सत्यमेव जयते

GOVERNMENT OF INDIA

(भारत सरकार)

MINISTRY OF RAILWAYS

(रेल मंत्रालय)

Annexure – J

Specification of KAVACH (The Indian Railway ATP)- Remote Interface Unit

(Amdt-3)

Issued by

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Amendment History:

Amdt	Date of issue	Amendment
---	30-05-2022	First issue
1	31.05.2023	• Following clauses are deleted for conformity J4.1, J4.2, J.6, J.7.1, J 8.1 • Follwing clauses corrected for conformity J.6.3 • Clause newly added, The operating principle of handover shall be as per Annexure-P.
2	14.11.2023	CL J 2.4 – MA in sections is made configurable as per railways choice. The word **"for cases where no signals are available"** is deleted**.** Cl J 3.8 – Old Cl J 3.9 to Cl J 3.13 are made as sub clauses of Cl 3.8 and are renumbered to Cl J 3.8.1 to Cl J 3.8.5. Cl. J 3.8.1 – Clause is modified with addition operating voltage of charger input for 230V AC/110 VDC. Cl J 3.9 – Renumbered from Cl J 3.14 to Cl J 3.9. Old Cl J 3.15 to Cl J 3.19 are made as subclauses of Cl J 3.9 and renumbered to Cl. J 3.9.1 to Cl. J 3.9.5 Cl. J 3.9.2 – The clause is modified as "The connection between RIU and the ~~adjacent~~ stationary KAVACH shall be through a dedicated dark fibre in redundant manner." Cl J 4.2 – The clause is modified as: "The Radio Signal Strength of both the handing over station and taking over station at the border tag ~~overlap zone~~ shall be above 70 dBm" Old Cl. J 5 – Handling of MA, Track Profile, TSR and Signal Aspect deleted. Susbequent clauses are renumbered accordingly. Cl. J 6.1- The Onboard KAVACH shall be able to display the deduced signals based on the track section status communicated by Stationary KAVACH.
3	03.07.2024	Cl. J2.4 modified as "The movement authority for the corresponding signal aspect and/or track occupancy status based on aspect control chart or rules of operation to be mentioned in sections". Cl J2.5 Modified with addition of IB/Gate Signal. ClJ2.9 The word is deleted. Cl J3.9.2 Modified with addition of "If additional converters/modems are used, necessary environmental testing certificate shall be submitted by the firm". Cl J3.9.3 Modified with addition of "Necessary logging of switching the communication link shall be ensured".

		Cl J7.1 Modified with addition of 'if hut is not available'.

J.1 **Scope: -**This document refers to requirement of Remote interface unit which can be installed in auto, IB or gate signal etc.

J.2 **Requirements for adapting KAVACH to Auto Signaling Territory:**

J 2.1. In an Auto Section, signals are set up and cleared autonomously by track occupancy detection systems.

J 2.2. ILLUSTRATIVE DIAGRAMS: Automatic change of sequence of aspects behind the train in three-aspect and four-aspect signalling is illustrated in the following diagrams, which are not drawn to scale.

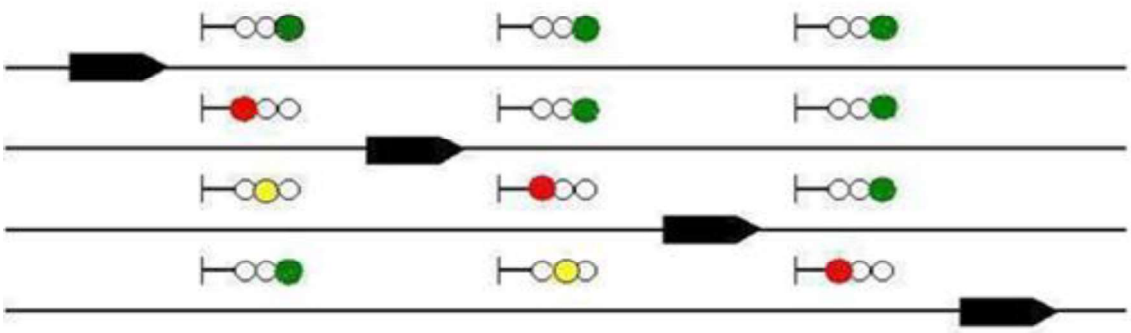


Figure 1 Automatic change of sequence of aspects behind the train in Three Aspect Signalling Territory

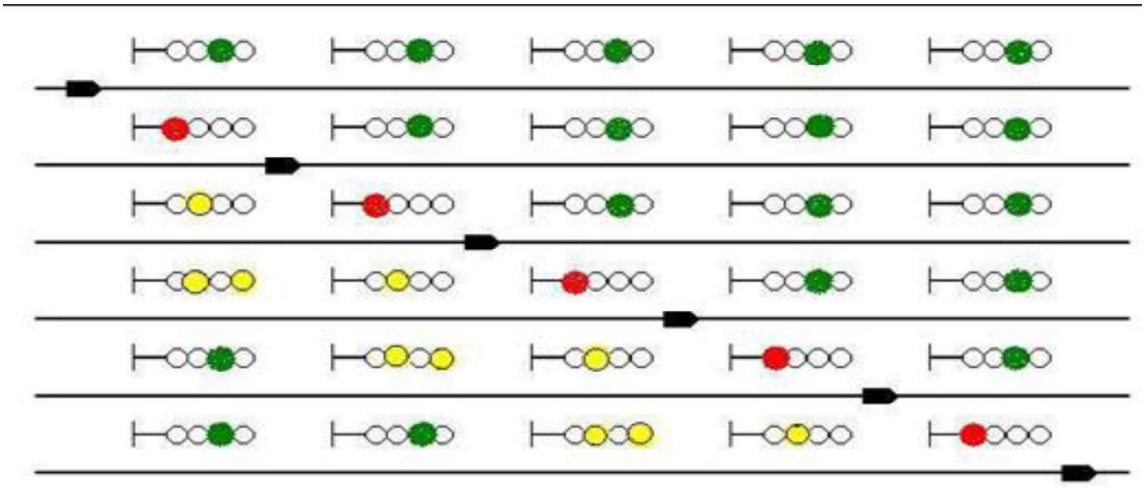


Figure 2 Automatic change of sequence of aspects behind the train in Four Aspect Signalling Territory:

J 2.3. For adapting KAVACH to an Auto section, it is necessary to communicate the signal aspects or / and Track occupancy status to Stationary KAVACH, which then determines movement authority and communicates the same to the Onboard KAVACH on radio.

J 2.4. The movement authority for the corresponding signal aspect and/or track occupancy status based on aspect control chart or rules of operation to be mentioned in sections.

J 2.5. The status of signal aspects in Auto section/IB/Gate Signal shall be gathered by a Remote Interface Unit (RIU) and communicated to the Stationary KAVACH on a redundant optical fiber cable.

J 2.6. In the case of single line working, KAVACH shall extend Movement Authority after ensuring the establishment of direction of traffic and all stop signals (if available) against the established direction shall be at ON.

J 2.7. The modified automatic signal working as per General Rules shall also be applicable for KAVACH in both single line as well as double line working. IB like working with ignoring signal foot tags at other signals to be ensured.

J 2.8. It shall be possible to pass a Semi-Automatic Stop signal at 'ON' by taking 'Off' the Calling-on signal fixed below it**.**

J.3 Interface Requirements:

J 3.1. Remote Interface unit shall have provision to interface only on redundant OFC Dark fiber for connectivity with Station/LC/IBS Vital Computer.

J 3.2. Stationary KAVACH shall be able to connect minimum 06 Remote Interface Units in one direction (up & down towards one side of a station is considered as one direction). Stationary KAVACH shall be able to handle minimum 06 directions. Demonstration for various combinations of routes (Single/Double/Triple/Quadruple sections) shall be carried through functional testing by defining appropriate test cases.

J 3.3. Remote Interface units shall be connected in ring fashion and they shall be able to communicate to Stationary KAVACH in case of failure of Main Path. Stationary KAVACH shall be intimated about the failure of Main/Stand-by Path failure by the Remote Interface Unit. This failure shall be intimated to NMS through Stationary KAVACH.

J 3.4. Communication between RIU and Stationary KAVACH shall comply with EN 50159 (closed) Standards.

J 3.5. The cyclic redundancy check for the communication protocol shall be complying with the requirements of EN 50159 (Closed).

J 3.6. Failure of primary or secondary communication links shall be logged in KAVACH NMS and also communicated through SMS.

J 3.7. All the Hardware and Software employed in RIU shall be certified for EN 50126, EN 50128, EN 50129 and EN 50159 for SIL-4.

J 3.8. **Power Supply, Surge Protection and Ground:**

J.3.8.1. In RE area: - Each RIU shall be fitted with a battery backed power supply with minimum 2 hours (Two Hour) with two chargers & designed to receive an input voltage of 230V AC/110 VDC. The power demand of RIU shall be as low as possible. The responsibility of power supply compatibility is with OEM. The RIU shall operate without any problem, even if the Neutral to Earth voltage is

as high as possible. Since, RIUs are connected through a power cable, where N-Earth and P-Earth and P-N insulation is prone to be low and hence, firms shall specify the recommended, minimum, and maximum permitted values of these with documental evidence. These parameters and min N-Earth voltage, min, max and recommended mains voltage shall be included in the pre-commissioning check list

J.3.8.2. In Non-RE area: - The power supply arrangement shall be decided by the PCSTE of the zonal Railway The battery backup shall comply with EN 50121-4 and RDSO/SPN/144 standards. The battery shall with stand for temperatures up to 60°C.

J.3.8.3. The battery charger shall have provision to generate alarms for AC Input fail, Charger fail and low battery. These alarms shall be integrated with RIU. It shall be possible to generate SMS of these alarms from NMS.

J.3.8.4. The surge protection arrangements for all the incoming and outgoing cables shall be provided as per RDSO latest applicable guidelines/specifications.

J.3.8.5. The Grounding arrangements are required to be provided as per RDSO latest specifications and as per the equipment requirements.

J 3.9. **Other Important features**:

J.3.9.1. The RIU shall have provision to Interface stationary KAVACH in two different paths for connecting to the Stationary KAVACH in the redundant manner

J.3.9.2. The connection between RIU and the stationary KAVACH shall be through a dedicated dark fibre in redundant manner. If additional converters/modems are used, necessary environmental testing certificate shall be submitted by the firm.

J.3.9.3. The failure of the communication link with one RIU shall not result in failure of subsequent Remote Interface Units. Necessary logging of switching the communication link shall be ensured.

J.3.9.4. Module wise health monitoring shall be made available at NMS through Stationary KAVACH.

J.3.9.5. Since Remote Interface unit is to be provided near track side, all plug-in connectors used, including OFC, shall have a locking arrangement, conforming to suitable international industrial / automotive / railway specifications or standards. The connectors shall have locks to retain the connection under vibration. They shall be keyed in order to prevent connection in wrong orientation.

J.4 Handing Over to Next Station seamlessly:

J 4.1. The operating principle of handover shall be as defined in Annexure-P.

J 4.2. The Radio Signal Strength of both the handing over station and taking over station at the border tag shall be above 70 dBm. If this signal strength is not achievable, then additional Stationary KAVACH shall be planned in the block section.

J 4.3. The time slot distribution charts shall be prepared for the maximum design limit and functional testing for the same shall be carried out.

J.5 Tags:

J 5.1. As far as possible, the adjustment of variation in actual distance to railway specified distance is to be carried out in the Normal tags.

J 5.2. The maximum distance correction to be incorporated in the Normal tag shall be restricted to 20m.

J 5.3. If the distance adjustment is required to be done beyond 20m, then adjustment tags shall be provided. The ISA assessment during the application safety case shall deliberate on this aspect and Hazard analysis for the same shall be carried out. This issue is also required to be taken into consideration during pre-installation check.

J.6 Implementation without Line Side Signals:

J 6.1. The Onboard KAVACH shall be able to display the deduced signals based on the track section status communicated by Stationary KAVACH. The possibility of display of deduced signals is left to the choice of Zonal Railway.

J.7 Installation

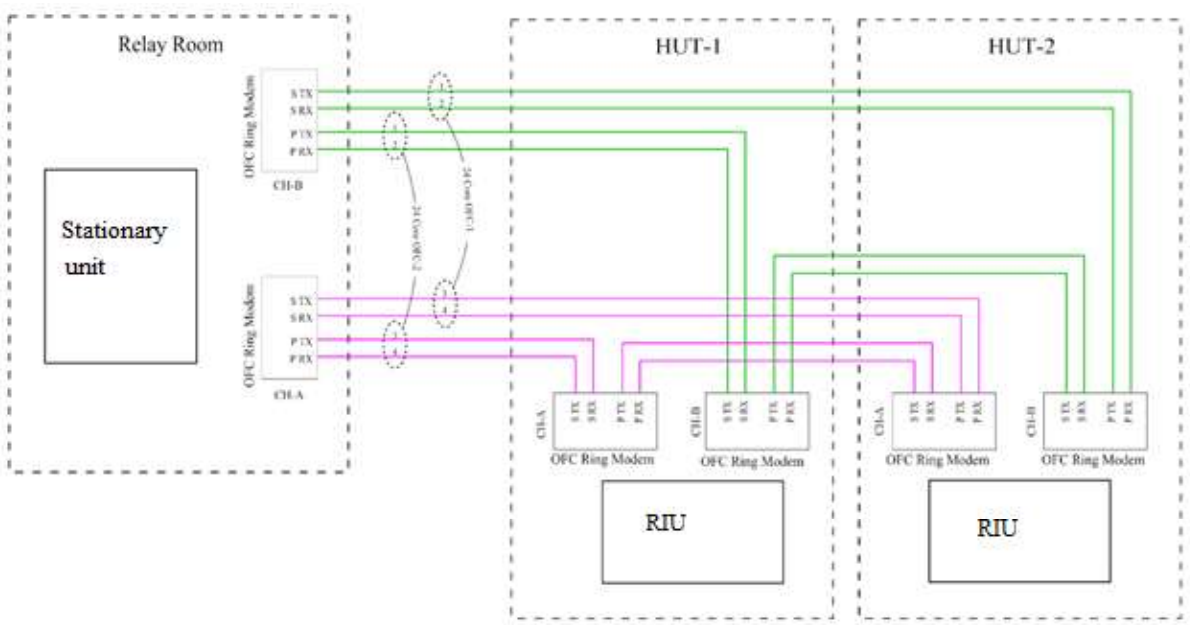
J 7.1. The Remote Interface Units shall be installed in Double-walled Apparatus Case with proper canopy if hut is not available.

J 7.2. The Apparatus case shall be painted with coolant paint.

J 7.3. The developing firm shall furnish the Layout of equipment in Apparatus Case.

J 7.4. Redundancy with monitoring shall be provided for Power and Communication channels.

J 7.5. The Apparatus case shall have provision of lighting and a laptop charging point.



Typical wiring diagram