SP145

CENTRE FOR RAILWAY INFORMATION SYSTEMS
CHANKYAPURI, NEW DELHI 110021

No. 2019/CRIS/NDLS-ITPI/RFID/POLICY/0151/PT-1 Dated: 22/08/2019

EDME/Freight
Railway Board
New Delhi-110001

EDME/Coaching
Railway Board
New Delhi-110001

EDS (Carriage)
RDSO, Manak Nagar,
Lucknow-226 011

EDS (Wagon)
RDSO, Manak Nagar,
Lucknow-226 011

Sub: Guidelines for using Data of RFID Tags of the Indian Railway (V3.1).
Ref: 2016/CRIS/NDLS-ITPI/WS-C/PROJECT/RFID/0102/Pt-1 dated 02/04/2019 (V3.0).

1. In supercession of the earlier document under reference, please find enclosed the latest version of the above document.

2. The changes in this version are detailed in the Change List.

3. For information and necessary action please.

Shikhar Gupta
AM/RFID/CRIS

DA: As above

Copy for information to:
1) EDME/Dev, EDEE/G, EDEE/RS, EDME/Traction, Railway Board

NOO:
2) CAO/COFMOW, Tilak Bridge, New Delhi

Given by EDME/FR
18/10/2019

CENTRE FOR RAILWAY INFORMATION SYSTEMS
CHANAKYAPURI, NEW DELHI 110021

No.: 2019/ CRIS/ NDLS-ITPI/ RFID/ POLICY/ 0151/ PT-1

Sub: Guidelines for using Data of RFID Tags of the Indian Railways (V3.1)

CHANGE LIST: Major changes done are listed below for information. Please necessarily read the full document.

V3.1:

- Change list of V3.0 at para 9 indicated the annexure K incorrectly.
- Para 4.1.1: Added "and its associated padding"
- 5.3.1.1.1 (pg 23): Data relevant to TID corrected.
- Para 1.2 (Control of Tag) inserted.
- Para 1.5.2: explanation of 2 byte write limit added.
- Para 4.1.2: Version number corrected
- Para 8.4. number of trailing zeros reduced to 4 (based on 2 bytes minimum write + spare)
- Ann A: MEMU added with EMUs. Separate code for Trainsets added
- Ann C: Codes for T18 and MEMUS added. BRNA was repeated, duplicate removed
- Ann E, pg 17: Length of GF and GL corrected. Explanation for GL updated. Full form of W changed to TagWriteOrOperate vs TagWrite only earlier.
- Ann E, pg 18: Added TT and TG codes
- Ann E, pg 18: Added 99 – Vendor Specific Code, against WE element.
- Ann E, pg 18: Corrected TPD21 to TPD2
- Ann G: Added the words "on the tag" against SV.
- Ann G: AE: 'AE' replaces 'AI' under the column Pneumonic and Description fields.
- Ann G: DV: removed 'Not to be written to tag' under the Element column.
- Ann G: NM default value implication changed to 'Unknown' from 'None'.
- Ann G: TN description updated to reflect number of mobiles rather than numbers no of items on trial.
- Annexure H, pg 22 – Annexure 'G' corrected to 'E'
- Ann K: User Area D: number of zeros reduced to 4, reserved bytes increased acccordingly.
- Ann K: 'DSFID_b' replaces 'DSFID_h' in all pages of the example in Annexure K.

- Anni K: <SV>310 replaces <SV>!iSVv300 in all pages of the example in Annexure K.

V3.0:

- Para 4.1.1 – 'after DSFID' added.
- Para 6 – Annexure updated to E.
- Para 7.1 – The importance of writing all the fields at the time of first time tag initialisation has been clarified and emphasised.
- Para 7.5 – Added what to do if errors in tag data structure found.
- Para 8.1 – The size of the SN field changed to char(10).
- Para 8.2 The number of trailing zeros changed from three to four for correct write alignment.
- Para 8.3 – The number of trailing zeros changed from seventeen to seven for correct write alignment based on the new 'NM' field.
- Para 8.4 – The number of trailing zeros changed from eleven to twelve for correct write alignment.
- Para 9 – Original para moved to annexure K and also corrected to reflect the changes under para 8.1 to 8.4 above. Para reworded accordingly
- Para 10 – new para added to explain Tag Vocabulary
- Para 11 – new paras added linking the annexure.
- Annexure C – updated
- Annexure D – reformatted and updated
- Changes in Annexure E (Vocabulary codes)– Completely revised and updated. Major changes:
  - LA (HDOP) definition corrected from NN.N to N.NN
  - MD (deployment platform for mobiles) added.
  - MV Description clarified.
  - RN (Number of tags written) added
  - GF and GL fields to now reflect the first and last TID instead of hash value
  - Time stamp field definition standardised.
  - T (Tag Write details) full section added.
  - E (Antenna) full section added.
  - N (Train Presence Detector details) full section added.
  - GS1 related values indicated.
- Annexure G:
  - Assembly Identifier (AE) clarified as an alternative to PL no for all non-stock items. Structure of Design Variant clarified.
  - Clarified that DV is not to be written as a code into the tag. It is only for data usage purposes.
  - Width of the SN field corrected as per para 8.1.
  - Description against HS field corrected to VN

- NM added for Name of Other major schedules
- PL field split to show the Design Variant (DV) component explicitly

- Annexure H (Data transfer format from field devices) added
- Annexure J (List of Location Functional Extensions) and K (Examples) added

V2.2:

- Para 4.1 – Added the para to explain the use of SV code (UserArea Data Structure Version).
- Para numbering corrected in subsequent paragraphs.
- Para 5.1 – clarification on opening and closing behaviour of delimiter.
- Paras 5.5, 8.2, 8.3, 8.4 & 9 – The concept of trailing zeros in User Area explained.
- Para 8 – field widths removed in all subparas since explained in Annexure E to G.
- Para 8.1 – behaviour of the field modified for wider SN field. Trailing '!' removed in example
- Para 8.2 – behaviour of the field clarified.
- Para 9 – Example revised completely
- Page 14 (Annexure G) – field width of SN field increased from char(8) to char(9)

V2,1:

- Para 3.5: Example corrected for version 'E'
- Annexure E: Code for Alternate email changed from UE to UT to avoid duplication

V2,0:

- The requirements for privately owned rolling stock have been incorporated.
- The concept behind Version number in EPC area has been expanded.
- The concept of padding with zeros has been made clear.
- The Company Code has been expanded and made clear.
- Concept of User Area version number has been added (SV code).
- The need to avoid two contiguous !! has been made explicit.

Guidelines continue on the next page

THE GUIDELINES

1. **BASICS**: The RFID Tag to be used on vehicles to run over the Indian Railways stores data under 2 functional heads: EPC Area and User Area.

1.1 The **EPC area** is ALWAYS read. From the Railways viewpoint it only stores the VehicleID. Additionally, internally there is a lot of information about the Tag that is also stored including a unique identifier for each tag. The VehicleID primarily consists of the Owning Railway (including Privately Owners), the VehicleType and the VehicleSerialNumber. The data is stored in a format prescribed by an international standard by an organisation called GS1 and the associated standard is GIAI-202.

1.1.1 Note: Specifically in wagons, the rightmost digit of the 11 digit number is a check digit and as such should NOT, repeat not, be stored in the RFID Tag.

1.1.2 **Side of a Vehicle:** All Vehicle shall have a left and right side explicitly defined. The Right side is represented by the number 2 and the Left side by the number 1 within the EPC. By default,

1.1.2.1 For wagons and coaches **the side on which the DV is located shall be the vehicle RIGHT side.**

1.1.2.2 For Locos, if a definition of sides exists then the same shall be used. Failing which, the side that the DV is located shall be the right side of the Vehicle.

1.1.2.3 For self-powered vehicles like DEMU and EMU power cars, SPART/ SPARME etc, the cab shall define the front of the vehicle and the Right side shall be defined from the point of the pilot in the cab.

1.1.2.4 For other vehicles, if there is an existing definition of vehicle right then the same shall be used. Failing which, the side that the DV is located shall be the Right side of the Vehicle.

1.2 **Control of Tag:** For controlling the use of the data on the RFID Tag the following fields are to be used as indicated below:

1.2.1 In Bank 00, the control bits are Kill and Access passwords:

1.2.1.1 Kill Password: This will be disabled and not to be used at all.

1.2.1.2 Access Password: This password is used to lock the full tag against unauthorised writing.

1.2.1.2.1 The password will be random hex number.

1.2.1.2.2 The password must be written on to the tag as a part of the tag initialisation.

1.2.1.2.3 These passwords are to be invariably changed in case of the a major maintenance schedule such as POH etc.

1.2.2 In Bank 01, the Filter value is important. As per GS1 standards, the filter value for Railways is 1. The PC field value as a whole should be 6C00h.

1.2.3 DSFID: The DSFID specifies the format of user memory bank. Its applicable value as per GS1 is 10001001 in binary.

1.3 The **User Area** is currently limited to 3072 bits. The data it stores will be read only when the vehicle is at REST, not when the vehicle is running. It is primarily used for storing maintenance related details.

1.4 ***All characters are in Capitals.***

1.5 ***All fields are fixed-width.*** In case the data is less than the defined field sizes there are 2 cases:

1.5.1 In case the data is less than the prescribed field width then it is to left-padded with zeros, e.g., NR becomes 00NR, 4321 becomes 004321 etc. please see the examples below. In the app being used for writing this shall be done automatically.

1.5.2 For the user area complete, a prescribed size has been given. In order to align with the prescribed size 0 is to be appended after the last exclamation mark. The minimum number of bits to be written in 16, i.e., 2 bytes (based on UCODE DNA).

2 <u>Company Code</u>:

2.1 As per GS1 standards, the EPC area must indicate the Country and the Company Code. For all Rolling Stock of the Indian Railways, the licence for the same has been procured by CRIS for and on behalf of the entire Indian Railways.

2.2 For privately owned Rolling Stock this company code has to be obtained by the owner of the Rolling Stock from GS1 India and conveyed to CRIS for incorporation into the tags. This would enable them to be tagged correctly. Any change in ownership would also have to be conveyed to CRIS so that the tags on each individual rolling stock get updated in the field.

3 VehicleID: Please also see the annexure attached to this document.

3.1 This is a string which is 23 characters wide.

3.2 All characters MUST be filled/ used.

3.3 The first field is a version number that defines the remaining fields in the VehicleID. By default, it is 'D', however there are other versions also.

3.4 For D version, an example of VehicleID as stored in the EPC area is

D1E1700NRWDTCSDV1004321 the explanation of the above string is as under:

Field	Sz	Field Description	Comments
D	1	**Version** number of the VehicleID spec	**'D' is the default currently.**
1	1	**Vehicle Side**	There are separate tags on the Left and Right of each vehicle. **1 is for LEFT and 2 is for RIGHT.** 0 can be used under very special circumstances for which permission will be given on a case by case basis.
E	1	**Asset Type** E is for EMUs	Please see Annexure A
17	2	**Year asset was put into service "17"**	when the asset was introduced into service, can be different from date of manufacture.
00NR	4	**Owning Railway "NR"**	Please see Annexure B
WDTCSDV1	8	**Vehicle Type**	This is the Mechanical Code NOT transportation code. Please see Annexure C
004321	6	**Vehicle serial number "4321"**	Please note the 00 on the left side to complete the field width. This does **NOT** include check digits used in 11 digit numbering.

3.5 For E version, an example of VehicleID as stored in the EPC area is

E1F1700NRBOBRNHSM104321 the explanation of the above string is as under:

Field	Sz	Field Description	Comments
E	1	**Version** number of the VehicleID spec	Version number = **'E'**
1	1	**Vehicle Side**	There are separate tags on the Left and Right of each vehicle. **1 is for LEFT and 2 is for RIGHT.** 0 can be used under very special circumstances for which permission will be given on a case by case basis.
F	1	**Asset Type** F is for Freight	Please see Annexure A
17	2	**Year asset was put into service "17"**	when the asset was introduced into service, can be different from date of manufacture.
00NR	4	**Owning Railway "NR"**	Please see Annexure B
BOBRNHSM1	9	**Vehicle Type**	This is the Mechanical Code NOT transportation code. Please see Annexure C
04321	5	**Vehicle serial number "4321"**	Please note the 0 on the left side to complete the field width. This does **NOT** include the check digit on the extreme right used in 11 digit numbering scheme.

4 User Area:

4.1 User Area Data Structure Version Number (SV): It is an index to the structure of the remaining data in the User area. This is critical for having variable data structures within the User Area.

4.1.1 *It necessarily has to be the first element in the User Area (after DSFID and its associated padding).*

4.1.2 It is the version number of this document – whose structure has been used for storing data in the user area ONLY, i.e., this document implies "!iSVv310" as the first element in the User Area.

4.1.3 *For all those tags which have the SV element, the SV value shall be assumed as '210' even if the actual value stored is less.* In future, if a higher version number is issued which affects the User area Data structure – such as this version – then the same shall supersede this default value being higher.

4.1.4 For those tags which do NOT have this element, the data structure version shall be assumed to be 100, i.e., V1,0,0.

4.1.5 The reader software shall handle it accordingly and any change in the data stored in the tag shall be done silently

4.2 The remaining memory in User Area is subdivided into 4 functional areas:

4.2.1 Area 'A' shall store the original manufacturer's details. This is akin to the Identity Plate on the Vehicle

4.2.2 Area 'B' shall store the last value of the VehicleID in case the VehicleID is changed.

4.2.3 Area 'C' shall store the maintenance details of the Vehicle.

4.2.4 Area 'D' shall store data for special requirements such as Trials.

5 Formatting principles of data in the User Area: The formatting principles are:

5.1 The "!" is the field delimiter. However two consecutive exclamation marks are NOT permitted, i.e., "!!" cannot appear anywhere in the tag data. This shall be used as opening *and* closing delimiter, i.e., The first and last characters must be "!". The only exception is beyond the end of Area D since no data can exist there.

5.2 The data in a field has 2 parts:

5.2.1 "i" (in small case) stands for the Identifier of the data. This is a field with a fixed width of 2 letters. It identifies the data stored in the next field, i.e, the 'v' field.

5.2.2 "v" (in small case) is the Value of the identifier. This is a variable length field and is delimited as given above.

5.3 All lines entries shall start with the Date field, i.e., '!iD' marks the start of a new set of data.

5.4 This should normally be followed by the StationCode associated with the data.

5.5 *Zeros are to be mandatorily added after the last exclamation mark of the respective areas as padding up to the end of the area.* This will ensure alignment of the User Area. Please see example below.

6 The Master vocabulary list for the User area is at Annexure E of this document.

7 **Data write/ modify/ read use cases** are as under:

7.1 First time write (tag initialisation): *All, repeat all, fields are to be written at the time of first time tag initialisation. For those fields whose data is not yet available '0' is the default value as per the field width defined.* The available data shall necessarily affect the EPC area and 'A' block of the user area. It may also involve Area 'D' also, for example, in case there are items on pan-India trials.

7.2 Change in VehicleId: This shall affect the EPC area and area 'B' block of the user area. The 'B' block incorporates the last available VehicleID data in EPC. It may also affect Area 'A' in case of such an upgrade which could imply a change in PL code (see below in vocabulary) – the older PL code shall be overwritten.

7.3 Updating the maintenance info: This affects only 'C' block of the user area. This basically stores the last PRO particulars (details of last POH, ROH/ IOH and last overhaul/ maintenance)

7.4 On condemnation of the Vehicle, the AssetType in the EPC area shall be set as "#" (mnemonic = completely cutup), while under normal circumstances it shall be a character.

7.5 *On error in structure*, the complete User Area is to be read, parsed, corrected and written back in the structure given in the latest version of this document. While reading any field, the structure must be checked as confirming to the structure defined as per the SV value on the tag. For checking a particular field, the starting delimiter, the "i" value and the structure of the "v" value – all of them must be as per the structure corresponding

to SV value on the tag. In case DSFID is not present, then the full user area has to be read, offset and written back.

8 Description & examples of data use in the User Area:

8.1 In area 'A', details from the manufacturer are recorded. This string can be in 2 forms out of which any one is to used:

8.1.1 In case it is a Railway stock item then 'PL' code is to be used with an optional design variant ('DV'). By default the design variant is 000. This is the default option.

!iDUv020917!iSUv0BLH!iVCv0000TEXB!iPLv12345678012!iSNv0123456789

(Where the PL no is 12345678; Design Variant is 012; Product Serial Number is 123456789)

8.1.2 Alternatively in case it is a assembly the 'AE' Assembly Identifier code should be used

!iDUv020917!iSUv0BLH!iVCv0000TEXB!iAEv00000000ABC!iSNv0123456789

(Where the Assembly identifier is ABC and its associated serial number is 123456789)

This area is supposed to be written at the time of manufacture. The PL part can be updated as and when any major upgrade/ change happens. It is meant for incorporating major assemblies such as bogies, into the system.

8.1.3 Note: For older vehicles only – the default value of all zeros can be used in case the relevant information is not available.

8.1.4 Note: the specific format for SN for assemblies such as bogies shall be as per the relevant RDSO specifications. Commonly they include Month, Year, batch, serial no etc. It is recommended that it be kept really simple and be a simple number series – all the associated data can be kept on computers at the backend.

8.2 In Area 'B', Only those values that have been changed in the EPC should be kept as and when the EPC is updated. *Four trailing zeros are necessarily needed.* For example,

!iDCv311217!iSCvJUDW!iI IAvC!iI IWvECOR!iHTv0BCACBMA!iHSv123456!0000

8.3 In Area 'C', the last major maintenance schedules are to be recorded. *Seven trailing zeros are necessarily needed.* an example:

!iDBv311214!iSBvJUDW!iDPv311215!iSPvJUDW!iDRv311216!iSRvJUDW!iNMv

NPOH!iDAv310217!iSAvNDLS!iDSv310317!iSSvNDLSM!iDDv310417!iKMv1000
0!iNSv000IOH!iHMvNDLSM!0000000

8.4 In Area 'D', up to three trial related contact mobile numbers can be stored, so the default string would be !iTNv3!iMAv9999911111, which would imply a maximum of 3 items can be monitored using the space available. *Four trailing zeros are necessarily needed.*

8.4.1 As such, this should normally be limited to a pan-India trials only on any vehicle. Local trials should, as a principle, not be monitored by this field. As such, the control of Area 'D' should primarily lie with RDSO or PUs only.

9 Example of the above data structure can be seen at Annexure K (Examples) para 1.

10 **Tag Vocabulary** (Annexure E): These are fields that are related to the ecosystem around the usage of the data on the tags. These fields relate to all possible use cases. In brief, they can be understood as under:

10.1 L codes – for Location related data. Both GPS based location as well as fixed identification are supported.

10.2 U codes – for User related data. Finally the HID system finalised by Board shall be come the single Id for all.

10.3 M codes – for Mobile related data. These are mobiles being used for either writing data on the RFID tags or even for accessing the application(s).

10.4 P codes – for Portable reader related data.

10.5 E codes – for Antenna related data for cases of Fixed Readers only.

10.6 A codes – for data related to the App itself

10.7 G codes – for a Group of data being transmitted together. It is possible that a tag reading device may accumulate a lot of data (possibly since the network was down). Transmitting all that data together may run the risk of failure forcing repeated retries. It may be more useful to transmit smaller groups of data at a time (chunking). As such, these codes are useful in case all the data is being transmitted in pieces. By default, at least one group must exist per transfer.

10.8 R codes – for data being logged while using a portable reader for data exchange with the RFID tag in a single sequence of related steps.

10.9 W codes – for data involved in the process of writing or reading to a tag. This does not include data which is being written which is governed by other codes.

10.10 T codes – for data onboard an RFID Tag which is not included elsewhere. This normally includes control bits etc

10.11 N codes – for data involving the use of TPDs (Train Presence Detectors)

11 The data structure (in XML) for transferring data from the field devices (portable readers etc.) to the backend is at Annexure H.

12 List of Location Functional Extensions is available at Annexure J. The associated examples are at Annexure K (Examples).

GM/ RFID/ CRIS 21/8/19

21/08/19

Encl: annexures as above:
Annexure A – Master List of Asset Types
Annexure B – Master list of Owning Railways in the Indian Railways
Annexure C – Master List of Vehicle Types
Annexure D – Vehicle Manufacturer's Code
Annexure E – Vocabulary related to using the data on the tags
Annexure F – Structure of EPC Data on the tags
Annexure G – Structure of User Data on the tags
Annexure H – Data transfer format from field devices
Annexure J – List of Location Functional Extension
Annexure K – Examples (for understanding purposes only)

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Annexure A: Asset Types [char(1)]

Type	Description
#	Condemned Vehicle
A	Ancillary vehicles, i.e., non-earning vehicles necessary for train operations e.g., Guard Vans in freight, Generator Cars in coaching
C	Coaching (Passenger Carrying ONLY)
D	DMU
E	EMU and MEMU
F	Freight (Earning vehicles ONLY)
L	Electric Locos
M	Maintenance related vehicles, e.g., Tower cars
N	Not revealed, e.g., Defense
P	Part, i.e., an assembly/ subassembly, e.g., LHB bogie
R	Rescue and safety related Vehicles, e.g., SPART/ SPARME, Cranes etc
S	Diesel Locos
T	Trainsets
X	Experimental, Vehicles on trial, e.g., the Talgo rake
Y	Departmental (Freight)
Z	Departmental (Coaching) includes saloons

Note: *I and O are NOT to be used at all ever due to possible confusion with the numerals 0 and 1.*

Annexure B: Owning Railway [char(4)]. This list is indicative only. The actual list is governed by Railway Board.

Rly	Description
CR	Central Railway
ECOR	East Coast Railway
ECR	East Central Railway
ER	Eastern Railway
KR	Konkan Railway
NCR	North Central Railway
NER	North Eastern Railway
NFR	North Frontier Railway
NR	Northern Railway
NWR	North Western Railway
SCR	South Central Railway
SECR	South East Central Railway
SER	South Eastern Railway
SR	Southern Railway
SWR	South Western Railway
WCR	West Central Railway
WR	Western Railway

Note: Over a period of time, owners of privately owned rolling stock shall be added to the list.

Annexure C: VehicleTypes [char (8)]. This list is indicative only. The actual list is governed by external bodies such as Railway Board and RDSO.

For EMUs:the existing codes are shortened by using the letter 'E' as per annexure A above in lieu of 'EMU/'. Also all '/' (forward slash character) are removed.

Type	VV	Type	VV	Type	VV	Type	VV	Type	VV
Freight				Coaching					
BCACBMA	D	BOBYNHS	D	GS	D	VP	D	18DT	D
BCACBMB	D	BOSTHSM2	D	GSD	D	VPH	D	18M	D
BCACMBA	D	BOXN	D	GSLR	D	VPU	D	18T	D
BCACMBB	D	BOXNCR	D	GSLRD	D	VR	D	18NDT	D
BCFC	D	BOXNHA	D	GSLRDAC	D	WACCNH	D	18ME	D
BCFCD	D	BOXNHL	D	GSRD	D	WACCW	D	18NDTE	D
BCFCE	D	BOXNHLE	D	LGS	D	WCBAC	D	18M2	D
BCN	D	BOXNHS	D	LGSLR	D	WFAC	D	DMGTU	D
BCNA	D	BOXNLW	D	LWACCN	D	WFCWAC	D	T1GTU	D
BCNAHS	D	BOXNS	D	LWACCW	D	WGACCN	D	T2GTU	D
BCNHL	D	BOY	D	LWCBAC	D	WGACCW	D	DMGT	D
BCXCIII	D	BRHNEHS	D	LWFAC	D	WGCB	D	TGMT	D
BFNS	D	BRN	D	LWFCZAC	D	WGCWNAC	D		
BFNSM22.9	E	BRN22.9	D	LWGACCN	D	WGFAC	D		
BLCA	D	BRNA	D	LWGACCW	D	WGFC	D		
BLCB	D	BRNAHS	D	LWGFAC	D	WGFCWAC	D		
BOBR	D	BTALNM	D	LWGSCN	D	WGSCN	D		
BOBRM1	D	BTAP	D	LWLRRM	D	WGSCZ	D		
BOBRN	D	BTCS	D	LWSCZAC	D	WGSCZAC	D		
BOBRNEL	D	BTPGLN	D	NMG	D	WGSCZACJ	D		
BOBRNHS	D	BTPN	D	PP	D	WGSCZJ	D		
BOBRNHSM1	E	BTPNHS	D	RA	D	WGSCZRJ	D		
BOBRNM1	D	BVCM	D	RAAC	D	WLRRM	D		
BOBRNUG	D	BVZI	D	RE	D	WRRMDAC	D		
BOBSN	D			RH	D	WSCZACH	D		
BOBSNM1	D			RT	D				
BOBYN	D			RU	D				



Annexure D: Vehicle Manufacturer's Code [Char (8)] & the associated Station Code

Note:
1) The StationCode is for the station where the vehicle enters the Railway system, it is NOT the location of the manufacturing unit/ factory

2) If a particular manufacturer has multiple units, then each unit gets a unique code to identify it.

ManCode	Takeover StnCode	Description	Location
ARC	SDY	Amtek Railcar Industries Pvt. Ltd.	Sadhoogarh
ASRW	ASR	Amritsar Workshop	Amritsar
BEML	BLHI	BEML	Byappanahalli
BESF	BRP	BESCO Ltd (Foundry), Kolkata	Baruipur
BESWL	BLN	BESCO Ltd. (Wagon), Kolkata	Ballygunge
BESWR	BRP	BESCO Ltd (Wagon), Kolkata	Baruipur
BUR	BURN	Burn Standard Co. Ltd.	Burnpur
BURH	HWH	Burn Standard Co. Ltd.	Howrah
BWELK	MKA	Bharat Wagon & Engineering Ltd.	Mokameh
BWELZ	MFP	Bharat Wagon & Engineering Ltd.	Muzaffarpur
BWT	MJT	Braithwate & Co. Ltd., Kolkata	Majerhat
CIM	BTE	CIMMCO Ltd, Bharatpur	Bharatpur
CLW	CRJ	Chittaranjan Locomotive Works	Chittaranjan
DLW	MUV	Diesel Locomotive Works	Manduadih
DMW	PTA	Diesel Loco Modernisation Works	Patiala
GOCW	GOC	Golden Rock Workshop, Trichurapalli	Ponmalai
HEIB	BLN	Hindustan Engineering Industries Ltd., Kolkata	Ballygunge
HEIS	SRC	Hindustan Engineering Industries Ltd., Kolkata	Santragachi
ICFW	VLK	Integral Coach factory	Villivakkam
JMPW	JMP	Jamalpur Workshop	Jamalpur
JRIL	MYG	Jindal Rail Infrastructure Ltd, Vadodara	Miyagam Karjan
JWL	BDC	Jupiter-Wagons Ltd, Chinsura, Hoogly	Bandel
MCFW	LLJ	Modern Coach Factory	Lalganj
MI	SBB	Modern Industries (UP)	Sahibabad
OFPL	LKZ	Oriental Foundry Pvt Ltd	Lakadiya
RCFW	HSQ	Rail Coach Factory	Husainpur
SPJW	SPJ	Samastipur Workshop	Samastipur
SR	ULT	Sail RITES Bengal Wagon Industry Pvt. Ltd.	Kulti
TEXB	BLH	Texmaco Rail and Engineering Ltd., Kolkata	Belgharia
TEXS	SEP	Texmaco Rail and Engineering Ltd., Kolkata	Sodpur
TWL	NH	Titagarh, Howrah	Naihati

Annexure [J]

...ble below:

...ware

Note:

13 All dates are in DDMMYY format.

14 Mobile number is without country code, i.e., 9876543210. India is assumed as country.

Element	Code	Pneumonic	Field	Description
Backend [B]	BL	Backend Location	varchar	URI pointing to backend server
Location [L]	LC	LocationID	Char(8)	
Location [L]	LS	RlyStationCode	Char(4)	ASR
Location [L]	LE	RlyStationCode Functional Extension	Char(1)	See Annexure K
Location [L]	LN	Location Number	NNN	LS+LE+LN must be unique
Location [L]	LM	Method	Char(1)	Manual/ GPS Coarse/ GPS accurate etc
Location [L]	LA	Accuracy	N.NN	HDOP
Location [L]	LT	Latitude	dddmm.mmmm	North is assumed and not stored explicitly
Location [L]	LG	Longitude	dddmm.mmmm	East is assumed and not stored explicitly
Location [L]	LD	DateTime Stamp of the fix	Timestamp	
User [U]	UR	Your Id	Char(8)	Same as HID - standardised ID for IR.
User [U]	UP	Password	Char (14)	
User [U]	US	Surname	Char (14)	
User [U]	UN	Rest of the Name	VarChar	Can be blank
User [U]	UA	Grade	Char(6)	SAG
User [U]	UD	Designation	Char(6)	CRSE
User [U]	UE	Designation extension	Char(6)	Chg
User [U]	UH	HQ	Char(4)	StnCode
User [U]	UM	MobileID		refers to MV
User [U]	UG	Gmail address	VarChar	
User [U]	UT	Alternate email	VarChar	
User [U]	UL	Role in application	Char(3)	default=USP (User Primary)
User [U]	UI	IMEI	Char(16)	
User [U]	UF	Referrer UserID		refers to UR
Mobile [M]	MV	MobileDeviceID	char(8)	Internal (Make+Model Identifier)
Mobile [M]	MK	Make	char (10)	
Mobile [M]	ML	Model	char (10)	
Mobile [M]	MH	Height of display	char (5)	
Mobile [M]	MW	Width of display	char (5)	
Mobile [M]	MP	PPI of display	char (4)	
Mobile [M]	MD	Mobile deployed on	char(1)	M=mobile; F=fixed reader
Portable/ Fixed Reader [P]	PR	ReaderID	char(8)	
Portable/ Fixed Reader [P]	PK	Make	char(10)	
Portable/ Fixed Reader [P]	PD	Model	char(10)	

	Code	Pneumonic	Field Eleme	Description	
Portable/ Fixed Reader [P]	PP	Power (mW)	Numeric (4)	Maximum power of the device	
Portable/ Fixed Reader [P]	PN	Range at azimuth of 45° (Portable readers only)	Numeric (2)	in multiples of 10 cm	
Portable/ Fixed Reader [P]	PS	Sensitivity at azimuth of 45° (Portable readers only)	NN.N	RSSI values	
Portable/ Fixed Reader [P]	PV	API Version number	N.NN.NNNN	major.minor.build	
Portable/ Fixed Reader [P]	PB	Battery Capacity (Portable Readers only) (in mAh)	Numeric (4)		
Antenna [E]	EK	Make of *Fixed* Reader Antenna	char(10)		
Antenna [E]	ED	Model of Fixed Reader Antenna	char(10)		
Antenna [E]	EG	Gain of Fixed Reader Antenna (in dBic)	NN.N		
Antenna [E]	EZ	Azimuth Angle (-3dB) of Fixed Reader Antenna	Numeric (3)		
Antenna [E]	EL	Location Code for Fixed Antenna. (Side is decided by facing in the same direction as the line) (For sections with more than 4 lines, 2 readers shall be used. For the second reader, line 5 shall be treates as UpMain, i.e, line 1 for the second reader)	Numeric (1)	*Left* 0 - UP MAIN: Line 1 2 - DN MAIN: Line 2 4 - UP SLOW: Line 3 6 - DN SLOW: Line 4 8 - UP - 3rd Line	*Right* 1 - UP MAIN: Line 1 3 - DN MAIN: Line 2 5 - UP SLOW: Line 3 7 - DN SLOW: Line 4 9 - UP - 3rd Line
App Specific [A]	AP	AppID	Char(8)		
App Specific [A]	AN	Vendor No	Numeric (8)	refers to RlyVendorNo from IREPS	
App Specific [A]	AV	Version	N.NN.NNNN	major.minor.build	
App Specific [A]	AS	Status		demo, alpha, beta, RC, GC	
App Specific [A]	AM	Maintained by Agency	VarChar	VendorCode or equivalent	
App Specific [A]	AD	App Deployment platform	char(1)	m=mobile (default); f=fixed; b=both	
Group of TagData [G]	GD	ID of 'Group of TagData'	NNN	Running serial for a mobile. Based on MaxChunkSize for transmission	
Group of TagData [G]	GT	DateTime stamp of transmission begin	Timestamp		
Group of TagData [G]	GF	First (Starting) TID	char (24)		
Group of TagData [G]	GL	Last (ending) TID	char (24)		
Group of TagData [G]	GS	Size of the file to be transferred (in bytes)	NNNNN		
Group of TagData [G]	GN	No of records transferred in this transaction	char (4)	Total number of operations (WN) which fit into the size for transmission.	
Tag Use Run [R]	RH	Run Header ID	NNN	Running serial for a session where multiple tag operations are done in one go.	
Tag Use Run [R]	RT	DateTimeStamp of first op START	Timestamp	= WS of the first operation	
Tag Use Run [R]	RL	LocationID		refers to LS+LE+LN	
Tag Use Run [R]	RU	User creating the record		refers to UR	
Tag Use Run [R]	RD	MobileDeviceID		refers to MV	
Tag Use Run [R]	RA	AppID		refers to AP	
Tag Use Run [R]	RP	Portable Reader ID		refers to PR	
Tag Use Run [R]	RN	Number of tags written in this run	char (4)	9999 tags max assumed	
Tag Use Run [R]	RS	DateTime Stamp of last op END	Timestamp		
TagWriteOrOperate [W]	W V	Verbosity level	Numeric (1)	1 Medium - Only time (Default) 2 Verbose - full log 9 No Log data	
TagWriteOrOperate [W]	WT	Operation serial number	N(2)	1 to 99 w.r.t Run header	
TagWriteOrOperate [W]	WR	RSSI value	Numeric(3)	Values are expected to be negative	
TagWriteOrOperate [W]	WB	Battery Status	Boolean	0 => OK	
TagWriteOrOperate [W]	WM	Portable reader memory status	Boolean	0 => OK	

TagWriteOrOperate [W]	WP	Power setting of the portable reader (in mW)	Numeric (4)	
TagWriteOrOperate [W]	WL	Bluetooth radio status	Boolean	0 => OK
TagWriteOrOperate [W]	WC	Common part of App - Error Code [Possibly CDAC]	Char (2)	00 => No error
TagWriteOrOperate [W]	WD	portable reader device specific error code	varchar()	device dependent
TagWriteOrOperate [W]	WN	Name of the operation	Char (1)	(R)ead Full tag, (P)artial Read, (U)pdate part of tag, (F)ull write, (Z)ero/ erase,(L)ock, u(N)lock, pa(S)sword change, (K)ill [unused]
TagWriteOrOperate [W]	WZ	Comma separated list of Fields for partial reads/ Updates	VarChar	
TagWriteOrOperate [W]	WS	DateTime stamp of tag operation Start	Timestamp	
TagWriteOrOperate [W]	WF	DateTime stamp of tag operation Finish	Timestamp	
TagWriteOrOperate [W]	WE	Operation status/ Error code	Char(2)	00 Any op - OK 10 Read op - No TID found 11 Read op - TID exists, no Tag data found 12 Read op - EPC control error 13 Read op - EPC data not as per V V 14 Read op - SV obsolete 15 Read op - Data not as per SV 16 Read op - no SV found 51 Write op - failed without reason 52 Write op - Unlock failed 53 Write op - Lock failed 81 User abort 82 Kill op - failed; 99 Vendor Specific Code
TagControl [T]	TP	Chip ID	char (12)	e.g., NXPUCODEDNA
TagControl [T]	TM	User Memory Size (bits)	Numeric (5)	3kb => 3072 (default)
TagControl [T]	TT	Tag TID data	varchar (24)	refer to TDS (GS1 standard)
TagControl [T]	TL	Locking password	char (8)	By default in hex. As per GS1 standards
TagControl [T]	TG	Get Password from backend		refer to TL
TagControl [T]	TH	Header in Hex	VarBinary	Tag data not included in Annexure F & G of in TT and TL
TagControl [T]	TS	Vendor no who sold the tag	Numeric (8)	refers to VendorNo from IREPS
TPD	N1	DateTime stamp of TPD1 being triggered	Timestamp	Up Line before antenna
TPD	N2	DateTime stamp of TPD2 being triggered	Timestamp	Up Line after antenna
TPD	N3	DateTime stamp of TPD3 being triggered	Timestamp	Dn Line before antenna
TPD	N4	DateTime stamp of TPD4 being triggered	Timestamp	Dn Line after antenna
TPD	N8	DateTime stamp of TPD8 being triggered	Timestamp	Both direction operations - higher km
TPD	N9	DateTime stamp of TPD9 being triggered	Timestamp	Both direction operations - lower km
TPD	NA	Make & Model identifier of TPD1	char (10)	TPD corresponding to N1
TPD	NB	Make & Model identifier of TPD2	char (10)	TPD corresponding to N2
TPD	NC	Make & Model identifier of TPD3	char (10)	TPD corresponding to N3
TPD	ND	Make & Model identifier of TPD4	char (10)	TPD corresponding to N4
TPD	NE	Make & Model identifier of TPD8	char(10)	TPD corresponding to N8
TPD	NF	Make & Model identifier of TPD9	char(10)	TPD corresponding to N9
TPD	NU	Distance of TPD1 from associated Antenna (in cms)	N(4)	TPD corresponding to N1
TPD	NV	Distance of TPD2 from associated Antenna (in cms)	N(4)	TPD corresponding to N2
TPD	NW	Distance of TPD3 from associated Antenna (in cms)	N(4)	TPD corresponding to N3
TPD	NX	Distance of TPD4 from associated Antenna (in cms)	N(4)	TPD corresponding to N4
TPD	NY	Distance of TPD8 from associated Antenna (in cms)	N(4)	TPD corresponding to N8
TPD	NZ	Distance of TPD9 from associated Antenna (in cms)	N(4)	TPD corresponding to N9

Annexure F: The Structure for the EPC Data is as under:

The first three fields are permanent and are not to be changed. The remaining structure subject to the total length being constant can be changed

Element	Code	Pneumonic	Field	Description
Vehicle [V]	VR	GS1 Country Code	N(3)	890 for India
Vehicle [V]	VG	GS1 Company Code	N(4)	7709 for IR
Vehicle [V]	V V	Version	char (1)	Version number of the VehicleID format

The structure for the remaining fields is as under:

Element	Code	Pneumonic	Ver D	Ver E
Vehicle [V]	VA	Asset Type	Char(1)	Char(1)
Vehicle [V]	VS	Side of the Rolling Stock	Char(1)	Char(1)
Vehicle [V]	VY	Year of manufacture	Char(2)	Char(2)
Vehicle [V]	V W	Owner	Char(4)	Char(4)
Vehicle [V]	VT	Detailed VehicleType	Char(8)	Char(9)
Vehicle [V]	VN	Serial No	Char(6)	Char(5)

For VV versions A, B and C – case by case clearance shall be given by CRIS.

Annexure G: The Structure for the User Data is as under:

Element	Code	Pneumonic	Field	Description
User Area	SV	User Area Structure Version No.	Char(3)	The version of the structure of the User Area on the tag as indicated in the subject of this letter without the dots. E.g., V2.2 shall be represented as 220
User Area A	DU	Date put into Use	DDMMYY	default = Today
User Area A	SU	Station put into Use/ Manufacture/ hand over/ fitment		refers to LS
User Area A	VC	Vehicle manufacturer's Code/ Vendor Code	char(8)	
User Area A	PL or AE	PL No or Assembly IdEntifier (Only one of them as applicable - PL in case of rly stock item; AE in all other cases) default = PL	char(8)	PL is in leftmost 8 characters followed by Design Variant in the rightmost 3 characters (see below) AE is any character string being used to identify an assembly or component.
	DV	Design Variant (for handling the design variant element data directly)	char (3)	These are the three rightmost characters of the PL field (see above). It indicates all variants of a particular PL No, default = 000
User Area A	SN	Product unique Serial/UnderframeNo/ Assembly No	char(10)	By each manufacturer
User Area B	DC	Date of Change in VehicleID	DDMMYY	default = Today()
User Area B	SC	StationCode where VehicleID Changed		refers to LS; default is derived from GPS
User Area B	HA	Historical Asset type		refers to VA
User Area B	HW	Historical Owner of Vehicle		refers to VW
User Area B	HT	Historical Vehicle Type		refers to VT
User Area B	HS	Historical Serial		refers to VN
User Area C	DB	Date of last Rebuilding		default = Today()
User Area C	SB	StationCode where Vehicle last rebuilt		refers to LS; default is derived from GPS
User Area C	DP	Date of last POH		default = Today()
User Area C	SP	StationCode where last POH done		refers to LS; default is derived from GPS
User Area C	DR	Date of last ROH/ IOH		default = Today()
User Area C	SR	StationCode where last ROH/ IOH done		refers to LS; default is derived from GPS
User Area C	NM	Name of Any other Major schedule done	char(4)	0000 Unknown (Default) NPOH NPOH NPSR NPOH + SR CONV Conversion to new Type UNLA Unload able 'A' UNLB Unload able 'B' UNLC Unload able 'C' CORL POH + Corrosion repair Low CORM POH + Corrosion repair Medium CORH POH + Corrosion repair High SPLR Special Repair POSR POH + SR ACDT Accidental
User Area C	DA	Date of Any other major schedule done		default = Today(); refers to NM above
User Area C	SA	StationCode where Any other major schedule was done		refers to LS; default is derived from GPS
User Area C	DS	Date of last Scheduled Running maintenance		default = Today()
User Area C	SS	Station of last Scheduled Running maintenance		refers to LS+LE; default is derived from GPS
User Area C	DD	Due Date for next scheduled maintenance	DDMMYY	*Periodicity taken from the backend*
User Area C	KM	KMs till next scheduled maintenance	NNNNN	0 => NOT APPLICABLE
User Area C	NS	Name of Next Schedule due	char(6)	*Sequence taken from backend*
User Area C	HM	Home/ base StationCode		refers to LS+LE
User Area D	TN	Trial - No. of mobile numbers	N	(0,1,2,3); default=0
User Area D	MA	Contact Mobile number of first item (A)	char (10)	
User Area D	MB	Contact Mobile number of second item (B)	char (10)	
User Area D	MC	Contact Mobile number of third item (C)	char (10)	
		Total Bits reserved by CRIS for future use	*184*	= 23 bytes

Annexure H: Data transfer format from field devices (V2,0)

```
<?xml version="1.0" encoding="UTF-8"?>
<root>
    <Cnl>
        <Cnl_Desc>Data upload from portable reader to backend</Cnl_Desc>
        <Cnl_Ver>2.0</Cnl_Ver>
        <Guideline_Ver>3.1.0</Guideline_Ver>
    </Cnl>
    <Group>
        <GD></GD>
        <GT></GT>
        <GF></GF>
        <GL></GL>
        <GS></GS>
        <GN></GN>
        <Header>
            <RH></RH>
            <RT></RT>
            <RL></RL>
            <RU></RU>
            <RD></RD>
            <RA></RA>
            <RP></RP>
            <RN></RN>
            <RS></RS>
            <TPI>
                <TID>
                    <TID_size></TID_size>
                    <TT_h></TT_h>
                </TID>
                <TPD>
                    <WT></WT>
                    <WN></WN>
                    <TG></TG>
                    <WS></WS>
                    <WE></WE>
                </TPD>
                <WV></WV>
                <TPD>
                    <WT></WT>
                    <WN></WN>
                    <WR></WR>
                    <WB></WB>
                    <WM></WM>
                    <WP></WP>
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                    <WC></WC>
                    <WS></WS>
                    <WF></WF>
                    <WE></WE>
                </TPD>
                <WV></WV>
                <TPD>
                    <WT></WT>
                    <WN></WN>
                    <WR></WR>
                    <WB></WB>
```

```
                    <WM></WM>
                    <WP></WP>
                    <WL></WL>
                    <WC></WC>
                    <WS></WS>
                    <WF></WF>
                    <Tag>
                        <EPC>
                            <EPC_Key>GIAI202</EPC_Key><!-- default value shown-->
                            <EPC_h></EPC_h>
                        </EPC>
                        <User>
                            <TM>3072</TM><!-- default value shown-->
                            <DSFID_b>10001001</DSFID_b><!-- default value shown-->
                            <SV></SV>
                            <User_Data></User_Data>
                        </User>
                        <Remaining>
                            <Bank00_Data_h></Bank00_Data_h>
                            <Bank01_Data_h></Bank01_Data_h><!-- PC bit default value of 6C00 -->
                        </Remaining>
                    </Tag>
                    <WE></WE>
                </TPD>
                <TPD>
                    <WT></WT>
                    <WN></WN>
                    <TL></TL>
                    <WS></WS>
                    <WE></WE>
                </TPD>
            </TPI>
        </Header>
    </Group>
</root>
```

Explanatory Notes:

1 All 2 letter codes are as per Tag Vocabulary at Annexure E.

2 Trailing '_b' after any field implies that the data in the field is in BITs; Trailing '_h' after any field implies that the data in the field is in HEX; if there is nothing trailing after a field then the data is in ASCII

3 In case any information is not available for a field then enter ~NULL~

4 In actual use, all comments can be stripped off the file.

5 All other codes are explained below:

5.1 <root>: This is a reserved word as per standards for XML.

5.2 <Cnl>: Control information for the remaining elements in the file

5.3 <Group>:Container for data pertaining to a group of records BEING TRANSFERRED TOGETHER. Multiple sessions can be transferred at one time in a group as per the value in the GN field.

5.3.1 <Header>:Container for all data pertaining to operations done in a SINGLE session/ sequence, i.e., COMMON DATA FOR A SINGLE CONTINUOUS SESSION BY A SINGLE PERSON. Inside a group there shall be at least one header that is common to the session.

5.3.1.1 <TPI>: A Tag Performance Information TPI contains all the data pertaining to all operations done on a SINGLE tag, i.e., ONE TPI PER TAG. Based on RN value that many sets of TPIs can exist. A TPI shall contain one or more TPDs (see below) specific to a particular tag.

5.3.1.1.1 <TID>: All the TID data onboard a tag.

5.3.1.1.1.1 <TID_size>: Is the size of the TID in bits. Example for NXP CODE DNA it is 96 corresponding to its TID size of 96 bits.

5.3.1.1.1.2 <TT_h>: Is the actual data in hex in the TID.

5.3.1.1.2 <TPD>:Tag Performance Data is for a SINGLE OPERATION ON A TAG such as zeroing a tag, full initialisation, part update etc.

5.3.1.1.2.1 <Tag>: container for all the data onboard a tag except TID. It has 3 parts - EPC, User and Remaining.

5.3.1.1.2.1.1 <EPC>:container for all the data in the EPC area of a tag consisting of:

5.3.1.1.2.1.1.1 <EPC_Key>:Encoding method used for writing data in the tag which is GIAI202.
5.3.1.1.2.1.1.2 <EPC_h>:EPC data in Hexadecimal format.

5.3.1.1.2.1.2 <User>: container for all the data in the User area of a tag.

5.3.1.1.2.1.2.1 <DSFID_b>:Data storage format identifier as per GS1 standards (in binary.)
5.3.1.1.2.1.2.2 <UserData>:User Data memory in ASCII format.

5.3.1.1.2.1.3 <Remaining>: container for all the contents of Bank 00 and Bank 01 of the tag

5.3.1.1.2.1.3.1 <Bank00_Data_h>:Contents of Bank 00 Access Password in Hexadecimal data format.The contents of Bank 00 will be HIDDEN in case of read a tag that is password locked and will be displayed in case of read a tag with password.

5.3.1.1.2.1.3.2 <Bank01_Data_h>:Contents of Bank 01 CRC and PC bits in Hexadecimal data format.CRC value gets updated by the reader and PC bit value should be 6C00 in hex.

Annexure J: Location Functional Extension

Note:

1) **Primary function of that area is the deciding factor for the code.** The same area may be used for other secondary functions also. Who controls the area is not relevant.
2) Overlap of areas is to be avoided to the extent practical, but is permitted where absolutely necessary.
3) The aim is to finally map geographical coordinates to functions
4) Example: HQs will include space for the offices, circulating areas, holding area, ancillary functions, energy related, green area, vacant space and so on.

Code	Primary Function	Explanation & Examples
A	Ancillary functions	Water/ sewerage etc related, security [fire, RPF] related, staff benefit related (hospitals, schools, stadiums, clubs, institutes etc), Training centers
B	Bridges & Special Civil structures	Bridge, tunnels, special structures, landslide slopes etc
C	Commercial use	Money earning - shops, leased land, public commercial parking, ad locations, etc
D	Direct Operations	All Controls, Lobbies, Running rooms, TTEs rooms, ASM/ SM's office, Yards, sidings, cabins, LCG etc
E	Electric Traction	Includes all trackside installations, linear traction assets, feeders, SCADA also
F	Offices of the Railways	HQs, EDP center etc
G	Green Area	Environment, Waste disposal, incinerators, Green Area, forests etc
H	Holding/ storage areas	ballast heaps, Stores wards, stabling yards, holding lines, Parking space in rly offices, linen stores, scrap yards etc
I	Journey related	Circulating areas, roads, pathways, entrance/ exit gates etc
K	crossings over tracks	RUB, ROB etc
L	Linear assets (Civil)	Track and track side assets (not included elsewhere)
M	Minor Maintenance related	Diesel/ Electric Sheds/ ROH depots/ Sick lines, maintenance yard etc
N	Not owned by Railways	But Railways operates there - private lines/ sidings
P	Public Facing	Used by/ for public - Platforms, reservation complexes, waiting/ retiring rooms, parcel office, any rly office that is public facing etc
Q	Questionable	Disputed, Squatted upon
R	Residential	Any residential colony/ quarters, rest houses for railway staff etc
S	S&T operations	All S&T equipment not included in other category including track side OFC etc
T	Temporary structures	Medical camps, relief activities, Any land belonging to others being used temporarily
U	Under construction	Includes areas vacant, under development etc
V	Virtual locations	video conferences, telephonic conferences, electronic data stores etc
W	Workshops	Major maintenance/ manufacture related
X	Restricted area	Area about which information cannot be released e.g., military related
Y	Energy related	Electricity use (other than traction), Fuel, Biodiesel plant, CNG/ PNG/ LNG, DG sets etc
Z	(reserved for future)	

Annexure K: Examples (for understanding purposes only)

1. Example of the data stored on a tag:

Desc	Data	Size	Padding Zeros	Total
EPC	E007709D2A17ECOR000BOBSN003333	30	0	30
DSFID	10001001 (in binary or 89h)	1	1	2
SV	!iSVv310	8	0	8
User A	!iDUv020917!iSUv0BLH!iVCv0000TEXB!iAEv00000000ABC!iSNv0123456789 or !iDUv020917!iSUv0BLH!iVCv0000TEXB!iPLv12345678012!iSNv0123456789	64	0	64
User B	!iDCv000000!iSCv0000!iHAv0!iHWv0ECR!iHTv00000000!iHSv00000!0000	60	4	64
User C	!iDBv311214!iSBvJHSW!iDPv311215!iSPvJHSW!iDRv311216!iSRv0UMB!iNMv NPSR!iDAv310217!iSAv0TKD!iDSv310317!iSSv0TKDM!iDDv310417!iKMv100 00!iNSv000!OH!iHMv0BSPM!0000000	153	7	160
User D	!iTNv0!iMAv9999911111!iMBv8383831111!iMCv8989897713!0000	52	4	56
(Reserved)	(For future purposes)			30
	TOTAL USER AREA (in bytes)			384

NOTE: The underlined zeros at the end of the area above – these are to be mandatorily added after the last exclamation mark of the respective areas – they act as padding up to end of the User Area.

2. Example of the data to be transferred from field portable reader:

```
<?xml version="1.0" encoding="UTF-8"?>
<root>
    <Cnl>
        <Cnl_Desc>Data upload from frontend to backend</Cnl_Desc>
        <Cnl_Ver>2.0</Cnl_Ver>
        <Guide_Ver>3.1.0</Guide_Ver>
    </Cnl>
    <!-- NOTE Comments are NOT needed in the final version and should be removed -->
    <Group><!-- group of records being transferred together -->
    <GD>001</GD><!-- Identifier -->
    <GT>22-Oct-2018 10:30:30.127</GT>
    <GF>E2C068922000280 21ED643AF</GF>
    <GL>E2C068922000F3021ED646F0</GL>
    <GS>29536</GS><!-- Size of this file in bytes -->
    <GN>0031</GN><!-- Number of records transferred in this transaction -->
        <Header>
            <RH>001</RH><!--1st - Running serial for a session where multiple tag operations are done in one go -->
<!-- 1st example of tag being written to for the first time -->
            <RT>22-Oct-2018 10:41:30.127</RT><!-- WS of the first op -->
            <RL>0JMPW001</RL><!-- Location ID, Jamalpur, Workshop, location 1 -->
            <RU>Someusr1</RU>
            <RD>ee0b806dd0d1e07a</RD><!-- Android ID -->
            <RA>1.002.0003</RA><!-- AppID -->
            <RP>SomePRdr</RP><!-- Portable Reader ID -->
            <RN>0001</RN><!-- Number of tags written in this run -->
```

<RS>22-Oct-2018 10:48:13.020</RS><!-- Date Time of last operation END in this group -->
<TPI><!-- Tag Performance Information -->
<TID>
<TID_size>96</TID_size>
<TT_h>E2C06892200028021ED643AF</TT_h><!-- The TID of the tag for which TPI details are available -->
</TID>
<WV>1</WV><!-- Verbosity level Medium -->
<TPD><!-- Tag performance data -->
<WT>01</WT><!-- 1st op -->
<WN>R</WN><!-- Read operation -->
<WS>22-Oct-2018 10:41:30.127</WS><!-- Date Time stamp of tag operation Start -->
<WF>22-Oct-2018 10:42:00.110</WF><!-- Date Time stamp of tag operation Finish -->
<WE>11</WE><!-- op status - Error TID exists, but no Tag DATA found -->
</TPD>
<WV>2</WV><!-- Verbosity raised since error -->
<TPD><!-- Tag performance data -->
<WT>02</WT><!-- 2nd op -->
<WN>F</WN><!-- Full Tag Write -->
<WR>-57</WR><!-- RSSI value -->
<WB>0</WB><!-- Battery status OK -->
<WM>0</WM><!-- Portable reader memory status OK -->
<WP>0500</WP><!-- Power setting of portable reader -->
<WL>0</WL><!-- Bluetooth radio status -->
<WC>00</WC><!-- Common part of App - Error Code -->
<WS>22-Oct-2018 10:43:03.027</WS><!-- Date Time stamp of tag operation Start -->
<WF>22-Oct-2018 10:44:25.105</WF><!-- Date Time stamp of tag operation Finish -->
<WE>00</WE><!-- successful op -->
</TPD>
<WV>1</WV><!-- Verbosity level Medium -->
<TPD><!-- Tag performance data -->
<WT>03</WT><!-- 3rd op -->
<WN>R</WN><!-- ReadBack after Initialization -->
<WS>22-Oct-2018 10:45:03.029</WS><!-- Date Time stamp of tag operation Start-->
<WF>22-Oct-2018 10:46:25.135</WF><!-- Date Time stamp of tag operation Finish -->
<Tag><!-- Tag data read-->
<EPC>
<EPC_Key>GIAI202</EPC_Key><!-- default value shown-->
<EPC_h>38361faef62318cc5c45873e93060c1842ad0e6b060c58356000</EPC_h>
</EPC>
<User>
<TM>03072</TM><!-- default value shown-->
<DSFID_b>10001001</DSFID_b>
<SV>310</SV><!-- version 3,1,0 -->
<UserData>IIDUv020918IISUv0ASRIIVCv0000ASRWIIPLv000000000000IISNv0000000000IIDCv000000IISCv0000IIHAv0IIHWv0000IIHTv000000000IIHSv000000!0000!iDBv000000IISBv0000IIDPv000000IISPv0000IIDRv000000IISRv0000IINMv0000!IDAv000000IISAv0000IIDSv000000IISSv00000IIDDv000000IIKMv00000IINSv000000!IHMv00000!0000000!TNv3!IMAv9999911111IIMBv8383831111!IMCv89899697713!0000</UserData>
</User>
<Remaining><!-- Only data that is not included above -->
<Bank00_Data_h>00000000</Bank00_Data_h><!-- Bank00 data visible as tag is not password locked -->
<Bank01_Data_h>1BDA6C00</Bank01_Data_h><!-- PC bit default value of 6C00 -->
</Remaining>
</Tag>
<WE>00</WE><!-- Successful Readback and Init op -->

```
                </TPD>
                <TPD>
                    <WT>04</WT><!-- 4th op -->
                    <WN>S</WN><!-- Update Password of the tag -->
                    <WS>22-Oct-2018 10:47:09.060</WS><!-- Date Time stamp of unlock operation -->
                    <WE>00</WE><!-- Successful password update operation -->
                </TPD>
                <WV>1</WV><!-- Verbosity level Medium -->
                <TPD><!-- Tag performance data -->
                    <WT>05</WT><!-- 5th op -->
                    <WN>R</WN><!-- Read to verify password -->
                    <WS>22-Oct-2018 10:48:03.029</WS><!-- Date Time stamp of tag operation Start-->
                    <WF>22-Oct-2018 10:48:56.135</WF><!-- Date Time stamp of tag operation Finish -->
                    <Tag><!-- Tag data read-->
                        <EPC>
                            <EPC_Key>GIAI202</EPC_Key><!-- default value shown-->
                            <EPC_h>38361faef62318cc5c45873e93060c1842ad0e6b060c58356000</EPC_h>
                        </EPC>
                        <User>
                            <TM>03072</TM><!-- default value shown-->
                            <DSFID_b>10001001</DSFID_b>
                            <SV>310</SV><!-- version 3,1,0 -->
                                <UserData>liDUv020918liSUv0ASRliVCv0000ASRWliPLv00000000000liSNv0000
                                000000liDCv000000liSCv0000liHAv0liHWv0000liHTv00000000liHSv000000!0000!
                                iDBv000000liSBv0000liDPv000000liSPv0000liDRv000000liSRv0000liNMv0000liD
                                Av000000liSAv0000liDSv000000liSSv00000liDDv000000liKMv00000liNSv000000!
                                iHMv00000!0000000liTNv3liMAv9999911111liMBv8383831111liMCv89898697713!
                                0000</UserData>
                        <Remaining><!-- Only data that is not included above -->
                            <Bank00_Data_h>587646EF</Bank00_Data_h><!-- Bank00 data visible as tag is not
password locked -->
                            <Bank01_Data_h>2BDA6C00</Bank01_Data_h><!-- PC bit default value of 6C00 -->
                        </Remaining>
                    </Tag>
                    <WE>00</WE><!-- Successful Readback and init op -->
                </TPD>
                <TPD>
                    <WT>06</WT><!-- 6th op -->
                    <WN>L</WN><!-- Lock Operation -->
                    <TL>587646EF</TL><!-- Locking Password -->
                    <WS>22-Oct-2018 10:48:13.020</WS>
                    <WE>00</WE><!-- successful operation -->
                </TPD>
            </TPI>
        </Header>
        <Header>
            <RH>002</RH><!-- 2nd run identifier -->
<!-- 2nd example of Tag undergoing full write since tag data structure is not correct -->
            <RT>22-Oct-2018 11:14:16.127</RT><!-- WS of the first op -->
            <RL>0JMPW001</RL><!-- Location ID -->
            <RU>Someusr2</RU>
            <RD>ee0b806dd0b3e08a</RD><!-- Android ID-->
            <RA>1.002.0003</RA><!-- AppID -->
            <RP>SomePRdr</RP><!-- Portable Reader ID -->
            <RN>0001</RN><!-- Number of tags written in this run -->
            <RS>22-Oct-2018 11:23:15.101</RS><!-- Date time stamp of last op end -->
            <TPI><!-- Tag Performance Information -->
                <TID>
```

```
            <TID_size>96</TID_size>
            <TT_h>E2C068922000B0021F4EB4AC</TT_h><!-- The TID of the tag for which TPI details are
available -->
        </TID>
        <WV>1</WV><!-- Verbosity level Medium -->
        <TPD><!-- Tag performance data -->
            <WT>01</WT><!-- 1st op -->
            <WN>R</WN><!-- Read operation -->
            <WS>22-Oct-2018 11:14:16.127</WS><!-- Date Time stamp of tag operation Start -->
            <WF>22-Oct-2018 11:14:59.030</WF><!-- Date Time stamp of tag operation Finish -->
            <Tag><!-- one record per tag, multiple sets of records are expected as per RN -->
                <EPC>
                    <EPC_Key>GIAI202</EPC_Key><!-- default value shown-->
                    <EPC_h>38361faef62328cc5c30615e93060c1842ad0e6b060c58336400</EPC_h>
                </EPC>
                <User>
                    <TM>03072</TM><!-- default value shown-->
                    <DSFID_b>10001001</DSFID_b>
                    <SV>220</SV><!-- version 2,2,0 -->
                        <UserData>!IDUv091117!ISUv0ASRIIVCv000000MIIIPLv00000000000!ISNv00000
                        0000!IDCv000000!ISCv0000!IHAv0!IHWv0000!IHTv00000000!IHSv000000I000!IDB
                        v311214!ISBvJHSW!IDPv311215!ISPvJHSW!IDRv311216!ISRv0TKD!IDAv310217!I
                        SAv0TKD!IDSv310317!ISSvTKDM!IDDv310417!IKMv10000!INSv000IOH!IHMvBSP
                        M!00000000000000000!ITNv3!IMAv9999911111!IMBv8989891111!IMCv95950716
                        28!00000000000</UserData>
                </User>
                <Remaining><!--Only data that is not included above -->
                    <Bank00_Data_h>HIDDEN</Bank00_Data_h><!-- Bank00 data is not visible as tag is
password locked -->
                    <Bank01_Data_h>BA586C00</Bank01_Data_h><!-- PC bit default value of 6C00 -->
                </Remaining>
            </Tag>
            <WE>15</WE><!-- op status - Data not as per current SV -->
        </TPD>
        <TPD>
            <WT>02</WT><!-- 2nd op -->
            <WN>N</WN><!-- Unlock the tag -->
            <TG>5D3070A1</TG><!-- unlock the tag with password available from backend -->
            <WS>22-Oct-2018 11:15:09.030</WS><!-- Date Time stamp of tag operation Start -->
            <WE>00</WE><!-- successful tag unlock -->
        </TPD>
        <WV>2</WV><!-- Verbosity raised since error -->
        <TPD><!-- Tag performance data -->
            <WT>03</WT><!-- 3rd op -->
            <WN>Z</WN><!-- Zero/ Erase the tag when error in structure operation -->
            <WR>-47</WR><!-- RSSI value -->
            <WB>0</WB><!-- Battery status -->
            <WM>0</WM><!-- Portable reader memory status -->
            <WP>0500</WP><!-- Power setting of portable reader -->
            <WL>0</WL><!-- BLE radio status -->
            <WC>00</WC><!-- Standard App Error Code -->
            <WS>22-Oct-2018 11:15:59.227</WS><!-- Date Time stamp of tag operation Start -->
            <WF>22-Oct-2018 11:16:58.500</WF><!-- Date Time stamp of tag operation Finish -->
            <WE>00</WE><!-- successful write op -->
        </TPD>
        <WV>1</WV><!-- Verbosity level Medium -->
        <TPD><!--Tag performance data -->
            <WT>04</WT><!-- 4th op -->
```

<WN>R</WN><!-- ReadBack of Zero operation with Password -->
<WS>22-Oct-2018 11:17:00.500</WS><!-- Date Time stamp of tag operation Start -->
<WF>22-Oct-2018 11:18:50.121</WF><!-- Date Time stamp of tag operation Finish -->
<Tag><!-- one record per tag, multiple sets of records are expected as per RN -->
<EPC>
<EPC_Key>GIAI202</EPC_Key><!-- default value shown -->
<EPC_h>000000000000000000000000000000000000000000000000000000000000</EPC_h>
</EPC>
<User>
<TM>03072</TM><!-- default value shown-->
<DSFID_b>10001001</DSFID_b>
<SV>310</SV><!-- version upgraded to 3,1,0 -->
<UserData>!IDUv000000!ISUv0000!IVCv00000000!IPLv000000000000!ISNv000000
0000!IDCv000000!ISCv0000!IHAv0!IHWv0000!IHTv00000000!IHSv000000!0000!ID
Bv000000!ISBv0000!IDPv000000!ISPv0000!IDRv000000!ISRv0000!INMv0000!IDAv
000000!ISAv0000!IDSv000000!ISSv00000!IDDv000000!IKMv00000!INSv000000!IH
Mv00000!0000000!ITNv0!IMAv0000000000!IMBv0000000000!IMCv0000000000!00
00</UserData>
</User>
<Remaining><!-- Only data that is not included above -->
<Bank00_Data_h>5D3070A1</Bank00_Data_h><!-- Bank00 data visible as tag is not
password locked -->
<Bank01_Data_h>BA586C00</Bank01_Data_h><!-- PC bit default value of 6C00 -->
</Remaining>
</Tag>
<WE>00</WE><!-- successful ReadBack of Zero operation -->
</TPD>
<WV>1</WV><!-- Verbosity level Medium -->
<TPD><!-- Tag performance data -->
<WT>05</WT><!-- 5th op -->
<WN>F</WN><!-- Full write operation -->
<WS>22-Oct-2018 11:19:31.227</WS><!-- Date Time stamp of tag operation Start -->
<WF>22-Oct-2018 11:20:58.500</WF><!-- Date Time stamp of tag operation Finish -->
<WE>00</WE><!-- successful write op -->
</TPD>
<WV>1</WV><!-- Verbosity level Medium -->
<TPD><!-- Tag performance data -->
<WT>06</WT><!-- 6th op -->
<WN>R</WN><!-- ReadBack operation of unlocked tag -->
<WS>22-Oct-2018 11:21:00.500</WS><!-- Date Time stamp of tag operation Start -->
<WF>22-Oct-2018 11:22:50.121</WF><!-- Date Time stamp of tag operation Finish -->
<Tag><!-- one record per tag, multiple sets of records are expected as per RN -->
<EPC>
<EPC_Key>GIAI202</EPC_Key><!-- default value shown -->
<EPC_h>38361faef62328cc5c30615e93060c1842ad0e6b060c58336400</EPC_h>
</EPC>
<User>
<TM>03072</TM><!-- default value shown -->
<DSFID_b>10001001</DSFID_b>
<SV>310</SV><!-- version upgraded to 3,1,0 -->
<UserData>!IDUv220918!ISUv0ASR!IVCv000000M!IPLv000000000000!ISNv000000
00000!IDCv000000!ISCv0000!IHAv0!IHWv0000!IHTv00000000!IHSv000000!0000!I
DBv311214!ISBvJHSW!IDPv311215!ISPvJHSW!IDRv311216!ISRv0TKD!INMvNPS
R!IDAv310217!ISAv0TKD!IDSv310317!ISSv0TKDM!IDDv310417!IKMv10000!INSv0
00!OH!IHMv0BSPM!0000000!ITNv3!IMAv9999911111!IMBv6989891111!IMCv9595
071628!0000</UserData>
</User>
<Remaining><!-- Only data that is not included above -->

<Bank00_Data_h>5D3070A1</Bank00_Data_h><!-- Bank00 data visible as tag is not password locked -->
<Bank01_Data_h>CC706C00</Bank01_Data_h><!-- PC bit default value of 6C00 -->
</Remaining>
</Tag>
<WE>00</WE><!-- Successful ReadBack op -->
</TPD>
<TPD>
<WT>07</WT><!-- 7th op -->
<WN>L</WN><!-- Lock the tag -->
<TL>5D3070A1</TL><!-- Lock the tag with password -->
<WS>22-Oct-2018 11:23:15.101</WS><!-- Date Time stamp of tag operation Start -->
<WE>00</WE><!-- successful tag locked -->
</TPD>
</TPI>
</Header>
<Header>
<RH>003</RH><!-- 3rd run Identifier -->
<!-- 3rd example of tag being reinitialised due to EPC filter value being 0 instead of 1 -->
<RT>22-Oct-2018 11:26:00.010</RT><!-- WS of the first op -->
<RL>0JMPW001</RL><!-- Location ID -->
<RU>Someusr3</RU>
<RD>ee0b806dd0babc8b</RD><!-- Android ID -->
<RA>1.002.0003</RA><!-- AppID -->
<RP>SomePRdr</RP><!-- Portable Reader ID -->
<RN>0003</RN><!-- Number of tags written in this run -->
<RS>22-Oct-2018 11:48:10.015</RS><!-- Date time stamp of last op END -->
<TPI><!-- Tag Performance Information -->
<TID>
<TID_size>96</TID_size>
<TT_h>E2C0689220006C021ED64831</TT_h><!-- The TID of the tag for which TPI details are available -->
</TID>
<WV>1</WV><!-- Verbosity level Medium -->
<TPD><!-- Tag performance data -->
<WT>01</WT><!-- 1st op -->
<WN>R</WN><!-- Read operation -->
<WS>22-Oct-2018 11:26:00.010</WS><!-- Date Time stamp of tag operation Start -->
<WF>22-Oct-2018 11:27:59.136</WF><!-- Date Time stamp of tag operation Finish -->
<Tag><!-- one record per tag, multiple sets of records are expected as per RN -->
<EPC>
<EPC_Key>GIAI202</EPC_Key><!-- default value shown-->
<EPC_h>38161faef62328cc5c30610e9429f4ea48a73593060c1b366400</EPC_h>
</EPC>
<User>
<TM>03072</TM><!-- default value shown -->
<DSFID_b>10001001</DSFID_b>
<SV>310</SV><!-- version upgraded to 3,1,0 -->
<UserData>liDUv221018liSUv0BLHliVCv0000TEXBliPLv000000000000liSNv00000
00000liDCv000000liSCv0000liHAv0liHWv0000liHTv00000000liHSv000000!0000li
DBv020516liSBvLLHMliDPv020517liSPvLLHMliDRv020518liSRv0BSLliNMvNPO
HliDAv020618liSAv0BSLliDSv020718liSSv0GZBMliDDv020818liKMv01000liNSv0
00lOHliHMv0BSPM!0000000!iTNv3liMAv9898198981liMBv9898767655liMCv8989
897777!0000</UserData>
</User>
<Remaining><!-- Only data that is not included above -->
<Bank00_Data_h>HIDDEN</Bank00_Data_h><!-- Bank00 data not visible as tag is password locked -->

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                    <Bank01_Data_h>0A586C00</Bank01_Data_h><!-- PC bit default value of 6C00 -->
                </Remaining>
            </Tag>
            <WE>12</WE><!-- Read op status - unsuccessful, as EPC control bit error -->
        </TPD>
        <TPD>
            <WT>02</WT><!-- 2nd operation -->
            <WN>N</WN><!-- Unlock the tag -->
            <TG>5D3070A2</TG><!-- get password from backend -->
            <WS>22-Oct-2018 11:28:05.011</WS><!-- Date Time stamp of operation -->
            <WE>00</WE><!-- tag unlock -->
        </TPD>
        <WV>2</WV><!-- Verbosity raised since error -->
        <TPD><!-- Tag performance data -->
            <WT>03</WT><!-- 3rd op -->
            <WN>R</WN><!-- Read operation -->
            <WR>-44</WR><!-- RSSI value -->
            <WB>0</WB><!-- Battery status -->
            <WM>0</WM><!-- Portable reader memory status -->
            <WP>0500</WP><!-- Power setting of portable reader -->
            <WL>0</WL><!-- BLE radio status -->
            <WC>00</WC><!-- Standard App Error Code -->
            <WS>22-Oct-2018 11:29:10.010</WS><!-- Date Time stamp of tag operation Start -->
            <WF>22-Oct-2018 11:29:50.121</WF><!-- Date Time stamp of tag operation Finish -->
            <Tag><!-- one record per tag, multiple sets of records are expected as per RN -->
                <EPC>
                    <EPC_Key>GIAI202</EPC_Key><!-- default value shown -->
                    <EPC_h>38161faef62328cc5c30610e9429f4ea48a73593060c1b366400</EPC_h>
                </EPC>
                <User>
                    <TM>03072</TM><!-- default value shown -->
                    <DSFID_b>10001001</DSFID_b>
                    <SV>310</SV><!-- version upgraded to 3,1,0 -->
                        <UserData>!iDUv221018!iSUv0BLH!iVCv0000TEXB!iPLv000000000000!iSNv00000
                        00000!iDCv000000!iSCv0000!iHAv0!iHWv0000!iHTv00000000!iHSv000000!0000!i
                        DBv020516!iSBvLLHM!iDPv020517!iSPvLLHM!iDRv020518!iSRv0BSL!iNMvNPO
                        H!iDAv020618!iSAv0BSL!iDSv020718!iSSv0GZBM!iDDv020818!iKMv01000!iNSv0
                        00!OH!iHMv0BSPM!0000000!iTNv3!iMAv9898198981!iMBv9898767655!iMCv6989
                        897777!0000</UserData>
                </User>
                <Remaining><!-- Only data that is not already included above -->
                    <Bank00_Data_h>5D3070A2</Bank00_Data_h><!-- Bank00 data visible as tag is
unlocked -->
                    <Bank01_Data_h>0A586C00</Bank01_Data_h><!-- PC bit default value of 6C00 -->
                </Remaining>
            </Tag>
            <WE>12</WE><!-- Read op status - unsuccessful as EPC control bit error -->
        </TPD>
        <WV>2</WV><!-- Verbosity raised since error -->
        <TPD><!-- Tag performance data -->
            <WT>04</WT><!-- 4th op -->
            <WN>F</WN><!-- Full write operation -->
            <WR>-47</WR><!-- RSSI value -->
            <WB>0</WB><!-- Battery status -->
            <WM>0</WM><!-- Portable reader memory status -->
            <WP>0500</WP><!-- Power setting of portable reader -->
            <WL>0</WL><!-- BLE radio status -->
            <WC>00</WC><!-- Standard App Error Code -->
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                <WS>22-Oct-2018 11:30:01.227</WS><!-- Date Time stamp of tag operation Start -->
                <WF>22-Oct-2018 11:30:58.500</WF><!-- Date Time stamp of tag operation Finish -->
                <WE>00</WE><!-- successful write op -->
            </TPD>
            <WV>1</WV><!-- Verbosity level Medium -->
            <TPD><!-- Tag performance data -->
                <WT>05</WT><!-- 5th op -->
                <WN>R</WN><!-- ReadBack after write with Password -->
                <WS>22-Oct-2018 11:31:06.200</WS><!-- Date Time stamp of tag operation start -->
                <WF>22-Oct-2018 11:31:59.036</WF><!-- Date Time stamp of tag operation Finish -->
                <Tag><!-- one record per tag, multiple sets of records are expected as per RN -->
                    <EPC>
                        <EPC_Key>GIAI202</EPC_Key><!-- default value shown -->
                        <EPC_h>38361faef62328cc5c30610a9429f4ea48a73593060c1b366400</EPC_h>
                    </EPC>
                    <User>
                        <TM>03072</TM><!-- default value shown -->
                        <DSFID_b>10001001</DSFID_b>
                        <SV>310</SV><!-- version upgraded to 3,1,0 -->
                            <UserData>!IDUv221018!ISUv0BLH!iVCv0000TEXB!IPLv00000000000!ISNv00000
                            00000!IDCv000000!ISCv0000!IHAv0!IHWv0000!IHTv00000000!IHSv000000!0000!I
                            DBv020516!ISBvLLHM!IDPv020517!ISPvLLHM!IDRv020518!ISRv0BSL!INMvNPO
                            H!IDAv020618!ISAv0BSL!IDSv020718!ISSv0GZBM!IDDv020818!IKMv01000!INSv0
                            00!OH!IHMv0BSPM!0000000!iTNv3!iMAv9898198981!IMBv9898767655!IMCv8989
                            897777!0000</UserData>
                    </User>
                    <Remaining><!-- Only data that is not already included above -->
                        <Bank00_Data_h>5D3070A2</Bank00_Data_h><!-- Bank00 data visible as tag is not
password locked -->
                        <Bank01_Data_h>09C86C00</Bank01_Data_h><!-- PC bit default value of 6C00 -->
                    </Remaining>
                </Tag>
                <WE>00</WE><!-- ReadBack op successful -->
            </TPD>
            <TPD>
                <WT>06</WT><!-- 6th op -->
                <WN>L</WN><!-- Lock the tag -->
                <TL>5D3070A2</TL><!-- Locking password -->
                <WS>22-Oct-2018 11:32:19.036</WS><!-- Date Time stamp of lock operation -->
                <WE>00</WE><!-- lock operation successful -->
            </TPD>
        </TPI>
<!-- 4th example of Partial update of 4 fields -->
        <TPI><!-- Tag Performance Information -->
            <TID>
                <TID_size>96</TID_size>
                <TT_h>E2C068922000DC021ED65B19</TT_h><!-- The TID of the tag for which TPI details are
available -->
            </TID>
            <WV>1</WV><!-- Verbosity level Medium -->
            <TPD><!-- Tag performance data -->
                <WT>07</WT><!-- 7th op -->
                <WN>P</WN><!-- Partial Read -->
                    <WZ>"DP","SP","DR","SR"</WZ>
                <WS>22-Oct-2018 11:34:02.210</WS><!-- Date Time stamp of tag operation Start -->
                <WF>22-Oct-2018 11:34:56.036</WF><!-- Date Time stamp of tag operation Finish -->
                <Tag><!-- one record per tag, multiple sets of records are expected as per RN -->
                    <EPC>
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                    <EPC_Key>GIAI202</EPC_Key><!-- default value shown-->
                    <EPC_h>38361faef62328cc5c30615e93060c1842ad0e6b060c58316e00</EPC_h>
                </EPC>
                <User>
                    <TM>03072</TM><!-- User area size default -->
                    <DSFID_b>10001001</DSFID_b>
                    <SV>310</SV><!-- version 3,1,0 -->
                    <UserData>!IDPv020317!ISPvJUDW!IDRv030418!ISRv0TKD</UserData>
                </User>
                <Remaining><!-- Only data that is not already included above -->
                    <Bank00_Data_h>HIDDEN</Bank00_Data_h><!-- Bank00 data not visible as tag is
paseword locked -->
                    <Bank01_Data_h>EECA6C00</Bank01_Data_h><!-- PC bit default value of 6C00 -->
                </Remaining>
            </Tag>
            <WE>00</WE><!-- Partial Read successful -->
        </TPD>
        <TPD>
            <WT>08<WT><!-- 8th op -->
            <WN>N</WN><!-- Unlock tag -->
            <TG>15D5A436</TG><!-- Get password from backend -->
            <WS>22-Oct-2018 11:35:48.010</WS><!-- Date Time stamp of unlock operation -->
            <WE>00</WE><!-- Successful tag unlock operation -->
        </TPD>
        <WV>1</WV><!-- Verbosity level Medium -->
        <TPD><!-- Tag performance data -->
            <WT>09</WT><!-- 9th op -->
            <WN>U</WN><!-- Update operation -->
                <WZ>"DP","SP","DR","SR"</WZ>
            <WS>22-Oct-2018 11:36:10.027</WS><!-- Date Time stamp of tag operation Start -->
            <WF>22-Oct-2018 11:36:51.030</WF><!-- Date Time stamp of tag operation Finish -->
            <WE>00</WE><!-- Successful write update op -->
        </TPD>
        <WV>1</WV><!-- Verbosity level Medium -->
        <TPD><!-- Tag performance data -->
            <WT>10</WT><!-- 10th op -->
            <WN>P</WN><!-- Partial Read of tag update operation -->
                <WZ>"DP","SP","DR","SR"</WZ>
            <WS>22-Oct-2018 11:37:06.200</WS><!-- Date Time stamp of tag operation start -->
            <WF>22-Oct-2018 11:37:59.056</WF><!-- Date Time stamp of tag operation Finish -->
            <Tag><!-- one record per tag, multiple sets of records are expected as per RN -->
                <EPC>
                    <EPC_Key>GIAI202</EPC_Key><!-- default value shown -->
                    <EPC_h>38361faef62328cc5c30615e93060c1842ad0e6b060c58316e00</EPC_h>
                </EPC>
                <User>
                    <TM>03072</TM><!-- Size of data transferred -->
                    <DSFID_b>10001001</DSFID_b>
                    <SV>310</SV><!-- version 3,1,0 -->
                    <UserData>!IDPv020318!ISPvJHSW!IDRv030419!ISRv00MB</UserData>
                </User>
                <Remaining><!-- Only data that is not included above -->
                    <Bank00_Data_h>15D5A436</Bank00_Data_h><!-- Bank00 data is visible as tag is not
password locked -->
                    <Bank01_Data_h>DBCA6C00</Bank01_Data_h><!-- PC bit default value of 6C00 -->
                </Remaining>
            </Tag>
            <WE>00</WE><!-- Partial ReadBack successful -->
```

```
            </TPD>
            <TPD>
                <WT>11</WT><!-- 11th op -->
                <WN>L</WN><!-- Lock tag -->
                <TL>15D5A436</TL><!-- locking password -->
                <WS>22-Oct-2018 11:38:09.010</WS><!-- Date Time stamp of lock operation -->
                <WE>00</WE><!-- Successful tag lock operation -->
            </TPD>
        </TPI>
<!-- 5th Example of change in vehicle type, POH date, station code and password change operation -->
        <TPI>
            <TID>
                <TID_size>96</TID_size>
                <TT_h>E2C068922000F3021ED646F0</TT_h><!-- The TID of the tag for which TPI details are
available -->
            </TID>
            <WV>1</WV><!-- Verbosity level Medium -->
            <TPD><!-- Tag performance data -->
                <WT>12</WT><!-- 12th op -->
                <WN>R</WN><!-- Read operation -->
                <WS>22-Oct-2018 11:40:00.000</WS><!-- Date Time stamp of tag operation Start -->
                <WF>22-Oct-2018 11:40:59.010</WF><!-- Date Time stamp of tag operation Finish -->
                <Tag><!-- one record per tag, multiple sets of records are expected as per RN -->
                    <EPC>
                        <EPC_Key>GIAI202</EPC_Key><!-- default value shown-->

<EPC_h>38361FAEF62318CC5C538B0E93060C214FB13A9B060C99316600</EPC_h>
                    </EPC>
                    <User>
                        <TM>03072</TM><!-- User area size default -->
                        <DSFID_b>10001001</DSFID_b>
                        <SV>310</SV><!-- version 3,1,0 -->
                            <UserData>!iDUv221018!iSUv0BLH!iVCv0000TEXB!iPLv000000000000!iSNv000000
                            00000!iDCv000000!iSCv0000!iHAv0!iHWv0000!iHTv000000000!iHSv000000!0000!i
                            DBv020516!iSBvLLHM!iDPv020317!iSPvJUDW!iDRv030418!iSRv0TKD!iNMvNPO
                            H!iDAv020618!iSAv0BSL!iDSv020718!iSSv0GZBM!iDDv020818!iKMv01000!iNSv0
                            00!OH!iHMv0BSPM!0000000!iTNv3!iMAv9898198981!iMBv9898767655!iMCv8989
                            897777!0000</UserData>
                    </User>
                    <Remaining><!-- Only data that is not already included above -->
                        <Bank00_Data_h>HIDDEN</Bank00_Data_h><!-- Bank00 data not visible as tag is
password locked -->
                        <Bank01_Data_h>EECA6C00</Bank01_Data_h><!-- PC bit default value of 6C00 -->
                    </Remaining>
                </Tag>
                <WE>00</WE><!-- Read successful -->
            </TPD>
            <TPD>
                <WT>13</WT><!-- 13th op -->
                <WN>N</WN><!-- Unlock tag -->
                <TG>25FA47E0</TG><!-- Get password from backend -->
                <WS>22-Oct-2018 11:41:19.010</WS><!-- Date Time stamp of unlock operation -->
                <WE>00</WE><!-- Successful tag unlock operation -->
            </TPD>
            <WV>1</WV><!-- Verbosity level Medium -->
            <TPD><!-- Tag performance data -->
                <WT>14</WT><!-- 14th op -->
                <WN>F</WN><!-- Full write operation -->
```

```
            <WS>22-Oct-2018 11:42:02.077</WS><!-- Date Time stamp of tag operation Start -->
            <WF>22-Oct-2018 11:43:00.020</WF><!-- Date Time stamp of tag operation Finish -->
            <WE>00</WE><!-- successful write op -->
        </TPD>
        <WV>1</WV><!-- Verbosity level Medium -->
        <TPD><!-- Tag performance data -->
            <WT>15</WT><!-- 15th op -->
            <WN>R</WN><!-- Read operation -->
            <WS>22-Oct-2018 11:43:05.004</WS><!-- Date Time stamp of tag operation Start -->
            <WF>22-Oct-2018 11:43:59.055</WF><!-- Date Time stamp of tag operation Finish -->
            <Tag><!-- one record per tag, multiple sets of records are expected as per RN -->
                <EPC>
                    <EPC_Key>GIAI202</EPC_Key><!-- default value shown-->

<EPC_h>38361FAEF62318CC5C538B0E93060C18429F6273060C99316600</EPC_h>
                </EPC>
                <User>
                    <TM>03072</TM><!-- User area size default -->
                    <DSFID_b>10001001</DSFID_b>
                    <SV>310</SV><!-- version 3,1,0 -->
                        <UserData>!iDUv221018!iSUv0BLH!iVCv0000TEXB!iPLv0000000000!iSNv00000
                        00000!iDCv221018!iSCvJUDW!iHAvF!iHWvSECR!iHTv000BOXNS!iHSv002213!0
                        000!iDBv221018!iSBvJUDW!iDPv221018!iSPvJUDW!iDRv000000!iSRv0000!iNMv
                        CONV!iDAv221018!iSAvJUDW!iDSv000000!iSSv00000!iDDv000000!iKMv01000!i
                        NSv000!OH!iHMv0BSPM!0000000!iTNv3!iMAv9898198901!iMBv9898767655!iMC
                        v8989897777!0000</UserData>
                </User>
                <Remaining><!-- Only data that is not already included above -->
                    <Bank00_Data_h>25FA47E0</Bank00_Data_h><!-- Bank00 data is visible as tag is not
password locked -->
                    <Bank01_Data_h>DECF6C00</Bank01_Data_h><!-- PC bit default value of 6C00 -->
                </Remaining>
            </Tag>
            <WE>00</WE><!-- Read successful -->
        </TPD>
        <TPD>
            <WT>16</WT><!-- 16th op -->
            <WN>S</WN><!-- Update Password of the tag -->
            <WS>22-Oct-2018 11:45:09.060</WS><!-- Date Time stamp of unlock operation -->
            <WE>00</WE><!-- Successful password update operation -->
        </TPD>
        <WV>1</WV><!-- Verbosity level Medium -->
        <TPD><!-- Tag performance data -->
            <WT>17</WT><!-- 17th op -->
            <WN>R</WN><!-- Read operation for verifying password -->
            <WS>22-Oct-2018 11:46:10.004</WS><!-- Date Time stamp of tag operation Start -->
            <WF>22-Oct-2018 11:47:09.055</WF><!-- Date Time stamp of tag operation Finish -->
            <Tag><!-- one record per tag, multiple sets of records are expected as per RN -->
                <EPC>
                    <EPC_Key>GIAI202</EPC_Key><!-- default value shown-->

<EPC_h>38361FAEF62318CC5C538B0E93060C18429F6273060C99316600</EPC_h>
                </EPC>
                <User>
                    <TM>03072</TM><!-- User area size default -->
                    <DSFID_b>10001001</DSFID_b>
                    <SV>310</SV><!-- version 3,1,0 -->
```

```
                        <UserData>!iDUv221018!iSUv0BLH!iVCv0000TEXB!iPLv000000000000!iSNv00000
                        00000!iDCv221018!iSCvJUDW!iHAvF!iHWvSECR!iHTv000BOXNS!iHSv00221310
                        000!iDBv221018!iSBvJUDW!iDPv221018!iSPvJUDW!iDRv000000!iSRv0000!iNMv
                        CONV!iDAv221018!iSAvJUDW!iDSv000000!iSSv00000!iDDv000000!iKMv01000!i
                        NSv000!OH!iHMv0BSPM!0000000!iTNv3!iMAv9898198901!iMBv9898767655!iMC
                        v8989897777!0000</UserData>
                    </User>
                    <Remaining><!-- Only data that is not already included above -->
                        <Bank00_Data_h>145ADB01</Bank00_Data_h><!-- Bank00 data is visible as tag is not
password locked -->
                        <Bank01_Data_h>DECF6C00</Bank01_Data_h><!-- PC bit default value of 6C00 -->
                    </Remaining>
                </Tag>
                <WE>00</WE><!-- Read successful -->
            </TPD>
            <TPD>
                <WT>18</WT><!-- 18th op -->
                <WN>L</WN><!-- Lock tag -->
                <TL>145ADB01</TL><!-- Locking Password -->
                <WS>22-Oct-2018 11:48:10.015</WS><!-- Date Time stamp of lock operation -->
                <WE>00</WE><!-- Successful tag lock operation -->
            </TPD>
        </TPI>
    </Header>
</Group>
</root>
```

— END —