

EUROCONTROL Specification for Surveillance Data Exchange ASTERIX

Part 26 Category 025 CNS/ATM Ground System Status Reports

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**EUROCONTROL Specification
for Surveillance Data Exchange
ASTERIX Part 26 Category 025
CNS/ATM Ground System
Status Reports**

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This document specifies the contents of ASTERIX Category 025 reports for the transmission of the status of CNS/ATM Ground Systems.			
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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
0.1	April 2013	First draft of a proposed new category to cover the status reporting for surveillance ground systems of various techniques.	ALL
0.2	September 2013	Internal Review	ALL
0.3	November 2013	Review following WG-51/SG-4 Meeting	ALL
0.4	May 2014	Development Meeting 23.05.2014	ALL
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1.0	September 2015	Data Item I025/015 reduced to 1 octet	5.2.3
1.1	November 2015	Correction in bit numbering of data item I025/105	5.2.7
1.2	April 2018	Data Item I025/600 Position of the System Reference Point added	5.2.11
		Data Item I025/610 Height of System Reference Point added	5.2.12
1.3	April 2020	Change Encoding Rules for I025/600 and I025/610 (Please check the Note in 5.2.1)	5.2.1
		First extension to I025/100 added	5.2.6
1.4	June 2021	Correction in Document Change Record for Edition 1.3 This change is editorial only.	Page iv
1.5	July 2021	Error in range of I025/610 corrected	5.2.12

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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	7
4.1 General	7
4.2 Time Management	7
4.3 Unused Bits in Data Items	7
4.4 Definitions and Addressing Concepts	8
4.4.1 Addressing Concepts: Assigning SAC/SIC Codes	8
4.5 Ground System Status Reports	8
4.5.1 Types of Ground System Status Reports	8
4.5.2 Report Composition	9
4.6 Composition of Reports	9
4.6.1 Sequence of Data Items	9
4.6.2 Presence of Data Items	9
5. LAYOUT OF CNS/ATM GROUND SYSTEM STATUS REPORTS	10
5.1 Standard Data Items	10
5.2 Description of Standard Data Items	11
5.2.1 Data Item I025/000, Report Type	11
5.2.2 Data Item I025/010, Data Source Identifier	13
5.2.3 Data Item I025/015, Service Identification	13
5.2.4 Data Item I025/020, Service Designator	14
5.2.5 Data Item I025/070, Time of Day	16
5.2.6 Data Item I025/100, System and Service Status	17
5.2.7 Data Item I025/105, System and Service Error Codes	20
5.2.8 Data Item I025/120, Component Status	22
5.2.9 Data Item I025/140, Service Statistics	23

5.2.10 Data Item I025/200 Message Identification	25
5.2.11 Data Item I025/600, Position of the System Reference Point	26
5.2.12 Data Item I025/610, Height of the System Reference Point.....	27
5.3 Standard User Application Profile	28

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1. INTRODUCTION

1.1 Scope

This document describes the structure and contents of ASTERIX records for the transmission of status reports from a CNS/ATM Ground System. This term is used to cover a multitude of ground systems, that may provide differing types of service applying various techniques.

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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 Specification.

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

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

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

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

2.2 Reference Documents

1. EUROCONTROL Specification SPEC-0149, edition 2.4, 24 October 2016
“EUROCONTROL Specification for Surveillance Data Exchange – Part 1
All Purpose Structured EUROCONTROL Surveillance Information
Exchange – ASTERIX”.

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3. DEFINITIONS, ACRONYMS AND ABBREVIATIONS

3.1 Definitions

For the purposes of this EUROCONTROL Specification, 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). |
| 3.1.3 | 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 Specification the following shall apply:

ADS-B	Automatic Dependent Surveillance - Broadcast
AMG	ASTERIX Maintenance Group
ASTERIX	All purpose STructured Eurocontrol suRveillance Information eXchange
CAT	Data Category
FRN	Field Reference Number
FSPEC	Field Specification
FX	Field Extension Indicator
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
LEN	Length Indicator
LSB	Least Significant Bit
NM	Nautical Mile, unit of distance (1852 metres)
REP	Field Repetition Indicator
s	second, unit of time
SAC	System Area Code
SIC	System Identification Code
SP	Special Purpose Indicator
UAP	User Application Profile (see Definitions)
UTC	Co-ordinated Universal Time

4. GENERAL PRINCIPLES

4.1 General

This document describes the application of ASTERIX to CNS/ATM Ground System Status Reports.

4.2 Time Management

The time stamping 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 System Service.

4.5 Ground System Status Reports

4.5.1 Types of Ground System Status Reports

Three types of service reports have been identified:

- Service and System Status Report (Message Type 001)
- Component Status Report (Message Type 002)
- Service Statistics Report (Message Type 003)

4.5.1.1 *Service and System Status Report*

These reports **shall** convey the status of individual services provided by the ground system as well as the individual components of the system that support the service. Each ground system may provide several services, and the status of each service **shall** be reported independently in each service status report.

4.5.1.2 *Component Status Report*

These reports **shall** be sent to signal the status of individual components independent from their use in a service. The component is identified by its Component ID (data item I025/120) and it is up to the receiving system to properly interpret this number. It is up to the management of the receiving system to determine the impact of a component failure.

4.5.1.3 *Service Statistics Report*

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

4.5.1.4 *Message Generation Principles*

Message Types 001 and 002 **shall** be generated periodically and optionally whenever a change of the status happens. The generation of the different message types **shall** be agreed between the communication partners and **shall** be described in the system's Interface Control Document (ICD).

The generation of message type 003 **shall** be agreed between the communication partners.

4.5.2 Report Composition

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

The composition of reports of Category 025 follows the principle according to Part 1 of ASTERIX edition 2.2 or later. Each report is composed according to the following principle:

CAT = 025	LEN	FSPEC	DATA ITEM	DATA ITEM	DATA ITEM	...
-----------	-----	-------	-----------	-----------	-----------	-----

Where:

- CAT = 025 is a one-octet field indicating Ground System Status reports;
- LEN is a two-octet field indicating the total length in octets of the Category 025 report, 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 SYSTEM STATUS REPORTS

5.1 Standard Data Items

The standardised Data Items which shall be used for the transmission of CNS/ATM Ground System Status reports are defined in Table 1 and described in the following pages.

Table 1 - Standard Data Items of Category 025

Data Item Ref. No.	Description	System Resolution
I025/000	Report Type	N.A.
I025/010	Data Source Identifier	N.A.
I025/015	Service Identification	N.A.
I025/020	Service Designator	N.A.
I025/070	Time of Day	1/128 s
I025/100	System and Service Status	N.A.
I025/105	System and Service Error Codes	N.A.
I025/120	Component Status	N.A.
I025/140	Service Statistics	N.A.
I025/200	Message Identification	N.A.
I025/600	System Reference Point	N.A.
I025/610	Height of System Reference Point	0.25m

5.2 Description of Standard Data Items

5.2.1 Data Item I025/000, 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:

Octet no. 1							
8	7	6	5	4	3	2	1
Report Type							RG

bits-8/2

Report Type

bit-1

Cat 025 Report Generation

=0: Periodic Report

=1: Event Driven Report

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 025 records:
 - 001 Service and System Status report (see [4.5.1.1](#) above)
 - 002 Component Status report (see [4.5.1.2](#) above)
 - 003 Service Statistics report (see [4.5.1.3](#) above)
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 Service and System Status	002 Component Status	003 Service Statistics
I025/000 Report Type	M	M	M
I025/010 Data Source Identifier	M	M	M
I025/015 Service Identification	M	X	M
I025/020 Service Designator	O	X	O
I025/070 Time of Day	M	M	M
I025/100 System & Service Status	O	X	X
I025/105 Service Error Codes	O	X	X
I025/120 Component Status	O	M	X
I025/140 Service Statistics	X	X	M
I025/200 Message Identification	O	O	O
I025/600 System Reference Point	O (See Note below)	O	X
I025/610 Height of System Reference Point	O (See Note below)	O	X

NOTE: With Edition 1.3 of this specification the Encoding Rules for Data Item I025/600 and I025/610 in Message Type 001 have been changed from “Mandatory” to “Optional”. Before changing the data source such that the encoding of these Data Items is changed from “included” to “not included” it needs to be ensured that downstream systems do not apply “Mandatory Item Checks”. Otherwise this may lead to suppression of the Category 025 Record by the receiving system.

5.2.2 Data Item I025/010, Data Source Identifier

Definition : Identification of the Ground System 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>).

NOTE - The SICs are allocated by the national authority responsible for the surveillance infrastructure.

5.2.3 Data Item I025/015, Service Identification

Definition : Identifies the service being reported.

Format : One-octet fixed length Data Item.

Structure:

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

bits-8/1 (SID) Service Identification

Note: The service identification is allocated by the system.

5.2.4 Data Item I025/020, Service Designator**Definition :** Designator of the service being reported.**Format :** Six-octet fixed length Data Item.**Structure:**

Octet no. 1						Octet no. 2									
48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
Character 1						Character 2						Character 3			

Octet no. 3								Octet no. 4							
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
			Character 4					Character 5							

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

bits-48/1 Service Designator. Characters 1-8 (coded on 6 Bits each) defining the text readable designator for each Service.

Each character of the service designator is encoded as defined below (see ICAO Annex 10, Volume IV, page 3-77, table 3-9):

				b ₆	0	0	1	1
				b ₅	0	1	0	1
b ₄	b ₃	b ₂	b ₁					
0	0	0	0			P	SP ¹	0
0	0	0	1		A	Q		1
0	0	1	0		B	R		2
0	0	1	1		C	S		3
0	1	0	0		D	T		4
0	1	0	1		E	U		5
0	1	1	0		F	V		6
0	1	1	1		G	W		7
1	0	0	0		H	X		8
1	0	0	1		I	Y		9
1	0	1	0		J	Z		
1	0	1	1		K			
1	1	0	0		L			
1	1	0	1		M			
1	1	1	0		N			
1	1	1	1		O			

SP¹ = SPACE code

For each character the following bit numbering convention shall be observed:

b6	b5	b4	b3	b2	b1
----	----	----	----	----	----

Notes:

1. Assignments of Service designators to specific services/systems and interpretation of these fields are implementation dependent.
2. Examples of Service Designators are "1090ADSB", "WAM", "1090TISB", etc.
3. Multiple Service Type Designators may be used to describe a single service where applicable

5.2.5 Data Item I025/070, 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)		$= (2^{-7})s = 1/128 \text{ s}$											

NOTES

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

5.2.6 Data Item I025/100, System and Service Status

Definition : Information concerning the status of the Service Volume.

Format : Variable Length Data Item, comprising a primary subfield of one octet, followed by one-octet extensions as necessary.

Structure of Primary Subfield

Octet no. 1							
8	7	6	5	4	3	2	1
NOGO		OPS		SSTAT			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-7/6	(OPS)	Operational Service Mode = 0 Operational = 1 Operational but in Standby = 2 Maintenance = 3 reserved for future use
bits-5/2	(SSTAT)	System and Service State = 0 Running = 1 Failed = 2 Degraded = 3 Undefined = 4 – 15 reserved for future use
bit-1	(FX)	= 0 No extension = 1 Extension

NOTES

1. Bit 8 (NOGO), when set to “1” indicates that the data transmitted by the system/service is not released for operational use. This indication is independent from the status of the system itself or that of the service. It just indicates that the system or service volume output **must not** be used for operational services but may be used for, e.g. test and validation purposes. The indication GO/NO-GO indicates a mode of the system rather than a status. Usually this bit will be set by operator input.
2. Bit 7/6 (OPS), when set to “1” indicates that the service is running but not operationally used (e.g. for a standby system in a redundant configuration).
3. Bits 5/2 (SSTAT): This information informs about the state of the overall service volume status. The actual implementation of this field is service dependent and should be described in the system/service specification. However, it is expected that – as far as this information is available – a mapping is performed between the states of individual components as reported in data item I025/120. As an example, if one component fails but the system is still operational (at least partially), the service status should change to “Degraded”.

Structure of I025/100 - First Extension: Detailed System & Service Status

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

bit-8	(Spare)	Spare-bit, set to "0"
bit-7/5	(SySTAT)	System Status = 0 Running / OK = 1 Failed = 2 Degraded = 3 Undefined = 4 – 7 reserved for future use
bits-4/2	(SeSTAT)	Service Performance Status = 0 OK = 1 Failed = 2 Degraded = 3 Undefined = 4 – 7 reserved for future use
bit-1	(FX)	= 0 No extension = 1 Extension

NOTES

This octet allows to separate reporting of the system and the service status as in particular in distributed systems it is possible that the degraded system state may not have an impact on the service state.

For reasons of backwards compatibility (for systems that are not yet capable to decode the first extension), the system and service status **shall** be propagated to the field SSTAT in the primary part of I025/100, bits 5/2 according to the following table:

SeSTAT	SySTAT	SSTAT
0	0	0
0	1	1
0	2	2
0	3	1
1	0	1
1	1	1
1	2	1
1	3	1
2	0	2
2	1	1
2	2	2
2	3	1
3	0	1
3	1	1
3	2	1
3	3	1

NOTES

The value of 3 'Undefined' is assumed to represent that the status cannot be determined. This inherently indicates a failure in system monitoring. Therefore, a value of 3 'Undefined' is equivalent to 1 'Failed', leading to rejection of data and prompting maintenance/operator investigation to occur.

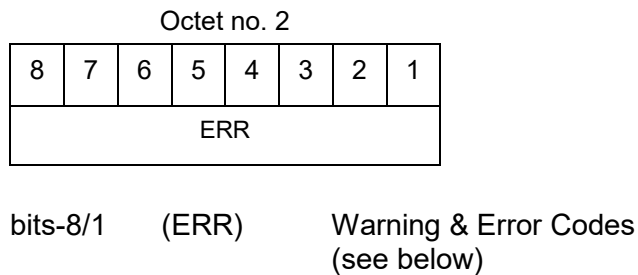
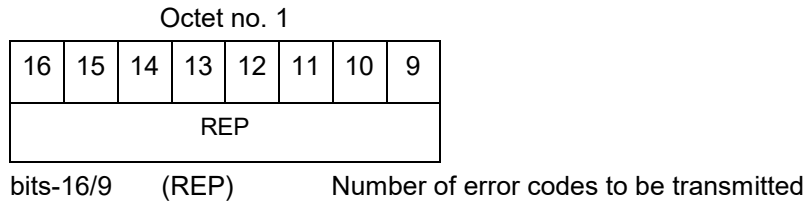
The population of SSTAT is determined to be the worst-case combination of SeSTAT and SySTAT, taking into account Note 1, where the hierarchy of best to worst case is as follows: Running, Degraded, Failed.

5.2.7 Data Item I025/105, System and Service Error Codes

Definition : Error Status of the System and the Service.

Format : Repetitive Data Item, starting with a one-octet Field Repetition Indicator (REP) followed by at least one error code of 1 octet.

Structure:



NOTES:

The Warning & Error codes contain information about the reason why the System and Service State (SSTAT in item I025/100) is different from “running”.

In this edition of the specification, the following warning & error codes are defined:

Error Code	Meaning
0	No error detected (shall not be sent)
1	Error Code Undefined
2	Time Source Invalid
3	Time Source Coasting
4	Track ID numbering has restarted
5	Data Processor Overload
6	Ground Interface Data Communications Overload
7	System stopped by operator
8	CBIT failed
9	Test Target Failure
10 – 31	Reserved for allocation by the AMG
32 - 255	Reserved for allocation by system manufacturers

- 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. A value of 4 indicates that the allocation of Track-IDs was re-started.
3. Multiple error codes can be transmitted within the same ASTERIX record.

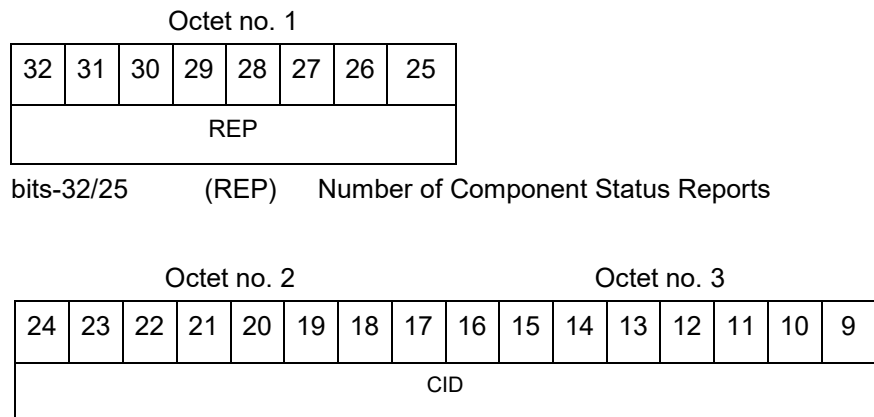
4. Error codes in the range 0 to 31 shall be allocated centrally by the AMG. Error codes in the range from 32 to 255 are available for specification by the system manufacturers. They are not standardised and shall be described in the Interface Control Document (ICD) of the respective system.

5.2.8 Data Item I025/120, Component Status

Definition: Indications of status of various system components and, when applicable, error codes.

Format : Repetitive Data Item, starting with a one-octet Field Repetition Indicator (REP) followed by at least one block of 3 octets.

Structure:

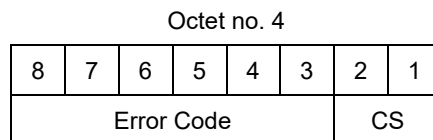


bits-32/25 (REP) Number of Component Status Reports

bits-24/9 (CID) Component ID

The Component ID is implementation specific

A Component ID of 65535 indicates that the following error code applies to **all** components defined.



Bits-8/3 (Error Code) 0: No Error Detected
 1: Error Code Undefined
 2-15 Reserved for allocation by the AMG
 16-63 Reserved for allocation by system manufacturers

bits-2/1 (CS) Component State/Mode
 =0: Running
 =1: Failed
 =2: Maintenance
 =3: reserved

NOTES:

Error codes in the range 2 to 15 shall be allocated centrally by the AMG. Error codes in the range from 16 to 63 are available for specification by the system manufacturers. They are not standardised and shall be described in the Interface Control Document (ICD) of the respective system.

5.2.9 Data Item I025/140, Service Statistics

Definition : Statistics concerning the service. Provides counts of various 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	SPARE						

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
		= 5-19 Reserved for AMG
		≥ 20 implementation specific
bit-40	(REF)	Reference from which the messages are counted
		= 0 From UTC midnight
		= 1 From the previous report

bits-39/33	(SPARE)	Spare bits set to 0
bits-32/1	(COUNTER VALUE)	32-bit counter value

Notes:

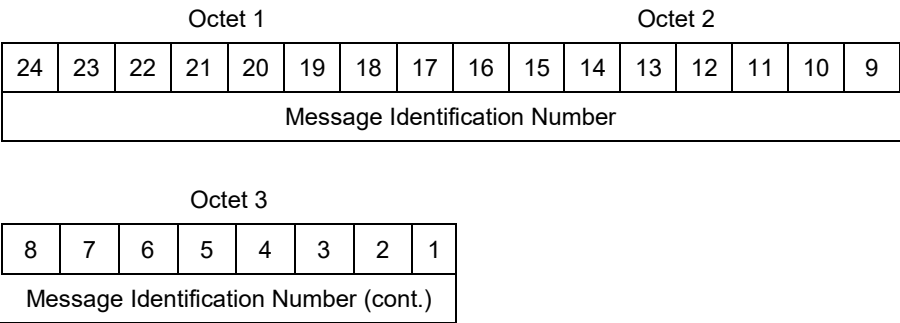
There is no special significance attributed to the numbering of the TYPE field. However the range from 0 to 19 is intended to cover generic messages which may be applicable to many types of service.

5.2.10 Data Item I025/200 Message Identification

Definition: Identification of a unique message.

Format: Three-octet fixed length Data Item.

Structure:



bits-24/1 Message Identification Number

Notes:

- 1. The Message Identification Number is to be used to uniquely identify each message. If messages are being sent on redundant links then this number shall be identical for the same message on each link. This will allow the receiver to easily identify and discard duplicate messages.
- 2. It is not required that Message Identification Numbers be assigned in ascending order by time of message transmission.

5.2.11 **Data Item I025/600, Position of the System Reference Point**

Definition : Position of the reference point in WGS-84 Coordinates.

Format : Eight-octet fixed length Data Item

Structure:

Octet no. 1								Octet no. 2							
64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
Latitude in WGS - 84															
Octet no. 3								Octet no. 4							
48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
LSB															
Octet no. 5								Octet no. 6							
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Longitude in WGS - 84															
Octet no. 7								Octet no. 8							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
LSB															
bits-64/33		(Latitude)		In WGS-84 in two's complement. Range -90 <= latitude < 90 deg. = 180/2 ³² degrees											
		(LSB)													
bits-32/1		(Longitude)		In WGS-84 in two's complement. Range -180 <= longitude < 180 deg. = 360/2 ³² degrees											
		(LSB)													

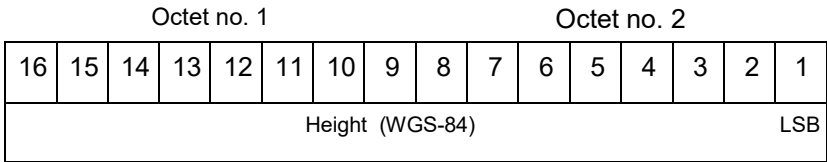
NOTE - Positive longitude indicates East. Positive latitude indicates North.

5.2.12 **Data Item I025/610, Height of the System Reference Point**

Definition: Height of the system reference point in two’s complement form. The height shall use mean sea level as the zero reference level.

Format: Two-octet fixed length Data Item.

Structure:



bits-16/1 Height (WGS-84) above MSL
LSB= 0.25 m
Range= -8192 m to +8191.75 m

NOTE: Item I025/610 shall only be sent together with item I025/600 “Position of the System Reference Point”.

5.3 Standard User Application Profile

The following standard UAP shown in Table 3 shall be used for the transmission of CNS/ATM Ground System Status reports:

Table 3 - Standard UAP for CNS/ATM Ground System Status Reports

FRN	Data Item	Data Item Description	Length
1	I025/010	Data Source Identifier	2
2	I025/000	Report Type	1
3	I025/200	Message Identification	3
4	I025/015	Service Identification	1
5	I025/020	Service Designator	6
6	I025/070	Time of Day	3
7	I025/100	System and Service Status	1+
FX	N/A.	Field Extension Indicator	N/A.
8	I025/105	System and Service Error Codes	1+
9	I025/120	Component Status	1+
10	I025/140	Service Statistics	1+
11	SP	Special Purpose Field	1+1+
12	I025/600	Position of the System Reference Point	8
13	I025/610	Height of System Reference Point	2
14	-	Spare	N/A.
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.



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