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No.: 2016/ CRIS/ NDLS-ITPI/ WS-C/ POLICY/ RFID/ 0101/ PT-1

15/02/19

Sub: Guidelines for using Data of RFID Tags of the Indian Railways (V3,0)

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

V3.0:

- 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 corrected to char(10).
- Para 8.2 – The number of trailing zeros increased from three to four for correct write alignment.
- Para 8.3 – The number of trailing zeros increased from seventeen to eighteen for correct write alignment.
- Para 8.4 – The number of trailing zeros increased from eleven to twelve for correct write alignment.
- Para 9 – The example corrected to reflect the changes under para 8.1 to 8.4 above.
- Annexure D – reformatted and updated
- Changes in Annexure E (Vocabulary codes)– Completely revised and updated.
- Major changes:
 - MD – deployment platform for mobiles added.
 - MV – Description clarified.
 - RN added
 - T (Tag Write details) full section added.
 - E (Antenna) full section added.
 - N (Train Presence Detector details) full section added.
 - Time stamp field definition standardised.
 - GS1 related values indicated.
- Annexure G:
 - Width of the SN field corrected as per para 8.1.
 - Description against HS field corrected to VN
- Annexure H (Data transfer format from field devices) added
- Annexure J (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.

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 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.

1.3 The Tag as a whole shall be password locked against writes using random hex numbers.

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.

2 **Company Code:**

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 <u>into service</u> , can be different from date of manufacture.
00NR	4	Owning Railway "NR"	Please see Annexure B
WDTCSVD1	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 <u>into service</u> , 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.*

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 "!iSVv230" 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' 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.

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

8.1 In area 'A', details from the manufacturer are recorded. For example, a string can be as

!iDUv311217!iSUv0KXH!iVCv00000RCF!iPLvRCFGS012345!iSNv0123456789

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.

8.1.1 Note: Information regarding the Identifier of the vehicle in the form of a superstructure/ underframe number is optional for *older* vehicles only.

8.1.2 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!iHAvC!iHWvECOR!iHTv0BCACBMA!iHSv12345678!0000

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

!iDBv311214!iSBvJUDW!iDPv311215!iSPvJUDW!iDRv311216!iSRvJUDW!iDAv310217!iSAvNDLS!iDSv310317!iSSvNDLS!iDDv310417!iKMv10000!iNSvIOH!iHMvNDLS!000000000000000000

8.4 In Area 'D', up to three trial related contact mobile numbers can be stored, so the default string would be !iTv3!iTMv9999911111, which would imply a maximum of 3

items can be monitored using the space available. *Twelve trailing zeros are necessarily needed.*

8.4.1 As such, this should 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 J (Examples) para 1.

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

10.1 The associated example is at Annexure J (Examples) para 2.

(TANMAY MEHTA)
GM/ RFID

Encl: annexure A to G 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 – Examples (for understanding purposes only)

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	DEMU
E	EMU
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
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.

Type	VV
BOXNHL	D
BCNHL	D
BOXNS	D
BOSTHSM2	D
BOBYN	D
BOBSN	D
BTPGLN	D
BFNS	D
BVCM	D
BVZI	D
BOBRNHSM1	E

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
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
BWELK	MKA	Bharat Wagon & Engineering Ltd.	Mokameh
BWELZ	MFP	Bharat Wagon & Engineering Ltd.	Muzaffarpur
BWT	MJT	Braithwaite & 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
ORIF	LKZ	Oriental Foundry Pvt Ltd	Lakadiya
RCFW	HSQ	Rail Coach Factory	Hussainpur
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 E: Vocabulary related to using the data on the tags, i.e., for the software related matters is given in the table below:

Note:

11 All dates are in DDMMYY format.

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

Element	Code	Pneumonic	Field	Description
Backend [B]	BL	Backend <u>L</u> ocation	varchar	URI pointing to backend server
Location [L]	LC	Loc <u>a</u> tionID	Char(8)	
Location [L]	LS	RlySt <u>a</u> tionCode	Char(4)	ASR
Location [L]	LE	RlyStationCode Functional <u>E</u> xtension	Char(1)	W => workshop etc.
Location [L]	LN	Location <u>N</u> umber	NNN	LS+LE+LN must be unique
Location [L]	LM	<u>M</u> ethod	Char(1)	Manual/ GPS Coarse/ GPS accurate etc
Location [L]	LA	<u>A</u> ccuracy	NN.N	HDOP
Location [L]	LT	Lat <u>i</u> tude	dddmm.mmmm	North is assumed and not stored explicitly
Location [L]	LN	Long <u>i</u> tude	dddmm.mmmm	East is assumed and not stored explicitly
Location [L]	LD	<u>D</u> ateTime Stamp of the fix	Timestamp	
User [U]	UR	Y <u>o</u> ur Id	Char(8)	Same as HID - standardised ID for IR.
User [U]	UP	<u>P</u> assword	Char (14)	
User [U]	US	<u>S</u> urname	Char (14)	
User [U]	UN	Rest of the <u>N</u> ame	VarChar	Can be blank
User [U]	UA	<u>G</u> rade	Char(6)	SAG
User [U]	UD	<u>D</u> esignation	Char(6)	CRSE
User [U]	UE	Designation <u>e</u> xtension	Char(6)	Chg
User [U]	UH	<u>H</u> Q	Char(4)	StnCode
User [U]	UM	<u>M</u> obileID		refers to MV
User [U]	UG	<u>G</u> mail address	VarChar	
User [U]	UT	Alternate email	VarChar	
User [U]	UL	<u>R</u> ole in application	Char(3)	default=USP (User Primary)
User [U]	UI	<u>I</u> MEI	Char(16)	
User [U]	UF	Ref <u>e</u> rrer UserID		refers to UR
Mobile [M]	MV	MobileDev <u>i</u> ceID	char(8)	Internal (Make+Model Identifier)
Mobile [M]	MK	Ma <u>k</u> e	char (10)	
Mobile [M]	ML	Mod <u>e</u> l	char (10)	
Mobile [M]	MH	<u>H</u> eight of display	char (5)	
Mobile [M]	MW	<u>W</u> idth of display	char (5)	
Mobile [M]	MP	<u>P</u> PI of display	char (4)	
Mobile [M]	MD	Mobile <u>d</u> eployed on	char(1)	M=mobile; f=fixed reader
Portable/ Fixed Reader [P]	PR	Rea <u>d</u> erID	char(8)	
Portable/ Fixed Reader [P]	PK	Ma <u>k</u> e	char(10)	
Portable/ Fixed Reader [P]	PD	Mod <u>e</u> l	char(10)	

Portable/ Fixed Reader [P]	PP	<u>P</u> ower (mW)	Numeric (4)	Maximum power of the device
Portable/ Fixed Reader [P]	PN	<u>R</u> ange at azimuth of 45° (Portable readers only)	Numeric (2)	in multiples of 10 cm
Portable/ Fixed Reader [P]	PS	<u>S</u> ensitivity at azimuth of 45° (Portable readers only)	NN.N	RSSI values
Portable/ Fixed Reader [P]	PV	<u>A</u> PI <u>V</u> ersion number	N.NN.NNNN	major.minor.build
Portable/ Fixed Reader [P]	PB	<u>B</u> attery Capacity (Portable Readers only) (in mAh)	Numeric (4)	
Antenna [E]	EK	<u>M</u> ake of Fixed Reader Antenna	char(10)	
Antenna [E]	ED	<u>M</u> odel of Fixed Reader Antenna	char(10)	
Antenna [E]	EG	<u>G</u> ain of Fixed Reader Antenna (in dBic)	NN.N	
Antenna [E]	EZ	<u>A</u> zimuth Angle (-3dB) of Fixed Reader Antenna	Numeric (3)	
Antenna [E]	EL	<u>L</u> ocation No	Numeric (1)	As N1 to N9 TPD codes
App Specific [A]	AP	<u>A</u> ppID	Char(8)	
App Specific [A]	AN	<u>V</u> endor <u>N</u> o	Numeric (8)	refers to RlyVendorNo from IREPS
App Specific [A]	AV	<u>V</u> ersion	N.NN.NNNN	major.minor.build
App Specific [A]	AS	<u>S</u> tatus		demo, alpha, beta, RC, GC
App Specific [A]	AM	<u>M</u> aintained by Agency	VarChar	VendorCode or equivalent
App Specific [A]	AD	<u>A</u> pp <u>D</u> eployment platform	char(1)	m=mobile (default); f=fixed; b=both
Group of TagData [G]	GD	<u>I</u> D of 'Group of TagData'	NNN	Running serial for a device. Based on MaxChunkSize for transmission
Group of TagData [G]	GT	<u>D</u> ate <u>T</u> ime stamp of transmission begin	Timestamp	
Group of TagData [G]	GF	<u>F</u> irst (Starting) Hash	char (14)	
Group of TagData [G]	GL	<u>L</u> ast (ending) hash	char (14)	
Group of TagData [G]	GS	<u>S</u> ize of the file to be transferred (in bytes)	NNNNN	
Group of TagData [G]	GN	<u>N</u> o of records transferred in this transaction	char (4)	9999 tags max assumed
Tag Record Header [R]	RH	<u>R</u> ecord <u>H</u> eadrID	NNN	Running serial for a device for a session
Tag Record Header [R]	RT	<u>D</u> ate <u>T</u> ime <u>S</u> tamp of first record op start	Timestamp	= WS of the first operation
Tag Record Header [R]	RL	<u>L</u> ocationID		refers to LS+LE+LN
Tag Record Header [R]	RU	<u>U</u> ser creating the record		refers to UR
Tag Record Header [R]	RD	<u>M</u> obile <u>D</u> eviceID		refers to MV
Tag Record Header [R]	RA	<u>A</u> ppID		refers to AP
Tag Record Header [R]	RP	<u>P</u> ortable Reader ID		refers to PR
Tag Record Header [R]	RN	<u>N</u> umber of tags written in this session	char (4)	9999 tags max assumed
Tag Record Header [R]	RS	<u>D</u> ate <u>T</u> ime <u>S</u> tamp of last record op end	Timestamp	
TagWrite [W]	W V	<u>V</u> erbo <u>s</u> ity level	Numeric (1)	1 Medium - Only time (Default) 2 Verbose - full log 9 No Log data
TagWrite [W]	WN	<u>O</u> peration serial <u>n</u> umber	N(2)	1 to 99
TagWrite [W]	WR	<u>R</u> SSI value	Numeric(3)	Values are expected to be negative
TagWrite [W]	WB	<u>B</u> attery Status	Boolean	0 => OK
TagWrite [W]	WM	Portable reader <u>m</u> emory status	Boolean	0 => OK
TagWrite [W]	WP	<u>P</u> ower setting of the portable reader (in mW)	Numeric (4)	
TagWrite [W]	WL	<u>B</u> LE radio status	Boolean	0 => OK
TagWrite [W]	WC	Standard App Error <u>C</u> ode	Char (2)	00 => No error [By CDAC]
TagWrite [W]	WD	portable reader <u>d</u> evice specific error code	varchar()	device dependent
TagWrite [W]	WN	<u>N</u> ame of the operation	Char (1)	(R)ead, (W)rite, i(N)it, (L)ock, (U)nlock, (K)ill etc.??

TagWrite [W]	WS	DateTime stamp of tag operation <u>Start</u>	Timestamp	
TagWrite [W]	WF	DateTime stamp of tag operation <u>Finish</u>	Timestamp	
TagWrite [W]	WE	Operation status/ <u>Error</u> code	Char(2)	00 Any op - OK 10 Read op - No Tag 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;
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	Bit (32)	refers to GS1 standards
TagControl [T]	TL	Locking password	char (8)	as per GS1 standards
TagControl [T]	TH	Header in Hex	VarBinary	Tag data not included in Annexure F & G or 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 TPD21 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 <u>S</u> tructure <u>V</u> ersion No.	Char(3)	The version of the structure of the User Area as indicated in the subject of this letter. E.g., V2,2 shall be represented as 220; V1,0 shall be 100.
			64	
User Area A	DU	<u>D</u> ate put into <u>U</u> se	DDMMYY	default = Today()
User Area A	SU	<u>S</u> tation put into <u>U</u> se/ Manufacture/ hand over/ fitment		refers to LS
User Area A	VC	<u>V</u> ehicle manufacturer's <u>C</u> ode/ Vendor Code	char(8)	
User Area A	PL	<u>PL</u> No/ UnderframeId/ Assembly SKU	char(11)	for linking to Stores PL_Master
User Area A	SN	Product unique <u>S</u> erial/UnderframeNo/ Assembly <u>N</u> o	char(10)	By each manufacturer
		<i>Total Bits assigned</i>	512	
User Area B	DC	<u>D</u> ate of <u>C</u> hange in VehicleID	DDMMYY	default = Today()
User Area B	SC	<u>S</u> tationCode where VehicleID <u>C</u> hanged		refers to LS; default is derived from GPS
User Area B	HA	<u>H</u> istorical <u>A</u> sset type		refers to VA
User Area B	HW	<u>H</u> istorical <u>O</u> wner of Vehicle		refers to VW
User Area B	HT	<u>H</u> istorical Vehicle <u>T</u> ype		refers to VT
User Area B	HS	<u>H</u> istorical <u>S</u> erial		refers to VN
		<i>Total Bits assigned</i>	512	
User Area C	DB	<u>D</u> ate of last <u>R</u> ebuilding		default = Today()
User Area C	SB	<u>S</u> tationCode where Vehicle last <u>r</u> ebuilt		refers to LS; default is derived from GPS
User Area C	DP	<u>D</u> ate of last <u>P</u> OH		default = Today()
User Area C	SP	<u>S</u> tationCode where last <u>P</u> OH done		refers to LS; default is derived from GPS
User Area C	DR	<u>D</u> ate of last <u>R</u> OH/ IOH		default = Today()
User Area C	SR	<u>S</u> tationCode where last <u>R</u> OH/ IOH done		refers to LS; default is derived from GPS
User Area C	DA	<u>D</u> ate of <u>A</u> ny other major schedule done (NPOH, SR etc)		default = Today()
User Area C	SA	<u>S</u> tationCode where <u>A</u> ny other major schedule was done		refers to LS; default is derived from GPS
User Area C	DS	<u>D</u> ate of last <u>S</u> cheduled Running maintenance		default = Today()
User Area C	SS	<u>S</u> tation of last <u>S</u> cheduled Running maintenance		refers to LS+LE; default is derived from GPS
User Area C	DD	<u>D</u> ue <u>D</u> ate for next scheduled maintenance	DDMMYY	<i>Periodicity taken from the backend</i>
User Area C	KM	<u>K</u> M _s till next scheduled maintenance	NNNN	0 => NOT APPLICABLE
User Area C	NS	<u>N</u> ext <u>S</u> chedule due	char(6)	<i>Sequence taken from backend</i>
User Area C	HM	<u>H</u> ome/ base StationCode		refers to LS+LE
		<i>Total Bits assigned</i>	1280	
User Area D	TN	<u>T</u> rial - <u>N</u> o. of items	N	(0,1,2,3); default=0
User Area D	MA	Contact <u>M</u> obile number of first item (<u>A</u>)	char (10)	
User Area D	MB	Contact <u>M</u> obile number of second item (<u>B</u>)	char (10)	
User Area D	MC	Contact <u>M</u> obile number of third item (<u>C</u>)	char (10)	
		<i>Total Bits assigned</i>	512	
		<i>Total Bits reserved by CRIS</i>	64	

Annexure H: Data transfer format from field devices (V1,0)

```
<?xml version="1.0" encoding="UTF-8"?>
<root>
  <Cnl>
    <Cnl_Desc>Data upload from frontend to backend</Cnl_Desc>
    <Cnl_Ver>1.0</Cnl_Ver>
    <Guideline_Ver>3.0.0</Guideline_Ver>
  </Cnl>
  <!-- All the underscores below to be replaced by actual data-->
  <!-- the 2 letter abbreviations are as per the Tag vocabulary-->
  <!-- Trailing _b implies bits-->
  <!-- Trailing _h implies hex-->
  <!-- Trailing _a implies ascii-->
  <!-- In case any information is not available then enter ~NULL~ -->
  <Group> <!-- group of records being transferred together-->
  <GD></GD><!--Identifier-->
  <GT></GT>
  <GF></GF>
  <GS></GS>
  <GL></GL>
  <GN></GN>
  <Header>
    <!--Common data for a single write session by a single person-->
    <!-- Multiple sessions can be transferred at one time in a group as per GN-->
    <RH></RH><!--Identifier-->
    <RT></RT>
    <RL></RL>
    <RU></RU>
    <RD></RD>
    <RA></RA>
    <RP></RP>
    <RN></RN>
    <RS></RS>
    <Tag><!-- one record per tag, multiple sets of records are expected as per RN-->
      <TID>
        <TID_Size_b>32</TID_Size_b><!-- default value shown-->
        <TT_h></TT_h>
      </TID>
      <EPC>
        <EPC_Key>GIAI202</EPC_Key><!-- default value shown-->
        <EPC_h></EPC_h>
      </EPC>
      <User>
        <TM>3072</TM><!-- default value shown-->
        <DSFID_b></DSFID_b>
        <SV></SV>
        <User_Data_a></User_Data_a>
      </User>
      <Remaining>
        <!--Only data that is not already included above-->
        <Bank00_Data_h></Bank00_Data_h>
        <Bank01_Data_h></Bank01_Data_h>
        <Bank11_Data_h></Bank11_Data_h>
      </Remaining>
    </Tag>
    <TPI><!--Tag Performance Information-->
```

```
<TT_h></TT_h><!--the TID of the tag for which TIP details are available-->
<WV></WV>
<TPD><!--Tag performance data-->
    <WN></WN>
    <WR></WR>
    <WE></WE>
    <WB></WB>
    <WM></WM>
    <WP></WP>
    <WC></WC>
    <WN></WN>
    <WS></WS>
    <WF></WF>
</TPD>
</TPI>
</Header>
</Group>
</root>
```

Annexure J: Examples (for understanding purposes only)

1. Example of the data stored on a tag:

Desc	Data	Size	Padding Zeros	Total
EPC	8907709D2A17ECOR000BOBSN003333	30	0	30
SV	!iSVv230	8	0	8
User A	!iDUv020917!iSUv0BLH!iVCv0000TEXB!iPLv0000000000!iSNv0000000000	64	0	64
User B	!iDCv000000!iSCv0000!iHAv0!iHWvECOR!iHTv00000000!iHSv000000!0000	60	4	64
User C	!iDBv000000!iSBv0000!iDPv000000!iSPv0000!iDRv000000!iSRv0000!iDAv000000!iSAv0000!iDSv000000!iSSv0000!iDDv000000!iKMv000000!iINSv000000!iHMv0000!000000000000000000	142	18	160
User D	!iTnv0!iMAv0000000000!iMBv0000000000!iMCv0000000000!000000000000	52	12	64
Reserved	For future purposes			24
	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:

```
<?xml version="1.0" encoding="UTF-8"?>
<root>
  <Cnl>
    <Cnl_Desc>Data upload from frontend to backend</Cnl_Desc>
    <Cnl_Ver>1.2</Cnl_Ver>
    <Guideline_Ver>2.3.0</Guideline_Ver>
  </Cnl>
  <!-- All the underscores below to be replaced by actual data-->
  <!-- the 2 letter abbreviations are as per the Tag vocabulary-->
  <!-- Trailing _b implies bits-->
  <!-- Trailing _h implies hex-->
  <!-- Trailing _a implies ascii-->
  <!-- In case any information is not available then enter ~NULL~ -->
  <Group> <!-- group of records being transferred together-->
  <GD>1</GD><!--Running serial Identifier-->
  <GT>2017-Nov-28 11:19:53</GT><!--DateTime stamp of transmission begin-->
  <GF>9a08ac71a6e7da42aa4c6fde1049b478</GF><!--Hash value of the First TAG data below-->
  <GL>9a08ac71a6e7da42aa4c6fde1049b478</GL><!--Hash value of the Last TAG data below-->
  <GS>5689</GS><!--Size of this file in bytes-->
  <GN>1</GN>
  <Header>
    <!--Common data for a single write session by a single person-->
    <!-- Multiple sessions can be transferred at one time in a group as per GN-->
    <RH>1</RH><!--Identifier-->
    <RT>2017-Nov-28 11:20:08</RT><!--WS of the first op (at line 61 of this file)-->
    <RL>JMPW1</RL><!--Location Number-->
    <RU>SomeUser</RU>
```

```

<RD>ee0b806dd0d1e07a</RD><!--Android ID-->
<RA>1.2.3</RA><!--ApplID-->
<RP>SomePRdr</RP><!--Portable Reader ID-->
<RN>1</RN>
<RS>2017-Nov-28 11:20:35</RS><!--Date Time of last session start-->
<Tag><!-- one record per tag, multiple sets of records are expected as per RN-->
  <TID>
    <TID_Size_b>32</TID_Size_b><!-- default value shown-->
    <TT_h>E2C06892200003021E33D9B5</TT_h>
  </TID>
  <EPC>
    <EPC_Key>GIAI202</EPC_Key><!-- default value shown-->

<EPC_h>38361FAEF62318AC5BB061169429F4EA48A7359346CD9BB66800</EPC_h>
  </EPC>
  <User>
    <TM>3072</TM><!-- default value shown-->
    <DSFID_b>~NULL~</DSFID_b><!--ToDo CORRECT-->
    <SV>2.3.0</SV>
    <UserData_a>!iDUv281117!iSUv0SEP!iVCv0000TEXS!iPLv0000000000
6!iSNv0000000089!iDCv000000!iSCv0000!iHAv0!iHWv0000!iHTv00000000!iHsv000000!iDBv000000!iSBv0000!iDP
v000000!iSPv0000!iDRv000000!iSRv0000!iDAv000000!iSAv0000!iDSv000000!iSSv0000!iDDv000000!iKMv000000!iNSv00
0000!iHMv0000!i000000000000000000!iTNv0!iMAv0000000000!iMBv0000000000!iMCv0000000000!i000000000000</Use
rData_a>
  </User>
  <Remaining>
    <!--Only data that is not already included above-->
    <Bank00_Data_h>7CD724F0</Bank00_Data_h>
    <Bank01_Data_h>0A536C00</Bank01_Data_h>
    <Bank11_Data_h>~NULL~</Bank11_Data_h>
  </Remaining>
</Tag>
<TPI><!--Tag Performance Information-->
  <TT_h>E2C06892200003021E33D9B5</TT_h><!--the TID of the tag for which
TIP details are available-->

  <WV>1</WV><!--Verbosity level - medium-->
  <TPD><!--Tag performance data-->
    <WN>1</WN><!--first op - read-->
    <WN>R</WN><!--Name of operation-->
    <WS>2017-Nov-28 11:20:08</WS><!--Date Time stamp of tag operation
Start-->

    <WF>2017-Nov-28 11:20:16</WF><!--Date Time stamp of tag operation
Finish-->

    <WE>13</WE><!--Error in structure of user area found-->
  </TPD>
  <TT_h>E2C06892200003021E33D9B5</TT_h><!--the TID of the tag for which
TIP details are available-->

  <WV>2</WV><!--Verbosity level - verbose, since error happened earlier-->
  <TPD><!--Tag performance data-->
    <WN>2</WN><!--second op - write-->
    <WR>-47</WR><!--RSSI value-->
    <WB>0</WB><!--Battery status-->
    <WM>0</WM><!--Portable reader memory status-->
    <WP>500</WP><!--Power setting of portable reader-->
    <WC>00</WC><!--Standard App Error Code-->
    <WL>0</WL><!--BLE radio status-->
    <WN>W</WN><!--Name of operation-->

```

Start-->	<WS>2017-Nov-28 11:19:53</WS><!--Date Time stamp of tag operation
Finish-->	<WF>2017-Nov-28 11:20:08</WF><!--Date Time stamp of tag operation
	<WE>51</WE><!--write failed without any reason-->
	</TPD>
TIP details are available-->	<TT_h>E2C06892200003021E33D9B5</TT_h><!--the TID of the tag for which
	<WV>2</WV><!--Verbosity level - verbose, since error happened earlier-->
	<TPD><!--Tag performance data-->
	<WN>3</WN><!--third op - write the second time-->
	<WR>-43</WR><!--RSSI value-->
	<WE>1</WE><!--Error in structure of user area found-->
	<WB>0</WB><!--Battery status-->
	<WM>0</WM><!--Portable reader memory status-->
	<WP>500</WP><!--Power setting of portable reader-->
	<WC>00</WC><!--Standard App Error Code-->
	<WL>0</WL><!--BLE radio status-->
	<WN>W</WN><!--Name of operation-->
Start-->	<WS>2017-Nov-28 11:20:16</WS><!--Date Time stamp of tag operation
Finish-->	<WF>2017-Nov-28 11:20:27</WF><!--Date Time stamp of tag operation
	<WE>00</WE><!--successful write op-->
	</TPD>
TIP details are available-->	<TT_h>E2C06892200003021E33D9B5</TT_h><!--the TID of the tag for which
	<WV>2</WV><!--Verbosity level - verbose, since error happened earlier -->
	<TPD><!--Tag performance data-->
	<WN>4</WN><!--fourth op - readback to validate-->
	<WR>-41</WR><!--RSSI value-->
	<WB>0</WB><!--Battery status-->
	<WM>0</WM><!--Portable reader memory status-->
	<WP>500</WP><!--Power setting of portable reader-->
	<WC>00</WC><!--Standard App Error Code-->
	<WL>0</WL><!--BLE radio status-->
	<WN>R</WN><!--Name of operation-->
Start-->	<WS>2017-Nov-28 11:20:27</WS><!--Date Time stamp of tag operation
Finish-->	<WF>2017-Nov-28 11:20:35</WF><!--Date Time stamp of tag operation
	<WE>00</WE><!--successful read op-->
	</TPD>
	</TPI>
	</Header>
	</Group>
	</root>