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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.