CHAPTER

6 Remote Interface Unit (RIU) used in KAVACH

6.0 Introduction

Refers to requirement of Remote interface unit which can be installed in auto, IB or gate signal etc. Requirements for adapting Kavach to Auto Signaling Territory. In an Auto Section, signals are set up and cleared autonomously by track occupancy detection systems.

6.1 Remote Interface Unit (RIU)

The following criteria shall be adopted for provision of **RIU**:

1. In case where concerned repeaters for signals of End Cabins/Distributed Interlocking/LC Gate/IB are not available at station, but radio signal strength of station Kavach tower is adequate at said End Cabins/Distributed Interlocking/LC Gate/IB location, separate Kavach RIU unit shall be installed at such location to bring the aspects over OFC to the nearby station whose radio tower is to be used. OFC Cable from Station Kavach to RIU (at LC/IB/cabin) in diverse path has to be laid to increase the availability of the network.
2. In case the signal strength is not adequate at locations such as mid-section LC Gate/IB, separate Station Kavach unit and tower to be installed at the said LC/IB location
3. The locations of such installations shall be finalized based on the findings of RSSI signal strength survey,
4. As a thumb rule, RIU may be placed at all LC locations which are less than 5 km from station. This is because radio signal strength may be adequate at such locations. For LC gates, which are more than 5 kms from station and radio signal strength is weak, separate Kavach unit and Tower may be installed.
5. In double distant territory, where distant or inner distant signal aspect is not available at station, the same shall be extended to approaching station by laying of cable. Cable for this purpose will be supplied by the Railways. Alternately,

the aspects of these permissive signals can be detected. The Railway will decide which option to exercise.

6. Suitable RIUs shall be provided in Automatic block section where Automatic Signalling is implemented by providing Signal Interlocking circuits in location boxes or Auto huts provided near signal posts to capture signal aspects. These RIUs shall be connected to a centralized Stationary Kavach unit to ensure functioning of Kavach in Automatic Signaling territory. Suitable power supply arrangement for RIUs is to be done by the concerned agency for this purpose.

6.2 Illustrative Diagrams

Automatic change of sequence of aspects behind the train in three-aspect and four-aspect signaling is illustrated in the following Figures 6.1 and 6.2.

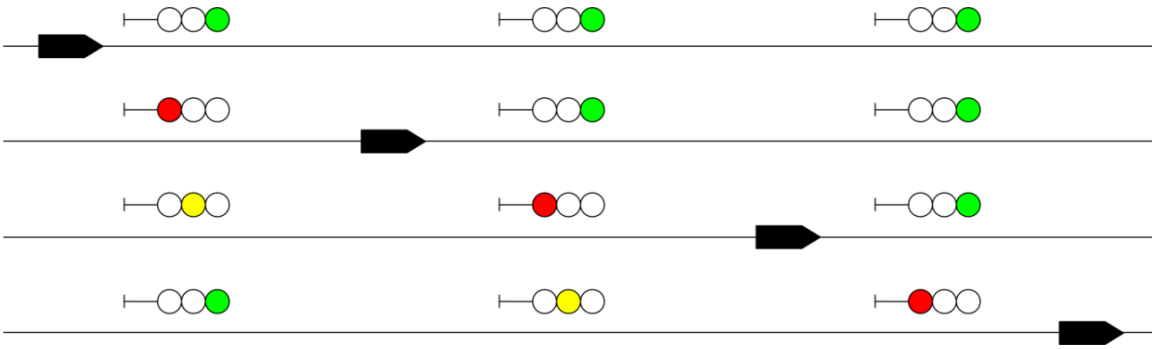

Fig. 6.1 Automatic change of sequence of aspects behind the train in Three Aspect Signalling Territory

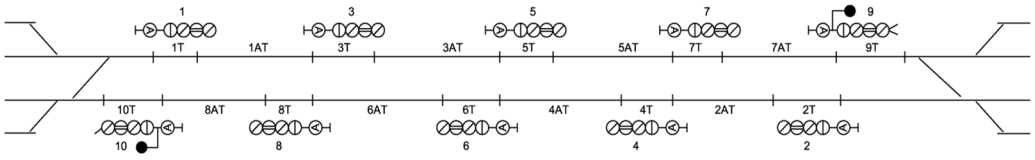

Fig. 6.2 Automatic change of sequence of aspects behind the train in Four Aspect Signalling Territory

- 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 Loco Kavach on radio.
- If the signal is at OFF and linked, loco shall transit to FS mode after passing the signal foot tag.
- If the signal is at OFF and not linked, loco shall transit to LS mode if SSP is available else transit to SR mode after passing the signal foot tag.

- If another Kavach equipped loco is ahead of the loco, the signal aspect & MA shall not be linked to the rear loco in OS mode.
- 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.
- 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 working with ignoring signal foot tags at other signals to be ensured.
- To pass a Semi-Automatic Stop signal at 'On' by taking 'Off' the Calling-on signal fixed below it, CAS shall follow the operation prescribed in Kavach specification.

6.3 Interface Requirements

- Remote Interface unit shall have provision to interface only on redundant OFC Dark fiber for connectivity with Station/LC/IBS Vital Computer.
- 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) shall be carried through functional testing by defining appropriate test cases.
- Interface Unit. This failure shall be intimated to NMS through Stationary Kavach. 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
- Communication between RIU and Stationary Kavach shall comply with EN 50159 (closed) Standards or equivalent standards\
- The cyclic redundancy check for the communication protocol shall be com- plying with the requirements of EN 50159 (Closed).
- Failure of primary or secondary communication links shall be logged in Kavach NMS and also communicated through SMS.
- All the Hardware and Software employed in RIU shall be certified for EN 50126, EN 50128, EN 50129 and EN 50159 for SIL-4.Power Supply, Surge Protection and Ground

6.4 In Railway Electrification (RE) Area

Each RIU shall be fitted with a battery backed power supply with minimum 2 hour (Two Hour) with two chargers &, designed to receive an input voltage of 230V AC. 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 checklist

6.5 In Non Railway Electrification (Non-RE) RE Area

- The power supply system in Non-RE area should be provided with proper backup. The battery backup shall comply with EN 50121-4 or equivalent standards and RDSO/SPN/ 144 standards. The battery shall with stand for temperatures up to 60°C.
- 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.
- The surge protection arrangements for all the incoming and outgoing cables shall be provided as per RDSO latest applicable guidelines/specifications.
- The Grounding arrangements are required to be provided as per RDSO latest specifications and as per the equipment requirements.

6.6 Other important features

- The RIU shall have provision to Interface stationary Kavach in two different paths for connecting to the Stationary Kavach in the redundant manner
- The connection between RIU and the adjacent stationary Kavach shall be through a dedicated dark fiber in redundant manner.
- The failure of the communication link with one RIU shall not result in failure of subsequent Remote Interface Units.
- Module wise health monitoring shall be made available at NMS through Stationary Kavach.

6.7 Handing Over to Next Station seamlessly

- The communication mandatory overlap zone where Loco is handed over and taken over shall consider minimum two Auto signals to be wired to both stationary Kavach units. In the overlap section, both the stations will communicate with Loco Kavach. Loco Kavach should set up the communication based on the approaching Station ID. Once communication is set up, Loco Kavach should ignore the radio packets coming from previous station.
- Signal whose aspects are to be shared by the handing over station and taking over station shall be wired to two Remote Interface Units. Two such signals per line shall be wired to each stationary Kavach through RIU inside the over- lap zone. Each Remote Interface Unit shall be wired to handing over station and taking over station respectively.

- In Loco Moving Direction, handing over station shall wire the taking over station's first auto signal as overlap and communicate it is signal aspect before taking over stationary Kavach establishes communication with Loco.
- The Radio Signal Strength of both the handing over station and taking over station at the overlap zone shall be above -85dBm. If this signal strength is not achievable, then additional Stationary Kavach shall be planned in the block section.
- The time slot distribution charts shall be prepared for the maximum design limit and functional testing for the same shall be carried out.

6.8 Handling of MA, SSP, TSR and Signal Aspect

I.	Movement Authority	Suppose XXXX m is available.	XXXX m is to be retained.	If YYYYY m is received and same is to be followed.
II.	SSP/TSR	Suppose Profile X is available.	Profile X is retained	If Profile Y is received, The profile X and Y are required to be superimposed to get a Continuous profile.
III.	Signal Aspect	Aspect is available	Aspect is to be retained on DMI (at least for 6 sec)	New aspect of Signal received shall be shown on DMI

Limited Supervision Time Out:

- In case of retaining the time out of 30 seconds, the firm shall carry out assessment primarily for this activity alone.

6.9 Tags

- Normal Tags only can be linked. Hence, to ensure linking up to the nearest location to the approaching signal, Normal Tags shall be provided in lieu of Signal Approach Tag.
- As far as possible, the adjustment of variation in actual distance to railway specified distance is to be carried out in the Normal tags.
- The maximum distance correction to be incorporated in the Normal tag shall be restricted to 20m.
- If the distance adjustment is required to be done beyond 20m, then adjustment tags shall be provided and Non-Communication Zone shall be introduced to avoid un-necessary emergency braking. 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.

6.10 Implementation without Line Side Signals

- Three track sections beyond the boundary of the Handing over stationary Kavach are required to be considered for determination of movement authority.
- The Loco Kavach shall be able to display the deduced signals based on the track section status. The possibility of display of deduced signals is left to the choice of Zonal Railway.

6.11 Installation

- The Remote Interface Units shall be installed in Double-walled Apparatus Case with proper canopy.
- The Apparatus case shall be painted with coolant paint as circulated by RDSO letter no. STS/E/Apparatus case (fabricated)/Vol II dated 06.06.2012.orlatest
- The developing firm shall furnish the Layout of equipment in Apparatus Case. Redundancy with monitoring shall be provided for Power and Communication channels.
- The Apparatus case shall have provision of lighting and a laptop charging point.

6.12 Criteria for Approval

- Detailed User, Installation and Maintenance manual along with pre- installation, pre-commissioning and Maintenance check lists shall be sub- mitted. Firms shall use these documents during the trials and shall place these documents at the respective stations. The utility of these documents shall be cross checked before the trials are allowed by RDSO. In case of in- sufficiency, the trial would not be permitted. The card wise power supply requirement shall be submitted.
- The RFID layouts, Kavach control table and wiring diagrams shall be got approved before the start of the trial.
- The dimensions of RIU and proposed Apparatus case along with installation details shall be submitted.
- Since, the equipment is to be provided near track side, all plug-in connectors used, including OFC, shall have a locking arrangement, conforming to suit- able 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.
- Type testing as per RDSO/SPN/144/2006 shall be carried out for all the equipment including FMS, Communication Modem, Remote Interface Unit and Charger treating this equipment as track side. For battery the highest operating temperature shall be limited to 60°C.