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BSI Standards Publication

Information technology — Radio frequency identification (RFID) for item management: Data protocol

Part 4: Application interface commands for battery assist and sensor functionality

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National foreword

This British Standard is the UK implementation of ISO/IEC 15961-4:2016. Together with BS ISO/IEC 15961-1:2013, BS ISO/IEC 15961-2 and BS ISO/IEC 15961-3, it supersedes BS ISO/IEC 15961:2004, which will be withdrawn upon publication of all parts of the series.

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A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Information technology — Radio frequency identification (RFID) for item management: Data protocol —

Part 4: Application interface commands for battery assist and sensor functionality

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Partie 4: Commandes de l'interface d'application pour l'assistance de la batterie et la fonctionnalité du capteur

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Foreword

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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*.

A list of all parts in the ISO/IEC 15961 series can be found on the ISO website.

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Introduction

The technology of radio frequency identification (RFID) is based on non-contact electronic communication across an air interface. The structure of the bits stored in the memory of the RFID tag is invisible and accessible between the RFID tag and the interrogator only by the use of the appropriate air interface protocol, as specified in the corresponding part of ISO/IEC 18000. Since the initial publication of ISO/IEC 18000, it has become possible to add sensors to the RFID tag using various physical methods, but always using the air interface protocol as a consistent means of communicating between the RFID tag and the interrogator.

For sensor information, functional commands from the application and responses from the interrogator are processed in a standard way. This allows equipment to be interoperable. In special cases, when the sensor is attached to or integrated within an RFID tag, this enables configuration parameters to be encoded in one system's implementation with the resultant sensory information to be read at a later time in a completely different and unknown system's implementation. The data bits stored on each RFID tag and sensor shall be formatted in such a way as to be reliably read at the point of use if the sensor is to fulfil its basic objective. The integrity of this is achieved through the use of an application protocol, for example, as supported by the functional commands specified in this document and as specified in ISO/IEC 24791.

Manufacturers of radio frequency identification equipment (interrogators, RFID tags, etc.), manufacturers of sensors and users of RFID technology supporting sensors each require a publicly available application protocol. This document specifies the sensor encoding and processing rules, which are independent of any of the air interface standards defined in the various parts of ISO/IEC 18000. As such, the sensor encoding and processing rules are consistent components in the RFID system that may, independently, evolve to support additional air interface protocols and different types of sensors.

The documents that comprise the data protocol are the following.

— ISO/IEC 15961-1 defines the transfer of data to and from the application, supported by appropriate application commands and responses.

— ISO/IEC 15961-2 defines the registration procedure of data constructs to ensure that as new applications adopt the data protocol, it becomes a relatively straightforward process to support that application. This can be achieved by the registration authority publishing regular updates of the RFID data constructs that have been assigned, and for a means of incorporating these updates into the processes of ISO/IEC 15961-1.

— ISO/IEC 15961-3 defines the data constructs and the rules that govern their use.

— ISO/IEC 15961-4 defines the transfer of sensor data to and from the application, supported by appropriate application commands and responses.

— ISO/IEC 15962 specifies the overall process and the methodologies developed to format the application data into a structure to store on the RFID tag.

— ISO/IEC 24753 specifies the overall process and methodologies developed to format and process sensory information in a standardised manner and provide an interface with the appropriate air interface protocol.

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Information technology — Radio frequency identification (RFID) for item management: Data protocol —

Part 4: Application interface commands for battery assist and sensor functionality

1 Scope

This document provides a set of application commands and their associated responses for the following functions:

— to start and stop battery assistance;

— to select and de-select a particular sensory function supported by the RFID tag;

— to set sensor parameters both initially and ongoing;

— to start and stop the sensor monitoring the environment;

— to access sensor data;

— to establish the battery status.

ISO/IEC 24753 defines the encoding rules for identifying sensors, their functions, their delivered measurements, and the processing rules for sensor data. As such, it receives commands as defined in this document and provides the information that is required for the appropriate responses.

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 18000-63, *Information technology — Radio frequency identification for item management – Part 63: Parameters for air interface communications at 860 MHz to 960 MHz Type C*

ISO/IEC 18000-64, *Information technology — Radio frequency identification for item management — Part 64: Parameters for air interface communications at 860 MHz to 960 MHz Type D*

ISO/IEC 24753:2011, *Information technology — Radio frequency identification (RFID) for item management — Application protocol: encoding and processing rules for sensors and batteries*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19762, ISO/IEC IEEE 21451-7, ISO/IEC 24753, and the following apply.

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

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

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

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3.1
sensor processor
implementation of the processes specified in ISO/IEC 24753 to convert between data and information relevant to the application layer and the bit based encoding on the sensor memory

4 Conformance

4.1 General

The commands and responses in this document are only expressed in an abstract syntax. Their structure is determined by the records and fields on the particular sensor. As such, conformance to this document for a particular sensor system is specifically indicated by the resultant proper encoding according to ISO/IEC 24753 and then passed through RFID air interface protocols to the sensor.

The arguments and fields contained in individual commands and responses identify what needs to be taken into account for correct input to the ISO/IEC 24753 Sensor Processor to achieve a valid encoding. Also, they identify what an application expects to have returned following access to a sensor on an RFID tag. Because of the way the protocol is structured, the commands and responses specified in this document are, to a large extent, independent of particular RFID tag types that support sensors. The effect of this is that ISO/IEC 24753 can specify conformance requirements for valid encoding, which this document cannot.

All the commands and arguments, and their associated processes, are specified in detail in ISO/IEC 24753. Object Identifiers are used throughout that document to uniquely identify arguments within commands and responses for each type of sensor. Object Identifiers are also used to identify fields with particular sensor records.

4.2 Conformance of the Sensor Processor

The Sensor Processor is, effectively, the implementation of ISO/IEC 24753. An implementation of ISO/IEC 24753 is required to support one or both of the following:

a) all the processes that are required to support all aspects of full function sensors for configuration and interpretation of sensor data;

b) all the processes that are required to support all aspects of simple sensors for configuration and interpretation of sensor data.

4.3 Application conformance

An application is expected to support the commands and responses that are defined in ISO/IEC 24753 for full function sensors and/or simple sensors. Therefore, this document shall support either one or both options a) and b) in 4.2 as determined by the implementation of ISO/IEC 24753 with which it interfaces.

In addition, the application conformance requirements defined by the commands and responses in this document may be simplified to address a specific type of simple or full function sensor, even to the extent of only the records and commands required for that sensor. For the commands that are supported, all the arguments in the command and response shall be supported to achieve the interface with the sensor processor.

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5 Logical interface model

5.1 General

The processes defined in this document are implemented between the application and the air interface protocol. This document performs similar functions for sensory data as ISO/IEC 15961-1 does for item-related data. The relationship and basic functions of the standards are illustrated in Figure 1.

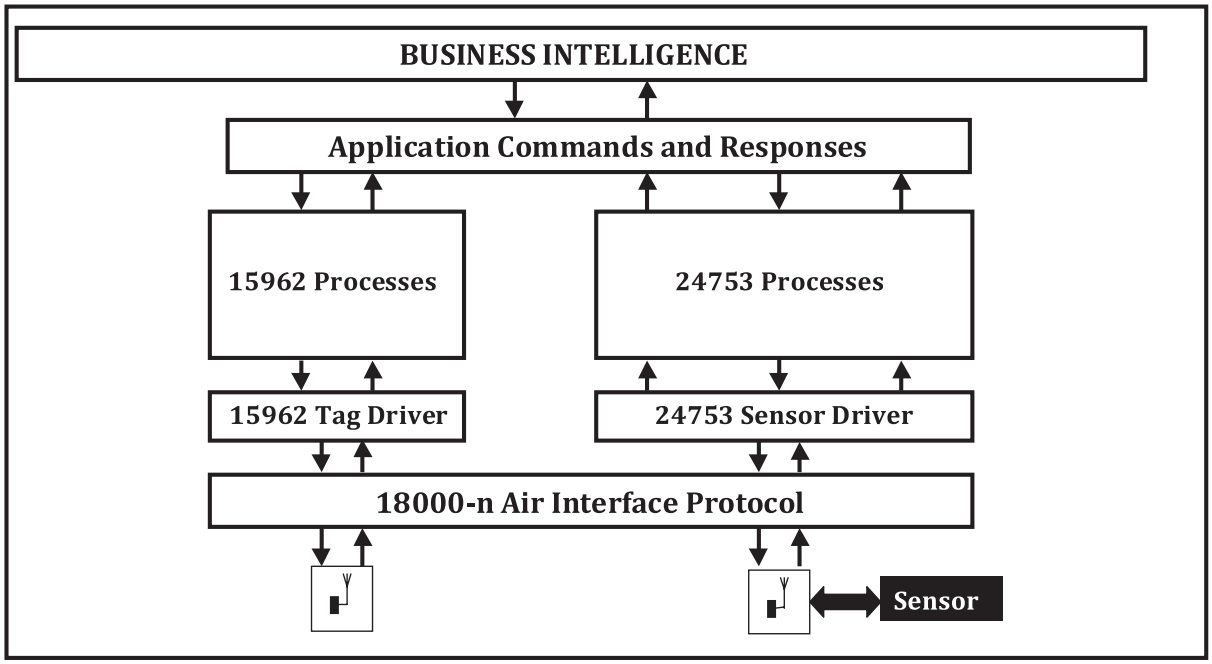

Figure 1 — Basic application interface model

ISO/IEC 24753 is an essential reading in implementing this document. Reference needs to be made to that standard for a full description of the component parts of the model relevant to sensors and batteries. An overview relevant to this document is provided below.

5.2 Application commands

A set of functional application commands is required to enable the application to identify what sensor functions are supported, to access data from sensors, to access the status of the battery power, and to reset values such as alarm values for the sensor activity. These are defined in Clause 6 for simple sensors and Clause 7 for full function sensors.

The structure of the application commands and response can be determined by clauses in ISO/IEC 24753 that use the same name. The structure of these commands may be derived from the set of Object Identifiers applicable for each command and response as specified in ISO/IEC 24753. Because of this, only selected application interface commands are fully described in this document.

5.3 The sensor information model for full function sensors

The sensor information model for full function sensors (Figure 2) shows the relationship between component processes and structures described later in ISO/IEC 24753 for full function sensors specified in ISO/IEC IEEE 21451-7. A physical sensor is defined as one that monitors a particular environmental feature capable of being expressed in terms of an SI unit or derived SI unit. A given physical sensor may support a number of logical sensors, each of which specifies a method of event data output, e.g. maximum value, observed value below a threshold qualified by a timestamp, count of events observed that are above a threshold.

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