EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

EUROCONTROL

# EUROCONTROL STANDARD DOCUMENT

# FOR

# SURVEILLANCE DATA EXCHANGE

# Part 10: Category 63

## Sensor Status Messages

**SUR.ET1.ST05.2000-STD-10-01**

| | | |
|---|---|---|
| **Edition** | **:** | **1.3** |
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EUROPEAN AIR TRAFFIC MANAGEMENT

# DOCUMENT IDENTIFICATION SHEET

## DOCUMENT DESCRIPTION

**Document Title**

Surveillance Data Exchange - Part 10

Sensor Status Messages

EWP DELIVERABLE REFERENCE NUMBER

| **PROGRAMME REFERENCE INDEX** | **EDITION :** 1.3 |
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**Abstract**

This document describes the application of ASTERIX to Sensor Status Messages



**Keywords**

ASTERIX | Category 63 | Sensor Status Messages



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|---|---|---|


## DOCUMENT STATUS AND TYPE

| STATUS | | CATEGORY | | CLASSIFICATION | |
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| Working Draft | ☐ | Executive Task | ☐ | General Public | ☑ |
| Draft | ☐ | Specialist Task | ☐ | EATMP | ☐ |
| Proposed Issue | ☐ | Lower Layer Task | ☑ | Restricted | ☐ |
| Released Issue | ☑ | | | | |

## ELECTRONIC BACKUP

**INTERNAL REFERENCE NAME :**

| HOST SYSTEM | MEDIA | SOFTWARE(S) |
|---|---|---|
| Microsoft Windows | Type : Hard disk | |
| | Media Identification : | |

## DOCUMENT APPROVAL

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

| AUTHORITY | NAME AND SIGNATURE | DATE |
|---|---|---|
| ASTERIX Manager | D. Doukas | |
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| SURT Chairman | M. Rees | |
| EATM/DAP Director | G. Kerkhofs | |

## 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 | Jul. 1999 | Creation of Eurocontrol document | ALL |
| 0.11 | Dec. 1999 | Modifications in definitions and items | ALL |
| 0.12 | Feb. 2000 | • Document renamed,<br>• New message type and item added | ALL |
| 0.13 | Jun. 2000 | Modifications in items | ALL |
| 0.14 | Dec. 2000 | Modifications in items | ALL |
| 0.15 | Mar. 2001 | Editorial corrections | ALL |
| 0.16 | Oct. 2002 | Suppression of data related to the transmission of Service Information messages | ALL |
| 0.17 | Dec. 2002 | Modification of I063/060<br>Suppression of I063/100, I063/101, I063/102 | 5.2.5 |
| 0.18 | March 2003 | Modification of the title<br>Correction of the UAP | 5.3 |
| 0.19 | June 2003 | Correction of the UAP | 5.3 |
| 0.20 | August 2003 | Addition of “no plot warning” bit to I063/060 | 5.2.5 |
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| 1.0 | March 2004 | Addition of encoding rules to precise the mandatory items<br>Indication that negative values are coded with the two’s complement form | |
| 1.1 | March 2005 | Document Identification Sheet updated<br>Document Approval page updated | Page ii<br>Page iii |
| 1.2 | April 2007 | Document Identification Sheet updated<br>Document Approval page updated | Page ii<br>Page iii |
| 1.3 | July 2007 | Length of item I063/070 in UAP corrected | 5.3 |

## TABLE OF CONTENTS

# 1. INTRODUCTION

## 1.1 Scope

**1.1.1** This document describes the structure for the transmission of sensor status messages.

**1.1.2** This document defines the data out of Category 063.

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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 Radar Information Exchange - ASTERIX, edition 1.29 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** | **Broadcast Service:** | A service not needing a session establishment between a user and a SDPS. |
| **3.1.2** | **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). |
| **3.1.3** | **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. |
| **3.1.4** | **Data Category:** | Classification of the data in order to permit inter alia an easy identification. |
| **3.1.5** | **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. |
| **3.1.6** | **Data Item:** | The smallest unit of information in each Data Category. |
| **3.1.7** | **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 |
| **3.1.8** | **Service:** | An SDPS information service is uniquely identified by a service identification and is composed of a track element and a sensor element. A track element is characterised by the track selection (e.g. set of Mode-3/A codes, filtering in height, primary only, secondary only…), the track item selection (e.g. WGS-84 position, Time of Day…), the track transmission characteristics (e.g. synchronised on sensor, periodical, a-periodical event-triggered). A sensor element is characterised by the sensor selection, the sensor item selection, the sensor transmission characteristics. |
| **3.1.9** | **Session:** | Point to point connection between a user and a SDPS. |
| **3.1.10** | **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 messages. |

## 3.2 Acronyms and Abbreviations

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

| | |
|---|---|
| **°** | Degree (angle) |
| **ADS-B** | Automatic Dependent Surveillance - Broadcast |
| **ASTERIX** | **A**ll Purpose **ST**ructured **Eurocontrol** su**R**veillance **I**nformation E**X**change |
| **CAT** | Data Category |
| **EATMP** | European Air Traffic Management Programme |
| **FRN** | Field Reference Number |
| **FSPEC** | Field Specification |
| **FX** | Field Extension Indicator |
| **ICAO** | International Civil Aviation Organization |
| **LEN** | Length Indicator |
| **LSB** | Least Significant Bit |
| **PSR** | Primary Surveillance Radar |
| **RE** | Reserved Expansion Indicator |
| **REP** | Field Repetition Indicator |
| **s** | second, unit of time |
| **SAC** | System Area Code |
| **SDPS** | 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) |
| **UAP** | User Application Profile (see Definitions ) |
| **UTC** | Co-ordinated Universal Time |
| **WGS-84** | World Geodetic System 84 |

# 4. GENERAL PRINCIPLES

## 4.1 General

This document describes the application of ASTERIX to Sensor Information messages
One message reports the status for one sensor.

## 4.2 Time Management

The timestamping shall comply with 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 User Application Profile and Data Blocks

**4.4.1** A single User Application Profile (UAP) is defined and shall be used for SDPS service messages.

**4.4.2** Data Blocks shall have the following layout.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CAT = 063** | **LEN** | | **FSPEC** | Items of the first record | | **FSPEC** | Items of the last record |

where:

- Data Category (CAT) = 063, is a one-octet field indicating that the Data Block contains SDPS status messages;
- 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.

## 4.5 Composition of messages

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

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

# 5. LAYOUT OF MESSAGES

## 5.1 Standard Data Items

The standardised Data Items which shall be used for the transmission of SDPS service messages are defined in Table 1 and described in the following pages. The column “Encoding rules” indicates what items are mandatory (M) or optional (O) in a record of ASTERIX Cat 063.

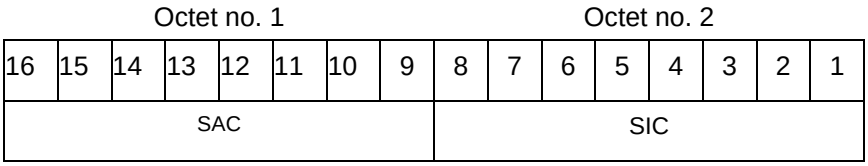
**Table 1 - Data Items of Category 063**

| Data Item Reference Number | Description | System Units | Encoding rules |
|---|---|---|---|
| I063/010 | Data Source Identifier | N.A. | M |
| I063/015 | Service Identification | N.A. | O |
| I063/030 | Time of Message | 1/128 s | M |
| I063/050 | Sensor Identifier | N.A. | M |
| I063/060 | Sensor Configuration and Status | N.A. | O |
| I063/070 | Time Stamping Bias | 1 ms | O |
| I063/080 | SSR/Mode S Range Gain and Bias | N.A. | O |
| I063/081 | SSR/Mode S Azimuth Bias | 0.0055° | O |
| I063/090 | PSR Range Gain and Bias | N.A. | O |
| I063/091 | PSR Azimuth Bias | 0.0055° | O |
| I063/092 | PSR Elevation Bias | 0.0055° | O |
| NOTE: N.A. = Not Applicable | | | |

## 5.2 Description of Standard Data Items

### 5.2.1 Data Item I063/010, Data Source Identifier

**Definition :** Identification of the SDPS sending the data
**Format :** Two-octet fixed length Data Item
**Structure:**



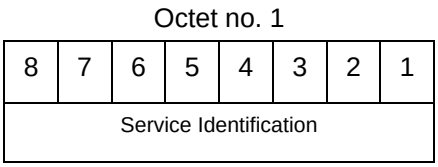

| | | |
|---|---|---|
| Bits-16/9 | (SAC) | System Area Code |
| Bits 8/1 | (SIC) | System Identification Code |

**NOTE -** The up-to-date list of SACs is published on the Eurocontrol Web Site (http://www.eurocontrol.int).

**Encoding Rule :**
This Item shall be present in every ASTERIX record

### 5.2.2 Data Item I063/015, Service Identification

**Definition :** Identification of the service provided to one or more users.
**Format :** One-Octet fixed length data item.
**Structure:**




| | |
|---|---|
| Bits-8/1 | Service Identification |

**NOTE -** the service identification is allocated by the SDPS

**Encoding Rule :**
This Item is optional

### 5.2.3 Data Item I063/030, Time of Message

**Definition :** Absolute time stamping of the message, in the form of elapsed time since last midnight, expressed as UTC.

**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 Message | | | | | | | | | | | | | | | LSB |

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

**NOTE -** The time of the day value is reset to zero at every midnight.

**Encoding Rule :**

This Item shall be present in every ASTERIX record

### 5.2.4 Data Item I063/050, Sensor Identifier

**Definition :** Identification of the Sensor to which the provided information are related.

**Format :** Two-byte fixed length data item

| 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).

**Encoding Rule :**

This Item shall be present in every ASTERIX record

### 5.2.5 Data Item I063/060, Sensor Configuration and Status

**Definition :** Configuration and status of the sensor

**Format :** Variable length data item comprising a first part of one octet, followed by one-octet extent as necessary

**Structure**

**Of First Part :**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|---|
| CON | | PSR | SSR | MDS | ADS | MLT | FX |

Bit 8/7 (CON) = 00 operational
= 01 degraded
= 10 Initialization
= 11 not currently connected

Bit 6 (PSR) = 0 PSR GO
= 1 PSR NOGO

Bit 5 (SSR) = 0 SSR GO
= 1 SSR NOGO

Bit 4 (MDS) = 0 Mode S GO
= 1 Mode S NOGO

Bit 3 (ADS) = 0 ADS GO
= 1 ADS NOGO

Bit 2 (MLT) = 0 MLT GO
= 1 MLT NOGO

Bit 1 (FX) = 0 End of Data Item
= 1 Extension into first extent

**Structure**

**Of First Extent :**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|---|
| OPS | ODP | OXT | MSC | TSV | NPW | 0 | FX |

Bit-8 (OPS) Operational Release Status of the System
= 0 System is released for operational use
= 1 Operational use of System is inhibited,

Bit-7 (ODP) Data Processor Overload Indicator
= 0 Default, no overload
= 1 Overload in DP

| | | |
|---|---|---|
| Bit-6 | (OXT) | Transmission Subsystem Overload Status<br>= 0 Default, no overload<br>= 1 Overload in transmission subsystem |
| Bit-5 | (MSC) | Monitoring System Connected Status<br>= 0 Monitoring system connected<br>= 1 Monitoring system disconnected |
| Bit-4 | (TSV) | Time Source Validity<br>= 0 valid<br>= 1 invalid |
| Bits 3 | (NPW) | No Plot Warning<br>= 0 Default (no meaning)<br>= 1 No plots being received |
| Bit 2 | spare Bit set to zero | |
| Bit 1 | (FX) | = 0 End of Data Item<br>= 1 Extension into next extent |

**NOTES**

1. GO/NOGO information from PSR, SSR, Mode S, ADS and MLT is derived from monosensor categories and has a meaning only for operational sensors, whereas (CON) is derived by the SDPS.
2. The information (OPS), (ODP), (OXT), (MSC) and (TSV) are only related to CNS/ATM Ground Station and are derived from monosensor category (ASTERIX Cat 023).

**Encoding Rule :**

This Item is optional

### 5.2.6 Data Item I063/070, Time Stamping Bias

**Definition :** Plot Time stamping bias
**Format :** Two-byte fixed length data item.

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

Bit 1 (LSB) = 1ms

**Encoding Rule :**
This Item is optional

### 5.2.7 Data Item I063/080, SSR / Mode S Range Gain and Bias

**Definition :** SSR / Mode S Range Gain and Range Bias, in two's complement form.
**Format :** Two-byte fixed length data item.

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

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

Bits 32/17 (SRG) SSR / Mode S Range Gain
(LSB) = $10^{-5}$

Bits 16/1 (SRB) SSR / Mode S Range Bias
(LSB) = 1/128 NM

**NOTE -** The following formula is used to correct range:

$$\rho_{corrected} = \left( \frac{\rho_{measured} - range\_bias}{1 + range\_gain} \right)$$

**Encoding Rule :**
This Item is optional

### 5.2.8 Data Item I063/081, SSR / Mode S Azimuth Bias

**Definition :** SSR / Mode S Azimuth Bias, in two's complement form.
**Format :** Two-byte fixed length data item.

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

Bit 1 (LSB) = 360°/ $2^{16}$ = 0.0055°

**NOTE -** The following formula is used to correct azimuth:

$$\theta_{corrected} = \theta_{measured} - azimuth\_bias$$

**Encoding Rule :**
This Item is optional

### 5.2.9 Data Item I063/090, PSR Range Gain and Bias

**Definition :** PSR Range Gain and PSR Range Bias, in two's complement form.
**Format :** Four-byte fixed length data item.

| Octet no. 1 | | | | | | | | | | | | | | | Octet no. 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 |
| PRG | | | | | | | | | | | | | | | LSB |

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

Bits 32/17 (PRG) PSR Range Gain
(LSB) = $10^{-5}$

Bits 16/1 (PRB) PSR Range Bias
(LSB) = 1/128 NM

**NOTE -** The following formula is used to correct range:

$$\rho_{corrected} = \left( \frac{\rho_{measured} - range\_bias}{1 + range\_gain} \right)$$

**Encoding Rule :**
This Item is optional

### 5.2.10 Data Item I063/091, PSR Azimuth Bias

**Definition :** PSR Azimuth Bias, in two's complement form.
**Format :** Two-byte fixed length data item.

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

Bit 1 (LSB) = 360°/ $2^{16}$ = 0.0055°

**NOTE -** The following formula is used to correct azimuth:

$$\theta_{corrected} = \theta_{measured} - azimuth\_bias$$

**Encoding Rule :**
This Item is optional

### 5.2.11 Data Item I063/092, PSR Elevation Bias

**Definition :** PSR Elevation Bias, in two's complement form.
**Format :** Two-byte fixed length data item.

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

Bit 1 (LSB) = 360°/ $2^{16}$ = 0.0055°

**Encoding Rule :**
This Item is optional

## 5.3 User Application Profile for Category 063

The following User Application Profile shall be used for the transmission of Sensor status messages.

**Table 2 – Sensor Status Messages UAP**

| FRN | Data Item | Information | Length |
|---|---|---|---|
| **1** | **I063/010** | Data Source Identifier | **2** |
| **2** | **I063/015** | Service Identification | **1** |
| **3** | **I063/030** | Time of Message | **3** |
| **4** | **I063/050** | Sensor Identifier | **2** |
| **5** | **I063/060** | Sensor Configuration and Status | **2** |
| **6** | **I063/070** | Time Stamping Bias | **2** |
| **7** | **I063/080** | SSR/Mode S Range Gain and Bias | **4** |
| **FX** | **-** | Field extension indicator | **-** |
| **8** | **I063/081** | SSR/Mode S Azimuth Bias | **2** |
| **9** | **I063/090** | PSR Range Gain and Bias | **4** |
| **10** | **I063/091** | PSR Azimuth Bias | **2** |
| **11** | **I063/092** | PSR Elevation Bias | **2** |
| **12** | **-** | spare | **-** |
| **13** | **RE** | Reserved Expansion Field | **1+1+** |
| **14** | **SP** | Special Purpose Field | **1+1+** |
| **FX** | **-** | Field extension indicator | **-** |

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.