OPERATION &TSD MANUAL

FOR

WAP5&7

PUSH-PULL OPERATION

South Central Railway

PUSH-PULL
OPERATING MANUAL

WAP7- PUSH PULL OPERATION

ADVANTAGES OF PUSH-PULL OPERATION

- Increased average speed of the train and reduction in run time and thus increased the section capacity.
- Acceleration and deceleration time is very less especially in graded section.
- Terminal detention is eliminated since shunting of loco is avoided.
- Smooth operation since jerks due to bumps and draft forces are avoided.
- More Re-generation of energy.
- Sectional failures of locomotive is avoided.

GENERAL DESCRIPTION:

- In push-pull operation two locomotives are operated in MU mode with the rake in-between the front and rear locomotives.
- The communication between front and rear locomotives is established through wired media laid on the coaches.
- For this purpose 22 core cables laid throughout the rake.
- At present only 18 core cables are used and 4 cables are kept as spare for future extension.
- Out of total 18 core
    - 3 wires for MU operation,
    - 8 wires for BL key duplication,
    - 7 wires for LED indication signal and fault acknowledge.
- In Push Pull mode one loco is in front of rake (called Master loco) and another loco is in rear of rake (called slave loco).

Modifications in cab:

- The modification for push pull operation involves provision of additional BL switch, additional BPFA and additional LSDJ provided on panel 'D' and and ZNN on 'A' panel in each cab of both master and slave loco.

- **On 'A' panel** - ZTEL switch is renamed as ZNN switch.
- It is used for passing neutral section when both locos (Master & Slave) are working in push pull mode. Keep in 'ON' position after energizing both locos.
- If **ZNN switch is in 'ON' position** – When BLDJ is operated to 'OFF' position on Master loco, then only Master loco DJ will open and Slave loco DJ will open after approx. 350 meters and will close after approx. 750 meters.
- If ZNN switch is in 'OFF' position – When BLDJ is operated to 'OFF' position on Master loco, then both locos DJ will open.

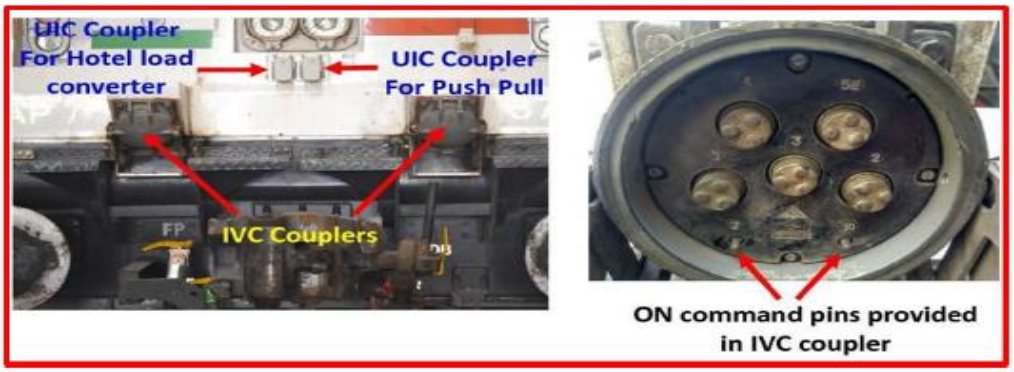
Both side cab ends:

- The WAP-7/WAP-5 locos are provided with four couplers.
    - IVC coupler – 2 Nos. for power connection of Hotel load.

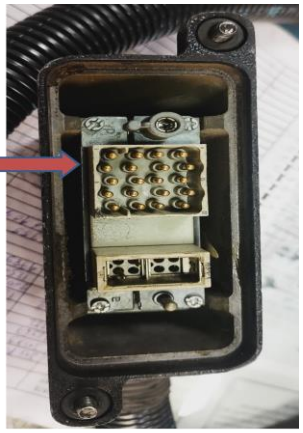
      (On command pins of hotel load converter are provided in IVC coupler only.)
    - LP side for Hotel load converter-2.
    - ALP side for Hotel load converter-1.

UIC coupler – 2 Nos.

- LP side for Push Pull operation.
- ALP side for Hotel load converter communication.
- On some locos for Push Pull operation 2 Nos. UIC couplers are provided.
- On some locos for Push pull operation 2 Nos. Harting couplers are provided in addition to UIC couplers.
- On these locos one/two UIC coupler(s) is/are provided for Push Pull operation.



Harting coupler socket on cab end



Harting Coupler cable and Male socket

UIC Coupler and socket

Harting Couplers on Power car

- UIC couplers, provided on loco cab for hotel load converter and push pull operation are female sockets.
- IVC couplers, provided on loco cab for hotel load converter power connections are male sockets.

- On rake side each power car is having male sockets at both sides (LH & RH) for Push Pull operation. (Both these sockets are connected in parallel)
- For Push Pull operation one/two flexible jumpers having male and female couplers at either end is required.
- One end of flexible jumper (male) is inserted in LP side female socket on loco cab and another end of jumper (female) is inserted in either of the two male sockets provided on power car.
- Similar jumpers are to be provided between rear power car and slave loco.
- Jumper connected between Master loco & front power car and another between slave loco & rear power car appears to be similar.
- Both jumpers are 18 pin but internal wire connection is different.
- **In Push Pull operation one straight and one cross jumper is must.**
- Location wise if straight jumper is provided between master loco & front power car then cross jumper has to be provided between slave loco and rear power car and vice versa.
- In Push Pull operation hotel load converters of master loco, if provided, will be in service.
- Therefore, IVC coupler & UIC coupler of hotel load of master loco only to be provided with jumpers from front power car.
- **No IVC & UIC jumper of hotel load converter to be connected between slave loco and rear power car.**

Preparation of Locos in shed:

Master & Slave Locos –

- Secure both locos with wooden wedges.
- Check both locos separately and energise separately.
- Conduct the prescribed tests in both locos separately.
- Remove wooden wedges in one loco and couple with other loco and ensure CBC locked properly.
- Now switch OFF MCE in both locos and trip/OFF MCB 112.1 in both locos.
- Now couple BP and FP pipes and open Angle cocks both sides.
- Couple UIC coupler between both locos or Harting coupler (cross connection)

Slave loco set up:

- Switch ON MCB 112.1
- **In E-70 Brake system locos:**

- On pn. panel close FP Cock(136) and 47(Dead cock) and ensure 70, 74, IG38 key are in open condition.
- Remove A9 handle from 'Neutral' position and release SA9 in both cabs.
- **In case of CCB2.0 Brake system locos:**
- On pn. panel close FP Cock (136) and 4(DER) and ensure 74, IG38 key are in open condition.
- Keep both cab A-9 handle in 'FS' and locked & both cab Mode switch on 'Trail' position.

Master loco set up:

- Switch ON MCB 112.1
- **In E-70 Brake system locos:**
- On pn. panel ensure 70, 74,136 cocks and IG38 key are in open condition and 47 in closed condition.
- Apply SA9 max. in working cab and ensure rear cab SA9 is released.
- Insert A9 handle in 'Neutral' position and bring to 'RUN' position in working cab.
- **In case of CCB2.0 Brake system locos:**
- On pn. panel ensure 74,136 cocks and IG38 key are in open condition and 47(DER) is closed.
- In working cab keep A-9 handle is in 'FS' till OK to RUN message in EBV LCD screen and in non working cab ensure A9 in 'FS' and locked
- Keep Mode switch in 'LEAD' in working cab and ensure in non working cab in 'Trail' position.

Checking Push-Pull Operation

- After coupling UIC/Hart couplers and setting both locos as One Master and one slave loco then go as follows:
- Keep one competent person in slave loco for assistance with Master loco operator.
- Take BL key and insert in Addl.BL socket provided on Panel 'A' or Panel 'D' and rotate to 'D' mode.
- Immediately Addl. LSDJ lamp glows.
- Now configuration starts in slave loco and Addl BPFA glows in Master loco.
- When configuration completes Addl. BPFA extinguishes. (MCE ON in slave Loco, to be confirmed from competent person who is in slave loco)
- Now take out key from Addl BL socket. (In Slave loco 'self hold mode active' message comes in DDU, to be confirmed)

- Now insert BL in Panel A and rotate to 'D'.
- After configuration both locos Node information appears in Master loco DDU

FLG1: 504	FLG2: 504	Slv: 504
SLG1: 3004	SLG2: 3004	
ALG1:B2B2h	ALG2: B2B2h	

- As per Node information energise both locos.
- Take Traction as per procedure and ensure both locos traction is coming.
- Keep throttle on '0', Put ZNN 'ON' and trip VCB in Master loco.
- Check Node information.

FLG1: 550	FLG2: 550	Slv: 596
SLG1: 3099	SLG2: 3099	
ALG1:B2B2h	ALG2: B2B2h	

- Move throttle towards TE side and ensure traction is coming in slave loco.(Master loco VCB is tripped condition)
- Keep ZNN OFF and ensure slave loco VCB also tripped. (Only Node information, addl.LSDJ will not glow).
- Apply A9 and release SA9. Ensure proportional braking working in both locos.
- Apply SA9 and release A9 and ensure slave loco brakes are released. If not released release as per procedure.
- **Conduct push-pull operation from other loco also.**

Preparation of Loco for service:

Slave Loco – (ALP in slave loco)

- Check loco as per single loco procedure.
- Check MU UIC jumper/Harting couplers (one or two) between loco and power car is connected and secured properly.
- Check BP & FP pipes are connected and their angle cocks are open.

In E-70 Brake system locos:

- On pn. panel ensure that cock No. 70, 74, IG38 key are in open position and cock 136 & 47 are in closed condition.
- Ensure both cab SA-9 handle is in released condition & both cab A-9 handle is removed in 'Neutral' position.

In case of CCB2.0 Brake system locos:

- Ensure both cab A-9 handle is in 'FS' and locked & both cab Mode switch is in 'Trail' position
- Ensure MCB 110 & 112.1 (SB-2 panel) are in SET (ON) condition and PSS on 'AUTO' position.

Master Loco: (LP & ALP)

- Check loco as per single loco procedure.
- Ensure MU UIC jumper/Harting Coupler (one or two) between loco and power car is connected and secured properly.
- Ensure BP & FP pipes are connected and their angle cocks are open.
- Ensure Hotel load (if provided) jumpers (3) are connected properly and secured.

In E-70 Brake system locos:

- On pn. panel ensure 70, 74,136 cocks and IG38 key are in open condition and 47 in closed condition.
- PSS kept on I/II as per rear cab.
- Apply SA9 max. in working cab and ensure rear cab SA9 is released.
- Insert A9 handle in 'Neutral' position and bring to 'RUN' position in working cab.

In case of CCB2.0 Brake system locos:

- On pn. panel ensure 74,136 cocks and IG38 key are in open condition and 47 (DER) is closed.
- In working cab keep A-9 handle is in 'FS' till OK to RUN message in EBV LCD screen in non working cab ensure A9 in 'FS' and locked.
- Keep Mode switch in 'LEAD' in working cab and ensure in non working cab in 'Trail' position.

Energisation of both Locos for Pull Push Operation:

- First insert BL key in Master loco Add BL slot provided on 'D' panel.
- Operate it from 'OFF' to 'D' position.
- Addl. LSDJ (D-panel) will illuminate and Slave loco control electronics will switch ON.
- When configuration starts on slave loco lamp in ADD BPFA will illuminate for few seconds and after configuration it will extinguish.
- While switching ON MCE of slave loco, if ADDL. BPFA illuminates immediately after putting BL key in ADDL. BL slot, then press ADDL. BPFA to ack. (there may

be some fault message in slave loco), it will extinguish & will again illuminate when configuration takes place.

- Now insert BL Key in Panel A and rotate to 'D'.
- After configuration both locos Node information appears in Master loco DDU

FLG1: 504	FLG2: 504	Slv: 504
SLG1: 3004	SLG2: 3004	
ALG1:B2B2h	ALG2: B2B2h	

- As per Node information energise both locos.
- Take Traction as per procedure and ensure both locos traction is coming. **(On slave loco it can be confirmed on DDU only because Bogie meters will not read on Slave locos.)**
- Keep throttle on '0', Put ZNN 'ON' and trip VCB in Master loco.
- Check Node information.

FLG1: 550	FLG2: 550	Slv: 596
SLG1: 3099	SLG2: 3099	
ALG1:B2B2h	ALG2: B2B2h	

- Move throttle towards TE side and ensure traction is coming in slave loco.(Master loco VCB is tripped condition)
- Keep ZNN OFF and ensure slave loco VCB also tripped. (Only Node information, addl.LSDJ will not glow).
- Apply A9 and release SA9. Ensure proportional braking working in both locos.
- Apply SA9 and release A9 and ensure slave loco brakes are released. If not released release as per procedure.
- Now Push-Pull operation is ready.

Procedure of passing Neutral Section:

- At 500 M board attain the maximum speed as per TSR/PSR and signals.
- At 250 M board bring throttle to '0' and ensure that ZNN switch is in 'ON' condition on 'A' panel in Master loco.
- At DJ open board operate BLDJ to OFF and ensure that LSDJ illuminates.
- Only master loco VCB will open & slave loco VCB will not open immediately which can be seen in Node information on DDU.

FLG1: 550	FLG2: 550	Slv: 596
SLG1: 3099	SLG2: 3099	
ALG1:B2B2h	ALG2: B2B2h	

- At DJ close board operate BLDJ to ON and ensure that LSDJ extinguishes. (Master loco VCB closes)
- Slave loco VCB will open automatically after approx. 350 M of master loco VCB open and will close automatically approx. 750 M after closing VCB of master loco which can be seen in Node information on Master loco DDU.
- After ensuring both loco VCB has closed and both locos node 590 comes on DDU, then operate throttle to traction or braking side as required.
- **NOTE:** While opening VCB of master loco keep watch on node information of slave loco, if slave loco VCB also opens with master loco then do not close VCB until the whole train passes neutral section.
- Due to any reason such as speed restriction, UP gradient or any other reason LP feels that train speed will drop, then LP can move Throttle to traction side immediately after closing master loco VCB.
- But when Slave loco VCB opens & closes automatically then 'Traction may not be available on the Slave loco' message will appear on DDU of Master loco.
- After appearing this message on DDU, operate throttle to '0' and again move to traction side.
- Ack. The message.
- **NOTE:** Without closing master loco VCB can take traction from slave loco by moving throttle in master loco.

Changing of Master Loco to Slave Loco:

On Master Loco -

- Keep throttle on '0'. Stop the train at convenient place and apply the brakes by operating A-9 to 'Emergency' position.
- Operate SA-9 to Max. position on Master Loco.
- Keep MPJ in 'Neutral' position.
- Ensure ZNN switch is in OFF position & then open VCB by operating BLDJ to 'OFF' position by which both loco VCB will open. (ensure node information 550 of both locos on DDU).
- Lower pantograph by operating ZPT to 'OFF' position by which both loco pantos will come down. (ensure node information 504 of both locos on DDU)

- Keep both cab SA-9 handle in release position.(Otherwise it can cause brake binding on that loco)
- If stopped on gradient then secure the loco by keeping wooden wedges.
- Operate BL key from 'D to OFF' and then 'OFF to C' and switch OFF MCE of Master loco.(DDU & SPM will switch off and all indication Lamps will extinguish)
- Now remove BL key from OFF position and insert in ADDL. BL slot provided on 'D' panel.
- Operate it from OFF position to 'C' position by which Slave loco control electronics will switch OFF.
- Now remove BL key from OFF position of ADDL. BL slot.
- Remove A-9 handle in Neutral position in E-70 locos. In CCB 2.0 locos keep A9 in FS & locked in both cabs and Mode switch in 'Trail' in both cabs.
- Keep PSS in AUTO mode.
- Close cock No. 136 on pneumatic panel.
- Go to slave loco.

On Slave loco : (Now Master loco)

- Keep PSS on I/II as per rear cab.
- Open cock No. 136 on pneumatic panel.
- Now switch ON MCE of slave loco first and then Master loco.
- Energise both locos as per node information.
- After energizing both locos test traction test and confirm from ALP who is monitoring slave loco.
- Ensure proportional brakes are applying and releasing in slave loco.

Procedure to make slave loco dead (On run):

- Due to any reason, on run if it is necessary to make slave loco dead then ALP shall make the slave loco dead in consultation with Master loco LP.
- In slave loco, On pneumatic panel close 70 & 74 cocks. and open 47 dead loco cock. (CCB 2.0 – Close 74 and open 47 cock)
- As soon as the cocks are closed on slave loco, On Master loco EMG. Exhaust cock closed, No traction 'F 10 10 P1' message will appear for 2-3 times, ack. it by pressing BPFA switch.
- Now Switch OFF 112.1 MCB in SB-2 in slave loco by ALP.

- As soon as MCB 112.1 kept OFF on the slave loco, F19 01P1 'Communication Disturbance' message will appear on the master loco DDU for 2-3 times and VCB will open on master loco.
- Ack. it until 'Train Bus Isolated' message appears on the master loco DDU.
- When 'Train Bus Isolated' message appears on the screen, press Enter button by which SS19 sub system will get isolated and LSFI lamp will illuminate continuously.
- Now close VCB of master loco and work ahead with single loco.
- Before starting ensure proportional brakes are applying and releasing in slave loco.
- **NOTE:** ALP provided on slave loco should ensure that brakes are in released condition and loco brakes via conjunction are coming whenever BP drops from master loco.

Procedure to make slave loco dead (stationary):

Due to any reason, if it is necessary to make slave loco dead, then ALP shall make the slave loco dead in consultation with Master loco LP.

- In slave loco On pneumatic panel close 70 & 74 and open. 47 (dead loco cock). (CCB 2.0 – Close 74 and open 47 cock)
- Switch OFF MCB 112.1 in SB-2 in slave loco by ALP.
- Ensure that brakes are in released condition. if not release as per procedure.
- Drop BP pressure from master loco and ensure that conjunction brakes are applied in slave loco.
- Finally, ALP shall ensure free wheel movement when train starts and inform immediately to Master loco LP if noticed any abnormality.

WAP5 PUSH – PULL OPERATION

Modifications both ends:

- Driving side cab end is aerodynamic design.
- Non driving cab end is flat.
- Four Nos. UIC connectors are provided on the flat end of WAP-5 Loco.
- The farthest most 22 pin UIC Coupler are for Push Pull operation. Both are redundant.
- LP side UIC is Line B-WTB channel and ALP side is Line A-WTB channel for Push Pull communication.
- The middle most 13 pins UIC couplers are for HOG operation. Both are redundant.
- LP side is UIC coupler for HLC2-SB2 connection and ALP side is HLC-SB1 connection.

➢ **NOTE**: There is no UIC or IVC coupler on the aerodynamic side of the cab.

AERODYNAMIC END CAB

FLAT END CAB

1. UIC SOCKETS FOR PUSH-PULL OPERATION
2. UIC SOCKETS FOR HOTEL LOAD
3. HOTE LOAD COUPLERS (MALE SOCKETS)

FLAT END CAB ELECTRICAL CONNECTIONS

ELECTRICAL CONNECTIONS BETWEEN LOCO AND SLRD

- UIC couplers, provided on loco flat end cab for hotel load converter and push pull operation are female sockets.
- IVC couplers, provided on loco flat end cab for hotel load converter power connections are male sockets.
- On rake both SLRs are having male sockets at both sides (LH & RH) for Push Pull operation. Both these sockets are connected in parallel.
- For Push Pull operation one/two flexible jumper(s) having male and female couplers at either end is required.
- One end of flexible jumper (male) is inserted in LP side female socket on loco cab and another end of jumper (female) is inserted in either of the two male sockets provided on SLR for Push Pull operation.

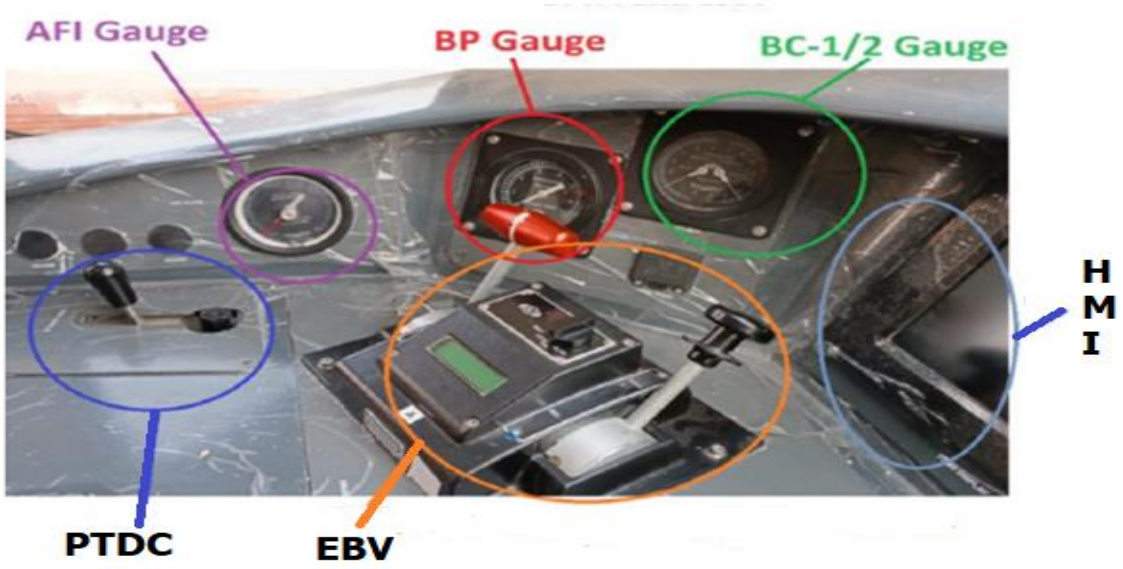
- Similar jumpers are to be provided between rear SLR and slave loco.
- In Push Pull operation hotel load converters of master and slave loco both will be in service.
- So IVC and UIC connector from both side should be connected to their respective SLRD.
- However it should be ensure that HLC doesn't get switched on same feeder.
- One push-pull jumper is straight between loco and SLR and another is cross between loco and SLR.

MODIFICATIONS IN CABS

Non Driving Cab- Driving desk

AERODYNAMIC END CAB - DRIVING DESK

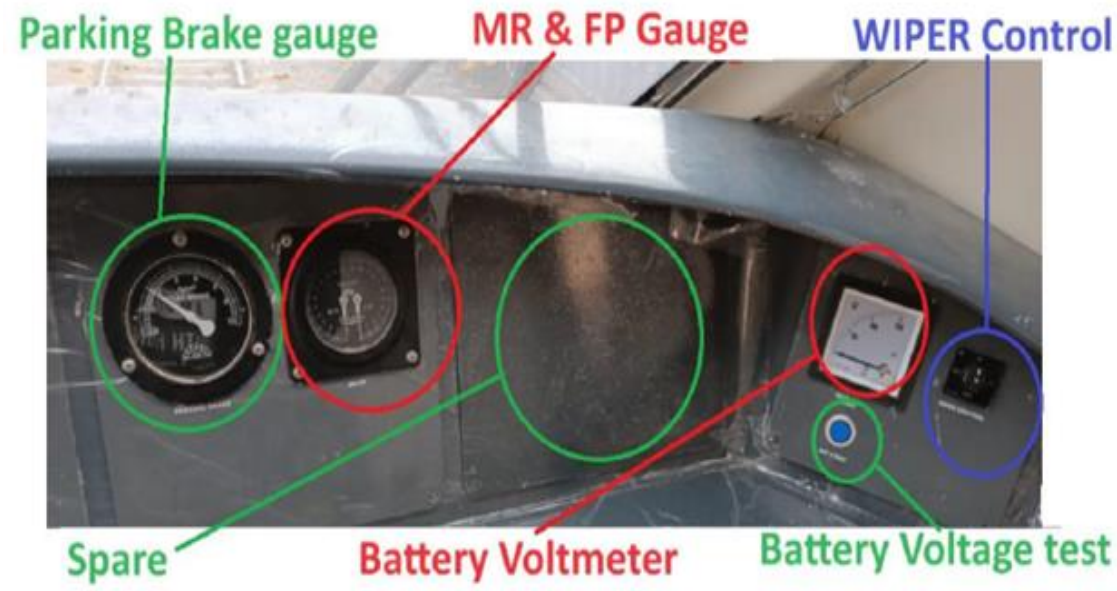
AERODYNAMIC END CAB - DRIVING DESK



1ST ROW:
1. U Meter
2. Bogie-1 Meter
3. Bogie-2 Meter

2nd Row:
1. LSCE
2. LSP
3. HLC-1
4. HLC-2

3rd Row:
1. ADDL.LSDJ
2. ADDL. BPFA
3. ADDL.BL SLOT
4. VCU Reset



PANAL-A

1ST ROW:
1. EMR. Stop PB
2. LSDJ
3. LSHO
4. BL Slot

2nd Row:
1. LSFI
2. LSAF
3. Spare
4. ZNN

3rd Row:
1. ZTEL
2. BPVR
3. LSVW
4. Spare

4th Row:
1. BLHO
2. BPPB
3. BPCS
4. ZBAN

5th Row:
1. ZPT
2. BLDJ
3. BLCP
4. BPFA

PANEL - C

1ST ROW:
1. Spare (Dummy)
2. Spare (Dummy)
3. Spare (PB)
4. Exchange signals (Green)

2nd Row:
1. ZLC
2. ZLDA
3. ZLH
4. Exchange signals (RED)

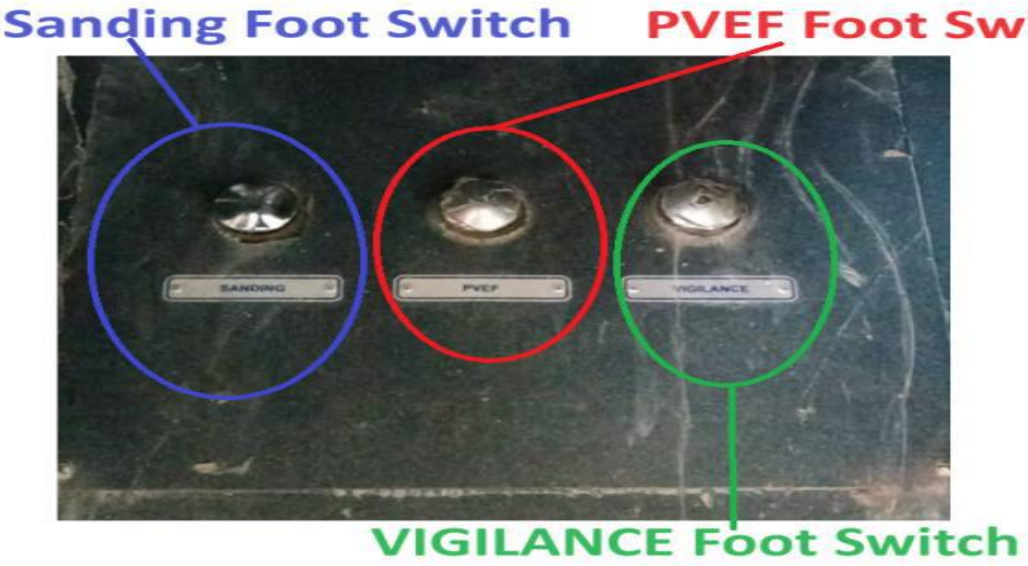
3rd Row:
1. ZLI
2. LSAF
3. Spare
4. HORN HT

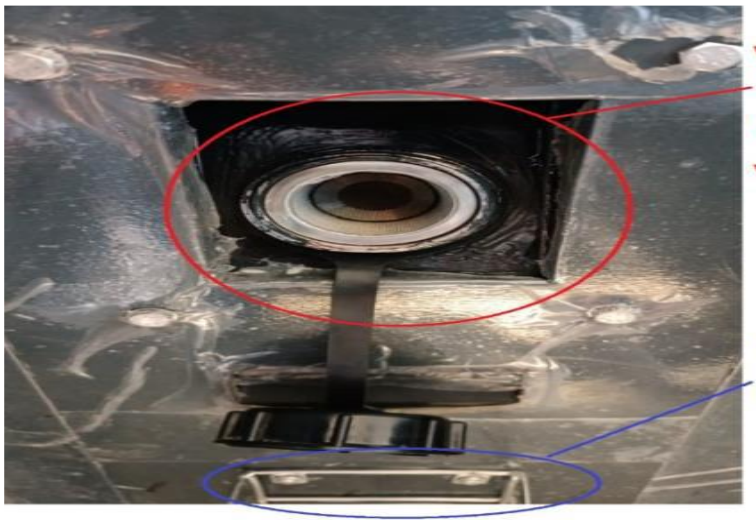
4th Row:
1. ZLDD
2. ZLFW
3. ZLFR
4. HORN LT

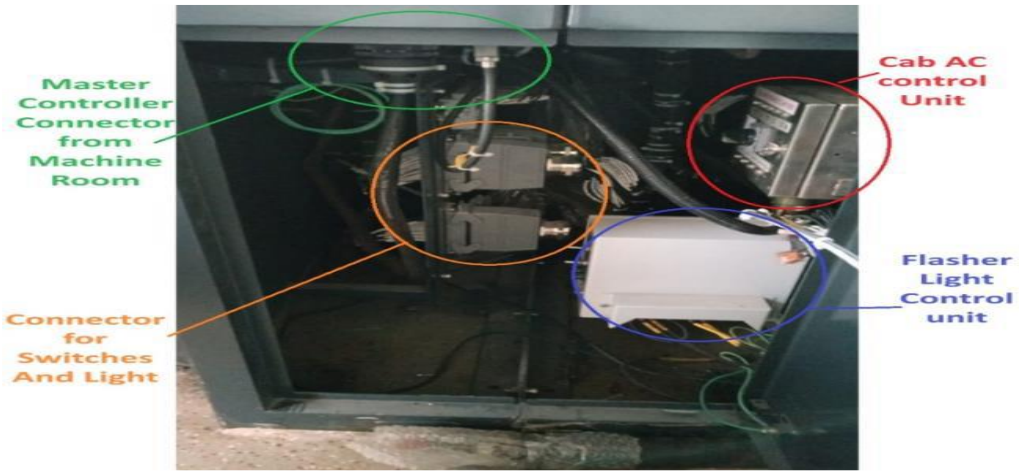
5th Row:
1. BLPR
2. ZPRD
3. BPFL
4. BPVG

Two microphones


KKI
INSTRUCTION
Isolation Cock with Pneumatic Pipeline
Control AC Main Control Unit


Sanding Foot Switch
PVEF Foot Switch
SANDING
PVEF
VIGILANCE
VIGILANCE Foot Switch


Water tank fill point for Wiper
Water Bottle Holder



Wiper Control Unit inside the cover

Connector from SB Panel in Machine Room

RS Cock Connection at ALP for Emergency

Preparation of Locos in shed:

Master & Slave Locos –

- Secure both locos with wooden wedges.
- Check both locos separately and energise separately from aerodynamic cab end.
- Conduct the prescribed tests in both locos separately.
- Remove wooden wedges in one loco and couple with other loco (both locos flat ends in middle) and ensure CBC locked properly.
- Now switch OFF MCE in both locos and trip/OFF MCB 112.1 in both locos.
- Now couple BP and FP pipes and open Angle cocks both sides.
- Couple UIC coupler between both locos or Harting coupler (cross connection)

Slave loco set up:

- Switch ON MCB 112.1
- **In E-70 Brake system locos:**
- On pn. panel close FP Cock(136) ensure 70, 74, IG38 key are in open condition and 47 in closed condition.
- Remove A9 handle from 'Neutral' position and release SA9 in both cabs.

In case of CCB2.0 Brake system locos:

- On pn. panel close FP Cock (136) ensure 74, IG38 key are in open condition and 47 in closed condition.
- Keep both cab A-9 handle is in 'FS' and locked & both cab Mode switch is in 'Trail' position

Master loco set up:

- Switch ON MCB 112.1
- **In E-70 Brake system locos:**
- On pn. panel ensure 70, 74,136 cocks and IG38 key are in open condition and 47 in closed condition.
- Apply SA9 max. in working cab and ensure rear cab SA9 is released.
- Insert A9 handle in 'Neutral' position and bring to 'RUN' position in working cab.

In case of CCB2.0 Brake system locos:

- On pn. panel ensure 74,136 cocks and IG38 key are in open condition and 47 is closed.

- In working cab keep A-9 handle is in 'FS' till OK to RUN message in EBV LCD screen in non working cab ensure A9 in FS and locked
- Keep Mode switch in 'LEAD' in working cab and ensure in non working cab in 'Trail' position.

Checking Push-Pull Operation

- After coupling UIC/Hart couplers and setting both locos as One Master and one slave loco go as follows:
- Keep one competent person in slave loco for assistance with Master loco operator.
- Take BL key and insert in Addl.BL socket provided below Bogie meters.
- Immediately Addl. LSDJ lamp glows below bogie meters.
- Now configuration starts in slave loco and Addl BPFA glows below Bogie meters.
- When configuration completes Addl. BPFA extinguishes. (MCE ON in slave Loco, to be confirmed from competent person who is in slave loco)
- Now take out key from Addl BL socket. (In Slave loco 'self hold mode active' message comes in DDU, to be confirmed)
- Now insert BL in Panel A and rotate to 'D'.
- After configuration both locos Node information appears in Master loco DDU

FLG1: 504	FLG2: 504	Slv: 504
SLG1: 3004	SLG2: 3004	
ALG1:B2B2h	ALG2: B2B2h	

- As per Node information energise both locos.
- Take Traction as per procedure and ensure traction is coming in both locos.
- Keep throttle on '0', Put ZNN 'ON' and trip VCB in Master loco.
- Check Node information.

FLG1: 550	FLG2: 550	Slv: 596
SLG1: 3099	SLG2: 3099	
ALG1:B2B2h	ALG2: B2B2h	

- Move throttle towards TE side and ensure traction is coming in slave loco.(Master loco VCB is tripped condition)
- Keep ZNN OFF and ensure slave loco VCB also tripped. (Only Node information, addl.LSDJ will not glow).

- Apply A9 and release SA9. Ensure proportional braking working in both locos.
- Apply SA9 and release A9 and ensure slave loco brakes are released. If not released release as per procedure.
- **Conduct push-pull operation from other loco also.**

Preparation of Loco for service:

Slave Loco – (ALP in slave loco)

- Check loco as per single loco procedure.
- Check MU UIC jumper/Harting couplers (one or two) between loco and SLRD is connected and secured properly.
- Check BP & FP pipes are connected and their angle cocks are open.

In E-70 Brake system locos:

- On pn. panel ensure that cock No. 70, 74, IG38 key are in open position and cock 136 & 47 are in closed condition.
- Ensure both cab SA-9 handle is in released condition & both cab A-9 handle is removed in 'Neutral' position.
- Keep/ensure PSS on 'AUTO' position.

In case of CCB2.0 Brake system locos:

- Ensure both cab A-9 handle is in 'FS' and locked & both cab Mode switch is in 'Trail' position
- Ensure MCB 110 & 112.1 (SB-2 panel) are in SET (ON) condition and PSS on 'AUTO' position.

Master Loco: (LP & ALP)

- Check loco as per single loco procedure.
- Keep PSS on I/II as per rear cab.
- Ensure MU UIC jumper/Harting Coupler (one or two) between loco and SLRD is connected and secured properly.
- Ensure Hotel load jumpers (2+2) are connected properly and secured.

In E-70 Brake system locos:

- On pn. panel ensure 70, 74,136 cocks and IG38 key are in open condition and 47 in closed condition.
- Apply SA9 max. in working cab and ensure rear cab SA9 is released.
- Insert A9 handle in 'Neutral' position and bring to 'RUN' position in working cab.

In case of CCB2.0 Brake system locos:

- On pn. panel ensure 74,136 cocks and IG38 key are in open condition and 47 is closed.
- In working cab keep A-9 handle in 'FS' till OK to RUN message in EBV LCD screen and in non working cab ensure A9 in FS and locked
- Keep Mode switch in 'LEAD' in working cab and ensure in non working cab in 'Trail' position.

Energisation of both Locos for Pull Push Operation:

- First insert BL key in Master loco Add BL slot provided below bogie meters.
- Operate it from 'OFF' to 'D' position.
- Add LSDJ (below bogie meters) will illuminate and Slave loco control electronics will switch ON.
- When configuration starts on slave loco lamp ADD BPFA will illuminate for few seconds and after configuration it will extinguish, provided below bogie meters.
- While switching ON MCE of slave loco, if ADD BPFA illuminates immediately after putting BL key in ADDL. BL slot, then press ADDL. BPFA to ack. (there may be some fault message in slave loco), it will extinguish & will again illuminate when configuration takes place.
- Now insert BL in Panel A and rotate to 'D'.
- After configuration both locos Node information appears in Master loco DDU

FLG1: 504	FLG2: 504	Slv: 504
SLG1: 3004	SLG2: 3004	
ALG1:B2B2h	ALG2: B2B2h	

- As per Node information energise both locos.
- Take Traction as per procedure and ensure in both locos traction is coming. **(On slave loco it can be confirmed on DDU only because Bogie meters will not read on Slave locos.)**
- Keep throttle on '0', Put ZNN 'ON' and trip VCB in Master loco.
- Only master loco VCB trips. Check Node information.

FLG1: 550	FLG2: 550	Slv: 596
SLG1: 3099	SLG2: 3099	
ALG1:B2B2h	ALG2: B2B2h	

- Move throttle towards TE side and ensure traction is coming in slave loco.(Master loco VCB is tripped condition)
- Keep ZNN OFF and ensure slave loco VCB also tripped. (Only Node information, Addl.LSDJ will not glow).
- Apply A9 and release SA9. Ensure proportional braking working in both locos.
- Apply SA9 and release A9 and ensure slave loco brakes are released. If not released release as per procedure.
- Now Push-Pull operation is ready.

Procedure of passing Neutral Section:

- On 500 M board attain the maximum speed as per TSR/PSR and signals.
- On 250 M board bring throttle to '0' and ensure that ZNN switch is in 'ON' condition on 'A' panel in Master loco.
- At DJ open board operate BLDJ to OFF and ensure that LSDJ illuminates.
- Only master loco VCB will open & slave loco VCB will not open immediately which can be seen in Node information on DDU.

FLG1: 550	FLG2: 550	Slv: 596
SLG1: 3099	SLG2: 3099	
ALG1:B2B2h	ALG2: B2B2h	

- On DJ close board operate BLDJ to ON and ensure that LSDJ extinguishes.
- Slave loco VCB will open automatically after approx. 350 M of master loco VCB open and will close automatically approx. 750 M after closing VCB of master loco which can be seen in Node information on Master loco DDU.
- After ensuring both loco VCB has closed and both locos node 590 comes on DDU, then operate throttle to traction or braking side as required.
- **NOTE:** While opening VCB of master loco keep watch on node information of slave loco, if slave loco VCB also opens with master loco then do not close VCB until the whole train passes neutral section.
- Due to any reason such as speed restriction, UP gradient or any other reason LP feels that train speed will drop, then LP can move Throttle to traction side immediately after closing master loco VCB.
- But when Slave loco VCB opens & closes automatically then 'Traction may not be available on the Slave loco' message will appear on DDU of Master loco.
- After appearing this message on DDU, operate throttle to '0' and again move to traction side.

- Ack. The message.

NOTE: Without closing master loco VCB can take traction from slave loco by moving throttle in master loco.

Changing of Master Loco to Slave Loco:

On Master Loco -

- Keep throttle on '0'. Stop the train at convenient place and apply the brakes by operating A-9 to 'Emergency' position.
- Operate SA-9 to Max. position on Master Loco.
- Keep MPJ in 'Neutral' position.
- Ensure ZNN switch is in OFF position & then open VCB by operating BLDJ to 'OFF' position. (ensure node information 550 of both locos on DDU).
- Lower pantograph by operating ZPT to 'OFF' position by which both loco pantos will come down. (ensure node information 504 of both locos on DDU)
- Keep both cab SA-9 handle in release position.(Otherwise it can cause brake binding on that loco)
- If stopped on gradient then secure the loco by keeping wooden wedges.
- Operate BL key from 'D to OFF' and then 'OFF to C' and switch OFF MCE of Master loco.(DDU & SPM will switch off and all indication Lamps will extinguish)
- Now remove BL key from OFF position and insert in ADDL. BL slot provided below bogie meters.
- Operate it from OFF position to 'C' position by which Slave loco MCE will switch OFF.
- Now remove BL key from OFF position of ADDL. BL slot.
- Remove A-9 handle in Neutral position in E-70 locos. In CCB 2.0 locos keep A9 in FS & locked in both cabs and Mode switch in 'Trail' in both cabs.
- Keep PSS in AUTO mode.
- Close cock No. 136 on pneumatic panel.
- Go to slave loco.

On Slave loco : (Now Master loco)

- Keep PSS on I/II as per rear cab.
- Open cock No. 136 on pneumatic panel.
- Now switch ON MCE of slave loco first and then Master loco.

- Energise both locos as per node information.
- After energizing both locos test traction test and confirm from ALP who is monitoring slave loco.
- Ensure proportional brakes are applying and releasing in slave loco.

Procedure to make slave loco dead (On run):

- Due to any reason, on run if it is necessary to make slave loco dead then ALP shall make the slave loco dead in consultation with Master loco LP.
- In slave loco, On pneumatic panel close 70 & 74 cocks. and open 47 dead loco cock. (CCB 2.0 – Close 74 and open 47 cock)
- As soon as the cocks are closed on slave loco, On Master loco EMG. Exhaust cock closed, No traction 'F 10 10 P1' message will appear for 2-3 times, ack. it by pressing BPFA switch.
- Now Switch OFF 112.1 MCB in SB-2 in slave loco by ALP.
- As soon as MCB 112.1 kept OFF on the slave loco, F19 01P1 'Communication Disturbance' message will appear on the master loco DDU for 2-3 times and VCB will open on master loco.
- Ack. it until 'Train Bus Isolated' message appears on the master loco DDU.
- When 'Train Bus Isolated' message appears on the screen, press Enter button by which SS19 sub system will get isolated and LSFI lamp will illuminate continuously.
- Now close VCB of master loco and work ahead with single loco.
- Before starting ensure proportional brakes are applying and releasing in slave loco.

  NOTE: ALP provided on slave loco should ensure that brakes are in released condition and loco brakes via conjunction are coming whenever BP drops from master loco.

  NOTE: ALP shall ensure Parking brakes are not applied when MCB 112.1 switched OFF.

Procedure to make slave loco dead (stationary):

- Due to any reason, if it is necessary to make slave loco dead, then ALP shall make the slave loco dead in consultation with Master loco LP.
- In slave loco On pneumatic panel close 70 & 74 and open. 47 (dead loco cock). (CCB 2.0 – Close 74 and open 47 cock)
- Switch OFF MCB 112.1 in SB-2 in slave loco by ALP.

- Ensure that brakes are in released condition. if not release as per procedure.
- Drop BP pressure from master loco and ensure that conjunction brakes are applied in slave loco.
- Finally, ALP shall ensure free wheel movement when train starts and inform immediately to Master loco LP if noticed any abnormality.

Points to keep in mind while working Push Pull operation -

- While attaching jumper cables ensure both loco (master & slave) MCB 112.1 in OFF condition.
- In slave loco only 'U' meter will read. UBA & Bogie 1&2 meters will not read.
- Battery voltage & TE/BE can be seen on DDU screen only.
- Ensure that on slave loco both cab SA-9 is in released condition & BC gauge shows '0' kg/cm^2 pressure. (In WAP5 push-pull operation ensure PB are released)
- Before starting ensure that cock No. 136 is closed in slave loco.
- While approaching neutral section, ensure ZNN switch is in 'ON' condition.
- While negotiating N/S opening & closing of VCB of slave loco can be seen on master loco DDU screen through node information.
- While passing neutral section, keep watch on master loco node information on DDU screen.
- If both loco VCB gets open at a time by operation of BLDJ then do not close VCB until whole train passes through neutral section.
- While changing Master loco to Slave loco, first operate A-9 to Emergency position and keep SA-9 handle in Released position after that remove BL Key.
- Whenever any fault takes place on slave loco, fault message will appear on Master loco DDU only, but fault message will store in slave loco DDS.
- Whenever any fault message appears on master loco DDU, first confirm loco number to identify whether the fault is in master loco or slave loco.
- On master loco DDS only master loco background fault messages can be seen. Slave loco background messages can be seen in slave loco only.
- Add BPFA, Add LSDJ & Add BL are used only for initially energising of push pull formation.
- **On slave loco do not reset MCE by VCU switch. If on slave loco VCU switch is pressed then slave loco will not reboot.**
- Whenever SA-9 is applied in master loco, brakes will be applied only on master loco.

- But whenever BP is dropped from master loco/ACP/BP pipe uncouple/train parted, conjunction brakes will be applied on slave loco & can be released by pressing PVEF pedal switch from master loco.
- While making slave loco dead first close cock no. 70, 74 & open cock no. 47 then only switch OFF MCB 112.1 to avoid emergency brake application.
- Whenever due to any reason slave loco is made dead then ensure that conjunction brakes are getting applied & released on slave loco.
- Slave loco VCD remains in sleep mode. If still due to any mal functioning VCD acts then isolate it by switch 237.1 (SB-1) & inform to TLC.
- **In Push Pull operation one straight and one cross jumper is must.**
- **Ensure slave loco parking brakes are not applied when slave loco make dead on run (In WAP 5 Locos)**