
**Information technology — Data
protocol for radio frequency
identification (RFID) for item
management —**

**Part 1:
Application interface**

*Technologies de l'information — Protocole de données relatif à
l'identification par radiofréquence (RFID) pour la gestion d'objets —
Partie 1: Interface d'application*





COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword	viii
Introduction	ix
1 Scope	1
2 Normative references	1
3 Terms, definitions and abbreviated terms	1
3.1 Terms and definitions.....	1
3.2 Abbreviated terms and designations.....	2
4 Conformance	2
4.1 General.....	2
4.2 Application conformance.....	2
4.3 Conformance of the Data Processor.....	3
5 Protocol model	3
6 Presentation conventions	3
6.1 Commands, responses, and arguments.....	3
6.1.1 General.....	3
6.1.2 Data types.....	3
6.2 Object Identifier presentation in the application interface.....	4
6.2.1 Object identifier structure to ISO/IEC 8824-1.....	4
6.2.2 Presenting the Object-Identifier in accordance with ISO/IEC 8824-1.....	5
6.2.3 Presenting the Object-Identifier as a Uniform Resource Name (URN).....	5
6.3 Byte notation.....	5
6.3.1 Byte — Basic unit for 8-bit coding.....	5
6.3.2 Bit ordering.....	5
6.3.3 Byte conversion.....	6
7 Processing application commands and responses	6
7.1 General.....	6
7.1.1 Option A: Straight through process.....	6
7.1.2 Option B: Transfer encoding.....	6
7.2 Encoding system related information in commands.....	7
7.2.1 Singulation-Id.....	7
7.2.2 AFI.....	7
7.2.3 DSFID.....	7
7.2.4 Access-Method.....	8
7.2.5 Data-Format.....	9
7.3 Preparing the basic Objects and other application-based arguments.....	10
7.3.1 General.....	10
7.3.2 General model.....	11
7.3.3 Object-Identifier.....	11
7.3.4 Relating Object-Identifiers.....	11
7.3.5 Object.....	11
7.3.6 Compact-Parameter.....	12
7.3.7 Object-Lock.....	14
7.4 Other command arguments.....	14
7.4.1 Access-Password.....	14
7.4.2 Additional-App-Bits.....	14
7.4.3 AFI-Lock.....	14
7.4.4 Append-To-Existing-Multiple-Record.....	14
7.4.5 Application-Defined-Record-Capacity.....	15
7.4.6 Avoid-Duplicate.....	15
7.4.7 Battery-Assist-Indicator.....	15
7.4.8 Block-Align.....	15
7.4.9 Block-Align-Packed-Object.....	15

7.4.10	Check-Duplicate	15
7.4.11	Data-CRC-Indicator	15
7.4.12	Data-Length-Of-Record	16
7.4.13	Delete-MR-Method	16
7.4.14	Directory-Length-EBV8-Indicator	16
7.4.15	DSFID-Lock	16
7.4.16	DSFID-Pad-Bytes	16
7.4.17	Editable-Pointer-Size	16
7.4.18	Encoded-Memory-Capacity	17
7.4.19	EPC-Code	17
7.4.20	Full-Function-Sensor-Indicator	17
7.4.21	Hierarchical-Identifier-Arc	17
7.4.22	Identifier-Of-My-Parent	17
7.4.23	Identify-Method	17
7.4.24	ID-Type	17
7.4.25	Instance-Of-Arc	18
7.4.26	Kill-Password	18
7.4.27	Length-Of-Mask	18
7.4.28	Lock-Directory-Entry	18
7.4.29	Lock-Multiple-Records-Header	18
7.4.30	Lock-Record-Preamble	18
7.4.31	Lock-UII-Segment-Arguments	18
7.4.32	Max-App-Length	18
7.4.33	Memory-Bank	19
7.4.34	Memory-Bank-Lock	19
7.4.35	Memory-Length-Encoding	19
7.4.36	Memory-Segment	19
7.4.37	Memory-Type	19
7.4.38	Multiple-Records-Directory-Length	19
7.4.39	Multiple-Records-Features-Indicator	19
7.4.40	NSI-Bits	20
7.4.41	Number-In-Data-Element-List	20
7.4.42	Number-Of-Records	20
7.4.43	Number-Of-Tags	20
7.4.44	Objects-Offsets-Multiplier	20
7.4.45	Packed-Object-Directory-Type	20
7.4.46	Password	21
7.4.47	Password-Type	21
7.4.48	PO-Directory-Size	21
7.4.49	PO-Index-Length	21
7.4.50	Pointer	21
7.4.51	Pointer-To-Multiple-Records-Directory	21
7.4.52	Read-Record-Type	21
7.4.53	Read-Type	23
7.4.54	Record-Memory-Capacity	23
7.4.55	Record-Type-Arc	23
7.4.56	Record-Type-Classification	24
7.4.57	Sector-Identifier	24
7.4.58	Simple-Sensor-Indicator	24
7.4.59	Start-Address-Of-Record	24
7.4.60	Tag-Data-Profile-ID-Table	24
7.4.61	Tag-Mask	25
7.4.62	Update-Multiple-Records-Directory	25
7.4.63	Word-Count	25
7.4.64	Word-Pointer	25
7.5	Command-related field names	25
7.5.1	General	25
7.5.2	Data-Set	25

7.5.3	Identities.....	25
7.5.4	Length-Lock Byte.....	25
7.5.5	Length-Of-Encoded-Data.....	26
7.5.6	Lock-Status.....	26
7.5.7	Logical-Memory-Map.....	26
7.5.8	Memory-Capacity.....	26
7.5.9	Module-OID.....	26
7.5.10	Number-Of-Tags-Found.....	26
7.5.11	PO-ID-Table.....	26
7.5.12	Protocol-Control-Word.....	26
7.5.13	Read-Data.....	26
7.6	Data security.....	26
8	Dataflows and processes to the air interface.....	27
8.1	General.....	27
8.2	Establishing communications between the application and the tag.....	27
8.2.1	General.....	27
8.2.2	Air interface services.....	27
8.2.3	System information.....	27
8.3	Application system services.....	28
9	Command-Codes, Completion-Codes, and Execution-Codes.....	28
9.1	General.....	28
9.2	Final arc values of the command and response modules.....	28
9.3	Completion-Code.....	30
9.4	Execution-Code.....	30
10	Commands and responses.....	30
10.1	General.....	30
10.2	Configure-AFI.....	30
10.2.1	Configure-AFI command.....	30
10.2.2	Configure-AFI response.....	31
10.3	Configure-DSFID.....	32
10.3.1	General.....	32
10.3.2	Configure-DSFID command.....	32
10.3.3	Configure-DSFID response.....	32
10.4	Inventory-Tags.....	33
10.4.1	Inventory-Tags command.....	33
10.4.2	Inventory-Tags response.....	34
10.5	Delete-Object.....	35
10.5.1	Delete-Object command.....	35
10.5.2	Delete-Object response.....	36
10.6	Modify-Object.....	36
10.6.1	Modify-Object command.....	36
10.6.2	Modify-Object response.....	37
10.7	Read-Object-Identifiers.....	38
10.7.1	Read-Object-Identifiers command.....	38
10.7.2	Read-Object-Identifiers response.....	38
10.8	Read-Logical-Memory-Map.....	39
10.8.1	Read-Logical-Memory-Map command.....	39
10.8.2	Read-Logical-Memory-Map response.....	39
10.9	Erase-Memory.....	40
10.9.1	Erase-Memory command.....	40
10.9.2	Erase-Memory response.....	40
10.10	Get-App-Based-System-Info.....	41
10.10.1	Get-App-Based-System-Info command.....	41
10.10.2	
	Get-App-Based-System-Info response.....	41
10.11	Write-Objects.....	41
10.11.1	Write-Objects command.....	41

10.11.2	Write-Objects response	43
10.12	Read-Objects	44
10.12.1	Read-Objects command	44
10.12.2	Read-Objects response	45
10.13	Write-Objects-Segmented-Memory-Tag	46
10.13.1	Write-Objects-Segmented-Memory-Tag command	46
10.13.2	Write-Objects-Segmented-Memory-Tag response	47
10.14	Write-EPC-UII	48
10.14.1	Write-EPC-UII command	48
10.14.2	Write-EPC-UII response	49
10.15	Inventory-ISO-UIImemory	49
10.15.1	Inventory-ISO-UIImemory command	49
10.15.2	Inventory-ISO-UIImemory response	50
10.16	Inventory-EPC-UIImemory	50
10.16.1	Inventory-EPC-UIImemory command	50
10.16.2	Inventory-EPC-UIImemory response	51
10.17	Write-Password-Segmented-Memory-Tag	51
10.17.1	Write-Password-Segmented-Memory-Tag command	51
10.17.2	Write-Password-Segmented-Memory-Tag response	51
10.18	Read-Words-Segmented-Memory-Tag	52
10.18.1	Read-Words-Segmented-Memory-Tag command	52
10.18.2	Read-Words-Segmented-Memory-Tag response	52
10.19	Kill-Segmented-Memory-Tag	53
10.19.1	Kill-Segmented-Memory-Tag command	53
10.19.2	Kill-Segmented-Memory-Tag response	53
10.20	Delete-Packed-Object	54
10.20.1	Delete-Packed-Object command	54
10.20.2	Delete-Packed-Object response	54
10.21	Modify-Packed-Object-Structure	55
10.21.1	Modify-Packed-Object-Structure command	55
10.21.2	Modify-Packed-Object-Structure response	56
10.22	Write-Segments-6TypeD-Tag	56
10.22.1	Write-Segments-6TypeD-Tag command	56
10.22.2	Write-Segments-6TypeD-Tag response	58
10.23	Read-Segments-6TypeD-Tag	59
10.23.1	Read-Segments-6TypeD-Tag command	59
10.23.2	Read-Segments-6TypeD-Tag response	60
10.24	Write-Monomorphic-UII	61
10.24.1	Write-Monomorphic-UII command	61
10.24.2	Write-Monomorphic-UII response	63
10.25	Configure-Extended-DSFID	63

10.25.1	General	63
10.25.2	Configure-Extended-DSFID command	64
10.25.3	Configure-Extended-DSFID response	64
10.26	Configure-Multiple-Records-Header	65
10.26.1	General	65
10.26.2	Configure-Multiple-Records-Header command	65
10.26.3	Configure-Multiple-Records-Header response	67
10.27	Read-Multiple-Records	68
10.27.1	Read-Multiple-Records command	68
10.27.2	Read-Multiple-Records response	69
10.28	Delete-Multiple-Record	69
10.28.1	Delete-Multiple-Record command	69
10.28.2	Delete-Multiple-Record response	70
11	Arguments	71
11.1	Add-Objects	71
11.2	DSFID-Constructs	71
11.3	EPC-UIImemory	72
11.4	Ext-DSFID-Constructs	72
11.5	ISO-UIImemory	73
11.6	Item-Related-Add-Objects	74
11.7	Item-Related-DSFID-Constructs	74
11.8	Multiple-Records-Constructs	74
11.9	Multiple-Records-Directory-Structure	75
11.10	Multiple-Records-Header-Structure	76
11.11	Multiple-Records-Preamble-Structure	77
11.12	Packed-Object-Constructs	78
11.13	Read-Objects	79
11.14	Read-Objects-Response	79
11.15	Read-OIDs-Response	80
11.16	UII-Add-Objects	80
11.17	UII-DSFID-Constructs	80
11.18	Write-Responses	80
Annex A (informative) Abstract syntax and transfer encoding rules of ISO/IEC 15961:2004		82
Annex B (informative) Accommodating established data formats		92
Annex C (informative) Relating data Objects		94
Annex D (informative) Data security issues		96
Annex E (informative) Original commands and responses using ASN.1 abstract syntax		98
Annex F (informative) Example of a transfer encoding to ISO/IEC 15961:2004		135
Bibliography		139

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 or www.iec.ch/members_experts/refdocs).

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 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. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by Joint Technical Committee 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 15961-1:2013), which has been technically revised.

The main changes are as follows:

- Clauses from ISO/IEC 15962 which had been reproduced in this document have been removed and replaced by references to these clauses.
- The requirement for backwards compatibility with the 2004 version of this document (ISO/IEC 15961:2004) has been clarified.
- The document was edited for clarity and conformity with ISO/IEC Directives Part 2 drafting rules.

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

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

The technology of radio frequency identification (RFID) is based on non-contact electronic communication across an air interface. The structure of the bits stored on the memory of the tag is invisible and accessible between the tag and the interrogator only using an air interface protocol, as specified in the appropriate part of ISO/IEC 18000. The result of the transfer of data between an application and an interrogator in open systems requires data to be encoded in a consistent manner on any tag that is part of that open system. This is not only to allow equipment to be interoperable, but in the special case of data carriers, for the data to be encoded on the tag in one system's implementation and to be read at a later time in a completely different and unknown system's implementation. The data bits stored on each tag must be formatted in such a way as to be reliably read at the point of use if the tag is to fulfil its basic objective. This reliability is achieved through the specification of a Data Protocol in this document and the data encoding rules of ISO/IEC 15962. Additionally, ISO/IEC 24791-1 specifies a software system infrastructure architecture that enables RFID system operations between business applications and RFID interrogators. Specific parts of the infrastructure standards address data management requirements (ISO/IEC 24791-2) and device interface requirements (ISO/IEC 24791-5). These support defined implementations that incorporate the encoding rules of ISO/IEC 15962 and the functional rules of the commands and responses in this document.

Manufacturers of RFID equipment (e.g. interrogators, tags) and users of RFID technology require standards-based Data Protocols for RFID for item management. This document, ISO/IEC 15962, ISO/IEC 24791-1, ISO/IEC 24791-2 and ISO/IEC 24791-5 specify these protocols, which are layered above the air interface standards defined in the ISO/IEC 18000 series.

The transfer of data to and from an application, supported by appropriate application commands, is the subject of this document. This document is intended to be used as a reference to develop software appropriate for RFID applications and equipment. ISO/IEC 15962, which is intended to be used with this document, specifies the overall process and the methodologies developed to format the application data into a structure to store on the tag.

NOTE ISO/IEC 15961:2004 is a withdrawn standard, replaced by ISO/IEC 15961-1, ISO/IEC 15961-2, ISO/IEC 15961-3 and ISO/IEC 15961-4. ISO/IEC 15961:2004 is referenced to point out the differences with this document because some systems still use the withdrawn version. All information pertaining to the use of the withdrawn ISO/IEC 15961:2004 is contained in this document. The intention is to remove reference to the withdrawn standard in the next version of this document.

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

Part 1: Application interface

1 Scope

This document focuses on the abstract interface between an application and the data processor and includes the specification and definition of application commands and responses. It allows data and commands to be specified in a standardised way, independent of the ISO/IEC 18000 series air interfaces.

This document:

- provides guidelines on presenting data as objects;
- defines the structure of Object Identifiers, based on ISO/IEC 9834-1;
- specifies the commands that are supported for transferring data between an application and the radio frequency identification (RFID) tag;
- specifies the responses that are supported for transferring data between the tag and the application;
- does not specify any required transfer syntax with ISO/IEC 15962, but provides the non-normative information in [Annex A](#) for backward compatibility with the 2004 version of this document (ISO/IEC 15961:2004¹).

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 15961-3, *Information technology — Data protocol for radio frequency identification (RFID) for item management — Part 3: RFID data constructs*

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

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

1) Withdrawn standard. Replaced by ISO/IEC 15961-1, ISO/IEC 15961-2, ISO/IEC 15961-3 and ISO/IEC 15961-4.