



EUROCONTROL Specification for Surveillance Data Exchange ASTERIX

Part 16 Category 023 CNS/ATM Ground Station and Service Status Reports

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Specification for Surveillance
Data Exchange ASTERIX
Part 16 Category 023
CNS/ATM Ground Station
and Service Status Reports

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Abstract			
This document specifies the contents of ASTERIX Category 023 messages used for the transmission of CNS/ATM Ground Station and Service Status Reports.			
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DOCUMENT APPROVAL

This document has been approved by the ASTERIX Maintenance Group (AMG).

For management approval of the complete set of ASTERIX documentation refer to Part 1.

DOCUMENT CHANGE RECORD

The following table records the complete history of the successive editions of the present document.

EDITION	DATE	REASON FOR CHANGE	SECTIONS PAGES AFFECTED
0.10	October 2002	First draft of a proposed new category to cover the status reporting for ADS-B and TIS-B ground stations as well as multilateration systems.	ALL
0.11	December 2002	Editorial Modifications Modification of item I023/120	5.2.8
0.12	March 2005	Document Identification Sheet updated Signature Page updated	ii iii
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0.14	May 2007	Document ID-Sheet Updated Approval Page Updated Results of EUROCAE WG51 SG4 integrated: <ul style="list-style-type: none"> • I023/070: Encoding rule consistent cat048 • I023/100: Ground Station Status • I023/101: Ground Station Configuration • Correction of I023/110 definition 	ii iii 5.2.4 5.2.5 5.2.6 5.2.7
0.15	June 2007	Item I023/030 Time of Day mandatory in all report types. Item I023/101 Ground Station Configuration updated (Ground Station Function bit)	5.2.1 5.2.6
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0.17	February 2008	Item I023/015: Service Identification added Item I023/100: Bit 8 redefined Item I023/101: Bit 5 redefined Item I023/200: Operational Range added	5.2.3 5.2.5 5.2.6 5.2.9
0.18	March 2008	I023/100: Definition OXT-bit clarified I023/101: LSB modified, Report Mode removed	5.2.5 5.2.6

1.0P	April 2008	I023/100: RN-bit added, encoding rule modified I023/101: encoding rule modified Status changed to "Proposed Issue"	5.2.5 5.2.6
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1.1	September 2008	Report composition (Table 2) updated Note 2 in I023/015 corrected Encoding rule in I023/100 updated Item I023/101 updated	5.2.1 5.2.3 5.2.5 5.2.6
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1.3	August 2021	Migration to new Template Approval Statement aligned with other Categories List of Abbreviations and Acronyms updated Message Type Definitions updated Name of I023/101 in Table 1 corrected Typo in item I023/101 corrected	All iii 3.2 4.5.1 5.1 5.2.6

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TABLE OF CONTENTS

DOCUMENT CHARACTERISTICS	ii
DOCUMENT APPROVAL	iii
DOCUMENT CHANGE RECORD	iv
1. INTRODUCTION	1
1.1 Scope	1
2. REFERENCES	3
2.1 General	3
2.2 Reference Documents	3
3. DEFINITIONS, ACRONYMS AND ABBREVIATIONS	5
3.1 Definitions	5
3.2 Acronyms and Abbreviations	6
4. GENERAL PRINCIPLES	8
4.1 General	8
4.2 Time Management	8
4.3 Unused Bits in Data Items	8
4.4 Definitions and Addressing Concepts	8
4.4.1 Addressing Concepts: Assigning SAC/SIC Codes	8
4.5 CNS/ATM Ground Station and Service Status Reports	8
4.5.1 Types of Ground Station and Service Status Reports	8
4.5.2 User Application Profile and Data Blocks	9
4.6 Composition of Messages	9
4.6.1 Sequence of Data Items.....	9
4.6.2 Presence of Data Items.....	9
5. LAYOUT OF CNS/ATM GROUND STATION SERVICE REPORTS	10
5.1 Standard Data Items	10
5.2 Description of Standard Data Items	11
5.2.1 Data Item I023/000, Report Type	11
5.2.2 Data Item I023/010, Data Source Identifier	12
5.2.3 Data Item I023/015, Service Type and Identification	13
5.2.4 Data Item I023/070, Time of Day.....	13
5.2.5 Data Item I023/100, Ground Station Status.....	14
5.2.6 Data Item I023/101, Service Configuration.....	16
5.2.7 Data Item I023/110, Service Status.....	17

5.2.8	Data Item I023/120, Service Statistics.....	18
5.2.9	Data Item I023/200, Operational Range.....	20
5.3	Transmission of Surveillance Information.....	21
5.3.1	Standard User Application Profile.....	21

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1. INTRODUCTION

1.1 Scope

- 1.1.1 This document describes the structure for the transmission of service reports from a CNS/ATM Ground station. This term is used to cover a multitude of ground stations, that may provide differing types of service. The status reporting currently covers the following types of service: ADS-B, TIS-B, FIS-B, GRAS, and MLT.

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2. REFERENCES

2.1 General

The following Documents and Standards contain provisions which, through references in this text, constitute provisions of this EUROCONTROL Standard Document.

At the time of publication of this EUROCONTROL Standard Document, the editions indicated for the referenced documents and standards were valid.

Any revision of the referenced ICAO Documents shall be immediately taken into account to revise this EUROCONTROL Standard Document.

Revisions of the other referenced documents shall not form part of the provisions of this EUROCONTROL Standard Document until they are formally reviewed and incorporated into this EUROCONTROL Standard Document.

In the case of a conflict between the requirements of this EUROCONTROL Standard Document and the contents of the other referenced documents, this EUROCONTROL Standard Document shall take precedence.

2.2 Reference Documents

1. EUROCONTROL Standard SUR.ET1.ST05.2000-STD-01-01. All Purpose Structured EUROCONTROL Surveillance Information Exchange - ASTERIX. Edition 1.29, Released Issue, February 2002.

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3. DEFINITIONS, ACRONYMS AND ABBREVIATIONS

3.1 Definitions

For the purposes of this EUROCONTROL Standard Document, the following definitions shall apply:

- | | | |
|-------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.1.1 | Catalogue of Data Items: | List of all the possible Data Items of each Data Category describing the Data Items by their reference, structure, size and units (where applicable). |
| 3.1.2 | Data Block: | Unit of information seen by the application as a discrete entity by its contents. A Data Block contains one or more Record(s) containing data of the same Category. |
| 3.1.3 | Data Category: | Classification of the data in order to permit inter alia an easy identification. |
| 3.1.4 | Data Field: | Physical implementation for the purpose of communication of a Data Item, it is associated with a unique Field Reference Number and is the smallest unit of transmitted information. |
| 3.1.5 | Data Item: | The smallest unit of information in each Data Category. |
| 3.1.6 | Record: | A collection of transmitted Data Fields of the same Category preceded by a Field Specification field, signalling the presence/absence of the various Data Fields. |
| 3.1.7 | User Application Profile: | The mechanism for assigning Data Items to Data Fields, and containing all necessary information which needs to be standardised for the successful encoding and decoding of the reports. |

3.2 Acronyms and Abbreviations

For the purposes of this EUROCONTROL Standard Document the following shall apply:

ADS-B	Automatic Dependent Surveillance - Broadcast
ASTERIX	All purpose STructured EUROCONTROL suRveillance Information eXchange
CAT	Data Category
FIS-B	Flight Information Service - Broadcast
FRN	Field Reference Number
FSPEC	Field Specification
FX	Field Extension Indicator
GRAS	Ground-based Regional Augmentation System
ICAO	International Civil Aviation Organization
LEN	Length Indicator
LSB	Least Significant Bit
MLT	Multilateration
NM	Nautical Mile, unit of distance (1852 metres)
PSR	Primary Surveillance Radar
RDP	Radar Data Processing (System)
RDPC	Radar Data Processing Chain
REP	Field Repetition Indicator
s	second, unit of time
SAC	System Area Code
SDP	Surveillance Data Processing (system)
SIC	System Identification Code
SP	Special Purpose Indicator
SSR	Secondary Surveillance Radar
TIS-B	Traffic Information Service - Broadcast
UAP	User Application Profile (see Definitions)
UTC	Co-ordinated Universal Time

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4. GENERAL PRINCIPLES

4.1 General

4.2 Time Management

The timestamping shall comply with the Coordinated Universal Time (UTC) as specified in ICAO Annex 5.

4.3 Unused Bits in Data Items.

Decoders of ASTERIX data **shall never assume and rely on** specific settings of spare or unused bits. However in order to improve the readability of binary dumps of ASTERIX records, it is recommended to set all spare bits to zero.

4.4 Definitions and Addressing Concepts

4.4.1 Addressing Concepts: Assigning SAC/SIC Codes

By convention a dedicated and unambiguous SAC/SIC code shall be assigned to every Ground Station.

4.5 CNS/ATM Ground Station and Service Status Reports

4.5.1 Types of Ground Station and Service Status Reports

Three types of service reports have been identified:

- Ground Station Status Report
- Service Status Report
- Service Statistics Report

4.5.1.1 *Ground Station Status Report*

These reports shall convey the health of the overall ground station, independently of the services that the ground station provides.

To ensure that each connected User has the latest information available, the Ground Station Status Report **shall** be sent periodically (every GSSP seconds – please refer to Data Item I023/100 (5.2.5)) and whenever a change occurs.

4.5.1.2 *Service Status Report*

These reports shall convey the status of individual services provided by the ground station. Each ground station may provide several services, and the status of each shall be reported independently in each service status report.

To ensure that each connected User has the latest information available, the Service Status Report **shall** be sent periodically (every SSRP seconds – please refer to Data Item I023/101 (5.2.6)) and whenever a change occurs.

4.5.1.3 *Service Statistics Report*

These reports shall be sent to provide statistical information about an identified service.

4.5.2 User Application Profile and Data Blocks

A single UAP has been standardised and shall be used to transmit service reports from a CNS/ATM Ground Station to user systems.

Data Blocks containing ground station service reports shall have the following layout:

CAT = 023	LEN	FSPEC	Items of the first record	FSPEC	Items of the last record
-----------	-----	-------	---------------------------	-------	--------------------------

where:

- Data Category (CAT) = 023, is a one-octet field indicating that the Data Block contains Ground Station and Service Status reports;
- Length Indicator (LEN) is a two-octet field indicating the total length in octets of the Data Block, including the CAT and LEN fields;
- FSPEC is the Field Specification.

4.6 Composition of Messages

4.6.1 Sequence of Data Items

Reports shall be composed of Data Items assembled in the order defined by the Field Reference Number (FRN) in the associated UAP.

4.6.2 Presence of Data Items

When sent, items shall always be transmitted in a Record with the corresponding FSPEC bits set to one.

5. LAYOUT OF CNS/ATM GROUND STATION SERVICE REPORTS

5.1 Standard Data Items

The standardised Data Items which shall be used for the transmission of ground station service reports are defined in Table 1 and described in the following pages.

Table 1 - Standard Data Items of Category 023

Data Item Ref. No.	Description	System Units
I023/000	Report Type	N.A.
I023/010	Data Source Identifier	N.A.
I023/015	Service Type and Identification	N.A.
I023/070	Time of Day	1/128 s
I023/100	Ground Station Status	N.A.
I023/101	Service Configuration	N.A.
I023/110	Service Status	N.A.
I023/120	Service Statistics	N.A.
I023/200	Operational Range	1 NM

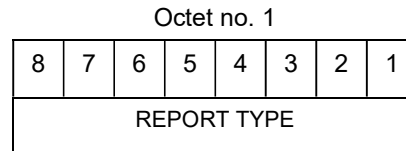
5.2 Description of Standard Data Items

5.2.1 Data Item I023/000, Report Type

Definition : This Data Item allows for a more convenient handling of the reports at the receiver side by further defining the type of transaction.

Format : One-octet fixed length Data Item.

Structure:



bits-8/1

Report Type

Encoding Rule: See Table 2

NOTES

1. In applications where transactions of various types are exchanged, the Report Type Data Item facilitates the proper report handling at the receiver side.
2. All Report Type values are reserved for common standard use.
3. The following set of Report Types are standardised for Category 023 records:
 - 001 Ground Station Status report – refer to 4.5.1.1
 - 002 Service Status report – refer to 4.5.1.2
 - 003 Service Statistics report – refer to 4.5.1.3
4. The list of items present for the three report types is defined in the following table.
M stands for mandatory, O for optional, X for never present.

Table 2 - Report Types

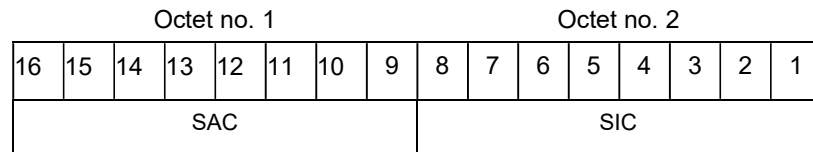
Type Item	001 Ground Station Status	002 Service Status	003 Service Statistics
I023/000 Report Type	M	M	M
I023/010 Data Source Identifier	M	M	M
I023/015 Service Type and Identification	X	M	M
I023/070 Time of Day	M	M	M
I023/100 Ground Station Status	M	X	X
I023/101 Service Configuration	X	M	X
I023/110 Service Status	X	M	X
I023/120 Service Statistics	X	X	M
I023/200 Operational range	O	O	X

5.2.2**Data Item I023/010, Data Source Identifier**

Definition : Identification of the Ground Station from which the data is received.

Format : Two-octet fixed length Data Item.

Structure:



bits-16/9

(SAC)

System Area Code

bits-8/1

(SIC)

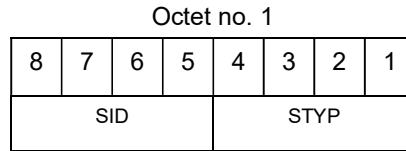
System Identification Code

Encoding Rule: See Table 2

NOTE - The up-to-date list of SACs is published on the EUROCONTROL Web Site (<https://www.eurocontrol.int/asterix>).

5.2.3 Data Item I023/015, Service Type and Identification

Definition : Identifies the type of service being reported.
Format : One-octet fixed length Data Item.
Structure:



- | | | |
|----------|--------|------------------------|
| bits-8/5 | (SID) | Service Identification |
| bits-4/1 | (STYP) | Type of Service |
| | = 1 | ADS-B VDL4 |
| | = 2 | ADS-B Ext Squitter |
| | = 3 | ADS-B UAT |
| | = 4 | TIS-B VDL4 |
| | = 5 | TIS-B Ext Squitter |
| | = 6 | TIS-B UAT |
| | = 7 | FIS-B VDL4 |
| | = 8 | GRAS VDL4 |
| | = 9 | MLT |

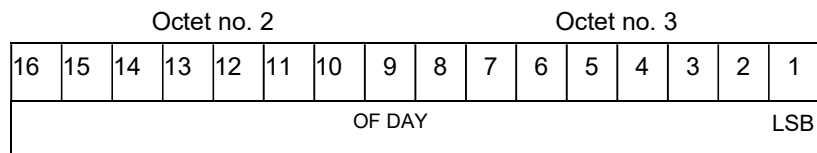
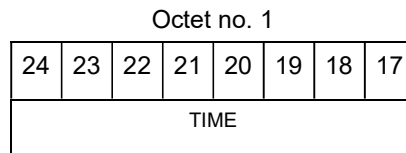
NOTES

1. The service identification is allocated by the system.
2. The service identification is also available in item I021/015.

Encoding Rule: See Table 2

5.2.4 Data Item I023/070, Time of Day

Definition : Absolute time stamping expressed as UTC time.
Format : Three-octet fixed length Data Item.
Structure:



bit-1 (LSB) = $(2^{-7})s = 1/128 s$

Encoding Rule:

This data item shall be present in every ASTERIX record, except in case of failure of all sources of time-stamping.

NOTE - The time of day value is reset to zero each day at midnight.

5.2.5 Data Item I023/100, Ground Station Status**Definition :** Information concerning the status of a Ground Station.**Format :** A one octet extensible field.**Structure:**

Octet no. 1

8	7	6	5	4	3	2	1
NOGO	ODP	OXT	MSC	TSV	SPO	RN	FX

bit-8	(NOGO)	Operational Release Status of the Data = 0 Data is released for operational use = 1 Data must not be used operationally
bit-7	(ODP)	Data Processor Overload Indicator = 0 Default, no overload = 1 Overload in DP
bit-6	(OXT)	Ground Interface Data Communications Overload = 0 Default, no overload = 1 Overload in transmission subsystem
bit-5	(MSC)	Monitoring System Connected Status = 0 Monitoring system not connected or unknown = 1 Monitoring system connected
bit-4	(TSV)	Time Source Validity = 0 valid = 1 invalid
bit-3	(SPO)	Indication of spoofing attack = 0 no spoofing detected = 1 potential spoofing attack
bit-2	(RN)	Renumbering Indication for Track ID = 0 default = 1 track numbering has restarted
bit-1	(FX)	= 0 No extension = 1 Extension

NOTES

1. A time source is considered as valid when either externally synchronised or running on a local oscillator within the required accuracy of UTC.
2. Bit 8 (NOGO), when set to "1" indicates that the data transmitted by the GS is not released for operational use.
3. Bit 2 indicates that the allocation of Track-IDs (Item I021/161) was re-started.

Structure of I023/100 - First Extension

Octet no. 1

8	7	6	5	4	3	2	1
GSSP						LSB	FX

bits-8/2 (GSSP)

Ground Station Status Reporting Period

LSB = 1 s

Valid range: $1 \leq \text{GSSP} \leq 127\text{s}$

bit-1 (FX)

= 0 End of item

= 1 Extension into Second Extension

Encoding Rule: See Table 2 and chapter 4.5.1.1

5.2.6 Data Item I023/101, Service Configuration**Definition :** Information concerning the configuration of a Service.**Format :** A two octet extensible field.**Structure:**

Octet no. 1							
8	7	6	5	4	3	2	1
RP							LSB

Bits-8/1 (RP) : Report Period for Category 021 Reports
 LSB = 0.5 seconds
 = 0: Data driven mode

Octet no. 2							
8	7	6	5	4	3	2	1
SC			0	0	0	0	FX

Bits-8/6 (SC) : Service Class
 = 0 No information
 = 1 NRA class
 = 2-7 reserved for future use

Bits-5/2 (Spare) Spare bits set to 0

Bit-1 (FX) : Field Extension Indicator
 = 0 End of Item
 = 1 Extension into next octet

Structure of I023/101 - First Extension

Octet no. 1							
8	7	6	5	4	3	2	1
SSRP						LSB	FX

bits-8/2 (SSRP) Service Status Reporting Period
 LSB = 1 s
 Valid range: $1 \leq \text{SSRP} \leq 127\text{s}$

bit-1 (FX)
 = 0 End of item
 = 1 Extension into Second Extension

Encoding Rule: See Table 2 and chapter 4.5.1.2

5.2.7

Data Item I023/110, Service Status

Definition : Information concerning the status of the Service provided by a Ground Station.

Format : A one octet extensible field.

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
0	0	0	0	STAT		FX	

bits-8/5 (Spare) Spare bit set to 0
 bits-4/2 (STAT) Status of the Service
 = 0 Unknown
 = 1 Failed
 = 2 Disabled
 = 3 Degraded
 = 4 Normal
 = 5 Initialisation
 bit-1 (FX) = 0 No extension
 = 1 Extension

Encoding Rule: See Table 2

5.2.8 Data Item I023/120, Service Statistics

Definition : Statistics concerning the service. Provides counts of various ADS-B message types that have been received since the report was last sent.

Format : Repetitive Data Item, starting with a one-octet Field Repetition Indicator (REP) followed by at least one block of 6 octets.

Structure:

Octet no. 1							
56	55	54	53	52	51	50	49
REP							

Octet no. 2								Octet no. 3							
48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
TYPE								REF	0	0	0	0	0	0	0

Octet no. 4								Octet no. 5							
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
COUNTER VALUE															

Octet no. 6								Octet no. 7							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
COUNTER VALUE															

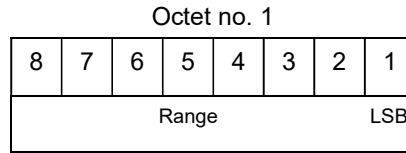
- | | | |
|------------|--------|---------------------------------------------------|
| bits-56/49 | (REP) | Number of counters following |
| bits-48/41 | (TYPE) | Type of report counter, encoded as follows |
| | | = 0 Number of unknown messages received |
| | | = 1 Number of 'too old' messages received |
| | | = 2 Number of failed message conversions |
| | | = 3 Total Number of messages received |
| | | = 4 Total number of messages transmitted |
| | | = 20 Number of TIS-B management messages received |
| | | = 21 Number of 'Basic' messages received |
| | | = 22 Number of 'High Dynamic' messages received |
| | | = 23 Number of ' Full Position' messages received |
| | | = 24 Number of 'Basic Ground ' messages received |
| | | = 25 Number of 'TCP' messages received |

	= 26	Number of 'UTC time ' messages received
	= 27	Number of 'Data' messages received
	= 28	Number of 'High Resolution' messages received
	= 29	Number of 'Aircraft Target Airborne' messages received.
	= 30	Number of 'Aircraft Target 'Ground' messages received.
	= 31	Number of 'Ground Vehicle Target' messages received.
	= 32	Number of '2 slots TCP messages received.
bit-40	(REF)	Reference from which the messages are countered
	= 0	From midnight
	= 1	From the last report
bits-39/33		Spare bits set to 0
bits-32/1	(COUNTER VALUE)	32-bit counter value

Encoding Rule: See Table 2

NOTE - There is no special significance attributed to the numbering of the TYPE field. However the range from 0 to 19 is intended to cover generic messages which may be applicable to many types of service.

5.2.9

Data Item I023/200, Operational Range**Definition :** Currently active operational range of the Ground Station.**Format :** A one octet fixed length field.**Structure:**

bits-8/1

(Range)

Operational range of the GS

LSB = 1 NM

Encoding Rule: See Table 2**NOTE** - Maximum value indicates "maximum value or above".

5.3 Transmission of Surveillance Information

5.3.1 Standard User Application Profile

The following standard UAP shown in Table 3 shall be used for the transmission of Ground Station service reports:

Table 3 - Standard UAP

FRN	Data Item	Data Item Description	Length
1	I023/010	Data Source Identifier	2
2	I023/000	Report Type	1
3	I023/015	Service Type and Identification	1
4	I023/070	Time of Day	3
5	I023/100	Ground Station Status	1+
6	I023/101	Service Configuration	2+
7	I023/200	Operational Range	1
FX	N/A.	Field Extension Indicator	N/A.
8	I023/110	Service Status	1+
9	I023/120	Service Statistics	1+
10	-	spare	-
11	-	spare	-
12	-	spare	-
13	RE-Data Item	Reserved Expansion Field	1+1+
14	SP-Data Item	Special Purpose Field	1+1+
FX	N/A.	Field Extension Indicator	N/A

In the above table

- the first column indicates the Field Reference Number (FRN) associated to each Data Item used in the UAP;
- the fourth column gives the format and the length of each item, a stand-alone figure indicates the octet-count of a fixed-length Data Item, 1+ indicates a variable-length Data Item comprising a first part of 1 octet followed by n-octets extents as necessary.



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