सत्यमेव जयते

GOVERNMENT OF INDIA

(भारत सरकार)

MINISTRY OF RAILWAYS

(रेल मंत्रालय)

Annexure – H

KAVACH
RFID Tag-TIN Layout Guidelines

(Amdt-5)

Issued by

S & T DIRECTORATE
RESEARCH, DESIGNS & STANDARDS ORGANISATION
MINISTRY OF RAILWAYS
MANAK NAGAR
LUCKNOW – 226 011

Amdt	Date of issue	Amendment
1.d	29.12.2022	Cl. H2.1-New clause added for version control. Cl.H2.6 – Signal foot Tag to be provided at the Ends of berthing track (may be with shunt signal sometimes). Cl. H2.7- Deleted. Cl. H2.8- The clause modified as "Normal tag shall be provided at distance of 150-250 meter (Preferably 200 meter)". Cl. H2.9 –Deleted. Cl.H2.11-The clause modified as "To demarcate TIN sections, TIN discrimination Turnout tags". Cl. H2.13 – The clause is modified as- "Location adjustment or Junction requirement are to be provided with Normal Tag where require". Cl. H2.14- The following text is added in clause "Minimum 2 sets of Tags shall be provided as exit tag. The 1st Exit RFID shall be programmed with Communication in Direction of entry & no communication in direction of exit and 2nd exit Tag shall be programmed with no communication required in both directions". Cl. H2.16- The clause is modified as "The duplicate RFID tag shall be installed minimum distance of 3 meter to 5 meter except turn out RFID tag. The turn out RFID tag shall be in same absolute location". Cl. H2.17 - New clause regarding border RFID Tag is added. Cl. H2.22 – The clause is modified to indicate notation for different types of Tag as per placement. Cl. H2.23, H2.25 and H2.26 are deleted. Cl. H2.27:- clause modified to accommodate TIN range upto -255. Cl. H2.31- Absolute location of Stop Board and BSLB to be mentioned in RFID Tag layout. Template for RFID layout is added after correction.

2	14.02.2023	Cl.H2.8- modified as correction as "Normal or LC Gate tag shall be provided between 150-250 meters in approach to all Main Signals (Preferably 200 meter). Cl. H2.10 – Deleted. Cl. H2.13 –Deleted. Cl. H2.14- Modified with addition of "Exit Tag may be provided at a distance of 20m". Cl. H2.15-modified as "The minimum distance between Tag set (Main & Duplicate) to Tag set (Main & Duplicate) shall be greater than 10 m. Cl. H2.13- New clause added with new numbering. Cl. H2.14- New clause added- Tag legend in RFID TIN Layout with new numbering. Cl. H2.17- modified with addition of definition.
3	08.08.2023	**Cl. H2.7 -Exception**: The minimum distance can be less than 150 reckoned for Advanced Starter or Intermediate Starter. **CL. H2.15- Exception:** If two stations are having overlap of signal, then border tag is defined.
4	14.11.2023	Cl. H2.5- The clause modified with addition of consecutive. The following is further added "All the tags are to be linked and Stationary Kavach shall communicate to Onboard Kavach." Cl. H2.8- modified as follows: "To demarcate TIN sections, TIN discrimination Turnout tags i.e. TIN demarcation type Normal Tag, Inline section type Normal tag, Signal Foot type Normal Tag and Gate tag shall be placed as per the feasibility. Cl. H2.10- Exit Tag may be provided at a distance of not less than 10m. Cl. H2.11- modified The TIN discrimination/turn out and adjustment/Junction RFID Tag shall be in same absolute location. Cl. H2.12- modified for minimum distance between Tag Set (main & duplicate) to Tag Set (main & Duplicate) shall not be less than 10 m.
5	03.06.2024	CL. H2.10- New clause added as "LC gate tag (optional) shall be provided at both sides of LC gate as required by operating Railway". CL. H2.11- Clause modified with addition of note for conformity and implementation of exit tag. CL.H2.12- Clause added with description of adjustment tag data programming with example. CL.H2.21- Tag notation for "Dead stop Tag" added.

H1 **Introduction**

H1.1 This document presents the guidelines for preparation of RFID Tag-TIN layouts for the purpose of KAVACH system.

H2 **Guidelines**

Following guidelines shall be followed while preparing RFID Tag-TIN layouts for Station/IB/LC or block sections.

H2.1 **Version Control**: - The version control for all documents submitted for approving authority shall have X.Y.Z format in which: -

(i) X means KAVACH Version Control.

(ii) Y means SIP version control.

(iii) Z means Guidelines change or review comments control.

H2.2 Reference SIP drawing numbers shall be mentioned on the layout. The stationary KAVACH ID is also to be written below the station name in the layout. The ID shall be uniquie and shall be allotted by planning section the Railway.

H2.3 RFID tag-TIN layout shall be prepared with Signal Interlocking Plan (SIP) as reference. However, the actual site considerations shall be taken into account prior to its preparation. A site survey shall be conducted to mark the locations where tags need to be placed.

H2.4 The center of Station Master's panel shall be taken as station's Centre Line for reference purpose.

H2.5 Normal tags shall be provided in the block section as well as in station section. The maximum distance between the two consecutive tags shall not be more than 1000m. All the tags are to be linked and Stationary Kavach shall communicate to Onboard Kavach.

H2.6 Every Main signal, Subsidiary signal, Stop board, Ends of berthing track (may be with shunt signal sometimes) and BSLB shall be provided with Signal foot tag.

H2.7 Normal (Signal Approach Tag) shall be provided between 150-250 meters in approach to all Main Signals (Preferably 200 meter). The distance of Signal Approach Tag from corresponding Signal Foot (S) Tag should be exact multiple of 1m. This should be invariably ensured during installation and verifica-

tion at site.

Exception: The minimum distance can be less than 150 m for Advanced Starter or Intermediate Starter.

H2.8 To demarcate TIN sections, TIN discrimination Turnout tags i.e. TIN demarcation type Normal Tag, Inline section type Normal tag, Signal Foot type Normal Tag and Gate tag shall be placed as per the feasibility.

H2.9 Gate tags shall be placed at such a distance that Auto whistling for approaching LC gate can commence from at least 600m or W/L board on approach of LC gate.

H2.10 LC gate tag (optional) shall be provided at both sides of LC gate as required by operating Railway.

H2.11 While moving from KAVACH to non KAVACH territory, Exit tags shall be provided at the exit boundary of Stationary KAVACH in KAVACH territory. Minimum 2 sets of Tags shall be provided as exit tag.

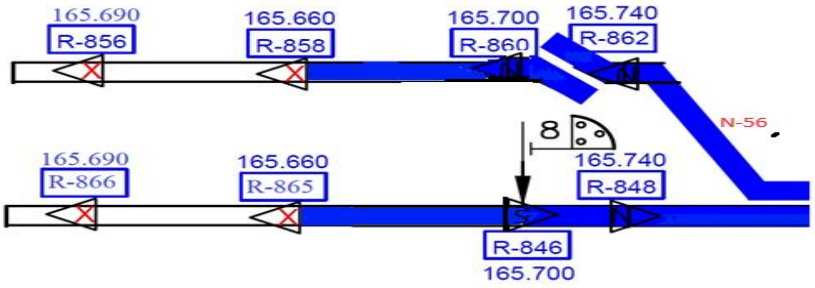
(i) The 1st Exit RFID shall be programmed with Communication in Direction of entry & no communication in direction of exit and 2nd exit Tag shall be programmed with no communication required in both directions.

(ii) Exit Tag may be provided at a distance of not less than 10m.

Note: i) On-board KAVACH shall maintain communication with same TIN & position report till its train length passes X-Tag when direction of movement from KAVACH area to Non-KAVACH area.

ii) Direction shall be established when direction of travel of Onboard from Non KAVACH area after reading the 2nd exit Tag and commincation shall be established with stationary KAVACH with transmission of Access request packet with position report.

Example



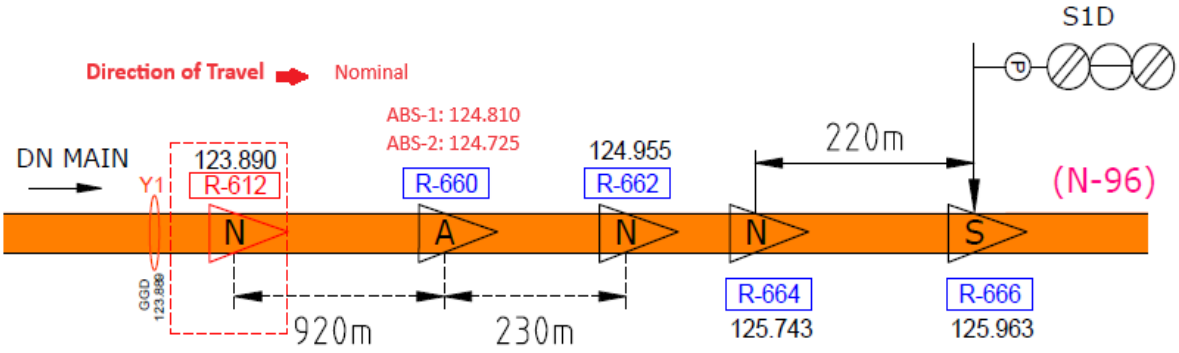
H2.12 The duplicate RFID tag shall be installed minimum distance of 3 meter to 5 meter except TIN discrimination/Turn out and adjustment/Junction RFID tag. The TIN discrimination/turn out and adjustment/Junction RFID Tag shall be in same absolute location.

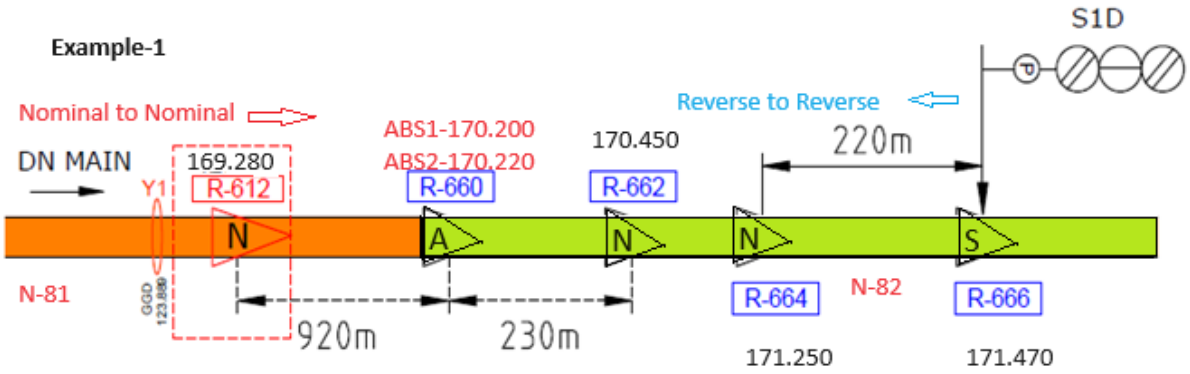
Note: **Adjustment Tag**: Adjustment tag shall be programmed for location and direction correction based on the physical absolute location.

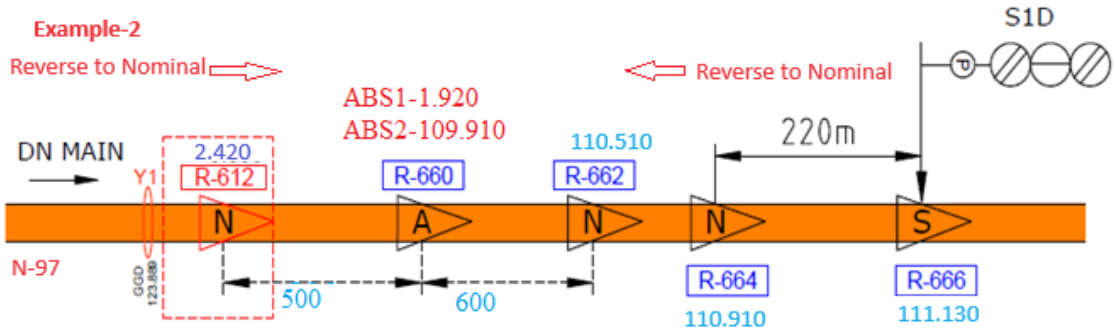
The **Absolute Location-1** shall be taken as the physical location in the direction of travel and Absolute Location-2 shall be taken as corrected absolute location.

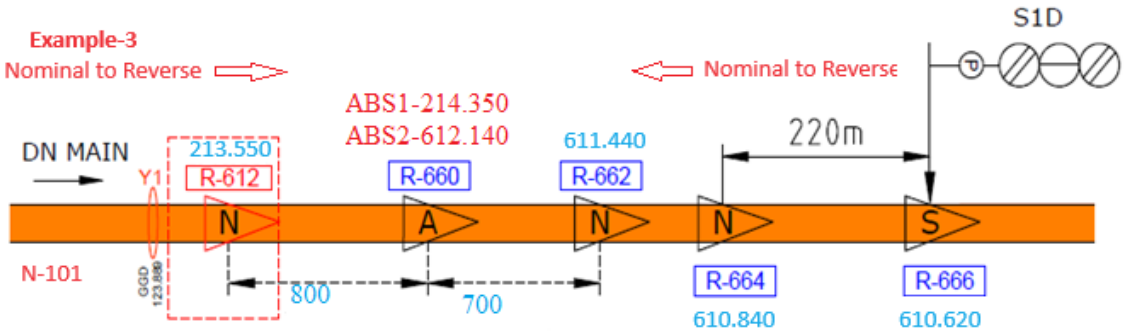
Direction Correction-1 shall be taken as physical direction of onboard travel and Direction Correction -2 shall be taken as physical direction after reading adjustment tag.

Example: In below diagram, the ABS-1 is physical location after RFID Tag R-612 and distance travelled by onboard i.e. 123.890 + 920= 124.810 and ABS-2 is corrected absolute location of -85 meter & direction of travel is Nominal to Nominal.









	Example-1	Example-2	Example-3
Abs Loc-1	170.200	1.920	214.350
TIN-1	81	97	101
TIN-2	82	97	101
ABS Loc-2	170.220	109.910	612.140
Dir Corr-1 (ABS Loc-1)	N-N	R-N	N-R
Dir Corr-2 (ABS Loc-2)	R-R	R-N	N-R

Direction - N TIN - 81 Location- 170.200 ± 5% of travelled distance from last read Tag	**Direction - R** TIN - 97 Location- 1.920 ± 5% of travelled distance from last read Tag	**Direction – N** TIN - 101 Location- 214.350 ± 5% of travelled distance from last read Tag
Direction: Matches only with Set-1. As current direction is Nominal, new direction is also Nominal (N-N). **TIN:** Matches with Set-1 and Set-2, hence correction is not required **Location:** **Linking Available:** As per linking data, expected location matches with 170.200, hence new location = 170.220 **Linking not available:** As direction is matches with Set-1, current location will be programmed in Set-1 and hence new location is in Set-2 i.e 170.220	**Direction:** Matches with Set-1 and Set-2. As current direction is Reverse, new direction is corrected as Nominal (R-N). **TIN:** Matches with Set-1 and Set-2, hence correction is not required **Location:** **Linking Available:** As per linking data, expected location matches with 1920, hence new location = 109.910 **Linking not available:** As current location with tolerance of 5% only matches with location in Set-1 hence new location is in Set-2 = 109.910	**Direction:** Matches with Set-1 and Set-2. As current direction is Reverse, new direction is corrected as Nominal (R-N). **TIN:** Matches with Set-1 and Set-2, hence correction is not required **Location:** **Linking Available:** As per linking data, expected location matches with 214350, hence new location = 612.140 **Linking not available:** As current location with tolerance of 5% only matches with location in Set-1 hence new location in Set-2 = 612.140
Direction - R TIN - 82 Location- 170.220 ± 5% of travelled distance from last read Tag	**Direction - R** TIN - 97 Location- 109.910 ± 5% of travelled distance from last read Tag	**Direction - N** TIN - 101 Location- 612.140 ± 5% of travelled distance from last read Tag

Direction: As current direction is Reverse, new direction is Reverse (R-R). Matches only with Set-2. **TIN:** Matches with Set-1 and Set-2, hence correction is not required **Location:** **Linking Available:** As per linking data, expected location matches with 170.220, hence new location = 170.200 **Linking not available:** As direction is matches with Set-2 current location will be programmed in Set-2 and hence new location is in Set-1 i.e 170.200	**Direction:** As current direction is Reverse, new direction is Nominal (R-N). Matches with Set-1 and Set-2. **TIN:** Matches with Set-1 and Set-2, hence correction is not required **Location:** **Linking Available:** As per linking data, expected location matches with 109.910, hence new location = 1.920 **Linking not available:** As current location with tolerance of 5% only matches with location in Set-2 hence new location is in Set-1 = 1.920	**Direction:** As current direction is Reverse, new direction is Nominal (R-N). Matches with Set-1 and Set-2. **TIN:** Matches with Set-1 and Set-2, hence correction is not required **Location:** **Linking Available:** As per linking data, expected location matches with 612.140, hence new location = 214.350 **Linking not available:** As current location with tolerance of 5% only matches with location in Set-2, hence new location is in Set-1 = 214.350

H2.13 The minimum distance between Tag set (Main & Duplicate) to Tag set (Main & Duplicate) shall not be less than 10m.

H2.14 Repeated Tag ID is not allowed within area of 25 Kilometer radius.

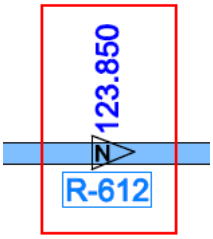
H2.15 **Tag legend in RFID TIN Layout**

(i) Legend in rectangle to be used when Main Tag and Duplicate Tags contain same location.

(ii) Legend in triangular to be used when Main Tag and Duplicate Tags contain different location. The duplicate tag shall be placed ahead of main tag in the direction of Tip of the Triangle.

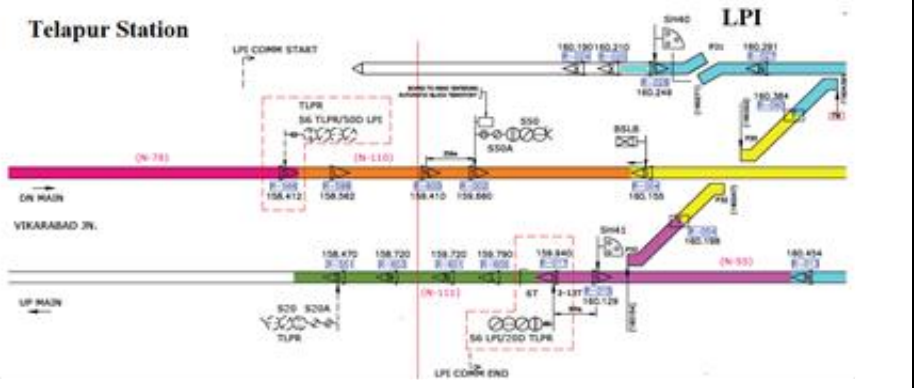
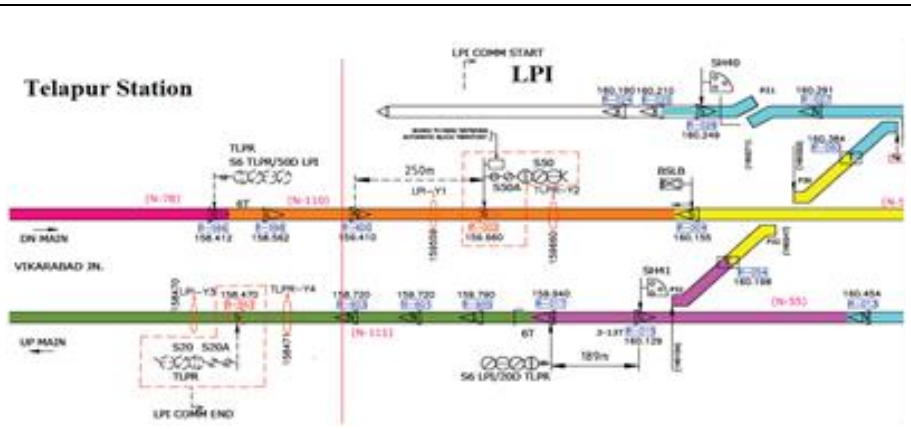
H2.16 Border RFID tag shall be indicated in RFID Tag layout with absolute location of station border line. Border RFID tag indicates the maximum distance from where the departed Loco will communicate with previous station SKAVACH. After crossing Border RFID tag, the loco shall communicate only from next stationary SKAVACH.

In RFID Layout, the border RFID tag shall be shown as below.



H2.16.1 Border Tag in absolute block section:

Exception: If two station are having overlap of signal, then the border tag shall be as per below example to avoid the issue of unsatisfactory working for display of signal.

	Not correct
	Correct

H2.17 A single TIN section shall be represented using a single color. The TIN,s in vicinity shall be represented in different colors.

H2.18 Non-KAVACH territory shall be represented through white color.

H2.19 The TIN layouts thus prepared, shall permit all the train movements allowed in a section as per Table of Control / Selection Table. For facilitating common loop reception when loco is standing between shunt signal and advance starter, TIN

shall be bifurcated

H2.20 At all places, where the train is likely to move outside KAVACH territory or remain stabilized for long duration for e.g., sidings, Exit tags shall be provided.

H2.21 Following notations shall be used to denote different types of tags as per placement:

Type of Tag		**Notation as per placement**
Normal Tag	Inline section tag	N
	Signal Foot Tag	S
	TIN Discrimination/Turn out Tag	T
	Exit Tag	X
	Dead stop tag	D
LC Gate Tag		G
Adjacent Line info tag		L
Adjustment/Junction Tag		A

H2.22 Block Section TIN should be extended up to BSLB on unidirectional lines (such as Double Line) and up to opposite direction Advanced Starter on Single Line. S-tag shall be provided at the Yard Exit Points not protected by Signals like BSLB etc.,

H2.23 Tag numbers (values in the range of 1 – 1023) and TIN numbers (values in the range of 1-255) shall be allotted by the user Railways. Sufficient spares for future needs shall be taken into consideration while allotting the numbers. The allotted numbers shall also be mentioned on the RFID tag-TIN layout.

H2.24 Signature Block and revision history blocks shall be prepared as per the practices of User Railways.

H2.25 Legends mentioning the notation used for the purpose of preparation of layout shall be specifically mentioned on the layout.

H2.26 RFID tag-TIN layout need not be up to scale. If the layout is not per scale, the same shall be mentioned on the layout.

H2.27 Absolute locations of tags, LC gates, signals and turnout switches, BSLB, Stop board shall be mentioned on the RFID layout.

H2.28 Absolute location of Station center line shall be mentioned on the layout.

H2.29 A typical RFID tag-TIN layout for Indian Railways is shown below for reference purpose.

LINGAMPALLI

Station ID:527 (km : 161.060)

REV. NO	REVISION HISTORY	DATE
0	Initial Version	04.10.2022
1	1. Fouling mark information is added and Tag outer line is shown with Triangular representation 2. Ajacent Line Information tag's R-598 & R-605 are newly added in the TLPR and LPI block Section.	06.03.2023
2	For the Purpose of S To S communication, Border Tags are shifted from R-977, R-017 to R-981, R-551 on UP Main Line & R-566, R-904 to R-002, R-910 on Down Main Line Respectively.	20.06.2023
3	1. The following X-Tags abs are updated as follows: • R-046 abs is updated from 160.347 to 160.327. • R-042 abs is updated from 160.347 to 160.327. • R-033 abs is updated from 160.347 to 160.327. • R-024 abs is updated from 160.190 to 160.169. • R-025 abs is updated from 160.210 to 160.209. 2. Route indicator for the signal S1 are updated accordingly to the SIP. 3. Tag R-873 has been removed.	13.12.2023
4	1. TINs are extended upto the first exit tag in the station section • N-63 TIN is extended upto the Exit tag R-43 & R-34. • N-60 TIN is extended upto the Exit tag R-25. • N-65 TIN is extended upto the Exit tag R-47. 2. Skavach to Skavach IP addresses and port number details table is added in the Layout.	15.03.2024

LEGEND

- N NORMAL TAG
- S SIGNAL FOOT TAG
- T TIN DISCRIMINATION /TURNOUT TAG
- X EXIT TAG
- G GATE TAG
- A ADJUSTMENT TAG
- L ADJACENT LINE TAG

	LPI	UP	DN	OTHER
STATION ID	527	501	528	–
RFID ALLOTMENT	1 – 128	1 – 17	2 – 18	19 – 66
TIN ALLOTMENT	49 – 76	49 – 55	50 – 56	57 – 65
AUTO SECTION RFID	897–992 & 872&873	975–991 (Except–983)	898–912	–
AUTO SECTION TIN	83–84	83	84	–
BOUNDARY TAG'S	–	981,551	002,910	–
TOTAL NO. OF TAGS are 71				

Skavach to Skavach IP Addresses and Port Details Table

	TLPR	LPI	HFZ
STATION ID	501(S)	527	528(P)
Skavach IP Address–1	192.254.1.245	192.254.2.15	192.254.2.16
Skavach IP Address–2	192.255.1.245	192.255.2.15	192.255.2.16
Port Number	60002	60002, 60001	60001

LINGAMPALLI (LPI)

Secunderabad Division, SC Railway

REF.SIP: IPU.1005B Alt–1
TOC : TC.1005B
LPI–SC Section:U.0043

KAVACH RFID TAG / TIN LAYOUT

NOT DRAWN TO SCALE

KAVACH_RFID_TAG_LAYOUT_LPI_2.0.4

Firm Logo

	Prepared By	Checked By	Checked By
SIGN.			
NAME.	G ARCHANA	CH MASTANAIAH	V VARUN KUMAR

APPROVED BY
EXE/. DIRECTOR TELE–II

SSE/PROJ/HQ/SCR	ASTE/PROJ/HQ/SCR	Dy.CSTE/P/HQ/SCR
JE/SSE/RDSO/LKO	ADE/RDSO/LKO	DIRECTOR/RDSO/LKO

संदर्भ. सिगनल आरेख. सं.
REF:SIG.PLAN.NO.

आई.पी.यू
IPU. 1005B Alt–1 & LPI–SC Sec.U.0043

संशेधन REVISION

आरेखकार DRAWN

सिगनल व दूर संचार
SIGNAL & TELECOMMUNICATIONS

KAVACH

लिंगमपल्ली
LINGAMPALLI (LPI)

KAVACH RFID TAG / TIN LAYOUT

द. म. रेलव. आरेख. सं. S.C.RLY.DRG.NO.	KAVACH IPU.1005B Alt–1	शीट SHEET	कुल शीट SHEETS
		01	01

GULLAGUDA (GGD)

Station ID:521 (km : 128.660)

LEGEND
NORMAL TAG
SIGNAL FOOT TAG
TIN DISCRIMINATION /TURNOUT TAG
EXIT TAG
GATE TAG
ADJUSTMENT/JUNCTION TAG
ADJACENT LINE TAG

REV. NO	REVISION HISTORY	DATE
0	Initial Version	17.04.2023
1	1. Border Tag is changed from R-528 & R-465 to R-452 & R-469 Respectively. 2. R-539 X-Tag ABS location is updated from 128.980 to 128.950. 3. R-612 ABS location is changed from 123.850 to 123.890. 4. N-71 TIN is extended upto the exit tag R-540 in the station section .	04.03.2024
2	1. R-609 ABS location is updated from 127.847 to 126.747. 2. R-611 ABS location is updated from 126.970 to 126.811. added in Up main line.	20.03.2024

	GGD	UP	DN	OTHER
STATION ID	521	520	522	–
RFID ALLOTMENT	505–529 & 612,660–672 , 514–528	549,609,611, 613,621,623 673	548 & 450–460	530 – 537 539 – 547
TIN ALLOTMENT	61 – 80	61 – 69	62 – 68	70 – 72
BORDER RFID TAG'S	469,611		612,452	
TOTAL NO. OF TAGS are 54				

GULLAGUDA (GGD) Secunderabad Division, SC Railway				REF. SIP: IPU.0011C Alt–5 TOC: TC.0011C
TCAS RFID TAG / TIN LAYOUT				RFID_TAG_LAYOUT_GGD_2.0.2
NOT DRAWN TO SCALE				
	Prepared By	Checked By	Checked By	FIRM LOGO
SIGN.				
NAME	G ARCHANA	CH MASTANAIAH	V VARUN KUMAR	

APPROVED BY EXE/. DIRECTOR TELE–II		
SSE/PROJ/HQ/SCR	ASTE/PROJ/HQ/SCR	Dy.CSTE/P/HQ/SCR
JE/SSE/RDSO/LKO	ADE/RDSO/LKO	DIRECTOR/RDSO/LKO

संदर्भ. सिगनल आरेख. सं. REF:SIG.PLAN.NO.	सिगनल व दूर संचार SIGNAL & TELECOMMUNICATIONS			
आई.पी.यू IPU.0011C Alt–5 & TC.0011C	KAVACH			
	गुलागुडा GULLAGUDA (GGD) KAVACH RFID TAG / TIN LAYOUT			
संशेधन REVISION				
आरेखकार DRAWN	द. म. रेलव. आरेख. सं. S.C.RLY.DRG.NO.	KAVACH: IPU.0011C Alt–5	शीट SHEET 01	कुल शीट SHEETS 01