, X13, X21, X22, X23 respectively. c. Disable the defective TM speed sensor through Display and inform to shed.
418- 423	Locked wheel detected on axle 1 - 6	a. Check physically the rotation of the particular wheel and inform to shed if wheel not rotates. b. Other wise Recycle the Computer breaker. c. Check the tightness of X-plug X11, X12, X13, X21, X22, X23 respectively. d. Disable the defective TM speed sensor through Display and inform to shed.
434	Ground Fault Detected in DC Link detected	a. Isolate TRUCK 1 and 2 one by one and found defective TRUCK, then isolate.
435	Ground Fault Detected in Power Mode detected	b. Check any water stagnation in TA room, Clean Aspirator and drain the water.
436	Ground Fault Detected in Braking Mode detected	Isolate Dynamic braking by slider switch.
458	Ground fault detection lock out	a. Isolate TRUCK 1 and 2 one by one and found defective TRUCK, then isolate. b. Check any water stagnation in TA room, Clean Aspirator and drain the water.
463	Ground Fault Ripple Detection TM	Isolate TRUCK 1 and 2 one by one and found defective TRUCK, then isolate.
484	switch gear Q8 failed tp pick up	a. Recycle computer control breaker. b. Shutdown the engine, Do Contactor & Relays self test, and crank the loco.
486	switch gear Q9 failed tp pick up	
490	Hardware Protection LCU active	a. Recycle computer control breaker. b. Check for DC link voltage it should not exceed 3200 volts, inform shed.
516 - 521	Temperature value traction motor 1 – 6 faulty	a. Ignore he fault and inform to shed.

<b>Fault code</b>	<b>Fault message</b>	<b>Action to be taken by LP</b>
536	Torque reduction due to inverter 1 module temperature	a. Check the TCC blower circuit breaker for ON position.
537	Torque reduction due to inverter 2 module temperature	b. Check the working of TCC blower if not inform shed.
552	CB Aux.Gen. is not closed	a. Check the Aux. Gen Field circuit breaker, reset if tripped.
598	No Engine cooling! CB RFC 1 Tripped or Not Closed!	Check for Radiator Fan Circuit Breaker for tripping, reset if tripped.
599	No Engine cooling! CB RFC 2 Tripped or Not Closed!	
601	aux power - LOCAL CONTROL CIRCUIT BREAKER is not closed	a. Check the LOCAL CONTROL CIRCUIT BREAKER, reset if tripped. b. Check the PS-5 circuit breaker, rest if tripped. b. If both are in ON position still the fault message coming, Bypass the <b>PS-5 circuit breaker</b> .
611	Radiator cooling Fan 1 Slow speed contactor FCS1 failed to pick up.	a. Check the coil wire at contactor, reconnect if it was in dis connected condition.
615	Radiator cooling Fan 1 Slow speed contactor FCS1 failed to pickup	b. Press the plunger available on contactor. C. Do Cooling fan contactor Self test through display.
612	Radiator cooling Fan 1 Fast speed contactor FCF1A or FCF1B failed to pick up.	Check the coil wire at contactor, reconnect if it was in disconnected condition.
617	Radiator cooling Fan 2 Fast speed contactor FCF2A or FCF2B failed to pick up.	b. Press the plunger available on contactor. C. Do Cooling fan contactor Self test through display.
700	VCD penalty brake	Press Alerter Reset button after loco speed become zero or 35 seconds whichever is later.
701	VCD bypass switch on	Keep VCD bypass slider toggle switch in OFF condition.

### 6.3 MEDHA LOCOMOTIVE FAULT MESSAGES

Message Code	Message	Remedial Action
8000	Filter Blower Motor Circuit Breaker is not Closed	Switch ON the FILTER BWR MTR Circuit Breaker in Circuit Breaker Panel.
8001	Fuel Pump Circuit Breaker is not Closed	Switch ON the FUEL PUMP Circuit Breaker in Circuit Breaker Panel.
8002	No Start - Fuel Pump is not Running, Check FP Relay and Circuit Breaker	Check FUEL PUMP Circuit Breaker, if it is in Tripped position, Reset the Circuit Breaker.
8003	No Load - Fuel Pump is not Running, Check FP Relay and Circuit Breaker	Check FUEL PUMP Circuit Breaker, if it is in Tripped position, Reset the Circuit Breaker.
8004	Fuel Pump is not Running, Check FP Relay and Circuit Breaker	Check FUEL PUMP Circuit Breaker, if it is in Tripped position, Reset the Circuit Breaker.
8005	No AUX GEN Output - Check AUX GEN Field Circuit Breaker	Check AGFCB breaker, if it is in Tripped position, Reset the Circuit Breaker.
8006	No Load - No CA Output, Check AUX GEN Field Circuit Breaker	Check AGFCB breaker, if it is in Tripped position, Reset the Circuit Breaker.
8007	No Load - AUX GEN Field Breaker Tripped Manual Reset Required	Reset the AUX GEN Field Circuit Breaker. If problem repeats inform to shed
8008	No AUX Power - AC Control Circuit Breaker is not Closed	Ensure that the AC Control Circuit Breaker Should be Closed.
8009	No Load - AC Control Circuit Breaker is not Closed	Ensure that the AC Control Circuit Breaker Should be Closed.
8010	DCL2 Control Circuit Breaker is not Closed	Switch ON the DCL2 Control Circuit Breaker(DCL2CB) in Circuit Breaker Panel.
8011	DCL3 Control Circuit Breaker is not Closed	Switch ON the DCL3 Control Circuit Breaker(DCL3CB) in Circuit Breaker Panel.

Message Code	Message	Remedial Action
8012	DCL4 Control Circuit Breaker is not Closed	Switch ON the DCL4 Control Circuit Breaker(DCL4CB) in Circuit Breaker Panel.
8013	DCL5 Control Circuit Breaker is not Closed	Switch ON the DCL5 Control Circuit Breaker(DCL5CB) in Circuit Breaker Panel.
8014	DCL6 Control Circuit Breaker is not Closed	Switch ON the DCL6 Control Circuit Breaker(DCL6CB) in Circuit Breaker Panel.
8015	Turbo Lube Pump Circuit Breaker is not Closed	Switch ON the TURBO Circuit Breaker in Circuit Breaker Panel.
8016	No Lubrication Allowed - Turbo Lube Pump Circuit Breaker is not Closed	Switch ON the TURBO Circuit Breaker in Circuit Breaker Panel.
8017	Air Brake Circuit Breaker is not Closed	Switch ON the MICRO AIR BRAKE Circuit Breaker.
8018	No DB - DB Circuit Breaker is not Closed	Switch ON the DYNAMIC BRAKE Circuit Breaker.
8019	TCC#1 Blower Circuit Breaker is not Closed	Switch ON the TCC#1 Blower Circuit Breaker(TCCBlwr1CB) in Circuit Breaker Panel.
8032	Engine Filters are Dirty, Change Out Required Power May be Limited to Throttle 6	Check EFS & FVS Switches. & Ensure is there any faults related to FVS & EFS. If faults are there. Then inform to Diesel Shed for Maintenance.
8034	Engine Dead Locomotive is not Isolated	Isolation Switch should be in Isolate Position.
8035	No Start - Locomotive is not Isolated	Isolation Switch should be in Isolate Position.
8036	No Load - Locomotive is Isolated	Isolation Switch should be in Run Position.
8037	Forced Minimum Engine Speed - Locomotive is Isolated	Isolation Switch kept at Isolate Position.
8038	Low Engine Water Level Detected	Check the water level. check the low water level switch press the switch and try to again crank the engine.



Message Code	Message	Remedial Action
8039	No Load - Low Engine Water Level Detected	Check the water level. check the low water level switch press the switch and try to again crank the engine.
8040	Alerter or Vigilance System has made a Penalty Brake Application	Press Alerter Reset button after loco speed become zero.
8045	Turbo Lube Pump is not Running	Check for TURBO Circuit Breaker, reset if it is Tripped.
8046	Engine Shut Down - Engine Over Speed Condition	Restart the engine and work further, If Problem repeats inform to shed
8047	Reduced Load - Turbo Charger Over Speed	Loco can be worked up to 6th notch. If more power required inform to shed.
8048	Emergency Fuel Cut off Activated	If this message comes during Loco working, verify the EFCO Switch in CAB and near Fuel tank.
8049	MU Engine Stop Requested	If this message comes during Loco working, verify the MU Stop Switch position for accidental Stop and re crank the Loco.
8052	No Start - Start Fuse is Open or Missing	a. Check for loose connection of start fuse. b. Starting fuse defective, replace the fuse.
8053	Forced Minimum Engine Speed - Engine Run Switch is Down	Switch On the ENG RUN SW in CONTROL console.
8054	No Load - Generator Field Switch is Down or SDR Relay is Picked Up	Switch On the GEN FLD SW in CONTROL console.
8070	Reduced DB - Engine Speed Up Failure	Inform to Shed.
8072	Reverser Handle Ignored - Speed is Too High	Keep RH in Centre Position till Loco kmph is Zero.
8073	Engine Shut Down - Low Water Level	Check the water level. check the low water level switch. Press the switch and try to again crank the engine.

Message Code	Message	Remedial Action
8074	Engine Speed Increase - High Auxiliary Generator Load	No Problem in Working.
8080	No Load - Engine Temperature Feedback Failure	No Problem in Working.
8082	Engine Speed Increase - Low Water Temperature	Wait till Temperature Raises up to the Set Level.
8083	AEB applied Penalty Brake Move Throttle to IDLE Press AEBRST Switch to release brake	Move Throttle Position to IDLE & Press AEB Reset Push Button.
8084	Penalty brake applied by MU loco Motoring Prohibited	Move Throttle Position to IDLE & Reset the MU STOP switch if pressed.
8087	No DB and No Load Test Power Ground Fault Lock Out	Keep Throttle in IDLE, RH in neutral, Isolation switch in ISOLATE, work further without Dynamic Brake. Check GRNTCO Switch Position, Switch On GRNTCO Switch if it is Off.
8088	Power Ground Fault	Keep Throttle in IDLE, RH in Centre Position. Till the Fault Recovery.
8089	No DB and No Load Test Power Ground Fault Lock Out	Keep Throttle in IDLE, RH in Centre Position. Till the Fault Recovery.
8090	Engine Speed Increase - Air Compressor Operation	No Problem in Working.
8091	MRPT Failed - Forced Air Compressor Loading	No Problem in Working.
8094	No Load - Loco Over Speed Bring Throttle to Idle	Keep Throttle in IDLE.
8100	Air Brake Place Independent Brake Handle in Release	Place Independent Brake Handle in Release Position.
8101	Air Brake Place Auto Brake Handle in Full Service	Place Auto Brake Handle in Full Service.
8114	No Load - B1 Failed to Drop Out bring Throttle Handle To Idle	Keep Throttle in IDLE Position.
8115	No Load - B2 Failed to Drop Out bring Throttle Handle To Idle	Keep Throttle in IDLE Position.

Message Code	Message	Remedial Action
8116	No Load - B3 Failed to Drop Out bring Throttle Handle To Idle	Keep Throttle in IDLE Position.
8117	No Load - B4 Failed to Drop Out bring Throttle Handle To Idle	Keep Throttle in IDLE Position.
8123	#1Locked Wheel/Speed Sensor/ Pinion Slip Fault Stop Train & Verify Axle Rotate	Verify the TM1 Physically for locked axle. If it is Locked inform to shed. Else Cut out the TM1 from Display and work further.
8124	#2Locked Wheel/Speed Sensor/ Pinion Slip Fault Stop Train & Verify Axle Rotate	Verify the TM2 Physically for locked axle. If it is Locked inform to shed. Else Cut out the TM2 from Display and work further.
8125	#3Locked Wheel/Speed Sensor/ Pinion Slip Fault Stop Train & Verify Axle Rotate	Verify the TM3 Physically for locked axle. If it is Locked inform to shed. Else Cut out the TM3 from Display and work further.
8126	#4Locked Wheel/Speed Sensor/ Pinion Slip Fault Stop Train & Verify Axle Rotate	Verify the TM4 Physically for locked axle. If it is Locked inform to shed. Else Cut out the TM4 from Display and work further.
8127	#5Locked Wheel/Speed Sensor/ Pinion Slip Fault Stop Train & Verify Axle Rotate	Verify the TM5 Physically for locked axle. If it is Locked inform to shed. Else Cut out the TM5 from Display and work further.
8128	#6Locked Wheel/Speed Sensor/ Pinion Slip Fault Stop Train & Verify Axle Rotate	Verify the TM6 Physically for locked axle. If it is Locked inform to shed. Else Cut out the TM6 from Display and work further.
8135	Blended Brake Cut Out	No effect in working of loco.
8136	No Load - PCS is Open	Check BP Pressure. Check PCS Relay Status.
8142	Generator Field Circuit Breaker is Open or Tripped	Close the Generator Field Circuit Breaker (GEN FLD CB).
8143	Radiator Blower1 Circuit Breaker is Open or Tripped, Limited Cooling	Reset the Radiator Blower1 Circuit Breaker.
8144	Radiator Blower2 Circuit Breaker is Open or Tripped, Limited Cooling	Reset the Radiator Blower2 Circuit Breaker.

Message Code	Message	Remedial Action
8148	Hot Engine - Soft Derate Power Limited to Throttle 6	1. Check Radiator Fans Working, 2. Check for RFCB Tripping. If RFCB is tripped, then reset the CB. 3. Check the Faults related to fan contactors and do self-tests of fan contactors.
8149	Brake Chopper Fired for 12 Secs bring Throttle to IDLE and Keep Reverser in Center	Keep Throttle in IDLE & RH in neutral Positions,
8160	No Load - PCS Open in Lead Loco	Check BP Pressure. Check PCS Relay Status.
8161	No Load - Locked Wheel Detected in Lead Loco	Verify the TM Physically for locked axle. Then Cut out that Particular TM from Display and work further.
8162	No Load - Penalty Applied in Remote Loco Due to Fire Alerter in Lead Loco	Inform to Shed.
8163	No Load - Penalty Applied in Remote Loco Due to Penalty Brake in Lead Loco	Keep Throttle in IDLE, RH in neutral, Place Auto Brake Handle in Full Service for 10sec.
8164	No Load - Emergency Brake in Remote Loco Due to Emergency Brake Applied in Lead Loco	Keep Throttle in IDLE, RH in neutral, Place Auto Brake Handle in Full Service for 60sec.
8165	No Load Locked Wheel Detected in Remote Loco	Verify the TM Physically for locked axle. If axle is Locked inform to Shed. Else Cut out that Particular TM from Display and work further.
8166	No Load PCS Open in Remote Loco	Check BP Pressure. Check PCS Relay Status.
8167	No Load - Penalty Applied in Lead Loco Due to Fire Alerter in Remote Loco	Inform to Shed.
8175	GF Tripped Due to Continuous Brake Chopper Firing	Keep Throttle in IDLE & RH in neutral Positions,
8190	CAB2 is Active	CAB2 is in Working Mode.

Message Code	Message	Remedial Action
8191	GF CB Should be Open in CAB2	Open the GEN FLD CB in CAB2
8192	GF CB Should be Open in CAB1	Open the GEN FLD CB in CAB1
8193	GF CB Open in CAB1	GEN FLD CB Should be Closed in the Active Cab.
8194	GF CB Open in CAB2	GEN FLD CB Should be Closed in the Active Cab.
800A	No AUX Power - Local Control Circuit Breaker is not Closed	Switch ON the Local Control Circuit Breaker
800B	Local Control Circuit Breaker is not Closed/Battery Knife Switch is Open	Switch ON the Local Control Circuit Breaker & Battery Knife Switch.
800C	No AUX Power - Control Circuit Breaker is not Closed	Switch ON the Control Circuit Breaker(CNTLCB) in Circuit Breaker Panel.
800D	No Start - Control Circuit Breaker or Control/Fuel Pump Switch is Down	Switch ON the Control Circuit Breaker(CNTLCB) & Fuel Pump Switch(CFPSW).
800E	No Load - Control Circuit Breaker is not Closed	Switch ON the Control Circuit Breaker(CNTLCB).
800F	DCL1 Control Circuit Breaker is not Closed	Switch ON the DCL1 Control Circuit Breaker(DCL1CB) in Circuit Breaker Panel.
801A	TCC#2 Blower Circuit Breaker is not Closed	Switch ON the TCC#2 Blower Circuit Breaker(TCCBlwr2CB) in Circuit Breaker Panel.
801B	TCC#3 Blower Circuit Breaker is not Closed	Switch ON the TCC#3 Blower Circuit Breaker(TCCBlwr3CB) in Circuit Breaker Panel.
801C	TCC#4 Blower Circuit Breaker is not Closed	Switch ON the TCC#4 Blower Circuit Breaker(TCCBlwr4CB) in Circuit Breaker Panel.
801D	TCC#5 Blower Circuit Breaker is not Closed	Switch ON the TCC#5 Blower Circuit Breaker(TCCBlwr5CB) in Circuit Breaker Panel.
801E	TCC#6 Blower Circuit Breaker is not Closed	Switch ON the TCC#6 Blower Circuit Breaker(TCCBlwr6CB) in Circuit Breaker Panel.

Message Code	Message	Remedial Action
803A	Engine will not Start - Low Engine Water Level Detected	Check the water level. check the low water level switch press the switch and try to again crank the engine.
803D	Control/Fuel Pump Switch is Down	Switch On the CONT & FP SW in Control Console.
803E	Control/Fuel Pump Switch is Down Engine Will Shut down within 10 min	Switch On the CONT & FP SW in Control Console.
803F	Train Line Alarm Bell	Check any fault is active in crew message. If no message in the self-loco, verify MU Loco for any fault and act accordingly
804A	No Start - MU Engine Stop Requested	Verify the MU Stop Switch position for accidental Stop and re crank the Loco.
804B	Engine Shutdown - Low Engine Oil Pressure	Check LLOB tripped in governor. If so reset. Verify the EPD Position for any Low water/Low crank case pressure button. Reset and Crank the loco. If problem repeats inform to shed.
806C	No Load - Simultaneous Forward and Reverse Request	This fault will log normally in MU operation with both loco having RH handles. If happen in single loco check master controller in non-working stand is thrown to any direction or struck up.
806D	No Load - Simultaneous Power and DB Request	Please Check the Throttle Handle Position.
806E	Improper Train Line Throttle Request in DB	Please Check the Throttle Handle Position.
807C	Cold Engine - Throttle 2 Limit	No Problem in Working.
807D	Hot Engine - Throttle 6 Limit	1. Check Radiator Fans Working, 2. Check for RFCB Tripping. If RFCB is tripped, then reset the Circuit Breaker. 3. Check the Faults related to fan contactors and do self-tests of fan contactors.



Message Code	Message	Remedial Action
807E	No Load - Hot Engine Throttle 6 Limit Extended Time	1. Check Radiator Fans Working, 2. Check for RFCB Tripping. If RFCB is tripped, then reset the Circuit Breaker. 3. Check the Faults related to fan contactors and do self-tests of fan contactors.
807F	Both Engine Temperature Probes are Failed	Please ensure working of Both Radiator Fans.
808A	Power Ground Fault Move Throttle to IDLE and Keep Reverser in Center	Keep Throttle in IDLE, RH in Centre Position. Till the Fault Recovery.
808B	No Load - Power Ground Fault Lock Out	Keep Throttle in IDLE, RH in neutral, isolation switch in ISOLATE. Recycle the Computer Control Circuit Breaker.
808C	Ground Fault-Main Generator Positive Half Side Phase Imbalance	Inform to Shed.
808D	No Load - MG Positive Half Side Phase Imbalance Ground Fault Lockout	Inform to Shed.
808E	Ground Fault-Main Generator Negative Half Side Phase Imbalance	Inform to Shed.
808F	No Load - MG Negative Half Side Phase Imbalance Ground Fault Lockout	Inform to Shed.
80A6	No Start - Low Lube Oil Pressure	Check LLOB tripped in governor. If so reset and crank.
80A7	No Start - Starter Motor Abutment Condition	a. check the Starter motor pinions engagement to main gear. b. push & pull the pinions of Both starter motors manually. c. switch off the all circuit breakers and open battery knife switch and wait for 5 to 10 minutes and try again.
80A8	TC1 Circuit Breaker not Closed	Switch ON the TC1 Computer Circuit Breaker in ECC#1.
80A9	TC2 Circuit Breaker not Closed	Switch ON the TC2 Computer Circuit Breaker in ECC#1.

Message Code	Message	Remedial Action
80AA	TC3 Circuit Breaker not Closed	Switch ON the TC3 Computer Circuit Breaker in ECC#1.
80AA	TC4 Circuit Breaker not Closed	Switch ON the TC4 Computer Circuit Breaker in ECC#1.
80AC	TC5 Circuit Breaker not Closed	Switch ON the TC5 Computer Circuit Breaker in ECC#1.
80AD	TC6 Circuit Breaker not Closed	Switch ON the TC6 Computer Circuit Breaker in ECC#1.
80AE	No Load and No DB Power Ground Protection Disabled	Verify the GRNTCO Switch position, Make it in Enable position
80AF	Unable to Build DCLV 600 Volts Check GEN. FLD CB	Check GEN FLD Circuit Breaker. If it is Tripped, Reset the Circuit Breaker.
80B0	No DB and Load Test, Grid Current Imbalance, Check Grids	Avoid dynamic brake and work further
80B2	No DB and Load Test, Grid Over Current	Avoid dynamic brake and work further
80B3	No DB and Load Test, Grid Over Current Locked Out	Avoid dynamic brake and work further
80B8	No DB and Load Test, Resistance of Grid Path#1 is Too High	Avoid dynamic brake and work further
80B9	No DB and Load Test, Resistance of Grid Path#2 is Too High	Avoid dynamic brake and work further
80BA	No DB and Load Test, Resistance of Grid Path#1 is Too Low	Avoid dynamic brake and work further
80BB	No DB and Load Test, Resistance of Grid Path#2 is Too Low	Avoid dynamic brake and work further
80BE	No DB and Load Test, Grid#1 Open Circuit	Avoid dynamic brake and work further
80BF	No DB and Load Test, Grid#2 Open Circuit	Avoid dynamic brake and work further
80C2	No DB and Load Test, Grid Path#1 Shorted	Avoid dynamic brake and work further
80C3	No DB and Load Test, Grid Path#2 Shorted	Avoid dynamic brake and work further

Message Code	Message	Remedial Action
80C4	No Load - Both DCLV Sensors Faulty	Keep Throttle in IDLE, RH in neutral, isolation switch in ISOLATE.
80C5	DCLI Crossed Max Limit, Announced Crow Bar Fire bring Throttle to Idle	Keep Throttle in IDLE Position. Shutdown the Engine and then Re crank the Engine.
80C6	DCLV Crossed Max Limit bring Throttle to Idle, Keep Reverser in Center	Keep Throttle in IDLE & RH in neutral Position,
80D3	No DB and Load Test, Grid Blower#1 Current Imbalance	Avoid dynamic brake and work further.
80D4	No DB and Load Test, Grid Blower#2 Current Imbalance	Avoid dynamic brake and work further
80D5	No DB and Load Test, Grid Blower Current Imbalance	Avoid dynamic brake and work further
80D8	No DB and Load Test, High Grid Blower#1 Current	Avoid dynamic brake and work further
80D9	No DB and Load Test, High Grid Blower#2 Current	Avoid dynamic brake and work further
80DA	No DB and Load Test, High Grid Blower Current	Avoid dynamic brake and work further
80DB	No DB and Load Test, High Grid Blower#1 Current Locked	Avoid dynamic brake and work further
80DC	No DB and Load Test, High Grid Blower#2 Current Locked	Avoid dynamic brake and work further
80DE	No DB and Load Test, High Grid Blower Current Locked	Avoid dynamic brake and work further
80E1	No DB and Load Test, No Grid Blower#1 Current	Avoid dynamic brake and work further
80E2	No DB and Load Test, No Grid Blower#2 Current	Avoid dynamic brake and work further
80E3	No DB and Load Test, No Grid Blower Current	Avoid dynamic brake and work further
80E7	No DB and No Load Test, Grid Blower #1 or Grid TAP Failure	Avoid dynamic brake and work further
80E8	No DB and No Load Test, Grid Blower #2 or Grid TAP Failure	Avoid dynamic brake and work further
80E9	No DB and No Load Test, Grid Blower or Grid TAP Failure	Avoid dynamic brake and work further

Message Code	Message	Remedial Action
80F1	Air Brake Emergency, Place Auto Brake Handle in Emergency for 60 sec	Place Auto Brake Handle in Emergency for 60 sec.
80F2	Loss of Train Line Pressure, Emergency Place Auto Brake Handle in Emergency for 60 sec	Crew message to recreate BP. Keep A9 handle for 60 sec and release.
80F3	Air Brake Failure Use Locomotive in Trail Only	Inform to Shed.
80F4	Low Main Reservoir Equalizing Pipe Use Locomotive in Trail Only	Inform to Shed.
80F5	Air Brake Controller NUM 1 Failure, Switch to Air Brake Controller NUM 2	Inform to Shed.
80F6	Air Brake Controller NUM 2 Failure, Switch to Air Brake Controller NUM 1	Inform to Shed.
80F7	Air Brake Failure Check for Proper Lead/Trail Set Up	Inform to Shed.
80F8	Air Brake Power Interruption Penalty Place Auto Handle in Full Service for 10 sec	Place Auto Brake Handle in Full Service for 10 sec.
80F9	Air Brake Penalty Place Handle in Full Service for 10 sec	Place Auto Brake Handle in Full Service for 10 sec.
80FA	To Restore Normal Air Brake Operation Place Automatic Handle in Running	Place Auto Brake Handle in Running Position.
80FB	Air Brake Failure BAIL OFF is not Available	Inform to Shed.
80FC	Air Brake Failure -Graduated Independent Braking is not Available	Inform to Shed.
80FD	Air Brake Failure Back Up Braking Active	Inform to Shed.
80FE	Air Brake Cut Off Failure Use Locomotive in Lead Only	Locomotive can be used in Lead mode only.
810E	Communication Failure Between LCC and CCB	Inform to Shed.
811D	DB Cut Out	Avoid dynamic brake and work further

Message Code	Message	Remedial Action
811E	Engine Speed Increase - Turbo Cool Down Cycle	This due to TLPR breaker switched off before cooling cycle. Wait till cooling cycle Completed.
813D	No Start - Starter Motor Overload Waiting for Motor to Cool Down	a. check the starter motor pinions engagement to main gear. b. push & pull the pinions of Both starter motors manually.
813E	Engine Speed Increased to 2nd Notch TM Stator Temperature High	No Problem in Working.
813F	Engine Speed Increased to 4th Notch TM Stator Temperature High	No Problem in Working.
814B	Break Chopper Power Supply Failed or OFC Disconnected	Inform to Shed.
814C	Hard Crow Bar Fired bring Throttle Handle to Idle	Keep Throttle in IDLE Position.
814D	Please Shut Down and Restart the Engine to Power Up the Motors Due to Crowbar Fired	Restart the Engine.
814E	Hard Crowbar Power Supply Failed or OFC Disconnected bring Throttle to Idle	Keep Throttle in IDLE Position.
814F	No Start Hard Crowbar is Fired	Keep Throttle in IDLE & RH in neutral Positions,
816A	No Load - Emergency Brake Applied	Keep Throttle in IDLE, RH in neutral, Place Auto Brake Handle in Full Service for 60sec.
816B	No Load - Penalty Brake Applied	Keep Throttle in IDLE, RH in neutral, Reset the Alerter.
816C	Emergency Brake in Lead Loco Due to Emergency Brake Applied in Remote Loco	Keep Throttle in IDLE, RH in neutral, Place Auto Brake Handle in Full Service for 10sec.
816D	Penalty Brake in Lead Loco Due to Penalty Brake Applied in Remote Loco	Keep Throttle in IDLE, RH in neutral, Place Auto Brake Handle in Full Service for 10sec.
818B	MAB CB not Closed in CAB1	a. Ensure MAB circuit breaker is in ON Position in CAB1. b. Bypass MAB circuit breaker if breaker Defective.

Message Code	Message	Remedial Action
818C	MAB CB not Closed in CAB2	a. Ensure MAB circuit breaker is in ON Position in CAB2. b. Bypass MAB circuit breaker if breaker Defective.
818D	BL Key Removed in Both Cabs	BL Key should be inserted in the Active CAB.
818E	BL Key Inserted in Both Cabs	Remove the BL Key in the inactive CAB.
818F	CAB1 is Active	CAB1 is in Working Mode.
819D	Engine Shut Down Due to Mechanical Over Speed, Reset OST Before Starting the Engine	Check EPD/OST is tripped. If so reset and crank.
819E	Engine Shutdown Unexpectedly	Check the Fuel Oil Flow in Fuel Indicator. Re crank the Engine. If not Cranked inform to Shed.
81A0	Memory Freeze Enabled	It Should be Enable during Emergency. If not Disable the Switch.
81A1	Power Ground Connector Open	Inform to Shed.
81A2	TLPM not Running	Check TURBO Circuit Breaker, if it Tripped then Reset the CB.
81A3	Wrong Engine RPM Check Gov Plug	Verify the Governor Harness coupler, inform to shed. Run the loco if there is required Power.
81A4	LRMS CB not Closed	Close the LRMS CB.
81A5	TM1 Speed Sensor Connected in Reverse	No Problem in Working.
81A6	TM2 Speed Sensor Connected in Reverse	No Problem in Working.
81A7	TM3 Speed Sensor Connected in Reverse	No Problem in Working.
81A8	TM4 Speed Sensor Connected in Reverse	No Problem in Working.
81A9	TM5 Speed Sensor Connected in Reverse	No Problem in Working.
81AA	TM6 Speed Sensor Connected in Reverse	No Problem in Working.
81AB	TM1 Power Cables Connection Wrong	Inform to Shed.



Message Code	Message	Remedial Action
81AC	TM2 Power Cables Connection Wrong	Inform to Shed.
81AD	TM3 Power Cables Connection Wrong	Inform to Shed.
81AE	TM4 Power Cables Connection Wrong	Inform to Shed.
81AF	TM5 Power Cables Connection Wrong	Inform to Shed.
81B0	TM6 Power Cables Connection Wrong	Inform to Shed.
81B1	Throttle Operated in CAB1 or GF Request Switch ON in CAB1	GF Request Switch Should be OFF in the Inactive CAB.
81B2	Throttle Operated in CAB2 or GF Request Switch ON in CAB2	GF Request Switch Should be OFF in the Inactive CAB.
81D9	No Start - TLP Circuit Breaker is not Closed	Switch ON the TURBO Circuit Breaker.
81DA	PGNDPIP Connector Open	Inform to Shed.
81DB	PGNDPIN Connector Open	Inform to Shed.

# Notes

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