
**Information technology — Radio
frequency identification for item
management —**

**Part 63:
Parameters for air interface
communications at 860 MHz to 960
MHz Type C**

*Technologies de l'information — Identification par radiofréquence
(RFID) pour la gestion d'objets —*

*Partie 63: Paramètres de communications d'une interface radio entre
860 MHz et 960 MHz, Type C*

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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. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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).

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

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 31, *Automatic identification and data capture techniques*.

This second edition cancels and replaces the first edition (ISO/IEC 18000-63:2013), which has been technically revised.

ISO/IEC 18000 consists of the following parts, under the general title *Information technology — Radio frequency identification for item management*:

- *Part 1: Reference architecture and definition of parameters to be standardized*
- *Part 2: Parameters for air interface communications below 135 kHz*
- *Part 3: Parameters for air interface communications at 13,56 MHz*
- *Part 4: Parameters for air interface communications at 2,45 GHz*
- *Part 6: Parameters for air interface communications at 860 MHz to 960 MHz General*
- *Part 61: Parameters for air interface communications at 860 MHz to 960 MHz Type A*
- *Part 62: Parameters for air interface communications at 860 MHz to 960 MHz Type B*
- *Part 63: Parameters for air interface communications at 860 MHz to 960 MHz Type C*
- *Part 64: Parameters for air interface communications at 860 MHz to 960 MHz Type D*
- *Part 7: Parameters for active air interface communications at 433 MHz*

Introduction

This part of ISO/IEC 18000 defines the physical and logical requirements for a passive-backscatter, Interrogator-talks-first (ITF), radio-frequency identification (RFID) system operating in the 860 MHz – 960 MHz frequency range. The system comprises Interrogators, also known as Readers, and Tags, also known as Labels or Transponders.

An Interrogator transmits information to a Tag by modulating an RF signal in the 860 MHz – 960 MHz frequency range. The Tag receives both information and operating energy from this RF signal. Tags are passive, meaning that they receive all of their operating energy from the Interrogator's RF signal.

An Interrogator receives information from a Tag by transmitting a continuous-wave (CW) RF signal to the Tag; the Tag responds by modulating the reflection coefficient of its antenna, thereby backscattering an information signal to the Interrogator. The system is ITF, meaning that a Tag modulates its antenna reflection coefficient with an information signal only after being directed to do so by an Interrogator.

Interrogators and Tags are not required to talk simultaneously; rather, communications are half-duplex, meaning that Interrogators talk and Tags listen, or vice versa.

The described backscatter radio frequency identification (RFID) system that supports the following system capabilities:

- identification and communication with multiple tags in the field;
- selection of a subgroup of tags for identification or with which to communicate;
- reading from and writing to or rewriting data many times to individual tags;
- user-controlled permanently lockable memory;
- data integrity protection;
- Interrogator-to-tag communications link with error detection;
- tag-to-Interrogator communications link with error detection;
- support for both passive back-scatter tags with or without batteries.

The International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) draw attention to the fact that it is claimed that compliance with this document may involve the use of patents concerning radio frequency identification technology.

ISO and IEC take no position concerning the evidence, validity and scope of these patent rights.

The holders of these patent rights have assured ISO and IEC that they are willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statements of the holders of these patent rights are registered with ISO and IEC.

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Information technology — Radio frequency identification for item management —

Part 63:

Parameters for air interface communications at 860 MHz to 960 MHz Type C

1 Scope

This part of ISO/IEC 18000 defines the air interface for radio frequency identification (RFID) devices operating in the 860 MHz to 960 MHz Industrial, Scientific, and Medical (ISM) band used in item management applications. It provides a common technical specification for RFID devices that can be used by ISO committees developing RFID application standards. This part of ISO/IEC 18000 is intended to allow for compatibility and to encourage inter-operability of products for the growing RFID market in the international marketplace. It defines the forward and return link parameters for technical attributes including, but not limited to, operating frequency, operating channel accuracy, occupied channel bandwidth, maximum effective isotropic radiated power (EIRP), spurious emissions, modulation, duty cycle, data coding, bit rate, bit rate accuracy, bit transmission order, and, where appropriate, operating channels, frequency hop rate, hop sequence, spreading sequence, and chip rate. It further defines the communications protocol used in the air interface.

This part of ISO/IEC 18000 specifies the physical and logical requirements for a passive-backscatter, Interrogator-Talks-First (ITF) systems. The system comprises Interrogators, also known as readers, and tags, also known as labels. An Interrogator receives information from a tag by transmitting a continuous-wave (CW) RF signal to the tag; the tag responds by modulating the reflection coefficient of its antenna, thereby backscattering an information signal to the Interrogator. The system is ITF, meaning that a tag modulates its antenna reflection coefficient with an information signal only after being directed to do so by an Interrogator.

In detail, this part of ISO/IEC 18000 contains Type C.

Type C uses PIE in the forward link and a random slotted collision-arbitration algorithm.

This part of ISO/IEC 18000 specifies

- physical interactions (the signalling layer of the communication link) between Interrogators and tags,
- logical operating procedures and commands between Interrogators and Tags.
- the collision arbitration scheme used to identify a specific tag in a multiple-tag environment.
- optional security commands that allow the use of crypto suites of ISO/IEC 29167.

2 Conformance

2.1 Claiming conformance

A device shall not claim conformance with this protocol unless the device complies with

- all clauses in this protocol (except those marked as optional), and
- the conformance document associated with this protocol, and,

- all local radio regulations.

Relevant conformance test methods are provided in ISO/IEC 18047-6.

Conformance can also require a license from the owner of any intellectual property utilized by said device.

2.2 General conformance requirements

2.2.1 Interrogators

To conform to this part of ISO/IEC 18000, an Interrogator shall:

- Meet the requirements of this part of ISO/IEC 18000,
- Implement the mandatory commands defined in this part of ISO/IEC 18000,
- Modulate/transmit and receive/demodulate a sufficient set of the electrical signals defined in the signaling layer of this protocol to communicate with conformant Tags, and
- Conform to the applicable local radio regulations.

To conform to this part of ISO/IEC 18000, an Interrogator may:

- Implement any subset of the optional commands defined in this part of ISO/IEC 18000, and
- Implement any proprietary and/or custom commands in conformance with this part of ISO/IEC 18000.

To conform to this part of ISO/IEC 18000, an Interrogator shall not:

- implement any command that conflicts with this part of ISO/IEC 18000 or any of the parts 61, 62 and 64, or
- Require using an optional, proprietary, or custom command to meet the requirements of this protocol.

2.2.2 Tags

To conform to this part of ISO/IEC 18000, a Tag shall:

- Meet the requirements of this part of ISO/IEC 18000,
- Implement the mandatory commands defined in this part of ISO/IEC 18000,
- Modulate a backscatter signal only after receiving the requisite command from an Interrogator, and
- Conform to local radio regulations.

To conform to this protocol, a Tag may:

- Implement any subset of the optional commands defined in this part of ISO/IEC 18000, and
- Implement any proprietary and/or custom commands as defined in 2.3.3 and 2.3.4, respectively.

To conform to this part of ISO/IEC 18000, a Tag shall not:

- Implement any command that conflicts with this part of ISO/IEC 18000 or any of the parts 61, 62 and 64,
- Require using an optional, proprietary, or custom command to meet the requirements of this protocol, or
- Modulate a backscatter signal unless commanded to do so by an Interrogator using the signaling layer defined in this part of ISO/IEC 18000.

2.3 Command structure and extensibility

This part of ISO/IEC 18000 allows four command types: (1) mandatory, (2) optional, (3) proprietary, and (4) custom. Subclause 6.3.2.12 and Table 6.28 define the structure of the command codes used by Interrogators and Tags for each of the four types, as well as the availability of future extensions. All commands defined by this protocol are either mandatory or optional. Proprietary or custom commands are manufacturer-defined.

2.3.1 Mandatory commands

Conforming Tags shall support all mandatory commands. Conforming Interrogators shall support all mandatory commands.

2.3.2 Optional commands

Conforming Tags may or may not support optional commands. Conforming Interrogators may or may not support optional commands. If a Tag or an Interrogator implements an optional command then it shall implement it in the manner specified in this protocol.

2.3.3 Proprietary commands

Proprietary commands may be enabled in conformance with this protocol, but are not specified herein. All proprietary commands shall be capable of being permanently disabled. Proprietary commands are intended for manufacturing purposes and shall not be used in field-deployed RFID systems.

2.3.4 Custom commands

Custom commands may be enabled in conformance with this protocol, but are not specified herein. An Interrogator shall issue a custom command only after (1) singulating a Tag, and (2) reading (or having prior knowledge of) the Tag manufacturer's identification in the Tag's TID memory. An Interrogator shall use a custom command only in accordance with the specifications of the Tag manufacturer identified in the TID. A custom command shall not solely duplicate the functionality of any mandatory or optional command defined in this protocol by a different method.

2.4 Reserved for Future Use (RFU)

This part of ISO/IEC 18000 denotes some Tag memory addresses, Interrogator command codes, and bit fields within Interrogator commands as RFU.

RFU values are reserved for future extensibility. Third parties, including but not limited to solution providers and end users, shall not use these RFU values for proprietary purposes.

2.5 Cryptographic Suite Indicators

A Tag may support one or more cryptographic suites. The *Challenge* and *Authenticate* commands include a CSI field that specifies a single cryptographic suite. CSI is an 8-bit field with bit values defined below.

- Four most-significant bits: Cryptographic suite assigning authority, as follows:
 - 0000₂ – 0011₂: ISO/IEC 29167
 - 0100₂ – 1100₂: RFU
 - 1101₂: Tag manufacturer
 - 1110₂: GS1
 - 1111₂: RFU
- Four least-significant bits: One of 16 cryptographic suites that the assigning authority may assign.

Example: CSI=00000000₂ is the first and CSI=00000001₂ is the second suite that ISO/IEC 29167 may assign.

3 Normative references

The following referenced documents are indispensable for the application 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/IEC 15961, *Information technology — Radio frequency identification (RFID) for item management — Data protocol: application interface*

ISO/IEC 15962, *Information technology — Radio frequency identification (RFID) for item management — Data protocol: data encoding rules and logical memory functions*

ISO/IEC 15963, *Information technology — Radio frequency identification for item management — Unique identification for RF tags*

ISO/IEC 18000-1, *Information technology — Radio frequency identification for item management — Part 1: Reference architecture and definition of parameters to be standardized*

ISO/IEC 18047-6:2012, *Information technology — Radio frequency identification device conformance test methods — Part 6: Test methods for air interface communications at 860 MHz to 960 MHz*

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

ISO/IEC 29167-1: *Information technology — Automatic identification and data capture techniques — Part 1: Security services for RFID air interfaces*

GS1 EPCglobal™: *GS1 EPC™ Tag Data Standard*

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19762 (all parts) and the following apply. Terms and definitions specific to this part of ISO/IEC 18000 that supersede any normative references are as follows:

4.1 air interface

complete communication link between an Interrogator and a Tag including the physical layer, collision-arbitration algorithm, command and response structure, and data-coding methodology

4.2 activation

waking up a tag from the **hibernate** state

4.3 asymmetric key pair

private key and its corresponding public key, used in conjunction with an asymmetric cryptographic suite