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TECHNICAL DATA			
Technical Data	WAP-5	WAP-7	WAG-9
Type of Service	Passenger	Passenger	Freight
Axle Arrangement	Bo-Bo	Co-Co	Co-Co
Gear Ratio	1:3.65	1:3.6	1:5.133
Gauge	1676 mm	1676 mm	1676 mm
Length over Buffer	18162 mm	20562 mm	20562 mm
Overall Width	3142 mm	3100 mm	3152 mm
Maximum Height with Pantograph Locked	4255 mm	4255 mm	4255 mm
Wheel Diameter			
New	1097 mm	10927mm	1097 mm
Worn	1016 mm	1016 mm	1016 mm.
Total Weight	78 T	123 T	123 T
OHE Voltage			
Nominal	25 KV	25 KV	25 KV
Minimum	17.5 KV	17.5 KV	17.5 KV
Maximum	30 KV	30 KV	30 KV
OHE Frequency			
Nominal	50 Hz	50 Hz	50 Hz
Minimum	45 Hz	45 Hz	45 Hz
Maximum	55 Hz	55 Hz	55 Hz
Power Supply to Aux.Frequency No of Aux. Converter	415 V $\pm$ 10% 0 to 59 Hz Aux.Conv. 1,2,3	415 V $\pm$ 10% 0 to 59 Hz Aux.Conv. 1,2,3	415V $\pm$ 10% 0 to 59 Hz Aux.Conv.1,2,3
Battery Voltage	110 V	110 V	110 V
Power Supply to Traction Motors	2180 V	2180 V	2180 V
No. Of Power Converters	2	2	2
Type of Traction Motor	Three phase Induction Motors (6FXA7059)	Three phase Induction Motors (6FRA6068)	Three phase Induction Motor (6FRA6068)
No.of Traction Motors	4	6	6
Power of T.M.	1563HP	1156 HP	1156 HP
Tractive Effort	258 KN	322.6 KN	458 KN



Braking	Regenerative, Pneumatic, Parking, Anti Spin	Regenerative Pneumatic, Parking, Anti Spin	Regenerative Pneumatic, Parking, Anti Spin
Braking Effort	160 KN	182 KN	260 KN
Parking Brakes:	Wheel No. 1,4,5 & 8	Wheel No. 2,6,7 & 11	Wheel No. 2,6,7 & 11
Horse Power	5440 HP	6120 HP	6120 HP
Maximum Speed	160 Kmph	130 Kmph	100 Kmph
Main Reservoir	3 nos	2 nos.	2 nos
Hotel Load	Available	Not available	Not available
Loco brakes	On Disc 5 kg/cm2	On Wheel 3.5 kg/cm2	On Wheel 3.5 kg/cm2

ABBREVIATIONS

ALG	Drive Control Unit - Drive Inverter and Line converter Control
ASC	Driver Converter Control
ASR	Drive Converter Key switch
BLCP	Spring-loaded switch for Main compressors
BLDJ	Spring-loaded switch for Main circuit breaker
BLHO	Spring-loaded switch for Hotel load(notactive on WAG-9)
BLPR	Switch Headlights
BPCS	Illuminated push-button, green for Constant speed control
BPFA	Illuminated push-button,yellowfor acknowledgement all fault Messages
BPFL	Illuminated push-button, yellow Emergency flashlight
BPPB	Illuminated push-button, red for parking brake
BPVG	Push-button, green for Vigilance
BPVR	Push-button, illuminated yellow for resetting vigilance
BUR	Auxiliary Converter
BZ-V-O-F	Buzzer for vigilance, over speed and fire
CEL	Central Electronics
CSC	Constant Speed Control
DDS	Diagnostic Data Set
FLG	Vehicle Control Unit
GTO	Gate Turn Off
HB	Cubicle Auxiliary Circuits
HBB	Processor



HRA	Switch Cab blower/heating
LSAF	Indication lamp - red for Train parting
LSCE	Indication lamp-amber for over temperature CEL
LSDJ	Indication lamp, red for Main Circuit Breaker
LSFI	indication lamp, red for Fault message, priority 1
LSHO	Indication lamp, yellow Hotel load (Not active on WAG-9)
LSP	Indication lamp, yellow for Wheel slipping
LSVW	Indication lamp, yellow for Vigilance Warning MCB
	Main Circuit Breaker
MCE	MICAS-S2 Control Electronics
MEMOTEL	Speed Recorder and Indicator
MR	Machine Room
MUB	Over voltage Protection Unit
NSR	Line Converter
Pan	Pantograph
PCLH	Socket Hand Lamp
PP	Pneumatic Panel
SB	Cubicle Control Circuits
SLG	Converter Control Unit
SR	Traction Converter
SS	Subsystem
STB	Low Voltage Cubicle Control
TE/BE	Tractive/braking effort
UBA	Voltmeter Battery Voltage
VCB	Vacuum Circuit Breaker - Main Circuit Breaker
ZBAN	Spring Loaded Switch- Banking operation
ZBV	Train Bus Administrator
ZLC	Switch for Driver's cab lighting
ZLDA	Switch for Assistant driver's desk Illumination
ZLDD	Switch for Driver's desk illumination
ZLFR	Switch for Marker lights, red
ZLFW	Switch for Marker lights, white
ZLH	Switch for Socket hand lamp
ZLI	Switch for Instrument lighting
ZPRD	Switch for Headlights, intensity
ZPT	Spring-loaded switch for Pantograph
ZTEL	Switch for Max.Traction limitation
ZK	DC link



GENERAL FEATURES OF 3-PHASE AC LOCO

Advanced Technological Features: -

In addition to the provision of latest 3-phase traction drive system; the 3-phase locomotives have certain improved technical features as compared to the conventional locomotives so being used on IR. Some major features are listed below.

1) Digital electronics based real time traction control System: -To obtain precise control over tractive effort and speed in the normal mode and constant speed control mode of operation respectively.

2)Electrical weight transfer control system:-To automatically reduce the tractive effort in the leading bogie and increase the same in the trailing bogie to take care of weight transfer effect.

3)Anti spin protection: -When the ratio of requested and effected tractive effort goes below 0.5, anti spin protection initiated, which reduce the TE and apply loco brakes to stop spinning.

4)On-board fault diagnostics system:-To eliminate/ elaborate trouble-shooting by engine crew and also to help maintenance staff to trace faults. The fault diagnostics system provides for automatic isolation of faulty equipment/ subsystems.

5)Simulation mode of operation: -To facilitate a complete functional testing of the locomotive without raising pantograph.

6)An exclusive harmonic filter circuit:-To reduce harmonics in the loco current

7)Static auxiliary converter: -To supply auxiliary 3-phase motors. The auxiliary converter, depending on the traction load, operates at an optimum frequency to minimize power consumed by auxiliaries

8)Electronic speedometer: - Paperless speed recording system. An over speed alarm system is built in.

9)Electronic energy meter: - For information of energy generated and energy consumed

10)Fire detection and alarm system:-For the machine room.

11) Low traction bar arrangement between bogie and body to reduce weight transfer :- Unidirectional mounting of traction motors to further reduce weight transfer effect.

12) Ergonomically designed and spacious driving cabs: - To provide comfort and relief to crew.

13) Use of inertial filters: - Pressurized machine room to prevent entry of dust into sensitive equipment in the machine room.



14)Electronic brake system: - For precise and fast control of braking effort, blending between electrical brake and pneumatic brake on the locomotive.

15)Triplet pneumatic brake panel :-To minimize pipingand provide single- place location of all pneumatic equipment.

16) Use of tread brake units: -To reduce maintenance

17) Spring loaded parking brake system -Instead of handbrakes, spring loaded parking brakes are provided on this loco, these brakes can be operated from loco and remain applied without pressure by spring.

18) Over-charge feature in the brake system for faster release of brakes - For faster release of train brakes after recreation, BP is charged to 5.4 kg / cm² for short time with restricted dropping rate to 5.0 kg/cm².

19)Electronic controlled vigilance system -To keep the loco pilot alert Vigilance system is provided, As per this system, loco pilot has to do predetermined task once within 60 seconds, otherwise VCD will apply emergency braking.

20)Wheel Flange lubrication system: -To reduce energy consumption and wheel wear.

21)Under-slung compressors:- To eliminate oil fumes and oil spillage inside the machine room, which is potential causes for fire hazards.



Advantages of 3-phase locomotives

The merits of 3-phase locomotives over D.C.-motored locomotives are summarized below.

1 -The size of traction motor for the same output power is much less in case of a 3-phase induction motor compared to DC motor. Therefore, with the permissible axle load and available space in a bogie, realization of a much higher-powered loco motive is possible.

2-Maintenance cost of a 3-phase locomotive is less due to absence of brush-gear/ commutator in the traction motors and switchgears in the power circuit.

3-Induction motors are very robust. Consequently reliability of a 3-phase locomotive is higher.

4 -The rated power of a D.C.-motored locomotive reduces beyond the field weakening range. In case of 3-phase loco motives, full power is available up to the maximum speed.

5-Overload capabilities in 3-phase locomotives are more Liberal.

6-Regeneration of power is available in 3-phase locomotives. Regenerative braking effort is available from the full speed till dead stop. Consequently, the overall efficiency of operation is higher.

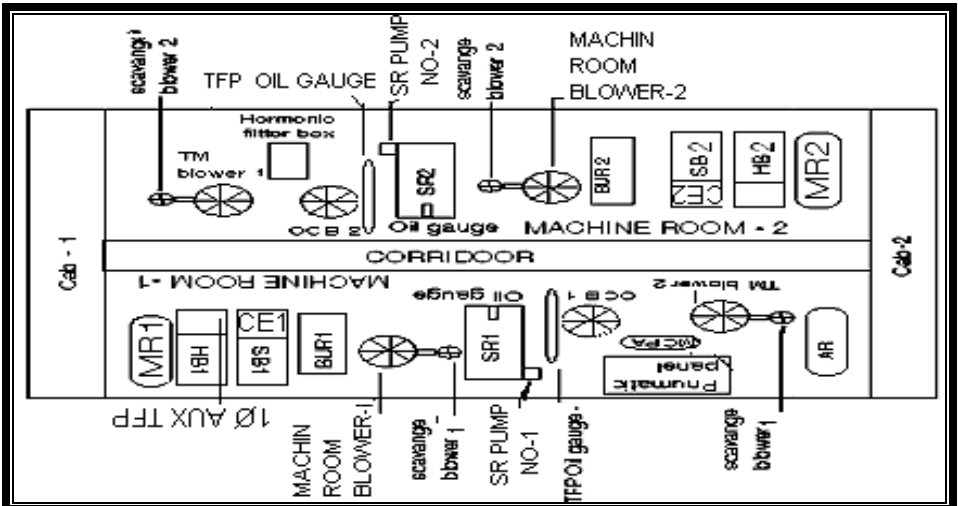
7-Due to superior drop characteristics of speed Vs. torque and the fact that the motor speed is limited by the synchronous speed, a much improved adhesion is available in 3-phase locomotive and thus higher tractive efforts can be realized within permissible axle load limits.

8-3-phase locomotive operates at near unity power factor throughout the speed range except at very low speeds.

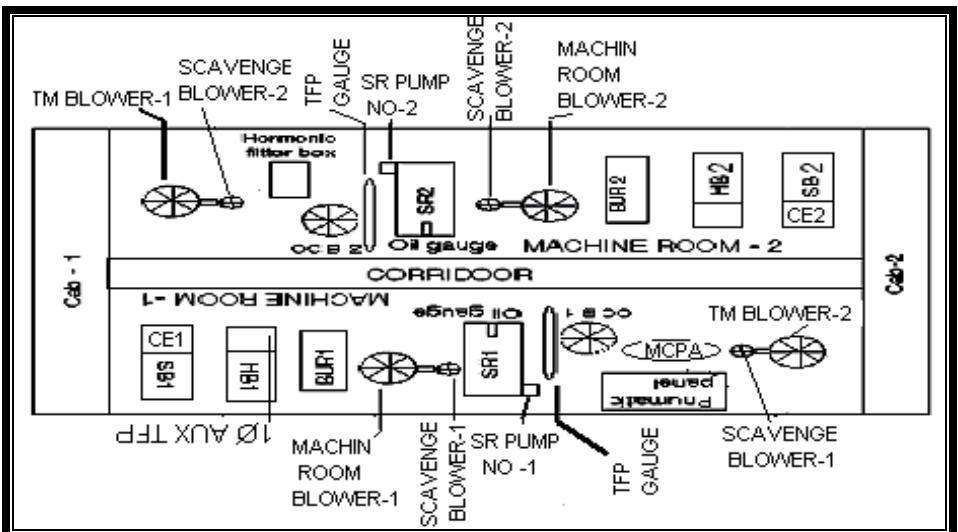
9-Due to lesser weight of the traction motors, the un-sprung masses in 3-phase locomotive are low. This reduces track forces and consequently minimizes wear on rails and disturbance to track geometry.



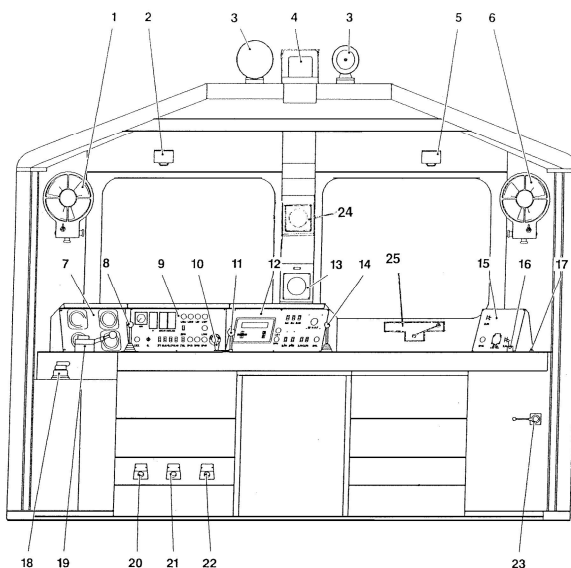
WAG9/ WAP7 LOCO



WAP-5 LOCO



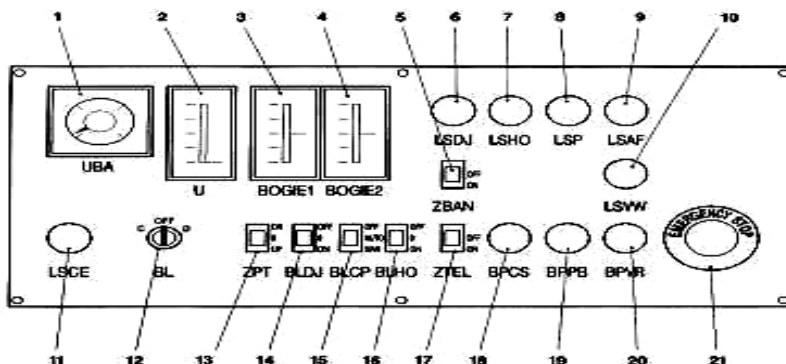
CAB OVER PREVIEW



1) CREW FAN	14)CONTROL LEVER FOR HORN
2) LAMP DR'S DESK ILLUMINATION	15 PANEL D
3) PNEUMATIC HORN	16)OPERATION OF WINDOW
4) EMERGENCY FLASH LIGHT	17)ROTARY SWITCH CAB HEATER/FAN DEVICE ILLUMINATION
5) LAMP ASSISTANT DRIVER'S DESK DEVICE ILLUMINATION	18) BRAKE HANDLE DIRECT LOCO BRAKE
6) CREW FAN	19-WIPERS/WASHERS
7) PANEL B	20 FOOT SWITCH "SANDING"
8) CONTROL LEVER FOR HORN	21 FOOT SWITCH "PVEF" FOR RELEASE OF
9 -PANEL A LOCO BRAKE	22 -FOOT SWITCH "VIGILANCE"
10)REVERSER	23- EMERGENCY BRAKE COCK
11) TE/BE THROTTLE	24-PARKING BRAKE (PB) GAUGE
12) PANEL C	25 -WIPER MOTOR
13) MEMOTEL	



A- Pannel



No	Name	Description
1	UBA	Voltmeter Battery voltage
2	U	Voltmeter Catenary voltage
3	Bogie-1TE/BE meter	Traction / braking effort, bogie 1
4	Bogie-2TE/BE meter	Traction / braking effort, bogie 2
5	ZBAN	Banking operation ON /OFF
6	LSDJ -red	Indication lamp for VCB
7	LSHO - yellow	Hotel load Indication lamp
8	LSP - yellow	Indication lamp-Wheel slipping
9	LSAF- red	Indication lamp, - Train parting
10	LSVW - yellow	Indication lamp Vigilance warning
11	LSCE	Lamp, - Over temperature CE
12	BL Key	Activation of Driver's cab
13	ZPT-Spring loaded switch	Raise / Lower Pantograph
14	BLDJ-Spring-loaded switch	Main circuit breaker ON/ OFF
15	BLCP-Spring-loaded switch	MCP AUTO mode ON /OFF
16	BLHO Spring-loaded switch	hotel load ON I OFF Switch
17	ZTEL	Traction limitation Switch
18	BPCS - green	constantSpeedcontrol pushbutton
19	BPPB - red	Parking brake push button
20	BPVR - yellow	Resetting vigilance Push button
21	Emergency Stop button-red	Emergency stop

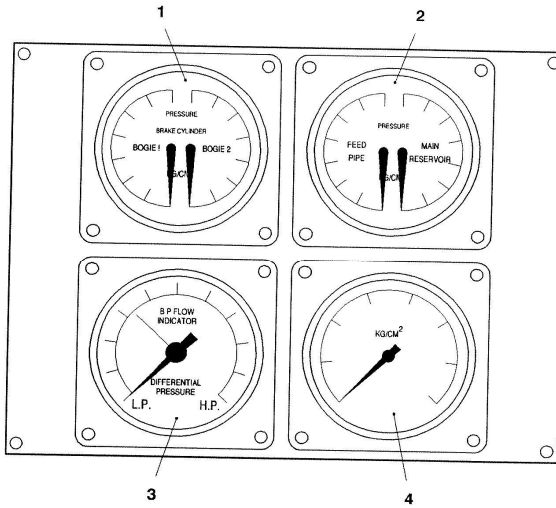


B- Pannel

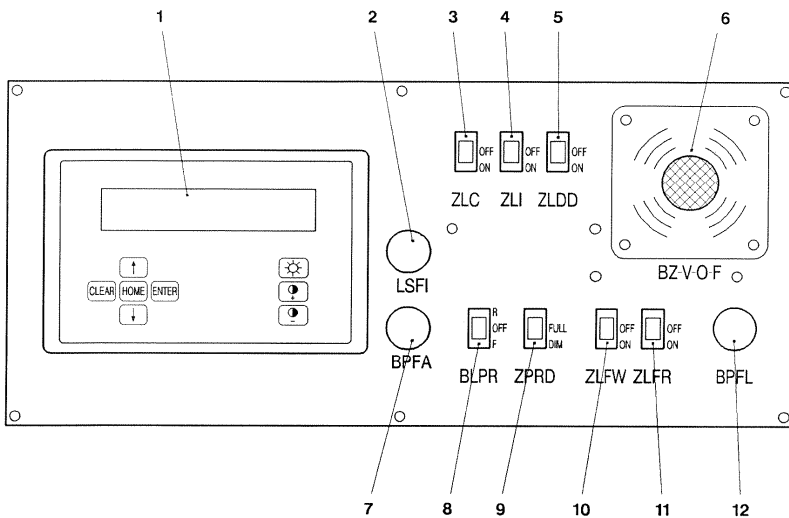
1- B. C. Pressure (Bogie 1+2) 2- FP/MR Pressure Gauge

3-Air Flow Meter

4-Brake Pipe Pressure Gauge

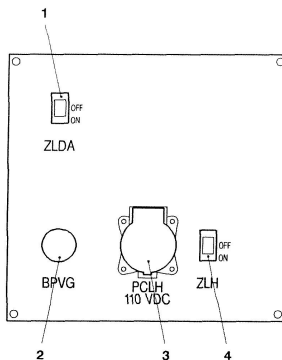


C- Pannel



No	Name	Work
1	Screen	Display of messages diagnosis
2	LSFI - red	Fault message, priority 1
3	ZLC	Switch - Driver's cab lighting
4	ZLI	Switch - Instrument lighting
5	ZLDD	Driver's desk illumination Switch
6	B-Z-V-O-F- Buzzer	Warning signal,3 frequencies
7	BPFA - yellow	Fault Acknowledgement push-button, messages
8	BLPR	Head Light, Bright Switch
9	ZPRD	Headlights, Dim Switch
10	ZLFW	Marker lights, white Switch
11	ZLFR	Marker lights, red Switch
12	BPFL	Emergency flash light - push-button

PANEL-D



- 1- Asstt Driver Desk Lamp
- 2- Vigilance Ack push button
- 3- 110V socket
- 4- 110 V socket ON/OFF button

PNEUMATIC PANEL

- COC-74 = Emergency exhaust coc.(Open)
- COC-70 = BP charging coc. (Open)
- COC-136 = FP charging coc.(Open)
- COC-47 = Dead loco (AR charging) coc.(close)
- PAN-1cock = Panto -1 pneumatic control coc. (Open)
- PAN-2cock = Panto -2 pneumatic control coc. (Open)
- VCB cock = VCB (DJ) pneumatic coc.(open)
- Sand-1&2 cock = Sander pneumatic control cock.(Open)
- Solenoid -30 = Parking brake solenoid valve.
- IG-38 = Pneumatic control key.(Open)
- E-70 = BP charging valve (like Add C-2 relay valve).
- C3W = Distributor valve.

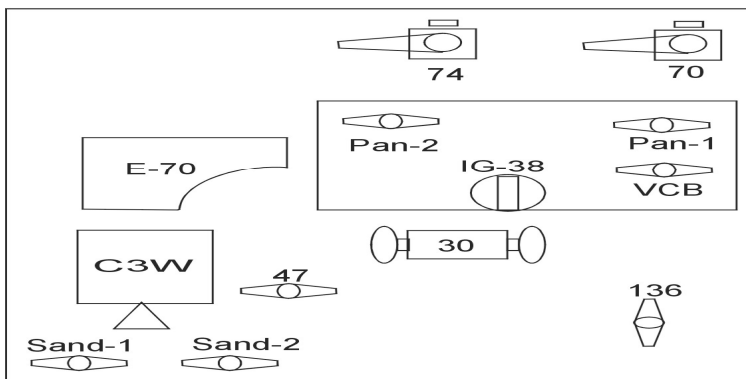


COCK POSITION -

COC	74	70	136	47
LIVE -SU	Open	Open	Open	Close
DEAD (Towed)	Close	Close	Close	Open
As Banker	Open	Close	Close	Close
M.U.LOCO				
MASTER LOCO	Open	Open	Open	Close
SLAB LOCO	Open	Open	Close	Close
DEAD (M.U.LOCO)	Close	Close	Close	Close



Panto selector switch



HB-1 Three phase 415 Volt Aux. Circuit breaker

Three phase 415 Volt Aux. circuit breaker

62.1/1 **63.1/1** **47.1/1** **53.1/1** **55.1/1** **59.1/1**

Single phase 415 /110 Volt Aux.circuit breaker

54.1/1 **56.1/1** **69.61** **69.62** **69.71**

- 1) 62.1/1 - Circuit breaker transformer oil pump -1
- 2) 63.1/1 - Circuit breaker converter oil pump-1
- 3) 47.1/1 - Circuit breaker, main compressor -1
- 4) 53.1/1 - Circuit breaker, traction motor blower -1
- 5) 55.1/1 – C.B., scavenge blower-1 for T M blower and oil cooling
- 6) 59.1/1 - Circuitbreaker,OCV-1for transformer/ converter

Single phase 415 /110 Volt Aux. circuit breaker

- 1) 54.1/1 - Circuit breaker, machine room blower -1
- 2) 56.1/1- Circuit breaker, scavenge blower-1 for machine room blower
- 3) 69.61 - Circuit breaker, cab ventilation



4) 69.62 - Circuit breaker, cab heater

5) 69.71 - Circuit breaker, crew fan

HB-2Three phase 415 Volt Aux. circuit breaker

Three phase 415 Volt Aux. circuit breaker

62.1/2 **63.1/2** **47.1/2** **53.1/2** **55.1/2** **59.1/2**

Single phase 415 /110 Volt Aux.circuit breaker

54.1/2 **56.1/2**

1) 62.1/2 - Circuit breaker transformer oil pump -2

2) 63.1/2 - Circuit breaker oil pump converter-2

3) 47.1/2 - Circuit breaker, main compressor-2

4) 53.1/2 -Circuit breaker, traction motor blower-2

5) 55.1/2- Circuit breaker, scavenge blower-2 for traction motor blower and oil cooling

6)59.1/2 -Circuit breaker, oil cooling unit-2,transformer/ converter

Single phase 415 /110 Volt Aux. circuit breaker

1) 54.1/2 -Circuit breaker, machine room blower-2

2)56.1/2-Circuit-breaker,scavenge-blower-2form/c-room blower

SB-1 PANNEL

152	154	160	237.1						78
127.3/1	127.1/2	127.9/1/1	310.1/1	127.1/1	127.11/1	127.2/1	127.22/1	127.9/1	127.9/2

No&Name of C.B	No&Name of C.B
127.3/1-Circuit breaker Driver's cab	127.11/1-C.B.Power supply Gate Units
127.12-C.B.Pantograph,VCB Control	127.2/1-C.B. Monitoring
127.91/1-C.B.Powersupply 24V/48V	127.22/1-C.B.Electronics,aux.conv
310.1/1-C. B.Lighting front	127.9/1-C.B.Central electronics-1
152-Rotary Switch Failure Mode Operation	127.9/2-Circuit breaker Central electronics-2
160-Rotary switch Configuration	154-Rotary switch Bogie cut-out
78-Relay Over Current Relay	237.1-Rotary switch VCD cut-off
127.1/1-C.B.Electronics S.R.	



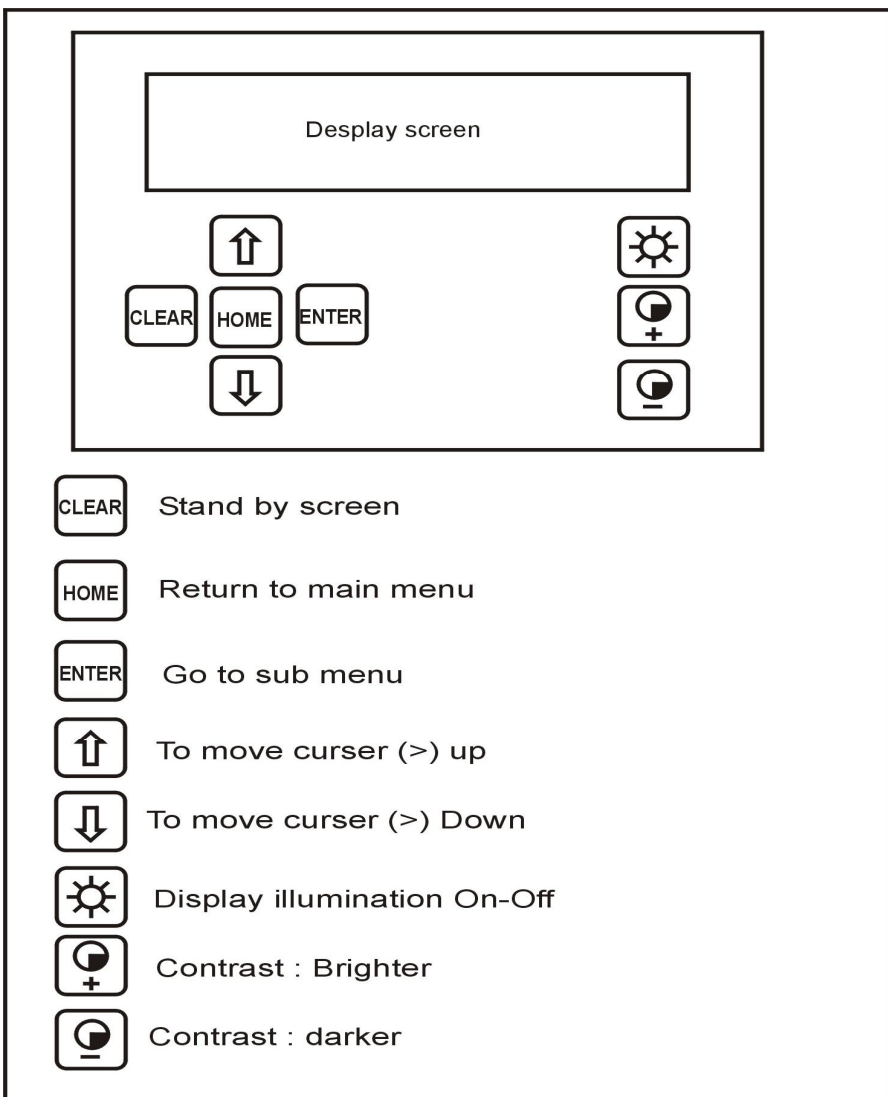
SB-2 PANNEL

110	127.81	127.15	127.7	127.82	48.1	127.3/2	127.91/2	310.7	310.1/2	310.4	127.1/2	127.11/2	127.2/2	127.22/2	127.22/3	127.9/3	127.9/4	127.92	127.24
112.1																			212

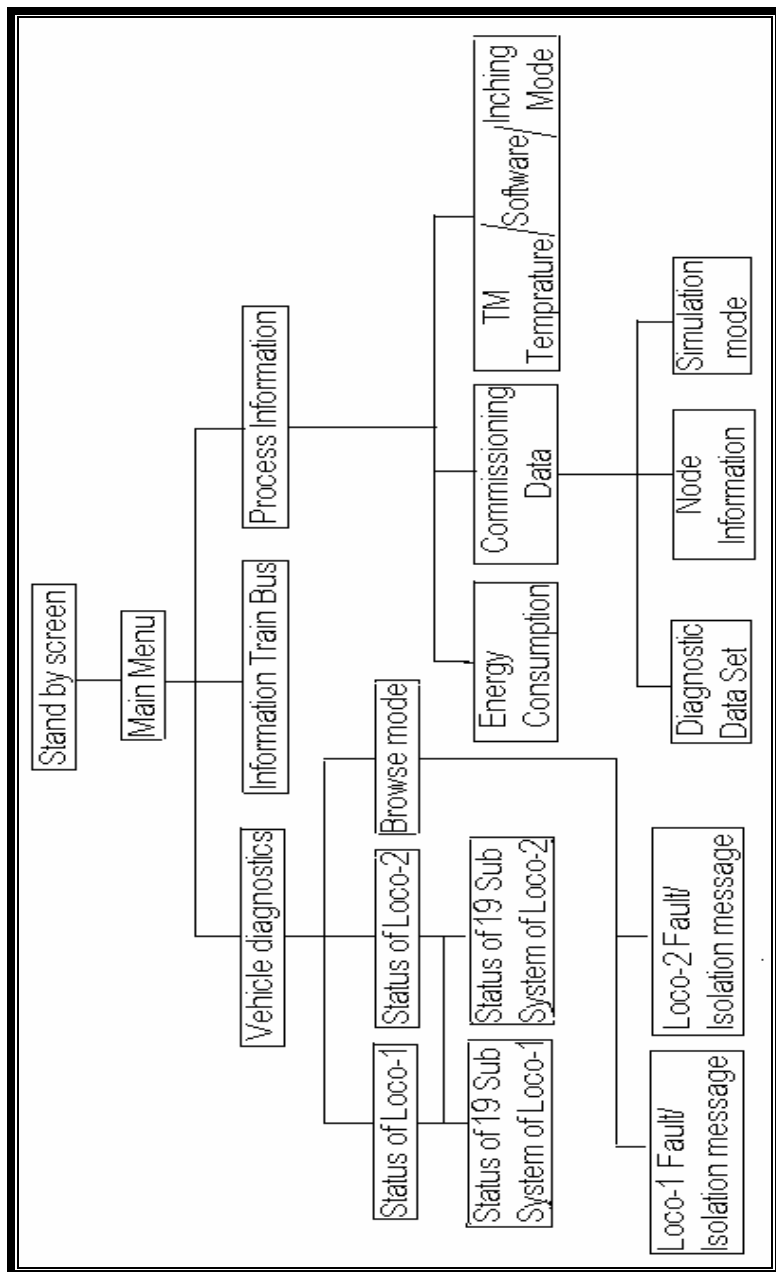
No & Name of CB	No & Name of CB
127.81 - CB Commissioning 1	127.11/2-C.B.Power supply Gate Units
127.15-CB Vigilance control	127.2/2-C.B Monitoring
127.7-CB Pneumatic panel	127.22/2-C.B.Electronics aux. converter
127.82-CB Commissioning 2	127.22/3-C.B.Electronics aux. converter
48.1-CB.Auxiliary comp.	127.9/3-C.B.Central electronics
127.3/2-CB Driver's cab	127.9/4-C.B.Central electronics
127.91/2-CB Power supply24/48 V	127.92-C.B.MEMOTEL speedometer
310.7-C.B. Marker lights	127.24-C.B.Auxiliary Converter
310.1/2-C.B. Lighting front	110-C.B. out put battery charger
310.4-C.B.Lighting machine room	112.1-C.B.control circuit locomotive
127.1/2-C.B.Electronics S.R.	212-Fire detection equipment



Screen



Screen Structure



Faults With Priority-1:

- The action to be taken is entirely clear.
- The action to be taken must be initiated immediately.
- A protective action is initiated (VCB OFF)
- BPFA will glow.
- LSFI will flicker.
- Priority-1 message will display on screen

Faults With Priority-2:

- The action to be taken is not entirely clear.
- The action to be taken does not have to be initiated immediately.
- The faults can be remedied manually by driver.
- BPFA will glow.
- Priority-2 message will appear on screen.

Note:

- If a fault message appear on the screen, the yellow illuminated push button "BPFA" lights up. If this is fault of priority-1, the red indication lamp "LSFI" starts flashing at the same time.
- If a fault message with priority-1 is displayed, a fault message with priority-2 is suppressed on the screen.
- A fault message with priority-2 remains on the screen until it is overwritten by a fault message with priority-1 or by subsequent fault with priority-2.

Isolation Of Sub System:

A constant priority-1 fault or priority-2 fault which occurs twice within one 30 minutes period causes the appropriate subsystem to be isolated.

If sub-system has been isolated it does not issue any more fault message and signals. Only LSFI remains glowing.

Acknowledgement Of Fault Message:**Priority-1**

If a priority-1 fault occurs the fault message must be acknowledged before the loco can travel further, If the train driver fails to acknowledge, the protection measures introduced remain in force. The fault is not remedied. Fault message can be acknowledge by pressing BPFA, if after acknowledgement LSFI extinguish then it indicates now loco is normal, but if LSFI glow continuously it indicates isolation of concerned sub-system.

Priority-2:-They are also acknowledged by pressing BPFA. Even if this acknowledgement is not forthcoming, the locomotive is still able



to operate. The fault message still remains visible on the screen until it is over written by a fault message with priority-1 or by subsequent fault with priority-2.

Indication And Recognition Of Faults

Illuminated push button (BPFA):

Fault indication/fault acknowledgement (Yellow) On occurrence of any fault, the illuminated push button for fault acknowledgement will light up and fault message will appear on the display. The driver is required to acknowledge the fault through the push button. On acknowledgement, the lamp of acknowledgement push button will go off and the display will be cleared.

Fault status lamp (Red) (LSFI) :

In case of priority-1 fault, the fault status lamp will start blinking additionally. On acknowledgement of fault, the lamp will be off but if there is an isolation of a subsystem persisting, then the lamp will continue to glow.

Automatic display of diagnosis messages

If a fault occurs that needs to be transmitted to the driver by means of a diagnosis message, such message will be displayed immediately. At the same time, the illuminated push-button for fault acknowledgement will light up. All diagnostic messages shall be acknowledged by the driver through the fault acknowledgement push button (BPFA). On acknowledgement, the lamp of acknowledgement push button will go off and the display will be cleared. In case of priority-1 fault, the fault status lamp (LSFI) will start blinking additionally. On acknowledgement of fault the lamp will be off but if there is an isolation of a subsystem persisting, the lamp will continue to glow. If the driver fails to acknowledge priority 1 fault, then the loco is shut down. If the driver fails to acknowledge faults of priority-2 then the fault message will remain on the display screen, unless it is overwritten by a fault message of priority-1 or priority-2 another cab.

The fault or isolation messages include following information:

- Locomotive number on which the fault or the subsystem isolation respectively occurred
- Name of subsystem being affected (SSO1 to SS19)
- Type of fault/subsystem isolation and related consequences
- Instructions to the engine driver



STATUS CODE

FIRST DIGIT

- 0- No sub system isolated
- 9- at least one sub system isolated

SECOND DIGIT

- 0- no fault WITH priority -1 OR 2
- 1- at least one Priority-1 fault
- 2- at least one Priority-2 fault

0 0 No fault and no sub system isolated

0 1 No sub system isolated, at least one Priority-1 fault

0 2 No sub system isolated , at least one Priority-2 fault

9 0 At least one sub system isolated , no fault

9 1 At least one sub system isolated , at least one Priority-1 fault

9 2 At least one sub system isolated , at least one Priority-2 fault

STATUS CODE

Display Of Subsystem Status

By means of keyboard entry, the driver can display the status of all subsystems of all locomotives within the train composition. Different display levels furnishing more or less detailed information are provided:

- Survey of all locomotives within the train composition: the status of each individual locomotive is indicated by a two-digit numerical code.
- Survey of all subsystems within one locomotive: the status of individual subsystem is indicated by a two-digit numerical code.

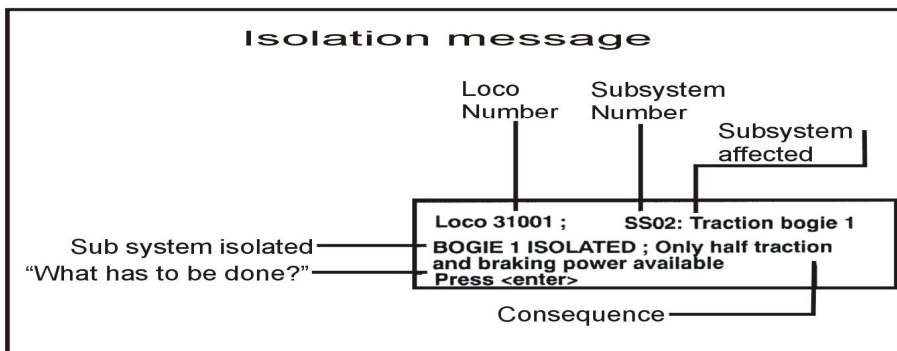
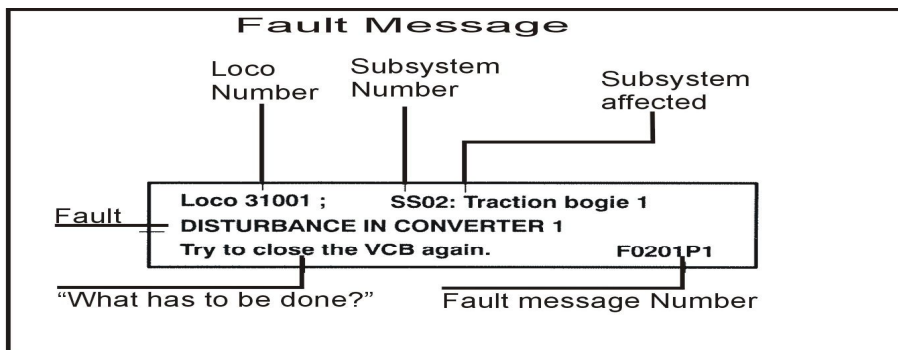
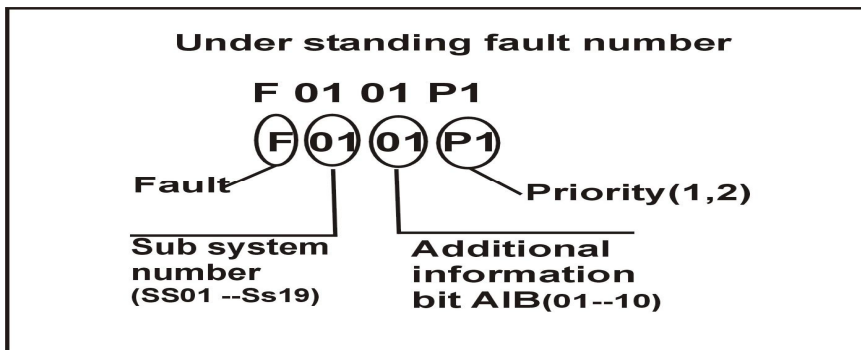
Browse Of Status Messages On Request

All diagnosis messages that appeared at the display since the last activation of the control system may be repeated on request. In this way, the relieving operating personnel is kept informed on the status of the vehicle. If the train composition consists of two locomotives, the driver can select the locomotive that he wants to process first.



Diagnosis Messages-There is three types of messages displayed to the driver on the display unit in the cab:

1. Information messages
2. Fault messages
3. Isolation messages



List of Subsystems

No. of SS	Subsystems	No. Of SS	Subsystems
SS01	Main power	SS11	Auxiliaries HB1
SS02	Traction Bogie 1	SS12	Auxiliaries HB2
SS03	Traction Bogie 2	SS13	Cab 1
SS04	Harmonic filter	SS14	Cab 2
SS05	Hotel load	SS15	Fire detection
SS06	Aux Converter 1	SS16	Speedometer
SS07	Aux Converter 2	SS17	Processor FLG1
SS08	Aux Converter 3	SS18	Processor FLG2
SS09	Battery System	SS19	Train bus
SS10	Brake System		

List Of Isolation Messages

SS01: Main power

MAIN POWER ISOLATED; VCB inhibited

Loco is dead Ask for relief loco

SS02: traction bogie 1

BOGIE-1ISOLATED;Only half T.E.and B.E.available

Inform maintenance staff

SS03: Traction bogie 2

BOGIE 2 ISOLATED; Only half traction and braking power available

Inform maintenance staff

SS04: Harmonic Filter

HARMONIC FILTER ISOLATED

Speak to TLC Reduce speed below 40 km/h

Inform maintenance staff speaks to TLC

SS06: Aux. Converter 1

AUXILIARY CONVERTER 1 ISOLATED

Driving still possible Max. Ventilation level will be reduced

Inform maintenance staff

SS07: Aux. Converter

AUXILIARY CONVERTER 2 ISOLATED

Driving still possible Max. Ventilation level will be reduced

Inform maintenance staff



SS08: Aux. Converter

AUXILIARY CONVERTER 3 ISOLATED

Driving still possible Max. Ventilation level 'ill be reduced

Inform maintenance staff

SS13: Cab 1

CAB 1 ISOLATED Drive from Cab 2 Change to Cab2

Inform maintenance staff

SS14: Cab 2

CAB 2 ISOLATED Drive from Cab 1 Change to cab-1

Inform maintenance staff

SS17: FLG 1

FLG1 ISOLATED

No multiple operations possible, Inform maintenance staff

SS18: FLG 2

FLG2 ISOLATED

No electrical brake power available, Inform maintenance staff

SS19: Train bus

TRAINBUS ISOLATED, Multiple operations not possible

Inform maintenance staff

List Of Information Messages

Information 001

SELF HOLD MODE ACTIVE for 10 mm. MCE will switch off

Change cab or repair train or multiple operations within 10 minutes

Information 002

MORE THAN ONE CAB ACTIVE

Deactivate non-driving cab otherwise after 10 mm. MCE switches off

Information 003

Traction MAY NOT BE AVAILABLE ON THIS LOCO OR ON THE SLAVE LOCO

Bring throttle to 0 . then set again Bring TE/BE throttle to "0" and set it again

Information 004

TRAINBUS CONFIGURATION RUNNING Please wait

Information 005

FULL TE/BE RESTORED+

Information 006

PANTO RAISING Please wait



Battery

- In ABB loco NiCD Battery is used. There are total 78 cells in the batteries which are placed in 2 boxes at either side of the locomotive. Each box contains 39 cells and each battery has 3 cells. Capacity of battery is 199 A-H and output is 110 V. To charge the battery, one battery charger is provided with circuit breaker no. 110 situated in SB2. Main switch for battery is 112 which is placed in a box provided near battery box no. 2. For control circuit supply 1 MCB no. 112.1 is provided in SB2. To show the battery voltage UBA is provided in either cab. MCB 100 is provided in HB-2 for Battery Charger.

Note:- If battery voltage is 92 V for more than 30 seconds, P-2 Fault will appear on the screen.

1-If charging current is reduced by 10 A, P-2 fault will appear on screen.

2-If battery voltage is reduced below 82 V, P-1 message with shutdown of loco will appear.

3-If cab is activated and panto is lowered than 10 minutes CE will switch off automatically.

4-Loco CE get power supply directly from battery and can supply upto maximum 5 hours.

5-For machine room light power supply is given directly through MCB 327.4.

Technical Specification:

Description	Detail	Description	Detail
Cell model	SBL-199	Number of battery boxes	2
Cell type	Nickel/ Cadmium	Total nominal capacity	199Ah
No. of cells per battery	3	voltage of each cell	1.4 V
No. of batteries / battery box	13	Total battery voltage	110 V

Pantograph

Two pantographs are provided on either end of loco. Design of pantograph is same as other AC locos. For raising and lowering of pantograph one switch 'ZPT' is provided on panel 'A' having 3 positions, UP , Off and DOWN.

When we press switch down ward (i.e. position UP) and release - panto will up.



When we press switch upward (i.e position DOWN) and release - panto will lower.

Note: The rear panto will rise automatically.

Selection Of Panto:-Panto selector switch is provided on Pneumatic Panel in machine Room

Position:

- Auto** - Normal position (only rear panto will raise)
- I** - Panto of Cab-1 will raise (2 will isolate electrically)
- II** - Panto of CAb-2 will raise (1 will isolate electrically)

For isolation of both panto pneumatically, there are two COCKS provided on Pn. Panel. PAN-1 & PAN-2. Normally these coc should be opened (Horizontal). For isolating particular panto keep that coc on closed position(i.e Vertical) One circuit breaker (127.12 Circuit breaker Pantograph, VCB Control) is provided for panto circuit in SB-1 cubicle.

Key IG-38 is provided on pneumatic panel to control the air pressure to Pantographs. For air passage to pantographs this key should be kept ON (horizontal)

Auxiliary Compressor (MCPA) :-The auxiliary compressor is used to raise the pantograph. While the control Ckt. Is switched 'ON, the auxiliary compressor controlled by Pn switch start automatically (independent of MCE) till the pressure reaches to 6 kg/cm².

Auxiliary compressor has one drain coc on pneumatic panel. Normally this coc should be horizontal to pipe line (i.e. closed)

Auxiliary compressor – MCB 48.1in SB -2 Panel.

TRACTION POWER

Potential transformer-The primary voltage transformer is situated on the converter roof hatch and attached to the pantograph via the roofline. The primary voltage transformer reduces the catenary voltage, approximately 25 KV, to 200 volts AC. A resistor is placed across the primary voltage TFP to provide a reference load. The output signal is used in three ways;

- 1)Main converter electronics - 4 volt AC
- 2)Catenary voltmeters on the driver's console-10volt DC
- 3)Minimum voltage relay.86

When panto is raised this potential transformer fed to U meter shows the OHE supply in drivers cab.As such we know the availability of



OHE supply before closing DJ and also idea of rising of panto.
However our responsibility of seeing panto is not finished, we have to check the condition of panto physically.

Main Transformer

General: 25 KV, 1-phase, AC Supply is taken from OHE catenary/contact wire through pantograph, roof equipment and VCB (DJ). The same supply is fed to charge the “ parallel induction transformer” where it is stepped down to different operating voltage.

.The tank is filled with transformer oil:

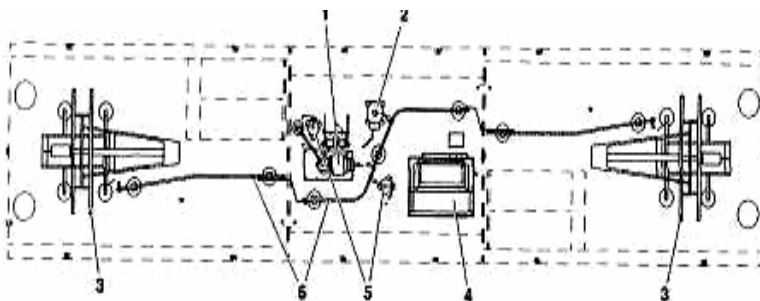
- In order to increase the insulation strength and
- So that the arising heat loss can be dissipated through the circulating oil

The two parallel oil circuits with pumps and heat exchangers are provided

A spy glass is provided in each machine room to check the oil level of transformer oil.

There are 3 secondary winding:

- Convertor secondary winding/Traction winding(4 nos.)
- Aux. Convertor secondary windings.(1 no.)
- Harmonic filter secondary winding.(1 no.)

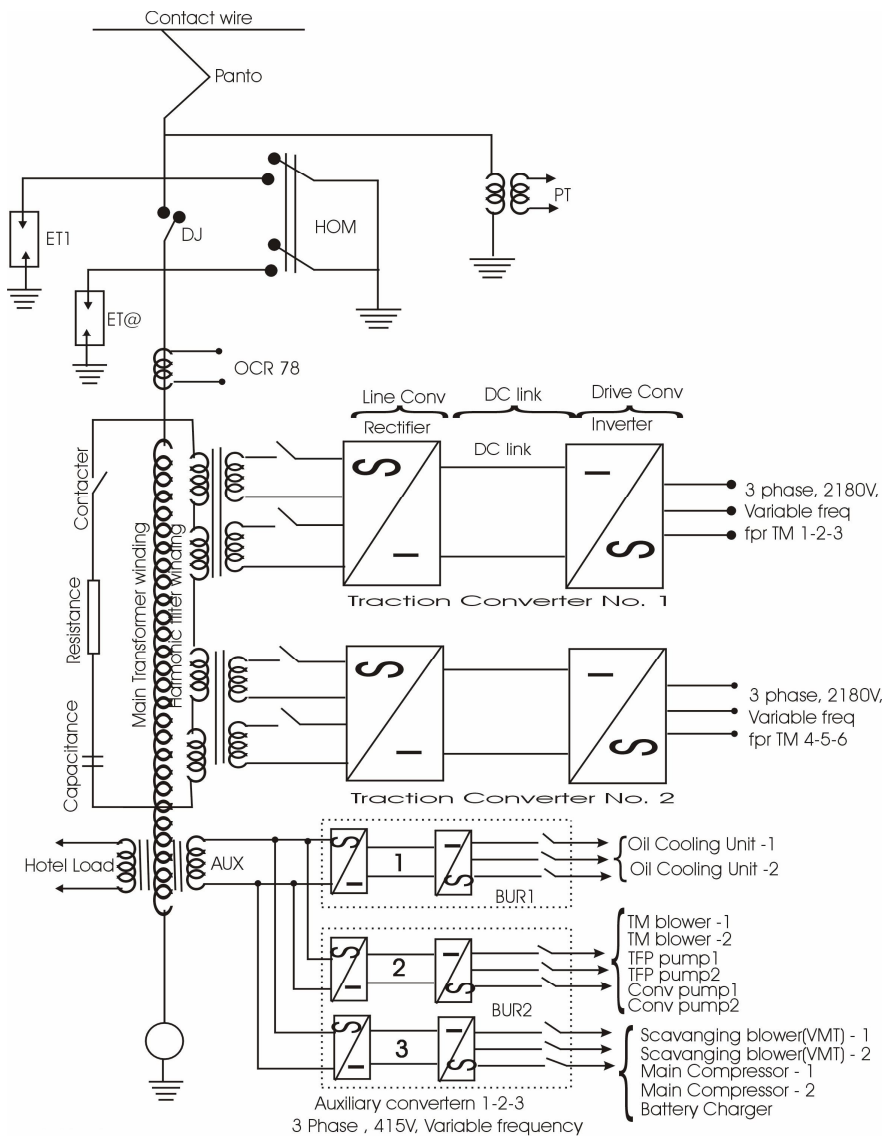


ROOF LAYOUT

S.NO.	parts name	S.NO.	parts name
1	Main circuit breaker	5	Surge arrester
2	Potential transformer	6	Roof line
3	Pantograph		



Traction Power Circuit (WAG-9 & WAP-7)



Traction Power Circuit:

Power from the overhead Catenary is directed to the main transformer, mounted on the locomotive under frame, via the pantograph. The traction circuit is split into two separate circuits after the main transformer.

The traction converters can conduct current from the Catenary to the traction motors to provide propulsion, or can act as in the opposite manner conducting, and rectifying, current from the traction motors to the Catenary. This allows the converter to work in both traction and braking mode. During braking the traction motors act as generators feeding power back into the catenary. The traction converters then act to convert the three phases into single phase for the catenary.

The traction converters provide continuous and automatic control of both speed and torque of the traction motors according to the driver's demand. The converters are controlled by the converter control electronics, and the locomotive central electronics.

Three, 3-phase asynchronous traction motors are connected in parallel to each traction converter.

Traction Converter: (SR)

Traction converter converts single-phase 25 KV AC supply into 3 phase AC, with Variable Voltage (max 2180 V) and frequency (from 0 to 130 Hz) while traction mode and fed it to traction motor group -1.

As such there are two traction converter i.e. Traction converter-1 for TM 1-2-3 and Traction converter-2 for TM 4-5-6 (In case of WAP-5, traction converter-1 for TM 1-2 and Traction converter-2 for TM-3-4)

While electrical braking the traction motor works as a generator and fed generated 3-phase supply to Traction converter. This converter now act in reverse manner i.e. it converts 3 phase AC supply into single phase AC supply and fed it to Transformer. Further main transformer steps up this supply and fed back to OHE. In this way 3 phase loco works as a small powerhouse, which generate supply and share the load by feeding it back to OHE.

SR is cooled by two separate oil cooling unit.

The traction converter has three main sub parts:

1) Line Converter 2) Intermediate DC link and 3) Drive converter.

One spy glass is provided on each SR to check the oil level.

Line Converter :(NSR)

The line converter converts the alternating current supplied from the main transformer into direct current (motoring) and forwards this direct current to the intermediate DC-Link. However, it is also able to convert direct current from the intermediate DC-Link into alternating



current and to supply this alternating current in turn to the main transformer (braking). Both functions are activated by the traction converter control electronics.

DC Link:

The intermediate DC-Link performs two main tasks. Firstly, it smoothes the direct current that flows through. Secondly, it also performs the storage function, thus covering the peak current demand of the line converter or of the motor. It works as a electrical buffer between ASR and NSR

Drive Converter- (ASR):

The drive converter converts the direct current from the intermediate DC-Link into three-phase current for the drive motors (motoring). Conversely, it is also able to convert the three-phase current generated by the drive motors into direct current for braking. The construction of the motor inverter valve set is identical to that of the line converter. The complete assembly of line converter No.1, DC link and drive converter No.1 is termed as "TRACTION CONVERTER NO.1" which in turn converts 1-phase AC supply of main transformer into 3-phase AC supply with variable voltage and frequency and fed to the 3-phase traction motor.

Technical Data Of Traction Converter

	WAG9 / WAP7	WAP5
Coolant oil	SHELL DIALA DX	SHELL DIALA DX
Input volt.	(RMS)2x1,269 Volt	(RMS)2x1,269 Volt
Input current	(RMS)2x1,142 Amp	(RMS)2x1,142 Amp
Input freq.	50Hz	50Hz
DC-Link volt.	2,800 Volt	2,800 Volt
Output volt	2,180 Volt	2,180 Volt
Output current	740 Amp	
freq.	0 -132 Hz	0-160 Hz

Traction Motor:

There are total 6 traction motors provided in WAG-9 / WAP-7 loco. TM 1-2-3 are mounted in bogie-1 and fed from traction converter -1 where as TM 4-5-6 are mounted in bogie -2 and fed from traction converter -2. In case of WAP-5 there are 4 traction motors in which, Traction converter-1 fed to TM-1-2 where as traction converter-2 fed to TM3-4.

Unlike conventional WAG-5/7 individual TM cannot be isolated in this loco only a group isolation is possible. For isolation of TM group



one rotating switch No. 154 is provided in SB-1, its normal position is “ Norm”.

In WAP-7 & WAG-9, the traction motor is forced—air cooled and intended for transverse installation in a 3—motor bogie. The power transmission is effected via a spur—wheel gear. In WAP-5 the TM is fully suspended and connected with gear by hurth coupling by which power is transmitted.

Traction motor is suspended on axle, by axle cap at one end and on link at another end.

To check the oil in gear case one spy glass is provided on each gear case.

To monitor the temperature & speed, sensors are provided in the stator assembly.

Technical Data Of Traction Motor:

	WAG-9 / WAP-7	WAP5
Cooling	Forced air cooling	Forced air cooling
Power supply	Current fed converter	Current fed converter
Temperature recording	2 thermal resistance elements installed in a stator tooth	2 thermal resistance elements installed in a stator tooth
Output P (KW)	Cont850, Max.850	Cont850, Max.1150
VOLT. (V)	Cont2180,Max2180	Cont2180,Max2180
Current Intensity (A)	Cont 270 Max.370	Cont 370 Max.540
Freq. (Hz)	Cont 65,Max.132	Cont80,Max.160



Auxiliary Converter

General:-

The motors used for the auxiliary circuits are 3-phase squirrel cage motors. The cost of maintenance is therefore low. There are total 12 auxiliaries run by 3-phase, 415 V AC supply. This 3-phase 415 V, AC supply is obtained by Auxiliary converter to feed different 3-phase auxiliaries and one battery charger.

The auxiliary circuits are controlled as required. The traction motor and oil cooling blowers run only when required. The control electronics adjusts the blower speeds depending on measured operating temperatures, nominal traction values and speed.

Transformer and traction converter oil pumps work continuously whenever the auxiliary converters are operating.

Auxiliary converter receives single-phase AC 1000 volts supply from auxiliary winding of main transformer.

This single-phase supply is fed to rectifier module auxiliary converter where it converts into DC supply. This DC supply is fed to DC link to suppressed AC pulses in DC.

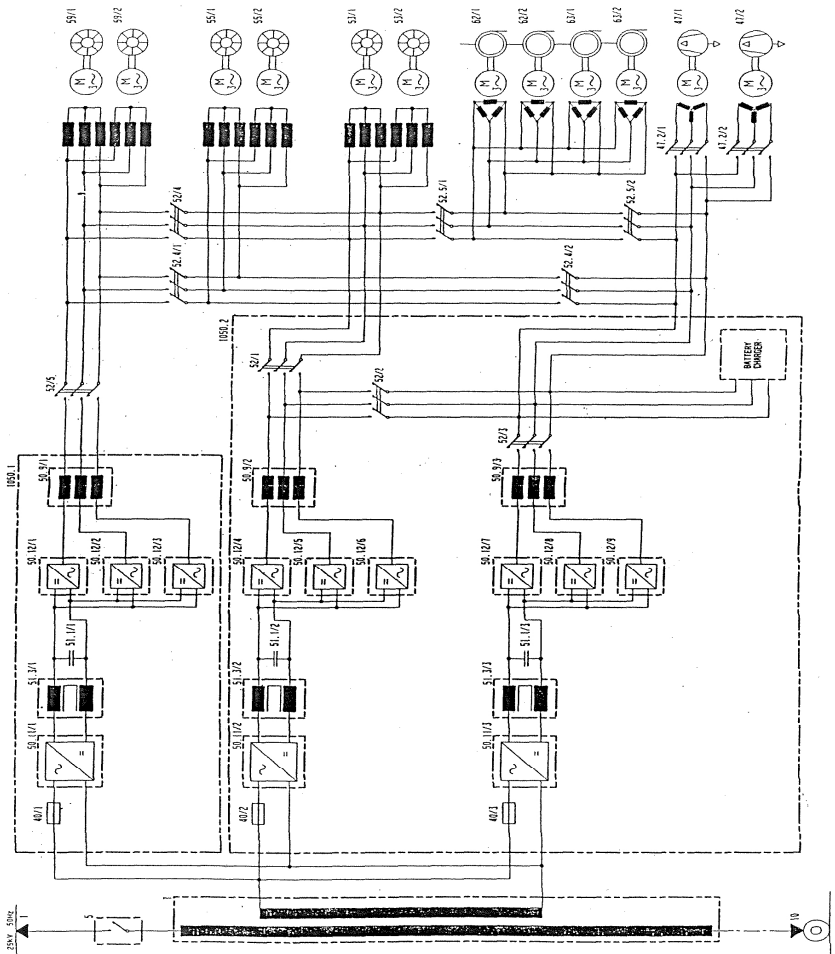
The pure DC supply then fed to inverter module auxiliary converter where it converts DC supply to 415V, 3-phase AC supply with variable amplitude of voltage and frequency and then fed to different 3-phase auxiliaries.

There are three, auxiliary converters which get single phase 1000 volts AC input supply from common auxiliary winding and fed 3-phase 415 volt out put to different 12 auxiliaries and one battery charger.

Auxiliary converter-1 is placed in cubicle called BUR-1 situated in machine room no-1 where as aux converter no. 2 and 3 are placed in cubicle BUR-2, which is situated in machine room no. 2



Auxiliary Power Circuit-



3-phase, 415 volt Auxiliaries

Following 3-phases, 415-volt auxiliaries are provided on this loco, which are fed from Auxiliary converter no. 1, 2 and 3.

Auxiliary	Location	Function	MCB
Load on Auxiliary Converter no.- 1			
Oil Cooling Blower-1 (OCB-1)	Machine Room-1	To cool transformer and SR-1 oil in cooling unit-1 by taking air from roof	59.1/1 In HB-1
Oil Cooling Blower-1 (OCB-1)	Machine Room-2	To cool transformer and SR-2 oil in cooling unit-1 by taking air from roof	59.1/2 In HB-2
Load on Auxiliary Converter no.- 2			
Tr. Motor Blower-1	Machine Room-2	To cool bogie –1 TM group by forced air.	53.1/1 In HB-1
Tr. Motor Blower-2	Machine Room-1	To cool bogie –2 TM group by forced air.	53.1/2 In HB-2
Transformer oil pump-1	Under Truck Below Machine room-1	To circulate oil from TFP to Cooling Unit-1 & back	62.1/1 In HB-1
Transformer oil pump-2	Under Truck Corridor-2	To circulate oil from TFP to Cooling Unit-2 & back	62.1/2 In HB-2
Tr. Converter Oil Pump-1	Machine Room-1 Near SR-1	To circulate oil from SR-1 to Cooling Unit-1 & back	63.1/1 In HB-1
Tr. Converter Oil Pump-2	Machine Room-2 Near SR-2	To circulate oil from SR-1 to Cooling Unit-2 & back	63.1/2 In HB-2
Load on Auxiliary Converter no.- 3			
Main Compressor-1	Under Truck below Machine room-1	To create MR pressure to 10.0 kg/cm ²	47.1/1 In HB-1
Main Compressor-2	Under Truck below Machine room-2	To create MR pressure to 10.0 kg/cm ²	47.1/2 In HB-2
Scavenging Blower-1	Machine Room-1 Near TMB-2	To clean dust from air filters of TMB-2 & OCB-1	55.1/1 In HB-1
Scavenging Blower-2	Machine Room-2 Near TMB-1	To clean dust from air filters of TMB-1 & OCB-2	55.1/2 In HB-2
Battery Charger	Within Auxiliary Converter Cubicle	To charge battery	110 In SB-2



Load Sharing

Generally all the 3 Auxiliary converters are loaded equally, but in case of failure of any converter another converter shares its load. In such condition, frequency of aux. Motor drops from 50 Hz to 37Hz.

Load sharing after isolation of any aux. converter.

Aux. Conv-1 Isolate	Load Aux.Conv-2	Oil cooling blower 1-2,Tr. Motor blower 1-2 Scavenging blower 1-2
	Load on A Conv.-3	MCP 1-2, Transformer pump 1-2 Converter pump 1-2, Battery Charger
Aux. Conv-2 Isolate	Load Aux.Conv-1	Oil cooling blower 1-2,Tr. Motor blower 1-2 Scavenging blower 1-2
	Load on A Conv.-3	MCP 1-2, Transformer pump 1-2 Converter pump 1-2, Battery Charger
Aux. Conv-3 Isolate	Load Aux.Conv-1	Oil cooling blower 1-2,Tr. Motor blower 1-2 Scavenging blower 1-2
	Load on A Conv.-2	MCP 1-2, Transformer pump 1-2 Converter pump 1-2, Battery Charger

Note: -

1. Machine Room blower and scavenging blowers (2+2) are directly supplied and starts as soon as VCB is closed independent of MCE in driving as well as in cooling mode.
2. The oil pump for transformer and converter works continuously during operation of converter.
3. TM blower and, oil cooling blower and scavenging are run as per requirement. The control electronics adjust the selected stage of measured operating temperature; nominal traction value and speed range lower - moderate – maximum. However, RDSO has issued instructions for the removal of 24 Hz from BUR1 to minimize OCB failure.

Main Compressor 1 & 2

Starting:

For starting the main compressor a spring-loaded switch (BLCP) is provided on panel, 'A' which is having 3 positions.

1. 'OFF' position - For stopping compressors.
2. 'AUTO' Position - Compressor 1&2 will work alternately according to cut in and cut out of cycle.
3. 'MAN' Position - Compressors work continuously irrespective of MR pressure. This is spring-loaded position.



Auto Position

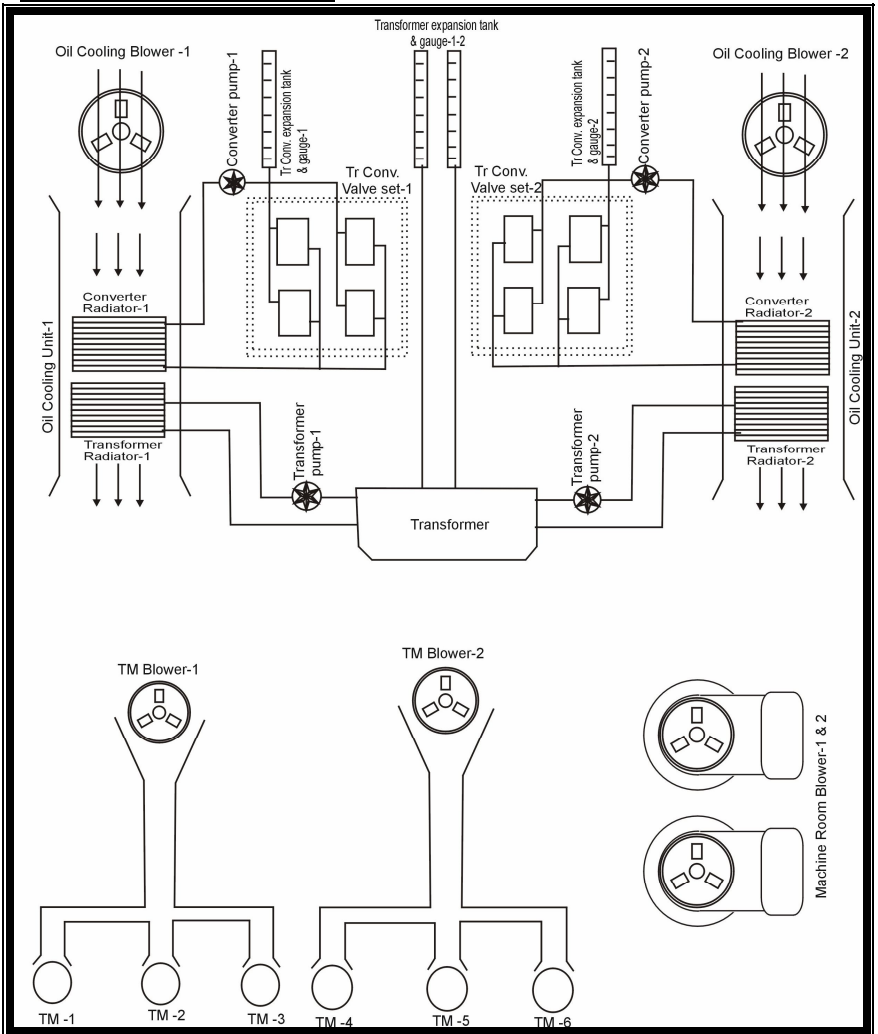
1. Air pressure goes below 8 kg/cm² Only one compressor start alternately up 10 kg/cm².
2. Air pressure goes below 6.4 Kg/Cm². Both compressors start till pressure reaches to 10 kg/cm²
3. Air pressure goes below 5.6 kg/cm²: "Low pressure, main reservoir" message appears on the screen with priority-1 fault along with LSFI indication. No TE/BE is possible till MR pressure reaches to 6.4 kg/cm². Both compressors will start till MR pressure reaches to 10 kg/cm².
4. After getting the start command, compressor starts but it takes 25 seconds to ramp up and unloading and start actual pumping there after. During this delay, pressure drops by 1 to 1.5 kg/cm². So if we sees the gauge cut in cut out setting will be appear as 7 to 10 kg/cm² instead of 8 to 10 kg/cm².

SINGLE-PHASE 415 V/110 V AUX.CIRCUIT:-The auxiliary transformer is located in cubicle-1(HB-1) and supplies following systems with 1-phase power. This circuit is independent of CE and all these auxiliaries work in Driving as well as cooling mode and start as soon as VCB closed.

Auxiliary	Location	Use	MCB
Single phase 415 Volts			
Machine Room Blower-1	Machine Room-1	To cool machine room by ducting and limit the temperature of C.E. parts below 70 ⁰ C	54.1/1 In HB-1
Machine Room Blower-2	Machine Room-2	-do-	54.1/2 In HB-2
Scavenging Blower for Machine room Blower-1	Machine Room-1	To clean dust from air filters of Machine Room Blower-1	56.1/1 In HB-1
Scavenging Blower for Machine room Blower-2	Machine Room-2	To clean dust from air filters of Machine Room Blower-2	56.1/2 In HB-2
Heater Element	In Both cab. Inside Desk	To deliver heat for keeping the cab warm	69.62 In HB-1
Single phase 110 Volts			
Crew Fan: 4 nos.	2nos. in Both cabs	Crew ventilation	69.71 In HB-1
Cab Ventilation Blower- 2 nos.	One in Both cab Inside Desk	To expel heat of heater element into the cab.	69.61 In HB-1



COOLING CONCEPT



Harmonic Filter:- Line harmonic filter is connected with primary winding of main transformer which consist of resistances and capacitor. This harmonic filter reduces/suppressed the high frequency harmonics to avoid disturbances in signaling. If the harmonic filter get bypassed by the system, the speed of the loco / train will be automatically restricted up to max 40 KMPH by CE.



(Different operations)

How To Energies The Loco:-

1. Check the machine room and cubicle HB1/2, SB1/2 and pneumatic panel and ensure that all Circuit breakers, rotating switches and cock at Pn. Panel are at Normal position and ensure that key 'IG-38' is provided on pneumatic panel. Also ensure that panto selector switch is at normal position.

2. compartment light, it ensures closing of main circuitry breaker 112 of battery.

3. Put battery additional circuit breaker No.112.1 to 'ON' position in cubicle SB-2. Also ensure that CHBA circuit breaker no. 110 (SB-2) is at ON position.

4. Go in operating cab.

5. Insert A-9 handles at 'Neutral' position and keep it in 'RUN' position by lifting lock.

6. Insert 'BL' key at 'OFF' position and turn it to 'D' position

a. Light of screen (panel-C) and Memotel will get ON.

b. MCPA will start (if pressure is less).

c. UBA will deviate to 110 volts.

d. LSDJ will glow.

All above indications indicates that Control Electronics is get 'ON'.

7. The message "Loco is in configuration, please wait" will appear on the screen and self testing is done for 20 seconds.

8. During testing, all pilot lamps will glow and extinguish, Bogies-1 & 2 meter will deviate both in TE/BE mode and come to -0

9. After testing FLG No. 504, will be displayed on the screen, Now press 'ZPT' in 'UP' mode for raising of pantograph and confirm the touching of panto with contact wire by seeing physically also U-meter will deviate and indicate the value of OHE voltage.

10. No.550 will display on the screen- now press BLDJ for closing VCB and check 'LSDJ' is extinguished. Now DJ will close, loco will energize and the all auxiliary will get start automatically.

11. Ensure that BLCP is at AUTO position.

12. No.570 will appear on the screen.

13. After MR pressure build up to 6.4 kg/cm^2 , set Reverser to F/R as per requirement. (FLG 590 will show on the screen.)

Note:- If the reverser is set without confirming the MR pressure i.e above 6.4 kg/cm^2 , then P-1 message will be there on screen- indicating wrong operation.



Apply loco brakes. Now release the parking brakes. Ensure BP pressure to 5 kg/cm^2 Ensure AFI is at Zero.

15. Now operate throttle in TE direction.

16. TE /BE meter will deviate in TE side indicating that traction is available. No. "596" will appear on the screen.

17. Check the loco brake power. Release loco brake.

18. Now you can move the train / loco.

Note:

Priority -1 message will appear on the screen if: -

1. If Reverser is put on position F or R before when MR pressure is below 6.4 kg/cm^2

2. If throttle is operated without releasing parking brakes.

3. If throttle is operated without recharging BP to 5 kg/cm^2 .

Information message will appear on the screen if :-

1. If throttle is operated before mode information No. 590.

Operation Of BL Key: -BL key is operated for following mode:

1. DRIVING MODE :- (Off - D)

2. SELF HOLD MODE .- (D - Off)

3. Switching OFF control electronics: (D - Off - C - Off)

4. COOLING MODE:-- (D - Off - C - Off - C)

Driving Mode:

This mode is used to drive the loco. To achieve this mode driver has to:

1) Insert BL key in 'OFF' position.

2) Turn it clockwise from 'OFF' to 'D'

3) By doing this, following indications will confirm the driving mode:

a) LSDJ will glow

b) UBA will show battery voltage.

c) Display screen will activate.

d) Memotel screen will activate.

Control electronics will get ON.

Self Hold Mode:

1) Open DJ , lower the pantograph

2) Rotate 'BL-key' from 'D' to 'OFF': Now control electronics will remain 'ON' for 10 minutes and then it will become 'OFF' automatically. This mode is used while changing the cab.

Switching Off - Control Electronics:

Driver has to switch off control electronics in many cases like;

a) Making the loco dead.

b) During troubleshooting.

c) For taking the isolated sub system in service.

d) Before e resetting circuit breaker or before rotating any switch.



To switch off the control electronics do the following:

- 1) Stop the train
- 2) Open the DJ and lower the pantograph.
- 3) Operate BL-key from 'D' to 'Off'
- 4) Operate BL-key from 'Off' to 'C' and wait until display screen, LSDJ, and UBA goes off.
- 5) It indicates that CE is get 'OFF' and now rotate it from 'C' to 'OFF'

Note :

- 1) C.E. get automatically 'off' after 10 minutes if BL-key is rotate from 'D' to 'OFF' (as explained in self hold mode.)
- 2) C.E. will get 'off' automatically after 10 minutes in driving mode also, if panto is remain lower for more than 10 minutes.
- 3) If the key switch is moved from Pos. "D" to Pos. "Off" without opening the VCB, and the panto graph lowering, this will initiates an automatic shutdown on loco.

Cooling Mode:-Whenever temperature of control electronics is increases above 70⁰ then lamp LSCE glows on Panel 'A' and throttle will not respond.

Control/Coast the train to stop at suitable place like starter etc.

- 1) Keep the throttle on '0'.
- 2) Try to stop the train at suitable place.
- 3) Inform TLC/SCOR regarding cooling.
- 4) Keep SA9- at applied condition and A-9 to emergency.
- 5) Open VCB and lower the pantograph.
- 6) CE - Off as per procedure – (D – Off – C – Off – C)
- 7) Again put 'BL key' from 'Off' to 'C' and ensure that UBA shows battery voltage and LSDJ glows, Screen is Off - no node information.(Note CE is OFF)
8. Now raise the panto, close the VCB- LSDJ will extinguish and loco will energies in cooling mode.
9. Machine room blowers & scavenge blowers will start automatically to cool the machine Room. Ensure working of machine room blowers.
10. When the machine room temperature goes below 70⁰C then LSCE will extinguish.
11. Now Open the VCB, lower the pantograph.
12. Put BL from 'C' to 'Off' and 'off' to 'D' and energize loco & resume traction.

Operation Of Reverser :-Reverser has following 3 positions.

Position 'F'	= Forward
Position 'O'	= Neutral
Position 'R'	= Reverse

Throttle and reverser are interlocked mechanically.



Driving:

1. After creating MR pressure above 6.4 kg/cm^2 and node information no. 570.
2. Move the reverser into desired position.
3. Release the parking brake if applied
4. Put A9 to 'RUN' position & ensure BP 5 kg/cm^2
5. Check AFI is not deviating.
6. Set the TE/BE throttle to desire position.
7. Put SA9 handle to 'Release' position.
8. In order to increase adhesion and to avoid wheel slipping use sanders.
9. Bogies 1 & 2 meters will show in TE side and loco started

Braking:

1. Set the TE/BE throttle to - '0' or move towards braking side as per requirement..
2. Move A9 from 'RUN' to 'Initial Application'. If more brake force is required move the A9 handle to desire position between 'Initial Application' and ' Full Service' & vice versa gradually.
3. Reg. Braking is possible up to 0 KMPH.
4. When train stops, apply SA9.
5. Max. Brake force is 260 KN in WAG-9/WAP-7 & 160 KN in WAP-5.

Note:-Train brakes can be applied with Regenerating brakes but Loco brake can not be applied simultaneously with Regenerating brakes.

Operation Of Throttle:

TE/BE Throttle

The TE/BE throttle controls traction and the electric braking effort of the locomotive with angle transmitter and auxiliary contacts.

The TE/BE throttle has the following three end positions:

For Traction

Position 1/3	33% tractive effort
Position 2/3	67% tractive effort
Position TE max	100% tractive effort
Position "0"	no tractive / no braking effort

For Regenerative Braking effort

Position 1/3	33% braking effort
Position 2/3	67% braking effort
Position TE max	100% braking effort

NOTE:

If TE doesn't increase beyond 300 KN in WAG-9/WAP-7 & 150KN in



WAP-5 then Driver should check ZTEL switch on 'A' Panel whether it is 'ON' or 'OFF', ZTEL should be kept 'OFF'.

The % tractive/braking effort is indicated on the two-tractive/braking meters on panel A.

Failure Mode Operation

This mode allows the locomotive to operate even if the angle transmitter of the TE/BE throttle has failed.

In this mode, driving and electrical braking are controlled by the auxiliary contacts on the TE/BE throttle.

Driving in failure mode

Driving in failure mode becomes necessary if the difference between auxiliary contacts and the absolute value of the angle transmitter is greater than 25% of the full range because of a defective master controller.

The following steps are initiated with a time delay of 2 sec:

1. Traction is set to 0 by the MCE.
2. A priority 2-fault message is displayed.
3. The driver must now move the rotary switch "152-Failure Mode Operation" in the machine room (SB1) into position '1'. This deactivates the angle transmitter.
4. The driver must move the TE/BE throttle into position "0".
5. The driver must acknowledge the fault message.
6. The driver can now select a new TE/BE throttle value carefully. Position '0'-Fine control though out the range by angle transmitter. Position '1'-fine control in steps though auxiliary contacts.

Loco Brake Testing:

- 1) Apply loco brakes by SA-9
- 2) Ensure that brake cylinders registered 3.5kg/cm² pressure in WAG9 & 5 Kg/CM² disk brake pressure in WAP5.
- 3) Release parking brakes and release A-9.
- 4) Operate MPJ to forward.
- 5) Move throttle in traction and give 45 % or 150 KN tractive effort in WAG9 & 30% or 100 KN. tractive effort in WAP5.
- 6) Loco should not be moved.

Note:- Presently there is no procedure for loco brake testing approved by RDSO. Same to be confirmed by RDSO or CLW.

How To Change The Cab :

Single Unit

1. Apply loco brakes by SA-9
2. Open 'DJ' by pressing BLDJ at 'OFF'
3. Lower the panto by pressing ZPT at 'DN'Operate
4. BL key from 'D' to 'off' and remove it (CE will remain ON for 10").



5. Set automatic brake controller to position 'Neutral' and then remove handle
6. Release direct brake handle.
7. Go in another cab and energize it in "Normal" way.

Note:

- * If BL key is taken 'OFF' without opening DJ and lowering panto, loco will be shutdown as emergency shutdown will initiate on loco.
- * During normal driving if BL key is kept 'OFF', emergency brakes will get applied as emergency shutdown will initiate on loco.

*After moving the key switch 'BL' to position 'O', the MCE remains active for 10 minutes. The change of driver's cab should take place during this time, If the MCE has to be restarted, it takes longer to set up the locomotive because Peripheral tests have to be carried out.

Banking Mode:-When it is required to use loco as a banker i.e. use of TE / BE without charging BP, at that time loco should be operate in banking

mode.

Procedure:

- 1) Trip the VCB and Set switch "ZBAN" to position "ON" (Panel A).
- 2) Close coc 70 & 136 provided on Pn panel.
- 3) Set up the loco in the normal manner.
- 4) BP pressure will be drop to 0, but when coupled with master loco, its BP will rush into BP pipe of this loco which will seen in the gauge.
- 5) Press BPFA

Note:-During the Set Up, the train driver receives a priority-2 messages that banking mode is active.

Constant Speed Controller:- This system enables the train to maintain a constant speed automatically and can be activated at any speed above 5 KMPH by pressing illuminated push button 'BPCS'.

The control electronics and GTO controls the constant speed by giving tractive or braking effort to the TM as per requirement irrespective of position of throttle (ATDC-Angle transmission driver Controller) i.e. TE/BE .

The actions of CSC are cancelled in following conditions.

1. Moving of throttle.
2. Pressing 'BPCS' while CSC is active, lamp will extinguished.
3. Drop in 'BP' by 0.25 kg/cm^2 and above.
4. BC pressure more that 0.6 kg/cm^2



CSC is activated only when

1. Speed is more than 5 KMPH
2. Throttle in either TE or BE side.
3. Train Br. and loco Br. are not applied
4. BPCS is pressed once, lamp will lit.

Some thing Important:

- 1) To minimize oscillation, the CSC should be set during a slow acceleration phase.
- 2) CSC will maintain the speed only up to max TE / BE. Speed may vary if required TE / BE is more than loco capacity. So, in an undulating area the speed may vary +/- 10 kmph to preset value. So in such areas BPCS should be pressed at the speed with margin of 10 KMPH. Also in some areas where special driving technique is required, CSC may stall the train. So, in such areas, instead of using CSC, L.P. should use his best driving technique by operation of throttle.
- 3) Also if CSC is used in very frequent up / down grade region, the loco will trigger for TE to BE and BE to TE very frequently with heavy amplitude, which is not good as far as driving technique is conserved.
- 4) While canceling CSC ensure that needle position of TE/BE meter and throttle are not just opposite. If so, first bring the throttle as per needle.

Emergency Stop Push Button

One red colored and arrowed push button is provided on panel 'A' at such a place that driver as well as Asst. driver can operate it. In normal condition it remain projected out. In case of an emergency if drivers/Asst. push this button, button go inside and remain pressed and following actions initiated.

1. VCB get opened.
2. TE/BE comes to '0'
3. Panto lowered
4. BP drops to 0 Kg/cm² - Train/Loco brakes applied.

5. LSFI /BPFA glow with message.

"Emergency shutdown on the loco" on screen and train will stop with emergency brakes.

Resetting:

- 1) Bring TE/BE throttle to '0'.
- 2) Press "emergency stop push button" slightly and rotate it clockwise as per arrow indication on it, the button will comes out from pressed condition.



- 3) Press BPFA and acknowledge the fault and node information will appear.
- 4) Flasher light will lit.
- 5) Energies the loco and work the train as per procedure given.

Automatic Vigilance Control System:

VCD is meant for checking and keeping the driver alert. It is a safety device. A foot switch of VCD is provided below driver's desk in each cab, also press button 'BPVG' is provided on drivers' desk on Asst. side.

Driver/Asst. driver is expected to activate VCD within every 60 seconds interval by one of the following way.

1. Press VCD "Foot switch" OR
2. Press BPVG (Green) OR
3. Operate throttle in TE/BE in different of more than 3% OR
4. Operate 'Sanders'.

If one of the above exercises is done, the driver is considered alert and the 60 seconds cycle get reset.

If none of the above activities are done once within 60 seconds, then buzzer will sound and 'LSVW' will glow for next 8 seconds.

Within these 8 second acknowledge the VCD by pressing 'vigilance footswitch' or 'BPVG', if not acknowledged, VCD will apply penalty with emergency braking ($2.5 - 3.0 \text{ kg/cm}^2$). TE/BE will become '0' & BP pressure will drop 2.5 to 3.0 kg/cm^2 .

Note:-For VCD, the speed of train should be more than 1.5 KMPH.

Dead Mans Mode:

If VCD 'Foot switch' lies remain pressed for more than 60 second, then the system will go automatically in "Dead Mans" mode, & buzzer will sound, if not released with next 8 second, VCD penalty will be applied with emergency braking. The BP will drop 2.5 to 3.0 kg/cm^2 .

Resetting Of VCD Penalty Brakes:

1. Bring throttle to '0'
2. Wait for 160 seconds in WAG-9/WAP-7 and 120 seconds in WAP-5 without switching ON/OFF of the electronics
3. Press "BPVR" to reset VCD, LSVW will extinguished and buzzer will stop.
4. Press and release VCD "Foot switch".
5. Press 'BPFA' for acknowledging fault message.
6. MR/BP pressure would come back to normal
7. Resume 'Normal' traction.



Isolation Of VCD :

If driver is acknowledging VCD correctly as per procedure, but till VCD penalty is applying, in that case it is assumed that VCD is malfunctioning. In such cases stop the train, take safety measures. VCD can be bypassed by keeping switch no. 237.1 (SB-1) on '0' position. Remark should be given in log book, TLC is to be informed and proceed carefully.

PASSING NEUTRAL SECTION (SU)

Before approaching neutral section:

- 1-Ensure that MR pressure is between 8.5 to 10 kg/cm²
- 2-Bring TE / BE throttle to '0' gradually before 250M board.
- 3-At DJ open board, open DJ by BLDJ, LSDJ will glow, Aux. sound will stop, but U meter will show OHE supply.
- 4-At actual neutral section location, OHE meter will comes down to "0" and will shoot up when neutral section over.
- 5-In PTFE type neutral section, at higher speed, needle will just fluctuate.
6. At DJ close board close VCB (DJ), and resume normal traction.

In case MU operation

- a)The command from the master locomotive to switch the main circuit breaker "ON", "OFF" also controls the main circuit breaker on the slave loco.
- b)The VCB of the slave loco is switched on after a delay of 0.5 seconds following the switch on of the master loco. When switching off, there is no delay.
- c)While passing neutral section follow the procedure mentioned for SU, but DJ should be closed after passing one mast after DJ close board.



PROGRAME SWITCHES

152 Rotary switch Failure mode operations

Position

0- Normal Position - Fine control throughout the range

1- Failure mode - Fine control in steps through aux.contacts

When throttle is not responding then Driver can keep this switch from 0 to 1 and now same throttle will respond, called failure mode operation.

154 -Rotary switch Bogie cut-out

Position

NORM : Traction converter-1 & 2 (All TM's) in service

I: Traction converter-1 (TM 1-2-3 WAG-9/WAP-7) (TM1-2 WAP-5) isolated

II: Traction converter-2 (TM 4-5-6 WAG-9/WAP-7) (TM 3-4 WAP- 5) isolated

I+II: Traction converter-1&2(TM1-2-3&4-5-6 WAG-9/WAP-7) (TM1-2 & 3-4 WAP-5) isolated

160 - Rotary switch Configuration

Position

1	:	Normal	Normal mode
0	:	Shunting	(Max Speed 15 KMPH) mode

237.1- Rotary switch Vigilance device cut-off

Position

1	:	Normal	VCD is in service
0	:	Isolation	VCD is isolated



Brake System:

There are 5 types of brakes available on this loco.

1. Automatic Train Brake (Pn)
2. Direct Brake (Pn)
3. Parking Brake (Spring Loaded)
4. Anti Spin Brake.(Pn)
- 5-Regeneration Brakes.(Elect)

Note: All the brake system functions are monitored by brake electronics and if there is any wrong configuration, the brake electronics do protective action along with P-1 message on screen. One circuit breaker is also provided in SB-2 for this brake electronics. In case of failure of brake electronics, crew should check this MCB.

Automatic Train Brake (A-9)- In both the cabs one Drivers Brake Controller (DBC) is provided which is the electrical switching equipment.

The function of the driver's brake controller is to generate a variable voltage code in accordance with the position of the controller handle and to perform a number of ancillary electrical functions. A pneumatic valve is incorporated to provide a pneumatic emergency brake function in addition to the electronically controlled emergency brake.

This brake is utilized for charging and discharging the B.P. Pressure to apply/release train brake and also loco brakes in conjunction working.

This A-9 is remaining active in active cab only. Once the BL key is rotate from D to OFF, this handle will not functions, but its emergency position will act. This valve has following 6 positions

Handle position

Release

Running

Initial Application

Full Service

Emergency

Neutral

Pressure (kg/cm²)

5.4 ± 0.05 (LPO)

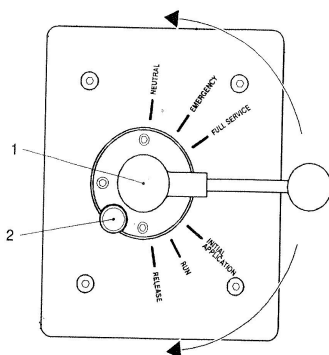
5 ± 0.05

4.60 ± 0.05 Variable

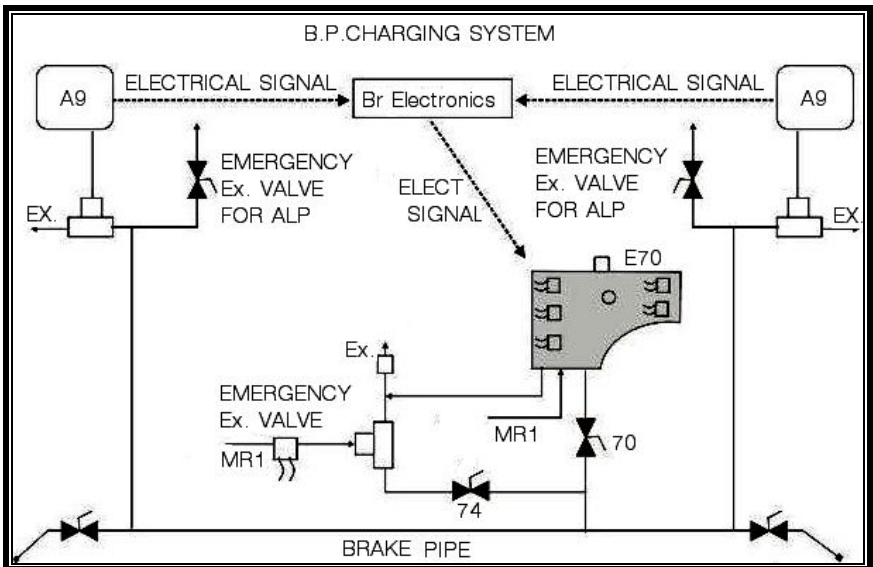
3.35 ± 0.10

0

0



B. P. Charging system



Running:- When the handle of the brake controller is placed in the 'Running' position, the 'Running' E.P. valve energized the E-70 valve and allow the 5 kg / cm² pressure to go in brake pipe via cock no.70.

As such A-9 gives electrical command to valve E-70 and E-70 allows 5 Kg / cm² pressure to enter in BP. The system for charging the brake pipe is fully self-maintaining.

Note: coc 70 performs the function of A-8 (L&T) coc as in WAG-5/7 locos). This coc is provided with electrical switch due to which its position is monitored by brake electronics and if there is wrong configuration of coc, concerned P-1 message appears on the screen.

Braking:

When the handle of the brake controller is placed in a apply position the control circuits will produce the pressure to give the relevant brake pipe pressure.

The brake signal from the brake controller causes the control pressure to fall to the level demanded by the particular brake code which in turn causes the Air from the brake pipe now flows past to atmosphere through E-70 valve. The brake pipe pressure is then held constant at a reduced level, which corresponds to the particular



braking requirement, against any normal leakage by the self-maintaining feature.

Emergency:

When the handle of the brake controller is placed in the 'EMERGENCY' position one of the cam operated switches within the controller opens to cut off the power supply to all E.P. valves of E-70, except the 'Isolate' E.P. valve which is already de-energized. At the same time the pilot valve in the driver's brake controller opens venting the operating air from above the piston in the emergency exhaust valve located in the driver's cab. This valve then opens to vent the brake pipe direct to atmosphere at the emergency rate.

In addition to direct exhaust as all the electrical supply switched off the 'Release' and 'Application' E.P. valves are de-energized causing the valve E-70 lifts and therefore vents the brake pipe to atmosphere. In emergency, brake of 2.5 kg/cm^2 is applied through C3W valve.

Neutral:

When the handle of the brake controller is in the 'Neutral' position the cam operated switches within the controller cut off the power supply to all the E.P. valves (except 'Isolate' E.P. valve which is already de-energized) as for the 'Emergency' position.

Release:

When the handle of the brake controller is held in the spring loaded 'Release' position, the 'Full Bore' and 'Running' E.P. valves (of E-70) are energized. In this condition the system operates as described for the 'Running' condition, except that the 'Full Bore' E.P. valve is energized. This valve allows a low-pressure overcharge in BP pipe.

Low pressure over charge is achieved by raising the normal brake pipe pressure of 5 kg/cm^2 to a pressure of 5.4 kg/cm^2 and holding this for a limited period after which the overcharge is arranged to bleed down at a prescribed rate.

The pressure of 5.4 kg/cm^2 in the brake pipe is held for a short period by an electronic timing device on the low-pressure overcharge circuit board. At the end of this period the 'Low Pressure Overcharge' release E.P. valve is de-energized in a controlled manner which thus reduces the pressure in the control reservoir and hence the brake pipe at a predetermined rate towards a level of 5 kg/cm^2 .

Even overcharging up to 5.4 kg/cm^2 for short time and normalized with restricted rate, there will be no brake binding in load as overcharging feature of DV will prevent DV to overcharge.

Note:

The handle of A-9 can be remove and insert in neutral position and can be locked by locking device.



If the electronic brake control system fails, a priority-1 message display on the screen and an emergency brake is triggered.

Direct Brake (SA-9):

To apply loco brakes, Drivers Direct air Brake Valve (SA-9) is provided in both the cabs. The operation of this system is near about same as in case of WAG-5/7. But unlike WAG-5/7 there are no cocks on inlet as well as outlet pipes of Drivers Direct air Brake Valve (SA-9). Instead of cock the EP valves (pilot valves) are provided which keep the Drivers Direct air Brake Valve (SA-9) in service only in active cab automatically.

As a preventive measure, the handle of Drivers Direct air Brake Valve in rear cab should be kept in release position.

Unlike WAG-5/7, separate relay valves are provided for loco brakes through Drivers Direct air Brake Valve and loco brakes through conjunction working. So possibility of total brake failure due to relay valve failure is eliminated.

The Drivers Direct air Brake Valve has two positions; APPLY and RELEASE

Apply: -When the driver's control handle is moved to the 'brake on' position, air from the main reservoir admits in the out let pipe which (3.5 kg/cm^2 max) is further connected to braking relay valve 58. This pressure operates the relay valve so relay valve again allow the MR pressure waiting at its port to the brake cylinders through 2 nos of DCVs and bogie isolating coc. Brake cylinder pressure can be seen in the gauges provided in both the cabs.

Release:

When the driver's control handle is moved towards the 'release' position, it isolates the main reservoir pressure from the relay valve. Simultaneously, allows the pressure from the relay valve to escape to atmosphere through its exhaust port. As the pressure from relay valve get exhausted, relay valve further disconnect the pressure flow from MR to brake cylinder and simultaneously the pressure of brake cylinder get exhausted to atmosphere through exhaust of relay valve.

Any desired releasing stage for the brake cylinder pressure may be obtained according to the position of the driver's control handle.

The direct brakes are used to apply loco brakes. In WAP5 direct brake apply on wheel disk with the pressure of 5 kg/cm^2 whereas in WAG-9/WAP-7 it apply on wheel tyre as conventional loco with the pressure of 3.5 kg/cm^2 . The brake handle remains active only in active driver Cab.



Start/running interlock (i.e. regression of TE / BE) is initiated when the speed of loco is above 10 KMPH and BC pressure share in gauge by 0.6 kg/cm² and above..

For isolation of brakes of particular bogie, bogie coc are provided. COC for bogie -1 is provided below machine room -1 above MCP-1 where as COC for bogie -2 is provided below machine room -2 above MCP-2 .

Brake cylinder gets supply from following:-

From SA-9 through C-2 (58) relay valve (3.5 kg/cm²)

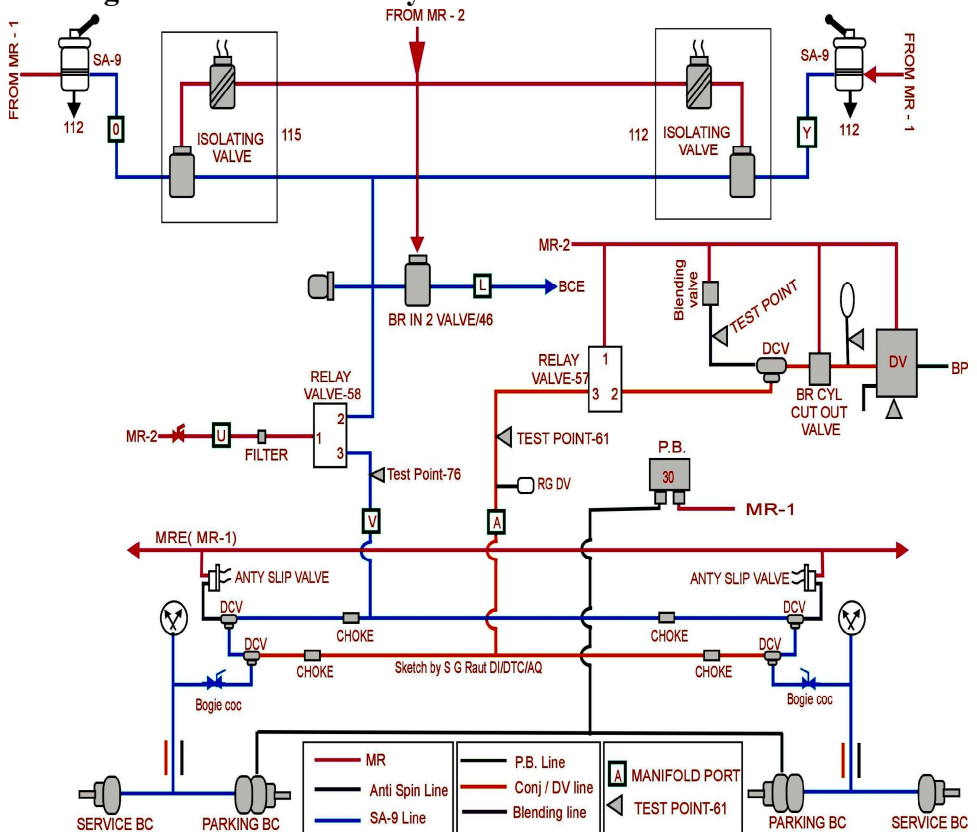
From C3W DV in conj. Working through C-2(57) relay valve(2.5 kg/cm²)

From Anti spin device (Wheel slip) (0.6 kg/cm² to 1.0 kg/cm²)

From blending valve (DBR cut off) : in proportion

To separate these different pressure paths different DCVs are provided in the path.

Diagram Of Loco Brake system



Anti Spin Brakes:

The principal of the anti-spin brake is to provide the traction equipment, with means to obtain a rapid yet light brake application to the driving wheels. The friction thus generated between the brake shoes and the tyres immediately absorbs the torque, which is in excess of the value that can be absorbed by the normal adhesion between the tyre and railhead. The net result is to prevent any increase of existing wheel slip.

The principal advantages are that the slip is prevented or controlled, so avoiding the possibility of damaging the traction equipment, and at the same time it normally enables the traction power to be maintained so improving and simplifying the control of the locomotive when operating under conditions which may cause wheel slip.

The anti-spin brake can give an improved adhesion condition between the rail and tyre, due to the cleaning effect of the brake shoe when used with 'On tread' braking.

A further important advantage of the anti-spin brake is that its use often enables a reduction in the use of sanding. This device is provided on each bogie behind MCP.

The automatic anti – spin protection is initiated as soon as the ratio between effective tractive/braking effort and requested tractive/braking effort is less than 0.5

As required, one or more of the following actions is/are initiated:

- Sanders start
- LSP glows
- TE/BE difference is reduced by control electronics.
- If necessary required braking force is given to wheel by applying loco brakes by control electronics- you can see that BC needle ups and down. (Which is limited to 0.6 kg/cm^2 to 1.0 kg/cm^{27})

Note :

1-If anti spin brakes are not applied at the time of wheel slipping, then wheels will get off loaded and to avoid further spinning, CE will reduce tractive effort. This will affect the hauling of load

2- When train is in motion with speed more than 10 KMPH, Start/Run interlock get activated if BC pressure rushes above 0.6 kg/cm^2 and TE becomes 0.

On run during anti spin brakes, 0.6 kg/cm^2 to 1.0 kg/cm^2 pressure rushes in brake cylinder. So as per above, due to this 0.7 kg/cm^2 pressure TE get reduced to 0 affecting haulage of load.



3-Presently as per RDSO's instructions anti spin brakes are isolated on the locos to avoid TM failure.

Brakes Through Blending Valve:-If train is running in regenerative (DBR) mode and suddenly regenerative braking gets cut off automatically due to internal fault or VCB tripping, to compensate regenerative braking, blending valve send the MR pressure in the brake cylinder in proportion. This pressure activates the relay valve (57), further this relay valve allows MR pressure into BC.

Synchronous loco brakes:-Whenever BP pressure drops below its pre- determined value (5 kg/cm^2), distributor valve gets activated and allows MR pressure to activate relay valve (57), further this relay valve allows MR pressure to rush in brake cylinder (2.5 kg/cm^2). Like this, when BP restores, DV gets balanced and releases the brakes accordingly.

Parking Brake:- In 3-phase loco, hand brakes are not provided. For parking the loco a new type brakes are available on this loco, called parking brake. The great feature of parking brake is that, it remains applied to indefinite time as per your requirement in absence of air pressure. Its function is just opposite to that of conventional brakes. i.e. it remain release when there is 6 kg/cm^2 pressure in parking activator and get applied when pressure exhausted below 3.8 kg/cm^2 in parking activator. But the brakes are applied through the same brake block of conventional loco brakes.

Parking brakes are provided on Wheel No.2-6-7-11 (WAG-9/WAP-7) and on wheel no. 1-4-5-8 in WAP-5 loco.

Applying Parking Brake

1. Press push button BPPB, a red lamp illuminated in it. Due to which 6 kg/cm^2 air in parking activator get exhausted and the PB gauge show '0' kg/cm^2 which indicates the application of P.B. (this is possible only when CE is ON)

OR

2. Press 'Apply' push button solenoid valve-30, BPPB red lamp will glow, P.B. pressure gauge show '0' kg/cm^2 and PB get applied. (This is possible when there is MR / AR pressure in the loco and lamp will glow if CE is ON)

OR

3. When 'BL' key is moved from 'D' to OFF parking brakes get automatically applied through control electronics. BPPB will not be illuminated since CE in OFF but P.B.gauge will show "0" kg/cm^2



Releasing Parking Brake:

1. Press BPPB illuminated red button once red lamp will get extinguished and 6 kg/cm² pressure enter in parking activators which can be seen in PB gauge indicating that PB are released

OR

2. Press "Release" push button on parking brake solenoid 30, BPPB red lamp will extinguish, air will be admitted in parking activator and gauge will show 6 kg/cm² pressure

OR

3. Pull "parking brake release spindle" provided on parking brake cylinder on wheel No.2,6,7,11. (for WAP-7/WAG-9) and on wheel no. 1-4-5-8 (for WAP-5 locos.) The lock of PB will open and piston return to release position due to re-setting spring at that time. 'KHUT' sound will be heard.

Note:

1-If PB are released through manual lever, BPPB will not extinguish in Energized loco and driver may get indication of application of PB and throttle will not respond, in such case press BPPB to release PB even though PB are released manually.

2-Ensure releasing of PB by physically shaking the brake block.

3-in dead loco if there is no air pressure even though the PB will remain in applied condition, but once the brakes get released, then PB cannot be applied again until the loco takes on pressure. So, while shunting the dead loco and stabling thereafter, this fact should be kept in mind and loco should be secured properly by wooden wedges as local hand brakes are not provided in the loco.

Locking Of Parking Brakes:

A) Parking brakes can be locked in applied or in release condition for this purpose locking arrangement is provided on release and application plunger of solenoid valve 30.

B) If plunger is pressed and then rotate, it will remain in that condition until you unlock it by again rotating it and taking out the plunger outside.

C) For locking the parking brake, follow the instructions of the division if any; otherwise don't lock the parking brakes.

Failure Of Brake Electronics:-Whenever brake control electronics get failed a priority-1 message appears on the screen with emergency brake application. One circuit breaker is also provided in SB-1, if this circuit breaker is tripped same symptoms will appear.

Regenerative Braking:-This is an electrical braking system in which brakes are applied on loco without physical application or brake block failure.



- 1.Brake block does not apply on wheel so wheel and brake block wear is eliminated.
- 2.Reliable braking.
- 3.Smooth controlling.
- 4.Energy generated during braking is fed back to OHE i.e. it works just like a small power station and helps in energy conservation.
- 5.Braking is available up to 0 KMPH.

When throttle is put to BE side, traction motor work as generator and generates 3-phase, AC supply which is converted into DC supply by driver converter and fed to line Converter through DC link. In line converter this DC supply is again converted into single phase/AC supply in such a way that it induces supply equal to line voltage in main transformer through converter, which later on fed to OHE through VCB and pantograph.

At the time of Regenerative braking, the TE / BE meter deviates down ward in RB mode.

If the RB fails during braking operation the independent loco brakes automatically takes over its function in proportion to RB force through blending valve.

Even if the RB and Pn brakes applied together due to fault in the system, excessive braking of loco is avoided because the anti spin slides control system reduced the electrical braking effort.

You can use the regenerative braking from full speed to '0' speed.

As train loco can be stopped only by using regenerative braking, there is a possibility of non Application of loco brakes, here one thing should be noted that loco can be stopped but cannot be held by regenerative braking. So, don't forget to apply loco /train brakes at halt/stop.

As already explained it feeds back to OHE during regeneration, so, Use RB as more as possible and generate the energy.

Also note the readings at the time of CTO & CHO to calculate energy conservation by you.

An Emergency Braking Operation

Emergency brakes will apply through brake electronics when:

- 1.Response from the Vigilance module
- 2.Permitted maximum speed being exceeded
- 3.Moving of the driver's brake handle to position EMERGENCY [automatic train brake]
- 4.Actuation of the emergency brake cock on the assistant driver's side
- 5.Actuation of the emergency stop push button on the panel A
6. Failure of the electronic brake control system



7. Train parting

Note:-The emergency stop button is only active in the activated driver's cab. However its function is not dependent on the speed of the locomotive. When the emergency stop button is pressed, the VCB opens and the pantograph is lowered along with BP drop and TE/BE "0". Emergency braking is actuated directly in all cases and is not controlled by the MCE. However, the MCE responds to emergency braking by reducing tractive effort to 0. If an emergency braking operation is triggered in multiple operation, it is transferred to the slave locomotive also.

Miscellaneous

Mechanical features of 3-phase AC loco. The three axles, three motor Co-Co bogie assemblies, is one of the major parts of the Locomotive. Two bogie assemblies support the entire weight of the 3-phase locomotive and provide a means for transmission of the tractive effort to the rails. The bogies are designed to withstand the stresses and vibrations resulting from normal rolling stock applications. An important function of the bogie is to absorb and isolate shock caused by variations in the track bed. The suspension systems minimize the transmission of these shocks to the locomotive under frame. The traction motors are suspended in the bogie frame and on the individual axles. The motors transmit their energy to the driving axles through a gearbox mounted on the driving axle. The force from the driving axles is transmitted to the contact point between the wheel tread and the rail. Traction force is, in turn, transmitted through the axle journal boxes and **guide rods** to the bogie frame. The **push-pull link rod**, connected between the bogie transom and loco under frame, transmits the tractive forces to the loco body.

As with the tractive effort, braking effort is transmitted to the bogie frame by the axle journal boxes and guide rods and from the bogie frame to the locomotive by the traction rods.

Isolation and absorption of shock loads and vibration is performed by the primary and secondary suspension. Movement between the loco body and bogie is smoothly controlled by the primary and secondary suspension. Although the springs permit free movement in any direction, **lateral buffers** and **dampers** limit the amount and rate of lateral movement. **Rebound limit chains** and **vertical dampers** limit the amount the rate of vertical rebound of the locomotive loco body.

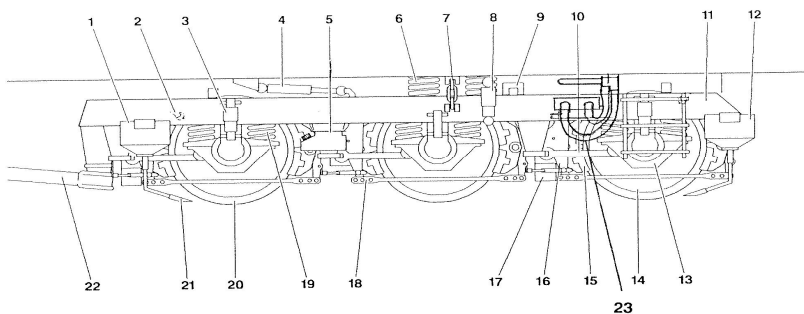


Yaw (longitudinal) dampers control the loco body pitch rate. **Guide rods** control the fore and aft movement between the axles and the bogie frame, while the **link rod** controls the fore and aft movement between the bogies and the loco body.

Primary suspension, located between the axles and the bogie frame, is provided by twin coil springs on the axle journal box fore and aft of the axle line. **Vertical hydraulic dampers** are used to dampen the rebound rate of the springs.This “Flexicoil” arrangement permits lateral movement of the axle. Longitudinal control of the axle, and the transmission of tractive and braking effort to the bogie frame, is provided by **guide rods** connected between the axle journal boxes and bogie frame. Spheribloc rubber bushes in the guide rods allow the axle lateral movement without undue restriction.

Secondary suspension is also provided by coil springs and vertical hydraulic dampers located between the bogie frame and the locomotive under frame on each side of the bogie. The weight of the loco body is carried by the secondary suspension springs.The“Flexi Float” arrangement of the secondary suspension allows the loco body to move both laterally and vertically within certain limits relative to the bogies.

Bogie layout



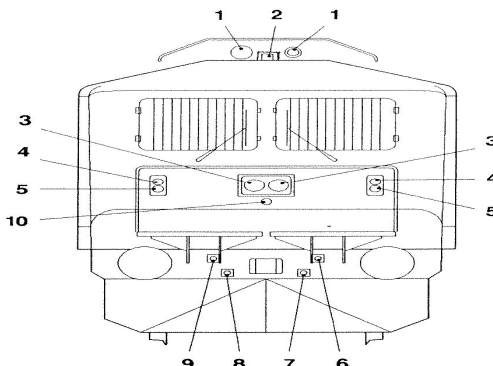
S.N	Name off part	S. N.	Name off part
1	Sanding box	9	Horizontal damper
2	Wheel flange lubrication nozzle	10	Wheel set guide
3	Primary suspension damper	11	Bogie frame
4	Secondary suspension yaw damper	12	Sanding box
5	Wheel flange lubrication reservoir	13	Wheel set
6	Secondary suspension spring	14	Wheel
7	Safety chain	15	Brake blocks
8	Secondary suspension vertical damper	16	Brake lever



17	Brake cylinder	21	Sanding pipe
18	Brake rod	22	Traction link
19	Primary suspension spring	23	Anti compounding valve
20	Wheel flange		

LIGHTING AND OUTSIDE CONNECTIONS

S.No	Name of Parts	S. No	Name of Parts
1	Horn	6	End cock direct brake (DB, yellow)
2	Emergency Flasher Light	7	End cock main reservoir(MR, red)
3	Headlight	8	End cock brake pipe (BP, green)
4	Marker light, white	9	End cock feed pipe (FP, white)
5	Marker light, red		



Main Reservoir

For shortage of compressed air pressure MR are provided on this loco. In WAP-7 & WAG-9 loco, Two MR and one AR is provided in machine Room in vertical manner. Capacity of MR is 450 liters. Drain coc is provided below each MR, which can be operated from machine room. In WAP-5 MR are located in under truck and each MR having capacity of 240 liters.

In dead loco AR is charged by BP pressure of Live loco provided that coc 47 should be in open condition. This AR pressure is utilized for conjunction loco braking and Parking brakes.

Memotel (Speedometer)-For indicating the speed of the loco, memotel type speedometer is provided in both the cab. Speed is indicated by both needle as well as LCD screen of SPM.



For Data entry one push button “A” is provided on SPM

When push button ‘A’ is pressed repeatedly following function done.(8 digits) in sequence.

1. Speed : kmph
2. Time : HH:MM:SS
3. Date : DD: MM: YY
4. Distance covered : Km
5. Encoded fault message : Aprox 10 seconds after push button ‘A’ is released time or speed is displayed automatically.

Sanding:-Sanding is done automatically on leading wheels when

1. Pressing ‘foot switch’ of sander.
2. Anti spin device activated.

Note :-Don’t press PSA continuously, but press and release it. Continuous sanding is not possible, If PSA pressed continuous for 1 minute, then dead mans penalty brakes will apply. 10-12 sec pause is required between two operations of PSA.

Control Electronics [Micas-S2]-All functions of the locomotive are controlled by the control electronics. It takes the form of bus stations with processors. The bus stations communicate with each other via fiber optic Cables which are resistant to the effects of Electro Magnetic Interference [EMI] The diagnostic equipment comprises a diagnosis computer with monitor and keyboard in the driver’s cab. This provides an effective support for the duties of the locomotive driver and maintenance personnel.

Active functions with deactivated driver’s cab

While the cab deactivated [key switch in position ‘O’], the following functions remain operative.

1. MEMOTEL functions
2. Catenary voltage display
3. Emergency brake cock on assistant driver’s side
4. Cab and desk lighting
5. Windshield wipers
6. Fault display screen
7. Marker lights switches
8. Cab venting and heating
9. Crew fans
- 10-Hand lamp socket

Resetting of MCB-Sometimes MCB trips momentarily without any equipment failure. Drivers should try to reset MCB once. While



resetting ABB make MCB, resetting screw below the respective circuit breaker turns to horizontal position from initial vertical position. This screw should be turned to vertical position first and then, MCB should be reset by lifting it's handle. For resetting MG make MCB, handle should be pulled first downward towards offside and then in upward direction towards on to reset the MCB, otherwise the MCB will not hold. If it is needed to trip any MCB, trip it with proper procedure i.e. by rotating screw or by pressing tripper knob provided on MCB. Don't trip any MCB directly and in VCB closed condition.

Flasher light

1. Automatic flasher light system is provided
2. One additional flasher light unit is provided in cab at Asstt side, ensure that switch provided on it is at ON
3. To switch on the flasher rotate the switch provided on panel –C
4. Note that flasher glows only when CE is ON or in cooling mode.
5. If on line CE gets off and at the same time if flasher is required then, switch ON it in cooling mode.
6. Note that in panto's down condition, CE remains ON only for 10 minutes after that CE will get off automatically. So, in such cases (like accident), flasher should switch ON in cooling mode.

Testing of automatic flasher light

1. In energize loco, ensure that BP is 5 kg/cm^2 and Set the reverser as per requirement.
2. Drop the 0.6 to 1.0 kg/cm^2 BP for 1 minute by opening ALP's emergency brake valve or by opening BP angle coc.
3. Ensure the following indications
 - ACP message of P-2 will appear on screen.
 - LSAF will glow.
 - Buzzer will sound.
 - BPFL light will flicker.
 - Flasher light will flicker.
4. Recharge the BP by closing BP angle coc or ALP's emergency brake valve, all above indication will disappear, acknowledge the fault by BPFA.
5. Apply A-9 to minimum reduction and full service and release, auto flasher light should not glow. If during normal operation of A-9 auto flasher light glows or if it does not glow during above testing, Inform the TLC/TRS staff.



KNORR's Computer Controlled Brake System

In some WAG-9 locos KNORR type brake system is provided which is different from conventional brake system of WAG-9 locos.

In conventional loco, loco get failed in case of brake electronics failure. But in this loco, block section can be cleared by 10 KMPH in case of failure of brake electronics.

CHANGES IN CAB

1) Pilot lamp panel

One panel of 6 pilot lamps is provided beside panel-C which is as under:

- a) Exclusive Flow :** This is a Red colored pilot lamp, glows when MR pressure is less.
- b) PCR open :** This is a Red colored pilot lamp, glows when BP pressure is less.
- c) PER action:** This is a Green colored pilot lamp, glows when PTDC (Pneumatic Time Dependent Control) is in service.
- d) EAB fail :** This is a Yellow colored pilot lamp, glows when brake electronics failed and PTDC in service.
- e) P-16 action:** This is a Green colored pilot lamp, glows when DV is isolated.
- f) SIFA cut off:** This is a Yellow colored pilot lamp, glows when coc 74 is closed

2) Changes in Auto brakes and Direct Brakes:

In case of conventional system, A-9 / SA-9 handle has to be operated from left to right, but in this system handle has to be operated forward and backward like throttle. Both valves are provided on left side of loco pilot on control stand.

a) SA-9 Direct Brake:- SA-9 has two positions; Applied and Release. One spring loaded clip called " Bail Ring "is provided below the handle of SA-9. If this clip pressed and released, synchronized brakes get released very fast where as brakes get released gradually if PVEF is pressed.

b) A-9 Auto brake:

A-9 handle can be locked or unlocked in FS (Full service) position by a key provided in each cab and coupled with a chain. Non-driving



cab A-9 is kept on FS-locked condition where as driving cab A-9 is kept in RUN condition. While clearing loco as dead both A-9 are to be kept on FS-locked condition. A-9 handle has following 5 positions.

i) REL-Release: In this position BP pressure is over charged to 5.5 kg/cm² and drop down automatically after some times with restricted flow to 5.0 kg/cm². This position is used for quick releasing of BP.

ii) RUN: This is the normal position of A-9 on which BP is charged to 5.0 kg/cm². At the time of recharging after application, BP is overcharged by 0.2 kg/cm² at this position for short time.

iii) MIN.(Minimum Reduction): BP pressure remains 4.5 kg/cm².

iv) FS (Full Service): BP pressure drops to 3.0 kg/cm². A-9 handle can be locked or unlocked in this position.

v) EMER. (Emergency): BP drops to zero kg/cm² on this position.

c) Mode switch: One rotating switch called mode switch is provided in each cab below SA-9 valve. This is spring-loaded switch and can be operated by pressing downward. This switch has following 4 positions.

i) HLPR: While using loco as banker, this switch should be kept at Help position on this mode in addition to ZBAN at ON.

ii)TRL (TRAIL): In non-driving cab (SU / MU), this switch should be kept on TRL position.

iii) LEAD: In driving cab (SU / MU), this switch should be kept on LEAD position, then BP will be charged 5.0 kg/cm².

iv)TEST:In this position BP leakage test is done. When this switch is kept on TEST position, Loco brakes get applied. This switch should be kept on lead position immediately after testing.

d)Pneumatic Time dependent Control (PTDC):

In this loco SA-9 and A-9 are governed by brake electronics. In case of failure of brake electronics train can be worked by max.10 KMPH by PTDC. This is provided in each cab near A-9 / SA-9 and has following 2 positions.

i) Release and ii) Apply.

PTDC is having one coc, which should always be in open condition. procedure of clearing block section by using PTDC:

- Bring throttle to “0”



- Open the DJ, Lower the panto and switch OFF CE.
- Trip the MCB 127.7 (SB-2) and ensure that MCB 127.15 (SB-2) is in ON condition.
- On Pneumatic panel, Close PB-BUS cock & PER-COS from horizontal to vertical position.
- Keep A-9 of working cab on RUN.
- If BPFA is glowing, then acknowledge the fault.
- Switch ON to CE and raise Panto, close VCB (DJ)
- Keep PTDC on release position and ensure that BP is 5.0 kg/cm^2 and BC is 0 kg/cm^2 .
- If BC pressure does not come to '0' then release by distributor valve.
- To apply / release auto brakes keep PTDC handle to apply or release as per requirement and clear the block section by 10 KMPH.

CHANGES IN UNDER TRUCK:

BC-1 & BC-2 cocs are not provided in under truck. These cocs are black in color and provided at the bottom of brake manifold in machine room. Normally these coc should be vertical (Open).

CHANGES IN PNEUMATIC PANEL IN MACHINE ROOM:

Pneumatic panel is divided into two parts.

- Air Brake Manifold.
- Auxiliary manifold.

1) Air Brake Manifold:

a) Parking Brake Back Up Switch – (PB-BUS):

This is a black colored switch; normally this switch should be in horizontal condition. But in case of PTDC mode or clearing loco as dead, this switch should be kept closed (Vertical) to release the parking brakes.

B) Pneumatic Equalizing Reservoir Cut Off Switch – (PER-COS):

This is a black colored switch; normally this switch should be in horizontal condition. But in case of PTDC mode this switch should be kept vertical.

C) Parking Brake Reservoir Cut Off Switch – (PBR-COS):

This is a black colored switch; normally this switch should be in horizontal condition. Maintenance staff uses this switch.



D) Parking Brake Pneumatic Disable switch- (PB-PDS) This is a black colored switch; normally this switch should be in horizontal condition. In case of parking brakes malfunctioning maintenance staff uses this switch and kept vertical along with PBR - COS.

E) SIFA-74 (Vigilance exhaust coc):

This is yellow colored coc. Normally this coc should be kept downward but while clearing loco, as dead this coc should be kept upward.

F) BC- & BC-2 coc:- These are bogie-isolating coc.

G) DV (Distributor valve):

2) Auxiliary Manifold:

Following cocs are provided on this manifold.

a) WFL:- Pressure switch for wheel flange lubrication.

b)TC1 & TC2:- Pressure switch for traction converter-1 & 2

c)KABA KEY:- Loco grounding key.

d)FC:- Harmonic filter contactor pressure switch.

e)PAN1&2:-Pressure switch for Panto1 & panto2.

f)VCB:- Pressure switch for VCB.

g)VESA1 & VESA2:-Pressure switch for sanders.

h)136:- Pressure coc for Feed Pipe.

i)47:-cock for dead loco (normally closed)

j)Panto selector switch:-for selection of panto (same as conventional)(coc position of a to f switch should be horizontal. COC position of h & I should be vertical.)

ITEMS TO BE NOTED:

1)Energizing of cab:-Loco should be energized as conventional 3 phase loco, but ensure following:

i) A-9 handle of driving loco should be at RUN, where as that of non-driving cab should be at FS in locked condition.

ii) Mode switch is at LEAD in driving cab, and at TRAIL in non-driving cab.

iii)Energize the loco as per normal position.

iv)For charging BP move A-9 to FS for 10 seconds and then keep it to RUN position. BP will be charged by 3.0 kg/cm^2

v)Ensure that parking brakes are released, if not then press BPPB.



vi)Keep A-9 from RUN to FS. Wait for 10 seconds, then again keep it to RUN and ensure that BP is charged to 5.0 kg/cm^2 and BC is "0" kg/cm^2 .

vii)Every time after recharging BP will overcharge to 5.5 kg/cm^2 at RUN position and then after some time become normal to 5.0 kg/cm^2 .

viii)For overcharging BP to 5.4 kg/cm^2 , operate A-9 to REL position.(If necessary)

ix)For releasing synchronized loco brakes use Bail Ring for quick release or use PVEF for normal release.

2.Procedure Of Cab Changing:

i)Keep A-9 handle in FS and lock it and remove the key out side.

ii)Keep the SA-9 in release and rotate MODE switch to trail position.

iii)Open the DJ, lower the panto and switch off the CE. Remove the BL key and go in another cab.

iv)In another cab, Unlock A-9 handle and keep it on RUN condition. Operate Mode switch from TRAIL to LEAD.

v)To charge BP, release parking brake and ensure charging of BP pressure.

vi)Take these precautions every time while changing the cab.

3.Parking brake – application & release.

Whenever parking brakes are applied by CE or manually, every time penalty auto brakes will be applied along with parking brakes in which BP will drop to 3 kg/cm^2 and loco brakes up to 2.5 kg/cm^2 with Priority-1 message on screen.

For recharging BP pressure, first release parking brakes and keep A-9 to FS position for 10 seconds. Again keep A-9 on RUN position and ensure that BP is recharged to 5.0 kg/cm^2 . Acknowledge the fault and work further.

For applying parking brake manually, rotate switch PB-Bus from horizontal to vertical and for releasing vertical to horizontal.

4.Vigilance penalty brakes:

In this loco BP pressure is dropped by 3.0 kg/cm^2 (in gauge 2.0 kg/cm^2) on application of vigilance parking brakes. Do the following for resetting vigilance penalty brakes:

i) Keep throttle at "0"



- ii) Wait for at least 2-3 minutes.
- iii) Keep A-9 to FS, press BPVR for acknowledging fault message.
- iv) Keep A-9 at RUN and ensure that BP is charged to 5.0 kg/cm² and loco brakes are released.
- v) Acknowledge the fault by BPFA and proceed further after ensuring pressure.

5) Action to be taken after Emergency Brake Application:

Emergency penalty brakes applied when, emergency push button is pressed or due to over speeding or due to emergency application by A-9 / ALP Emergency valve, in which BP pressure drops to "0". For releasing this penalty brake, keep A-9 to Emergency (EMER) for 10 seconds and again keep to RUN position, BP will charge to 5.0kg/cm² then acknowledge the fault message and work further.

6) Service penalty brakes:

Service penalty brakes apply automatically in following condition in which, BP is dropped to 3.0 kg/cm².

i) If BC-1 & BC-2 are isolated in locos "LEAD" mode.

ii) If any one coc of PB-PDS, PB-BUS, PB-R-COS is isolated. If all these switches are in isolated condition and BPPB is pressed then also penalty brakes will apply.

To release service penalty brakes, normalize the above switches, keep A-9 to FS for 10 seconds and then again keep to RUN position and ensure BP to charge at 5.0 kg/cm².

7. Clearing loco as DEAD.

i) Keep the throttle at "0". Open the DJ, lower the panto, and remove the BL by switching OFF CE.

ii) Keep the A-9 of both the cab in FS and remove the key after locking it.

iii) Keep both SA-9 handle at release and keep MODE switch at TRAIL.

iv) Open coc 47 (Dead loco) and close coc136 (FP) provided on auxiliary manifold.

v) Keep PAN-1 & 2 (Auxiliary manifold) coc on vertical position.



vi) Close coc 74 SIFA (Vigilance) provided on pneumatic manifold by keeping upward.

vii) Switch OFF MCB 112.1 (in SB-2). Drain out the MR & AR.

viii) Couple the energize loco with dead loco and couple BP/FP pipes and open their angle cocks.

ix) BC pressure should be '0' and if not then release the distributor valve.

x) For application and releasing of brakes in dead locomotive rotate PB-BUS (air brake manifold) from horizontal to vertical. Ensure 5 kg/cm² pressure in parking brake gauge.

NOTE :-

a. COC number 70 of BP is not provided in this loco.

b. Solenoid valve no. 30 is not provided in this locomotive.

Before clearing loco as dead ensure that parking brakes are released fully and parking brake gauge is showing 5 kg/cm² pressure. Also ensure the same on run.



DO's and Don'ts for Loco Pilots

DO's

- 1) Acknowledge VCD always within every 60 sec.
- 2) Do maximum use of regenerative braking, it not only control the train but participate in generating the power.
- 3) In case of any trouble, as a last step, switch off the CE for 5 min.
- 4) In panto down condition and in CE off condition, to switch on the flasher, use cooling mode.
- 5) In case of heavy airflow, instead of attending the screen, do the protection of train and adjacent track.
- 6) In case of emergency use emergency stop push button.
- 7) While deactivating the CSC, check the position of throttle, it should not be opposite to the force.
- 8) Use throttle gradually.
- 9) Before regenerative braking, bunch the load.
- 10) While working dead loco, ensure conjunction working in dead loco.
- 11) While working dead loco ensure releasing of parking brakes and pneumatic brakes in dead loco.
- 12) First note down the fault message and then acknowledge the fault.
- 13) During failure mode operation, use throttle carefully.
- 14) Before resetting MCB, first rotate the knob provided on it.
- 15) Keep the SA-9 handle of rear loco at release.
- 16) Apply parking brakes when stationary.
- 17) Instead of continuous operation of sanders, use frequently.

Don'ts

- 1) Don't operate BL when loco is in motion.
- 2) Don't believe on U-meter, ensure the panto physically.
- 3) Don't press PSA continuously.
- 4) Don't allow any unauthorized person in rear cab, as some functions are remains active in rear cab.
- 5) Don't declare the loco FAIL, without switching OFF and ON the control electronics.
- 6) Don't lower the panto for more than 10 minutes otherwise CE will switch off.
- 7) Don't forget to acknowledge the fault message.
- 8) Don't use CSC in undulating area.
- 9) Don't isolate VCD unnecessarily.
- 10) Don't switch off CE in running train.
- 11) Don't smoke in the loco.
- 12) Don't use quick release position of A-9 frequently and unnecessarily.
- 13) If MR pressure is less than 6.4 kg/cm^2 , don't operate MPJ.



PROTECTION SCHEME

Protective measures by control electronics:

Initiation of protective measure in dangerous situation is controlled by Control Electronics. MCE monitors a range of values such as voltage, current, temperature, pressure and other signals.

Catenary voltage out of range

When catenary voltage drop down below 17.0 KV and raise above 30 KV VCB will open automatically.

Temperature protection- When temp of Transformer exceeds beyond 84 degree C, for more than 10 sec, VCB will trip.

Primary Over Current Protection (QLM)

Reason for over current.

1. Disturbance in measurement of primary current.
2. Fault in converter.
3. Short circuit in Xmer winding
4. Check machine room for oil flash/smoke/abnormal.
5. Check OCR.78 is in normal.

If any thing is abnormal- fail the loco. If VCB trips during 'C' mode then check oil level of Xmer and converter and check relay 78. If any thing is abnormal, fail the loco.

Train Parting:

Airflow measuring valve is provided in loco. Whenever train get parted, or air flow increased and AFM get activated, resulted into glowing of LSAF and sounding of buzzer. Also message of ALARM CHAIN PULLING will appear on screen. As due to uncoupling / parting, the BP pressure start expelling at very fast rate, resulting into sudden drop in MR pressure which leads to Priority -1 message on screen " Low Pressure Main reservoir"

So, after parting / uncoupling, the driver will get message of low MR pressure which is counter effect.

So, when ever AFI shoot up with sudden drop in BP pressure, your first duty is to act as in case load parting / accident (like switching ON of flasher light, protection of adjacent track, Securing of load / loco, etc.), After asserting that trailing load is OK, then think about the loco/ message.

Fire Alarm:

In loco fire detection unit is provided in SB2. There are two smoke detector to detect the smoke in machine room.



When one detector detects the smoke –

1. Buzzer will sound
2. Priority-2 message will appear on screen.

When both detectors detect the smoke –

1. Priority-1 message will appear on the screen - Inspect Machine room
2. Throttle T/E, B/E becomes '0'
3. Buzzer will sound.

Do the necessary arrangement to extinguish the fire by using suitable fire extinguisher provided in Cab1/2 and Machine Room 1/2 (Total 4 Nos.)

Resetting Of Fire Alarm:

1. Press Reset button on fire detection equipment provided in Machine Room (SB-2)
2. Press BPFA.

Action to be taken by Driver

1) Inspect the Machine room and take necessary action. In case of fire on loco, use big fire extinguisher provided in the rack behind asstt. Driver in cab. To operate this fire extinguisher, open the cut out coc and release the gas by rotating adjusting knob, gas will expel and extinguish the fire at appropriate places in machine room behind it. In addition to this two numbers of portable fire extinguishers are provided on the loco which should be used accordingly as per requirement.

2) To reset the FDU, press the white knob provided on it. To acknowledge the fault press BPFA. Resume normal traction.

Note:- In case of defect in FDU, P-2 fault message will appear on the screen. After inspecting the machine room, reset the white knob on the FDU. Acknowledge the fault and keep watch on machine room.



Alarm Chain Pulling:- When airflow increases without initiated by driver or CE i.e. in case of ACP/Gds brake applied/leakage in train/HPD etc. Following indication appears.

1. Air Flow Indicator needle will deviate.
2. LSAF will glow.
3. Buzzer will sound.
4. BPFA will illuminate with P-2 message.
5. Auto flasher will start.

ACP Indication:

- 1).Put right the ACP/leakage.
- 2).Buzzer will sound continuously until the leakage/ACP is arrested so to stop sounding, Press BPFA. If ACP/leakage is not arrested buzzer will start again.
- 3).When ACP leakage is put right, all indications will disappear, but for BPFA indication press it once.



Loco Preparation & Inspection:

Before commissioning Journey, perform an inspection check of the locomotive and through the machine room. In particular, check the following items:

1. In front Of Cab:

1. Ensure that loco is standing on the rail and under the OHE
2. Ensure that both side MRE, BCE BP , FP hoses are connected properly and their angle cocs are as per requirement. Also ensure that hoses are not hanging.
3. Ensure that rail guard, cattle guard, has not any damages
4. Ensure that CBC having no abnormalities and locking pin is available and provided with operating handle.
5. Ensure that UIC connector sockets are covered.
6. Ensure that Flasher light, marker lights, headlights are glowing properly and their glasses are clean.
7. Ensure that both look out glasses are clean and wipers are wiping properly.

2. Below Machine Room No. 1(Cab-1 To Cab-2)

1. Ensure that all sand boxes are filled with dry fine sand and sanders are working properly.
2. Ensure that additional angle coc of MRE & BCE are opened.
3. Ensure that Air dryer unit is in service that (D-in open, D- out open & D-off closed)
4. Ensure that all suspension dampers; helical springs having no abnormalities like, crack etc.
5. Guide rod is fitted properly and its bolts are tightened.
6. All brake rigging; brake block, brake shoe, sleeve rod, assembly hanger arrangement are OK.
7. Wheels are not skidded.
8. Return current bush are connected properly.
9. Parking brakes cylinders are provided with manual releaser hook.
10. Traction link is fitted properly and their all 6+6 bolts are tightened.
11. Oil level in CP is above min mark; also ensure that CP foundation bolts are tightened.
12. Bogie brake -1 coc is in open condition.
13. Battery box cover is locked.
14. Safety chain is intact.
15. BP and FP additional coc are in open condition.

3. Below Machine Room No. 2(Cab-2 To Cab-1)

1. Ensure that all sand boxes are filled with dry fine sand and sanders are working properly.
2. Ensure that additional angle coc of MRE & BCE are opened.
3. Ensure the all suspension dampers, helical springs having no abnormalities like, crack etc.



4. Guide rod are fitted properly and its bolts are tightened.
5. All brake rigging; brake block, brake shoe, sleeve rod, assembly hanger arrangement are OK.
6. Wheels are no skidded.
7. Return current bush are connected properly.
8. Parking brakes cylinders are provided with manual releaser hook.
9. Traction link is fitted properly and their all 6+6 bolts are tightened.
10. Oil level in CP is above min mark; also ensure that CP foundation bolts are tightened.
11. Bogie brake -2 coc is in open condition.
12. Battery box cover is locked.
13. Safety chains are intact.
14. BP and FP additional coc are in open condition..

4 In Cab

1. Cab and look out glasses are clean.
2. All switches are normal, ZBAN-OFF, BLCP-AUTO
3. Emergency exhaust cocks are normal.
4. Water is filled up in windshield washer unit.
5. Spare hoses, wooden wedges are provided in side locker.
6. Fixed and handy both fire extinguisher are in good condition and filled with gas.
8. Ensure that emergency push button is released.

5. In Machine Room

1. Control and power Circuit breakers in cubicle SB-1 / SB-2 , HB-1 and HB-2 are normal
2. Switches provided in SB-1 are at normal position.
3. Oil level of conv-1/2 and transformer-1/2 are above min mark.
4. All fittings and connections are normal.
5. Outer cover of any power equipment is not opened.

6. Pneumatic Panel

1. Panto selector switch is at "auto" position.
2. COC 70,74,136 are in open condition and COC 47 is in close position.
3. COC of panto 1, panto 2, VCB and sanders are in open condition.
4. Distributor valve is in service.
5. IG 38 Key is inserted and kept 'ON'.
6. CPA drain cock is in close condition.
7. Parking brake apply/release plungers are not in locked condition.



Multiple Unit Operation

Multiple operation with two locomotives

In multiple operations a maximum of two locomotives can be operated. Both must be directly coupled to one another. They must not be separated by a carriage.

While in motion, the front driver's cab is usually activated. When linking up or in unusual situations, it is also possible to control the locomotives from another driver's cab.

The train bus configuration for multiple operation is only possible from the driver's cab at the uncoupled end. A configuration from a rear driver's cab is referred to as single-unit traction. The train bus automatically checks the configuration :

The leading manned locomotive is called the master locomotive and the other one is called the slave locomotive.

The two locomotives are correctly linked together once the mechanical and pneumatic systems and the UIC cable have been connected. Commands are transmitted down the UIC cable.

Pantograph:- In multiple operation, both the most distant pantographs are raised if "pantograph selection switches" in both the locomotives are in position "AUTO". The train bus connections define the free end of each locomotive. The command from the master locomotive to raise/lower the pantographs also controls the pantographs on the slave locomotive.

Note :

Whenever the simulation key switches on the master and slave locomotives are not in the same position, the pantograph are not active (fault message).

Main circuit breaker

The command from the master locomotive to switch the main circuit breaker "ON/OFF" also control the main circuit breaker on the slave locomotive.

The VCB on the slave locomotives is switched on after a delay of 0.5 seconds following the switch on of the VCB on the master locomotive. When switching off, there is no delay.

Note :

If the VCB on the slave locomotive cannot be closed due to a fault, an appropriate fault message appears on the screen.



Regenerative brake

During multiple operation, there is a limitation on the regenerative brake on the slave locomotive. This limitation reduces forces on the loco buffers (prevention of derailling).

Constant Speed Control (CSC):- During multiple operation, the constant speed control of the slave locomotive is inactive. The train bus transmits the selected tractive/braking effort from the master locomotive to the slave locomotive. The master loco performs speed controlling function, demanding TE/BE on master and slave loco.

Anti-spin protection:-The anti-spin protection of the slave locomotive is independent of the master locomotive.

Compressor control :-The compressors are able to operate in three different operating modes.

These modes can be selected with the spring-loaded switch “BLCP”, (Panel A).

Pos. “Off” Compressor switched off.

Pos. “Auto” Automatic pressure monitoring.

Pos. “Man” Compressor switched on (manual monitoring).

The selected position of the compressor switch is transmitted to the slave locomotive.

In the “Main” and “Off” positions, all main compressors in both locomotives are controlled directly.

In the position “Auto”, there are the following options:

1- A main reservoir pressure below 8 kg/cm^2 on the master or slave locomotive activates a particular compressor on both locomotives. Each locomotive switches alternately and independently between its two compressors.

2- A main reservoir pressure below 8.5 kg/cm^2 on the master or slave locomotive activates all compressors on both locomotives at the same time.

3- At a main reservoir pressure below 6.4 kg/cm^2 , each locomotive independently control its compressors.

Parking brake:-The multiple unit cannot drive if one of the parking brakes is applied.

Note :-An activated parking brake on the master or slave locomotive is indicated in the activated driver’s cab of the master locomotive by the red illuminated push button “BPPB”.

Emergency Brake- An emergency brake on the slave locomotive can only be initiated in the following manner :

1-By actuating the brake handle of the automatic train brake to “Emergency” position.



2-By actuating the emergency brake cock on the assistant driver's side. If the pressure switch 269.1 on the master or slave locomotive registers actuation of the emergency brake, the ensuing command for emergency braking applies to both locomotives. The master for all other emergency braking commands is the master locomotive in the double (multiple) unit

Other Brake functions:-If the pressure switch (269.6) registers a pressure in the brake cylinder of any bogie, and if speed exceeds 10 km/h, tractive effort is set to 0.

Note : If the electrical brake on one of two locomotives fails, the electrical brake on the other locomotive remains functional.

Coupling

1-Both loco must be deactivated. The key switch must be in position "0"

2-Couple both locomotives mechanically, pneumatically and connect the UIC cable.

3-Close the isolating cock on the brake supply line of the slave locomotive.

4-Move the key switch on the slave locomotive into position "D" and, as soon as the light test starts, turn back to position "0". The MCE on the slave locomotive is now in self-hold mode.

5-During the self-hold mode of the slave locomotive, move key switch into Pos. "D" on the master locomotive. The control electronics starts to configure the train bus.

6-After the configuration procedure, screen on the display shows the serial numbers of the master and slave locomotives.

Example:

Train configuration	
Loco 31001	Loco 31002

Note :-If configuration proves impossible, (or if no locomotive is available) locomotive number 00000 appears.

If more than one driver's cab is activated in both locomotive, one is shutdown and a corresponding message appears on the displays in both locomotives.

Uncoupling:- Starting position :

Master and slave locomotives are available and both are ready.

1-Shut down both locomotives in accordance with regulations (VCB switched off, pantograph lowered).

2-Remove the UIC cable and disconnect the locomotives pneumatically and mechanically.



3-Both the locomotives are now ready for setting up as a single locomotive.

Note:-If for any reason the train bus link is interrupted, or if both locomotives are set up or in motion, the system protection initiates a monitored shut down of the slave locomotive.

Reaction :-The pantograph of the slave locomotive is lowered and a corresponding fault message appears on the screen of the master locomotive.

Sanding:-Sanding on both locos can be initiated by the driver by pressing the sanding foot switch on the master loco.

Fire alarm:-A fire detection on the slave locomotive initiates an audio signal on the master locomotive.

In addition, the VCB on the slave locomotive is switched off and a priority 1 fault message appears on the displays of both locomotives.

Trailing mode:-Trailing mode means that on the master locomotive in a multiple unit no tractive effort is available, if both bogies are electrically isolated. The driver's cab of the master locomotive still controls the slave locomotive.

The status of the master locomotive is as follows :

1. VCB switched off.
2. Pantograph is lowered.
3. Train bus is working correctly.
4. Pneumatic brake system is working correctly.
5. Brakes are controlled from the master locomotive.
6. The TE/BE meters show the values for the slave locomotive.

Note:-All equipments on the master locomotive are supplied by the battery and are functional for a maximum of 5 hours, if battery is fully charged.

Process of Cab Changing For Multiple units

1. Move key switch 'BL' on master locomotive into position 'Off' and remove the key.
2. Set automatic brake controller to position 'Neutral'
3. Release direct brake
4. Set the feed pipe cock 136 to the 'Close' Position
5. Change the loco and set the feed pipe cock 136 to the 'Open' position on this previous slave loco.
6. Insert A-9 key in driver's cab of previous slave loco.
7. Move key switch "BL" into position "D"

Note:- The change of driver's cab has to take place within this 10 minutes period otherwise the MCE has to be restarted.



DEAD LOCO MOVEMENT

(FOR DETAILS, REFER RAILWAY BOARD LETTER No. 2000 /M (L) /466/803/Pt. dated 28.06.2006)

Hauling 3-Phase loco fitted with E-70 brake system as a dead loco.

These locomotives are fitted with electro pneumatic E-70 brake system. These locomotives in dead condition can be hauled both by locomotive fitted with IRAB-1/28LAV-1 brake system and locomotive fitted with E-70 brake system.

If these locos are coupled with conventional A.C. locos as a dead, then direct loco brake application is not possible by SA-9 since MRE & BCE can not be coupled but if BP is dropped from live loco, conjunction loco brakes application will take place in dead loco.

A) Hauling dead WAP-5/WAG-9 electric locomotive fitted with E-70 brake pipe control system in a train.

1) Switch off BLDJ and lower the pantograph of the loco to be sent as dead. Isolate the pantograph through panel isolating cock on pneumatic panel.

2). Switch off CEL as follows:

- a) Operate BL-key from 'D' to 'Off' (wait for 2 sec.)
- b) Operate BL-key from 'Off' to 'C' and wait until display screen, LSDJ, and UBA goes off.
- c) It indicates that CE is get 'OFF' and now rotate BL from 'C' to 'OFF'.

Switch off the 'circuit breaker control circuit locomotive' (112.1) in SB2 panel.

3). Couple the dead loco in the train.

4) Put auto brake controller (A9) in "Neutral" position in both cabs of dead loco.

5) Put the direct brake controller (SA9) in "Release" position in both cabs of dead locomotive.

6) Drain the Main and Aux. reservoirs of dead locomotive completely. After draining out, close the drain cock of main reservoir and aux. reservoir.

7) If loco brake in the dead locomotive have not got released, which can be verified by observing the BC pressure gauge, then release the same in the following steps.

A) Manual handle of distributor valve at pneumatic panel should be operated manually to release control pressure. BC pressure shall automatically vent through D2 relay valve to release loco brakes.



B) In case residual BC pressure remains in brake cylinder line, the BC pressure should be released through bogie isolating cock of both bogies. Make bogie-isolating cocks in 'Normal' position after releasing the BC pressure

8) In the dead locomotive, ensure isolating cock position in the pneumatic panel as follows. (Towed dead):

Cock	47 (Dead Engine)	74 (Emergency/ Vigilance)	136 (Brake Feed Pipe)	70 (E-70 brake pipe)
Position	Open	Closed	Closed	Closed

9). Connect BP pipe of the dead loco to the BP pipes of load and open BP angle cock of both of loco and load side. The aux. reservoir on dead locomotive will get charged from BP supply. Check the BP pressure gauge in the cab of dead loco. It should show the same pressure as that of the load in case of load (In case of locos are to be attached on a train having twin pipe i.e. both BP and FP then FP of dead locos should also connected and its angle cock should be opened.)

10) Lock the parking brakes in applied condition. This procedure is safe to avoid brake binding and condensation of moisture in the parking brake cylinder. It is as under

A) Apply the parking brakes of dead loco by apply push button.

B) Lock the parking brakes in applied condition.

C) Release the parking brake of the dead loco by manual operation of parking brake release handle on each of the four parking brake units. For manual brake release, first turn the release handle slightly clockwise and then pull till a sound of locking mechanism is heard. The parking brake units are fitted on the following wheels:

LOCO TYPE	WHEEL POSITION OF PARKING BRAKE UNITS			
WAP5	1	4	5	8
WAG9	2	6	7	11

D) If some of the parking brake handles are defective and due to this if not possible to release manually, then release the same by manually pressing the "Release" Push Button of the latched solenoid valve no.30 on the pneumatic panel of the dead locomotive.

11). As parking brakes are locked in applied condition PB gauge will show 0 Kg/Cm².

12). Double check the release of parking brakes of dead loco by moving the parking brake unit by hand.



A) Apply auto brakes (A9) in the working locomotive and check that loco brakes on both the locomotives are getting applied. Then release the auto brake in the working loco and check that loco brakes are getting released on both the locomotives. Rear locomotive (WAG-9 / WAP-5 dead) takes about 1 minute to release.

B) As a final check, run the coupled loco for about 500 metres and feel for any abnormal rise in temperature of wheels of dead loco and also check if at subsequent stop during journey.

C) Remember that in the dead locomotive, the loco brakes takes about 1 minute to release after auto brake application from the live loco. Hence after every auto brake application and release wait for adequate time (minimum 1 minute) for release of loco brakes in dead locomotive before resuming traction

13). Escorts accompanied dead locomotive should never put BL key in position 'D' and also strictly avoid energising the dead locomotive.

14). After reaching the destination, before detaching the working loco,

A) Unlock the application plunger of parking brake solenoid valve no. 30.

B) Press the release button of parking brake solenoid valve no. 30. This will charge parking brake line by 5 kg/cm².

C) Apply parking brakes on dead locomotive by application plunger of parking brake solenoid valve no. 30.

B) Hauling dead WAP5/WAG-9 locomotive fitted with E-70 brake pipe control system when attached next to leading working locomotive:

1. Switch off BLDJ and lower the pantograph of the loco to be sent as dead. Isolate the pantograph through panel isolating cock on pneumatic panel.

2. Switch off CEL as follows:

a) Operate BL-key from 'D' to 'Off' (wait for 2 sec.)

b) Operate BL-key from 'Off' to 'C' and wait until display screen, LSDJ, and UBA goes off.

c) It indicates that CE is get 'OFF' and now rotate BL from 'C' to 'OFF'. Switch off the 'circuit breaker control circuit locomotive' (112.1) in SB2 panel.

3. Couple the dead loco in rear of the working loco.

4. Put auto brake controller (A9) in "Neutral" position in both cabs of dead loco.

5. Put the direct brake controller (SA9) in "Release" position in both cabs of dead locomotive



6. Drain the Main and Aux. reservoirs of dead locomotive completely. After draining out, close the drain cock of main reservoir and aux. reservoir

7. If loco brake in the dead locomotive have not got released, which can be verified by observing the BC pressure gauge, then release the same in the following steps.

a) Manual handle of distributor valve at pneumatic panel should be operated manually to release control pressure. BC pressure shall automatically vent through D2 relay valve to release loco brakes.

b) In case residual BC pressure remains in brake cylinder line, the BC pressure should be released through bogie isolating cock of both bogies. Make bogie-isolating cocks in 'Normal' position after releasing the BC pressure

c) In the dead locomotive, ensure isolating cock position in the pneumatic panel as follows. (Towed dead):

Cock	47 (Dead Engine)	74 (Emergency/ Vigilance)	136 (Brake Feed Pipe)	70 (E-70 brake pipe)
Position	Open	Closed	Closed	Closed

8. Connect BP pipe of the dead loco to the BP pipe of working loco and open BP angle cock of both the locos. The aux. reservoir on dead locomotive will get charged from BP supply of the working locomotive. Check the BP pressure gauge in the cab of dead loco. It should show the same pressure as that of the live locomotive (In case of locos are to be attached on a train having twin pipe i.e. both BP and FP then FP of both the locos should also connected and its angle cock should be opened.)

9. Lock the parking brakes in applied condition. This procedure is safe to avoid brake binding and condensation of moisture in the parking brake cylinder. It is as under

a) Apply the parking brakes of dead loco by apply push button.

b) Lock the parking brakes in applied condition.

c) Release the parking brake of the dead loco by manual operation of parking brake release handle on each of the four parking brake units. For manual brake release, first turn the release handle slightly clockwise and then pull till a sound of locking mechanism is heard.

The parking brake units are fitted on the following wheels:

LOCO TYPE	WHEEL POSITION OF PARKING BRAKE UNITS			
WAP5	1	4	5	8
WAG9	2	6	7	11



d). If some of the parking brake handles are defective and due to this if not possible to release manually, then release the same by manually pressing the “Release” Push Button of the latched solenoid valve no.30 on the pneumatic panel of the dead locomotive.

10) As parking brakes are locked in applied condition PB gauge will show 0 Kg/Cm².

11) Double check the release of parking brakes of dead loco by moving the parking brake unit by hand.

12) Apply auto brakes (A9) in the working locomotive and check that loco brakes on both the locomotives are getting applied. Then release the auto brake in the working loco and check that loco brakes are getting released on both the locomotives. Rear locomotive (WAG-9 / WAP-5 dead) takes about 60 seconds to release.

13) As a final check, run the coupled loco for about 500 metres and feel for any abnormal rise in temperature of wheels of dead loco and also check if at subsequent stop during journey.

14) Remember that in the dead locomotive, the loco brakes takes about 60 seconds to release after auto brake application from the live loco. Hence after every auto brake application and release wait for adequate time (minimum 1 minute) for release of loco brakes in dead locomotive before resuming traction

15) Escorts accompanied dead locomotive should never put BL key in position 'D' and also strictly avoid to energise the dead locomotive.

16). After reaching the destination, before detaching the working loco,

a) Unlock the application plunger of parking brake solenoid valve no. 30.

b) Press the release button of parking brake solenoid valve no. 30. This will charge parking brake line by 5 kg/cm². Apply parking brakes on dead locomotive by application plunger of parking brake solenoid valve no. 30.

C) Hauling dead locomotive fitted with IRAB-1/28LAV-1 brake system by WAP-5/WAG-9 locomotive

1. Set up the IRAB-1/28LAV-1 locomotives for hauling dead in normal condition.

2. Connect BP pipe of the dead loco to the BP pipes of working loco and open BP angle cock of both of loco and load side. The aux. reservoir on dead locomotive will get charged from BP supply. Check the BP pressure gauge in the cab of dead loco. It should show the same pressure as that of the live locomotive (In case of locos are to be attached on a train having twin pipe i.e. both BP and FP then FP of both the locos should also connected and its angle cock should be opened.)



3. Check the release of parking brakes/hand brakes of dead loco by moving the parking brake/hand brakes unit by hand and observing the clearance between the brake blocks/pads and the wheels wheel disc.
4. Apply auto brake (A9) in the working locomotive and check that loco brakes on both the locomotives are getting applied. Then release the auto brake in the working loco and check that loco brakes are getting released on both the locomotives.
5. As a final check, run the coupled loco for about 500 metres and feel for any abnormal rise in temperature of wheels of dead loco and also check if at subsequent stop during journey.
6. After reaching destination, before detaching the working loco, apply parking brake/hand brake on dead locomotive.



PART - B

TROUBLE SHOOTING DIRECTORY

SS01- MAIN POWER

1. SUB SYSTEM NO:-SS01 FAULT NO:-F0101P1

a) fault message :- Loco XXXXXX SS01: Main Power VCB STUCK IN ON POSITION Loco will be shut down F0101P1

Indication:- LSDJ will not glow

Effect:- SR Contactor will open (Hotel & Converter) Panto will lower

ACTION:-

- 1-Bring Throttle to '0' position.
- 2-Coast to clear the block section.
- 3-Bringing the loco to dead stop.
- 4-Swith OFF and ON the Electronics and check if LSDJ is glowing.
- 5-If so, raise panto and close VCB and resume Traction.

B) fault message :- Loco XXXXXX SS01: Main Power Isolated VCB Inhibited Loco is dead

Indication:- LSDJ will not glow

Effect:- VCB will not close

ACTION:-1- Switch OFF the Electronics and Switch it ON once again. Try to resume traction, if not succeeful, then-

2-Ask for relief loco within 20 minutes.

2. SUB SYSTEM NO:-SS01 FAULT NO:-F0102P1

a) fault message:- Loco XXXXX SS01: Main Power VCB STUCK IN OFF POSITION Try to close VCB again F0102P1

Indication:- LSDJ will glow

Effect:- VCB control changed to redundant processor

ACTION:-

- 1-Press BLDJ to close VCB.
- 2-If VCB gets closed then resume traction.
- 3-Otherwise coast to clear the block section, if possible, then bring the loco to dead stop.
- 4-Switch OFF the Electronics and Switch it ON once again.
- 5-Raise panto and close VCB and resume Traction.

b) fault message:-Loco XXXXX SS01: Main Power Isolated VCB Inhibited Loco is dead

Indication:- LSDJ will glow

Effect:-VCB will not close

ACTION:- 1-Swith OFF the Electronics and Switch it ON once again. Try to resume traction, if not successful, then-

2-Ask for relief loco within 20 minutes.



3. SUB SYSTEM NO:-SS01**FAULT NO:-F0103P1**

fault message:- Loco XXXXX SS01: Main Power Low Pressure Panto/Faulty Panto Check Isolating Cock Check Aux. Reservoir Pressure . F0103P1

Indication:- LSDJ will glow

Effect:- Panto will not raise

ACTION:- 1.Ensure that IG-38 (Blue key is inserted and keep horizontal on Pn.Panel.

2.Check that auxiliary compressor is working or not.

3.If not working, tap gently on Pressure switch No. 26 on pneumatic panel.

4.Check that pressure is available in Aux. Reservoir and more than 5.2 Kg/cm² on the gauge provided on pneumatic panel.

5.If not, then Switch OFF the Electronics and Switch it ON once again.

6.Check Panto isolating cocks on pneumatic panel.

7.Try to raise pantograph. If not successful, try to raise other pantograph by changing the position of panto selector switch (85) on pneumatic panel. Pressure in Pan circuit is monitored by a pressure switch (130.4/1 & 130.4/2).After giving panto raising command, if pressure switch not picked up within 35 sec, then VCB will be disabled. In case VCB is closed then it will open with delay of 2 seconds, if above pressure switch not picked up.

8.Try by changing the cab/ changing panto selector switch no. 85 on pneumatic panel.

4. SUB SYSTEM NO:-SS01**FAULT NO:-F0104P1**

fault message:- Loco XXXXX SS01 : Main Power Catenary Voltage Out Of Limit Watch Catenary Voltmeter Close VCB When Voltage is OK F0104P1

Indication:- LSDJ will glow

Effect:- VCB remain trip between Catenary voltage 17.5 kV to 30.0kV

ACTION:- 1-Bring throttle to '0' position. Wait for catenary voltage to rise above 17.5 KV but less than 29.5 KV. After OHE voltage get restored, then re-close the VCB and resume traction.

2-Switch OFF the Electronics and Switch it ON once again. Try to resume traction, if not succeed, then-

3-Change PT fuse (SB-1 Panel)

3-Try by changing panto.

4-Try by changing cab.

5-Try by isolating Traction converter 1 or Traction converter-2 one by one.



5. SUB SYSTEM NO:-SS01

FAULT NO:-F0105P1

Fault message:- Loco XXXXX

SS01:MainPower

TRANSFORMER OIL TEMPERATURE OR PRESSURE NOT OK
TE/BE reduction or VCB trips Try to close VCB if open F0105P1

Indication:-Nil

Effect:- Possibility of Reduced TE/BE. GTO pulsing will stop. Hotel load will off & VCB will trip.

ACTION:- 1-Bring throttle to '0' position.

2-Try to clear the block section by coasting.

3-Check manually if Transformer oil pumps are working by touching the pumps outlets and inlet pipes in the under frame. Check if MCB 62.1/1 and HB1& 62.1/2 in HB2 Cubicle. If found tripped open VCB and reset MCB once. If MPH not working then

a) Switch OFF and ON Electronics.

b) Keep loco in idle mode for 10 minutes.

4-Check the oil level in both the expansion tanks of transformer in Machine room located near Oil Cooling Unit. It should be in between the Max & Min Mark.

5-Driver should check the working of Oil cooler blower unit located in machine room; If it is not working then ensure that MCB 59.1/1 (in HB-1 Cubicle) & 59.1/2 (in HB-2 Cubicle) should not be in tripped condition. If found tripped, then open VCB & reset MCB only once. If OCBs are not working, then

A)Switch OFF and ON Electronics.

B)Keep loco in idle mode for 10 minutes. If driver noticed that OCB impeller and its casing got physically damaged, then driver should immediately isolate

a) concerned OCB by opening MCB 59.1/1 OR 59.1/2

b) concerned traction converter pump by opening oil pumps MCB 63.1/1 OR 63.1/2 and

c) concerned transformer oil pumps by opening MCB 62.1/1 OR 62.1/2.Driver should operate above MCB after opening VCB and switching OFF control electronics. Then driver should isolate concerned Bogie-by-Bogie isolating switch (154) located in SB-1 cubicle. Switch ON control electronics raise panto & close VCB. Work the train with one bogie in service after making conversation with TLC.

6-Try to resume traction.

7-If the same message repeats, Bring throttle to 0. Switch OFF the Electronics and Switch it ON once again. Raise panto and close VCB and resume traction.



8- If not successful within 20 minutes, ask for relief loco.

6. SUB SYSTEM NO:-SS01 FAULT NO:-F0106P1

Fault message:- :- Loco XXXXX SS01 : Main Power
FILTER ON/OFF CONTACTOR STUCK ON VCB will not close again
F0106P1.

Indication:- LSDJ will glow

Effect:- Filter discharging contactor will open

ACTION:- 1-If VCB opens, it will not close again.

2-Bring Throttle to 0. Switch OFF the Electronics and Switch it ON once again. Raise panto and close VCB and resume Traction if loco get normal.

3-Harmonic filter get isolated automatically. Driver can work at 40 KMPH.

7. SUB SYSTEM NO:-SS01 FAULT NO:-F0107P1

A) Fault message:- Loco XXXXX SS01 : Main Power
PRECHARGE OR MAIN CONTACTOR STUCK ON
Main converter blocked F0107P1

Indication:- LSDJ will glow

Effect:- VCB will trip

ACTION:-1- Bring throttle to '0' position.

2-Switch OFF the Electronics and Switch it ON once again. Raise panto and close VCB and resume traction.

3-If no success received, then clear block section with one bogie in service, then talk to TLC and act accordingly.

4-If not successful within 20 minutes ask for relief loco.

B)Fault message:- Loco XXXXX SS01 : Main Power MAIN POWER
ISOLATED VCB inhibited Loco is dead .

Indication:- LSDJ will glow.

Effect:- VCB will trip.

ACTION:-1-Switch OFF the Electronics and Switch it ON once again.
Raise panto and close VCB and resume traction

2-If VCB can not be closed, shut down loco.

3-Ask for relief loco within 20 minutes

8. SUB SYSTEM NO:-SS01 FAULT NO:-F0108P1

A)Fault message:- Loco XXXXX SS01 : Main Power
PRIMARY OVER CURRENT Check over current relay flag Try to
close VCB again F0108P1

Indication:- LSDJ will glow

Effect:- Power supply of VCB closing / Holding coil will interrupt
through Maximum current relay.

ACTION:-1- Don't close DJ until you check the loco.



2-Coast to clear block section. Bringing the loco to dead stop.

3-Check over current relay-78 flag in SB-1 panel

4-Inspect the Machine Room for any oil spillage.

5-Check the oil level in both the expansion tanks of transformer in Machine room located near Oil Cooling Unit and the expansion tanks of both converters. It should be in between the Max. & Min. Mark. If there is any abnormality like splashing of oil inside the machine room or Transformer, shut down the loco. Ask for relief loco within 20 minutes.

6-If flag found dropped, but there is no abnormality of oil splashing, oil level is in between max & min in all the four gauges, press BLDJ to close VCB after resetting the relay target. Inform TLC and record in the logbook.

7-If not successful after making one attempt as given in step 6 then VCB will inhibited ask for relief loco without loosing time.

B) Fault message:- Loco XXXXX SS01 : Main Power MAIN POWER ISOLATED VCB inhibited Loco is dead

Indication:- LSDJ will glow

Effect:- VCB will not close

ACTION:-1-Switch OFF the Electronics and Switch it ON once again. Raise panto and close VCB and resume Traction.

2-If not succeed then, VCB can not be closed.

3-Ask for relief loco within 20 minutes

9. SUB SYSTEM NO:-SS01 FAULT NO:-F0109P1

A)Fault message:- Loco XXXXX SS01 : Main Power AUX. WINDING OVER CURRENT Try to close VCB again

Indication:- LSDJ will glow

Effect:- VCB will trip

ACTION:- Press BLDJ to close VCB

B) Fault message:- Loco XXXXX SS01: Main Power MAIN POWER ISOLATED VCB inhibited Loco is dead

Indication:- LSDJ will glow

Effect:- VCB will not close

ACTION:-1- Switch OFF the Electronics and Switch it ON once again. Raise panto and close VCB and resume Traction.

2-If VCB cannot be closed, shut down the loco.

3-Ask for relief loco within 20 minutes.

10. SUB SYSTEM NO:-SS01 FAULT NO:-F0110P1

A)Fault message:- Loco XXXXX SS01 : Main Power FATAL ERROR IN MAIN CIRCUIT



Turn OFF the loco .

Indication:- LSDJ will glow

Effect:- VCB will Open & panto will Lower

ACTION:- 1-Bring throttle to '0' position.

2-Check MCB's in HB / SB, if found tripped, reset once.

3-Switch OFF the Electronics and Switch it ON once again. Raise panto and close VCB and resume Traction. More than one sub system isolated

B)Fault message:- Loco XXXXX SS01 : Main Power

MAIN POWER ISOLATED VCB inhibited Loco is dead

Indication:- LSDJ will glow

Effect:- VCB will not close

ACTION:-1-Trouble shoot as per Additional items given at end of SS-01 for OCB, TMB, MPH-C and MCP.If not successful then,

2-Switch OFF the Electronics and Switch it ON once again. Raise panto and close VCB and resume Traction

3-If VCB can not be closed, shut down loco.

4-Ask for relief loco within 20 minutes

11-SUB SYSTEM NO:-SS01

FAULT NO:-F0101P2

Fault message:- Loco XXXXX SS01 : Main Power

OVER TEMPERATURE CONTROL ELECTRONICS

Turn off the loco. Setup cooling mode F0101P2

Indication:- LSCE will glow

Effect:- Contactor of Control electronics will not close

ACTION:-1-Check MCB's in HB/SB, if found tripped, reset once.

2-Try to clear section.

3-Advice station, regarding inability for 10-15 minutes.

4-Switch OFF the control Electronics. Put BL Key in position 'C' raise pantograph with ZPT, close VCB both Machine Room Blowers will start working. The loco is now, in cooling mode and Electronics is being cooled wait till LSCE extinguished.After Extinguishing LSCE open DJ, lower panto. Put BL Key to 'D' position. Raise panto, close VCB and resume traction.

12. SUB SYSTEM NO:-SS01

FAULT NO:-F0102P2

Fault message:- Loco XXXXX SS01 : Main Power

TRANSFORMER OIL PRESSURE NOT OK Any Oil Pump Circuit Not Working TE/BE Will Be Reduced F0102P2

Indication:- NIL

Effect:- Possibility of reduced TE/BE. Ventilation will increase. VCB will trip

ACTION:-1- Coast to clear block section.



2-Check manually that oil pumps are working or not by touching the pumps outlets and inlet pipes in the under frame. Check MCB 62.1/1 in HB1 & 62.1/2 in HB2 panels. If found tripped, open VCB and reset MCB once.

3- Switch OFF the Electronics and Switch it ON once again. Raise the panto and close VCB and resume traction. If not successes clear the section TE/BE less or one bogie isolated. Then talk to TLC and act accordingly.

4-Train works one bogie. If not successes Ask for relief loco within 20 minutes.

13. SUB SYSTEM NO:-SS01

FAULT NO:-F0103P2

Fault message:- Loco XXXXX SS01:MainPower EARTH FAULT AUX. WINDING CIRCUIT Normal operation can continue. To be checked during maintenance F0103P2

Indication:-NIL

Effect:-NIL

ACTION:-1- Inform TLC and record in the logbook.

2- Normal operation can continue.

3-Check visually machine room for burning / burning smell of Auxiliaries. If found, trip MCB of that Aux.

14.SUB SYSTEM NO:-SS01

FAULT NO:-F0104P2

Fault message:- Loco XXXXX SS01:MainPower F0104P2

LOW FREQUENCY CATENARY VOLTAGE Wait for 1 minute and set TE/BE again.

Indication:-nil

Effect:- Traction will start above 45 Hz.

ACTION:-1-Coast to clear block section.

2- Inform TLC at scheduled stop and record in the logbook.

3-Keep trying for traction and resume normal operation.

15. SUB SYSTEM NO:-SS01

FAULT NO:-F0105P2

Fault message:- Loco XXXXX SS01 : Main Power CATENARY FREQUENCY IS HIGH Bring throttle to zero F0105P2

Indication:-nil

Effect:- Traction will start till the frequency is below 55 Hz.

ACTION:-1- Coast to clear block section.

2- Inform TLC at scheduled stop and record in the logbook.

3. Keep trying for traction and resume normal operation.



16. SUB SYSTEM NO:-SS01

FAULT NO:-F0106P2

Fault message:- Loco XXXXX

SS01 : Main Power

AUXILIARY CAPACITOR MACHINE ROOM BLOWER NOT OFF

Continue normal traction F0106P2

Indication:-nil

Effect:-nil

ACTION:-1- If M/R Blower 1 and 2 working, continue normal operation.

2- Inform TLC at scheduled stop and record in the logbook.

SS02- TRACTION BOGI-1

1. SUB SYSTEM NO:-SS02

FAULT NO:-F0201P1

A)Fault message:- Loco XXXXX

SS02: Traction Bogie 1

DISTURBANCE IN CONVERTER1 Try to close VCB againF0201P1

Indication:- LSDJ Will Glow.

Effect:-

ACTION:-1- Press BLDJ to close VCB.

2-If the message repeats, switch OFF the electronics and switch it ON once again after 5 minutes. Raise panto, close VCB and resume traction if loco gets normal.

3-If the message repeats and bogie-1 is not getting isolated automatically then isolate bogie 1 by Switch No. 154 Provided in SB-1 cubicle. Rotary switch No. 154 to be operated after switching off control electronics only.

4-Inform TLC and record DDS message which comes before isolation of bogie in the logbook

B)Fault message:- Loco XXXXX SS02: Traction Bogie 1

BOGIE 1 ISOLATED : Only half traction and electrical braking power available Press <Enter>

Indication:- LSFI will glow

Effect:- Bogie 1 will isolate. Only half TE/BE power will available

ACTION:-1- If bogie-1 is isolated by Driver through (154) switch (by keeping electronics in off condition) then only acknowledge the isolation message by pressing <ENTER> on display key board otherwise-

2-Switch OFF the Electronics and Switch it ON once again. Raise the panto and close VCB and resume traction.

3-If the same message repeats resume normal operation with half traction/braking power.



4- Inform TLC and record in the logbook.

2. SUB SYSTEM NO:-SS02 FAULT NO:-F0202P1

A)Fault message:- LocoXXXXX SS02: Traction Bogie 1
CONVERTER CONTACTOR STUCK OFF Try to close VCB again
F0202P1

Indication:-NIL

Effect:-NIL

ACTION:-1-Check MCBs in SB-1.If found tripped, reset it once.

2-Press BLDJ to close VCB.

3-Check for air leakage from SR-1. If air is leaking, then isolate air supply to concerned SR by cock on pneumatic panel.

4-If VCB not closed and same message repeated, then this will lead to isolation of Bogie-1.

B) SUB SYSTEM NO:-SS02 FAULT NO:-F0202P1

Fault message:- Loco XXXXX SS02: Traction Bogie 1
BOGIE 1 ISOLATED: Only half traction and electrical braking power available Press <Enter>

Indication:- LSFI will glow

Effect:- Bogie 1 will isolate. Only half TE/BE power will available.

ACTION:-1- If bogie-1 is isolated by Driver through (154) switch (by keeping electronics in off condition) then only acknowledge the isolation message by pressing <ENTER> on display key board otherwise-

2-Switch OFF the Electronics and Switch it ON once again. Raise the panto and close VCB and resume traction.

3-If the same message repeats resume normal operation with half traction/braking power.

4- Inform TLC and record in the logbook.

3. SUB SYSTEM NO:-SS02 FAULT NO:-F0203P1

A)Fault message:- LocoXXXXX SS02: Traction Bogie 1
GATE UNIT SUPPLY STUCK OFF Try to close VCB again F0203P1

Indication:- LSDJ Will Glow

Effect:-NIL

ACTION :-1-Check MCB in SB-1.If found tripped,reset once.

2-Press BLDJ to close VCB

B)SUB SYSTEM NO:-SS02 FAULT NO:-F0203P1

Fault message:- Loco XXXXX SS02: Traction Bogie 1
BOGIE 1 ISOLATED: Only half traction and electrical braking power available Press <Enter>

Indication:- LSFI will glow

Effect:- Bogie 1 will isolate. Only half TE/BE power will available.



ACTION:-1-Coast to clear the block section or up to next schedule stop with one Bogie in service provided there is no loss of time in hauling the train with one Bogie in service.

2-Driver should check the MCB (127.1/1) located in SB-1 cubicle. If found tripped, reset it once after opening VCB.

3-Switch OFF the Electronics and Switch it ON once again. Raise the panto and close VCB and resume traction.

4-If the same message repeats, resume normal operation with half traction / braking power.

5-Inform TLC and record in logbook.

4. SUB SYSTEM NO:-SS02 FAULT NO:-F0205P1

A)Fault message:- Loco XXXXX SS02: Traction Bogie 1

CONVERTER -1 OIL TEMPERATURE TOO HIGH Try to close VCB againF0205P1

Indication:- LSDJ

Effect:-NIL

ACTION:-1- Check oil level in converter expansion tank, located above the converter cubicle.

2-Check manually that oil-cooling blower unit-1 is working by checking the air coming out of the radiator in the underframe. Check MCB 59.1/1 in HB1 panel. If found tripped, open VCB and reset MCB once. Ensure working of traction converter pump-1. If not working then check MCB (62.1/1) located in HB1. If found tripped, reset it once after opening VCB.

3-Driver should also inspect the oil cooler blower motor-1 impeller and casing for any sign of damage. If found damaged, then driver should open VCB, lower panto and switch off control electronics. Open MCB 59.1/1, open MCB 62.1/1 & MCB 63.1/1 (all located in HB1 cubicle). Then isolate bogie-1 by bogie isolating switch 154 (located in SB-1) cubicle.

4-Energise the loco and work the train with one bogie in service.

Under such condition, LSFI will glow permanently. Inform to TLC and record in Loco logbook.

B)Fault message:- Loco SS02: Traction Bogie 1

BOGIE 1 ISOLATED: Only half traction and electrical braking power available. Press <Enter>

Indication:- LSFI will glow

Effect:- Bogie 1 will isolate. Only half TE/BE power will available.

ACTION:-1- Switch OFF the Electronics and Switch it ON once again. Raise panto, close VCB and resume Traction.



2-If the same message repeats resume normal operation with half traction/braking power.

3- Inform TLC and record in the logbook.

5. SUB SYSTEM NO:-SS02 FAULT NO:-F0206P1

A)Fault message:- Loco XXXXX SS02: Traction Bogie 1

CONVERTER 1 OIL PRESSURE NOT OK Check oil level

Try to close the VCB again

Indication:- LSDJ

Effect:- NIL

ACTION:-1- BUR-II to be kept isolated and try to close VCB.

2-If problem disappear, work with BUR-II isolated.

3-If problem persist, BG-I will get automatically isolated.

4- Check oil level in converter expansion tank.

5- Check manually that converter-1 oil pumps are working or not by touching the pumps outlet and inlet pipes in the machine room. Check MCB 63.1/1 in HB1 panel. If found tripped, open VCB and reset MCB only once.

6-If MCB 63.1/1 getting trip again after resetting it once then do not try to reset the MCB again. BG-I will get automatically isolated. Work with half traction.

7-Driver should also inspect the traction converter No.1 oil pipe line for any sign of damage causing oil leakage and inspect the oil cooler blower-1 casing for any sign of damage due to failure of its impeller. In this case it may lead to damage of converter radiator causing oil leakage and lead to fault message "Converter No.1 oil pressure low". Then driver should open VCB, lower panto & switch off control electronics. Open MCB 59.1/1, 63.1/1 (all located in HB-1 cubicle). Isolate bogie-1 by putting rotating switch 154 at position-1.

8-Energise the loco and work the train with one bogie in service. Under such condition LSFI will glow permanently if driver isolated the bogie-1 as described in step 6 & 7 above. Inform TLC and record in loco log book.

B)Fault message:- Loco XXXXX SS02: Traction Bogie 1

BOGIE 1 ISOLATED : Only half traction and electrical braking power available.Press <Enter>

Indication:- LSFI will glow

Effect:- Bogie 1 will isolate. Only half TE/BE power will available.

ACTION:-1- Switch OFF the Electronics and Switch if ON once again. Raise panto,close VCB and resume traction.

2-If the same message repeats, resume normal operation with half traction / braking power.

3- Inform TLC and record in the logbook.



6. SUB SYSTEM NO:-SS02 FAULT NO:-F0207P1
A)Fault message:- Loco XXXXX SS02: Traction Bogie 1
TRACTION MOTOR TEMPERATURE TOO HIGH Converter 1
blocked Bogie 1 may get isolated F0207P1
Indication:-NIL

Effect:-NIL

ACTION:-1- Clear block section. Bring throttle to '0' position.
2-Check manually whether traction motor blower-1 is working or not, by checking air suction at TM Louver. Check MCB 53.1/1 in HB1 panel. If found tripped, open VCB and reset MCB once

B)Fault message:- LocoXXXXX SS02: Traction Bogie 1
BOGIE 1 ISOLATED: Only half traction and electrical braking power available Press<Enter>

Indication:- LSF1 will glow

Effect:- Bogie 1 will isolate. Only half TE/BE power will available.

ACTION:-1- BUR-II to be kept isolated and try to close VCB.

2-Switch OFF the electronics and switch it ON once again. Raise panto, close VCB and resume traction if loco gets normal.

3-If problem disappear, work with BUR-II isolated.

4-If problem persist, BG-I will get automatically isolated

5-If the same message repeats, resume normal operation with half traction / braking power.

6-Inform TLC and record in the logbook.

7. SUB SYSTEM NO:-SS02 FAULT NO:-F0201P2

Fault message:- Loco XXXXX SS02: Traction Bogie 1
EARTH FAULT IN CONVERTER1 Normal operation can continue To be checked during maintenance F0201P2

Indication:-NIL

Effect:-NIL

ACTION:-1- Resume normal operation.

2-Inform TLC and record in the logbook.

8. SUB SYSTEM NO:-SS02 FAULT NO:-F0202P2

Fault message:- Loco SS02: Traction Bogie 1
TRACTION MOTOR OVERSPEED TE is being reduced F0202P2

Indication:-NIL

Effect:-NIL

ACTION:- 1-Reduce speed.

2-Resume normal operation



9. SUB SYSTEM NO:-SS02**FAULT NO:-F0203P2**

Fault message:- Loco XXXXX SS02: Traction Bogie 1
MUB RESISTANCE TOO HOT IN CONVERTER 1

Wait for 30 seconds F0203P2

Indication:- LSDJ

Effect:- NIL

ACTION:- 1-Wait for 30 seconds before re closing VCB in order to cool MUB resistance (15.1 located in converter cubicle)

2-Press BLDJ to close VCB.

10. SUB SYSTEM NO:-SS02**FAULT NO:-F0204P2**

Fault message:- Loco XXXXX SS02: Traction Bogie 1 FAULTY
MOTOR TEMPERATURE SENSOR Normal operation can continue To be checked during maintenance F0204P2

Indication:- NIL

Effect:- NIL

ACTION:- 1- Resume normal operation.

2- Inform TLC and record in the logbook.

11. SUB SYSTEM NO:-SS02**FAULT NO:-F0205P2**

Fault message:- Loco XXXXX SS02: Traction Bogie 1
EQUIPMENT TEMPERATURE HIGH TE/BE is being reduced F0205P2

Indication:- NIL

Effect:- TE/BE will continuously reduced.

ACTION:- 1-Clear block section. Bring throttle to '0' position.

2-Wait for 10 minutes or some time till transformer/ converter oil temperature normalizes.

3-Check MCBs n HB/SB , if tripped , reset it once.

4-Ensure working of all auxiliaries and MRB.

5-Resume normal traction.

6-If message persists, switch OFF the electronics and Switch it ON once again. Raise panto, close VCB and resume traction if loco get normal otherwise isolate bogie-1 by switch (154) & work the train on one bogie after making conversation with TLC.

7-If no success within 20 minutes, ask for relief loco.

12. SUB SYSTEM NO:-SS02**FAULT NO:-F0206P2**

Fault message:- Loco XXXXX SS02: Traction Bogie 1
DC LINK CAPACITORS PRESSURE NOT OK Normal operation can continue To be checked during maintenance F0206P2

Indication:- NIL

Effect:- NIL



ACTION:-1 Acknowledge the fault by pressing BPFA & resume normal operation.
2-Inform TLC and record in the logbook. Inform maintenance staff at destination station.
3-DC link capacitors have to be checked during maintenance. Capacitors may get open circuit or defective.

13. SUB SYSTEM NO:-SS02 FAULT NO:-F0207P2

Fault message:- Loco XXXXX SS02: Traction Bogie 1

WHEEL SKIDING IN BOGIE 1 Reduce BE F0207P2

Indication:-NIL

Effect:-NIL

ACTION:-1- Ensure free running of wheels.

2-Ensure that there is no brake binding on loco.

3 -Check all parking brakes are released properly.

4 -If speed is more than 1 KMPH and there is message in DDS" Error Tacho Generator". Then driver can work normally after switching OFF and ON control electronics.

5 -Reduce braking effort, physically experience the wheel skidding sound in running condition. Inform TLC & make entry in Logbook

SS03- TRACTION BOGI-2

1. SUB SYSTEM NO:-SS03 FAULT NO:-F0301P1

A)Fault message:- Loco XXXXX SS03: Traction Bogie 2

DISTURBANCE IN CONVERTER2 Try to close VCB againF0301P1

Indication:- LSDJ, LSFI will glow

Effect:-Nil

ACTION:-1- Press BLDJ to close VCB.

2-If the message repeats, switch OFF the electronics and switch it ON once again after 5 minutes. Raise panto, close VCB and resume traction if loco gets normal.

3-If the message repeats and bogie-2 is not getting isolated automatically then isolate bogie 2 by Switch No. 154 Provided in SB-1 cubicle. Rotary switch No. 154 to be operated after switching off control electronics only.

4-Inform TLC and record DDS message which comes before isolation of bogie in the logbook.

B)Fault message:- Loco XXXXX SS03: Traction Bogie 2

BOGIE 2 ISOLATED : Only half traction and electrical braking power available Press <Enter>

Indication:- LSFI will glow



Effect:- Bogie 2 will isolate. Only half TE/BE power will available.

ACTION:-1- If bogie-2 is isolated by Driver through (154) switch (by keeping electronics in off condition) then only acknowledge the isolation message by pressing <ENTER> on display key board otherwise-

2-Switch OFF the Electronics and Switch it ON once again. Raise the panto, close VCB and resume traction.

3-If the same message repeats resume normal operation with half traction/braking power.

4-Inform TLC and record in the logbook.

2. SUB SYSTEM NO:-SS03 FAULT NO:-F0302P1

A)Fault message:- Loco XXXXX SS03: Traction Bogie 2
CONVERTER CONTACTOR STUCK OFF Try to close VCB again
F0302P1

Indication:-Nil

Effect:-Nil

ACTION:-1-Check MCBs in SB-2.If found tripped, reset it once.

2-Press BLDJ to close VCB.

3-Check for air leakage from SR-2.If air is leaking, then isolate

4-air supply to concerned SR by cock on pneumatic panel.

If VCB not closed and same message repeated, then this will lead to isolation of Bogie-2.

B)Fault message:- Loco XXXXX SS03: Traction Bogie 2
BOGIE 2 ISOLATED: Only half traction and electrical braking power
available Press <Enter>

Indication:- LSF1 will glow.

Effect:- Bogie 2 will isolate. Only half TE/ BE power will available.

ACTION:-1-If bogie-2 is isolated by Driver through (154) switch (by keeping electronics in OFF condition) then only acknowledge the isolation message by pressing <ENTER> on display key board otherwise-

2-Switch OFF the Electronics and Switch it ON once again. Raise the panto, close VCB and resume traction.

3-If the same message repeats resume normal operation with half traction/braking power.

4-Inform TLC and record in the logbook.

3. SUB SYSTEM NO:-SS03 FAULT NO:-F0303P1

A)Fault message:- Loco XXXXX SS03: Traction Bogie 2
GATE UNIT SUPPLY STUCK OFF Try to close VCB again F0303P1

Indication:- LSDJ

Effect:-NIL



ACTION:- 1-Check MCB in SB-2, if any MCB is found tripped, reset it once.

2-Press BLDJ to close VCB.

B)Fault message:- Loco XXXXX SS03: Traction Bogie 2

BOGIE 2 ISOLATED: Only half traction and electrical braking power available Press <Enter>

Indication:- LSF1 will glow

Effect:- Bogie 2 will isolate. Only half TE/BE power will available.

ACTION:-1- Coast to clear the block section or up to next schedule stop with one Bogie in service provided there is no loss of time in hauling the train with one Bogie in service.

2-Driver should check the MCB (127.1/2) located in SB-2 cubicle. If found tripped, reset it once after opening VCB.

3-Switch OFF the Electronics and Switch it ON once again. Raise the panto, close VCB and resume traction.

4-If the same message repeats, resume normal operation with half traction / braking power

5-Inform TLC and record in logbook.

4. SUB SYSTEM NO:-SS03 **FAULT NO:-**F0304P1

Fault message:- Loco XXXXX SS03: Traction Bogie 2

Faulty Motor Temp. Sensor Normal Operation To Continue F0305P1

Indication:-NIL

Effect:-NIL

ACTION:- Normal operation can be continued.

5. SUB SYSTEM NO:-SS03 **FAULT NO:-**F0305P1

A)Fault message:- Loco XXXXX SS03: Traction Bogie 2

Converter 2 Oil Temperature Too High Try To Close VCB Again F0305P1

Indication:- LSDJ, LSF1

Effect:-NIL

ACTION:-1- Check oil level in converter expansion tank, located above the converter cubicle.

2-Check manually that oil-cooling blower unit-2 is working by checking the air coming out of the radiator in the under frame. Check MCB 59.1/2 in HB2 panel. If found tripped, open VCB and reset MCB once. Ensure working of traction converter pump-2. If not working, then check MCB (63.1/2) located in HB-2. If found tripped, reset it once after opening VCB.

3-Driver should also inspect the oil cooler blower motor-2 impeller and casing for any sign of damage. If found damaged, then driver should open VCB, lower panto and switch off control electronics. Open MCB 59.1/2, open MCB 62.1/2 & MCB 63.1/2 (all located in



HB-2 cubicle). Then isolate bogie-2 by bogie isolating switch 154 (located in SB-1) cubicle.

4-Energise the loco and work the train with one bogie in service. Under such condition, LSFI will glow permanently. Inform TLC and record in Loco logbook.

B)Fault message:- Loco SS03: Traction Bogie 2
BOGIE 2 ISOLATED: Only half traction and electrical braking power available. Press <Enter>

Indication:- LSFI will glow

Effect:- Bogie 2 will isolate. Only half TE/BE power will available.

ACTION:-1-Switch OFF the Electronics and Switch it ON once again. Raise panto, close VCB and resume Traction.

2-If the same message repeats resume normal operation with half traction/braking power.

3-Inform TLC and record in the logbook.

6. SUB SYSTEM NO:-SS03 FAULT NO:-F0306P1

A)Fault message:- Loco XXXXX SS03: Traction Bogie 2
CONVERTER 2 OIL PRESSURE NOT OK Check oil level Try to close the VCB again

Indication:- LSDJ Will Glow

Effect:-NIL

ACTION:-1- BUR-II to be kept isolated and try to close VCB.

2-If problem disappear, work with BUR-II isolated.

3-If problem persist, BG-2 will get automatically isolated

4-Check oil level in converter 2 expansion tank.

5-Check manually that converter-2 oil pumps are working or not by touching the pumps outlet and inlet pipes in the machine room. Check MCB 63.1/2 in HB-2 panel. If found tripped, open VCB and reset MCB only once.

6-If MCB 63.1/2 getting tripped again after resetting it once then do not try to reset the MCB again. BG-2 will get automatically isolated. Work with half traction.

7-Driver should also inspect the traction converter No.2 oil pipe line for any sign of damage causing oil leakage and inspect the oil cooler blower casing-2 for any sign of damage due to failure of its impeller. In this case it may lead to damage of converter radiator causing oil leakage and lead to fault message "Converter No.2 oil pressure low". Then driver should open VCB, lower panto & switch off control electronics. Open MCB 59.1/2, 63.1/2 (all located in HB-2 cubicle). Isolate bogie-2 by putting rotating switch 154.



8-Energise the loco and work the train with one bogie in service. Under such condition LSFI will permanently glow if driver isolated the bogie-2 as described in step 6 & 7 above. Inform TLC and record in loco log book.

B)Fault message:- Loco XXXXX SS03: Traction Bogie 2 BOGIE 2 ISOLATED: Only half traction and electrical braking power available. Press <Enter> Bogie 2 will isolate. Only half TE/BE power will available

Indication:- LSFI will glow

Effect:-NIL

ACTION:-1- Switch OFF the Electronics and Switch if ON once again. Raise panto, close VCB and resume traction.

2-If the same message repeats, resume normal operation with half traction / braking power.

3-Inform TLC and record in the logbook.

7. SUB SYSTEM NO:-SS03 **FAULT NO:-**F0307P1

A)Fault message:- Loco xxxxxx SS03: Traction Bogie 2 TRACTION MOTOR TEMPERATURE TOO HIGH Converter 2 blocked Bogie 2 may get isolated F0307P1

Indication:- LSFI will glow

Effect:-NIL

ACTION:-1- Bring throttle to '0' position.

2-Check manually whether traction motor blower-2 is working or not, by checking air suction at TM Louver. Check MCB 53.1/2 in HB-2 panel. If found tripped, open VCB and reset MCB once.

B)Fault message:- Loco xxxxx SS03: Traction Bogie 2 BOGIE 2 ISOLATED: Only half traction and electrical braking power available Press<Enter>

Indication:- LSFI will glow

Effect:- Bogie 2 will isolate. Only half TE/BE power will available.

ACTION:-1- BUR-II to be kept isolated and try to close VCB.

2-Switch OFF the electronics and switch it ON once again. Raise panto and close VCB and resume traction if loco gets normal.

4-If problem disappear, work with BUR-II isolated.

5-If problem persist, BG-II will get automatically isolated

6-If the same message repeats, resume normal operation with half traction / braking power.

7-Inform TLC and record in the logbook.



8. SUB SYSTEM NO:-SS03**FAULT NO:-F0301P2**

Fault message:- Loco xxxxx SS03: Traction Bogie 2
EARTH FAULT IN CONVERTER 2 Normal operation can continue To
be checked during maintenance F0301P2

Indication:- nill

Effect:- nill

ACTION:- 1 Resume normal operation.
2-Inform TLC and record in the loco logbook.

9. SUB SYSTEM NO:-SS03**FAULT NO:-F0302P2**

Fault message:- Locoxxxxxx SS03: Traction Bogie 2
TRACTION MOTOR OVERSPEED TE is being reduced
Reduce Loco speed F0302P2

Indication:- --

Effect:- ---

ACTION:- 1-Reduce speed.
2-Resume normal operation

10. SUB SYSTEM NO:-SS03**FAULT NO:-F0303P2**

Fault message:- Loco xxxxx SS03: Traction Bogie 2
Mub Resistance Too Hot In Converter 2 Wait For 30 Seconds
F0303P2

Indication:- LSDJ will glow

Effect:- --

ACTION:- 1- Wait for 30 seconds before re closing VCB in
2-order to cool MUB resistance (15.1 located in converter cubicle)
Press BLDJ to close VCB.

11. SUB SYSTEM NO:-SS03**FAULT NO:-F0304P2**

Fault message:- Loco xxxxx SS03: Traction Bogie 2
FAULTY MOTOR TEMERATURE SENSOR Normal operation can
continue To be checked during maintenance F0304P2

Indication:- ---

Effect:- --

ACTION:- 1- Resume normal operation.
2-Inform TLC and record in the logbook.

12. SUB SYSTEM NO:-SS03**FAULT NO:-F0305P2**

Fault message:- Loco xxxxx SS03: Traction Bogie 2
EQUIPMENT TEMPERATURE HIGH TE/BE is being reduced
F0305P2

Indication:- ---

Effect:- TE/BE will continuously reduced



ACTION:- 1-Clear block section. Bring throttle to '0' position.
 2-Wait for 10 minutes or some time till transformer/ converter oil temperature normalizes.
 3-Check MCBs HB/SB , if tripped , reset it once.
 4-Ensure working of all auxiliaries and MRB.
 5-Resume normal traction.
 6-If message persists, switch OFF the electronics and Switch it ON once again. Raise panto, close VCB and resume traction if loco get normal otherwise isolate bogie-2 by switch (154) & work the train on one bogie after making conversation with TLC.
 7-If no success within 20 minutes, ask for relief loco.

13. SUB SYSTEM NO:-SS03 FAULT NO:-F0306P2

Fault message:- Loco xxxxxx SS03: Traction Bogie 2
 DC LINK CAPACITORS PRESSURE NOT OK Normal operation can continue To be checked during maintenance
 F0306P2

Indication:-

Effect:-

ACTION:- 1-Acknowledge the fault by pressing BPFA & resume normal operation.
 2-Inform TLC and record in the logbook. Inform maintenance staff at destination station.

14. SUB SYSTEM NO:-SS03 FAULT NO:-F0307P2

Fault message:- Loco xxxxxx SS02: Traction Bogie 2
 WHEEL SKIDING IN BOGIE 2 Reduce BE F0307P2

Indication:- --

Effect:- ----

ACTION:- 1- Ensure free running of wheels.
 2-Ensure that there is no brake binding on loco.
 3-Ensure that all parking brakes are released.
 4-If speed is more than 1 KMPH and there is message in DDS" Error Tacho Generator". Then driver can work normally after switching OFF and ON control electronics.
 5-Reduce braking effort, physically experience the wheel skidding sound in running condition. Inform TLC & make entry in Logbook



SS04 – HARMONIC FILTER

1. SUB SYSTEM NO:-SS04 SUB SYSTEM NO:-F0401P1

A)Fault message:- Loco XXXXX SS01: Harmonic filter
HARMONIC FILTER CURRENT TOO HIGH Try to close VCB again
F0401P1

Indication:- LSDJ, LSFI will glow

Effect:-

ACTION:-1- Press BLDJ to close VCB

2-If the message persists. Switch OFF the Electronics and Switch it ON once again. Raise panto, close VCB and resume Traction.

B) Fault message:- Loco XXXXX SS01: Harmonic filter
HARMONIC FILTER ISOLATED Speak to TLC Max. permitted speed
is 40 Kmph Press <Enter>

Indication:- LSFI will glow

Effect:- Harmonic Filter will isolate. Max speed 40 Kmph

ACTION:-1- Speed will be reduced to 40 KMPH.

2-Inform TLC and Resume normal Traction.

3-After passing 1-2 section , switch OFF the CE and switch it ON again.

4-If Harmonic filter comes in service, resume normal traction with normal speed.

5-If not successful , work the train with 40 KMPH and both SR in service or isolate SR-1 by switch 154, and work with half TE / BE at normal speed.

2. SUB SYSTEM NO:-SS04 FAULT NO:-F0402P1

A)Fault message:- Loco XXXXX SS01: Harmonic filter HARM.
FILTER CONTACTOR (S) STUCK OFF/ON Harmonic filter will be
isolated Speak to TLC F0402P1

Indication:- LSDJ,LSFI will glow

Effect:-

ACTION:- 1-Press BLDJ to close VCB.

2-If the message persist, switch OFF the Electronics and Switch it ON once again. Raise panto, close VCB and resume Traction.

B) Fault message:- Loco XXXXX SS01: Harmonic filter
HARMONIC FILTER ISOLATED Speak to TLC Max. permitted speed
is 40 Km/h Press <Enter>

Indication:- LSFI will glow

Effect:- Harmonic Filter will isolate. Max speed 40 Kmph

ACTION:-1- Speed will be reduced to 40 KMPH.

2-Inform TLC and Resume normal Traction.



3-After passing 1-2 section , switch OFF the CE and switch it ON again.

4-If Harmonic filter comes in service, resume normal traction with normal speed.

5-If not successful , work the train with 40 KMPH and both SR in service or isolate SR-1 by switch 154, and work with half TE / BE at normal speed.

3. SUB SYSTEM NO:-SS04 FAULT NO:-F0404P1

Fault message:- Loco XXXXX SS01: Harmonic filter RESISTOR TOO HOT No. of filter discharges exceeded

VCB will remain inhibited 15 min. F0404P1

Indication:- LSDJ,LSFI will glow

Effect:- Harmonic Filter will isolate. Max speed 40 Kmph

ACTION:-1- Wait for 15 minutes and try to close VCB again by pressing BLDJ.

2-If the message persists, switch OFF the electronics and Switch it ON once again. Raise panto, close VCB and resume traction.

4. SUB SYSTEM NO:-SS04 FAULT NO:-F0401P2

Fault message:- Loco XXXXX SS01: Harmonic filter FILTER CONTACTOR 8.1 STUCK ON If VCB opens it will not close again F0401P2

Indication:-

Effect:-

ACTION:- 1-If VCB opened it will not be possible to close VCB again by pressing BLDJ.

2-Switch OFF the electronics and switch it ON once again. Raise panto , close VCB and resume Traction.

3-If VCB not closing ask for relief loco.

5. SUB SYSTEM NO:-SS04 FAULT NO:-F0402P2

Fault message:- Loco XXXXX SS01: Harmonic filter EARTH FAULT HARMONIC FILTER CIRCUIT Normal operation can continue To be checked during maintenance F0402P2

Indication:-

Effect:-

ACTION:-1-Acknowledge the fault by pressing BPFA & resume normal operation.

2-Inform TLC and record in the logbook.



SS06: AUX-CONVERTER 1

1. SUB SYSTEM NO:-SS06 FAULT NO:-F0601P1

(A) Fault message:- Loco xxxxx SS06: Aux-converter-1
DISTURBANCE IN PROCESSOR BUR 1 TRY TO CLOSE VCB
AGAIN F0601P1

Indication:- LSDJ

Effect:- NIL

ACTION:- 1- Press BLDJ to close VCB.

(B) Fault message:- Loco xxxxx SS06: Aux-converter-1
AUX CONVERTER1 ISOLATED Driving still Possible
Max. Ventilation level will be reduced Press<Enter>

Indication:- LSF1 will glow

Effect:- Aux. Converter 1 will isolate. Driving possible but Max ventilation level will reduced.

ACTION:- 1- Check MCB No. 127.22/1 in SB-1. If found tripped, reset it once.

2-Switch OFF the electronics and Switch it ON once again. Raise panto ,close VCB and resume traction if loco gets normal.

3-If the same message repeated, resume normal operation with BUR 1 isolated and don't try to bring BUR-1 in service by switching ON/OFF control electronics and work the train with BUR-1 isolated.

4 -Inform TLC and record in the logbook.

2. SUB SYSTEM NO:- SS06 FAULT NO:-F0602P1

A) Fault message:- Loco XXXXX SS06: Aux-converter1
FAULT IN AUXILIARY CONVERTER 1Try to close VCB again
F0602P1

Indication:- LSDJ

Effect:-

ACTION:- Press BLDJ to close VCB.

B) Fault message:- Loco SS06: Aux-converter1
AUX CONVERTER1 ISOLATED Driving still possible
max. ventilation level will be reduced Press<Enter>

Indication:- LSF1 will glow

Effect:- Aux. Converter 1 will isolate. Driving possible but Max ventilation level will reduced.

ACTION:- 1- Check MCB No. 127.22/1 in SB-1. If found tripped, reset it once.

2-Switch OFF the electronics and switch it ON once again. Raise panto, close VCB and resume traction if loco gets normal.



3-If the same message repeated resume normal operation with BUR-1 isolated. If BUR-1 is not getting isolated, then isolate the BUR-1 by opening MCB (127.22/1) located in SB-1 cubicle after opening VCB and switching OFF control electronics.

4-Energise the loco and work the train with BUR-1 isolated. Under such condition LSFI will go permanently.

5- Inform TLC and record in the logbook.

3. SUB SYSTEM NO:-SS06 FAULT NO:-F0603P1

A)Fault message:- Loco XXXXX SS06: Aux-converter1
CONTACTOR FAULT IN AUX-CONV1/ HB1 Contactor 52/4 or 52/5
stuck F0603P1

Indication:- LSDJ

Effect:-NIL

ACTION:-1- Press BLDJ to close VCB.

2-If fault still persist, then BUR-1 will get isolated. Driver should continue normal operation till next schedule stop.

B) Fault message:- Loco XXXXX SS06: Aux-converter1
AUX CONVERTER1 ISOLATED Driving still possible
max. ventilation level will be reduced Press<Enter>

Indication:- LSFI will glow

Effect:- Aux. Converter 1 will isolate. Driving possible but Max ventilation level will reduced.

ACTION:-1-Switch OFF the electronics and Switch it ON once again.
Raise panto, close VCB and resume traction if loco gets normal.

2-If the same message repeated, resume normal operation with BUR-1 isolated.

3-Inform TLC and record in the logbook

SS07: AUX-CONVERTER 2

1. SUB SYSTEM NO:-SS07 FAULT NO:-F0701P1

A)Fault message:- Loco XXXXX SS07: Aux-converter2
DISTURBANCE IN PROCESSOR BUR 2 Try to close VCB again
F0701P1

Indication:- LSDJ

Effect:-NIL

ACTION:-1- Press BLDJ to close VCB.

B)Fault message:- Loco XXXXX SS07: Aux-converter2
AUX CONVERTER2 ISOLATED Driving still Possible
max. ventilation level will be reduced Press<Enter>



Indication:- LSFI will glow

Effect:- Aux. Converter 2 will isolate. Driving possible but Max ventilation level will reduced.

ACTION:-1- Check all MCB No. 127.22/2 in SB-2. If found tripped, reset it once.

2-Switch OFF the electronics and Switch it ON once again. Raise panto , close VCB and resume traction if loco gets normal.

3-If the same message repeated, resume normal operation with BUR 2 isolated.

4-Inform TLC and record in the logbook.

1. SUB SYSTEM NO:-SS07 FAULT NO:-F0702P1

A)Fault message:- Loco XXXXX SS07: Aux-converter2
FAULT IN AUXILIARY CONVERTER 2 Try to close VCB again
F0702P1

Indication:-

Effect:-

ACTION:- Press BLDJ to close VCB.

B)Fault message:- Loco XXXXX SS07: Aux-converter2
AUX CONVERTER2 ISOLATED Driving still possible
max. ventilation level will be reduced Press<Enter>

Indication:- LSFI will glow

Effect:- Aux. Converter 2 will isolate. Driving possible but Max ventilation level will reduced.

ACTION:-1- Check all MCB No. 127.22/2 in SB-2. If found tripped, reset it once.

2-Switch OFF the electronics and switch it ON once again. Raise panto, close VCB and resume traction if loco gets normal.

3-If the same message repeated, resume normal operation with BUR-2 isolated.If BUR-2 is not getting isolated, then isolate BUR-2 by opening MCB (127.22/2) located in SB-2 cubicle after opening VCB and switching OFF control electronics.

4-Energise the loco and work the train with BUR-2 isolated. Under such condition LSFI will glow permanently.

5-Inform TLC and record in the logbook.

3. SUB SYSTEM NO:-SS07 FAULT NO:-F0703P1

A) Fault message:- Loco XXXXX SS07: Aux-converter2
CONTACTOR FAULT IN AUX-CONV 2/HB2 Contactor 52/1/2/4 stuck
off or on F0703P1

Indication:-

Effect:-

ACTION:-1- Press BLDJ to close VCB.



If fault still persist, then BUR-2 will get isolated. Driver should continue normal operation till next schedule stop.

B)Fault message:- Loco XXXXX SS07: Aux-converter2

AUX CONVERTER2 ISOLATED Driving still possible
max. ventilation level will be reduced Press<Enter>

Indication:- LSF1 will glow

Effect:- Aux. Converter 2 will isolate. Driving possible but Max ventilation level will reduced.

ACTION:-1- Switch OFF the electronics and Switch it ON once again. Raise panto , close VCB and resume traction if loco gets normal.

2-If the same message repeated, resume normal operation with BUR-2 isolated.

3-Inform TLC and record in the logbook

SO8: AUX-CONVERTER 3

1. SUB SYSTEM NO:-SS08 FAULT NO:-F0801P1

A)Fault message:- Loco XXXXX SS08: Aux-converter3
DISTURBANCE IN PROCESSOR BUR- 3 Try to close VCB again
F0801P1

Indication:- LSDJ will glow

Effect:-

ACTION:- Press BLDJ to close VCB

B)Fault message:- Loco XXXXX SS08: Aux-converter3

AUX CONVERTER-3 ISOLATED Driving still Possible
max. ventilation level will be reduced Press<Enter>

Indication:- LSF1 will glow

Effect:- Aux. Converter 3 will isolate. Driving possible but Max ventilation level will reduced

ACTION:-1- Check MCB No. 127.22/3 in SB-2. If found tripped, reset it once.

2-Switch OFF the electronics and Switch it ON once again. Raise panto, close VCB and resume traction if loco gets normal.

3-If the same message repeated, resume normal operation with BUR 3 isolated and don't try to bring BUR-3 in service by switching ON/OFF control electronics and work the train with BUR-3 isolated.

4-Inform TLC and record in the logbook.

2. SUB SYSTEM NO:-SS08 FAULT NO:-F0802P1

A)Fault message:- Loco XXXXX SS08: Aux-converter-3
FAULT IN AUXILIARY CONVERTER 3 Try to close VCB again
F0802P1



Indication:- LSDJ

Effect:-

ACTION:-1- Press BLDJ to close VCB.

B)Fault message:- Loco XXXXX SS08: Aux-converter3

AUX CONVERTER3 ISOLATED Driving still possible

max. ventilation level will be reduced Press<Enter>

Indication:- LSFI will glow

Effect:- Aux. Converter 3 will isolate. Driving possible but Max ventilation level will reduced.

ACTION:- 1-Check MCB No. 127.22/3 in SB-2. If found tripped, reset it once.

2-Switch OFF the electronics and switch it ON once again. Raise panto, close VCB and resume traction if loco gets normal.

3-If the same message repeated, resume normal operation with BUR-3 isolated. If BUR-3 is not getting isolated, then isolate BUR-3 by opening MCB (127.22/3) located in SB-2 cubicle after opening VCB and switching OFF control electronics.

4-Energise the loco and work the train with BUR-3 isolated. Under such condition LSFI will glow permanently.

5-Inform TLC and record in the logbook.

3. SUB SYSTEM NO:-SS08 FAULT NO:-F0803P1

A)Fault message:- Loco XXXXX SS08: Aux-converter-3

CONTACTOR FAULT IN AUX-CONV 3 Contactor 52/3 stuck off or on F0803P1

Indication:- LSDJ

Effect:-

ACTION:-1- Press BLDJ to close VCB.

If fault still persist, then BUR-3 will get isolated. Driver should continue normal operation till next schedule stop.

B)Fault message:- Loco XXXXX SS08: Aux-converter-3

AUX CONVERTER-3 ISOLATED Driving still possible max.

ventilation level will be reduced Press<Enter>

Indication:- LSFI will glow

Effect:- Aux. Converter 3 will isolate. Driving possible but Max ventilation level will reduced.

ACTION:-1- Switch OFF the electronics and Switch it ON once again. Raise panto, close VCB and resume traction if loco gets normal.

2-If the same message repeated, resume normal operation with BUR-3 isolated.

3-Inform TLC and record in the logbook.



SS - 06, SS- 07, SS- 08

A)Fault message:- experiences repeated tripping of

Indication:-

Effect:-

ACTION:-1- Reset MCB.

2-Switch OFF electronics.

3-BUR- I to be isolated by tripping MCB 127.22/1 located in SB-1.

4-Try to work with BUR-I isolated and OCB 1/2 will work on BUR-II.

B)Fault message:- experiences repeated tripping of

Indication:-

Effect:-

ACTION:-1- Reset MCB.

2-Switch OFF electronics.

3-BUR- II to be isolated by tripping MCB 127.22/2 located in SB-2.

4-Try to work with BUR-II isolated and MPH-C 1/2 will work on BUR-I.

C)Fault message:- If driver experiences repeated tripping of MCB 53.1/1 or 53.1/2 of TMB-1 or TMB-2.

Indication:-

Effect:-

ACTION:- 1-Reset MCB.

2-Switch OFF electronics.

3-BUR- II to be isolated by tripping MCB 127.22/2 located in SB-2.

4-Try to work with BUR-II isolated and TMB 1/2 will work on BUR-I.

Note: This problem may arise due to unbalance out put voltage of BUR-II.

D)Fault message:- If driver experiences repeated tripping of MCB 47.1/1 or 47.1/2 of MCP-1 or MCP-2.

Indication:-

Effect:-

ACTION:-1- Reset MCB.

2-Switch OFF electronics.

3-BUR- III to be isolated by tripping MCB 127.22/3 located in SB-2.

4-Try to work with BUR-III isolated and MCP 1/2 will work on BUR-II.



SS09: BATTERY SYSTEM

1. SUB SYSTEM NO:-SS09 FAULT NO:-F0901P1

A)Fault message:- Loco XXXXX SS09: Battery system
BATTERY VOLTAGE TOO LOW Electronics will switch off F0901P1

Indication:- LSF1 will glow

Effect:-

ACTION:- 1-Check MCB (112.1 & 110) in SB-2. MCB 112, located besides battery Box No. 2, should not be in tripped condition. If so, then reset the MCB.

2-If message is generated by BUR-II and actual voltage in UBA is above 82 volts, then try by isolating BUR-II.

3-If message is generated by BUR-III and actual voltage in UBA is above 82 volts, then try by isolating BUR-III.

Note. Some of the Ajni based locos has been down loaded with modified software in which, if battery voltage is available to any of BUR II OR BUR-III, this message will not appear.

4-If UBA showing voltage less than 82 volts then immediately ask for relief loco.

B)Fault message:- Loco XXXXX SS09: Battery system
MAIN POWER ISOLATED VCB can not be closed: VCB inhibited
Loco is dead

Indication:- LSDJ,LSFI will glow

Effect:- VCB will not close

ACTION:-1- If the battery can't be switched ON ask for relief loco.

2. SUB SYSTEM NO:-SS09 FAULT NO:-F0902P1

A)Fault message:- Loco XXXXX SS09: Battery system
BATTERY VOLTAGE LOW Converters being switched off Open
VCB, lower Panto F0902P1

Indication:-

Effect:-

ACTION:-1- Check MCB (112.1 & 110) in SB-2. MCB 112, located besides battery Box No. 2, should not be in tripped condition. If so, then reset the MCB.

2-Try to switch OFF / ON Electronics once. Check battery voltage on UBA, if above 82 volts and MCB-100 trips, Reset MCB. Loco to be kept energized for battery charging.



B)Fault message:- Loco XXXXX SS09: Battery system
MAIN POWER ISOLATED VCB can not be closed: VCB inhibited
Loco is dead

Indication:- LSDJ,will glow

Effect:- VCB will not close

ACTION:- If the battery can't be switched ON, ask for relief loco.

3. SUB SYSTEM NO:-SS09 FAULT NO:-F0903P1

Fault message:- Loco XXXXX SS09: Battery system
PAN LOWERED LONGER THAN 10 MINUTES Control electronics
will switch off

Indication:- LSDJ,will glow

Effect:- Control electronics will OFF

ACTION:-1-If BL key is at D and panto is lowered longer than 10
minutes, then this message is expected.

2-Switch ON electronics once again by BL Key if required. Driver
could avoid occurrence of such fault message by raising one
pantograph within 10 minutes after activating the particular cab by
putting BL Key in driving position.

3-If panto pan is not raising and message arise then trouble shoot as per F
0103P1.

4. SUB SYSTEM NO:-SS09 FAULT NO:-F0901P2

Fault message:- Loco XXXXX SS09: Battery system
WARNING: LOW BATTERY VOLTAGE Driving available for less
than30 min Check battery charger MCB F0901P2

Indication:- Loco may be energized for 30 minutes. Guiding available

Effect:-

ACTION:-1- Check battery charger output MCB 110 in SB-2.

2-If found tripped, reset battery charger out put MCB.

5. SUB SYSTEM NO:-SS09 FAULT NO:-F0902P2

Fault message:- Loco XXXXX SS09: Battery system
BATTERY CHARGER MCB OFF Try to close the MCB F0902P2

Indication:-

Effect:-

ACTION:-1- Check MCB 110 in SB2 and 100 in BUR Box 2 or in
HB2. If tripped, reset it once.

2-Clear the block section..

3-In some Ajni based locomotives, MCB-100 has been shifted from
BUR Box No.2 to HB-2 panel.

4-If MCB-100 is tripping repeatedly, then isolate BUR-III and try to
work with CHBA on BUR-II.



5 - If still message persist, then inform TLC and ask for relief loco. Loco can work till battery voltage drops to 86 V. Record in Log book that driver could not Trouble shoot because it is not possible for the driver to reset the battery charger input MCB (100) which is located inside Auxiliary Converter box-2. (In case of unmodified locos)

6. SUB SYSTEM NO:-SS09 FAULT NO:-F0903P2

Fault message:- Loco XXXXX SS09: Battery system
LOW BATTERY CHARGER CURRENT Battery charger MCB may have Tripped Battery not being charged F0903P2

Indication:-

Effect:-

ACTION:- 1-Check battery charger output MCB 110 in SB2 and MCB 112, located besides BA box No. 2. If found tripped, reset the tripped MCB.

2-Check battery and connection of battery cables.

7. SUB SYSTEM NO:-SS09 FAULT NO:-F0904P2

Fault message:- Loco XXXXX SS09: Battery system
DIAGNOSIS MEMORY BATTERY EMPTY Inform TLC during next stop F0904P2

Indication:-

Effect:- No more fault will store in DDS.

ACTION:- Resume normal operation. Inform TLC and record in the logbook

8. SUB SYSTEM NO:-SS09 FAULT NO:-F0905P2

Fault message:- Loco XXXXX SS09: Battery system
EARTH FAULT BATTERY CIRCUIT Normal operation can continue
To be checked during maintenance F0905P2

Indication:-

Effect:-

ACTION:- 1- Resume normal operation.

2- Inform TLC and record in the logbook.



SS10: BRAKE SYSTEM

1. SUB SYSTEM NO:-SS10 FAULT NO:-F1001P1

Fault message:- Loco XXXXX SS10: Brake System
FUALT IN BRAKE ELECTRONICS Emergency brake applied No traction allowed F1001P1

Indication:- LSF1

Effect:- Emergency brake will apply

ACTION:-1-Check MCB No 127.7. If found tripped, reset it once.

2-Switch OFF the Electronics and Switch it ON once again. Raise panto, close VCB and resume Traction, if loco get normal.

3-If the same message repeated bring TE/BE throttle to '0' position.

4-If no success within 20 minutes, ask for relief loco.

2. SUB SYSTEM NO:-SS10 FAULT NO:-F1002P1

Fault message:- Loco XXXXX SS10: Brake System
LOW PRESSURE MAIN RESERVOIR No traction allowed till pressure reaches 6.4 kg/cm² F1002P1

Indication:- LSF1

Effect:- TE/BE will not possible till MR pressure reaches to 6.4 Kg/cm²

ACTION:-1- Bring TE/BE throttle to '0' position.

2-Wait until a MR pressure of 6.4 Kg/cm² reached.

3-Check whether compressor works or not. Check the MCB of compressors 47.1/1 in HB1 & 47.1/2 in HB2 panels. If found tripped, open VCB and reset the MCB once.

4-Check leakage from Air dryer. If leakage persists, then isolate Air dryer by isolating D in cock & by putting D out to normal position provided in under frame.

5-Check leakage from Auto drain valve provided under the main reservoir 1 & 2 or air leakage from CP delivery pipe.

6-Check train for heavy leakage in pneumatic system.

7-If there is no leakage and MCBs of both the Compressors are in closed condition, even then compressor are not working and MR is not being maintained, Switch OFF the Electronics and Switch it ON once again. Raise panto, close VCB and resume Traction if loco get normal.

8-If no success within 20 minutes, ask for relief loco.



3-SUB SYSTEM NO:-SS10 FAULT NO:-F1003P1

Fault message:- Loco XXXXX SS10: Brake System

VIGILANCE EMERGENCY BRAKE APPLICATION Bring TE/BE Throttle to 0 Press vigilance reset push button F1003P1

Indication:- LSVW, LSFI will glow

Effect:- Emergency brake BP pressure will drop to 3 kg to 2.5 kg/cm². buzzer will sound

ACTION:-1- A. If this message is due to not acknowledging VCD by crew, then

2-Bring TE/BE Throttle to '0' position.

3-Apply A-9 to emergency to avoid depletion of MR through BP.

4-Wait for 120 seconds as Penalty Brake applied due to Vigilance can be reset only after 120 seconds. So, don't press BPVR during this 120 seconds.

5-Press yellow Vigilance Reset Pushbutton BPVR on Panel A of Driving Desk after 120 seconds.

6-Press and Release 'Vigilance' Paddle Switch.

7-Press BPFA

8-After resetting Penalty Brake, BP will be charged to 5 Kg/cm². If the penalty brake brakes remains applied even after the above, Switch OFF the Electronics and Switch it ON once again. Raise panto, close VCB and resume normal traction.

B. If vigilance penalty brakes are applied even when driver is alert during running, there is a chance that vigilance control Device may be defective. So switch OFF control Electronics and put vigilance isolating switch (Vigilance Cut-out Switch 237.1) provided on SB1 panel to '0' position. This will make vigilance control device isolated.

1-Switch ON electronics, close VCB and resume Normal traction with VCD in isolated condition.

2-Inform TLC and be vigilant.

Note: In this case low MR pressure message is expected. So ignore it.

4. SUB SYSTEM NO:-SS10 FAULT NO:-F1004P1

Fault message:- Loco XXXXX SS10: Brake System

WRONG CONFIGURATION BRAKE SYSTEM

Check isolating coc brake control Wrong coc position, to reset open VCB F1004P1

Indication:- LSFI

Effect:-

ACTION:- 1-Bring TE/BE throttle to '0' position.



2-Check isolating Cock No. 70 (E70 Brake Pipe isolating cock) provided on pneumatic panel. If found close then open cock No. 70 .
Close VCB.
3-Resume Normal Traction.

5. SUB SYSTEM NO:-SS10 FAULT NO:-F1005P1
Fault message:- Loco XXXXX SS10: Brake System
TRACTION WITH AUTO BRAKE NOT ALLOWED
Release auto brakes Bring TE/BE Throttle to 0 F1005P1
Indication:- LSF1

Effect:- Auto brake applied TE/BE not possible

ACTION:-1- Release Auto Air Brake.

2-Bring TE/BE Throttle to '0' position.

3-Resume normal traction.

4-If not successful, try from other cab.

6. SUB SYSTEM NO:-SS10 FAULT NO:-F1006P1
Fault message:- Loco XXXXX SS10: Brake System
TRACTION WITH PARKING BRAKES NOT ALLOWED
Release parking brakes Bring TE/BE Throttle to 0 F1006P1
Indication:- LSF1

Effect:- Parking brake applied TE/BE not possible

ACTION:-1- Bring TE/BE Throttle to '0' position.

2-Release parking brake with illuminated Red Push Button BPPB. In case parking brakes get released, then parking brake gauge will show pressure of 5 Kg/cm² and BPPB will extinguish.

3-If parking brake is not getting released, then inspect the Latch Solenoid valve (30) on pneumatic panel. If it is found permanently latched in applied condition, then release it.

4-Press releasing knob and lock in that condition if necessary.

5-If still parking brakes not released, check for any sign of air leakage from parking brake cylinder hosepipe. If there is leakage, then arrest the leakage. After releasing parking brakes, resume normal traction.

7. SUB SYSTEM NO:-SS10 FAULT NO:-F1007P1
Fault message:- Loco XXXXX SS10: Brake System
REGENERATIVE BRAKE FAILURE Pneumatic loco brake applied
F1007P1

Indication:- LSF1

Effect:- Brake will apply to loco

ACTION:-1- Bring TE/BE Throttle to '0' position, loco brakes will be released.



- 2-Control the train through A-9. Press PVEF, till BC-1/BC-2 gauge pressure reaches '0' Kg/cm²
- 3-No electrical Brake power available; braking can be done with A9/SA9 only.
- 4-Resume Normal Traction
- 5-Inform TLC and record in the Logbook.

8. SUB SYSTEM NO:-SS10 FAULT NO:-F1008P1

Fault message:- Loco XXXXX SS10: Brake System

EMERGENCY STOP, SHUTDOWN ON THE LOCO

To release, reset emergency stop push button Bring TE/BE Throttle to 0 F1008P1

Indication:- LSDJ,LSFI

Effect:- VCB open, panto lower, TE/BE '0', Emergency brake will apply

ACTION:-1- Bring TE/BE throttle to '0' position.

2-Reset Emergency Stop push Button by rotating it in the direction of Arrow marked on it. It will come out a little bit.

3-Press BPFA.

4-Raise Pantograph.

5-Close VCB.

6-Resume Normal Traction after charging BP and MR.

7-If not successful, try from other cab

9. SUB SYSTEM NO:-SS10 FAULT NO:-F1009P1

Fault message:- Loco XXXXX SS10: Brake System

TRACTION NOT ALLOWED WITH APPLIED BRAKE

Release loco brake Bring TE/BE Throttle to F1009P1

Indication:-

Effect:- Loco brake is applied

ACTION:-1- This fault messages is generated when BC pressure is over 0.65 Kg/cm², throttle is not at zero position and speed is over 10 KMPH.

2-Bring TE/BE throttle to '0' position.

3-Release Loco Brakes with SA9.

10. SUB SYSTEM NO:-SS10 FAULT NO:-F1010P1

Fault message:- Loco XXXXX SS10: Brake System

EMG. EXHAUST COCK CLOSED,NO TRACTION For traction open the cock Bring TE/BE Throttle to F1010P1

Indication:-

Effect:- BP is reduced to '0'

ACTION:-1- Bring TE/BE throttle to '0' position.



- 2-Open the Emergency Exhaust Cock No. 74 on the pneumatic panel
- 3-If cock 74 is already open and even though message appear, then problem may be with limiting switch provided on cock , operate it manually 2-3 times.
- 4-If loco becomes normal, then proceed otherwise, switch off CE and switch it ON again.

11. SUB SYSTEM NO:-SS10 FAULT NO:-F1001P2

Fault message:- Loco XXXXX SS10: Brake System
 LOCO IS IN BANKING MODE Loco brake controller isolated
 Emergency brakes can be applied F1001P2

Indication:-

Effect:-

- ACTION:-**1-This message is expected when loco is in banking mode.
 2-Bring TE/BE throttle to '0'.
 3-Check position of ZBAN switch. If ON, then switch it OFF.
 4-Close VCB and resume normal traction.
 5-If not successful, try to work from rear cab after switching ON/ OFF MCE.

12. SUB SYSTEM NO:-SS10 FAULT NO:-F1002P2

A)Fault message:- Loco XXXXX SS10: Brake System
 ALARM CHAIN PULLING Check train F1002P2

Indication:-

Effect:-

- ACTION:-**1- Bring the train to a halt at convenient place immediately. Work as per operating Manual and GR. 4.45/1.
 2-Check the affected coach, find out the reason of ACP, reset the ACP and work the train accordingly.

B)Fault message:- If driver experiences "Speed not increasing more than 1 KMPH" and "Loco moving with heavy jerk above 50 % of TE"

Indication:-

Effect:-

- ACTION:-**1-Check at the time of jerk LSP will glow for short time with "ERROR TACHO GENERATOR OF ASC-1/ASC-2".
 2- Switch off / ON electronics. If it is ASC-1, isolate BG-1 by switch No. 154. Work with BG-2 in service.
 If it is ASC-2, isolate BG-2 by switch No. 154. Work with BG-1 in service.



SS11: AUXILIARIES HB 1

1. SUB SYSTEM NO:-SS11 FAULT NO:-F1101P2

Fault message:- Loco XXXXX SS11: Auxiliaries HB1
MCB(S) TRIPPED IN AUX. CUBICLE 1 Traction power may get reduced, if temperature exceeds. F1101P2

Indication:-

Effect:-

ACTION:-1- Acknowledge the fault by pressing BPFA and continue normal operation till block section is cleared.

2-Check MCB's in Auxiliary cubicle HB1. If any MCB found tripped, then reset it once after opening VCB.

3-If any MCB is not tripped but still message is coming and all auxiliaries are working, ignore it. This may be due to defective control contact of concerned MCB.

4-If MCB (59.1/1 or 62.1/1 or 63.1/1 or 53.1/1) getting tripped after resetting it once as given in step 2 above, then driver should not try to reset these MCBs.

5-Inform TLC and record in loco log book. Resume traction with bogie 1 in isolated condition if automatically isolated.

6-In case of any other MCB excluding MCB given in step 4 above is getting tripped after resetting once, then continue normal operation as long as possible and inform TLC.

2. SUB SYSTEM NO:-SS11 FAULT NO:-F1102P2

Fault message:- Loco XXXXX SS11: Auxiliaries HB1
EARTH FAULT 415/110V CIRCUIT Normal operation can continue To be checked during maintenance F1102P2

Indication:-

Effect:-

ACTION:-1- Resume normal traction.

2-Inform TLC and record in loco logbook.

3. SUB SYSTEM NO:-SS11 FAULT NO:-F1103P2

Fault message:- Loco XXXXX SS11: Auxiliaries HB1
MCB OFF MAIN COMPRESSOR OPEN Compressor 1 not available F1103P2

Indication:-

Effect:-

ACTION:-1- Check MCB No. 47.1/1 provided in Auxiliary cubicle 1 (HB1). If found in tripped condition, then open VCB and reset MCB once.



2-Resume normal traction. If the message repeats then work the train with one compressor.

3-Inform TLC and record in loco logbook

4. SUB SYSTEM NO:-SS11 FAULT NO:-F1104P2

Fault message:- Loco XXXXX SS12: Auxiliaries HB1
OVERLOAD ON OCB-1 Isolate OCB F1104P2

Indication:-

Effect:-

ACTION:-1- Isolate MCB 59.1/1 (Oil Cooling Blower) in HB-1. Bogie-1 also to be isolated in this condition. Normal operation can be continued with one bogie.

SS12: AUXILIARIES HB 2

1. SUB SYSTEM NO:-SS12 FAULT NO:-F1201P2

Fault message:- Loco XXXXX SS12: Auxiliaries HB2
MCB(S) TRIPPED IN AUX. CUBICLE 2 Traction power may get reduced, if temperature exceed.F1201P2

Indication:-

Effect:-

ACTION:-1- Acknowledge the fault by pressing BPFA and continue normal operation till block section is cleared.

2-Check MCB's in Auxiliary cubicle HB2. If any MCB found tripped, then reset it once after opening VCB.

3-If any MCB is not tripped but still message is coming and all auxiliaries are working, ignore it. This may be due to defective control contact of concerned MCB.

4-If MCB (59.1/2 or 62.1/2 or 63.1/2 or 53.1/2) getting tripped after resetting it once as given in step 2 above, then driver should not try to reset these MCBs.

5-Inform TLC and record in loco log book. Resume traction with bogie 2 in isolated condition if automatically isolated.

6-In case of any other MCB excluding MCB given in step 4 above is getting tripped after resetting once, then continue normal operation as long as possible and inform TLC.



2. SUB SYSTEM NO:-SS12 FAULT NO:-F1202P2
Fault message:- Loco XXXXX SS12: Auxiliaries HB2
MCB OF MAIN COMPRESSOR OPEN Compressor 2 not available
F1202P2

Indication:-

Effect:-

ACTION:-1- Check MCB No. 47.1/1 provided in Auxiliary cubicle 1 (HB1). If found in tripped condition, then open VCB and reset MCB once.

2-Resume normal traction.

3-Inform TLC and record in loco logbook.

3. SUB SYSTEM NO:-SS12 FAULT NO:-F1203P2

Fault message:- Loco XXXXX SS12: Auxiliaries HB2
OVERLOAD ON OCB-2 Isolate OCB F1203P2

Indication:-

Effect:-

ACTION:-1- Check MCB No. 47.1/2 provided in Auxiliary cubicle 2 (HB2). If found in tripped condition, then open VCB and reset MCB once.

2-Resume normal traction. Even if the message repeats, then work the train with one compressor.

3-Inform TLC and record in loco logbook

ACTION:- Isolate MCB 59.1/2 (Oil Cooling Blower) in HB-2. Bogie-2 also to be isolated in this condition. Normal operation can be continued with one bogie.



SS13: CAB 1

1. SUB SYSTEM NO:-SS13 FAULT NO:-F1301P1

A)Fault message:- Loco XXXXX SS13: Cab 1
DISTURBANCE IN PROCESSOR HBB1 Cab 1 may get isolated,
drive from cab 2 refer to driver's manual
F1301P1

Indication:- LSF1

Effect:- Cab 1 may get isolated,

ACTION:- Switch OFF the Electronics and Switch it ON once again.
Raise panto , close VCB and resume Traction.

B)Fault message:- Loco XXXX SS13: Cab 1
CAB 1 ISOLATED Drive from cab 2 Press<Enter>

Indication:-

Effect:- Cab 1 isolated

ACTION:-1- If the same message repeats, change to Cab 2.
2-Inform TLC and record in loco logbook.

2. SUB SYSTEM NO:-SS13 FAULT NO:-F1302P1

(A)Fault message:- Loco XXXXX SS13: Cab 1
DISTURBANCE IN PROCESSOR STB1 Cab 1 may get isolated,
drive from cab 2 refer to driver's manual F1302P1

Indication:- LSF1

Effect:- Cab 1 may get isolated,

ACTION:- Switch OFF the Electronics and Switch it ON once again. Raise
panto , close VCB and resume traction.

(B) SUB SYSTEM NO:-SS13 FAULT NO:-F1302P1

Fault message:- Loco XXXXX SS13: Cab 1
CAB 1 ISOLATED Drive from cab 2 Press<Enter>

Indication:-

Effect:- Cab 1 isolated

ACTION:-1- If the same message repeats, change to Cab-2
2-Inform TLC and record in Loco logbook.

3. SUB SYSTEM NO:-SS13 FAULT NO:-F1303P1

Fault message:- Loco XXXXX SS13: Cab 1
REVERSER DEFECTIVE Drive from cab 2

Indication:-

Effect:-

ACTION:- 1-Switch OFF the Electronics and Switch it ON once again.
Raise panto, close VCB and resume traction.

2-If the same message repeats, change to Cab-2. Inform TLC & record in
logbook.



SS14: CAB 2

1. SUB SYSTEM NO:-SS14 FAULT NO:-F1401P1

A)Fault message:- Loco XXXXX SS14: Cab 2
DISTURBANCE IN PROCESSOR HBB2 Cab 2 may get isolated,
drive from cab 1 refer to driver's manual F1401P1

Indication:- LSFI

Effect:- Cab 2 may get isolated,

ACTION:-1- Switch OFF the Electronics and Switch it ON once again.
Raise panto, close VCB and resume Traction.

B)Fault message:- Loco XXXXX SS14: Cab 2

CAB 2 ISOLATED Drive from cab 1 Press <Enter>

Indication:-

Effect:- Cab 2 isolated

ACTION:-1- If the same message repeats, change to Cab 1.

2-Inform TLC and record in loco logbook.

2. SUB SYSTEM NO:-SS14 FAULT NO:-F1402P1

A)Fault message:- Loco XXXXX SS14: Cab 2
DISTURBANCE IN PROCESSOR STB2 Cab 2 may get isolated,
drive from cab 1 refer to driver's manual F1402P1

Indication:- LSFI

Effect:- Cab 2 may get isolated,

ACTION:- Switch OFF the Electronics and Switch it ON once again. Raise panto, close VCB and resume traction.

B)Fault message:- Loco XXXXX SS14: Cab 2

CAB 2 ISOLATED Drive from cab 1 Press<Enter>

Indication:-

Effect:- Cab 2 isolated

ACTION:-1- If the same message repeats, change to Cab-1

2-Inform TLC and record in Loco logbook.

3. SUB SYSTEM NO:-SS14 FAULT NO:-F1403P1

Fault message:- Loco XXXXX SS14: Cab 2

REVERSER DEFECTIVE Drive from cab 1

Indication:- LSFI

Effect:-

ACTION:-1-Switch OFF the Electronics and Switch it ON once again.

Raise panto, close VCB and resume traction.

2-If the same message repeats,change to Cab-1.Inform TLC & record in logbook.

Note:If Cab-1 or Cab-2 get hanged and not getting activated after making Control Electronics OFF and ON, then check all MCBs in SB-1 and SB-2 and reset it if found tripped.



SS15: FIRE DETECTION UNIT

1. SUB SYSTEM NO:-SS15 FAULT NO:-F1501P1

Fault message:- Loco XXXXX SS15: Fire detection
FIRE IN MACHINE ROOM Extinguish the fire Reset the fire detection unit F1501P1

Indication:- LSF1 will glow, Buzzer will sound

Effect:-

ACTION:-1- Open VCB, Lower Pantograph and switch off the Electronics.

2-Inspect the Machine Room. If there is any sign of smoke mission , use portable fire extinguisher.

3-In case of larger fire, especially in Traction converter, then open the cock of CO2 Cylinder provided in the locker on Asst. Driver side in each cab. Keep the machine room door locked.

4-Subsequently, reset the fire detection unit by pressing reset push button provided on fire detection unit (located in SB-2 cubicle) then acknowledges the fault by pressing BPFA.

5-Inform TLC and record in loco logbook..

2. SUB SYSTEM NO:-SS15 FAULT NO:-F1501P2

Fault message:- Loco XXXXX SS15: Fire detection
FAULT IN FIRE DETECTION UNIT No FIRE DETECTION,
POSSIBLE NORMAL OPERATION CAN CONTINUE F1501P2

Indication:-

Effect:-

ACTION:-1- Resume Normal Traction.

2-Keep on checking the Machine Room as frequently as possible for the sign of any smoke/fire.

3-Inform TLC and record in the logbook.

3. SUB SYSTEM NO:-SS15 FAULT NO:-F1502P2

Fault message:- Loco XXXXX SS15: Fire detection
WARNING SMOKE IN MACHINE ROOM INSPECT MACHINE ROOM F1502P2

Indication:-

Effect:-

ACTION:-1- Open VCB, lower pantograph and switch off the Electronics.

2-Inspect the Machine Room carefully. In case of any fire/smoke, extinguish the fire by using portable fire extinguishers.



- 3-In case of larger fire, especially in Traction converter, then open the cock of CO2 and operate regulator Cylinder provided in the locker on Asst. Driver side in each cab. Keep the machine room door locked
- 4-If every thing is found normal, resume normal Traction.
- 5-Inform TLC and record in the logbook.

SS16: SPEEDOMETER

1. SUB SYSTEM NO:-SS16 FAULT NO:-F1601P1

Fault message:- Loco XXXXX SS16: Speedometer
SPEED LIMIT EXCEEDED Emergency brakes TE/BE Throttle to 0
F1601P1

Indication:- LSF1

Effect:- Emergency brakes will applied

ACTION:- 1-Acknowledge the fault by pressing BPFA.

2-Bring throttle to zero position to reduce loco speed.

3-When speed comes down the limit, resume normal traction.

4-If the speed shown in speedometer is not coming within the limits, but actual speed has come down this means that speedometer is defective. The drivers advise to open the speedometer MCB (127.92) provided in SB2 cubicle.

5-Now the speedometer will be isolated. So drive carefully and watch speed on display in simulation mode screen.

6-Inform TLC and record in loco logbook and act accordingly.

2. SUB SYSTEM NO:-SS16 FAULT NO:-F1601P2

Fault message:- Loco XXXXX SS16: Speedometer
FAULT IN SPEEDOMETER No display of speed in the cab Drive
carefully, use diagn screen F1601P2

Indication:-

Effect:-

ACTION:- 1- Inspect the speedometer MCB (127.92) in SB2 cubicle. If found in tripped condition then reset the MCB once and resume normal operation if loco gets normal.

2-If fault still persist, then isolate the speedometer by opening MCB (127.92) provided in SB2 cubicle.

3-Now the speedometer will be isolated . So drive carefully and watch speed on display in simulation mode screen.

4-Inform TLC and record in the logbook.

5-As per instruction of TLC. Normal traction can be resumed.



SS17: FLG1

1. SUB SYSTEM NO:-SS17 FAULT NO:-F1701P1

A)Fault message:- Loco XXXXX SS17: Processor FLG1
DISTURBANCE IN PROCESSOR FLG1 FLG1will be isolated
F1701P1

Indication:- LSF1

Effect:- FLG1 will be isolated

ACTION:-1- Resume Normal Traction.

2-Inform TLC and record in the logbook.

B)Fault message:- Loco XXXXX SS17: Processor FLG1
FLG1 ISOLATED Refer to driver's manual Press<Enter>

Indication:-

Effect:- FLG1 is isolated

ACTION:-1- Multiple Operation is not possible.

2-Resume normal traction.

3-Inform TLC and record in the logbook.

2. SUB SYSTEM NO:-SS17 FAULT NO:-F1702P1

Fault message:- Loco XXXXX SS17: Processor FLG1
SOFTWARE MISMATCH WAP-5/WAG-9 Panto will not raise
F1702P1

Indication:- LSF1

Effect:- Panto will not raise

ACTION:-1- Inform TLC and record in the logbook.

2-Ask for relief loco immediately.

3. SUB SYSTEM NO:-SS17 FAULT NO:-F1703P1

Fault message:- Loco XXXXX SS17: Processor FLG1
FAULT IN ANGLE TRANSMITTER OF THROTTLE
Bring TE/BE Throttle to zero Operate switch failure mode F1703P1

Indication:-

Effect:- LSF1

ACTION:-1- Bring TE/BE Throttle to '0'.

2-Switch OFF the control electronics.

3-Acknowledge the Fault with illuminated button BPFA.

4-Drive loco in Failure Mode Operation (by operating Rotating Switch
152 from '0' to '1' position) located in SB1 panel.

5-Resume normal traction with 152 switch in failure mode position.

6-Inform TLC and record in the logbook



4. SUB SYSTEM NO:-SS17 FAULT NO:-F1704P1

Fault message:- Loco XXXXX SS17: Processor FLG1
SIMULATION SWITCH POSITION NOT MATCHING
Check simulation Key on master/slave F1704P1

Indication:- LSFI

Effect:- Panto will not raise.

ACTION:-1- Bring TE/BE Throttle to '0'.

2-Switch OFF the control electronics.

3-Check if Simulation key 179 in SB1 panel is on '0' position. If not, operate it from '1' to '0' position.

4-Resume Normal Traction.

5-Inform TLC and record in the logbook

5. SUB SYSTEM NO:-SS17 FAULT NO:-F1701P2

Fault message:- Loco XXXXX SS17: Processor FLG1
DISTURBANCE IN PROCESSOR DIA 1
DIA 1 will be isolated No fault data will be stored
Press<Enter> F1701P2

Indication:-

Effect:- DDS will not store.

ACTION:-1- Since no fault will be stored in DDS, record all faults in the loco logbook.

2-Resume Normal Traction.

3-Inform TLC and record in the logbook.

SS18: FLG2

1. SUB SYSTEM NO:-SS18 FAULT NO:-F1801P1

A) Fault message:- Loco XXXXX SS18: Processor FLG2
DISTURBANCE IN PROCESSOR FLG2. FLG2 will be isolated
F1801P1

Indication:- LSFI

Effect:- FLG2 will be isolated

ACTION:- Switch OFF the Electronics and Switch it ON once again.

B) Fault message:- Loco XXXXX SS18: Processor FLG2
FLG2 ISOLATED Refer to driver's manual Press<Enter>

Indication:- FLG2 is isolated

Effect:-

ACTION:-1- If the same message repeats resume normal traction.

2-No regenerative braking power is available. So control the train/loco with help of pneumatic brake (A9 or SA9)

3-Inform TLC and record in the logbook.



2. SUB SYSTEM NO:-SS18 FAULT NO:-F1802P1
Fault message:- Loco XXX SS18: Processor FLG2
SOFTWARE MISMATCHED WAP-5/WAG-9 Panto will not raise
F1802P1
Indication:- LSF1
Effect:- Panto will not raise
ACTION:-1- Inform TLC and record in the logbook.
2-Ask for relief loco immediately.

3. SUB SYSTEM NO:-SS18 FAULT NO:-F1803P1
Fault message:- Loco XXXXX SS18: Processor FLG2
FAULT IN ANGLE TRANSMITTER OF THROTTLE
Bring TE/BE Throttle to zero Operate switch failure mode
F1803P1
Indication:- LSF1
Effect:-
ACTION:-1- Bring TE/BE Throttle to '0'.
2-Switch OFF the control electronics.
3-Acknowledge the Fault with illuminated button BPFA.
4-Drive loco in Failure Mode Operation (by operating Rotating
Switch 152 from '0' to '1' position) located in SB1 panel.
5-Resume normal traction with 152 switch in failure mode position.
5-Inform TLC and record in the logbook.

4. SUB SYSTEM NO:-SS18 FAULT NO:-F1804P1
Fault message:- Loco XXXXX SS18: Processor FLG2
SIMULATION SWITCH POSITION NOT MATCHING
Check simulation Key on master/slave F1804P1
Indication:- LSF1
Effect:- Panto will not raise.
ACTION:-1- Bring TE/BE Throttle to '0'.
2-Switch OFF the control electronics.
3-Check if Simulation key 179 in SB1 panel is on '0' position. If not,
operate it from '1' to '0' position.
4-Resume Normal Traction.
5-Inform TLC and record in the logbook.

5. SUB SYSTEM NO:-SS18 FAULT NO:-F1801P2
Fault message:- Loco XXXXX SS18: Processor FLG2
DISTURBANCE IN PROCESSOR DIA 1
DIA 1 will be isolated No fault data will be stored F1801P2



Indication:-

Effect:- DDS will not store.

ACTION:-1- Since no fault will be stored in DDS, record all faults in the loco logbook.

2-Resume Normal Traction.

3-Inform TLC and record in the logbook.

SS19: TRAIN BUS

1. SUB SYSTEM NO:-SS19 FAULT NO:-F1901P1

A)Fault message:- Loco XXXXX SS19: Train Bus
COMMUNICATION DISTURBANCE Try to close the VCB again
Multiple operation not possible F1901P1

Indication:-

Effect:-

ACTION:-1- Press BLDJ to close VCB.

2-Check cable for multiple operation's

3-Inform TLC and record in the logbook.

B)Fault message:- Loco XXXXX SS19: Train Bus
TRAIN BUS ISOLATED Multiple operation not possible
Press <Enter>

Indication:-

Effect:-

ACTION:-1- No multiple operation possible.

2-Inform TLC and record in the logbook.

3-Continue normal operation. LSFI will glow continuously.



ADDITIONAL TROUBLE SHOOTING (O.C.B)

(SS01)

1) If The Earth Fault in OCB1& OCB2. Following Fault Message Will Appear -

- A) F0103P2 : Earth Fault Auxiliary Winding Circuit In The Front Display.
- B) STB2 : 004: Earth Fault Auxiliary Circuit In The Background DDS.
- C) Auxiliary Converter -1 Isolated Due To Inverter Over Current.
- D) Auxiliary Converter -2 Isolated Due To Inverter Over Current.
- E) Main Power Off . VCB Inhibited .

ACTION-

A) If The MCB NO. 59.1/1 or 59.1/2 of OCB is not trips. LP will follow the following instructions –

- 1- Trip and isolate the MCB No. 59.1/1 of OCB-1 which is in HB!
- 2) Close the DJ.
- 3) If Again Same Message Will Not Displayed –
 - Defective OCB Isolated .
 - Off The CE .
 - Isolate the Bogi No -1 by switch no. 154 .

If again same message will display –

- 1- Trip and isolate the MCB No. 59.1/2 of OCB-2 which is in HB2
- 2) Close the DJ.
- 3) If Again Same Message Will Not Displayed –
 - Defective OCB Isolated .
 - Off The CE .
 - Isolate the Bogie No -2 by switch no. 154 .

In this case only half TE/BE is available . Clear the section & ask for asstt engine.

B) Due to defect of OCB if MCB no 59.1/1 or 59.1/2 . Found trip conditions then-

- Do not reset the MCB.
- Off the CE .
- Isolate the concerned bogie by switch no. 154.
- Clear the section by one bogie & ask for asstt engine.



ADDITIONAL TROUBLE SHOOTING (T.M.BLOWER)

(SS01)

- 1) If The Earth Fault in TM Blower-1& TM Blower- 2. Following Fault Message Will Appear -
- A) F0103P2 : Earth Fault Auxiliary Winding Circuit In The Front Display.
 - B) STB2 : 004: Earth Fault Auxiliary Circuit In The Background DDS.
 - C) Auxiliary Converter -2 Isolated Due To Inverter Over Current.
 - D) Auxiliary Converter -1 Isolated Due To Inverter Over Current.
 - E) Main Power Off . VCB Inhibited .

ACTION-

- A)** If The MCB NO. 53.1/1 or 53.1/2 is not trips of OCB. LP will follow the following instructions –
- 1- Trip and isolate the MCB No. 53.1/1 of TM Blower-1 which is in HB!
 - 2) Close the DJ.
 - 3) If Again Same Message Will Not Displayed –
 - Defective TM Blower Isolated .
 - Off The CE .
 - Isolate the Bogi No -1 by switch no. 154 .

If again same message will display –

- 1- Trip and isolate the MCB No. 53.1/2 of TMBlower-2 which is in HB2
- 2) Close the DJ.
- 3) If Again Same Message Will Not Displayed –
 - Defective TM Blower Isolated .
 - Off The CE .
 - Isolate the Bogi No -2 by switch no. 154 .

In this case only half TE/BE is available . Clear the section & ask for asstt engine.

ADDITIONAL TROUBLE SHOOTING (TFP PUMP)

(SS01)

- 1) If The Earth Fault in TFP PUMP-1& TFP PUMP-2. Following Fault Message Will Appear -
- A) F0103P2 : Earth Fault Auxiliary Winding Circuit In The Front Display.
 - B) STB2 : 004: Earth Fault Auxiliary Circuit In The Background DDS.
 - C) Auxiliary Converter -2 Isolated Due To Inverter Over Current.
 - D) Auxiliary Converter -3 Isolated Due To Inverter Over Current.



E) Main Power Off . VCB Inhibited .

ACTION-

A) If The MCB NO. 62.1/1 or 62.1/2 of TFP Pump is not trips. LP will follow the following instructions –

1- Trip and isolate the MCB No.62.1/1 of TFP Pump -1 which is in HB1

2) Close the DJ.

3) If Again Same Message Will Not Displayed –

- Defective TFP Pump Isolated .
- Off The CE .
- Isolate the Bogi No -1 by switch no. 154 .

If again same message will display –

1- Trip and isolate the MCB No.62.1/2 of TFP Pump -2 which is in HB2

2) Close the DJ.

3) If Again Same Message Will Not Displayed –

- Defective TFP Pump Isolated .
- Off The CE .
- Isolate the Bogi No -2 by switch no. 154 .

In this case only half TE/BE is available . Clear the section & ask for asstt engine.

B) Due to defect of TFP Pump if MCB no62.1/1 or 62.1/2 . Found trip conditions then-

- Do not reset the MCB.
- Off the CE .
- Isolate the concerned bogie by switch no. 154.
- Clear the section by one bogie & ask for asstt engine.



ADDITIONAL TROUBLE SHOOTING (S.R.PUMP) (SS01)

1) If The Earth Fault in S.R.PUMP 1& S.R.PUMP 2. Following Fault Message Will Appear -

- A) F0103P2 : Earth Fault Auxiliary Winding Circuit In The Front Display.
- B) STB2 : 004: Earth Fault Auxiliary Circuit In The Background DDS.
- C) Auxiliary Converter -2 Isolated Due To Inverter Over Current.
- D) Auxiliary Converter -3 Isolated Due To Inverter Over Current.
- E) Main Power Off . VCB Inhibited .

ACTION-

A) If The MCB NO.63.1/1 or 63.1/2 of OCB is not trips. LP will follow the following instructions –

- 1- Trip and isolate the MCB No. 63.1/1 of S.R.PUMP -1 which is in HB1
- 2) Close the DJ.
- 3) If Again Same Message Will Not Displayed –
 - Defective S.R.PUMP Isolated .
 - Off The CE .
 - Isolate the Bogi No -1 by switch no. 154 .

If again same message will display –

- 1- Trip and isolate the MCB No. 63.1/2 of S.R.PUMP -2 which is in HB2
- 2) Close the DJ.
- 3) If Again Same Message Will Not Displayed –
 - Defective S.R.PUMP Isolated .
 - Off The CE .
 - Isolate the Bogie No -2 by switch no. 154 .

In this case only half TE/BE is available . Clear the section & ask for asstt engine.

B) Due to defect of S.R.PUMP if MCB no 63.1/1 or 63.1/2 . Found trip conditions then-

- Do not reset the MCB.
- Off the CE .
- Isolate the concerned bogie by switch no. 154.
- Clear the section by one bogie & ask for asstt engine.



ADDITIONAL TROUBLE SHOOTING (MCP)

(SS01)

- 1) If The Earth Fault in MCP 1& MCP 2. Following Fault Message Will Appear -
- A) F0103P2 : Earth Fault Auxiliary Winding Circuit In The Front Display.
 - B) STB2 : 004: Earth Fault Auxiliary Circuit In The Background DDS.
 - C) Auxiliary Converter -3 Isolated Due To Inverter Over Current.
 - D) Auxiliary Converter -2 Isolated Due To Inverter Over Current.
 - E) Main Power Off . VCB Inhibited .

ACTION-

- (A)** If The MCB NO. 47.1/1 or 47.1/2 of MCP is not trips. LP will follow the following instructions –
- 1- Trip and isolate the MCB No.47.1/1 of MCP -1 which is in HB!
 - 2) Close the DJ.
 - 3) If there is success by isolation of MCP-1 or MCP-2 work the ahead with the one MCP.

- (B)** Due to defect of MCP 1 or MCP-2 MCB No. 47.1/1

ADDITIONAL TROUBLE SHOOTING

While starting If you experience speed not increasing more than 1 KMPH and loco moving with heavy jerk above 50% of TE.

Check the back ground message in the driver display unit and operate the concerned TM speed sensor change over switch alternate / stand by position under below-

ASC1: 0052 Error Tacho Generator 1	-	TM-1
ASC1: 0053 Error Tacho Generator 2	-	TM-2
ASC1: 0054 Error Tacho Generator 3	-	TM-3

ASC2: 0052 Error Tacho Generator 1	-	TM-4
ASC2: 0053 Error Tacho Generator 2	-	TM-5
ASC2: 0054 Error Tacho Generator 3	-	TM-6

Note- If change over switch are not available, then isolate the concern SR by switching off its MCB (127.1/1 for SR-1 located in SB-1 or 127.1/2 for SR-2 located in SB-2)



Maintenance schedule of locomotive

Time to time maintenance is essential to get proper output by any machine.

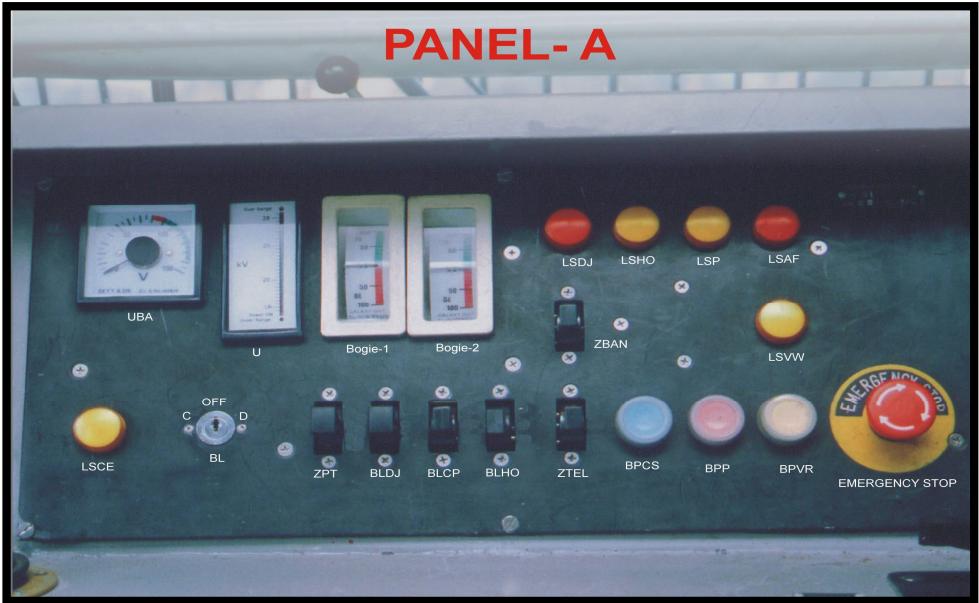
Maintenance schedule of 3Ø Loco (Ref.-Railway Board Letter No. 97/Elect/TRS/440/18/44 dated 23.02.2207)

Maintenance schedule

S.No	Types of Sch.	Goods Loco WAG-9,WAG-9H	Mail/Exp. Loco WAP-5, WAP-7	Remark
1	T I	45 days	One trip or 3000Km.Which Completed After	Any Trip Shed
2	IA	90 days	90 days	Only H/S
3	IB	180 days	180 days	Only H/S
4	IC	270 days	270 days	Only H/S
5	MOH	18 Months	18 Months	Only H/S
6	IOH	6 Years± 6 M. / 12 Lacks Km which ever earlier.	4.1/2Years± 6 M./12 Lakes Km which ever earlier.	Only H/S
7	POH	12Y. ± 6 M./ 24 Lakes Km which ever earlier.	9Y. ± 6 M. / 24 Lakes Km which ever earlier.	Nominated Workshop



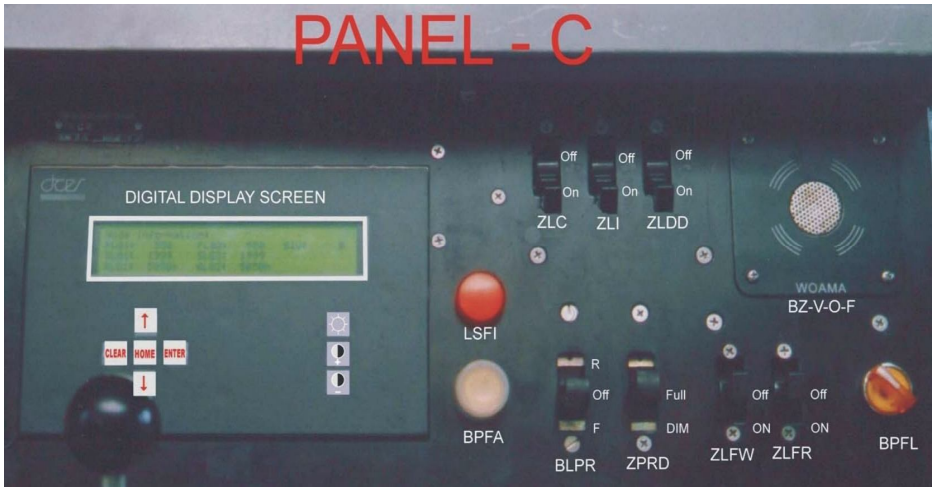
PART – C
DIFFERENT PHOTOGRAPHS
OF LOCO PARTS
Fig - A Panel



B Panel



C Panel



D Panel





Fig - Pneumatic Panel

- | | |
|----------------------------------|---------------------------------|
| 1. COC-70 (BP) | 10. Parking brake apply plunger |
| 2. COC-74(Emergency Ex.) | 11. E-70 brake apply plunger |
| 3. PAN-1 | 12. C3W Distributor Valve |
| 4. PAN-2 | 13. COC - 47 |
| 5. VCB COC | 14. COC 136 |
| 6. IG 38 Key socket | 15. MCPA Drain |
| 7. Panto Pressure gauge | 16. MCPA |
| 8. Solenoid valve -30 | 17. Sander Isolating COC |
| 9. Parking brake release plunger | 18. Relay valve Direct brake |



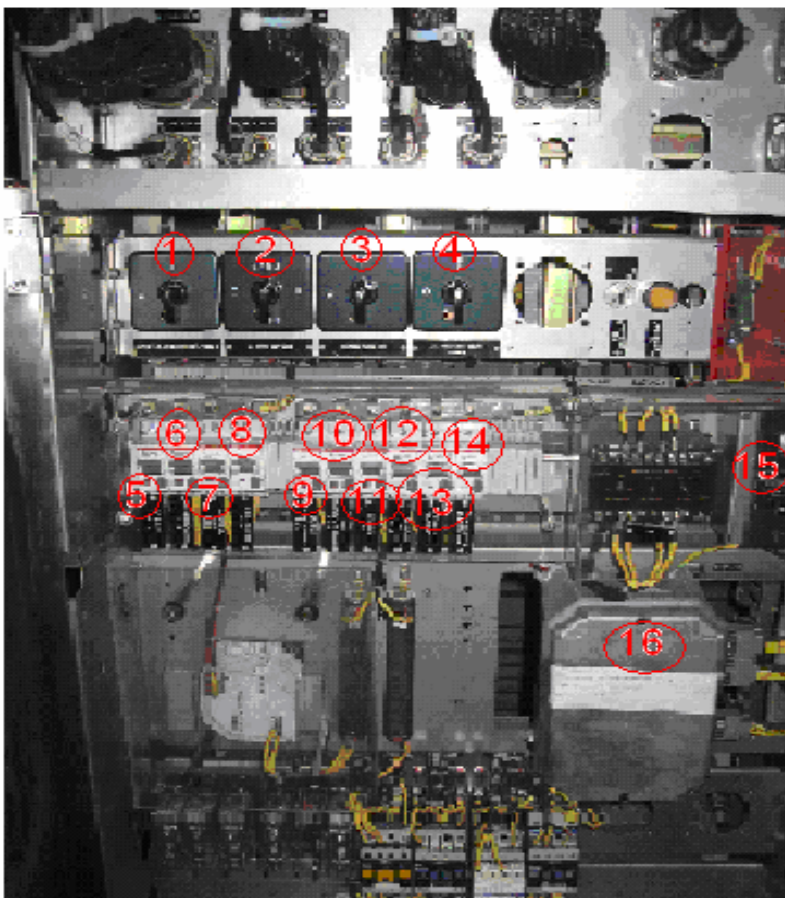


Fig :- SB 1

1	152 Failure Mode Operation	9	127.1/1 SR-1 Elect Breaker
2	154 Bogie Cut Out Cock	10	127.1/1/Get Unit Supply Breaker
3	160 Configuration	11	127.2/1 Monitoring Breaker
4	237.1 VCD Cut Out Switch	12	127.22/1 Aux.Con.Elect.Breackar
5	127.3/1 Cab-1 Ckt Breaker	13	127.9/1 Central .Breackar-1
6	127.12 Pento & DJ Breaker	14	127.9/2 - Central .Breaker 2
7	127.91/1 Power Supply Brk	15	78 Over Current Relay
8	310.1/1 Front Light breaker	16	Wire Connecting (Train Bus)

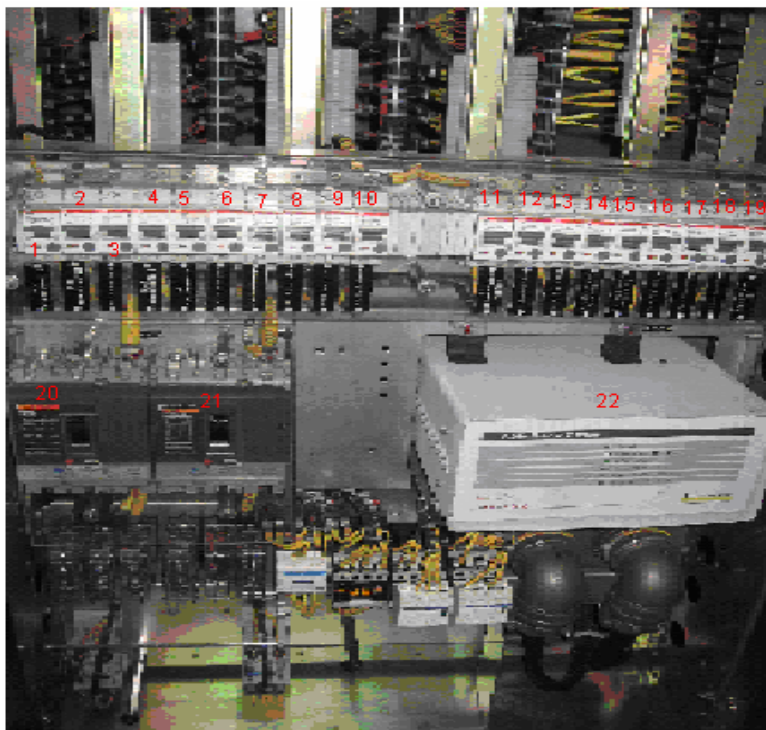


Fig SB 2

1	127..81 Commissioning C.B.1	12	127.11/2 Get Unit C.B.2
2	127.15 VCD C.B.	13	127.2/2 Monitoring CB 2
3	127.7 Pneumatic Panel C.B.	14	127.22/2 Aux.Con.Elect CB2
4	127.82 Commissioning C.B.2	15	127.22/3 Aux.Con.Elect CB -3
5	48.1 Aux.Compressor CB	16	127.9/3 CentralCon.Elect CB-3
6	127.3/2 Crew Cab C.B.2	17	127.9/4 CentralCon.Elect CB-3
7	127.91/2 Power Supply CB	18	127.92 Memotel CB
8	310.7 Marker Light CB	19	127.24 Aux.Con.CB
9	310.1/2 Head Light CB	20	110 Battery Charger C.B.
10	310.4 M. room Light CB	27	112.1 Battery C.B.
11	127.1/2 S.R. Elect CB	22	212 Fire Detection Unit







Fig. Traction Link & Compressor

1. Push Pull Rod
2. Locking Plate
3. Housing
4. Hexa-Bolt of Traction Link Locking Plate.
5. Main Compressor

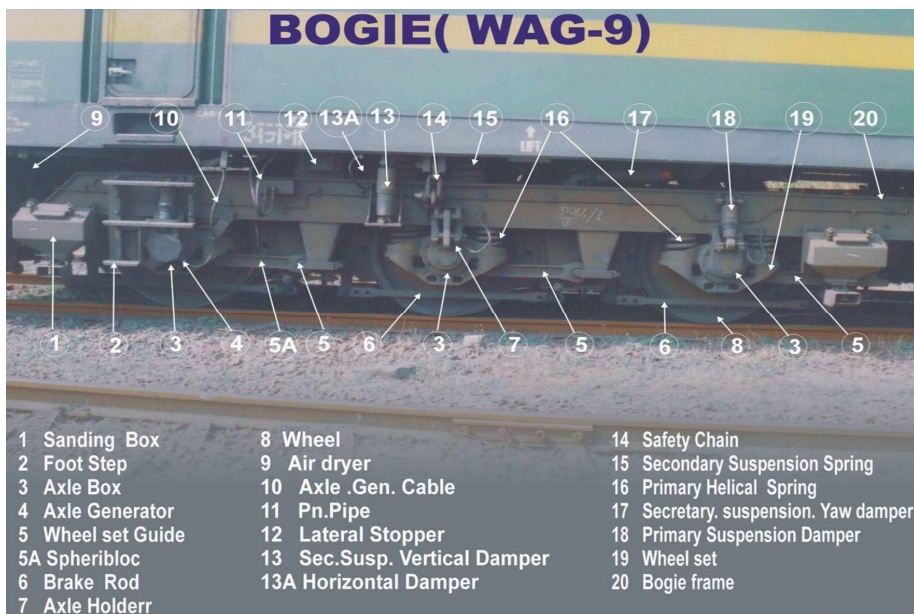




Fig. - A9



Fig . - SA9

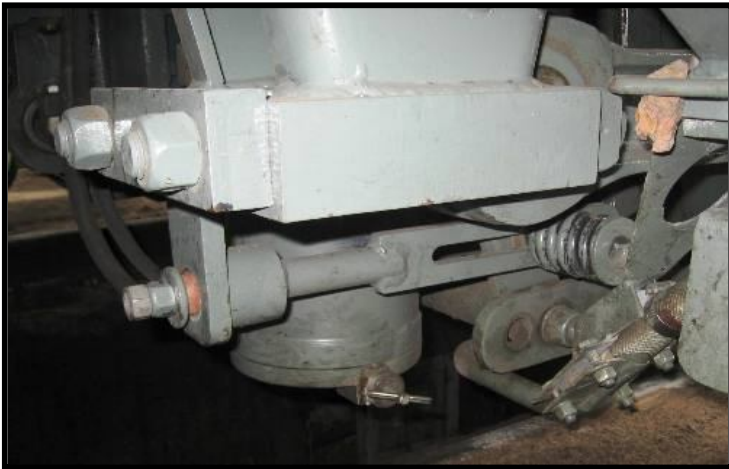
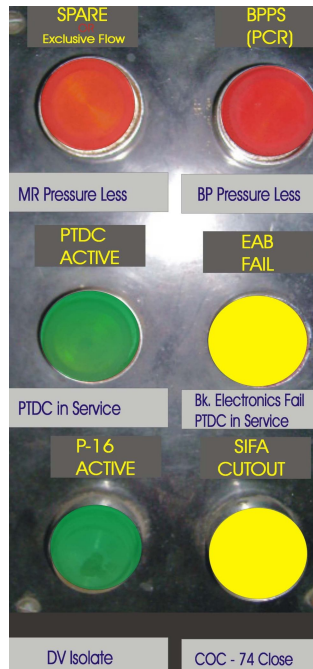
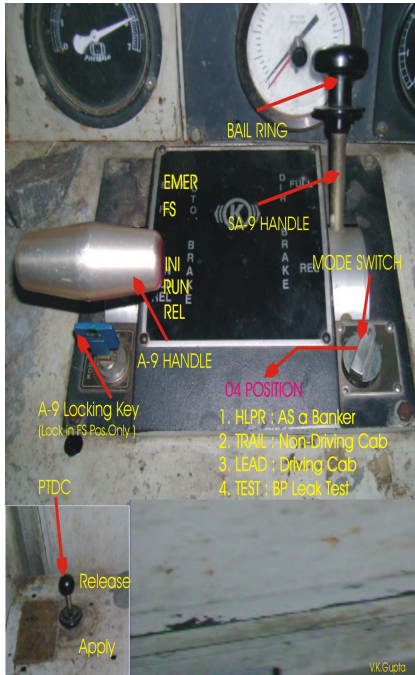
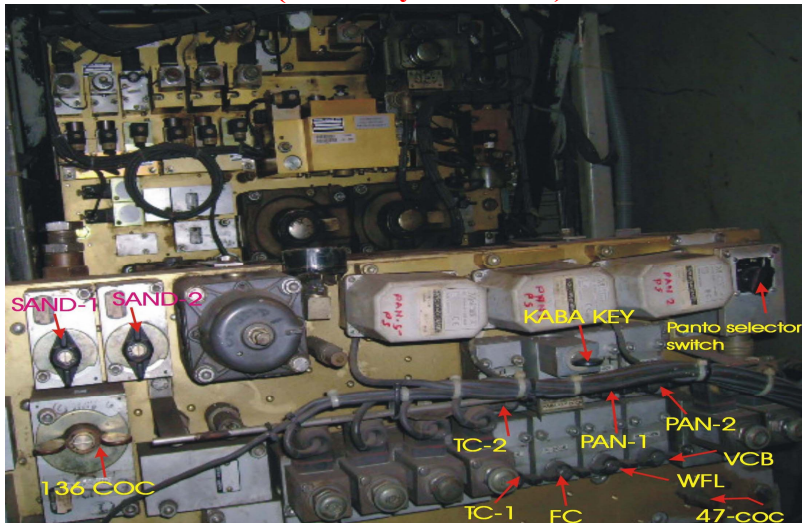


Fig. Of Parking Brake

Knorr Brames System



Pneumatic Panel(Auxiliary manifold)



Air Brake Manifold

