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FOR

SURVEILLANCE DATA EXCHANGE

Part 16: Category 23

**CNS/ATM Ground Station and Service
Status Reports**

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Abstract

This document describes the application of ASTERIX to the transmission of service reports from CNS/ATM ground stations.

Keywords

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Data Item	Category 23	UAP	ADS-B
TIS-B	MLT	GRAS	FIS-B

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The following table identifies all management authorities who have successively approved the present issue of this document.

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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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0.18	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

1.0	August 2008	Item I023/015: Note added Item I023/110: Status "Initialisation" added Editorial "clean-up" Status changed to "Released Issue"	5.2.3 5.2.7
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
1.2	March 2009	Reporting Period Report Type 1 added Reporting Period Report Type 2 added Aligned to ADS-B Terminology	5.2.5 5.2.6

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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 000-1-92. Directives for the Uniform Drafting and Presentation of Eurocontrol Standard Documents. 1992.
2. Eurocontrol Standard SUR.ET1.ST05.2000-STD-01-01. All Purpose Structured Eurocontrol Surveillance Information Exchange - ASTERIX. Edition 1.29, Proposed, February 2002

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3. DEFINITIONS, ACRONYMS AND ABBREVIATIONS

3.1 Definitions

For the purposes of this Eurocontrol 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 Document the following shall apply:

ADS-B	Automatic Dependent Surveillance - Broadcast
ASTERIX	All purpose STructured Eurocontrol suRveillance Information eXchange
CAT	Data Category
COMT	Communications Team (EATMP)
EATMP	European Air Traffic Control Management Programme
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
MSSR	Monopulse Secondary Surveillance Radar
MTD	Moving Target Detection
NM	Nautical Mile, unit of distance (1852 metres)
PSR	Primary Surveillance Radar
RDE-TF	Radar Data Exchange Task Force
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
STFRDE	Surveillance Task Force on Radar Data Exchange
SURT	Surveillance Team (EATMP)
TIS-B	Traffic Information Service - Broadcast
UAP	User Application Profile (see Definitions)
UTC	Co-ordinated Universal Time

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 Ground Station Service Reports

4.5.1 Types of Ground Station Service 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.

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.

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 Block

A single UAP has been standardised and shall be used to transmit service reports from a 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:

- CAT = 023 is a one-octet field indicating that the Data Block contains service reports;
- 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 Reports

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 Resolution
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	Ground Station Configuration	N.A.
I023/110	Service Status	N.A.
I023/120	Service Statistics	N.A.
I023/200	Operational Range	1 NM

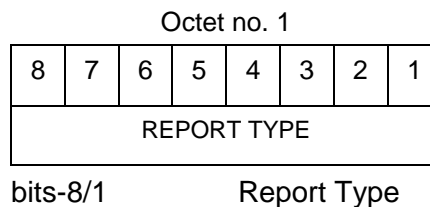
5.2 Description of Standard Data Items

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:



Encoding Rule:

This data item shall be present in every ASTERIX record.

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
 - 002 Service Status report
 - 003 Service Statistics report
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:

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

bits-16/9

(SAC)

System Area Code

bits-8/1

(SIC)

System Identification Code

NOTE - The up-to-date list of SACs is published on the Eurocontrol Web Site (<http://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:

Octet no. 1							
8	7	6	5	4	3	2	1
SID				STYP			

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

Note: The service identification is allocated by the system.

Note: The service identification is also available in item I021/015.

Encoding Rule: This item is optional

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:

Octet no. 1							
24	23	22	21	20	19	18	17
TIME							

Octet no. 2								Octet no. 3							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
OF DAY															LSB
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.

NOTES

1. 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 :

This item is optional. This item will be sent periodically (every "GSSP" seconds) and each time a value change occurs

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

bit-1 (FX)

= 0 End of item

= 1 Extension into Second Extension

Encoding Rule :

This item is optional. This item will be sent periodically (every "SSRP" seconds) and each time a value change occurs

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

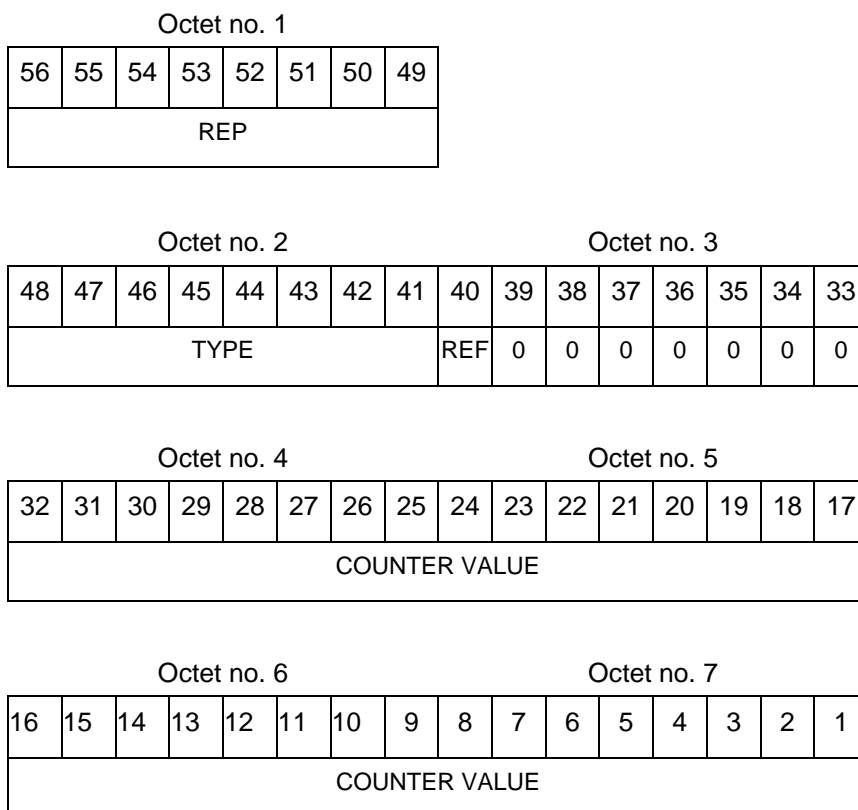
bit-1 (FX) = 0 No extension
 = 1 Extension

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:

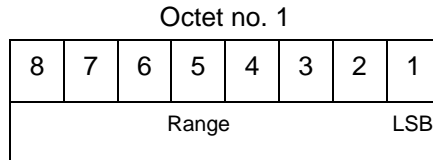


- | | | |
|------------|--------|---|
| bits-56/49 | (REP) | Number of counters following |
| bits-48/41 | (TYPE) | Type of report counter, encoded as follows |
| | | = 0 Number of unknown messages received |
| | | = 1 Number of 'too old' messages received |
| | | = 2 Number of failed message conversions |
| | | = 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

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: This item is optional**NOTES**

1. Maximum value indicates "maximum value or above".

5.3 Standard User Application Profile

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

Table 3 - Standard UAP for Ground Station Service Reports

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

where:

- the first column indicates the 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 one-octet followed by n-octets extent as necessary.