

**MAINTENANCE SCHEDULE**  
**FOR**  
**ONBOARD KAVACH V2.0**  
**IN**  
**WAP-4, WAP-5, WAP-7, WAG-7, WAG-9, WDM & WDG Locomotives**

**Document Number: 5 53 76 0018**

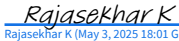




**Version: 1.0**

**Date Published: 26-04-2025**

**Prepared by**  
**HBL Engineering Ltd**  
**Hyderabad**

This Document and its content are the property of HBL Engineering Ltd who alone reserves the right for distribution, use application and reproduction.

## DOCUMENT CONTROL SHEET

#	Name	Function	Level	Signature
1	K.V. Rajasekhar	GM - TCAS Projects	Approve	 Rajasekhar K (May 3, 2025 18:01 GMT+5.5)
2	Hemant Sagade	Safety Manager	Validate	
3	Y. Subrahmanyam	General Manager - Engineering	Verify	
4	Suresh Jaluka	DGM - Loco Kavach I&C	Prepare	 Suresh Jaluka (May 3, 2025 17:05 GMT+5.5)
5	D. Lova Raju	Sr. Engineer – Engineering	Prepare	 DLRaju (May 3, 2025 16:54 GMT+5.5)

## CHANGE HISTORY

#	Name of the Document	Date	Reason for changes	Version No.
1	Maintenance Schedule for Onboard Kavach V2.0	26-04-2025	Initial Version	1.0

**REFERENCES**

#	Document Name	Document Number	Version Number/Year	Source
A	Safety and Reliability Requirements of Electronic Signaling Equipment	RDSO/SPN/144/2006	Rev 2	RDSO
B	RDSO Specification for Train Collision Avoidance System	RDSO/SPN/196/2020	4.0	RDSO
C	Railway Applications - Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS)	EN50126-1&2	1999 (with corrigendum 1-28 Feb 2007), Feb 2007	CENELEC

**Glossary of terms**

#	Abbreviation	Meaning
1	BIU	Brake interface unit
2	BP	Brake pipe
3	CAB	Cabin
4	CENELEC	European Committee for Electro Technical Standardization
5	COM/Com	Common/Communication. (The abbreviation stands for “Common” when used for describing relay contacts and stands for “communication” when used for hardware port description)
6	DC	Direct Current
7	DPS	Digital Power Supply
8	GNSS	Global navigation satellite system
9	GPS	Global Positioning System
10	GSM	Global System for Mobile Communications
11	Loco	Locomotive
12	LP-OCIP	Loco pilot’s operation cum indication panel
13	MCB	Molded circuit breaker
14	Modem	Modulator- demodulator
15	PPC	Peripheral Processing Card
16	RDSO	Research Designs and Standards Organization
17	RF	Radio Frequency
18	RFID	Radio Frequency Identification Number
19	RPS	Radio power supply
20	Rx	Receive
21	SOS	“Save our souls” a distress message
22	SPN	Specification
23	TCAS	Train Collision Avoidance System
24	VC	Vital Computer
25	VGW	Vital gateway

## Contents

<b>Glossary of terms.....</b>	<b>4</b>
<b>1.0 Purpose: .....</b>	<b>6</b>
<b>2.0 Specification.....</b>	<b>6</b>
<b>3.0 Components of Loco Kavach System:.....</b>	<b>6</b>
<b>4.0 References:.....</b>	<b>6</b>
<b>5.0 Safety instructions.....</b>	<b>7</b>
<b>6.0 Technical description of Loco KAVACH.....</b>	<b>7</b>
<b>7.0 List of special tools: .....</b>	<b>7</b>
<b>8.0 List of field replaceable spare parts: .....</b>	<b>8</b>
<b>9.0 Maintenance – Locomotive (Cabins) .....</b>	<b>10</b>
<b>10.0 Maintenance – Locomotive (Machine Room) .....</b>	<b>12</b>

**1.0 Purpose:**

- 1.1 This document provides guidelines for maintenance schedules for Onboard Kavach system along with its peripheral components.

**2.0 Specification**

- 2.1 The TCAS System has been designed to meet the RDSO Specification No: RDSO/SPN/196/2020 V4.0 Amdt 3.

**3.0 Components of Loco Kavach System:**

- 3.1 Loco Kavach System consists of the following sub-systems.

- 3.1.1 Loco Kavach Unit
- 3.1.2 Loco Pilot Operation-cum-Indication Panel (LP-OCIP)
- 3.1.3 RFID Reader
- 3.1.4 RF Communication and GPS/GSM Antennae
- 3.1.5 Pulse Generators
- 3.1.6 Speedometer Interface Unit
- 3.1.7 Brake Interface System
- 3.1.8 Other equipment
  - 3.1.8.1 EMI Filter Box
  - 3.1.8.2 Cab Input Box
  - 3.1.8.3 RFID Reader Power Supply &
  - 3.1.8.4 Radio Unit
- 3.1.9 Inter-connection Cable Assembly

**4.0 References:**

Ref #	Document title	Document number
1	Personnel Safety Instruction Manual	5 16 76 0014
2	Loco Kavach Power Supply Connectivity Diagram	5 16 49 0426
3	Loco Kavach inter connectivity diagram for E-70	5 16 49 0608
4	Loco Kavach inter connectivity diagram for CCB	5 16 49 0618
5	Loco Kavach inter connectivity diagram for IRAB	5 16 49 0619
6	Block diagram of Loco KAVACH Vital Computer	5 16 49 0628
7	Block diagram of Radio Unit	5 16 49 0629
8	Block diagram of Interface Units	5 16 49 0630
9	Inter-connection drawing from Cab Termination Unit and SB Panels E-70	5 16 49 0624

Ref #	Document title	Document number
10	Inter-connection drawing from Cab Termination Unit and SB Panels CCB	5 16 49 0625
11	Inter-connection drawing from Cab Termination Unit and SB Panels IRAB	5 16 49 0626
12	Manual for Installation of Loco KAVACH V2.0 In WAP-4, WAP-5, WAP-7, WAG-7, WAG-9, WDM & WDG Locomotives	5 53 76 0014
13	Procedure for Commissioning Kavach in Locomotives	5 53 76 0013
14	Maintenance Activities for Onboard Kavach, issued by CoE	IRISET/CoE/Kavach/Misc dated 31-01-2024

## 5.0 Safety instructions



*Maintenance of Loco TCAS and its associated sub-systems in a railway environment is prone to personnel safety risks. Instructions for personnel safety as indicated in document Personnel Safety Instruction Manual 5 16 76 0014 [Ref: 1] shall always be followed. Failure to follow these instructions will cause insurance claims to be invalid.*

**SRAC\_LOCO6:** On failure of VC module, the loco shall be sent for maintenance at the first available instance, and the faulty VC module shall be replaced as per guidelines given in the maintenance manual

## 6.0 Technical description of Loco KAVACH

- 6.1 Loco Kavach inter connectivity diagram for E-70 [Ref: 3]
- 6.2 Loco Kavach inter connectivity diagram for CCB [Ref: 4]
- 6.3 Loco Kavach inter connectivity diagram for IRAB [Ref: 5]
- 6.4 Block diagram of Loco KAVACH Vital Computer [Ref: 6]
- 6.5 Block diagram of Radio Unit [Ref: 7]
- 6.6 Block diagram of Interface Unit [Ref: 8]

## 7.0 List of special tools:

- 7.1 Power Analyser app
- 7.2 Spare cable with 14shell Male & Female cable,20mtr -1No
- 7.3 Spare cable with 12shell Male & Female cable,20mtr -1No
- 7.4 Spare GSM cable, 20Mtr – 1No
- 7.5 Spare GPS cable, 20Mtr – 1No.
- 7.6 Allen key set - 1No
- 7.7 Screwdriver set- 1No
- 7.8 Digital multi meter-1No
- 7.9 Torque wrenches up to 60N-M – 1No

**8.0 List of field replaceable spare parts:**

#	Module Name	SAP Part number	Spare part description
1	Peripheral Processing Card (PPC)	6000041106	PPC MODULE ASSEMBLY LOCO
2	Vital Computer Card (VCC)	6000030472	VCC MODULE ASSEMBLY_51690003
3	Voter Card (VTR)	6000044351	VOTER_MODULE_ASSEMBLY_LOCO
4	Vital Gate Way card (VGW)	6000054725	VITAL_GATEWAY_MODULE_ASSEMBLY_LOCO
5	CAB INPUT	6000030476	CAB INPUT MODULE ASSEMBLY_51690007
6	Radio Power Supply (RPS)	6000032843	PPCB_RADIO_POWER_SUPPLY_LOCO
7	RADIO	1000024985	GUARDIAN RADIO MODEM_10W RF POWER_CALAMP
8	Digital Power Supply-1 (DPS-1)	6000033735	MODULE DIGITAL POWER SUPPLY DPS1-ELECT
9	Digital Power Supply-2 (DPS-2)	6000033736	MODULE DIGITAL POWER SUPPLY DPS2-ELECT
10	Driver Machine Interface (DMI) Unit	6000043167	OCIP_DMI_UNIT
11	Speedometer-1 (SPD-1)	6000052976	SPEEDO-METER_UNIT-1_ASSY_KAVACH_4.0
12	Speedometer-2 (SPD-2)	6000052977	SPEEDO-METER_UNIT-2_ASSY_KAVACH_4.0
13	CAB INPUT BOX	6000054464	CAB_INPUT_BOX_E70_ASSY_KAVACH_4.0
14	Electro Magnet Interference (EMI) FILTER card	6000032852	PPCB_EMI_LINE_FILTER_ELECT
15	Radio Frequency Identifier Power Supply Unit (RFID PSU)	6000033492	RFID_POWER_SUPPLY_MODULE
16	RFID READER UNIT	6000051262	RFID_READER_UNIT_HBL
17	GPS+GSM ANTENNA	6000050102	GPS_GSM_UNIT_ASSEMBLY



18	Relay Interface Box (RIB)	6000044546	RELAY INTERFACE BOX E70 ASSY KAVACH 4.0
19	LOCO ANTENNA	6000049391	LOCO KAVACH ANTENNA HBL UHF-OMNI-LOCO-03
20	Pulse Generator (PG)	6000052789	PULSE_GENERATOR_UNIT_KAVACH_4.0
21	GSM Antenna Cable (LMR200)	6000058270	CABLE_ASY_LMR200_GSM A_15M_516490596
		6000058271	CABLE_ASY_LMR200_GSM B_23M_516490597
22	GPS Antenna Cable (LMR200)	6000058268	CABLE_ASY_LMR200_GPS A_15M_516490594
		6000058269	CABLE_ASY_LMR200_GPS B_23M_516490595
23	RF Antenna Cable (LMR400)	6000058272	CABLE_ASY_LMR400_RD-A RX_15M_516490598
		6000058273	CABLE_ASY_LMR400_RD-A TX_15M_516490600
24	BIU Signal Cable (MC5 to MC15)	6000058274	CABLE_ASY_LMR400_RD-B RX_23M_516490601
		6000058275	CABLE_ASY_LMR400_RD-B TX_23M_516490602
25	DMI Interface Cable (MC1 to MC11) & MC3 to MC13)	6000032084	CABLE ASY_OCIP/DMI-A SIG(10P)_516490011
		6000032086	CABLE ASY_OCIP/DMI-B SIG(10P)_516490013
26	RFID PS to READER Interface Cable	6000057978	CABLE ASY RFID A CN1_CN2_18M_516490575
		6000057979	CABLE ASY RFID B CN1_CN2_28M_516490576
27	TCAS to RFID PS Interface Cable (MC6 to MC19) & (MC7 to MC20)	6000032088	CABLE ASY_RFID READER-A_516490015
		6000032089	CABLE ASY_RFID READER-B_516490016
28	Speedometer Interface Cable (MC8 to MC21) & MC22 to MC23)	6000032090	CABLE ASY_SPEEDO METER_516490017
		6000056486	CABLE ASSY_SPEEDO METER B_516490537
29	CAB Input Interface cable	6000032091	CABLE ASY_CAB TERMINATION_516490018

## 9.0 Maintenance – Locomotive (Cabins)

Maintenance activities during minor/major schedules in locomotives equipped with Kavach(TCAS)										
	Loco No :	Date:				Identified Schedule in which the activity shall be carried out				
S.No	Description of the Equipment	Parameter for quality check	Details of work done		Remarks	Trip	IA/IB	IC	TOH/	IOH/
			Cab 1	Cab 2					AOH	POH
9.1	Locomotive (Cabin)									
9.1.1	LPOCIP	Cleanliness				✓	✓	✓	✓	✓
9.1.2		Physical condition				✓	✓	✓	✓	✓
9.1.3		Fixing condition					✓	✓	✓	✓
9.1.4		Open all couplers and check the intactness of couplers and its pins.							✓	✓
	Brake interface									
9.2	E-70 Brake System									
9.2.1	Interface Relay Unit	Intactness of Mounting					✓	✓	✓	✓
9.2.2		Intactness of connectors					✓	✓	✓	✓
9.2.3		Visually inspect the condition of Relays inside interface relay unit for any sulphation marks								✓
9.2.4	EM valve (E-70) (both CAB1 and CAB2)	Air leakage					✓	✓	✓	✓
9.2.5		Wiring terminations					✓	✓	✓	✓
9.2.6		Cleanliness					✓	✓	✓	✓
9.2.7	EM valve isolating cock	Air leakage					✓	✓	✓	✓
9.2.8		Cleanliness					✓	✓	✓	✓
9.2.9		Labelling OK						✓	✓	✓
9.3	CCB Brake System									

Maintenance activities during minor/major schedules in locomotives equipped with Kavach(TCAS)										
	Loco No :	Date:				Identified Schedule in which the activity shall be carried out				
S.No	Description of the Equipment	Parameter for quality check	Details of work done		Remarks	Trip	IA/IB	IC	TOH/	IOH/
			Cab 1	Cab 2					AOH	POH
9.3.1	Train Protection Module (CCB)	Intactness of Mounting					✓	✓	✓	✓
9.3.2		Intactness of connectors					✓	✓	✓	✓
9.3.3	SIFA magnet valve (CAB-1 only)	Air Leakage					✓	✓	✓	✓
9.3.4		Wiring terminations/connections					✓	✓	✓	✓
9.3.5		Cleanliness					✓	✓	✓	✓
9.3.6	Testing of Transducers (Cab-1 only)	Ensure proper recording of pressures through Transducers by comparing with Data logging in Onboard Kavach. (Cab-1 only)						✓	✓	
<b>9.4</b>	<b>Horn</b>									
9.4.1	Horn Circuit	Check the proper condition of Horn EP coil piping							✓	✓
9.4.2		Check working of Horn Isolation Cock for any leakage							✓	✓
<b>9.5</b>	<b>Underframe</b>									
9.5.1	RFID Reader	Cable Conduit clamping condition				✓	✓	✓	✓	✓
9.5.2		RFID Reader Mounting fixture welding Intactness (visual check)				✓	✓	✓	✓	✓
9.5.3		Ensure intactness of welding by Magnetic particle testing/DPT						✓	✓	✓
9.5.4		Availability and intactness of Sling for RFID Reader					✓	✓	✓	✓
9.5.5		Intactness of Guard for RFID reader					✓	✓	✓	✓

## 10.0 Maintenance – Locomotive (Machine Room)

Maintenance activities during minor/major schedules in locomotives equipped with Kavach(TCAS)									
	Loco No:	Date:			Identified Schedule in which the activity shall be carried out				
S No.	Description of the Equipment	Parameter for quality check	Details of work done( only one item per locomotive)	Remarks	Trip	IA/IB	IC	TOH/ AOH	IOH/ POH
<b>10.1</b>	<b>Locomotive (Machine Room)</b>								
10.1.1	Onboard Kavach	Cleanliness				✓	✓	✓	✓
10.1.2		Physical condition				✓	✓	✓	✓
10.1.3		Intactness of Connectors and Couplers				✓	✓	✓	✓
10.1.4		Fixing condition				✓	✓	✓	✓
10.1.5		Feeding/ensuring of correct wheel dia. As per the wheel dia. Measurement carried out by Shed				✓	✓	✓	✓
10.1.6		Remove all connectors/couplers and examine the intactness of connectors/couplers						✓	✓
10.1.7	Counter Readings	Note EB counter reading				✓	✓	✓	✓
10.1.8		Note Isolation counter reading				✓	✓	✓	✓
10.1.9		Note SOS counter reading				✓	✓	✓	✓
10.2.1	Radio Unit	Cleanliness			✓	✓	✓	✓	✓
10.2.2		Physical condition			✓	✓	✓	✓	✓
10.2.3		Fixing condition				✓	✓	✓	✓
10.2.4		Open all couplers and check the intactness of couplers and its pins.						✓	✓
10.3.1	CAB Input Box	Cleanliness				✓	✓	✓	✓
10.3.2		Physical condition				✓	✓	✓	✓
10.3.3		Intactness of Connectors and Couplers				✓	✓	✓	✓
10.3.4		Fixing condition				✓	✓	✓	✓

Maintenance activities during minor/major schedules in locomotives equipped with Kavach(TCAS)									
	Loco No:	Date:			Identified Schedule in which the activity shall be carried out				
S No.	Description of the Equipment	Parameter for quality check	Details of work done( only one item per locomotive)	Remarks	Trip	IA/IB	IC	TOH/ AOH	IOH/ POH
10.4.1	E70/CCB Interface Unit(If applicable) (HBL)	Cleanliness				✓	✓	✓	✓
10.4.2		Physical condition				✓	✓	✓	✓
10.4.3		Intactness of Connectors and Couplers				✓	✓	✓	✓
10.4.4		Fixing condition				✓	✓	✓	✓
10.4.5	MCBs (2 nos.)	Check Working and Tripping of MCBs on Test Bench						✓	✓
10.4.6	LE Valve (E-70 )	Fixing condition						✓	✓
10.4.7		Overhauling of LE Unit						✓	✓
10.5	<b>IRAB panel (HBL) (Machine room)</b>								
10.5.1	BIU in machine room (HBL)	Intactness of Mounting				✓	✓	✓	✓
10.5.2		Intactness of connectors				✓	✓	✓	✓
10.5.3		Visually inspect the condition of sensors for any sulphation marks							✓
10.5.4	Isolation switch (on BIU) (HBL)	Switch Working (Service/Isolation)				✓	✓	✓	✓
10.5.5		Counter (Incrementing or Not incrementing whenever system is isolated)				✓	✓	✓	✓
10.5.6		Labelling OK					✓	✓	✓
10.5.7	MR and BP isolating cocks	Air leakage				✓	✓	✓	✓
10.5.8		Cleanliness				✓	✓	✓	✓
10.5.9		Labelling OK				✓	✓	✓	✓
10.6	<b>Underframe</b>								

Maintenance activities during minor/major schedules in locomotives equipped with Kavach(TCAS)									
	Loco No:	Date:			Identified Schedule in which the activity shall be carried out				
S No.	Description of the Equipment	Parameter for quality check	Details of work done( only one item per locomotive)	Remarks	Trip	IA/IB	IC	TOH/ AOH	IOH/ POH
10.6.1	Speed Sensor I	Visual check of Speed Sensor Cables			✓	✓	✓	✓	✓
10.6.2		Physical condition of PG mounting and Speedometer I			✓	✓	✓	✓	✓
10.6.3		Remove the speed sensor and clean any excess grease					✓	✓	✓
10.6.4	Speed Sensor II	Visual check of Speed Sensor Cables			✓	✓	✓	✓	✓
10.6.5		Physical condition of PG mounting and Speedometer II			✓	✓	✓	✓	✓
10.6.6		Remove the speed sensor and clean any excess grease					✓	✓	✓
10.7	<b>Roof</b>								
10.7.1	GSM/GNSS(GPS) Combined antenna on roof	Physical condition				✓	✓	✓	✓
10.7.2		Cable conduit clamping condition				✓	✓	✓	✓
			Antenna-1	Antenna-2					
10.7.3	RF Antennae on Roof of CAB1	Physical condition				✓	✓	✓	✓
10.7.4		Cable Conduit clamping condition				✓	✓	✓	✓
10.7.5		Checking Reverse Power status				✓	✓	✓	✓
10.7.6	RF Antennae on Roof of CAB2	Physical condition				✓	✓	✓	✓
10.7.7		Cable Conduit clamping condition				✓	✓	✓	✓
10.7.8		Checking Reverse Power status				✓	✓	✓	✓
10.7.9	System Functionality	Testing as per the Station Kavach Layout in Shed(in Trip sheds subject to availability of Station Kavach)			✓	✓	✓	✓	✓