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Information technology — Radio frequency identification for item management —

Part 1: Unique identification for RF tags numbering systems

Technologies de l'information — Identification par radiofréquence pour la gestion des objets —

Partie 1: Systèmes numériques pour l'identification unique des tags RF

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see http://patents.iec.ch).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 31, *Automatic identification and data capture techniques*.

This first edition of ISO/IEC 15963-1, together with of ISO/IEC 15963-2, cancels and replaces ISO/IEC 15963:2009, which has been technically revised.

The main changes compared to the previous edition are as follows:

— Update to include the addition of part 2 — registration details, and to add new registration information.

A list of all parts in the ISO/IEC 15963 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

ISO/IEC 15963 (all parts) is one of a series of International Standards and Technical Reports developed by ISO/IEC JTC 1/SC 31 for the identification of items (Item Management) using radio frequency identification (RFID) technology.

This document describes numbering systems for the unique identification of RF tags.

It is intended for use in conjunction with other International Standards developed by SC 31 for "RFID for item management" and “Real time locating systems”, such as ISO/IEC 18000 (all parts) and ISO/IEC 24730 (all parts).

Information technology — Radio frequency identification for item management —

Part 1: Unique identification for RF tags numbering systems

1 Scope

This document describes numbering systems that are available for the identification of RF tags and assigns various allocation classes to various agencies that issue manufacturer codes.

The unique ID can be used:

— for the traceability of the integrated circuit itself for quality control in its manufacturing process;

— for the traceability of the RF tag during its manufacturing process and along its lifetime;

— for the completion of the reading in a multi-antenna configuration;

— by the anti-collision mechanism to inventory multiple tags in the reader's field of view; and

— for the traceability of the item to which the RF tag is attached.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 7816-6, *Identification cards — Integrated circuit cards — Part 6: Interindustry data elements for interchange*

ISO 14816, *Road transport and traffic telematics — Automatic vehicle and equipment identification — Numbering and data structure*

ISO/IEC 15963-2, *Information technology — Radio frequency identification for item management — Part 2: Unique identification for RF tags registration procedures*

ISO/IEC 19762, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary*

GS1 General Specifications (GS1, Brussels)

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19762 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
RF tag unique identifier
number that uniquely identifies an RF tag

3.2
RF tag issuer
company or organization that allocates the RF tags to the items they identify

3.3
IC manufacturer
company that manufactures the RF tag integrated circuit

3.4
RF tag manufacturer
company that manufactures the RF tag in a ready-to-use configuration

3.5
allocation class
8-bit value used to classify companies or organizations allowed to allocate unique tag identification

3.6
IC manufacturer registration number
number allocated to *IC manufacturers* (3.3)

Note 1 to entry: This number is allocated according to ISO/IEC 7816-6 or ANSI ASC INCITS T6.

3.7
RF tag issuer registration number
number allocated to *RF tag issuers* (3.2)

Note 1 to entry: This number is allocated according to ISO 6346, ISO 14816, GS1 or ANSI ASC INCITS T6.

3.8
chip ID
CID
DEPRECATED: unique identifier (UID)
unique permanent ID of the integrated circuit in an RF tag

Note 1 to entry: See tag ID, unique item identifier and object identifier in ISO/IEC 19762.

3.9
mask designer identifier
MDID
identification of *IC manufacturer* (3.3) in TID memory bank of EPC Gen2/ISO/IEC 18000-63 tags, allocated by GS1 upon request

4 Abbreviated terms

AC	Allocation class
AI	Application identifier
ANS	American National Standard
ANSI	American National Standards Institute
ASC	Accredited Standards Committee
CID	Chip identifier

EPC Electronic Product Code

ID Identifier

INCITS InterNational Committee for Information Technology Standards

LSB Least significant bit

MDID Mask designer identifier

MSB Most significant bit

OID Object identifier

RFU Reserved for future use

RTLS Real-time locating system

TDS EPC tag data standard

TID Unique tag identifier

UII Unique item identifier

5 Unique identifiers

There are several types of identifiers associated with an RF tag. The most basic form is a chip ID (CID), which is assigned by the integrated circuit (IC) manufacturer to a specific semiconductor device at the time of manufacture in a manner that prevents it from being changed. Multiple semiconductor devices may be associated with a single RF tag, though one IC per tag is common. In such a case, the RF tag (TID) may simply assume the CID as its identity or it may assume an identifier distinct from the IC. In many cases, and as a recommendation of this document, the TID is assigned at the time of RF tag manufacture in a manner that prevents the TID from being changed.

The RF tag is then attached to some item. In some implementations, the TID can then become the unique item identifier (UII). In others, such as ISO/IEC 18000-63 and ISO/IEC 18000-3 Mode 3, the UII is held in a separate part of memory and is written subsequent to being attached or associated with a specific item. The UII may either be locked or available for reprogramming.

Global uniqueness requires a central body (Registration Authority) to either assign manufacturer identities or to assign unique identities to various agencies that in turn assign manufacturer identities. Manufacturers then assign unique identification to the chip, tag or item. This document serves as the central body for assignment of unique identifiers to RF tags. This document assigns various allocation classes to various agencies that issue manufacturer codes (referred to as issuer codes in ISO/IEC 7816-6).

Some tags only have identity down to a specific lot, batch or mask identifier. Other tags, and as recommended by this document, are serialized so that all RF tags are globally unique from all other RF tags.

The combination of globally unique serialized tag (TID) programmed and locked at the time of manufacture with the unique item identifier (UII) programmed when attached or associated with a specific item and trusted trading partner communications are the cornerstones of several anti-counterfeiting techniques used within the supply chain.

For anti-collision, inventorying, reading from and writing to an RF tag, techniques exist to utilize the TID, UII or a randomly generated number. Neither the UII nor the randomly generated number provide life-cycle traceability for the RF tag. A TID does provide for such traceability.

6 Unique identification of an RF tag

6.1 Unique identification

6.1.1 General

When unique identification of an RF tag is required, it can be done in several ways. The following subclauses list and explain some of them.

6.1.2 Virtual ID

A virtual tag ID is a temporary ID based on tag parameters that can vary over the life of the tag. It may take several forms. A virtual ID is also known as a logical ID or a session ID. Several tags can have the same virtual ID at different times, but all tags at the same time for the same interrogator should have a different virtual ID, allowing an unambiguous identification of each tag at any time relative to any given interrogator.

The technical means to achieve and guarantee such uniqueness are outside of the scope of this document. However, 6.1.3, 6.1.4 and 6.1.5 discuss possible approaches.

6.1.3 Data as a unique ID

Data is a possible way to implement a virtual ID where the tag contains data that, when read, is unique in time and location to a single tag. An example is a tag that contains date and time information. The time information can be unique to a single tag from a manufacturer but is not guaranteed to be unique over all tags at all times. Another situation is a closed application where tag data describes only one set of information. Taken globally, the tag bit pattern can be repeated, but in a closed application the tag data uniquely identifies a single tag.

6.1.4 Time as a unique ID

Time is a possible way to implement a virtual ID where bit patterns alone do not necessarily identify a single tag unambiguously. Tag response time slot can be part of a uniquely identifying parameter set. For example, some tags use time slots to differentiate between several tags appearing to a reader at the same time. If these time slots are fixed for a single interrogation exchange, then the time slot may be used to help define a single tag at a particular time.

NOTE If the time slots are randomly defined each time a tag responds, then time slots are not suitable for determining a unique tag ID.

6.1.5 Position as a unique ID

In some applications, tag position may define a unique tag ID at a particular time. For instance, some tags have a read and write distance of only a few millimetres. In this case, it is difficult to have more than one or two tags in the interrogation zone at any time. Thus, any tag continually in the reading zone may be considered unique at that single time and location. A common example of this case is the tag used for fare collection on public transportation or telecommunication charges.

6.2 Permanent unique ID

6.2.1 Unique ID

When a completely and globally unique ID is required, it shall be programmed into the tag and therefore become permanent.

The methods for assigning permanent unique identifiers are provided in Tables A.1 to A.6 and shall be followed.

6.2.2 Benefits of permanent unique ID versus virtual ID

The advantage of a virtual (session) ID is the reduced number of identification bits required. The disadvantage is the absence of a unique ID, independent of the reader, application, time or data configuration used. The virtual ID is unique only at a specific time and location and is sufficient to allow the identification of a singular tag relative to time and space.

The advantage of a permanent unique ID is that it guarantees a single ID over all application, space and time situations. It is the only identification method where a unique ID is guaranteed in all situations.

6.2.3 Selection of the size of a permanent unique ID

Several criteria shall be taken into account when selecting the size (i.e. the number of bits) of a permanent unique ID:

a) To comply and coexist with existing International Standards, so that the uniqueness is guaranteed globally, and that the objectives of the International Standards are met.

b) To structure it such that its technical implementation is optimized. This results for RF tags in the selection of a "2 power N" (2^N) number of bytes (1, 2, 4, 8).

c) To guarantee a number of combinations large enough to ensure that no two tags will be allocated the same ID within the maximum expected lifetime of a tag, under reasonable conditions, e.g. 10 years.

d) To ensure that individual ID assignments can be delegated to IC or tag manufacturers in an efficient manner.

e) To limit it to the absolute minimum size (i.e. number of bits) required to meet the above criteria, as its size can penalize the performance of the interrogator-to-tag communication by increasing the number of bits to transmit. As an example, a small number of bits (e.g. 32 bits) may be sufficient for applications with a small number of tags.

Annex A
(normative)

Numbering system of a permanent unique RF tag identifier (TID)

A.1 General

This annex contains the numbering system for RF tags using permanent unique RF tag identifiers (TIDs). For the realization of such a numbering system, it is necessary to incorporate the specification below and the specification of associated registration procedures in an International Standard.

In order to ensure the uniqueness of the RF tag identifier, the following rules specify its structure and length.

A.2 TID issuer identifier

To ensure the uniqueness of each TID, each TID issuer shall be uniquely identified. Six classes of issuer are defined, as shown in Table A.2. Two number blocks shown in Table A.2 ("00100001 to 11011111" and "11100100 to 11111111") are reserved for future use by ISO/IEC.

The length of the RF tag unique identifier is assigned in accordance with the standards identified below. It consists of three fields, as shown in Table A.1.

Table A.1 — Structure of the permanent unique identifier (TID)

AC	TID issuer registration number	Serial number
8 bits	Size defined by AC value	Size defined by AC and TID issuer value

MSB **LSB**

A.3 Allocation class (AC)

The size of the allocation class is 8 bits. Six classes of TID issuer are defined as shown in Table A.2.

Table A.2 — Classes of unique tag ID (TID) issuer

Binary allocation class value	Class	TID issuer identifier size	Serial number size
00000000 to 00011111	ISO/IEC 15963-2	Per ISO/IEC 18000-63, ISO/IEC 18000-7 and the ISO/IEC 24730 series	Per ISO/IEC 18000-63, ISO/IEC 18000-7 and the ISO/IEC 24730 series
00100000	ISO/IEC 18000-4	Per ISO/IEC 18000-4	Per ISO/IEC 18000-4
00100001 to 11011111	RFU	N/A	N/A
11100000	ISO/IEC 7816-6	8 bits	48 bits
11100001	ISO 14816	Per ISO 14816	Per ISO 14816
11100010	GS1	Per ISO/IEC 18000-63, Type C, GS1 EPC & 18000-3 Mode 3	Per 18000-3 Mode 3, ISO/IEC 18000-63 Type C and GS1 EPC
11100011	ISO/IEC 7816-6	8 bits	48 bits

Table A.2 *(continued)*

Binary allocation class value	Class	TID issuer identifier size	Serial number size
11100100 to 11111111	RFU	N/A	N/A

A.4 TID issuer registration number

The TID issuer registration number is assigned according to one of the following documents, as applicable:

— ISO/IEC 7816-6 (for ISO/IEC 7816 IC card manufacturers);

— ISO 14816 (for freight container and transport applications);

— GS1 for MDID assignment;

— ISO/IEC 15963-2.

A.5 Serial number

The TID issuer issues the serial number and has the responsibility to ensure its uniqueness.

It shall be unique in the sense that the issuer does not re-issue a number until a sufficient period of time has passed so that the first number has ceased to be of significance to any user.

The serial number is a binary value. The length of the unique tag ID is dependent upon the specific allocation class used.

A.6 Allocation classes

A.6.1 In support of ISO/IEC 7816-6

The IC manufacturer is registered in ISO/IEC 7816-6.

If AC = '11100000' or '11100011', the unique identifier is allocated by an IC manufacturer, identified by an 8-bit (1 byte) number. The IC manufacturer shall be registered in ISO/IEC 7816-6.

The AC is followed by the 8-bit IC manufacturer registration number and a 48-bit serial number allocated by the IC manufacturer. See Table A.3.

The E0 and E3 Allocation Class IC manufacturer registration numbers shall be assigned in accordance with Annex B. The E3 features distinguished from E0 are also found in Annex B.

Table A.3 — ISO/IEC 7816-6 unique TID

Allocation class	IC manufacturer registration number	Serial number
8 bits '11100000'	8 bits As registered in ISO/IEC 7816-6	48 bits Allocated by the IC manufacturer

MSB **LSB**

A.6.2 In support of ISO 14816

If AC = '11100001', the unique identifier is issued by an RF tag manufacturer in support of ISO 14816, identified consistent with ISO 14816.

The RF tag manufacturer shall be registered in accordance with the procedures defined in ISO 14816.

The AC shall be followed by the convention shown in Annex C.

Table A.4 — ISO 14816 Unique TID

AC	RF tag issuer registration number	Serial number
8 bits '11100001'	As defined ISO 14816	As defined ISO 14816

MSB **LSB**

A.6.3 In support of GS1 standardized numbering

If AC = '11100010', the unique identifier is issued by an RF tag manufacturer in support of GS1 standardized number, consistent with GS1's EPC Tag Data Standard and ISO/IEC 18000-63 or ISO/IEC 18000-3 Mode 3.

The RF tag manufacturer shall be registered in accordance with the procedures defined in the GS1 General Specifications.

NOTE 1 The Electronic Product Code (EPC) is an identification scheme for universally identifying physical objects (e.g. trade items, assets and locations) via RFID tags and other means. The EPC structure(s) is (are) standardized by GS1 and published in the *EPC Tag Data Standard (TDS)*.

NOTE 2 GS1 uses EPC, ISO uses UII.

The AC is followed by the convention shown in ISO/IEC 18000-63 or ISO/IEC 18000-3 Mode 3.

The E2 allocation class shall be used as detailed in Annex D.

Table A.5 — ISO/IEC 18000-63, Type C or ISO/IEC 18000-3, Mode 3 unique TID

AC	Indicator bits for tag support of optional features	Mask design identifier (MDID)	Tag model number	Extended tag identification (XTID)
8 bits '11100010'	3 bits As defined in *GS1's Gen 2 Protocol Standard*	9 bits As defined in the *GS1's Gen 2 Protocol Standard*	12 bits As defined in *GS1's Gen 2 Protocol Standard*	As defined in *GS1's EPC Tag Data Standard*

MSB **LSB**

A.6.4 In support of Class ISO/IEC 15963-2

If AC = '000xxxxx', the unique identifier is issued by an IC manufacturer in support of Class ISO/IEC 15963-2.

The IC manufacturer shall be registered in accordance with the procedures defined for Class ISO/IEC 15963-2.

The AC is followed by the convention shown in Class ISO/IEC 15963-2. The total length of this unique identifier including allocation class (AC), IC manufacturer registration number and serial number is detailed in the appropriate air-interface standard.

Table A.6 — Class ISO/IEC 15963 unique TID

AC	IC manufacturer registration number	Serial number
8 bits (00000000 - 00011111)	As defined in Class ISO/IEC 15963-2	As defined in Class ISO/IEC 15963-2

Table A.6 *(continued)*

AC	IC manufacturer registration number	Serial number

MSB LSB

The “00” to “1F” allocation classes shall be used as detailed in Annex E.

A.6.5 Reserved for future use

If AC = '00100001' to '11001111' or '11100100' to '11101111', the unique TID is reserved for future use (RFU) by this document.

Annex B
(normative)

ISO/IEC 7816-6 numbering systems for RFID

B.1 ISO/IEC 7816-6 issuer codes

Within supply chain applications for RFID, there are several numbering structures that are used by JTC 1/SC 31, ISO TC 104, ISO TC 122 and ISO TC 204. At the time of publication of this document, ISO/IEC 7816-6 issuer codes are employed in ISO/IEC 18000-2, Type A; ISO/IEC 18000-3, Modes 1 and 3; ISO/IEC 18000-4, Modes 1 and 2; ISO/IEC 18000-62, ISO/IEC 18000-63 and ISO/IEC 18000-64.

The current listing of issuer codes is available through the Registration Authority for ISO/IEC 15963-2[1].

B.2 E0 as the basic allocation class for ISO/IEC 7816-6 TIDs

"E0" is the allocation class for the basic 7816-6 company issuer identifier codes consisting of the 8-bit identifier followed by a 48-bit serial number.

B.3 E3 as the extended allocation class for ISO/IEC 7816-6 TIDs

B.3.1 General

"E3" builds on an existing allocation class "E0" for compatibility. The AC is followed by the 8-bit IC manufacturer registration number, the 2-byte user memory present and size data, the 48-bit unique tag ID, the 1-byte XTID and 15-byte XTID Header data. Table B.1 shows the TID format of allocation class of “E3”:

Table B.1 — ISO/IEC 7816-6 Extended TID

TID mem bank bit address	Bit address															
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
	MSB															LSB
50_h-$5F_h$	XTID	XTID Header [14:0]														
40_h-$4F_h$	Serial Number [15:0]															
30_h-$3F_h$	Serial Number [31:16]															
20_h-$2F_h$	Serial Number [47:32]															
10_h-$1F_h$	User memory and size [15:0]															
00_h-$0F_h$	$E3_h$								IC manufacturer identification							

B.3.2 User memory and size

The MSB declares whether user memory (logical or physical) is on the tag:

— “0_2” = user memory is not resident on the tag.

— “1_2” = user memory is resident on the tag.

1) http://www.iso.org/mara

NOTE The above binary statements make no declaration concerning User DATA. They only declare whether or not logical or physical user memory is present on the tag. The remaining 15 bits will declare the size of user memory in bits:

- **User memory size examples:**
  - $x000000001000000_2$ = 64 bits;
  - $x000001000000000_2$ = 512 bits;
  - $x000100000000000_2$ = 2 048 bits;
  - $x111111111111111_2$ = 32 767 bits.
- **User memory and size examples:**
  - 0000000000000000_2 = no user memory;
  - 1000000001000000_2 = user memory; 64 bits.

B.3.3 Locking of serial number

A 48-bit serial number shall be allocated and permanently locked by the IC manufacturer.

B.3.3 Extended TID (XTID) Header

The MSB declares whether there is an XTID Header:

- 0_2 = no XTID Header data.
- 1_2 = XTID Header data.

XTID Header data beyond the MSB is to be determined.

Annex C
(normative)

ISO 14816 — Numbering and data structures

Within supply chain applications for RFID, there are several numbering structures that are used by ISO/IEC JTC 1/SC 31, ISO TC 104, ISO TC 122 and ISO TC 204. These structures are shown in Table C.1.

Table C.1 — Coding structure identifiers (CSI)

<table>
<tr><th>CSI</th><th>Length</th><th colspan="4">Coding structure data field</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Variable</td><td colspan="4">Reserved for CEN/ISO</td></tr>
<tr><td colspan="4">Not defined</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">7 octets/
56 bits</td><td>Country code[a]</td><td colspan="2">Issuer identifier</td><td>Service number</td></tr>
<tr><td>10</td><td colspan="2">14</td><td>32</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">6 octets/
48 bits</td><td colspan="2">Manufacturer identifier</td><td colspan="2">Service number</td></tr>
<tr><td colspan="2">16</td><td colspan="2">32</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">22 octets/
176 bits</td><td>Start time</td><td>Stop time</td><td>Geographic limit</td><td>Application limit</td></tr>
<tr><td>80</td><td>80</td><td>8</td><td>8</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Variable</td><td>Country code[a]</td><td colspan="2">Alphabet indicator</td><td>License plate #</td></tr>
<tr><td>10</td><td colspan="2">8</td><td>Not defined</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">17 octets/
136 bits</td><td colspan="4">Vehicle identification (chassis) number</td></tr>
<tr><td colspan="4">126</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Variable</td><td colspan="4">Reserved for CEN/ISO</td></tr>
<tr><td colspan="4">Not defined</td></tr>
<tr><td rowspan="2">7</td><td rowspan="2">93 bits</td><td colspan="4">Freight container numbering</td></tr>
<tr><td colspan="4">93</td></tr>
<tr><td rowspan="2">8</td><td rowspan="2">Variable</td><td colspan="2">Country code[a]</td><td colspan="2">Tax code</td></tr>
<tr><td colspan="2">10</td><td colspan="2">Not defined</td></tr>
<tr><td rowspan="2">9</td><td rowspan="2">Variable</td><td colspan="4">Reserved for CEN/ISO</td></tr>
<tr><td colspan="4">Not defined</td></tr>
<tr><td rowspan="2">...</td><td rowspan="2">Variable</td><td colspan="4">Reserved for CEN/ISO</td></tr>
<tr><td colspan="4">Not defined</td></tr>
<tr><td rowspan="2">30</td><td rowspan="2">Variable</td><td colspan="4">Reserved for CEN/ISO</td></tr>
<tr><td colspan="4">Not defined</td></tr>
<tr><td rowspan="2">31</td><td rowspan="2">Variable</td><td colspan="4">Reserved for CEN/ISO (extension)</td></tr>
<tr><td colspan="4">Not defined</td></tr>
<tr><td colspan="6">[a] Country code is in accordance with ISO 3166-1.</td></tr>
</table>

Annex D
(normative)

ISO/IEC 18000-63 or ISO/IEC 18000-3 Mode 3 numbering systems for RFID

GS1's EPC Tag Data Standard describes how to encode a TID corresponding with allocation class "E2". Table D.1 shows the short EPC TID format. Table D.2 shows the extended EPC TID (XTID) format. An up-to-date list of MDID assignments is available through the Registration Authority for ISO/IEC 15963-2[2].

Table D.1 — EPCglobal Short TID

TID mem bank bit address	Bit address (In Hex)															
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
10_h-$1F_h$	TAG MDID [3:0]				TAG MODEL NUMBER [11:0]											
00_h-$0F_h$	$E2_h$								X	S	F	TAG MDID [8:4]				

NOTE

— 08h: XTID (X) indicator (whether a Tag implements an XTID;

— 09h: Security (S) indicator (whether a Tag supports the Authenticate and/or Challenge commands);

— 0Ah: File (F) indicator (whether a Tag supports the FileOpen command).

TID will not contain serialization if Bit 08_h (X) of the TID memory bank has a value of zero. In addition, there can be more data present in the TID, which is not covered by this document.

Table D.2 — EPCglobal Extended TID (TDS 1.9)

TID mem bank bit address	Bit address (In Hex)															
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
$C0_h$-CF_h	User Memory and BlockPermaLock Segment [15:0]															
$B0_h$-BF_h	User Memory and BlockPermaLock Segment [31:16]															
$A0_h$-AF_h	BlockWrite and BlockErase Segment [15:0]															
90_h-$9F_h$	BlockWrite and BlockErase Segment [31:16]															
80_h-$8F_h$	BlockWrite and BlockErase Segment [47:32]															
70_h-$7F_h$	BlockWrite and BlockErase Segment [63:48]															
60_h-$6F_h$	Optional Command Support Segment [15:0]															
50_h-$5F_h$	Serial Number Segment [15:0]															

NOTE

— 08h: XTID (X) indicator (whether a Tag implements an XTID);

— 09h: Security (S) indicator (whether a Tag supports the Authenticate and/or Challenge commands);

— 0Ah: File (F) indicator (whether a Tag supports the FileOpen command).

TID will contain serialization if both of the following conditions are met.

1 Bit 08_h (X) of the TID memory bank has a value of one.

2 Bits 20_h-22_h do not equal zero when treated as a three-bit unsigned number. The MSB of this number is bit 20_h.

If condition one is met above, there is a 16-bit XTID header present from address 20_h-$2F_h$ of the TID memory bank. In addition, there can be more data present in the TID, which is not covered by this document.

2) http://www.iso.org/mara

