सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

# Pre-Commissioning Checklist for Onboard KAVACH (Diesel/Electrical) as per specification RDSO/SPN/196/2020 version 4.0 of M/s Firm's Name

Issued by

**SIGNAL AND TELECOM DIRECTORATE**
**RESEARCH DESIGNS & STANDARDS ORGANISATION**
**MINISTRY OF RAILWAYS**
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**Revision History**

| SN. | Issue | Version | Reason of Amendment |
|---|---|---|---|
| 1 | First | 1.0 | First Issue |
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| | | | |

| Prepared by: | Approved by: |
|---|---|
| JE/SSE/S&T/RDSO<br>ADE/S&T/RDSO<br>Dir/Sig-IV/RDSO<br>ED/Tele-II/RDSO | PED S&T/RDSO/LKO |



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## REFERENCES

| # | Document name | Document number | Version Number/Date | Source |
|---|---|---|---|---|
| 1. | Railway Applications: The Specification and Demonstration of Dependability: Reliability, Availability, Maintainability and Safety (RAMS) | EN 50126-1 | October 2017 | CENELEC |
| | | EN 50126-2 | October 2017 | |
| 2. | Software for Railway Control and Protection System | EN50128 | June 2011 | CENELEC |
| 3. | Safety Related Electronic Systems for Signaling | EN50129 | February 2003 | CENELEC |
| 4. | Communications, Signaling and Processing Systems- Safety related communication in Transmission Systems | EN50159 | September 2010 | CENELEC |
| 5. | Railway applications - Electromagnetic compatibility -- Part 4: Emission and immunity of the signalling and telecommunications apparatus | EN50121-1 | January 2017 | CENELEC |
| 6. | Product Specifications | RDSO/SPN/ 196/2020 | 4.0 | RDSO |
| 7. | Safety and Reliability Requirement of electronic signaling equipment | RDSO/SPN/144/2006 | 4.0 | RDSO |



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## GLOSSARY OF TERMS

| # | Abbreviation | Meaning |
|---|---|---|
| 1. | ACK | Acknowledgement |
| 2. | BC | Brake Cylinder |
| 3. | BIU | Brake Interface Unit |
| 4. | BP | Brake Pressure |
| 5. | BR | Brake Release |
| 6. | CAB-INPUT | Cabin Input |
| 7. | CAN | Controller Area Network |
| 8. | CENELEC | European Committee for Electro Technical Standardization |
| 9. | DC | Direct Current |
| 10. | DMI | Driver machine interface |
| 11. | PS | Power Supply |
| 12. | EB | Emergency Brake |
| 13. | EP | Electro pneumatic |
| 14. | EP Valve | Emergency EP Relay Valve |
| 15. | EMI | Electromagnetic Interference |
| 16. | FSB | Full-Service Brake |
| 17. | IR | Indian Railways |
| 18. | GSM | Global System for Mobile |
| 19. | GNSS | Global Navigation Satellite System |
| 20. | GPS | Global Positioning System |
| 21. | LAT | Latitude |
| 22. | LNG | Longitude |
| 23. | LE | Light Engine |
| 24. | LOCO | Locomotive |
| 25. | LP-OCIP | Loco Pilot Operation Cum Indication Panel |
| 26. | MCB | Miniature Circuit Breaker |
| 27. | MR | Main Reservoir |
| 28. | NB | Normal Brake |
| 29. | OCIP | Operation Cum Indication Panel |
| 30. | CPU | Central Processing Unit |
| 31. | QRV | Quick Release Valve |
| 32. | RFID | Radio Frequency Identification |
| 33. | RL | Reliability Level |
| 34. | SIM | Subscriber Identification Module |
| 35. | SMS | Short Message Service |

| # | Abbreviation | Meaning |
|---|---|---|
| 36. | SOS | Save Our Souls – A distress message |
| 37. | KAVACH | Indian Railway Automatic Train Protection System |
| 38. | VC | Vital computer |
| 39. | VSWR | Voltage Standing Wave Ratio |

**Objective of the document:**
(i) Testing of ONBOARD KAVACH equipped trains with UHF radio on Static test Bed.
(ii) Recording complete train diagnostics and test reports before entering mainline operation.

| S. No | Tools | Description |
|---|---|---|
| 1. | Test Depot (Static Test Bed) | Test Depot will be equipped with<br>• LTE network (F)<br>• STATIONARY KAVACH Simulator<br>ONBOARD KAVACH equipped with UHF or LTE (F) or both can be tested from Test Depot before entering traffic line. |
| 2. | STATIONARY KAVACH | Simulation of STATIONARY KAVACH environment with RFID Tags and virtual signals in the yard |



Note: F- Future option

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**Specific procedure for commission of onboard KAVACH.**

Para 1 provides general information about Locomotive and onboard KAVACH

Para-2 provides details about module being used in onboard KAVACH along with brake interface unit.

## 1. General Information

| | |
|---|---|
| Loco shed Name: | |
| Division: | |
| Zonal Railway: | |
| Onboard Number: | |
| Onboard Type: | |
| Brake interface type: | |
| Serial Number of Onboard KAVACH: | |
| SIM-1 No and Date of recharge: (Applicable for prepaid only) : | |
| SIM-2 No and Date of recharge (Applicable for prepaid only) : | |
| Date of installation: | |
| Date of Commissioning: | |

## 2. Module Level

2.1. **Onboard KAVACH Unit**

2.2. **Details of Onboard KAVACH unit Inspecting agency and inspection certificate: RDSO/RITES/Zonal Railways**

2.3.

Inspecting agency and name of the inspecting official by

Inspection on

| Sl.NO | Module Name | Qty | Module Serial Number(s) |
|---|---|---|---|
| **1.** | *Onboard KAVACH Panel | | |
| 2. | *Vital Processing card | | |
| 3. | *Vital Input Card | | |
| 4. | *Vital Output Card | | |
| 5. | *Vital Communication Card | | |
| 6. | *Vital Gateway card | | |
| 7. | *Critical Counter Card | | |
| 8. | *Mother Board | | |
| 9. | *Power Supply Module 24VDC | | |
| 10. | *Power Supply Module 12VDC | | |
| 11. | RFID reader | | |

| Sl.NO | Module Name | Qty | Module Serial Number(s) |
|---|---|---|---|
| 12. | LP-OCIP | | |
| 13. | Radio Modem | | |
| 14. | RF Antenna | | |
| 15. | GPS Antenna | | |
| 16. | GSM Antenna | | |
| 17. | Directional type pulse Generator | | |
| 18. | Any other additional module | | |
| 19. | | | |
| 20. | | | |
| 21. | | | |
| 22. | | | |
| 23. | | | |
| 24. | | | |
| 25. | | | |
| 26. | | | |
| 27. | | | |
| 28. | | | |
| 29. | | | |

*Details of module name and quantity may be amended as per firm approval letter, as format is in generic in nature for all vendor.

2.4. **E-70 Interface Unit (As applicable)**

2.5. **Details of BIU Inspecting agency and inspection certificate: RDSO/RITES/Zonal Railways**

| Inspecting agency and name of the inspecting official | | Inspection on | |
|---|---|---|---|

| Sl. No. | Module Name | Qty | Serial No./Reading |
|---|---|---|---|
| 1. | Interface Relay Units (IRU) | **2** | |
| 2. | LE unit | **1** | |
| 3. | EP valve | **2** | |
| 4. | EM cock | **2** | |
| 5. | | - | |
| 6. | | - | |
| 7. | | - | |

2.6. **CCB Interface Unit (As applicable)**

2.7. **Details of BIU Inspecting agency and inspection certificate: RDSO/RITES/Zonal Railways**

| | |
|---|---|
| Signature of firm Representative with Name, Designation & Date. | Signature of SSE Loco Shed/SSE EMU Shed with Name, Designation & Date |

| Inspecting agency and name of the inspecting official | | Inspection on | |
|---|---|---|---|

| Sl. No. | Module Name | Qty | Serial No./Reading |
|---|---|---|---|
| 1. | Train Protection Module (TPM) (WAG9/WAP7- SW 2537 ; WAP5-SW2538) | **1** | |
| 2. | Additional bracket and hardware to secure TPM on panel(hardware) | **1** | |
| 3. | Cable Assembly(PSJB HO to TPM) | **1** | |
| 4. | SIFA Valve (For redundant emergency braking) (To be kept below A9 of CAB1) | **1** | |
| 5. | SIFA Base plate for installation | # | |
| 6. | Power supply Junction Box HO (PSJB-HO)- | # | |
| 7. | Cable assemble EPCU –PSJB HO (WJB to PSJB-HO) | # | |
| 8. | Mounting of SIFA valve (mounting stool, pipe & pipefittings) | # | |
| 9. | Cable assembly from KAVACH to TPM | # | |
| 10. | Cable assembly from KAVACH to Emergency valve(SIFA) | # | |

# Note: Quantity shall be mentioned as per type of loco requirement.

2.8. **IRAB Type Locomotive (As applicable)**

2.9. **Details of BIU Inspecting agency and inspection certificate: RDSO/RITES/Zonal Railways**

| Inspecting agency and name of the inspecting official | | Inspection on | |
|---|---|---|---|

| **Sl. No.** | **Module Name** | **Qty** | **Serial No./Reading** |
|---|---|---|---|
| 1. | CONTROL UNIT SUB-SYSTEM | | |
| 2. | CONTROL UNIT POWER SUPPLY CARD | | |
| 3. | ANALOG INPUT CARD | | |
| 4. | CONTROL CARD | | |
| 5. | DIGITAL OUTPUT CARD | | |
| 6. | DIGITAL INPUT CARD | - | |
| 7. | PNEUMATIC PANEL POWER SUPPLY CARD | - | |
| 8. | PNEUMATIC PANEL | | |

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| Sl. No. | Module Name | Qty | Serial No./Reading |
|---|---|---|---|
| | Any other additional module | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |

3. **Verification of Executive Software Version No and Checksum are as per approval letter in DMI:**

| Sl. No | Module Name | Version | Checksum | Remarks (OK/NOT OK) |
|---|---|---|---|---|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |
| 7. | | | | |

4. **Verification of software version and checksum of Onboard braking configuration (As per approved Onboard KAVACH configuration Manual) in DMI or through laptop.**

| Sl. No | Onboard Type | Version | Checksum | Remarks (OK/NOT OK) |
|---|---|---|---|---|
| (i) | | | | |



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## 5. Hardware Check list

Before making the interconnections between the sub-systems, ensure the following:

Note 1: Before conducting the following tests ensure that the KAVACH ISOLATE switch is in ISOLATE position only unless specifically mentioned otherwise.

| Sl. No. | Items / Requirements | Observed/ Measured | Remarks OK/ Not OK |
|---|---|---|---|
| 5.1. | **Visual inspection on KAVACH Equipment** | | |
| 5.1.1. | The mechanical mountings of KAVACH should be welded properly to withstand vibrations. | | |
| 5.1.2. | Ensure that proper Module / Cards are properly inserted in respective slots and secured as per slot details of cards | | |
| 5.1.3. | KAVACH unit shall be properly mounted. | | |
| 5.1.4. | Check whether RF antennas are connected to Transmit & Receive connectors of both Radio Modems. | | |
| 5.1.5. | Check whether two GPS/GSM antennae cables are firmly connected to the respective module. | | |
| 5.1.6. | (i) RFID reader shall be installed as per the approved fitment plan by the KAVACH standard installation drawings & RFID reader OEM engineering team.<br>(ii) The intactness of welding of RFID reader mounting bracket on locomotive underframe shall be ensured by carrying Dye Penetration Testing where Magnetic Particle Testing (MPT) is not available with the help of shed.<br>(iii) Check proper mechanical mounting of RFID reader (safety sling) with enclosure under the locomotive at an appropriate location, angle & height and the cables are firmly connected to the KAVACH.<br>(iv) Vertical distance from bottom of RFID reader antenna to top of the rail level is 400 mm ±100mm and it is normally at the centre of rolling stock with offset permissible to ± 100mm in horizontal plane. It should be placed as low as possible based on the design by OEM. | | |
| 5.1.7. | i. Check the mounting of both Pulse generators along with the Junction boxes and its connections. | | |
| | ii. Pulse generator shall be directional type.<br>Redundant channels are preferable. | | |
| | iii. Pulse Generators shall be fixed preferably at Axle 2/3/4/5 in CO-CO & Axle 2/3 in BO-BO.as per approved layouts of RDSO. | | |

| Sl. No. | Items / Requirements | Observed/ Measured | Remarks OK/ Not OK |
|---|---|---|---|
| | iv. PG1 & PG2 shall be fitted on different axles and in opposite direction. | | |
| | Ensure conduit pipes are used for interconnecting cables from PG | | |
| 5.1.8. | Check whether brake interface Unit (BIU) is mounted & secured properly. Cables from BIU to IO Distribution Box are firmly connected. (As applicable) | | |
| 5.1.9. | a) Check the Electro Pneumatic (EP) cocks at both the cabins in case of E-70 both EM Cocks below A9 & cock in case of CCB brake system (below A9 of CAB1) are securely mounted. It should be in Close position for KAVACH usage. | | |
| | b) The cock below A9 of cab-1 shall be easily accessible to loco pilot. | | |
| 5.1.10. | Check proper mechanical mounting of LP-OCIP on both the cabs | | |
| 5.1.11. | a) The Radio Antennae mounted on cab roof of locomotive should be as per fitment plan approved by RDSO. | | |
| | b) Physical staggering of antenna to be ensured by distributing to both ends of Cab/Car. | | |
| 5.1.12. | Installation & wiring done as per fitment plan of OEM | | |
| 5.2. | **Wiring and Routing** | | |
| 5.2.1. | Ensure insulated wires are protected from mechanical damage in bend. | | |
| 5.2.2. | Ensure that there are no loose wires hanging out from any of the modules. | | |
| 5.2.3. | Ensure that wires are tagged and marked for easy identification. | | |
| 5.2.4. | Ensure that the wire ends are properly crimped with correct size of lugs and inserted properly in the terminals. | | |
| 5.2.5. | Check whether the proper input power supply connections are extended from Loco to KAVACH system. | | |
| 5.2.6. | Check whether the MCB are of proper rating as designed by OEM, (……..Amps) and ensure it is connected to the KAVACH power distribution Unit, LPOCIP and Brake interface unit. | | |
| 5.2.7. | Check that all MCB are being operated with single operation. | | |
| 5.2.8. | Check whether all the Coupler connectors are tightened properly. | | |
| 5.2.9. | Check 110/ 72 VDC is appearing across its output terminals when MCBs of KAVACH (As applicable) is in ON condition | | |



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| Sl. No. | Items / Requirements | Observed/ Measured | Remarks OK/ Not OK |
|---|---|---|---|
| 5.3. | **Power ON Tests** | | |
| 5.3.1. | Ensure that Loco ID has been registered in the KMS server and key are being received from the KMS server. | | |
| 5.3.2. | Power on the MCB switch to start the KAVACH system. | | |
| 5.3.3. | Ensure both the displays after booting up are showing the desktop screen before running KAVACH application. | | |
| 5.3.4. | Ensure after booting the KAVACH application screen is being shown and Check whether the time taken for the LP-OCIP display is getting updated within 2 minutes.<br>a) GPS stabilisation time to be noted. | | |
| 5.3.5. | Ensure the System Healthy LED present on the KAVACH display unit glows GREEN. | | |
| 5.3.6. | The status of EM Valve/EM Cock inputs shall reflect on KAVACH. | | |
| 5.3.7. | Ensure that the communication link with the display has been established and the previous communication fail message is replaced with the KAVACH default screen, after the KAVACH system Power ON.<br>Ensure the System healthy LED present on the LP-OCIP unit glows Green. | | |
| 5.3.8. | Ensure the power is received in the RFID reader at both the ends of the locomotive. | | |
| 5.3.9. | Swipe any known RFID tag under the reader and check whether the Tag ID is shown in the KAVACH display screen or Move the Loco over the RFID tags placed 10 meters apart under the reader and check whether the Tag ID is shown in the KAVACH display screen and Confirm both the tags IDs are read by RFID reader. | | |
| 5.3.10. | Confirm by swiping another tag with a different tag ID in the same manner. | | |
| 5.3.11. | Repeat the above two steps for the RFID reader at the other end of the locomotive and note whether the same are read properly. | | |
| 5.3.12. | Ensure the power is received to both the Radio units. By switching OFF power supply of each radio one after other by removing power supply connector from Radio MODEM. | | |
| 5.3.13. | Run the Loco to compare the speed shown in the LP-OCIP display screen with the speed shown CAB speedometer available in LOCO. Ensure both are showing the same speed. | | |
| 5.3.14. | Select Horn ON button on DMI INFO screen. Ensure Horn is being blown from KAVACH system. Ensure the KAVACH Horn Isolate handle is in service position. | | |

| Sl. No. | Items / Requirements | Observed/ Measured | Remarks OK/ Not OK |
|---|---|---|---|
| 5.3.15. | The isolation switch positions shall be named as "ISOLATION" and "SERVICE".( Labelling, metallic riveted labels shall be used). | | |

## 6. CAB Inputs Testing

| S.N | Item/Requirement | Observed/Measured | Remarks OK/Not Ok |
|---|---|---|---|
| 6.1. | The BL Key of CAB 1 is inserted and turned to ON position. The CAB 1 Active signal shall be high and the same shall be observed in operation of DMI. | (i) Check that DMI of cab-1 is active and command of configuration is active in Cab-1.<br>(ii) Configuration shall not be possible in Cab-2 DMI | |
| | The BL Key of CAB 2 is inserted and turned to ON position. The CAB 2 Active signal shall be high and the same shall be observed in operation of DMI | (i) Check that DMI of cab-2 is active and command of configuration is active in Cab-2.<br>(ii) Configuration shall not be possible in Cab-1 DMI | |

## 7. Counter testing

| S. No | Counter description | Initial count | Final count | Result (OK/Not OK) |
|---|---|---|---|---|
| 1. | Initial count of the SOS counter | | --- | |
| (i) | Generate the SOS from the DMI and check counter reading has increased by one number. | --- | | |
| 2. | Initial count of the TRIP/Override counter | | --- | |
| (i) | After carrying out SPAD prevention and check that onboard TRIPPED after emergency brake applied and counter has incremented by one number. | --- | | |
| (ii) | After carrying out Override and check that onboard override selected and counter has incremented by one number. | | | |
| 3. | Initial count of the ISOLATION counter. | | --- | |
| (i) | Isolate the System and check that counter has incremented by one number. | --- | | |

## 8. Availability of MR/BP/BC1/BC2 Pressure Transducers as per the Standard Interfacing Scheme.

**RDSO interface drawing No……**

| S. No | Counter description | Condition. | Result (OK/Not OK) |
|---|---|---|---|

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| | | | |
|---|---|---|---|
| **1.** | Ensure the provision of MR/BP/BC1/BC2 transducers as per the standard interfacing scheme for the rolling stock as per RDSO approved interfacing drawings wherever applicable. | a. Check for proper installation MR Pressure Transducer. | |
| | | b. Check for proper installation BP Pressure Transducer. | |
| | | c. Check for proper installation BC1 Pressure Transducer. | |
| | | d. Check for proper installation BC2 Pressure Transducer. | |

## 9. Conformity of Brake Blocks for Electric Locomotives as per Loco maintenance manual

| S. No | Counter description | Action from shed | Result (OK/Not OK) |
|---|---|---|---|
| 1. | The braking performance of KAVACH system depends on the integrity of KAVACH system with Brake system of Locomotive and the quality of brake blocks. The quality of brake blocks shall be in conformity with RDSO Specification no. RDSO/M&C/MTD/ 101/2007. | To be checked if it is part of loco maintenance schedule or not. | |

## 10. Miscellaneous Items to be procured from RDSO/CLW approved Sources

| S. No | Name of the Item | Make Supplied by OEM | Make as per RDSO/CLW approved list (Yes/No) | Result (OK/Not OK) |
|---|---|---|---|---|
| 1. | Control Cables as per RDSO/CLW/Other co-ordinating agencies approved | | | |
| 2. | Control cable as per RDSO/CLW/Other co-ordinating agencies approved | | | |
| 3. | Pulse generator shall be governed by CLW approved sources or shall be inspected by RDSO/MP for diesel Locos and RDSO/EL for other Locos. | | | |
| 4. | Pneumatic Fittings | | | |
| 5. | Copper Pipe | | | |
| 6. | MS Pipe | | | |
| 7. | SS Pipe | | | |
| 8. | Isolation Cocks (Other than cocks supplied as part of BIU of IRAB, EM cocks as a part of E-70 and SIFA cock as part of CCB) | | | |
| 9. | Cable Ties | | | |
| 10. | Magnet Valves | | | |
| | | | | |



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|---|---|---|---|---|
| 11. | All the internal wiring shall be governed by RDSO/CLW/Other co-ordinating agencies approved | | | |

## 11. Onboard KAVACH Configurable Parameters

The following configuration parameter shall be verified during pre-commissioning in configuration tool and in DMI.

| **S. No** | Parameter | Description | Default | Min | Max | Units | Configured Value | Remarks OK /Not OK |
|---|---|---|---|---|---|---|---|---|
| 1.1. | SOURCE Loco _VERSION | Executive software version field | 2 | 1 | 7 | Number | | |
| 1.2. | Locomotive /Self Propelled Unit ID | Locomotive or self Propelled Unit Unique ID | LD1 | 0 | 999999 | Number | | |
| 1.3. | Loco/Self Propelled Unit Max Speed | Max Speed of Locomotive or self propelled Unit | LD | 0 | 510 | kmph | | |
| 1.4. | Loco/Self Propelled Unit Wheel Dia(D1) | Wheel diameter in mm | LD | 640 | 1220 | mm | | |
| 1.5. | Loco /Self Propelled Unit Wheel Dia.(D2) | Wheel diameter in mm | LD | 640 | 1220 | mm | | |
| 1.6. | RFID Reader -1 OFFSET in front | | 3 | 0 | 20 | Meter | | |
| 1.7. | RFID Reader -1 OFFSET in REAR | | 3 | 0 | 20 | Meter | | |
| 1.8. | RFID Reader -2 OFFSET in FRONT | | 3 | 0 | 20 | Meter | | |
| 1.9. | RFID Reader -2 OFFSET in REAR | | 3 | 0 | 20 | Meter | | |
| 1.10. | Location Accuracy of RFID Tag | This is difference between the location read from the Tag & its actual location | 5 | 2 | 10 | meter | | |



1 LD means Locomotive or self-Propelled unit dependent

| **S. No** | Parameter | Description | Default | Min | Max | Units | Configured Value | Remarks OK /Not OK |
|---|---|---|---|---|---|---|---|---|
| 1.11. | L_DOUBTOVER in reading | odometer error | 5 | 2 | 10 | % | | |
| 1.12. | L_DOUBTUNDER in reading | odometer error | 5 | 2 | 10 | % | | |
| 1.13. | Loco/Self Propelled Unit Max Acceleration | Max Acceleration of Loco or Self Propelled Unit | LD | 0.1 | 2.0 | $m/s^2$ | | |
| **2.** | **Speed sensor 1** | | | | | | | |
| 2.1. | Tacho Pulses/Rev | Tacho output pulses per Revolution | LD | 30 | 700 | Number | | |
| 2.2. | Tacho type in num | Single pulse(0),Quadrature out(1), Redundant Quad output(2) | LD | 0 | 3 | Number | | |
| 2.3. | Tacho Mounting Dir | Left side(0)/ Right side(1) mount wrt CAB1/ Short Hood cab(Based on this Onboard KAVACH may complement Feedback Direction) | LD | 0 | 1 | Number | | |
| **3.** | **Speed sensor 2** | | | | | | | |
| 3.1. | Tacho Pulses/Rev | Tacho output pulses per Revolution | LD | 30 | 700 | Number | | |
| 3.2. | Tacho type | Single pulse(0),Quadrature out(1), Redundant Quad output(2) | LD | 0 | 2 | Number | | |
| 3.3. | Tacho Mounting Dir | Left side(0)/ Right side(1) mount wrt CAB1/ Short Hood cab(Based on | LD | 0 | 1 | Number | | |

| S. No | Parameter | Description | Default | Min | Max | Units | Configured Value | Remarks OK /Not OK |
|---|---|---|---|---|---|---|---|---|
| | | this Onboard KAVACH may complement Feedback Direction) | | | | | | |
| 3.4. | Loco/Self Propelled Unit Max Acceleration | Max Acceleration of Loco or Self Propelled Unit | LD | 0.1 | 2.0 | $m/s^2$ | | |
| 3.5. | **Speed margin** | | | | | | | |
| 3.6. | Speed Margin – Warning | Speed beyond permitted speed after which warning is to be displayed on DMI | 2 | 0 | 10 | kmph | | |
| 3.7. | Speed Margin – NB | Speed beyond permitted speed after which NSB to be applied | 5 | 5 | 10 | kmph | | |
| 3.8. | Speed Margin – FSB | Speed beyond permitted speed after which FSB to be applied | 8 | 5 | 10 | kmph | | |
| 3.9. | Speed Margin – EB | Speed beyond permitted speed after which EB to be applied | 10 | 5 | 15 | kmph | | |
| **4.** | **Restricted Speed** | | | | | | | |
| | | | | | | | | |
| 4.1. | Release speed Limit | Release speed Limit in approach of EOA for LE | 0 | 0 | 30 | kmph | | |
| | | Release speed Limit in approach of | 10 | 0 | 30 | Kmph | | |



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|---|---|
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| **S. No** | Parameter | Description | Default | Min | Max | Units | Configured Value | Remarks OK /Not OK |
|---|---|---|---|---|---|---|---|---|
| | | EOA for other formation | | | | | | |
| 4.2. | SOS speed Limit | SOS Speed limit | 30 | 5 | 60 | kmph | | |
| 4.3. | SOS stop speed | Speed to maintain while reaching SOS originated loco | 0 | 0 | 30 | kmph | | |
| 4.4. | Reverse mode Speed | RV mode speed limit | 25 | 15 | 60 | kmph | | |
| 4.5. | Shunt Speed | SH mode speed Limit | 15 | 5 | 50 | kmph | | |
| 4.6. | Wheel Sensor direction discrimination speed | Wheel Sensor direction discrimination speed | 5 | 1 | 10 | kmph | | |
| 4.7. | Brake intervention withdrawal speed limit | When target speed is non Zero, the brake command is released when actual speed is within this limit above permitted speed | 5 | 2 | 10 | kmph | | |
| 4.8. | Slipping acceleration Limit | Slipping acceleration Limit | LD | 0.5 | 2.5 | $m/s^2$ | | |
| 4.9. | Slipping Percentage | Slipping Percentage | 5% | 2% | 10% | % | | |
| 4.10. | Slip Limit 1 | To detect slip in Kmph (PG1) | 4 | 2 | 10 | kmph | | |
| 4.11. | Slip Limit 2 | To detect slip in Kmph (PG2) | 4 | 2 | 10 | kmph | | |
| 4.12. | Skid Limit 1 | To detect skid in Kmph (PG1) | 6 | 2 | 10 | kmph | | |
| 4.13. | Skid Limit 2 | To detect skid in Kmph (PG2) | 6 | 2 | 10 | kmph | | |
| **5.** | **Warning Time margin in second** | | | | | | | |



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| Signature of firm Representative with Name, Designation & Date. | Signature of SSE Loco Shed/SSE EMU Shed with Name, Designation & Date |

| **S. No** | Parameter | Description | Default | Min | Max | Units | Configured Value | Remarks OK /Not OK |
|---|---|---|---|---|---|---|---|---|
| 5.1. | Warning indication before KAVACH brake intervention | Warning indication before KAVACH brake intervention | 2 | 0 | 20 | second | | |
| 5.2. | Loco Pilot time margin in second | After warning indication, the LP reaction time margin before KAVACH brake intervention | 04 | 0 | 30 | second | | |
| **6.** | **Time Out** | | | | | | | |
| 6.1. | Traction Cut off Time | The time delay between command to Traction cutoff | LD | 0 | 30 | second | | |
| 6.2. | SoS Timeout | SoS clears after this time if SoS source not transmitting SoS | 180 | 30 | 300 | second | | |
| 6.3. | Reverse mode Timeout | Reverse mode will be exited after this time out. | 600 | 60 | 900 | second | | |
| 6.4. | Override Time out | Override mode will be exited afer this time out | 120 | 60 | 600 | second | | |
| 6.5. | Onsight MA expiry timeout | Onsight movement authority expires, if communication is not available for this time in communication mandatory zone. | 240 | 30 | 600 | second | | |



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| **S. No** | Parameter | Description | Default | Min | Max | Units | Configured Value | Remarks OK /Not OK |
|---|---|---|---|---|---|---|---|---|
| 6.6. | Communication time out – Absolute Block Section | The time up to which the loco shall remain in Full Supervision Mode when valid Radio packets are not received. | 30 | 6 | 120 | second | | |
| 6.7. | Communication time out – Automatic Section | The time up to which the loco shall remain in Full Supervision Mode when valid Radio packets are not received. | 10 | 6 | 120 | second | | |
| 6.8. | Random number time out | Resetting the secured communication after communication failure | 30 | 6 | 120 | second | | |
| 6.9. | Block stop announce time out | Tme allowed for generating block stop SoS (Acknowledgement time for LP) | 15 | 0 | 60 | second | | |
| 6.10. | Time out for Signal display | Time out to display description display of signal aspect after previous signal foot tag/location crossed | 8 | 2 | 20 | second | | |
| 6.11. | Slip Skid Time out | To detect slip/skid time out | 90 | 10 | 180 | second | | |
| 6.12. | Acknowledgement Time out for SR mode transition | Time out for SR mode transition | 7 | 5 | 30 | second | | |



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| **S. No** | Parameter | Description | Default | Min | Max | Units | Configured Value | Remarks OK /Not OK |
|---|---|---|---|---|---|---|---|---|
| | | when train move KAVACH area to Non KAVACH area. | | | | | | |
| 6.13. | Time out for display of multi DMI messages | First and second targets (for Head ON/Rear End Collision, Turnout PSR. TSRLC Gate Approach | 2 | 1 | 10 | second | | |
| 6.14. | GPS/GNSS failure and Real Time Clock (RTC) | Post GPS/GNSS failure the time out Real Time Clock (RTC) | 30 | 10 | 60 | Minute | | |
| 6.15. | Request for KMS periodicity | Request for Key Management System (Not having any key) | 5 | 1 | 30 | Minute | | |
| 6.16. | Request for KMS Key set validity check | Request for KMS (having any key) | 30 | 1 | 30 | Minute | | |
| 6.17. | Randomized request mod value for Key | Randomized request mode value for Key | 120 | 30 | 240 | Minute | | |
| **7.** | **Reaction Time** | | | | | | | |
| 7.1. | LP Reaction time | Loco pilot Time margin before KAVACH Intervention during mode change or unusual stop SoS in block section. | 7 | 4 | 30 | second | | |
| **8.** | **Margin Distance** | | | | | | | |
| 8.1. | Overlap Distance | Overlap in addition to MA | 80 | 500 | 400 | meter | | |

| **S. No** | Parameter | Description | Default | Min | Max | Units | Configured Value | Remarks OK /Not OK |
|---|---|---|---|---|---|---|---|---|
| | | control (overlap through the application of EB) | | | | | | |
| 8.2. | Collision Margin Distance | For Rear End Collisions | 300/120 m for EMUs | 100 | 500 | meter | | |
| | | For Head On collision | 3000 | 300 | 5000 | meter | | |
| 8.3. | SOS Trig Distance | Distance for Acceptance of SOS from Station or other Loco | 3000 | 500 | 6000 | meter | | |
| 8.4. | SOS Cancellation Distance | Distance for Clear of SOS from Station or other Loco | 1500 | 500 | 5000 | meter | | |
| 8.5. | SOS Hold distance | Distance to clear SOS from the point of occurrence | 1500 | 0 | 3000 | meter | | |
| 8.6. | Roll away or Roll Back Trigger Distance | Roll away or Roll Back Trigger Distance | 5 | 5 | 30 | meter | | |
| 8.7. | Override Permit Distance | Override Permitted only when MA is Less than this limit | 200 | 50 | 500 | meter | | |
| 8.8. | Unusual Stoppage Bypass MA Limit | SoS will not generate even if train stops in block section, If MA is less than this Distance limit | 300 | 100 | 1000 | meter | | |
| 8.9. | Signal foot Tag miss distance | Distance to declare signal foot crossed in | 30 | 10 | 100 | meter | | |

| **S. No** | Parameter | Description | Default | Min | Max | Units | Configured Value | Remarks OK /Not OK |
|---|---|---|---|---|---|---|---|---|
| | | case of tag missed | | | | | | |
| 8.10. | Normal Tag Miss distance | Maximum Tolerance distance allowed for declaring Normal tag miss | 50 | 10 | 100 | meter | | |
| 8.11. | Distance for Signal description display | Distance for display of signal aspect after previous signal foot tag/location crossed | 50 | 10 | 200 | meter | | |
| 8.12. | Signal Name update | Distance to update signal name after passing Signal | 50 | 10 | 200 | meter | | |
| 8.13. | Trip Margin Distance in mts | Distance to enter to TRIP mode after the End of MA | 30 | 0 | 100 | meter | | |
| 8.14. | LC Horn Enable Dist | Distance at which Horn to be enable at LC gate | 600 | 0 | 1000 | meter | | |
| 8.15. | Grad Scan Distance | Distance upto which gradient is to be scanned | 3000 | 1000 | 10000 | meter | | |
| 8.16. | PSR Scan Distance | Distance upto which PSR to be scanned | 3000 | 1000 | 10000 | meter | | |
| 8.17. | Min Track Profile required distance | Minimum Track Profile distance required to go to LS/SR mode | 3000 | 1000 | 10000 | meter | | |
| 8.18. | RV mode distance margin | RV mode distance to move the Train | 500 | 100 | 1000 | meter | | |

| S. No | Parameter | Description | Default | Min | Max | Units | Configured Value | Remarks OK /Not OK |
|---|---|---|---|---|---|---|---|---|
| | | in reverse direction | | | | | | |
| **9.** | **Others** | | | | | | | |
| 9.1. | Signal linking in OS mode | Target distance for availing Signal info e.g. Signal aspect , marker , description in OS mode | 200 | 50 | 300 | meter | | |
| 9.2. | Missed Valid Radio Packet | For Mode transition from FS to LS/SR or OS/OV to SR in Absolute Block | 14 | 5 | 30 | cycle | | |
| 9.3. | Missed Valid Radio Packet | For Mode transition from FS to LS/SR or OS/OV to SR in Automatic Block | 5 | 1 | 30 | cycle | | |
| 9.4. | Missed Valid Radio Packet | For Mode transition from FS to LS/SR or OS/OV to SR in Virtual Block | 5 | 1 | 30 | Cycle | | |
| 9.5. | Reverse movement trigger distance | Cab input and wheel sensor direction discrimination distance | 2 | 2 | 10 | meter | | |
| **10.** | **Periodicity of Packet Transmission** | | | | | | | |
| 10.1. | Radio packet transmission | Onboard-to-Stationary Radio Packet in Non-Leading mode | 120 | 30 | 240 | second | | |
| 10.2. | Radio packet transmission | Onboard-to-Stationary Radio Packet in Isolation mode | 120 | 30 | 240 | second | | |

| **S. No** | Parameter | Description | Default | Min | Max | Units | Configured Value | Remarks OK /Not OK |
|---|---|---|---|---|---|---|---|---|
| 10.3. | Threshold to update Train length after TLM (Train Length Measurement) | | 25 | 10 | 100 | meter | | |
| **11.** | **LC Gate Auto Whistling** | | | | | | | |
| 11.1. | LC Horn ON Time | Horn on time for whistling at LC gate | 2 | 0 | 10 | second | | |
| 11.2. | LC Horn OFF Time | Horn OFF time for whistling at LC gate | 3 | 0 | 10 | second | | |
| **12.** | **UHF Radio modem configuration** | | | | | | | |
| 12.1. | Power | Radio Transmission Power | 10 | 1 | 20 | watt | | |
| 12.2. | Frequency Resolution | --- | KHz | Hz | MHz | Hz | | |
| 12.2.1. | Base Frequency | Base Frequency | 406 | 100 | 999 | MHz | | |
| 12.2.2. | f0 freq | Centre frequency Tx & Rx | 427.625 | 100 | 999 | MHz | | |
| 12.2.3. | Channel Bandwidth | Trans frequency Channel Bandwidth | 25 | 25 | 100 | KHz | | |
| 12.2.4. | Channel switching time | Transmitter Turn-on time (Tx. Freq. stable)/ Channel Switching time | 3 | 1 | 15 | Milli sec | | |
| **13.** | **Time slot Management** | | | | | | | |
| 13.1. | Frame cycle | | 2 | 0.5 | 2 | second | | |
| 13.2. | Number of slots in centre Frequency | Slot required for Access request packet and additional emergency packet | 16 | 1 | 100 | Number | | |



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| **S. No** | Parameter | Description | Default | Min | Max | Units | Configured Value | Remarks OK /Not OK |
|---|---|---|---|---|---|---|---|---|
| 13.3. | Time slot for access request packet | 12 time slot are catered | P47,P48, P49, P50, P51, P52, P59, P60, P61, P62, P63 and P64 | P47 | P70 | --- | | |
| 13.4. | Time slot for additional emergency Pacekt | 4 time slot to cater | P53, P54, P65 ,P66 | P47 | P70 | | | |
| 13.5. | Time slot width | Time slot width | 22.5 | 15 | 40 | millisecond | | |
| 13.6. | Time slot spacing | Spacing between the time slot | 5 | 5 | 20 | millisecond | | |
| 13.7. | Time slot for station to Loco | Time slot for station to Loco | P2 to P45 | P2 | P45 | | | |
| 13.8. | Start time of P2 | Start time of P2 slot in radio transmission | 45 | 45 | 100 | millisecond | | |
| 13.9. | Start time of P47 | Start time of P2 slot in radio transmission | 1320 | 1200 | 1400 | millisecond | | |
| **14.** | **GSM Configuration** | | | | | | | |
| 14.1. | GSM 1 APN Name | Address to which GPRS packet to be sent | https://202.21.40.15 | | | | | |
| 14.2. | GSM 2 APN Name | | Shed can give their one public IP address. | | | | | |
| **15.** | **IP Address** | | | | | | | |
| 15.1. | 1st octet IP Address NMS | | 127 | 1 | 255 | Number | | |
| 15.2. | 2nd octet IP Address NMS | | 168 | 1 | 255 | Number | | |
| 15.3. | Port-1 of NMS | | 60901 | 1 | 65535 | Num | | |
| 15.4. | Port-2 of NMS | | 60902 | 1 | 65535 | Num | | |



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| S. No | Parameter | Description | Default | Min | Max | Units | Configured Value | Remarks OK /Not OK |
|---|---|---|---|---|---|---|---|---|
| 15.5. | 1st octet IP Address KMS | | 127 | 1 | 255 | Number | | |
| 15.6. | 2nd octet IP Address KMS | | 168 | 1 | 255 | Number | | |
| 15.7. | Port-1 of KMS | | 60901 | 1 | 65535 | Num | | |
| 15.8. | 1st octet of IP address (Station KAVACH) | | 127 | 1 | 255 | Number | | |
| 15.9. | 2nd octet of IP address (Station KAVACH) | | 168 | 1 | 255 | Number | | |
| 15.10. | Port-1 of stationary KAVACH | | 60901 | 1 | 65535 | Num | | |
| 15.11. | Port-2 of stationary KAVACH | | 60902 | 1 | 65535 | Num | | |
| **16.** | **LP OCIP** | | | | | | | |
| 16.1. | Min press time for button | Min time required for button to be pressed | 500 | 100 | 10000 | Milli second | | |
| 16.2. | Max press time for button | Max time required for button to be pressed | 6000 | 100 | 10000 | Milli second | | |
| **17.** | **RFID Missed Tag** | | | | | | | |
| 17.1. | Max consecutive miss count | Max consecutive miss count | 3 | 1 | 10 | No | | |
| 17.2. | Onboard KAVACH for transmitting Health bits to Stationary KAVACH | Logical ID shall be configurable as per Annexure-G | | | | Logical ID | | |
| 17.3. | Fault Code | Fault code shall be configurable as per Annexure-G | | | | Vendor specific | | |

**Note:** The braking interface unit functionality shall be tested as per attached Annexure A1, A2 & A3.



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सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

# Pre-Commissioning Checklist for IRAB Brake interface Unit of M/s Firm's Name

## ANNEXURE-A1

**(Part of Pre-Commissioning Checklist for Onboard KAVACH (Diesel/Electrical) as per specification RDSO/SPN/196/2020 version 4.0)**

Issued by


SIGNAL AND TELECOM DIRECTORATE
RESEARCH DESIGNS & STANDARDS ORGANISATION
MINISTRY OF RAILWAYS
MANAK NAGAR
LUCKNOW – 226 011




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## Revision History

| SN. | Issue | Version | Reason of Amendment |
|---|---|---|---|
| 1 | First | 1.0 | First Issue |
| 2 | | | |
| | | | |



| Prepared by: | Approved by: |
|---|---|
| JE/SSE/S&T<br>ADE/S&T/RDSO<br>Dir/Sig-IV/RDSO<br>ED/Tele-II/RDSO | PED/ S&T/RDSO |

## 1. Objectives of the tests

1.1. **BIU shall not interfere with the Loco braking system**.:- Loco pilot's braking operations shall be effective using "A9" and "SA9" levers, when BIU is kept in isolation as well as in service condition. Brake application and release time should not change in both cases i.e. BIU is kept in isolation or in service condition.

1.2. **Loco pilot shall be able to override the brakes applied by BIU:-** Loco pilot shall be able to override the brakes applied by KAVACH by applying higher brake pressure for train formation braking by controlling the "A9" lever as well as for light engine braking by controlling the "SA9" lever.

1.3. **BIU shall be able to override brakes applied by Loco Pilot** :- Whenever required, the BIU shall be able to override the loco-pilot applied brakes during train formation ("A9" control) or in case of light engine, ("SA9" control) by applying higher brake pressure.

**Note**:

(i) The tests mentioned below shall be performed when Main reservoir pressure in loco is 8 to 10 kg/cm$^2$.

(ii) All braking operation on BIU shall be performed by selecting the "BRAKE" option in the menu of pre-commissioning tests.

## 2. General Information

BIU Control Unit Serial .No :_____

BIU Pneumatic Panel Serial .No :_____

Loco Number :_____

Loco Type :_____

Date of Installation :_____

Date of Commissioning :_____

## 3. Visual Inspection

| S.No | Items/Requirements | Observed/ measured | Remarks OK/Not OK |
|---|---|---|---|
| 3.1. | Ensure that there are no loose wires hanging out from any of the modules. | | |
| 3.2. | Ensure that wires are marked for easy identification. | | |
| 3.3. | Ensure Pneumatic Connections of BIU Pneumatic Panel Ports are firmly interfaced with the IRAB Panel as per "*Piping diagram of Universal Brake Interface* | | |

## 4. Preliminary Check Points:

1.1. Keep BIU Power Supply Breaker in ON position.

1.2. Keep Isolate Switch in NORMAL position.

1.3. Keep MR_COC & EM_COC in CUT IN Position and BP_COC in CUT OUT position (applicable only locomotive with DPCS) which are available on Pneumatic Panel.

| S.No | Items/Requirements | Acceptance Criteria | Observed/ measured | Remarks OK/Not OK |
|---|---|---|---|---|
| 4.1. | Ensure MU2B switch is in LEAD position | | | |
| 4.2. | Ensure Main Reservoir Pressure of minimum 8 $Kg/Cm^2$ is available . | 8 to 10 $Kg/Cm^2$ | | |
| 4.3. | Place the SA9 handle & A9 handle in the RELEASE position. | BP: 5 ± 0.1 $Kg/Cm^2$. BC: 0 ± 0.1 $Kg/Cm^2$. | **BP:** **BC:** | |

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| **S.No** | **Items/Requirements** | **Acceptance Criteria** | **Observed/ measured** | **Remarks** OK/Not OK |
|---|---|---|---|---|
| 4.4. | Move A9 handle to EMERGENCY position. | BP: 0 ± 0.1 Kg/ $Cm^2$<br>BC:1.8 ± 0.1 Kg/$Cm^2$ | **BP:**<br>**BC:** | |
| 4.5. | Move the SA9 handle to FULL SERVICE. position. | BP:0 ± 0.1 Kg/$Cm^2$.<br>BC:3.5±0.1 Kg/$Cm^2$ | **BP:**<br>**BC:** | |
| 4.6. | Place the SA9 handle & A9 handle in the RELEASE position. | BP:5 ± 0.1 Kg/$Cm^2$.<br>BC: 0 ± 0.1 Kg/$Cm^2$ | **BP:**<br>**BC:** | |
| 4.7. | Ensure availability of standard choke of 6mm in the exhaust port of Addl. C2 Relay valve as per RDSO SMI. No. ELRS/SMI/0197-2001, REV.'1'.<br>(If the size of choke is less than 6mm, it will effect brake application and release times) | Is this part of loco maintenance check list or not? | | |

**5. Brake Application Checking through ONBOARD KAVACH:**

| **S.No** | **Items/Requirements** | **Acceptance Criteria** | **Observed/ measured** | **Remarks** OK/Not OK |
|---|---|---|---|---|
| 5.1. | Keep LEADING / NON LEADING knob switch on the LP-OCIP unit with the knob pointing to NON LEADING in both the LP-OCIP units. | No brake shall be carried out. | | |
| 5.2. | Now Keep LEADING / NON LEADING knob switch on the LP-OCIP unit with the knob pointing to LEADING in both the LP-OCIP units. | "Brakes Testing Success" is to be displayed on LP-OCIP. | | |
| 5.3. | Now ONBOARD KAVACH unit will undergo Self-Test and gives NSB, | Cab1 or driving position-1 | | |



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| | FSB and EB commands one after the other | Cab 2 or driving position-2 | | |

6. **BIU ISOLATE Mode Checking:** Place BIU Isolate switch in ISOLATE position.

| **S.No** | **Items/Requirements** | **Acceptance Criteria** | **Observed/ measured** | **Remarks** OK/Not OK |
|---|---|---|---|---|
| 6.1. | Keep LEADING / NON LEADING knob switch on the LP-OCIP unit with the knob pointing to NONLEADING in both the LP-OCIP units. | No brake shall be carried out. | | |
| 6.2. | Now Keep LEADING / NON LEADING knob switch on the LP-OCIP unit with the knob pointing to LEADING in both the LP-OCIP units. | "**BIU Isolated**" is to be displayed on LP-OCIP | | |
| 6.3. | Now place BIU Isolate switch in "SERVICE" position. ONBOARD KAVACH unit will undergo Self-Test and gives NSB, FSB and EB commands one after the other. | Brake testing success is to be displayed on LP-OCIP | | |

**7. Emergency Brake Application Checking:**

| **S.No** | **Items/Requirements** | **Acceptance Criteria** | **Observed/ measured** | **Remarks** OK/Not OK |
|---|---|---|---|---|
| 7.1. | Switch OFF BIU Power Supply | Emergency Brakes should get apply | | |
| 7.2. | Switch ON BIU Power Supply. | Emergency Brakes should get release | | |

**8. Overriding of brake pressure by loco Pilot over ONBOARD KAVACH applied brakes**

Keep BIU in service mode using the switch on BIU.



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| **S.No** | **Items/Requirements** | **Acceptance Criteria** | **Observed/ measured** | **Remarks** OK/Not OK |
|---|---|---|---|---|
| 8.1. | No application of brake by Loco pilot. | BP should remain intact. | | |
| 8.2. | No application of brake by KAVACH. | BP should remain intact. | | |
| 8.3. | Apply Normal brake operation through KAVACH. | BP should drop to approx 4.2 Kg/cm$^2$. | | |
| 8.4. | Apply FSB using "A9" control on loco. After the tests, release brake applied through "A9". | BP should drop to approx 3.5 Kg/cm$^2$ | | |
| 8.5. | Apply Full service brake through KAVACH. | BP should drop to approx 3.5 Kg/cm$^2$ | | |
| 8.6. | Apply EB using "A9" control on loco. | BP should drop to 0 Kg/cm$^2$ | | |
| 8.7. | Now Release all the brake | BP: 5 ± 0.1Kg/Cm$^2$<br>BC: 0Kg/Cm$^2$ | | |
| 8.8. | Verify over riding of ONBOARD KAVACH brakes using SA9 control as follows: | | | |
| 8.8.1. | Select BIU LE operation and enable brake operation NB. | BP should drop to approx 4.2 Kg/cm$^2$ and BC should show approx. 1.0 Kg/cm$^2$. | | |
| 8.8.2. | Apply FSB through BIU in LE Mode. | BC should be 2.0 Kg/cm$^2$. | | |
| 8.8.3. | Apply maximum brake using SA9 control | BC should show approx. 3.5 Kg/cm$^2$ | | |

9. **Testing of BIU for over-riding the brake pressure selected by Loco Pilot.**

| **S.No** | **Items/Requirements** | **Acceptance Criteria** | **Observed/ measured** | **Remarks** OK/Not OK |
|---|---|---|---|---|
| 9.1. | **For loco pilot's Control through A9** (NB by Loco pilot and FSB by KAVACH) | | | |
| 9.1.1. | Position A9 lever to create minimum reduction of BP pressure. | (a) BP should drop to approx 4.5 Kg/cm$^2$<br>(b) BC should show approx. 0.5 to 1.1 Kg/cm$^2$. | | |
| 9.1.2. | Operate KAVACH for Full Service braking | (a) BP should drop to approx 3.5 Kg/cm$^2$<br>(b) BC should show | | |

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| S.No | Items/Requirements | Acceptance Criteria | Observed/ measured | Remarks OK/Not OK |
|---|---|---|---|---|
| | | approx. 1.8 Kg/cm² | | |
| 9.2. | **For loco pilot's Control through A9 (**FSB by Loco pilot and EB by KAVACH**)** | | | |
| 9.2.1. | Position A9 lever to create minimum reduction of BP pressure. | (a) BP should drop to approx 3.5 Kg/cm²<br>(c) BC should show approx. 1.8 Kg/cm². | | |
| 9.2.2. | Operate KAVACH for Emergency braking | (d) BP should drop to approx 0 Kg/cm²<br>(e) BC should show approx. 1.8 Kg/cm² | | |
| 9.3. | **For loco pilot's Control through A9 (**Release of all brake by Loco pilot and KAVACH | | | |
| 9.3.1. | Now Release all the brake | BP: 5 ± 0.1Kg/Cm²<br>BC: 0Kg/Cm² | | |
| 9.4. | **For loco pilot's Control through SA9** | | | |
| 9.4.1. | Apply 2.0 Kg/cm² Brake through SA9 lever. | (a) BC should show approx. 2.0 Kg/cm² & B.P is 5.0 Kg/cm². | | |
| 9.4.2. | Apply EB through BIU in LE Mode. | (b) BP should be 0 Kg/cm² and B.C should be approx. 3.0 Kg/cm² | | |

## 10. Brake Application and Release Timings

| S.No | Items/Requirements | Acceptance Criteria | Observed/measured Cab-1 | Cab-2 | Remarks OK/Not OK |
|---|---|---|---|---|---|
| 10.1. | Auto Brake Application and Release Timings (through A9) with BIU in Isolation. These test are to be conducted to check that Loco braking is not affected when BIU is isolated. | | | | |
| 10.1.1. | Time to build up BC pressure upto 1.7 kg/cm² when auto brake valve in "Full Service" | | | | |
| (a) | with C3W valve in "Passenger" position | 7 to 10 sec | | | |
| (b) | With C3W valve in "Goods" position | 15 to 25 sec | | | |
| 10.1.2. | Time for BC pressure to drop from maximum to 0.4kg/cm² Once auto brake valve in "run" position. | | | | |
| (a) | With C3W valve in "Passenger" position | 10 to 15 sec | | | |

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| S.No | Items/Requirements | Acceptance Criteria | Observed/measured Cab-1 | Cab-2 | Remarks OK/Not OK |
|---|---|---|---|---|---|
| (b) | With C3W valve in "Goods" position | 25 to 40 sec | | | |
| 10.2. | Auto Brake Application and Release Timings through A9 with BIU in Service. (These tests are to be conducted to check that brake application is not affected when BIU in service). | | | | |
| 10.2.1. | Time to build up BC pressure upto 1.7kg/cm$^2$ when auto brake valve in "Full Service" | | | | |
| (a) | With C3W valve in "Passenger" position | 7 to 10 sec | | | |
| (b) | With C3W valve in "Goods" position | 15 to 25 sec | | | |
| 10.2.2. | Time for BC pressure to drop from maximum to 0.4kg/cm$^2$ once auto brake valve in "run" position. | | | | |
| (a) | with C3W valve in "Passenger" position | 10 to 15 sec | | | |
| (b) | with C3W valve in "Goods" position | 25 to 40 sec | | | |
| 10.2.3. | Brake Application and Release Timings through KAVACH Commands (A9 Interface) with BIU in Service. | | | | |
| 10.3. | Brake Application and Release Timings through KAVACH Commands (A9 Interface) with BIU in Service. These tests are conducted to see that BIU performance is inline with timing requirements specified. | | | | |
| 10.3.1. | Apply BIU Full service brake operation. Time to build up BC pressure upto 1.7kg/cm$^2$ | | | | |
| (a) | With C3W valve in "Passenger" position | 7 to 10 sec | | | |
| (b) | With C3W valve in "Goods" position | 15 to 25 sec | | | |
| 10.3.2. | Release BIU Full service brake operation. Time for BC pressure to drop from maximum to 0.4kg/cm$^2$ | | | | |
| (a) | With C3W valve in "Passenger" position | 10 to 15 sec | | | |
| (b) | With C3W valve in "Goods" position | 25 to 40 sec | | | |
| 10.4. | Independent Brake Application and Release Timings (through SA9) with BIU in Isolation. | | | | |



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| S.No | Items/Requirements | Acceptance Criteria | Observed/measured Cab-1 | Cab-2 | Remarks OK/Not OK |
|---|---|---|---|---|---|
| 10.4.1. | Apply Independent Brake Valve in Full. Record Brake Cylinder Charging Time for 95% BC pressure build up | 4-8sec | | | |
| 10.4.2. | Release Independent Brake & record BC release time to fall BC pressure up to 0.4 kg/cm$^2$ | 8-12 sec | | | |
| 10.5. | Independent Brake Application and Release Timings (through SA9) with BIU in Service. | | | | |
| 10.5.1. | Apply Independent Brake Valve in Full. Record Brake Cylinder Charging Time for 95% BC pressure build up | 4-8sec | | | |
| 10.5.2. | Release Independent Brake & record BC release time to fall BC pressure up to 0.4 kg/cm$^2$ | 8-12 sec | | | |
| 10.6. | Brake Application and Release Timings through KAVACH Commands (LE Interface) with BIU in Service. | | | | |
| 10.7. | Apply Independent Brake Valve in Full. Record Brake Cylinder Charging Time for 95% BC pressure build up | 4-8sec | | | |
| 10.8. | Release Independent Brake & record BC release time to fall BC pressure up to 0.4 kg/cm$^2$ | 8-12 sec | | | |

**Note:** The brake application and release timing has been taken from reference document of RDSO/2012/EL/TC/0116 dt:01.10.2012 , TC-113 Rev.'0' dt: 29.03.2012 & MP-MI-138/88.



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सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

# Pre-Commissioning Checklist for Brake interface Unit (E-70 Brake System) of M/s Firm's Name

**(Annexure-A2)**

**(Part of Pre-Commissioning Checklist for Onboard KAVACH (Diesel/Electrical) as per specification RDSO/SPN/196/2020 version 4.0)**

Issued by


SIGNAL AND TELECOM DIRECTORATE
RESEARCH, DESIGNS & STANDARDS ORGANISATION
MINISTRY OF RAILWAYS
MANAK NAGAR
LUCKNOW – 226 011




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## Revision History

| SN. | Issue | Version | Reason of Amendment |
|---|---|---|---|
| 1 | First | 0 | First Issue |
| 2 | | | |
| | | | |

| Prepared by: | Approved by: |
|---|---|
| JE/ SSE/S&T/RDSO<br>ADE/S&T/RDSO<br>Dir/Sig-IV/RDSO<br>ED/Tele-II/RDSO | PED/S&T/RDSO |



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## 1. Introduction

Interface unit and light engine (LE) module for E-70 Brake System is designed and developed to brake against digital signals coming from Onboard KAVACH unit. Braking actions will be initiated when the signals are received by Interface relay unit and light engine module for initiating braking through E-70 Brake System fitted on 3 Phase Electric Locomotives. This Pre Commissioning Check List is applicable to Onboard KAVACH 4.0 and any subsequent versions of KAVACH till it is revised.

## 2. Objectives of the tests

(i) **BIU shall not interfere with the loco braking system.:-** Loco pilot's braking operations shall be effective using DBC, when BIU is kept in isolation as well as in service condition. Brake application and release time should not change in both cases i.e. BIU is kept in isolation or in service condition.

(ii) **Loco pilot shall be able to override the brakes applied by BIU:-** Loco pilot shall be able to override the brakes applied by KAVACH by applying higher brake pressure for train formation braking by controlling DBC lever as well as for light engine braking by controlling the SA9 lever.

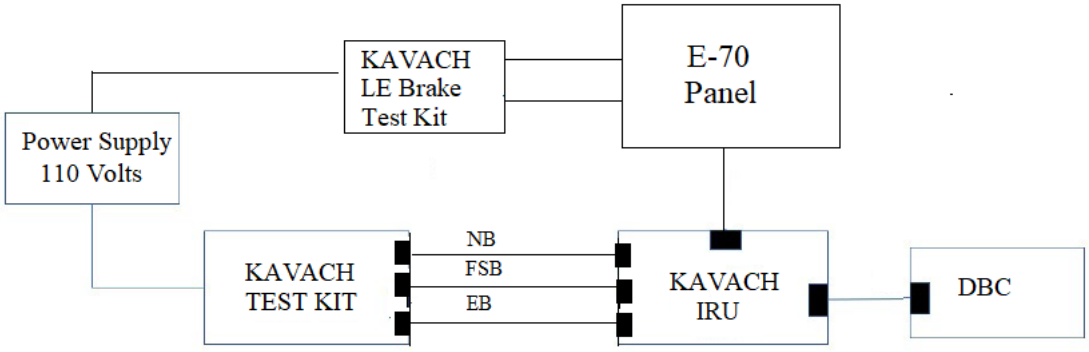
(iii)**BIU shall be able to override brakes applied by Loco Pilot** :- Whenever required, the BIU shall be able to override the loco-pilot applied brakes during train formation ("DBC" control) or in case of light engine, ("SA9" control) by applying higher brake pressure.

3. Test set up for generating NB, FSB, EB and LE in loco shed.

(i) The KAVACH test kit is to be sourced from FTRTIL and shall be used for testing NB, FSB and EB command.

(ii) KAVACH LE brake test kit sourced from KAVACH OEM and shall be used for LE Brake test.

(iii)The block diagram for connection is as:-



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## 4. General Information

Loco Number :_____

Loco Type :_____

Interface Relay Unit :_____& _____

Light Engine Braking Kit :_____

Date of Installation :_____

Date of Commissioning :_____

## 5. Visual Inspection

| S.No | Items/Requirements | Observed/ measured | | Remarks OK/Not OK |
|---|---|---|---|---|
| | | Cab-1 | Cab-2 | |
| 5.1. | Ensure that there are no loose wires hanging out from any of the modules. | | | |
| 5.2. | Ensure that wires are marked for easy identification. | | | |

## 6. Test Procedure for KAVACH IRU

(i) Power ON the system.

(ii) Check the DBC for its normal Operation by moving, its handle step by step from Run to Emergency

| S.No | Items/Requirements | Acceptance Criteria | Observed/ measured | | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| | | | Cab-1 | Cab-2 | |
| | Run | BP = 5.0± 0.1 kg/cm$^2$ | | | |
| | Initial | BP =4.60 ± 0.1 kg/cm$^2$ | | | |
| | Full-service | BP = 3.35 ± 0.15 kg/cm$^2$ | | | |
| | Emergency | BP= 0 kg/cm$^2$ | | | |
| | Keep the DBC handle in "RUN" position. | BP = 5.0 ± 0.1 kg/cm$^2$ | | | |



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## 7. KAVACH IRU - INITIAL (NB) SIGNAL TEST

(i) Keep the KAVACH switch on IRU in Normal Mode.

(ii) Keep the Initial brake (NB) signal (S4) ON condition from KAVACH test kit .

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Observed/ Measured Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 7.1. | KAVACH IRU Lamp status | NB BR SIGNAL LED is ON | | | |
| 7.2. | BP Pressure & BC Pressure | BP =4.6 ±0.1 kg/cm² BC=0.4 ±0.1 kg/cm² (For WAP-7 & WAG-9) BC=0.75 ±0.15 kg/cm² (For WAP-5) | | | |
| 7.3. | **Move the Driver Brake Controller (DBC) handle step by step** | | | | |
| **a)** | Run | BP= 4.60±0.1 kg/cm$^2$ | | | |
| **b)** | Initial | BP=4.60 ± 0.1 kg/cm$^2$ | | | |
| **c)** | Full-service | BP= 3.35 ± 0.15 kg/cm$^2$ | | | |
| **d)** | Emergency | BP ≤ 0.3 kg/cm$^2$ | | | |
| **e)** | Keep the DBC handle in "RUN" position. | BP = 4.6 ± 0.1 kg/cm$^2$ | | | |
| **f)** | To check over riding by SA9, operate SA9 to full and observe BC Pressure | BC = 3.5± 0.2 kg/cm$^2$ (For WAP-7 & WAG-9) BC = 5.15± 0.3 kg/cm$^2$ (For WAP-5) | | | |
| **g)** | Release SA9 and observe BC pressure | BC=0.4 ±0.1 kg/cm² (For WAP-7 & WAG-9) BC=0.75 ±0.15 kg/cm² (For WAP-5) | | | |
| 7.4. | **KAVACH IRU - INITIAL (NB) SIGNAL TEST: Keep the Initial brake signal S4 in OFF condition in KAVACH test kit** | | | | |
| **a)** | KAVACH IRU Lamp status | NB BR SIGNAL LED is OFF | | | |
| **b)** | BP Pressure<br><br>BC Pressure | BP=5.0± 0.1 kg/cm$^2$<br><br>BC=0kg/cm² | | | |
| 7.5. | **KAVACH IRU – FULL SERVICE BRAKE (FSB) SIGNAL TEST** | | | | |
| | Keep the KAVACH switch in Normal Mode<br>Keep the Full Service Brake signal S1 in On condition in KAVACH test kit | | | | |
| **a)** | KAVACH IRU Lamp status | SERVICE BR SIGNAL LED is ON | | | |
| **b)** | BP Pressure | BP = 3.35± 0.15 kg/cm$^2$ | | | |

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| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| | BC Pressure | BC=2.5 ±0.1kg/cm² (For WAP-7 & WAG-9) BC=5.15 ±0.3kg/cm² (For WAP-5) | | | |
| 7.6. | **Move the DBC handle step by step** | | | | |
| **a)** | Run | BP = 3.35± 0.15 kg/ cm$^2$ | | | |
| **b)** | Initial | BP = 3.35± 0.15 kg/ cm$^2$ | | | |
| **c)** | Full-service | BP = 3.35± 0.15kg/ cm$^2$ | | | |
| **d)** | Emergency | BP = <0.3 kg/cm$^2$ | | | |
| **e)** | Keep the DBC handle in "RUN" position. | BP = 3.35± 0.15kg/cm$^2$ BC=2.5±0.1kg/cm² (For WAP-7 & WAG-9) BC=5.15±0.3kg/cm² (For WAP-5) | | | |
| **f)** | To check over riding by SA9, operate SA9 to full and observe BC Pressure | BC = 3.5± 0.15 kg/cm$^2$ (For WAP-7 & WAG-9) BC=5.15±0.3kg/cm² (For WAP-5) | | | |
| **g)** | Release SA9 and observe BC pressure | BC=2.5±0.1kg/cm² (For WAP-7 & WAG-9) BC=5.15±0.3kg/cm² (For WAP-5) | | | |
| 7.7. | **Keep the Full Service Brake Signal (S1) OFF condition in KAVACH test kit** | | | | |
| a) | KAVACH IRU Lamp status | SERVICE BR SIGNAL LED is OFF | | | |
| b) | BP Pressure BC Pressure | BP = 5.0±0.1kg/cm$^2$ BC≤ 0.3 kg/cm$^2$ (For WAP-5, WAP-7 & WAG-9) | | | |
| 7.8. | **KAVACH IRU – EMERGNCY BRAKE (EB) SIGNAL TEST** | | | | |
| Keep the KAVACH switch in Normal Mode Keep the Emergency Brake signal S2 in ON condition in KAVACH test kit | | | | | |
| a) | KAVACH IRU Lamp status | EB BR SIGNAL LED is ON | | | |
| b) | BP Pressure | BP = 0 kg/cm$^2$ | | | |
| 7.9. | **Move the DBC handle step by step** | | | | |
| (a) | Run | BP = 0 kg/cm$^2$ | | | |
| (b) | Initial | BP = 0 kg/cm$^2$ | | | |
| (c) | Full-service | BP = 0 kg/cm$^2$ | | | |
| (d) | Emergency | BP = 0 kg/cm$^2$ | | | |
| (e) | Keep the DBC | BP = 0 kg/cm$^2$ | | | |

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| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| | handle in "RUN" position | | | | |
| (f) | To check over riding by SA9, operate SA9 to full and observe BC Pressure | BC = 3.5± 0.15 kg/cm$^2$ (For WAP-7 & WAG-9) BC=5.15±0.3kg/cm$^2$ (For WAP-5) | | | |
| (g) | Release SA9 and observe BC pressure | BC = 3.5± 0.15 kg/cm$^2$ (For WAP-7 & WAG-9) BC=5.15±0.3kg/cm$^2$ (For WAP-5) | | | |
| 7.10. | **Keep the Emergency Brake signal S2 in OFF condition in KAVACH test kit.** | | | | |
| (a) | KAVACH IRU Lamp status | EB BR SIGNAL LED is OFF | | | |
| (b) | BP Pressure | BP = 5.0± 0.1kg/cm$^2$ | | | |
| 7.11. | **KAVACH IRU – NORMAL/BYPASS SWITCH TEST IN NORMAL MODE** | | | | |
| (a) | Keep the KAVACH switch in Normal Mode (**(All the above tests were conducted in Normal mode only).** | | | | |
| 7.12. | **KAVACH IRU – BYPASS MODE TEST** | | | | |
| (a) | Keep the KAVACH switch in Bypass Mode | | | | |
| (b) | Keep the Initial Brake signal **switch** (S4) ON condition in KAVACH test kit | | | | |
| (c) | KAVACH IRU Lamp status | NB BR SIGNAL LED is OFF | | | |
| 7.13. | **Keep the DBC handle in "RUN" position.** | | | | |
| **(a)** | BP Pressure (Pressure Remains Unchanged) | BP = 5.0± 0.1kg/cm$^2$ | | | |
| 7.14. | **Keep the Initial brake signal Switch S4 in OFF condition in KAVACH Test kit. Keep the Full Service signal switch (S1) ON condition in KAVACH test kit** | | | | |
| **(a)** | KAVACH IRU Lamp status | SERVICE BR SIGNAL LED is OFF | | | |
| 7.15. | **Keep the DBC handle in "INITIAL" position.** | | | | |
| **(a)** | BP Pressure | BP = 4.6 ± 0.1kg/cm$^2$ | | | |
| 7.16. | **Keep the Full Service Brake signal (S1) OFF condition in KAVACH test kit** | | | | |
| (a) | Keep the Emergency Brake signal (S2) ON condition in KAVACH test kit | | | | |
| (b) | KAVACH IRU Lamp status (Pressure Remains Unchanged) | EB BR SIGNAL LED is OFF & BP=4.6 ± 0.1kg/cm$^2$ | | | |
| 7.17. | **Keep the DBC handle in "FSB" position.** | | | | |
| (a) | BP Pressure | BP = 3.5± 0.15 kg/cm$^2$ | | | |

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## 8. Test Procedure for TCAS IRU in LE

Check the Independent/Direct brake (SA9) for its normal Operation by moving, its handle step by step from Release to Full service

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 8.1. | **Energize Light engine EP Valve from Kavach LE test kit** | | | | |
| 8.1.1. | BC Pressure | BC = 3.5± 0.15 kg/cm$^2$ (For WAP-7 & WAG-9) BC=5.15±0.3kg/cm² (For WAP-5) | | | |
| 8.2. | **De-energise Light engine EP Valve from Kavach LE test kit**) | | | | |
| 8.2.1. | BC Pressure | BC = <0.3 kg/cm$^2$ (For WAP-5, WAP-7 & WAG-9) | | | |
| | **Apply Direct Brake (SA9) in FULL** | | | | |
| 8.3.1 | BC Pressure | BC = 3.5 ± 0.2 kg/cm$^2$ (For WAP-7 & WAG-9) BC = 5.15 ± 0.3 kg/cm$^2$ (For WAP-5) BP = 5.0±0.1kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |
| 8.3.2 | Energize Light engine EP Valve from KAVACH LE test kit Record BC Pressure (Pressure Remains Unchanged) | BC = 3.5 ± 0.2 kg/cm$^2$ (For WAP-7 & WAG-9) BC = 5.15 ± 0.3 kg/cm$^2$ (For WAP-5) BP = 5.0±0.1kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |
| 8.3.3 | Release Direct Brake (SA9) Record BC Pressure (Pressure Remains Unchanged) | BC = 3.5 ± 0.2 kg/cm$^2$ (For WAP-7 & WAG-9) BC = 5.15 ± 0.3 kg/cm$^2$ (For WAP-5) BP = 5.0±0.1kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |
| | De-energise Light engine EP Valve from KAVACH Test kit Record BC Pressure | BC=<0.3 kg/cm$^2$ (For WAP-5, WAP-7 & WAG-9) BP = 5.0±0.1 kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |

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## 9. Test Procedure for Emergency Magnet Valve (Vital EB):

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Observed/ Measured Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 9.1. | **Work from CAB1 and Energize the Emergency Magnet Valve of Working CAB (CAB1) and Keep A9 Handle in Run Position.** | | | | |
| 9.1.1. | BP Pressure | BP = 5.0±0.1 kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |
| 9.2. | **De-energise Emergency Magnet Valve of CAB1 by disconnecting either the DIN Plug or De-energizing the Coil by removing incoming feed from WAGO. Record the BP Pressure** | | | | |
| 9.2.1. | BP Pressure | BP = <0.3 kg/cm$^2$ (For WAP-5, WAP-7 & WAG-9) | | | |
| 9.3. | **Now prevent the venting of BP pressure by closing the Isolation Cock. Record the BP pressure** | | | | |
| 9.3.1. | BP Pressure (Pressure should create to the nominal value i.e. as per the position of A9 handle and in this case it is RUN). | BP = 5.0±0.1 kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |
| 9.4. | **Restore the DIN plug connection or incoming feed to energize the Emergency Magnet Valve of CAB1 and then Open the Isolation Cock of CAB1. Record the BP pressure** | | | | |
| 9.4.1. | BP Pressure (Pressure should create to the nominal value i.e. as per the position of A9 handle and in this case it is RUN). BP pressure should remain unchanged. | BP = 5.0±0.1 kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |
| 9.5. | **Work from CAB2 and Energize the Emergency Magnet Valve of Working CAB (CAB2) and Keep A9 Handle in Run Position.** | | | | |
| 9.5.1. | BP Pressure | BP = 5.0±0.1 kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |
| 9.6. | **De-energise Emergency Magnet Valve of CAB2 by disconnecting either the DIN Plug or De-energizing the Coil by removing incoming feed from WAGO. Record the BP Pressure** | | | | |
| 9.6.1. | BP Pressure | BP = <0.3 kg/cm$^2$ (For WAP-5, WAP-7 & WAG-9) | | | |
| 9.7. | **Now prevent the venting of BP pressure by closing the Isolation Cock. Record the BP pressure** | | | | |
| 9.7.1. | BP Pressure (Pressure should create to the | BP = 5.0±0.1 kg/cm² (For WAP-5, WAP-7 | | | |

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| | nominal value i.e. as per the position of A9 handle and in this case it is RUN). | & WAG-9) | | | |
| 9.8. | **Restore the DIN plug connection or incoming feed to energize the Emergency Magnet Valve of CAB2 and then Open the Isolation Cock of CAB2. Record the BP pressure** | | | | |
| 9.8.1. | BP Pressure (Pressure should create to the nominal value i.e. as per the position of A9 handle and in this case it is RUN). BP pressure should remain unchanged. | BP = 5.0±0.1 kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |

**10. Brake Application and Release Timings**

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 10.1. | **Auto Brake Application and Release Timings (through A9) with BIU in Isolation. (Keep the Isolation switch in Isolation Position)** | | | | |
| 10.1.1. | Move Auto brake handle from "running to Emergency" and record BC filling time from 0.4kg/cm$^2$ to Max BC developed.<br>WAP5-BC: 5.15± 0.3 kg/cm²<br>WAP7-BC: 2.50± 0.10 kg/cm²<br>WAG9-BC: 2.50± 0.1 kg/cm² | WAP5: 4± 1s<br>WAP7: 7.5± 1.5s<br>WAG9: 21± 3s | | | |
| 10.1.2. | Move auto brake handle to Full service and allow BP pressure 3.5kg/cm$^2$. Move brake controller to running position.<br>Record BC release time to fall BC pressure up to 0.4 kg/cm2 i.e. 95% of Max. BC developed.<br>BC Release Time WAP5 &WAP7 ,WAG9 | WAP5&WAP7: 17.5±2.5s<br>WAG9: 52.5± 7.5s | | | |
| 10.2. | **Auto Brake Application and Release Timings through A9 with BIU in Service. (Keep the Isolation switch in Normal Position).** | | | | |

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| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 10.2.1. | Move Auto brake handle from "running to Emergency" and record BC filling time from 0.4kg/cm$^2$ to Max BC developed.<br>WAP5-BC: 5.15± 0.3 kg/cm²<br>WAP7-BC: 2.50± 0.10 kg/cm²<br>WAG9-BC: 2.50± 0.1 kg/cm² | WAP5: 4± 1s<br>WAP7: 7.5± 1.5s<br>WAG9: 21± 3s | | | |
| 10.2.2. | Move auto brake handle to Full service and allow BP pressure 3.5kg/cm$^2$. Move brake controller to running position.<br>Record BC release time to fall BC pressure up to 0.4 kg/cm2 i.e. 95% of Max. BC developed.<br>BC Release Time WAP5 &WAP7 WAG9 | WAP5&WAP7: 17.5±2.5s<br>WAG9: 52.5± 7.5s | | | |
| 10.3. | **Brake Application and Release Timings through KAVACH Commands (A9 Interface) with BIU in Service. (Keep the Isolation switch in Normal Position).** | | | | |
| 10.3.1. | Keep the S2 ON (Emergency Brake signal HIGH) from KAVACH test kit and record BC filling time from 0.4kg/cm$^2$ to Max BC developed.<br>WAP5-BC: 5.15± 0.3 kg/cm²<br>WAP7-BC: 2.50± 0.10 kg/cm²<br>WAG9-BC: 2.50± 0.1 kg/cm² | WAP5: 4± 1s<br>WAP7: 7.5± 1.5s<br>WAG9: 21± 3s | | | |
| 10.3.2. | Keep the Full Service Brake Signal S1 ON in KAVACH test and Keep the Emergency Brake signal S2 OFF in KAVACH test kit allow BP pressure 3.5kg/cm$^2$.<br>Keep the Full Service Brake signal S1 OFF in KAVACH test Kit.<br>Record BC release time to fall BC pressure up to 0.4 kg/cm2 i.e. 95% of Max. BC developed. | WAP5&WAP7: 17.5± 2.5s<br>WAG9: 52.5± 7.5s | | | |
| 10.4. | **Direct Brake Application and Release Timings (through SA9) with BIU in Isolation. (Keep the** | | | | |

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| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| | **Isolation switch in Isolation Position).** | | | | |
| 10.4.1. | Apply Direct Brake in Full. Record Brake Cylinder Charging Time. | 8sec Max. | | | |
| 10.4.2. | Release Direct Brake & record BC release time to fall BC pressure up to 0.4 kg/cm$^2$ | 10-15 sec | | | |
| 10.5. | **Direct Brake Application and Release Timings (through SA9) with BIU in Service. (Keep the Isolation switch in Normal Position).** | | | | |
| 10.5.1. | Apply Direct Brake in Full. Record Brake Cylinder Charging Time. | 8sec Max. | | | |
| 10.5.2. | Release Direct Brake & record BC release time to fall BC pressure up to 0.4 kg/cm$^2$ | 10-15 sec | | | |
| 10.6. | **Brake Application and Release Timings through KAVACH Commands (LE Interface) with BIU in Service. (Keep the Isolation switch in Normal Position).** | | | | |
| 10.6.1. | Energise Light engine from KAVACH LE test kit. Record Brake Cylinder Charging Time. | 8sec Max. | | | |
| 10.6.2. | De-energise Light engine from KAVACH LE test kit Record BC release time to fall BC pressure up to 0.4 kg/cm$^2$ | 10-15 sec | | | |

**Note : The above are as per TC-113 Rev.'0' dt: 29.03.2012**

**11. Test Procedure for PVEF Circuit:**

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 11.1. | **Configure Locomotive as Light Engine. Remove Din plug connector of LE valve. Keep A9 handle in RUN position and ensure full charging of BP.** | | | | |
| 11.1.1. | BP Pressure | BP = **5.0±0**.1 kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |
| 11.2. | **Keep Initial brake (NB) signal (S4) ON condition from KAVACH test kit** | | | | |
| 11.2.1. | BP Pressure & BC Pressure | BP =4.6 ±0.1 kg/cm² BC=0.4 ±0.1 kg/cm² | | | |

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| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| | | (For WAP-7 & WAG-9)<br>BC=0.75 ±0.15 kg/cm²<br>(For WAP-5) | | | |
| 11.3. | **Now press PVEF from Activated CAB. Brake Cylinder Pressure Should not release.** | | | | |
| 11.3.1. | BP Pressure & BC Pressure | BP =4.6 ±0.1 kg/cm²<br>BC=0.4 ±0.1 kg/cm²<br>(For WAP-7 & WAG-9)<br>BC=0.75 ±0.15 kg/cm²<br>(For WAP-5) | | | |
| 11.4. | **Keep Initial brake (NB) signal (S4) OFF condition from KAVACH test kit Now ensure complete releasing of Brake Cylinder Pressure and Charging of Brake Pipe Pressure.** | | | | |
| 11.4.1. | BP Pressure & BC Pressure | BP=5.0± 0.1 kg/cm²<br><br>BC=0kg/cm² | | | |
| 11.5. | **Keep Full Service Brake signal S1 in On condition in KAVACH test kit** | | | | |
| 11.5.1. | BP Pressure & BC Pressure | BP = 3.35± 0.15 kg/cm²<br>BC=2.5 ±0.1kg/cm²<br>(For WAP-7 & WAG-9)<br>BC=5.15 ±0.3kg/cm²<br>(For WAP-5) | | | |
| 11.6. | **Now press PVEF from Activated CAB. Brake Cylinder Pressure Should not release.** | | | | |
| 11.6.1. | BP Pressure & BC Pressure | BP = 3.35± 0.15 kg/cm²<br>BC=2.5 ±0.1kg/cm²<br>(For WAP-7 & WAG-9)<br>BC=5.15 ±0.3kg/cm²<br>(For WAP-5) | | | |
| 11.7. | Keep Full Service Brake signal S1 in OFF condition in KAVACH test kit. .Now ensure complete releasing of Brake Cylinder Pressure and Charging of Brake Pipe Pressure. | | | | |
| 11.7.1. | BP Pressure & BC Pressure | BP=5.0± 0.1 kg/cm²<br><br>BC=0kg/cm² | | | |
| 11.8. | Keep the Emergency Brake signal S2 in ON condition in KAVACH test kit. | | | | |
| | BP Pressure & BC Pressure | BP = 3.35± 0.15 kg/cm²<br>BC=2.5 ±0.1kg/cm²<br>(For WAP-7 & WAG-9)<br>BC=5.15 ±0.3kg/cm²<br>(For WAP-5) | | | |
| 11.9. | **Now press PVEF from Activated CAB. Brake Cylinder Pressure Should not release.** | | | | |
| | BP Pressure & BC | BP = 3.35± 0.15 | | | |

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| **S.No** | **Items/Requirements** | **Acceptance Criteria** | **Observed/ Measured Cab-1** | **Cab-2** | **Remarks OK/ Not OK** |
|---|---|---|---|---|---|
| | Pressure | $kg/cm^2$<br>BC=2.5 ±0.1kg/cm²<br>(For WAP-7 & WAG-9)<br>BC=5.15 ±0.3kg/cm²<br>(For WAP-5) | | | |
| 11.10. | Keep the Emergency Brake signal S2 in OFF condition in KAVACH test kit. Now ensure complete releasing of Brake Cylinder Pressure and Charging of Brake Pipe Pressure. | | | | |
| | BP Pressure & BC Pressure | BP=5.0± 0.1 $kg/cm^2$<br><br>BC=0kg/cm² | | | |



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| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |

## 12. Test Procedure for Traction Cut-off Feedback Circuit:

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Observed/ Measured Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 12.1. | **Configure Locomotive as Formation. Keep A9 handle in RUN position and ensure full charging of BP. Charge the locomotive in Simulation mode with the help of shed and Operate the locomotive at 70kmph and keep throttle at 1/3rd power.** | | | | |
| 12.1.1. | BP Pressure | BP = **5.0±0**.1 kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |
| 12.2. | **Initiate Brake Test either by Switching ON and OFF of Kavach or by pressing MBT and CNFM buttons from the DMI screen.** | | | | |
| 12.2.1. | Traction Shall cut off with message "Emergency Brake Pressure Switch" in the background. | | | | |
| 12.2.2. | On completion of Brake test, the traction shall not resume automatically. Throttle needs to be brought to zero and placed again either in traction or braking side. | | | | |

## 13. Testing for detecting merging of cables of CAB1 and CAB2 through Kavach due to Improper Wiring

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Observed/ Measured Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 13.1. | **Activate CAB1 with KAVACH in Isolation. Keep CAB1 Reverser in "Forward" Position.** | | | | |
| 13.1.1. | Operate CAB2 (without keeping BL key i.e. CAB 2 is In active) reverser to "Forward" position. | Wait for 8s and observe for "Brake Electronics Fail" message in DDU. If wiring is proper No message should appear in DDU. If "Brake Electronics Fail" message appears in DDU, check for merging of CAB1 and | | | |

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| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Observed/ Measured Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| | | CAB2 cables through Kavach System. Identify the cables and ensure independent termination of CAB1 and CAB2 input cables. | | | |
| 13.1.2. | Operate CAB2 (without keeping BL key i.e. CAB 2 is inactive) reverser to "Reverse" position. | Wait for 8s and observe for "Brake Electronics Fail" message in DDU. If wiring is proper No message should appear in DDU. If "Brake Electronics Fail" message appears in DDU, check for merging of CAB1 and CAB2 cables through KAVACH System. Identify the cables and ensure independent termination of CAB1 and CAB2 input cables. | | | |
| 13.2. | **Activate CAB1 with KAVACH in Isolation. Keep CAB1 Reverser in Reverse" Position.** | | | | |
| 13.2.1. | Operate CAB2 (without keeping BL key i.e. CAB 2 is inactive) reverser to Forward" position. | Wait for 8s and observe for "Brake Electronics Fail" message in DDU. If wiring is proper No message should appear in DDU. If "Brake Electronics Fail" message appears in DDU, check for merging of CAB1 and CAB2 cables through Kavach System. Identify the cables and ensure independent termination of CAB1 and CAB2 input cables. | | | |
| 13.2.2. | Operate CAB2 (without keeping BL key i.e. CAB 2 is inactive) reverser to "Reverse" position. | Wait for 8s and observe for "Brake Electronics Fail" message in DDU. If wiring is proper No message should appear in DDU. | | | |



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| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| | | If "Brake Electronics Fail" message appears in DDU, check for merging of CAB1 and CAB2 cables through Kavach System. Identify the cables and ensure independent termination of CAB1 and CAB2 input cables. | | | |
| 13.3. | **Activate CAB2 with KAVACH in Isolation. Keep CAB2 Reverser in "Forward" Position** | | | | |
| 13.3.1. | Operate CAB1 (without keeping BL key i.e. CAB1 is inactive) reverser to "Forward" position. | Wait for 8s and observe for "Brake Electronics Fail" message in DDU. If wiring is proper No message should appear in DDU. If "Brake Electronics Fail" message appears in DDU, check for merging of CAB1 and CAB2 cables through KAVACH System. Identify the cables and ensure independent termination of CAB1 and CAB2 input cables. | | | |
| 13.3.2. | Operate CAB1 (without keeping BL key i.e. CAB1 is inactive) reverser to Reverse" position. | Wait for 8s and observe for "Brake Electronics Fail" message in DDU. If wiring is proper No message should appear in DDU. If "Brake Electronics Fail" message appears in DDU, check for merging of CAB1 and CAB2 cables through KAVACH System. Identify the cables and ensure independent termination of CAB1 and CAB2 input cables. | | | |



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| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 13.4. | **Activate CAB2 with KAVACH in Isolation. Keep CAB2 Reverser in "Reverse" Position** | | | | |
| 13.4.1. | Operate CAB1 (without keeping BL key i.e. CAB1 is inactive) reverser to Forward" position. | Wait for 8s and observe for "Brake Electronics Fail" message in DDU. If wiring is proper No message should appear in DDU. If "Brake Electronics Fail" message appears in DDU, check for merging of CAB1 and CAB2 cables through KAVACH System. Identify the cables and ensure independent termination of CAB1 and CAB2 input cables. | | | |
| 13.4.2. | Operate CAB1 (without keeping BL key i.e. CAB1 is inactive) reverser to "Reverse" position. | Wait for 8s and observe for "Brake Electronics Fail" message in DDU. If wiring is proper No message should appear in DDU. If "Brake Electronics Fail" message appears in DDU, check for merging of CAB1 and CAB2 cables through KAVACH System. Identify the cables and ensure independent termination of CAB1 and CAB2 input cables. | | | |

**Note: 1.** The above test cases should be carried out on both CAB-1 and CAB-2 side.

2. KAVACH OEM has to ensure fitness of onboard KAVACH System after installation and testing of onboard KAVACH.



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## 14.Braking configuration parameter

Checksum to be tallied with approved checksum by cross checking from KAVAVH VCMS file of RDSO for that Loco and KAVACH OEM.

Check sum observed……. OK/Not OK

| Sl. No. | Items / Requirements | Min | Max | Units | Configured value Min | Max | Remarks |
|---|---|---|---|---|---|---|---|
| 14.1. | **Braking configuration in E-70 (WAP-5, WAP-7 & WAG-9)** | | | | | | |
| 14.1.1. | MR Pressure | >7.5 | ---- | $Kg/cm^2$ | | | |
| 14.1.2. | BP Pressure | 4.9 | 5.1 | $Kg/cm^2$ | | | |
| 14.1.3. | Formation BP Pressure when NB High (WAP-5, WAP-7 & WAG-9) | 4.5 | 4.7 | $Kg/cm^2$ | | | |
| 14.1.4. | Formation BP Pressure when FSB High (WAP-5, WAP-7 & WAG-9) | 3.15 | 3.55 | $Kg/cm^2$ | | | |
| 14.1.5. | Formation BP Pressure when EB1 High(WAP-5, WAP-7 & WAG-9) | 0 | 0.3 | $Kg/cm^2$ | | | |
| 14.1.6. | Formation BP Pressure when EB2 Low (WAP-5, WAP-7 & WAG-9) | 0 | 0.3 | $Kg/cm^2$ | | | |
| 14.1.7. | Formation BC Pressure in NB High (WAP-7 & WAG-9) | 0.3 | 0.5 | $Kg/cm^2$ | | | |
| 14.1.8. | Formation BC Pressure when FSB High (WAP-7 & WAG-9) | 2.4 | 2.6 | $Kg/cm^2$ | | | |
| 14.1.9. | Formation BC Pressure in EB1 High (WAP-7 & WAG-9) | 2.4 | 2.6 | $Kg/cm^2$ | | | |
| 14.1.10 | Formation BC Pressure in EB2 Low (WAP-7 & WAG-9) | 2.4 | 2.6 | $Kg/cm^2$ | | | |
| 14.1.11 | Formation BC Pressure in NB High (WAP-5) | 0.6 | 0.9 | $Kg/cm^2$ | | | |
| 14.1.12 | Formation BC Pressure when FSB High (WAP-5) | 4.85 | 5.45 | $Kg/cm^2$ | | | |
| 14.1.13 | Formation BC Pressure when EB1 High (WAP-5) | 4.85 | 5.45 | $Kg/cm^2$ | | | |
| 14.1.14 | Formation BC Pressure when EB2 Low (WAP-5) | 4.85 | 5.45 | $Kg/cm^2$ | | | |
| 14.1.15 | Light Engine(high) – BP Pressure- NB High (WAP-5, WAP-7 & WAG-9) | 4.5 | 4.7 | $Kg/cm^2$ | | | |
| 14.1.16 | Light Engine(high) – BP Pressure- FSB High (WAP-5, WAP-7 & WAG-9) | 3.15 | 3.7 | $Kg/cm^2$ | | | |

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| Sl. No. | Items / Requirements | Min | Max | Units | Configured value Min | Configured value Max | Remarks |
|---|---|---|---|---|---|---|---|
| 14.1.17 | Light Engine(high) – BP Pressure- EB1 High (WAP-5, WAP-7 & WAG-9) | 0 | 0.3 | $Kg/cm^2$ | | | |
| 14.1.18 | Light Engine(high) – BP Pressure- EB2 Low (WAP-5, WAP-7 & WAG-9) | 0 | 0.3 | $Kg/cm^2$ | | | |
| 14.1.19 | Light Engine(high) -BC Pressure- NB High (WAP-7 & WAG-9) | 3.3 | 3.7 | $Kg/cm^2$ | | | |
| 14.1.20 | Light Engine(high) – BC Pressure- FSB High (WAP-7 & WAG-9) | 3.3 | 3.7 | $Kg/cm^2$ | | | |
| 14.1.21 | Light Engine(high) – BC Pressure- EB1 High (WAP-7 & WAG-9) | 3.3 | 3.7 | $Kg/cm^2$ | | | |
| 14.1.22 | Light Engine (High) – BC Pressure- EB2 Low (WAP-7 & WAG-9) | 3.3 | 3.7 | $Kg/cm^2$ | | | |
| 14.1.23 | Light Engine(high) -BC Pressure- NB High (WAP-5) | 4.85 | 5.45 | $Kg/cm^2$ | | | |
| 14.1.24 | Light Engine(high) -BC Pressure- FSB High (WAP-5) | 4.85 | 5.45 | $Kg/cm^2$ | | | |
| 14.1.25 | Light Engine(high) – BC Pressure- EB1 High (WAP-5) | 4.85 | 5.45 | $Kg/cm^2$ | | | |
| 14.1.26 | Light Engine (High) – BC Pressure- EB2 Low (WAP-5) | 4.85 | 5.45 | $Kg/cm^2$ | | | |



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| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |

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GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

# Pre-Commissioning Checklist for Brake Interface Unit (CCB Brake System) of M/s Firm's Name

**(Annexure - A3)**

**(Part of Pre-Commissioning Checklist for Onboard KAVACH (Diesel/Electrical) as per specification RDSO/SPN/196/2020 version 4.0)**

Issued by

SIGNAL AND TELECOM DIRECTORATE
RESEARCH, DESIGNS & STANDARDS ORGANISATION
MINISTRY OF RAILWAYS
MANAK NAGAR
LUCKNOW – 226 011



अअमासंRDSO
रेल अग्रदूत Transforming Railways
www.rdso.gov.in

## Revision History

| SN. | Issue | Version | Reason of Amendment |
|---|---|---|---|
| 1 | First | 1.0 | First Issue |
| 2 | | | |



| Prepared by: | Approved by: |
|---|---|
| JE/SSE/S&T/RDSO<br>ADE/S&T/RDSO<br>Dir/Sig-IV/RDSO<br>ED/Tele-II/RDSO | PED/S&T/RDSO |

1. **Introduction**

KAVACH designed and developed Train Protection Module (TPM) for CCB Brake System to brake against digital signals received from KAVACH System. Braking actions will be initiated when the signals are received by Train Protection Module for initiating braking through CCB Brake System fitted on 3 Phase Electric Locomotives.

2. **Objectives of the tests**

(i) **BIU shall not interfere with the loco braking system**: - Loco pilot's braking operations shall be effective using EBV, when BIU is kept in isolation as well as in service condition. Brake application and release time should not change in both cases i.e. BIU is kept in isolation or in service condition.

(ii) **Loco pilot shall be able to override the brakes applied by BIU: -** Loco pilot shall be able to override the brakes applied by KAVACH by applying higher brake pressure for train formation braking by controlling Auto or A9 lever of EBV as well as for light engine braking by controlling the Independent Brake lever of EBV.

(iii) **BIU shall be able to override brakes applied by Loco Pilot: -** Whenever required, the BIU shall be able to override the loco-pilot applied brakes during train formation (Auto or A9 control) or in case of light engine, (Direct or SA9 control) by applying higher brake pressure.

3. **Testing of KAVACH braking Functions:**

i. After powering ON the Loco KAVACH initially, the brake testing shall be performed by operating the A9 and SA9 operations through Loco KAVACH.

ii. For verifying braking operations through Loco KAVACH, the application software of PCCL provided in laptop shall be used or it can be tested by toggle switches to generate commands or by disconnecting individual brake command cables.

**Note: The KAVACH CCB Interface unit shall be kept in service position for performing the tests.**

4. **General Information**

Loco Number :_____

Loco Type :_____

Loco KAVACH CCB Interface Box(BIU): _____(Wherever applicable)

Train Protection Module (TPM) / MPIO (794209) :……

Power Supply Junction Box (PSJB-HO)(794501):……

SIFA Valve with Isolating Cock with Micro switch (I74911/110RC):……

Date of Installation :_____

Date of Commissioning :_____

5. **Visual Inspection**

| S.No | Items/Requirements | Observed/ measured | | Remarks OK/Not OK |
|---|---|---|---|---|
| | | Cab-1 | Cab-2 | |
| 5.1. | Ensure that there are no loose wires hanging out from any of the modules. | | | |
| 5.2. | Ensure that wires are marked for easy identification. | | | |

6. **Test Procedure for KAVACH CCB Interface Unit**

(i) Power ON the KAVACH system.
(ii) CCB modules should be "ON".
(iii) Ensure the Software 2537 installed on WAP-7 & WAG-9 CCB system and 2538 should be installed on WAP-5 CCB system. Yes/No
(iv) TPM mounted on CCB rack and connected using the connector given by OEM.
(v) Ensure PSJB-HO also mounted on CCB rack (P/N: 794501).
(vi) Power 'ON' KAVACH CCB Interface Unit/ Test Box and ensure NB, FS, EMER inputs to TPM module are 'HIGH'.

7. **Light Engine Mode- LE command HIGH - Nominal Brake (NB)**

| S.No | Items/ Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 7.1. | Keep A9 handle in "RUN" and check the followings: | | | | |
| i. | BP Pressure | BP = 5.0± 0.1 kg/cm$^2$ | | | |
| ii. | BC Pressure | BC =0 kg/cm$^2$ (for WAP-7)<br>BC =0 kg/cm$^2$ (for WAP-5)<br>BC = 0 kg/cm$^2$ (for WAG-9) | | | |
| 7.2. | Keep A9 handle in "MIN" and check the followings | | | | |
| i. | BP Pressure | BP = 4.6± 0.1 kg/cm$^2$ | | | |

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| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |

| S.No | Items/ Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| ii. | BC Pressure | BC =0.4± 0.1 kg/cm$^2$ (for WAP-7 &WAG-9)<br>BC =0.75± 0.15 kg/cm$^2$ (for WAP-5) | | | |
| 7.3. | Keep A9 handle in "FS" and check the followings: | | | | |
| i. | B.P. Pressure | B.P =3.35±0.2 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =2.50±0.1 kg/cm$^2$ (For WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (For WAP-5) | | | |
| 7.4. | Keep A9 handle in "EMER" and check the followings: | | | | |
| i. | B.P. Pressure | B.P < 0.3 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =2.50±0.1 kg/cm$^2$ (For WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (For WAP-5) | | | |
| iii. | Press PVEF/ Pull Bail Ring to Bail-Off the BC . | BC remains unchanged | | | |
| 7.5. | Keep Brake Controller's A9 Handle to EMER & after "OKAY TO RUN" message on EBV display bring A9 handle back to RUN and check the following: | | | | |
| i. | B.P. Pressure | B.P =5.0±0.1 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =0 kg/cm$^2$ (For WAP-7 & WAG-9)<br>BC = 0 kg/cm$^2$ (For WAP-5) | | | |
| 7.6. | Make the **NB command** to CCB: **'LOW'** for nominal brake (NB) application by KAVACH module/ Test Box, brake should be applied and check the followings: | | | | |
| i. | B.P. Pressure | B.P =4.4±0.1 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =1±0.1 kg/cm$^2$(For WAP-7 & WAG-9)<br>BC =2.16±0.15 kg/cm$^2$ (For WAP-5) | | | |
| iii. | Timing to be taken: 0-95% of maximum BC developed from gauge needle movement) | Timing≤ 8 s (For WAP-7 & WAG-9)<br>Timing ≤ 8 s (For WAP-5) | | | |
| 7.7. | Keep A9 handle in "MIN" and check the followings: | | | | |
| i. | B.P. Pressure | B.P =4.4±0.1 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =1±0.1 kg/cm$^2$(For WAP-7 & WAG-9)<br>BC =2.16±0.15 kg/cm$^2$ (For WAP-5) | | | |
| 7.8. | Keep A9 handle in "FS" and check the followings: | | | | |
| i. | B.P. Pressure | B.P =3.35±0.2 kg/cm$^2$ | | | |

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|---|---|
| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |

| S.No | Items/ Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| ii. | B.C Pressure | BC =2.50±0.1 kg/cm$^2$(For WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (For WAP-5) | | | |
| 7.9. | Keep A9 handle in "EMER" and check the followings: | | | | |
| i. | B.P. Pressure | B.P <0.3 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =2.50±0.1 kg/cm$^2$(For WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (For WAP-5) | | | |
| 7.10. | Keep Brake Controller A9 Handle to "EMER" & after "OKAY TO RUN" message on EBV display bring A9 handle back to RUN and check the following: | | | | |
| i. | B.P. Pressure | B.P =4.4±0.1 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =1±0.1 kg/cm$^2$(For WAP-7 & WAG-9)<br>BC =2.16±0.15 kg/cm$^2$ (For WAP-5) | | | |
| 7.11. | Make the NB command to CCB: 'HIGH' by KAVACH module/ Test Box, Brake should be released and check the following pressures | | | | |
| i. | B.P. Pressure | B.P =5.0±0.1 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =0 kg/cm$^2$(For WAP-7 & WAG-9)<br>BC =0 kg/cm$^2$ (For WAP-5) | | | |
| iii. | (Timing to be taken: From gauge needle movement up to BC< 0.4 kg/cm$^2$) | Timing≤ 45 s (For WAG-9)<br>Timing≤ 15 s (For WAP-7)<br>Timing ≤ 15 s (For WAP-5) | | | |

8. **Light Engine Mode- LE command HIGH Full Service (FS)**

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 8.1. | Make the FS command to CCB: 'LOW' for Full Service (FS) application by KAVACH module/ Test Box, Brake should be applied and check the followings: | | | | |
| i. | BP Pressure | BP = 3.5±0.2 kg/cm$^2$ | | | |
| ii. | BC Pressure | BC =3.5±0.1 kg/cm$^2$ (for WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (for WAP-5) | | | |
| iii. | Timing to be taken: 0-95% of maximum BC developed from gauge needle movement) | Timing ≤ 8s (For WAP-7 & WAG-9)<br>Timing ≤ 8s (For WAP-5) | | | |

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|---|---|
| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 8.2. | Keep A9 handle in "MIN" and check the followings | | | | |
| i. | BP Pressure | BP = 3.5±0.2 kg/cm$^2$ | | | |
| ii. | BC Pressure | BC =3.5± 0.1 kg/cm$^2$ (for WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (for WAP-5) | | | |
| 8.3. | Keep A9 handle in "FS" and check the followings: | | | | |
| i. | B.P. Pressure | B.P =3.35±0.2 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =3.5±0.1 kg/cm$^2$ (For WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (For WAP-5) | | | |
| 8.4. | Keep A9 handle in "EMER" and check the followings: | | | | |
| i. | B.P. Pressure | B.P < 0.3 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =3.50±0.1 kg/cm$^2$ (For WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (For WAP-5) | | | |
| iii. | Press PVEF/ Pull Bail Ring to Bail-Off the BC. | BC remains unchanged | | | |
| 8.5. | Keep Brake Controller's A9 Handle to EMER & after "OKAY TO RUN" message on EBV display bring A9 handle back to RUN and check the following: | | | | |
| i. | B.P. Pressure | B.P =3.5±0.2 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =3.50±0.1 kg/cm$^2$ (For WAP-7 & WAG-9)<br>BC = 5.15±0.3 kg/cm$^2$ (For WAP-5) | | | |
| 8.6. | Make the **FS command** to CCB: **'HIGH'** by KAVACH module/ Test Box, Brake should be applied and check the followings: | | | | |
| i. | B.P. Pressure | B.P =5.0±0.1 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =0 kg/cm$^2$(For WAP-7 & WAG-9)<br>BC =0 kg/cm$^2$ (For WAP-5) | | | |
| iii. | Timing to be taken: From gauge needle movement up to BC < 0.4kg/cm$^2$. | Timing≤ 60 s (For WAG-9)<br>Timing≤ 20s (For WAP-7)<br>Timing ≤ 20s (For WAP-5) | | | |



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|---|---|
| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |

9. **Light Engine Mode- LE command HIGH Emergency (EMER)**

| S. No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 9.1. | Make the **EM command** to CCB: **'LOW'** for emergency (EM) application by KAVACH module/ Test Box, Brake should be applied and check the followings: | | | | |
| i. | BP Pressure | BP <0.3 kg/cm$^2$ | | | |
| ii. | BC Pressure | BC =3.5±0.1 kg/cm$^2$ (for WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (for WAP-5) | | | |
| iii. | Timing to be taken: 0-95% of maximum BC developed from gauge needle movement) | Timing ≤ 8s (For WAP-7 & WAG-9)<br>Timing ≤ 8s (For WAP-5) | | | |
| iv. | Press PVEF/ Pull Bail Ring to Bail-Off the BC. | BC remains unchanged | | | |
| 9.2. | Put Brake controller's A9 handle to "EMER" (EBV display "Safety Emer Wait") | | | | |
| i. | BP Pressure | BP <0.3 kg/cm$^2$ | | | |
| ii. | BC Pressure | BC =3.5±0.1 kg/cm$^2$ (for WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (for WAP-5) | | | |
| 9.3. | Make the **EM command** to CCB **'HIGH'** by KAVACH module/ Test Box | | | | |
| i. | B.P. Pressure | BP <0.3 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =3.5±0.1 kg/cm$^2$ (for WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (for WAP-5) | | | |
| 9.4. | Put Brake controller's A9 handle to "RUN" | | | | |
| i. | B.P. Pressure | B.P =5.0±0.1 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =0 kg/cm$^2$ (For WAP-7 & WAG-9)<br>BC =0 kg/cm$^2$ (For WAP-5) | | | |
| iii. | Timing to be taken: From gauge needle movement up to BC < 0.4kg/cm$^2$ | Timing ≤ 60 s (For WAG-9)<br>Timing ≤ 25 s (For WAP-7)<br>Timing ≤ 20 s (For WAP-5) | | | |



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|---|---|
| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |

10. **Formation Mode- LE command LOW Nominal Brake (NB)**

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 10.1. | **Keep A9 handle in "RUN" and check the followings:** | | | | |
| i. | BP Pressure | BP = 5.0± 0.1 kg/cm$^2$ | | | |
| ii. | BC Pressure | BC =0 kg/cm$^2$ (for WAP-7 & WAG-9)<br>BC =0 kg/cm$^2$ (for WAP-5) | | | |
| 10.2. | **Keep A9 handle in "MIN" and check the followings** | | | | |
| i. | BP Pressure | BP = 4.6± 0.1 kg/cm$^2$ | | | |
| ii. | BC Pressure | BC =0.4± 0.1 kg/cm$^2$ (for WAP-7 & WAG-9)<br>BC =0.75± 0.15 kg/cm$^2$ (for WAP-5) | | | |
| 10.3. | **Keep A9 handle in "FS" and check the followings:** | | | | |
| i. | B.P. Pressure | B.P =3.35±0.2 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =2.50±0.1 kg/cm$^2$ (For WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (For WAP-5) | | | |
| 10.4. | **Keep A9 handle in "EMER" and check the followings:** | | | | |
| i. | B.P. Pressure | B.P ≤ 0.3 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =2.50±0.1 kg/cm$^2$ (For WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (For WAP-5) | | | |
| iii. | Press PVEF/ Pull Bail Ring to Bail-Off the BC . | BC remains unchanged | | | |
| 10.5. | **Keep Brake Controller's A9 Handle to EMER & after "OKAY TO RUN" message on EBV display bring A9 handle back to RUN and check the following:** | | | | |
| i. | B.P. Pressure | B.P =5.0±0.1 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =0 kg/cm$^2$ (For WAP-7 & WAG-9)<br>BC =0 kg/cm$^2$ (For WAP-5) | | | |
| 10.6. | Make the **NB command** to CCB: **'LOW'** for nominal brake (NB) application by KAVACH module/ Test Box, Brake should be applied and check the followings: | | | | |
| i. | B.P. Pressure | B.P = 4.4±0.1 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =1±0.1 kg/cm$^2$(For WAP-7 & WAG-9)<br>BC =2.16±0.15 kg/cm$^2$ (For WAP-5) | | | |
| iii. | Timing to be | Timing≤ 18 s (For WAG-9) | | | |

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| | taken: 0-95% of maximum BC developed from gauge needle movement) | Timing≤ 9 s (For WAP-7)<br>Timing ≤ 9 s (For WAP-5) | | | |
| 10.7. | **Keep A9 handle in "MIN" and check the followings:** | | | | |
| i. | B.P. Pressure | B.P =4.4±0.1 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =1±0.1 kg/cm$^2$(For WAP-7 & WAG-9)<br>BC =2.16±0.15 kg/cm$^2$ (For WAP-5) | | | |
| 10.8. | **Keep A9 handle in "FS" and check the followings:** | | | | |
| i. | B.P. Pressure | B.P =3.35±0.2 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =2.50±0.1 kg/cm$^2$(For WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (For WAP-5) | | | |
| 10.9. | **Keep A9 handle in "EMER" and check the followings:** | | | | |
| i. | B.P. Pressure | B.P <0.3 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =2.50±0.1 kg/cm$^2$(For WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (For WAP-5) | | | |
| 10.10 | **Keep Brake Controller's A9 Handle to "EMER" & after "OKAY TO RUN" message on EBV display bring A9 handle back to RUN and check the following:** | | | | |
| i. | B.P. Pressure | B.P =4.4±0.1 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =1±0.1 kg/cm$^2$(For WAP-7 & WAG-9)<br>BC =2.16±0.15 kg/cm$^2$ (For WAP-5) | | | |
| 10.11 | **Make the NB command to CCB: 'HIGH' by KAVACH module/ Test Box, Brake should be released and check the following pressures** | | | | |
| i. | B.P. Pressure | B.P =5.0±0.1 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =0 kg/cm$^2$(For WAP-7 & WAG-9)<br>BC =0 kg/cm$^2$ (For WAP-5) | | | |
| iii. | (Timing to be taken: From gauge needle movement up to BC< 0.4 kg/cm$^2$) | Timing≤ 45 s (For WAG-9)<br>Timing≤ 15 s (For WAP-7)<br>Timing ≤ 15 s (For WAP-5)<br><br>(Shed is responsible for maintaining timing limits) | | | |

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|---|---|
| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |

11. **Formation Mode- LE command LOW Full Service (FS)**

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 11.1. | **Make the FS command to CCB: 'LOW' for Full Service (FS) application by KAVACH module/ Test Box, Brake should be applied and check the followings**: | | | | |
| i. | BP Pressure | BP = 3.5±0.2 kg/cm$^2$ | | | |
| ii. | BC Pressure | BC =2.5±0.1 kg/cm$^2$ (for WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (for WAP-5) | | | |
| iii. | Timing to be taken: 0-95% of maximum BC developed from gauge needle movement) | Timing: 18 -24s (For WAG-9)<br>Timing ≤ 9s (For WAP-7)<br>Timing ≤ 9s (For WAP-5) | | | |
| 11.2. | **Keep A9 handle in "MIN" and check the followings** | | | | |
| i. | BP Pressure | BP = 3.5±0.2 kg/cm$^2$ | | | |
| ii. | BC Pressure | BC =2.5± 0.1 kg/cm$^2$ (for WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (for WAP-5) | | | |
| 11.3. | **Keep A9 handle in "FS" and check the followings:** | | | | |
| i. | B.P. Pressure | B.P =3.35±0.2 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =2.5±0.1 kg/cm$^2$ (For WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (For WAP-5) | | | |
| 11.4. | **Keep A9 handle in "EMER" and check the followings:** | | | | |
| i. | B.P. Pressure | B.P < 0.3 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =2.50±0.1 kg/cm$^2$ (For WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (For WAP-5) | | | |
| iii. | Press PVEF/ Pull Bail Ring to Bail-Off the BC. | BC remains unchanged | | | |
| 11.5. | **Keep Brake Controller's A9 Handle to EMER & after "OKAY TO RUN" message on EBV display bring A9 handle back to RUN and check the following**: | | | | |
| i. | B.P. Pressure | B.P =3.5±0.2 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =2.50±0.1 kg/cm$^2$ (For WAP-7 & WAG-9)<br>BC = 5.15±0.3 kg/cm$^2$ (For WAP-5) | | | |
| 11.6. | Make the **FS command** to CCB: **'HIGH'** by KAVACH module/ Test Box, Brake | | | | |

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Observed/ Measured Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| | should be applied and check the followings: | | | | |
| i. | B.P. Pressure | B.P =5.0±0.1 kg/cm$^2$ | | | |
| ii. | B.C Pressure | BC =0 kg/cm$^2$(For WAP-7 & WAG-9)<br>BC =0 kg/cm$^2$ (For WAP-5) | | | |
| iii. | Timing to be taken: From gauge needle movement up to BC < 0.4kg/ cm$^2$. | Timing: 45-60 s (For WAG-9)<br>Timing≤ 20 s (For WAP-7)<br>Timing ≤ 20 s (For WAP-5) | | | |

12. **Formation Mode- LE command LOW Emergency (EMER)**

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Observed/ Measured Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 12.1. | Make the **EM command** to CCB: **'LOW'** for emergency (EM) application by KAVACH module/ Test Box,<br>Brake should be applied and check the followings: | | | | |
| **i.** | BP Pressure | BP <0.3 kg/cm$^2$ | | | |
| **ii.** | BC Pressure | BC =2.5±0.1 kg/cm$^2$ (for WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (for WAP-5) | | | |
| **iii.** | Timing to be taken: 0-95% of maximum BC developed from gauge needle movement) | Timing: 18-24 s (For WAG-9)<br>Timing ≤ 9s (For WAP-7)<br>Timing ≤ 5s (For WAP-5) | | | |
| **iv.** | Press PVEF/ Pull Bail Ring to Bail-Off the BC. | BC remains unchanged | | | |
| 12.2. | **Put Brake controller's A9 handle to "EMER" (EBV display "Safety Emer Wait")** | | | | |
| **v.** | BP Pressure | BP <0.3 kg/cm$^2$ | | | |
| **vi.** | BC Pressure | BC =2.5±0.1 kg/cm$^2$ (for WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (for WAP-5) | | | |
| 12.3. | **Make the EM command to CCB 'HIGH' by KAVACH module/ Test Box** | | | | |
| **vii.** | B.P. Pressure | BP <0.3 kg/cm$^2$ | | | |
| **viii.** | B.C Pressure | BC =2.5±0.1 kg/cm$^2$ (for WAP-7 & WAG-9)<br>BC =5.15±0.3 kg/cm$^2$ (for WAP-5) | | | |
| 12.4. | **Put Brake controller's A9 handle to "RUN"** | | | | |
| **ix.** | B.P. Pressure | B.P =5.0±0.1 kg/cm$^2$ | | | |



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|---|---|
| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| **x.** | B.C Pressure | BC =0 kg/cm$^2$ (For WAP-7 & WAG-9) BC =0 kg/cm$^2$ (For WAP-5) | | | |
| **xi.** | Timing to be taken: From gauge needle movement up to BC < 0.4kg/cm$^2$ | Timing: 45-60s (For WAG-9) Timing ≤ 20s (For WAP-7) Timing ≤ 20 s (For WAP-5) | | | |

13. **Testing for Ensuring Working of SIFA valve:**

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/Not OK |
|---|---|---|---|---|---|
| 13.1. | **Work from CAB1 and Energize the SIFA Magnet Valve kept below A9 of CAB1 and Keep A9 Handle in Run Position.** | | | | |
| 13.1.1. | BP Pressure | BP = 5.0±0.1 kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |
| 13.2. | **De-energise SIFA Magnet Valve Kept below A9 of CAB1 by disconnecting DIN Plug or De-energizing the Coil by removing incoming feed from WAGO. Record the BP Pressure.** | | | | |
| 13.2.1 | BP Pressure | BP = <0.3 kg/cm$^2$ (For WAP-5, WAP-7 & WAG-9) | | | |
| 13.3. | **Now prevent the venting of BP pressure by closing the Isolation Cock kept below A9 of CAB1. Keep Brake Controllers A9 handle of CAB1 to "EMER" & after "OKAY TO RUN", message on EBV display bring A9 handle back to RUN and record brake pipe pressure.** | | | | |
| 13.3.1 | BP Pressure (Pressure should create to the nominal value i.e. as per the position of A9 handle and in this case it is RUN). | BP = 5.0±0.1 kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |
| 13.3.2 | **Restore the DIN plug connection or incoming feed to energize the SIFA Magnet Valve Kept Below CAB1 and then Open the Isolation Cock kept below A9 of CAB1. Record the BP pressure** | | | | |
| 13.4. | BP Pressure (Pressure should create to the nominal value i.e. as per the position of A9 handle and in this case it is RUN). BP pressure should | BP = 5.0±0.1 kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/Not OK |
|---|---|---|---|---|---|
| | remain unchanged. | | | | |
| 13.5. | **Work from CAB2 and Energize the SIFA Magnet Valve kept below A9 of CAB1 and Keep A9 Handle in Run Position.** | | | | |
| 13.5.1 | BP Pressure | BP = 5.0±0.1 kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |
| 13.6. | **De-energise SIFA Magnet Valve Kept below A9 of CAB1 by disconnecting DIN Plug or De-energizing the Coil by removing incoming feed from WAGO. Record the BP Pressure.** | | | | |
| 13.6.1 | BP Pressure | BP = <0.3 kg/cm$^2$ (For WAP-5, WAP-7 & WAG-9) | | | |
| 13.7. | **Now prevent the venting of BP pressure by closing the Isolation Cock kept below A9 of CAB1. Keep Brake Controllers A9 handle of CAB2 to "EMER" & after "OKAY TO RUN", message on EBV display bring A9 handle back to RUN and record brake pipe pressure.** | | | | |
| 13.7.1 | BP Pressure (Pressure should create to the nominal value i.e. as per the position of A9 handle and in this case it is RUN). | BP = 5.0±0.1 kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |
| 13.8. | **Restore the DIN plug connection or incoming feed to energize the SIFA Magnet Valve Kept Below CAB1 and then Open the Isolation Cock kept below A9 of CAB1. Record the BP pressure** | | | | |
| 13.8.1 | BP Pressure (Pressure should create to the nominal value i.e. as per the position of A9 handle and in this case it is RUN). BP pressure should remain unchanged. | BP = 5.0±0.1 kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |

14. **Testing of Isolation of KAVACH:**

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| 14.1. | **Operate the KAVACH Isolation Switch to "Isolation" position and perform the following operations from both the CABs of loco.** | | | | |
| **xii.** | Apply NB, FSB, EB and LE Respectively through KAVACH control | Brakes shall not get applied | | | |
| **xiii.** | Apply NB, FSB, EB | The respective brake shall | | | |

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/ Not OK |
|---|---|---|---|---|---|
| | and LE respectively through A9 and SA9 control on driver's desk | get applied. | | | |
| ***Note:*** *Keep the Kavach Isolation switch in SERVICE position and Configure Loco to SR mode.* | | | | | |
| **xiv.** | Operate SIFA Valve isolation Cock from Open(O) to Close(C) | Loco KAVACH shall go to standby mode and "Emergency Brake Bypassed (EB clock closed)" message shall be displayed on LP-OCIP. | | | |
| **xv.** | Operate SIFA Valve isolation Cock from Close (C) to Open(O) | "Staff Responsible (SR) Mode" message shall be displayed on LP-OCIP. | | | |

15. **Test Procedure for PVEF Circuit: (Please refer to Drg No. SDO/S&T/Kavach/010/ALT-01)**

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/Not OK |
|---|---|---|---|---|---|
| 15.1. | **Configure Locomotive as Light Engine. Keep A9 handle in RUN position and ensure full charging of BP.** | | | | |
| 15.1.1. | BP Pressure | BP = **5.0±0**.1 kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |
| 15.2. | **Make NB Command to CCB "LOW"** | | | | |
| 15.2.1. | BP Pressure & BC Pressure | BP =4.4 ±0.1 kg/cm²<br>BC=1.0 ±0.1 kg/cm²<br>(For WAP-7 & WAG-9)<br>BC=2.16 ±0.15 kg/cm²<br>(For WAP-5) | | | |
| 15.3. | **Now press PVEF from Activated CAB. Brake Cylinder Pressure Should not release.** | | | | |
| 15.3.1. | BP Pressure & BC Pressure | BP =4.4 ±0.1 kg/cm²<br>BC=1.0 ±0.1 kg/cm²<br>(For WAP-7 & WAG-9)<br>BC=2.16 ±0.15 kg/cm²<br>(For WAP-5) | | | |
| 15.4. | Make NB Command to CCB "HIGH". Now ensure complete releasing of Brake Cylinder Pressure and Charging of Brake Pipe Pressure. | | | | |
| 15.4.1. | BP Pressure & BC Pressure | BP=5.0± 0.1 kg/cm² | | | |

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|---|---|
| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/Not OK |
|---|---|---|---|---|---|
| | | BC=0kg/cm² | | | |
| 15.5. | Make FSB Command to CCB "LOW" | | | | |
| 15.5.1. | BP Pressure & BC Pressure | BP = 3.5± 0.2 kg/cm²<br>BC =3.5 ±0.1kg/cm²<br>(For WAP-7 & WAG-9)<br>BC=5.15 ±0.3kg/cm²<br>(For WAP-5) | | | |
| 15.6. | **Now press PVEF from Activated CAB. Brake Cylinder Pressure Should not release.** | | | | |
| 15.6.1. | BP Pressure & BC Pressure | BP = 3.5± 0.2 kg/cm²<br>BC =3.5 ±0.1kg/cm²<br>(For WAP-7 & WAG-9)<br>BC=5.15 ±0.3kg/cm²<br>(For WAP-5) | | | |
| 15.7. | **Make FSB Command to CCB "HIGH". Now ensure complete releasing of Brake Cylinder Pressure and Charging of Brake Pipe Pressure.** | | | | |
| 15.7.1. | BP Pressure & BC Pressure | BP=5.0± 0.1 kg/cm²<br>BC=0kg/cm² | | | |
| 15.8. | Make the EM command to CCB "LOW" for Emergency | | | | |
| 15.8.1. | BP Pressure & BC Pressure | BP <0.3 kg/cm²<br>BC=3.5 ±0.1kg/cm²<br>(For WAP-7 & WAG-9)<br>BC=5.15 ±0.3kg/cm²<br>(For WAP-5) | | | |
| 15.9. | **Now press PVEF from Activated CAB. Brake Cylinder Pressure Should not release.** | | | | |
| 15.9.1. | BP Pressure & BC Pressure | BP <0.3 kg/cm²<br>BC=3.5 ±0.1kg/cm²<br>(For WAP-7 & WAG-9)<br>BC=5.15 ±0.3kg/cm²<br>(For WAP-5) | | | |
| 15.10. | **Put Brake controller's A9 handle to "EMER" (EBV display "Safety Emer Wait")** | | | | |
| | Make the **EM command** to CCB **'HIGH'** by KAVACH module/ Test Box | | | | |
| 15.10.1. | BP Pressure & BC Pressure | BP <0.3 kg/cm²<br>BC=3.5 ±0.1kg/cm²<br>(For WAP-7 & WAG-9)<br>BC=5.15 ±0.3kg/cm²<br>(For WAP-5) | | | |
| 15.11. | Put Brake controller's A9 handle to "RUN" | | | | |
| 15.11.1. | BP Pressure & BC Pressure | BP =5.0±0.1 kg/cm²<br>BC =0 kg/cm²<br>(For WAP-7 & WAG-9)<br>BC =0 kg/cm² (For | | | |

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab-1 | Cab-2 | Remarks OK/Not OK |
|---|---|---|---|---|---|
| | | WAP-5) | | | |

16. **Test Procedure for Traction Cut-off Circuit: (Please refer to Interfacing Scheme SDO/S&T/Kavach/010.ALT-01)**

| S.No | Items/Requirements | Acceptance Criteria | Observed/ Measured Cab1 | Cab-2 | Remarks OK/Not OK |
|---|---|---|---|---|---|
| 16.1. | **Configure Locomotive as Formation. Keep A9 handle in RUN position and ensure full charging of BP. Charge the locomotive in Simulation mode with the help of shed and Operate the locomotive at 70kmph and keep throttle at 1/3rd power.** | | | | |
| 16.1.1. | BP Pressure | BP = **5.0±0**.1 kg/cm² (For WAP-5, WAP-7 & WAG-9) | | | |
| 16.2. | **Initiate Brake Test either by Switching ON and OFF of Kavach or by pressing MBT and CNFM buttons from the DMI screen.** | | | | |
| 16.2.1. | Traction Shall cut off with message "Emergency Brake Pressure Switch" in the background. | | | | |
| 16.2.2. | On completion of Brake test, the traction shall not resume automatically. Throttle needs to be brought to zero and placed again either in traction or braking side. | | | | |

17. **Braking configuration parameter**

Checksum to be tallied with approved checksum by cross checking from KAVAVH VCMS file of RDSO for that Loco and KAVACH OEM.

Checksum observed……. OK/Not OK

**Braking configuration in CCB (WAP-5, WAP-7 & WAG-9)**

| S.No | Description | Min | Max | Unit | Observed value | OK/ Not OK | Remarks |
|---|---|---|---|---|---|---|---|
| 17.1. | MR Pressure | 8 | 9.5 | Kg/cm$^2$ | | | |
| 17.2. | BP Pressure | 4.9 | 5.1 | Kg/cm2 | | | |
| 17.3. | Formation BP Pressure when NB Low(WAP-5, WAP-7 & WAG-9) | 4.3 | 4.5 | Kg/cm2 | | | |
| 17.4. | Formation BP Pressure when FSB Low(WAP-5, WAP-7 & WAG-9) | 3.3 | 3.7 | Kg/cm2 | | | |

| | |
|---|---|
| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |

| S.No | Description | Min | Max | Unit | Observed value | OK/ Not OK | Remarks |
|---|---|---|---|---|---|---|---|
| 17.5. | Formation BP Pressure when EB1 Low(WAP-5, WAP-7 & WAG-9) | 0 | 0.3 | $Kg/cm^2$ | | | |
| 17.6. | Formation BP Pressure when EB2 Low(WAP-5, WAP-7 & WAG-9) | 0 | 0.3 | $Kg/cm^2$ | | | |
| 17.7. | Formation BC Pressure in NB Low (WAP-5, WAP-7 & WAG-9) | 0.9 | 1.1 | $Kg/cm^2$ | | | |
| 17.8. | Formation BC Pressure when FSB Low (WAP-7 & WAG-9) | 2.4 | 2.6 | $Kg/cm^2$ | | | |
| 17.9. | Formation BC Pressure in EB1 Low (WAP-7 & WAG-9) | 2.4 | 2.6 | $Kg/cm^2$ | | | |
| 17.10 | Formation BC Pressure in EB2 Low (WAP-7 & WAG-9) | 2.4 | 2.6 | $Kg/cm^2$ | | | |
| 17.11 | Formation BC Pressure when FSB Low (WAP-5) | 4.85 | 5.45 | $Kg/cm^2$ | | | |
| 17.12 | Formation BC Pressure when EB1 Low (WAP-5) | 4.85 | 5.45 | $Kg/cm^2$ | | | |
| 17.13 | Formation BC Pressure when EB2 Low (WAP-5) | 4.85 | 5.45 | $Kg/cm^2$ | | | |
| 17.14 | Light Engine (high) – BP Pressure- NB Low (WAP-5, WAP-7 & WAG-9) | 4.3 | 4.5 | $Kg/cm^2$ | | | |
| 17.15 | Light Engine(high) – BP Pressure- FSB Low (WAP-5, WAP-7 & WAG-9) | 3.3 | 3.7 | $Kg/cm^2$ | | | |
| 17.16 | Light Engine(high) – BP Pressure- EB1 Low (WAP-5, WAP-7 & WAG-9) | 0 | 0.3 | $Kg/cm^2$ | | | |
| 17.17 | Light Engine(high) – BP Pressure- EB2 Low (WAP-5, WAP-7 & WAG-9) | 0 | 0.3 | $Kg/cm^2$ | | | |
| 17.18 | Light Engine(high) -BC Pressure-NB Low(, WAP-7 & WAG-9) | 0.9 | 1.1 | $Kg/cm^2$ | | | |
| 17.19 | Light Engine(high) – BC Pressure- FSB Low (WAP-7 & WAG-9) | 3.4 | 3.6 | $Kg/cm^2$ | | | |
| 17.20 | Light Engine(high) – BC Pressure- EB1 Low (WAP-7 & WAG-9) | 3.4 | 3.6 | $Kg/cm^2$ | | | |
| 17.21 | Light Engine(high) – BC Pressure- EB2 Low (WAP-7 & WAG-9) | 3.4 | 3.6 | $Kg/cm^2$ | | | |
| 17.22 | Light Engine(high) -BC Pressure-NB Low( WAP-5) | 2.01 | 2.31 | $Kg/cm^2$ | | | |
| 17.23 | Light Engine(high) -BC Pressure-FSB Low (WAP-5) | 4.85 | 5.45 | $Kg/cm^2$ | | | |



| | |
|---|---|
| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |

| S.No | Description | Min | Max | Unit | Observed value | OK/ Not OK | Remarks |
|---|---|---|---|---|---|---|---|
| 17.24 | Light Engine(high) – BC Pressure- EB1 Low (WAP-5) | 4.85 | 5.45 | $Kg/cm^2$ | | | |
| 17.25 | Light Engine(high) – BC Pressure- EB2 Low (WAP-5) | 4.85 | 5.45 | $Kg/cm^2$ | | | |



| | |
|---|---|
| Signature of firm Representative with Name, Designation & Date. | Signature of (SSE/JE Loco Shed) with Name, Designation & Date |