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Generic Set of Requirements RFID for Public Libraries

Netherlands Public Library Association

version: 5.0

date: April 21, 2011

Version table

Version number	Date	Changes	Distribution
1.0	July 2003	First document in English language	RFID project group of the Netherlands Institute for Public Libraries / Task Force Library Automation of this association / vendors of RFID-systems
1.8	November 2003	Annex 2 added. References in main text to the appendices added. Implementation questions to vendors of RFID-labels and RFID-systems removed and answers received included in the specification. Definition of Library Identifier added.	Internal version
1.9	28 November 2003	Checksum specified. Definition of Library Identifier modified. Annex 3 added (example).	Distribution as version 1.0
1.99	17 December 2003	Fine tuning implementation details. Three additional appendices added.	Final check with vendors
2.0	8 January 2004	Minor consistency change in version 1.99	For publication (withdrawn)
3.0	19 January 2004	Definition of Library Identifier modified.	For publication (replaced by version 4.1)
4.0	1 September 2005	Evaluation of the document. Major changes: Annex 7 (ASN-1) added and instructions for barcode with the character 'X'.	For publication (withdrawn)
4.1	14 October 2005	Minor consistency change in version 4.0.	For publication
5.0	21 April 2011	Minor changes in mandatory part. Major changes in optional part.	For publication

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1 Purpose and realisation of this document

1.1 Purpose of this generic set of requirements

The purpose of this generic set of requirements is to define a standard for the use of Radio Frequency Identification Technology (RFID) in public libraries in order to allow a central supply of standardised RFID labels by suppliers for embodiment in lending materials and to improve the efficiency of the loan process.
Using RFID in libraries generates a number of advantages. It creates possibilities

- to automate and rationalise the logistic processes in libraries and
- to combine identification with the security handling of loan objects within a unified RFID label technology.

In order to use RFID labels in libraries, the labels have to be embodied in books or other media. When implementing RFID in a public library, also access gates, handheld readers, self service desks and interfaces to the library automation system can be part of the system.

1.2 Realisation of this generic set of requirements version 5.0

At the start of 2011 the Netherlands Institute for Public Libraries (SIOB) has assigned its Sounding Board RFID in Public Libraries to develop a next version 5.0 of the "Generic Set of Requirements for RFID labels" for use in Dutch public libraries. The group was supported by consultants from M&I/Partners.

1.3 Previous versions

For major roll-outs the version 2.0 (January 2004) and the version 4.1 (October 2005) were used.

1.4 Dutch version versus English Version

There is only an English version of this technical document. In addition there is an explanatory document in Dutch language[1] that focuses on the business arguments to upgrade the national model to version 5.0. Moreover the document describes in some detail minor problems in implementation and the future mapping to an ISO 28560 data model. When there is a discrepancy between this document and the Dutch language document, this English document is dominant in technical details. In matters of policy and objectives, the Dutch language document is the primary document.
This document restricts itself to the content of the RFID tag only. The Dutch language document describes ambitions for the full RFID chain.

[1] Vereniging van Openbare Bibliotheken, *RFID datamodel voor openbare bibliotheken; een toelichting bij versie 5.0 van het Nederlandse datamodel voor RFID op leenmateriaal,* 21 April 2011.

2 Data model: overall structure

The data model that is defined in this set of requirements concerns mainly the 'user data' in a RFID label. Besides these 'user data', there are standard or 'system' data in a label such as the unique ID number that the chip manufacturer enters in the chip. Such standard or system data were not branch specific up to version 4.1. One system data element (AFI) becomes library specific in this version 5.0.

Any party should have free access to reading the 'user data' that are stored in the RFID label. The reading may never be blocked by access control rules.

This data model consists of three parts for the user data:

Mandatory part	These data have a fixed location in the memory of the RFID chip; this part of the memory has to be filled with data.
Optional part with fixed structure	These data have a fixed location in the memory of the RFID chip; this part of the memory is not required to be filled with data.
Optional part with dynamic structure	This part has flexible memory size and the data have no fixed location in the chip; it can be filled with arbitrary data, according to some general rules for dynamic memory. This part is not required.

The Dutch national data model is a model which has a fixed data structure for its important data elements and in this respect it is comparable with ISO 28560, Part 3. In comparison with this ISO 28560 Part 3 it is more efficient in memory use, but less flexible. A subset of the data elements in ISO 28560 Part 1 is used in this Dutch national model.

In chapter 3 the details of the Dutch national data model are given. Chapter 4 defines the system data. The possibilities to combine anti-theft security with a RFID-label are also explained. Chapter 5 lists additional requirements and chapter 6 contains a reference list to standards.

The data structures in the model are summarized in Annex A. Implementation guidelines have been included in an Annex B. These implementation guidelines should be implemented for compliance with this Generic Set of Requirements. Annex C contains an example for a specific Dutch library and is for information only. Annex D provides details of data encoding and transformation rules for 'old' barcodes with an X character. Annex E and F provide technical details about formats and checksums and are for information only.

3 User memory

3.1 Mandatory part

3.1.1 Data model identifier

The data model identifier indicates which version of the data model is used in a specific RFID chip.

Field name	*Format*	*Type*	*Mandatory?*	*Who has write access?*	*Checksum*
Data model identifier	2 positions	Numeric	Yes	The owner	No

- Who owns the series of data model identifiers? Answer: The Netherlands Institute for Public Libraries.
- Who issues data model identifiers: Answer: The Netherlands Institute for Public Libraries.
- Who registers the data model identifiers that are issued? Answer: The Netherlands Institute for Public Libraries.

This document contains the definition of the data model after a major revision. This 2nd generation data model has therefore identification number '02'. The data model identifier is stored in the label as one binary byte. See annex D and E for details on BCD codes and binary numbers for this data field and all other memory parts that use binary bytes..

3.1.2 Type identification

In the field "Type RFID label" is indicated whether the concerning computer chip serves to identify an object or a library user.

Field name	*Format*	*Type*	*Man-datory?*	*Who has write access?*	*Check sum*
Type of identi-fication	1 position	Boolean	Yes	The owner	No

If the value of 'type of identification' is equal to '0', the label identifies an object.
If the value of 'type of identification' is equal to '1', the label identifies a human being (library user).
In the case that the label identifies a user instead of an object, this Generic Set of Requirements does not define the applicable data model.

The type of identification is stored in the label as one binary byte.

3.1.3 Object identifier

In this Generic Set of Requirements, an object is defined as: 'A physical entity owned by a library. An object can consist of one or more items'. (e.g. a book, a double-CD or a book accompanied by a CD-ROM).

Unique identification of an object
An object is identified by a number that should be unique in the Dutch language area. This unique number does not contain any structure or logic. The number is not made equal to an existing barcode

number of an already owned object. We assume that by using 14 positions[2], the amount of possible numbers will be sufficient for a period of 20 years, without having to re-use the numbers. No numeric sequences are assigned to individual libraries or groups of libraries. It is however possible to assign sequences of object identifiers to the library suppliers.

Field name	*Format*	*Type*	*Required?*	*Who has write access?*	*Checksum*
Object identifier	14 positions	Numeric	Yes	The owner	Yes

- Who is owner of the sequence of object identifiers? Answer: The Netherlands Institute for Public Libraries.
- Who registers issued sequences of object identifiers? Answer: The Netherlands Institute for Public Libraries.
- Who registers issued object identifiers? Answer: Parties registered with the Netherlands Institute for Public Libraries to whom sequences of object identifiers have been delivered are allowed (but not mandated) to maintain a database that links object identifiers to specific libraries. Parties have to register the unique identifiers they have used to avoid duplicates..
- Who writes object identifiers in a RFID-chip? Answer: The party that is chosen by the owner of the object and the RFID-label. The chosen party could either be a supplier of loan material to libraries, a distributor of the label or a vendor of RFID systems. It is also possible that the owner of the loan material orders the necessary equipment and performs the work himself.

The Object identifier is stored in the label in seven BCD bytes and one CRC byte. See annex D for details on BCD codes. Over the 7 bytes of the Object Identifier a 8 bit Cyclic Redundancy Code is calculated. The calculation starts with the lowest byte (0x0000), followed by the higher bytes (0x0001), etcetera, etcetera. The 8 bit CRC uses the polynom: 0xB8 (x8 + x4 + x3 + x2 + 1) and is preset with FF (hexadecimal). In annex F an example of the CRC calculation for Object Identifier 12345678901234 can be found.

3.1.4 Item identifier

A loan object may consist of more than one item[3]. All the items of an object have the same object identifier, but within this set of items they have a unique item identifier. If the object consists of one item, the item is equal to the object itself.
The item identifier consists of two components; a digit for the sequential number of the item and a digit to indicate the total number of items.

Field name	*Format*	*Type*	*Required?*	*Who has write access?*	*Checksum*
Item identifier	4 positions	Numeric	Yes	The owner	No

The item identifiers are not centrally registered.

If the object consists of one item only, the item identifier is equal to '0101'. If the object consists of more than one item one should discriminate between:

- the situation where a single item is labelled while none of the other items are;

2 An amount of 14 positions implies a thousand billion objects. This assumes a total number of 1400 Libraries in the Netherlands, with an average of 71.4 billion objects per library.

3 Remark: ISO 28560 uses the words 'object' and 'item' in a different manner.

- the situation where a main item is labelled while only some of the other items are labelled as well;
- the situation where all items of a loan object are labelled.

The item identifier is stored in the label as two binary bytes.

The following table lists the value of the four digits for each situation.

Item Identifier	Meaning of the digits
00mm	An object consists of [mm] items while only one of these is labelled
nn00	The object has more than one item; the total number of items is not specified, but this is item number [nn]
0101	An object consists of one item only
nnmm	This is item [nn] of an object that consists of [mm] items

In the table above both [nn] and [mm] should be unequal to [00].

3.1.4.1 Examples of objects and items

A book is an object and consists of one item. The object and item identifier look, for example, as follows:

Object Identifier	Item identifier
12345678901234	0101

A double-CD for loan is an object with more than one item. For example it might consist of 4 items: two disc-items; a booklet and a cover. The object and item identifiers will look as follows when all the items are labelled:

Object	Object Identifier	Item identifier	Item Identifier (Hex/binary)
CD1	12345678901234	0104	0104 / 0000000100000100
CD2	12345678901234	0204	0204 / 0000001000000100
Booklet	12345678901234	0304	0304 / 0000001100000100
Cover	12345678901234	0404	0404 / 0000010000000100

If only the two CD's are labelled in the the example with 4 items above, the item identifiers will be:

Object	Object Identifier	Item identifier	Item Identifier (Hex/binary)
CD1	12345678901234	0100	0100 / 0000000100000000
CD2	12345678901234	0200	0200 / 0000001000000000

In this example the library automation system could inform the library user that he should be aware that the two CD's are accompanied by an additional booklet and a cover. Of course the information that an additional booklet and cover exist, should then be stored in the system.

3.1.5 Library identifier

The set of requirements as described in this document is designed for use in the Dutch language area. To identify libraries within the Netherlands, the usage of the ISO 15511 standard (also named International Standard Identifier for Libraries and Related Organizations) has been chosen. This Generic Set of Requirements is yet only endorsed by libraries in the Dutch language territory. So the first positions are entered as 'NL' or 'BE'. The country code 'NL' or 'BE' is followed by a hyphen-minus. The hyphen-minus is a mandatory character in the ISIL string.

The fourth and fifth position indicate the type of library as defined in the following table:

Type indicator	Meaning of the type indicator
01	National library
02	University library
03	Higher education schools
04	Regional scientific libraries
05	Special libraries, non profit
06	Special libraries, profit
07	Regional service organisation of public libraries
08	Public library
09	Secondary education schools

This RFID model is used by public libraries in the Dutch language area (codes 07 and 08), but other types of libraries as indicated above may adopt the model as well and this happens incidentally. Dutch secondary education schools (code 09) have adopted the model as well.

The following 8 positions include the NCC-number (NCC = National Central Catalogue) of four digits followed by four zero's. In Belgium ISIL-codes may be shorter than 13 positions. The remaining positions have to be filled with zeros.

Field name	*Format*	*Type*	*Required?*	*Who has write access?*	*Checksum*
Library identifier	13 positions	First 2 positions alpha numeric, followed by a hyphen-minus, next 10 positions numeric	Yes	The owner	No

The Royal Library allocates the ISIL-codes within the Netherlands. It has mandated the Netherlands Institute for Public Libraries to allocate ISIL-codes for Dutch public libraries. The codes are published on the web address www.stichtingbibliotheek.nl/rfid. The website also contains working rules in case of mergers of public libraries.

- Who is the owner of the numeric sequence? Answer: The ISIL coordinator for the Netherlands regarding public library issues (Netherlands Institute for Public Libraries)
- Who issues numbers? Answer: For public libraries numbers consist of elements that have been allocated already. So there is no need to define additional responsibilities.
- Who allocates type indicators for additional type of libraries? Answer: The ISIL coordinator[4] for the Netherlands.
- Who registers issued numbers? Answer: Numbers consist of elements that have been allocated already. So there is no need to define additional responsibilities. In case of mergers the Netherlands Institute for Public Libraries has a responsibility to modify or invalidate numbers.
- Who writes numbers in a RFID chip? Answer: A body that is designated by he owner of the object and the RFID label.

[4] In the Netherlands this is the Royal Library.

In Belgium a different approach is chosen for the ISIL. See www.bibnet.be.

The Library identifier is stored in to the label in eight BCD bytes. Library identifiers that are shorter than 13 positions (as may happen in Belgium) use zero's to fill the remaining space.

3.1.6. Collection codes within the ISIL

The last four zero's of a Dutch code for a public library organisation may be replaced by a number that divides the collection of the ISIL-owner into sub collections. These sub collections will be often related to a location where the loan object is. These location codes may support IBL.

3.2 Optional part with fixed structure

3.2.1 Barcode

In this field, the existing barcode of an object or item can be stored. In a hybrid environment (use of both barcode and RFID) and during the migration period from barcode to RFID technology this field can be used. After full migration to RFID technology the barcode should no longer be used for identifying loan objects.

Field name	*Format*	*Type*	*Required?*	*Who has write access?*	*Checksum*
Barcode	maximum 16 positions	Numeric	No	The owner	Usually included in the barcode

- Who is owner of the barcode sequence? Answer: The public library.
- Who issues barcodes? Answer: The public library.
- Who registers issued barcodes? Answer: The public library.
- Who writes barcodes in the RFID chip? Answer: The public library.

The Barcode is stored in the label as maximum seven BCD bytes. See annex D for details on BCD codes and transformation rules for barcodes including an alphabetic control character. The length of barcodes may differ between libraries. In the case of shorter barcodes than 14 positions, the remaining memory space is filled with "F" (Hex). See annex E.

3.2.2. Logistic party identifier

In this field, we identify the logistic party[5].

Field name	*Format*	*Type*	*Required?*	*Who has write access?*	*Checksum*
Logistic party identifier	2 positions	Numeric	Yes, if using a logistic number	Supplier of objects	No

- Who is owner of the logistic party identifier sequence? Answer: The Netherlands Institute for Public Libraries.
- Who issues logistic party identifier numbers? Answer: The Netherlands Institute for Public Libraries.
- Who registers issued logistic party identifier numbers? Answer: The Netherlands Institute for Public Libraries.

5 For example NBD|Biblion.

- Who writes the logistic party identifier numbers in a RFID chip? Answer: is determined by the owner of the object and the RFID label.

The Logistic party Identifier is stored in the label as one BCD byte at the beginning of the data block (see annex 4).

3.2.3 Logistic number

In this field, the supplier of objects and items can store its own logistic information.[6] The structure of this information is determined by the supplier itself.

Field name	*Format*	*Type*	*Required?*	*Who has write access?*	*Checksum*
Logistic number	Available space may be used	Numeric	No	Supplier of objects	No

- Who is owner of the logistic number sequence? Answer: suppliers[7] registered and authorized by the Netherlands Institute for Public Libraries.
- Who issues logistic numbers? Answer: suppliers registered and authorized by the Netherlands Institute for Public Libraries.
- Who registers issued logistic numbers? Answer: suppliers registered and authorized by the Netherlands Institute for Public Libraries.
- Who writes logistic numbers in a RFID chip? Answer: this is determined by the owner of the object and the RFID label.

The way the Logistic number is stored in to the label is not specified.

Logistic party identifier and logistic number may be rewritten by the owner of the tag after delivery. The memory space may then be used for local purposes. There is a registration obligation for such local use, organised by the Netherlands Institute for Public Libraries (SIOB).

3.2.4 Container type

A numeric container type code informs whether a tag is attached to a loan object or to a container which locks the loan material – especially optical media like CD's or DVD's. Such a container for optical media has an electro-mechanical lock that will be opened when the material is given out on loan.

Field name	*Format*	*Type*	*Required?*	*Who has write access?*	*Checksum*
Container type indicator	2 positions	Numeric	No	The owner	No

This code has two values on current tags:

Container type	
00	No container; label attached to loan object
12	Label attached to plastic container with lock (brand is Clear-VU)

6 For example, a NBD order number

7 A logistic party identifier will be issued to organisations as NBD | Biblion, RFID system vendors that supply labels to their client libraries and so on.

Other number combinations that start with 1 are reserved for other container types with similar storage and lock functionality and / or other brands.

- Who is owner of the Container type? Answer: the Netherlands Institute for Public Libraries.
- Who issues Container types? Answer: the Netherlands Institute for Public Libraries.
- Who registers issued Container types? Answer: the Netherlands Institute for Public Libraries.
- Who writes container types in a RFID chip? Answer: this is determined by the owner of the object and the RFID label.

3.2.5 Two blocks for local use

Two memory blocks (10 and 11 when starting from zero) are specifically reserved for local use. The registration obligation as defined in 3.2.3 applies as well.

- Who is owner of the blocks for local use? Answer: the owner of the loan object and the RFID label.
- Who determines the rules for these local data: the owner of the loan object
- Have these local data any significance for other libraries than the owner? Answer: no.

3.2.6 ISBN-code

Public libraries are not allowed to store an ISBN-code (or generalised GS1 code) on the RFID tag. This would generate privacy issues. But libraries start to deliver learning material to pupils on behalf of educational institutes, particular secondary education institutes. Moreover some schools have adopted the Dutch public library model for the organisation of their own learning material. It is allowed to store the 13-digit ISBN on this learning material.

Field name	*Format*	*Type*	*Required?*	*Who has write access?*	*Checksum*
Barcode	13 positions	Numeric	No	The owner	Usually included in the barcode

The remaining positions to fill the block are filled with F(hex).

- Who is owner of the ISBN code in the tag? Answer: the owner of the loan object
- Who issues ISBN codes? This is done by an organisation outside the library sector: In the Netherlands or Belgium at the 'Bureau ISBN'.
- Who writes the ISBN code in the tag? Answer: A body that is designated by the RFID applying school or educational institute.

3.2.7 Inter library loan library

A loan object may be delivered to another library for inter library loan (ILL). The structure of this data element is identical to the library identifier that indicates the ownership (see paragraph 3.1.5 and 3.1.6).

- What is the format of the ILL library data field? Answer: identical to the library identifier.
- Who is the owner of the numeric sequence? Who writes the data in the chip? Answer: See library identifier.

3.3 Resulting fixed memory structure

The resulting structure of the fixed memory is given in Annex B (mandatory).

3.4 Dynamic part

In this dynamic part, all information should be stored in the memory in accordance with the ASN-1 standard. The ASN-1 standard defines a dynamic data structure using a 'tag, length and value' system. ASN-1 tags refer to data fields that were not defined in part 2.1 or 2.2 of this Generic Set of Requirements. Public libraries can choose themselves which dynamic data they want to add to the RFID label and may apply to obtain an ASN-1 tag number if not already available. The 'Sounding Board RFID in Public Libraries' grants requests for new tag numbers, issues tag numbers and monitors the unambiguity.

One example of tags that can be included in the dynamic part is:

- Medium type.

RFID labels only comply with this Generic Set of Requirements when

- the dynamic part is structured with the ASN-1 method
- the ASN-1 tag is registered by the Dutch Public Library Association
- and the ASN-1 tag is used according to its registered meaning.

At the publication date of version 5 no ASN-1 codes are active. One has been issued earlier but has been withdrawn.

4 System memory

4.1 AFI

The AFI is set to C2 (hex) as defined in ISO 28560.

4.2 DSFID

The DSFID value is zero as defined in ISO 28560 for legacy systems (nation models or vendor specific solutions that do not comply with ISO 28560).

4.3 Security

The RFID chip has to include a field that can be used for the Electronics Article Surveillance (EAS) function. Libraries are free to use this function.[8]

The EAS function of RFID labels has to be switched on and off according to a procedure that is publicly documented.

It is allowed to protect access to the EAS function with a user ID if desired.[9]

8 Usage condition: Place label in the proximity of the reader and do not move outside the reading area during an EAS action.

9 Most vendors have expressed a preference not to do so.

5 Additional requirements

5.1 Communication between reader and label

The communication between the reader and the RFID label should comply with the ISO 18000-3 mode 1 standard.[10]

5.2 Communication between reader and library automation system

The communication between the RFID reader and the library automation system is not described in this Generic Set of Requirements. However, the Dutch language document referred to earlier formulates ambitions that apply to the complete RFID chain.

5.3 Physical characteristics

The physical characteristics of the RFID labels have to comply with the ISO 18000-3 mode 1 standard. In this standard, temperature resistance and electromagnetic field strength are preset. The working life of a RFID label must be 10 years as a minimum.

10 ISO 18000-3 mode 1 complies with ISO 15693-2/3 technology for chip cards.

6 Reference to existing standards

- ISO 15511-2002 (ISIL), www.iso.ch
- ASN-1 protocol, www.asn1.org
- ISO 3166 (country codes), www.iso.ch
- ISO 15693-1, www.iso.ch
- ISO 15693-2, www.iso.ch
- ISO 18000-3, www.iso.ch
- ISO 28560, www.iso.ch.

Annex A

Overview of mandatory and optional fields (for information only)

Mandatory part

Field name	Format	Type	Mandatory?	Checksum
Data model identifier	2 positions	Numeric, 1 binary byte	Yes	No
Type of identification	1 position	Boolean, 1 binary byte	Yes	No
Object identifier	14 positions	Numeric, 7 BCD bytes, 1 byte CRC	Yes	Yes
Item identifier	4 positions	Numeric, 2 binary bytes	Yes	No
Library identifier	13 positions	First 2 positions alpha numeric, followed by a hyphen-minus, next 10 positions may very in format	Yes	No

Optional part

Field name	Format	Type	Mandatory?	Checksum
Barcode	14 positions	Numeric, maximum 7 BCD bytes, F as delimiter	No	Included in the barcode
Logistic party identifier	2 positions	Numeric, 1 BCD byte	Yes, if using a logistic number	No
Logistic number	Available memory may be used	Numeric, not specified	No	No
Container type	2 positions	Numeric, 1 byte	No	No
For local use	2 blocks	Not specified	No	Not applicable
ISBN-code	13 positions	Numeric, F as delimiter	No	Included in the ISBN-code
ILL-library	13 positions	Same format as the library identifier	No	No

Three bytes are reserved for future use and are not yet allocated.

Annex B

Implementation guidelines (mandatory)

Labels should comply with the ISO 18000-3 mode 1 standard. This implies that the system data consist of

- a unique serial number of the chip that has a size of 64 bits (8 bytes)
- a memory part that is used to store EAS-functionality, AFI and DSFID codes, write access conditions or other internally used data; the requirements for both the AFI (application family identifier) and the DSFID (Data Storage Format Identifier) are given in ISO-standards (Part 3 of ISO-15693 or ISO-18000 or ISO 28560).

Address	Block	Byte 0	Byte 1	Byte 2	Byte 3
system data		RFID 64 bits unique serial number			
		Internally used / EAS / AFI / DSFID / Write Access Conditions			

The user data are stored in the user data area as indicated in the next table (for a label with 28 remaining blocks):

user data				
0x0000	0	Object identifier 7 BCD bytes + 1 byte CHECKSUM (Cyclic Redundancy Check over the first 7 bytes)		
0x0004	1			
0x0008	2	Item identifier (2 bytes Binary)	Type ID (1 byte Binary)	Datamodel ID (1 byte Binary)
0x000C	3	Barcode (maximum 7 BCD bytes, delimit with extra 'F' (Hex))		
0x0010	4			
0x0014	5	Library identifier (total 8 BCD bytes)		
0x0018	6			
0x001C	7	Logistic party identifier (1 BCD byte) + logistic number (free format for logistic number); may be overwritten after delivery for local use		
0x0020	8			
0x0024	9	Container type in byte 0; remaining 3 bytes reserved for future use		
0x0028	10	For local use (format not specified)		
0x002C	11			
0x0030	12	ISBN (2 blocks; last block filled with 'F' (Hex))		
0x0034	13			
0x0038	14	ILL library identifier (same structure as library identifier)		
0x003C	15			
0x0040 ..... 0x006C	16 ... 27	Dynamic part		

Annex C:

Example of a label (for information only)

C1 Label after full migration to RFID technology

The loan object at the Public Library of Amsterdam with the following description
In de ban van Fortuyn : reconstructie van een politieke aardschok / Jutta Chorus, Menno de Galan. - Amsterdam : Mets & Schilt
has an object identifier: 12345678901234 (14 digits). The ISIL code of the Public Library of Amsterdam is NL-0800070000. The RFID label contains the following user data, assuming an item identifier 0101 and no storage of the barcode in the tag:

In Bits:

<table>
<tr><th colspan="6">User data</th></tr>
<tr><th>Address</th><th>Block</th><th>Byte 1</th><th>Byte 2</th><th>Byte 3</th><th>Byte 4</th></tr>
<tr><td>0x0000</td><td>0</td><td>0001 0010</td><td>0011 0100</td><td>0101 0110</td><td>0111 1000</td></tr>
<tr><td>0x0004</td><td>1</td><td>1001 0000</td><td>0001 0010</td><td>0011 0100</td><td>1101 1011</td></tr>
<tr><td>0x0008</td><td>2</td><td>0000 0001</td><td>0000 0001</td><td>0000 0000</td><td>0000 0010</td></tr>
<tr><td>0x000C</td><td>3</td><td colspan="4" rowspan="2">Empty barcode field (all zeros)</td></tr>
<tr><td>0x0010</td><td>4</td></tr>
<tr><td>0x0014</td><td>5</td><td>0010 0101</td><td>0010 0011</td><td>0010 0000</td><td>0000 1000</td></tr>
<tr><td>0x0018</td><td>6</td><td>0000 0000</td><td>0000 0111</td><td>0000 0000</td><td>0000 0000</td></tr>
<tr><td>0x001C</td><td>7</td><td colspan="4" rowspan="2">Logistic party identifier + logistic number
(free format for logistic number)</td></tr>
<tr><td>0x0020</td><td>8</td></tr>
<tr><td>0x0024</td><td>9</td><td>0000 0000</td><td colspan="3">For future use</td></tr>
<tr><td>0x0028</td><td>10</td><td colspan="4" rowspan="2">Blocks 10 and 11 are used by the Public Library Amsterdam for an automatic sorting machine (details are local)</td></tr>
<tr><td>0x002C</td><td>11</td></tr>
<tr><td>0x0030</td><td>12</td><td colspan="4" rowspan="2">Empty (memory for ISBN in schools); all zeros</td></tr>
<tr><td>0x0034</td><td>13</td></tr>
<tr><td>0x0038</td><td>14</td><td colspan="4" rowspan="2">May be used in ILL (memory content will change in time)</td></tr>
<tr><td>0x003C</td><td>15</td></tr>
<tr><td>0x0040

0x006C</td><td>16
....
27</td><td colspan="4">Dynamic part</td></tr>
</table>

- Blocks 0,1,3,4,5,6,9,12,13,14,15: BCD code, except for CRC byte;
- Block 2: Binary bytes;
- Block 10,11,16 … 27: Not (fully) specified.

Hexadecimal:

User data					
Address	**Block**	**Byte 1**	**Byte 2**	**Byte 3**	**Byte 4**
0x0000	0	12	34	56	78
0x0004	1	90	12	34	DB (CRC)
0x0008	2	01	01	00	02
0x000C	3	00	00	00	00
0x0010	4	00	00	00	00
0x0014	5	25	23	20	08

0x0018	6	00	07	00	00
0x001C	7	Logistic party identifier + order number (free format for order number)			
0x0020	8				
0x0024	9	00	For future use		
0x0028 … 0x003C	10 … 15	Partly empty, partly for local use, partly for IIL			
0x0040 … 0x006C	16 … 27	Dynamic part			

C2 Label for existing loan material

Suppose that this loan object at the Public Library of Amsterdam with the following description

In de ban van Fortuyn : reconstructie van een politieke aardschok / Jutta Chorus, Menno de Galan. - Amsterdam : Mets & Schilt

was part of the library collection before the large scale introduction of RFID. It will be tagged with the existing conventional 14 character barcode: 3 2000 03466 1738. Suppose the object identifier of the FRID-tag is agian 12345678901234. The ISIL code of the Public Library of Amsterdam remains the same NL-0800070000.

The barcode will now be stored in the tag. The RFID label contains the following user data (again assuming an item identifier 0101) .

In Bits:

User data					
Address	**Block**	**Byte 1**	**Byte 2**	**Byte 3**	**Byte 4**
0x0000	0	0001 0010	0011 0100	0101 0110	0111 1000
0x0004	1	1001 0000	0001 0010	0011 0100	1101 1011
0x0008	2	0000 0001	0000 0001	0000 0000	0000 0010
0x000C	3	0011 0010	0000 0000	0000 0000	0011 0100
0x0010	4	0110 0110	0001 0111	0011 1000	1111 1111
0x0014	5	0010 0101	0010 0011	0010 0000	0000 1000
0x0018	6	0000 0000	0000 0111	0000 0000	0000 0000
0x001C	7	Logistic party identifier + logistic number (free format for logistic number)			
0x0020	8				
0x0024	9	0000 0000	For future use		
0x0028 … 0x006C	10 … 27	Identical to tag in C1			

- Blocks 0,1,3,4,5,6,9,12,13,14,15: BCD code, except for CRC byte;
- Block 2: Binary bytes;
- Block 10,11,16 … 27: Not (fully) specified.

Hexadecimal:

User data					
Address	**Block**	**Byte 1**	**Byte 2**	**Byte 3**	**Byte 4**
0x0000	0	12	34	56	78
0x0004	1	90	12	34	DB (CRC)
0x0008	2	01	01	00	02
0x000C	3	32	00	00	34
0x0010	4	66	17	38	FF
0x0014	5	25	23	20	08
0x0018	6	00	07	00	00
0x001C	7	Logistic party identifier + order number (free format for order number)			
0x0020	8				
0x0024	9	00	For future use		
0x0028 … 0x006C	10 … 27	Identical to tag in C1			

Annex D

BCD Code Table (mandatory)

BCD = Binary Coded Data.

For the barcode the so-called packed version of BCD is used with two digits per byte.

Decimal/character	Hex	packed BCD code
0	0	0000
1	1	0001
2	2	0010
3	3	0011
4	4	0100
5	5	0101
6	6	0110
7	7	0111
8	8	1000
9	9	1001
X	A	1010
not applicable	F	1111

With this packed BCD-code a numeric 14-digit barcode results in a 7 byte field. Some old barcodes contain an X control character. This X should be transformed in a 1010 binary code. Remaining memory space is filled with "F" (Hex).

In the ISIL-code the prefix "NL-" will be used for Dutch libraries. The corresponding binaries are indicated in the table below.

Character	Hex	BCD code
N	25	00100101
L	23	00100011
-	20	00100000

For Belgium:

Character	Hex	BCD code
B		00110010
E		00110101
-	20	00100000

Annex E

Binary / hexadecimal numbers (for information only)

Decimal/character	Hex	Binary
0	0	0000
1	1	0001
2	2	0010
3	3	0011
4	4	0100
5	5	0101
6	6	0110
7	7	0111
8	8	1000
9	9	1001
10	A	1010
11	B	1011
12	C	1100
13	D	1101
14	E	1110
15	F	1111

CRC calculation (for information only)

Eight steps are required to calculate the Cyclic Redundancy Check data:
Polynoom: 0xB8 (x8 + x4 + x3 + x2 + 1)
Preset: 0xFF

Step	Data	CRC8
0	init	0xFF
1	0x12	0xFC
2	0x34	0x57
3	0x56	0x64
4	0x78	0x45
5	0x90	0x76
6	0x12	0x93
7	0x34	CRC8 checksum over '12345678901234' = 0xDB
8 (control)	0xDB	0x00 (The CRC8 checksum of the calculation result should be zero)