EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION



EUROCONTROL STANDARD DOCUMENT

FOR

SURVEILLANCE DATA EXCHANGE

Part 12: Category 021

ADS-B Reports

SUR.ET1.ST05.2000-STD-12-01

Edition : 1.8
Edition Date : January 2011
Status : Released Issue
Class : General Public

DOCUMENT IDENTIFICATION SHEET

DOCUMENT DESCRIPTION						
		Document Title	•			
	Surveill	ance Data Exchanç	ge - Part 12	!		
		ADS-B Reports	;			
EWP DELIVERABLE REFER	ENCE NUM	MBER				
PROGRAMME REFER	ENCE IND	EX EDITION	ON:		1.8	
SUR.ET1.ST05.2000-	STD-12-0	EDITIO	ON DATE :	J	lanuary 2011	
		Abstract				
This document describes the	application		S-B			
This document describes the	аррисацоп	OI AOTENIA IO AD	О Б.			
		Keywords				
ASTERIX Cate	egory 21		3 Reports			
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	DOCO	WIENT STATUS A		-		
STATUS		CATEGORY		CLAS	SIFICATION	
Working Draft	⊐ Exed	cutive Task		General Pu	ıblic	$\overline{\checkmark}$
		cialist Task		EATMP		
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ELECTRONIC BACKUP						
INTERNAL REFERENCE N	AME:					
HOST SYSTEM		MEDIA		SOF	TWARE(S)	
Microsoft Windows	Type	: Hard disk		231		
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DOCUMENT APPROVAL

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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	Dec. 1999	Creation of Eurocontrol document	ALL
0.11	Mar. 2000	Modifications in items Creation of UAP	ALL
0.12	Feb. 2001	Modifications in items and UAP	ALL
0.13	Jun. 2001	Modifications in items and UAP	ALL
0.14	Sep. 2001	Modifications in items and UAP	ALL
0.15	Nov. 2001	Modifications in items and UAP	ALL
0.16	Dec. 2001	Addition of paragraph 4.4Editorial corrections	ALL
0.17	Jan. 2002	Modifications in items and UAP	ALL
0.18	Feb. 2002	Modifications in items and UAP	ALL
0.19	Oct. 2002	Modifications in items • 1021/110 • 1021/148 • 1021/152 • 1021/155 Modification of the UAP	5.2.9 5.2.14 5.2.17 5.2.18 5.3
0.20	Dec. 2002	Addition of "Encoding rules" Modification of I021/040 Modification of I021/110 Suppression of items I021/035 and I021/037 Modification of the UAP	All 5.2.5 5.2.9 5.3
0.21	March 2003	Modification of the title Modification of I021/140	5.2.11
0.22	August 2003	Editorial modification in layout of reports	5.1
0.23	Nov. 2003	Addition of ICAO Annex 10 Vol I Part I as Reference Document Addition of one bit (DTI) in item 021/210 Editorial modifications	2.2 5.2.24
0.24	Oct. 2004	Modification of the format of item I021/130 to increase the resolution of the position in WGS-84 format	5.2.10

	1	T	T
0.25	Mar. 2005	Document Identification Sheet updated	Page ii
		Signature Page updated	Page iii
		Correction of length for item I021/040 in table 2	5.3
		– ADS-B reports UAP	
		Definition Item 021/140 updated	5.2.11
0.26	27 June 2005	Item I021/070 Mode 3/A added	5.2.6
		Item I021/131 Signal Amplitude added	5.2.12
0.27	October 2007	Change proposals from WG51-SG4 integrated	Almost all
		Document completely restructured	
0.28	January 2008	Editorial changes throughout document	Numerous
		Error Conditions in I021/040 defined	5.2.6
		New item I021/161 Track ID	5.2.31
		New item I021/400 Receiver ID	5.2.41
0.29	March 2008	Internal Edition, once accepted, 0.29a will	
		become 0.29	
0.29a	March 2008	Status changed to Draft	All
		Results EUROCAE WG51-SG4 meeting:	
		I021/008: encoding rule updated plus editorial	5.2.1
		I021/016: LSB and layout modified, encoding	5.2.4
		rule updated	
		1021/040: Modified following EUROCAE WG51	5.2.6
		l021/161: Typo in heading corrected	5.2.31
		l021/200: Encoding rule modified	5.2.34
		1021/250: Editorial in encoding rule corrected	5.2.38
		I021/295 (Data Ages) added	5.2.41
		Input from Austrocontrol:	5.0.4
		1021/016 Test Target Reference removed	5.2.4
		1021/040 restructured, notes added	5.2.6
4.00	A = =:1 0000	1021/161 Re-Numbering indication added	5.2.31
1.0P	April 2008	Update following RDE-TF #41:	F 0 04
		Item I021/161: RN bit moved to cat 023	5.2.31
		Item I021/295: Note 2 added	5.2.41
		Items I021/148, I021/165: note added "not available in 1090 MHz ES"	5.2.24 5.2.25
		available III 1030 NIDZ ES	5.2.25
			5.2.32
		Item I021/230: Note added	5.2.37
		Status changed to "Proposed Issue"	3.2.37
1.0	August 2008	List of Abbreviations corrected	3.2
1.0	/ lugust 2000	Item I021/015: Note added	5.2.3
		Item I021/040, second extension: note added	5.2.6
		Category corrected in Items 250 and 260	5.2.38
		a sale gold a constant	5.2.39
		Note 6 in I021/110 corrected	5.2.17
		Editorial "clean-up"	3.2
		Status changed to "Released Issue"	
1.1	September	Editorial update	
	2008		
L	1		

			1
1.2	November	List of reference documents updated	2.2
	2008	Encoding rule and notes to I021/016 updated	5.2.4
		Notes in I021/040 updated	5.2.6
		Note in I021/130 updated	5.2.18
		Note in I021/131 updated	5.2.19
		Note in I021/260 updated	5.2.39
		Description/Note updated in I021/271	5.2.40
		Table 2 updated	5.3
1.3	March 2009	Alignment with ADS-B Terminology	All
		0,	
1.4	July 2009	Numerous editorial clarifications for consistency	
		Meaning of "Full Second Indication" clarified	5.2.11/5.2.13
		Meaning of "Range Exceeded" clarified	5.2.26/5.2.28
			5.2.29/5.2.30
1.5	September	Signature Page updated	iii
	2010	Note added to item I021/250	5.2.38
1.6	October 2010	Reference document [6] corrected	Page 2
		Reference in item I021/170 corrected	5.2.33
1.7	December	Error condition IPC added in item I021/040	5.2.6
	2010		
1.8	January 2011	Note in items I021/071 and I021/072 updated	5.2.8
			5.2.9

TABLE OF CONTENTS

DOCUMENT IDENTIFICATION SHEETii							
DOCUMENT	DOCUMENT APPROVALv						
DOCUMENT	DOCUMENT CHANGE RECORDvi						
1	INTRODUCTION1						
1.1	Scope1						
2	References2						
2.1	General2						
2.2	Reference Documents2						
3	Definitions, acronyms and abbreviations3						
3.1	Definitions3						
3.2	Acronyms and Abbreviations4						
4	GENERAL PRINCIPLES5						
4.1	General5						
4.2	Time Management5						
4.3	Unused Bits in Data Items5						
4.4	User Application Profile and Data Blocks6						
4.5	Composition of reports6						
5	LAYOUT OF REPORTS7						
5.1	Standard Data Items7						
5.2	Description of Standard Data Items9						
5.2.1	Data Item I021/008, Aircraft Operational Status9						
5.2.2	Data Item I021/010, Data Source Identification10						
5.2.3	Data Item I021/015, Service Identification10						
5.2.4	Data Item I021/016, Service Management11						
5.2.5	Data Item I021/020, Emitter Category12						
5.2.6	Data Item I021/040, Target Report Descriptor13						
5.2.7	Data Item I021/070, Mode 3/A Code in Octal Representation16						

5.2.8	Data Item I021/071, Time of Applicability for Position1	7
5.2.9	Data Item I021/072, Time of Applicability for Velocity1	8
5.2.10	Data Item I021/073, Time of Message Reception for Position	9
5.2.11	Data Item I021/074, Time of Message Reception of Position-High Precision2	20
5.2.12	Data Item I021/075, Time of Message Reception for Velocity	21
5.2.13	Data Item I021/076, Time of Message Reception of Velocity-High Precision 2	22
5.2.14	Data Item I021/077, Time of ASTERIX Report Transmission	23
5.2.15	Data Item I021/080, Target Address2	24
5.2.16	Data Item I021/090, Quality Indicators2	25
5.2.17	Data Item I021/110, Trajectory Intent	26
5.2.18	Data Item I021/130, Position in WGS-84 Co-ordinates	30
5.2.19	Data Item I021/131, High-Resolution Position in WGS-84 Co-ordinates3	31
5.2.20	Data Item I021/132, Message Amplitude	32
5.2.21	Data Item I021/140, Geometric Height	32
5.2.22	Data Item I021/145, Flight Level	3
5.2.23	Data Item I021/146, Intermediate State Selected Altitude	3
5.2.24	Data Item I021/148, Final State Selected Altitude	34
5.2.25	Data Item I021/150, Air Speed	35
5.2.26	Data Item I021/151 True Airspeed	35
5.2.27	Data Item I021/152, Magnetic Heading	36
5.2.28	Data Item I021/155, Barometric Vertical Rate	36
5.2.29	Data Item I021/157, Geometric Vertical Rate	37
5.2.30	Data Item I021/160, Ground Vector	38
5.2.31	Data Item I021/161, Track ID	}9
5.2.32	Data Item I021/165, Track Angle Rate	39
5.2.33	Data Item I021/170, Target Identification	łO

5.3	User Application Profile for Category 021	61
5.2.42	Data Item I021/400, Receiver ID	60
5.2.41	Data Item I021/295, Data Ages	49
5.2.40	Data Item I021/271, Surface Capabilities and Characteristics	48
5.2.39	Data Item I021/260, ACAS Resolution Advisory Report	47
5.2.38	Data Item I021/250, Mode S MB Data	46
5.2.37	Data Item I021/230, Roll Angle	45
5.2.36	Data Item I021/220, Met Information	43
5.2.35	Data Item I021/210, MOPS Version	42
5.2.34	Data Item I021/200, Target Status	41

1 INTRODUCTION

1.1 Scope

- **1.1.1** This document describes the structure for the transmission of ADS-B reports.
- **1.1.2** This document defines the data out of Category 021.

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 February 2002.
- 3. EUROCONTROL Document SUR.ET1.ST05.2000-STD-16-1 ASTERIX Category 023 "CNS/ATM Ground Station Service Reports".
- 4. RTCA/DO-242A, Minimum Aviation System Performance Standards for ADS-B, June 25, 2002.
- 5. SUR/ET3/ST06.3220/001, Automatic Dependent Surveillance Requirements, edition 0.8 November 2000.
- 6. ICAO Annex 10, Vol. IV.
- 7. ICAO Annex 5
- 8. RTCA DO-260 "Minimum Operational Performance Standards for 1090 MHz Automatic Dependent Surveillance Broadcast (ADS-B)"
- RTCA DO-260A"Minimum Operational Performance Standards for 1090 MHz Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Services – Broadcast (TIS-B)"
- 10. ICAO SARPS for ACAS in ICAO Annex 10, Volume IV, Chapter 4

3 DEFINITIONS, ACRONYMS AND ABBREVIATIONS

3.1 Definitions

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

	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:

Degree (angle)

ADS-B Automatic Dependent Surveillance - Broadcast

ASTERIX All Purpose STructured Eurocontrol suRveillance Information

E**X**change

CAT Data Category

CPR Compact Position Reporting

EATM European Air Traffic Management

FRN Field Reference Number

FSPEC Field Specification

FX Field Extension Indicator

ICAO International Civil Aviation Organization

LDPJ Local Decoding Position Jump

LEN Length Indicator
LSB Least Significant Bit

PSR Primary Surveillance Radar

RDE-TF Radar Data Exchange Task Force
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 (EATM)

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 ADS-B target reports.

4.2 Time Management

The time-stamping shall comply with ICAO Annex 5 [Ref. 7].

With ADS-B information on time can be provided by two different instances: the aircraft or the Ground Station (GS).

If the avionics of the aircraft are synchronised to a high precision time-source (such as GPS), it is able to downlink the position and velocity information synchronised to a precise moment in time, the "Time of Applicability". In this case, items I021/071 (Time of Applicability for Position) or I021/072 (Time of Applicability for Velocity) shall be used to transmit the time-stamp for the respective information.

If the avionics are not synchronised to a high precision time-source, the information downlinked from the aircraft is not synchronised in time. In this case, the only precise time available is the time of reception of the respective message in the GS. The GS will indicate this by using items I021/073 (Time of Message Reception of Position) or I021/075 (Time of Message Reception of Velocity) to time-stamp the respective data-items.

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 ADS-B reports.
- **4.4.2** Data Blocks shall have the following layout.

CAT = 021	LEN	FSPEC	Items of the first record	FSPEC	Items of the last record

where:

- Data Category (CAT) = 021, is a one-octet field indicating that the Data Block contains ADS-B 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.

4.5 Composition of reports

- **4.5.1** Reports 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 REPORTS

5.1 Standard Data Items

The standardised Data Items which shall be used for the transmission of ADS-B reports are defined in Table 1 and described in the following pages.

Table 1 - Data Items of Category 021

Data Item		
Reference	Description	Resolution
Number		
1021/008	Aircraft Operational Status	N.A.
1021/010	Data Source Identification	N.A.
1021/015	Service Identification	N.A.
1021/016	Service Management	N.A.
1021/020	Emitter Category	N.A.
1021/040	Target Report Descriptor	N.A.
1021/070	Mode 3/A Code	N.A.
1021/071	Time of Applicability for Position	1/128 s
1021/072	Time of Applicability for Velocity	1/128 s
1021/073	Time of Message Reception for Position	1/128 s
1021/074	Time of Message Reception for Position – High Precision	2- ³⁰ s
1021/075	Time of Message Reception for Velocity	1/128 s
1021/076	Time of Message Reception for Velocity – High Precision	2- ³⁰ s
1021/077	Time of Report Transmission	1/128 s
1021/080	Target Address	N.A.
1021/090	Quality Indicators	N.A.
1021/110	Trajectory Intent	N.A.
1021/130	Position in WGS-84 co-ordinates	180/2 ²³ °
1021/131	Position in WGS-84 co-ordinates, high resolution	180/2 ³⁰ °
1021/132	Message Amplitude	1 dBm
1021/140	Geometric Height	6.25 ft
1021/145	Flight Level	¼ FL
1021/146	Intermediate State Selected Altitude	25 ft
1021/148	Final State Selected Altitude	25 ft
1021/150	Air Speed	N.A.
1021/151	True Air Speed	N.A.
1021/152	Magnetic Heading	360/2 ¹⁶ °
1021/155	Barometric Vertical Rate	6.25 ft / min
1021/157	Geometric Vertical Rate	6.25 ft / min
1021/160	Ground Vector	N.A.
1021/161	Track Number	N.A.
1021/165	Track Angle Rate	1/32 %s
1021/170	Target Identification	N.A.
1021/200	Target Status	N.A.
1021/210	MOPS Version	N.A.
1021/220	Met Information	N.A.
1021/230	Roll Angle	0.01 deg
1021/250	Mode S MB Data	N.A.
1021/260	ACAS Resolution Advisory Report	N.A.
1021/271	Surface Capabilities and Characteristics	N.A.
1021/295	Data Ages	N.A.
1021/400	Receiver ID	N.A.

5.2 Description of Standard Data Items

5.2.1 Data Item I021/008, Aircraft Operational Status

Definition: Identification of the operational services available in the aircraft while

airborne.

Format: One-octet fixed length Data Item.

Structure:

	Octet no. 1											
8	7	6	5	4	ļ		3	2	1			
RA	T	Ö	TS	AF	٧٢	С	DTI/A	Not TCAS	0			
		bit-8	=	RA) :0 :1	TCAS Resolution Advisory active TCAS II or ACAS RA not active TCAS RA active							
		bits-7	=	TC) : 0 : 1 : 2 : 3								
	bit-5			 (TS) Target State Report Capability =0 no capability to support Target State Report Capable of supporting target State Report Capable of supporting target State Report Capable State Report Capability 								
	=0 no capability						ferenced Velocity Report Capability ability to generate ARV-reports e of generate ARV-reports					
		bit-3	t-3 (CDTI/A) Cockpit Display of Traffic Information a =0 CDTI not operational =1 CDTI operational							ation airborne		
		bit-2	=	not T0 : 0 : 1	TCAS): TCAS System Status TCAS operational or unknown TCAS not installed or not operational							
		bit-1	s	pare l	oit, s	et to	0 0					

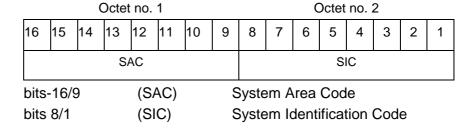
Encoding Rule : This item is optional. It shall be sent only if at least one bit is set to 1.

5.2.2 Data Item I021/010, Data Source Identification

Definition: Identification of the ADS-B station providing information.

Format : Two-octet fixed length Data Item.

Structure:



Encoding Rule:

This Item shall be present in every ASTERIX record.

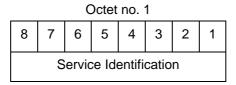
NOTE - The up-to-date list of SACs is published on the Eurocontrol Web Site (http://www.eurocontrol.int/asterix).

5.2.3 Data Item I021/015, 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 system.

NOTE - The service identification is also available in item I023/015 [Ref. 3].

Encoding Rule:

This item is optional.

5.2.4 Data Item I021/016, Service Management

Definition: Identification of services offered by a ground station (identified by a

SIC code).

Format: One-octet fixed length Data Item.

Structure:

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

Bits-8/1 (RP): Report Period LSB = 0.5 s

= 0: Data driven modeRange 0 ... 127.5 seconds, a value of 127.5 indicates127.5 seconds or above

Encoding Rule:

This item is optional. It shall be sent periodically and each time a value change occurs.

NOTE - This item contains the same information as item I023/101 in ASTERIX category 023 [Ref. 3]. Since not all service users receive category 023 data, this information has to be conveyed in category 021 as well.

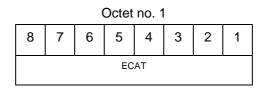
NOTE - If this item is due to be sent according to the encoding rule above, it shall be sent with the next target report

5.2.5 Data Item I021/020, Emitter Category

Definition: Characteristics of the originating ADS-B unit.

Format : One-Octet fixed length data item.

Structure:



bits-8/1 (ECAT) Emitter Category

0 = No ADS-B Emitter Category Information

1 = light aircraft <= 15500 lbs

2 = 15500 lbs < small aircraft < 75000 lbs

3 = 75000 lbs < medium a/c < 300000 lbs

4 = High Vortex Large

5 = 300000 lbs <= heavy aircraft

6 = highly manoeuvrable (5g acceleration capability) and high speed (>400 knots cruise)

7 to 9 = reserved

10 = rotocraft

11 = glider / sailplane

12 = lighter-than-air

13 = unmanned aerial vehicle

14 = space / transatmospheric vehicle

15 = ultralight / handglider / paraglider

16 = parachutist / skydiver

17 to 19 = reserved

20 = surface emergency vehicle

21 = surface service vehicle

22 = fixed ground or tethered obstruction

23 = cluster obstacle

24 = line obstacle

Encoding Rule:

This Item is optional.

5.2.6 Data Item I021/040, Target Report Descriptor

Definition: Type and characteristics of the data as transmitted by a

system.

Format: Variable Length Data Item, comprising a primary subfield of

one octet, followed by one-octet extensions as necessary.

Structure of Primary Subfield

			Octe	t no.	. 1								
8	7	6	5	4	3	2	1						
	ATP		AF	RC	RC	RAB	FX						
bits-	8/6			(AT	P)		= (= ' = 2 = 3	Address Type = 0 24-Bit ICAO address = 1 Duplicate address = 2 Surface vehicle address = 3 Anonymous address = 4-7 Reserved for future u					
bits-	5/4			(A	RC)		= C = 1		Reporting Capability 25 ft 100 ft Unknown Invalid				
bit-3	3			(R	C)		Ra = 0 = 1	-	Check Default Range Check passed, CPR Validation pending				
bit-2	2		(RAB)				Re = 0 = ')	Type Report from target transponder Report from field monitor (fixed transponder)				
bit-1				(FX	()		Fie = C		ktension End of item				

NOTES

Bit 3 indicates that the position reported by the target is within a credible range from the ground station. The range check is followed by the CPR validation to ensure that global and local position decoding both indicate valid position information. Bit 3=1 indicates that the range check was done, but the CPR validation is not yet completed.

= 1

Entension into first extent

Once CPR validation is completed, Bit 3 will be reset to 0.

Structure of I021/040 - First Extent

Octet no. 1

8	7	6	5	4	3	2	1
DCR	GBS	SIM	TST	SAA	(CL	FX

bit-8 (DCR) Differential Correction

= 0 No differential correction (ADS-B)

= 1 Differential correction (ADS-B)

bit-7 (GBS) Ground Bit Setting

= 0 Ground Bit not set

Ground Bit set

bit-6 (SIM) Simulated Target
= 0 Actual target report
= 1 Simulated target report

bit-5 (TST) Test Target
= 0 Default
= 1 Test Target

= 1

bit-4 (SAA)

Selected Altitude Available

= 0 Equipment capable to provide Selected Altitude

= 1 Equipment not capable to provide Selected Altitude

bits-3/2 (CL) Confidence Level = 0 Report valid

= 1 Report suspect= 2 No information

= 3 Reserved for future use

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

= 1 Entension into second extent

Structure of I021/040 - Second Extent: Error Conditions

	Octet no. 1											
	8	7	6	5	4	3	2	1				
Ī	EC7	EC6	IPC	NOGO	CPR	LDPJ	RCF	FX				

ľ		TIPC NOGO	CPK	
	Bit-8 :	(EC7)	= 0 = 1	Error Condition 7 not existing Error Condition 7 existing
	Bit-7 :	(EC6)	= 0 = 1	Error Condition 6 not existing Error Condition 6 existing
	Bit-6 :	(IPC)	= 0 = 1	Independent Position Check default failed
	Bit-5 :	(NOGO)	= 0 = 1	No-go Bit Status NOGO-bit not set NOGO-bit set
	Bit-4 :	(CPR)	= 0 = 1	Compact Position Reporting CPR Validation correct CPR Validation failed
	Bit-3 :	(LDPJ)	= 0 = 1	Local Decoding Position Jump LDPJ not detected LDPJ detected
	Bit-2 :	(RCF)	= 0 = 1	Range Check default Range Check failed
	Bit-1	(FX)	= 0 = 1	Field Extension end of data item extension into third extent

NOTES The second extension signals the reasons for which the report has been indicated as suspect (indication Confidence Level (CL) in the first extension).

Bit 2 indicates that the Range Check failed, i.e. the target is reported outside the credible range for the Ground Station. For operational users such a target will be suppressed. In services used for monitoring the Ground Station, the target will be transmitted with bit 2 indicating the fault condition.

NOTES Bit 5 represents the setting of the GO/NOGO-bit as defined in item 1023/100 of category 023 [Ref. 3].

NOTES Bits 8/6 are reserved for future use.

Encoding Rule:

This Item shall be present in every ASTERIX record. The extensions shall be sent only if at least one bit is set to 1.

5.2.7 Data Item I021/070, Mode 3/A Code in Octal Representation

Definition: Mode-3/A code converted into octal representation.

Format: Two-octet fixed length Data Item.

Structure:

		C	ctet	no.	1			Octet no. 2							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
0	0	0	0	A4	A2	A1	B4	B2	B1	C4	C2	C1	D4	D2	D1

bits-16/13 Spare bits set to 0

bits-12/1 Mode-3/A reply in octal

representation

Encoding Rule : This item is optional.

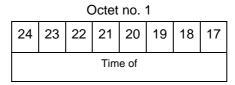
5.2.8 Data Item I021/071, Time of Applicability for Position

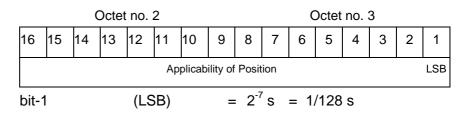
Definition: Time of applicability of the reported position, in the form of elapsed

time since last midnight, expressed as UTC.

Format : Three-Octet fixed length data item.

Structure:





Encoding Rule:

This Item is optional.

Either item I021/071 or item I021/073 shall be available in a category 021 report conveying position information.

NOTE - The time of applicability value is reset to zero at every midnight.

NOTE - The time of applicability indicates the exact time at which the position transmitted in the target report is valid.

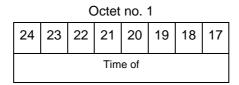
5.2.9 Data Item I021/072, Time of Applicability for Velocity

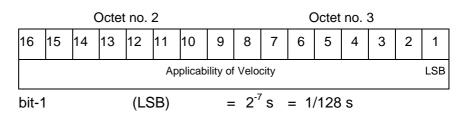
Definition: Time of applicability (measurement) of the reported velocity, in the

form of elapsed time since last midnight, expressed as UTC.

Format : Three-Octet fixed length data item.

Structure:





Encoding Rule:

This Item is optional.

Either item 1021/072 or item 1021/075 shall be available in a category 021 report conveying velocity information.

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

NOTE - The time of applicability indicates the exact time at which the velocity information transmitted in the target report is valid.

NOTE - This item will not be available in some ADS-B technologies.

5.2.10 Data Item I021/073, Time of Message Reception for Position

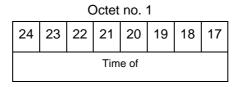
Definition: Time of reception of the latest position squitter in the Ground

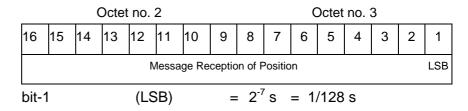
Station, in the form of elapsed time since last midnight, expressed

as UTC.

Format : Three-Octet fixed length data item.

Structure:





Encoding Rule:

This Item is optional.

Either item I021/071 or item I021/073 shall be available in a category 021 report conveying position information.

NOTE - The time of message reception value is reset to zero at every midnight.

5.2.11 Data Item I021/074, Time of Message Reception of Position-High Precision

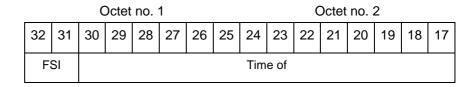
Definition: Time at which the latest ADS-B position information was received

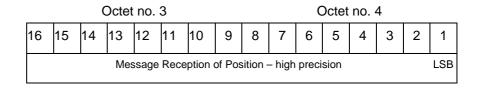
by the ground station, expressed as fraction of the second of the

UTC Time.

Format : Four-Octet fixed length data item.

Structure:





Bits 32 - 31 (FSI) Full Second Indication

Bits 32-31	Meaning
11	Reserved
10	TOMRp whole seconds =
	(I021/073) Whole seconds – 1
01	TOMRp whole seconds =
	(I021/073) Whole seconds + 1
00	TOMRp whole seconds =
	(I021/073) Whole seconds

Bit 30 - 1 Fractional part of the time of message reception for position in the ground station.

Bit 1 (LSB) = 2^{-30} s ≈ 0.9313 ns

Encoding Rule:

This Item is optional.

It shall only be transmitted together with item I021/073 "Time of Message Reception of Position".

5.2.12 Data Item I021/075, Time of Message Reception for Velocity

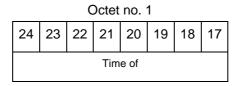
Definition: Time of reception of the latest velocity squitter in the Ground

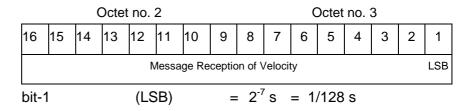
Station, in the form of elapsed time since last midnight, expressed

as UTC.

Format : Three-Octet fixed length data item.

Structure:





Encoding Rule:

This Item is optional.

Either item I021/072 or item I021/075 shall be available in a category 021 report conveying velocity information.

NOTE - The time of message reception value is reset to zero at every midnight.

5.2.13 Data Item I021/076, Time of Message Reception of Velocity-High Precision

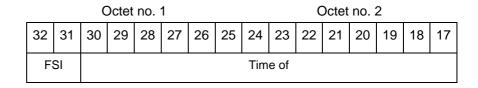
Definition: Time at which the latest ADS-B velocity information was received

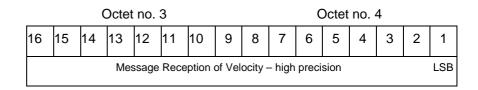
by the ground station, expressed as fraction of the second of the

UTC Time.

Format : Four-Octet fixed length data item.

Structure:





Bits 32 - 31 (FSI) Full Second Indication

Bits 32-31	Meaning
11	Reserved
10	TOMRv whole seconds =
	(I021/075) Whole seconds – 1
01	TOMRv whole seconds =
	(I021/075) Whole seconds + 1
00	TOMRv whole seconds =
	(I021/075) Whole seconds

Bit 30 - 1 Fractional part of the time of message reception for velocity in the ground station.

Bit 1 (LSB) = 2^{-30} s ≈ 0.9313 ns

Encoding Rule:

This Item is optional.

It shall only be transmitted together with item I021/075 "Time of Message Reception of Velocity".

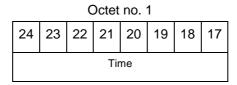
5.2.14 Data Item I021/077, Time of ASTERIX Report Transmission

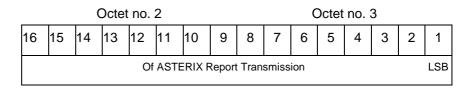
Definition: Time of the transmission of the ASTERIX category 021 report in

the form of elapsed time since last midnight, expressed as UTC.

Format : Three-Octet fixed length data item.

Structure:





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

Encoding Rule:

This Item is optional.

NOTE - The time of ASTERIX report transmission value is reset to zero at every midnight.

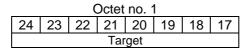
5.2.15 Data Item I021/080, Target Address

Definition: Target address (emitter identifier) assigned uniquely to each

target.

Format: Three-octet fixed length Data Item.

Structure:



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

bits-24/1 24-Bits address, A23 to A0

Encoding Rule:

This Item shall be present in every ASTERIX record.

5.2.16 Data Item I021/090, Quality Indicators

Definition: ADS-B quality indicators transmitted by a/c according to MOPS

version.

Format: Variable Length Data Item, comprising a primary subfield of one-

octet, followed by one-octet extents as necessary.

Structure of Primary Subfield:

	Octet no. 1										
8	7	6	5	4	3	2	1				
NU	Cr or N	IACv	N	IUC _p	or NI	<u> </u>	FX				

Bits-8/6: "Navigation Uncertainty Category for velocity" NUCr or the "Navigation Accuracy Category for Velocity" NACv

Bits-5/2: "Navigation Uncertainty Category for Position" NUCp or "Navigation Integrity Category "NIC".

Bit-1 (FX) Field Extension

= 0end of data item

extension into first extent

Structure of first extent : Navigation Accuracy Category for Position.

Octet no. 1											
8	7	6	5	4	3	2	1				
NIC_{BARO}	S	IL		NA	C_{p}		FX				

"Navigation Integrity Category for Barometric Altitude" Bit-8:

Bits-7/6: "Surveillance Integrity Level"

Bits-5/2: "Navigation Accuracy Category for Position"

Bit-1 (FX) Field Extension

= 0end of data item

= 1 extension into next extent

Encoding Rule:

This item shall be present in every ASTERIX record.

NOTE -All accuracy values are described in the ADS-B MASPS DO-242A [Ref.4].

5.2.17 Data Item I021/110, Trajectory Intent

Definition: Reports indicating the 4D intended trajectory of the aircraft.

Format: Compound Data Item, comprising a primary subfield of one octet,

followed by the indicated subfields.

Structure of

Primary Subfields:

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

bit-8 (TIS) **Trajectory Intent Status** = 0Absence of Subfield #1 = 1 Presence of Subfield #1 bit-7 (TID) Trajectory Intent Data = 0Absence of Subfield #2 = 1 Presence of Subfield #2 bit-6/2 Spare bits set to 0 bit-1 (FX) Field Extension = 0End of Data Item = 1 Extension into next extent

Structure of I021/110 - Subfield #1:

Trajectory Intent Status

	8	7	6	5	4	3	2	1	
	NAV	NVB	0	0	0	0	0	FX	
bit	-8			(NA	AV)		=		Trajectory Intent Data is available for this aircraft Trajectory Intent Data is not available for this aircraft
bit	-7			(N\	/B)		=		Trajectory Intent Data is valid Trajectory Intent Data is not valid

bits-6/2 Spare bits set to zero

Octet no. 1

bit-1 (FX) Field Extension

= 0 End of Data Item

= 1 Extension into next extent

Structure of I021/110 - Subfield #2:

Trajectory Intent Data

Format:

Repetitive Data Item starting with a one-octet Field Repetition Indicator (REP) followed by at least one Trajectory Intent Point comprising fifteen octets.

		(Octet	no.	1										
128	127					122	121								
1-0			RE		0										
			Octet		2										
400	440			_		444	440								
-		118				114	113								
TCA	NC			CP n		er									
	1	(Octet	no.	3	ı	1		1	(Octet	no. 4	4	1	ı
112	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97
						А	ltitud	е							LSB
		C	Octet	no.	5					(Octet	no. (6		
96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81
					ı	Latitu	de in	WG	S - 84	1					
		(Octet	no.	7					(Octet	no. 8	8		
80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65
						l	LSB								l
			Octet	no.	9					О	ctet	no. 1	0		
64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
					Lon	gitud	e in V	VGS	- 84						LSB
		0	ctet	no. 1	1					О	ctet	no. 1	2		
48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
F	Point	Туре)	Т	D	TRA	TOA				TC	ΟV			l
		0	ctet	no. 1	3					О	ctet	no. 1	4		
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
						I	TOV								LSB
		0	ctet	no. 1	5					О	ctet	no. 1	6		
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
						•	TTR								LSB

bits-128/121	(REP)	Repetition Factor
bit-120	(TCA)	= 0 TCP number available= 1 TCP number not available
bit-119	(NC)	= 0 TCP compliance= 1 TCP non-compliance
bits-118/113	(TCP Number)	Trajectory Change Point number
bits-112/97	(Altitude)	Altitude in two's complement form LSB= 10ft -1500 ft <= altitude <= 150000 ft
bits-96/73	(Latitude)	In WGS.84 in two's complement. -90 <= latitude <= 90 deg. LSB = $180/2^{23}$ deg. = approx.2.145767*10 ⁻⁰⁵ deg.
bits-72/49	(Longitude)	In WGS.84 in two's complement. -180 <= longitude < 180 LSB = $180/2^{23}$ deg. = approx.2.145767*10 ⁻⁰⁵ deg.
bits-48/45	Point Type	 Unknown Fly by waypoint (LT) Fly over waypoint (LT) Hold pattern (LT) Hold pattern (LT) Procedure hold (LT) Procedure turn (LT) RF leg (LT) Top of climb (VT) Top of descent (VT) Start of level (VT) Cross-over altitude (VT) Transition altitude (VT)
bits-44/43	(TD)	= 00 N/A = 01 Turn right = 10 Turn left = 11 No turn
bit-42	(TRA)	Turn Radius Availabilty = 0 TTR not available = 1 TTR available
bit-41	(TOA)	= 0 TOV available= 1 TOV not available
bits-40/17	(TOV)	Time Over Point LSB = 1 second
bits-16/1	(TTR)	TCP Turn radius LSB = 0.01 Nm 0 <= TTR <= 655.35 Nm

Encoding Rule:

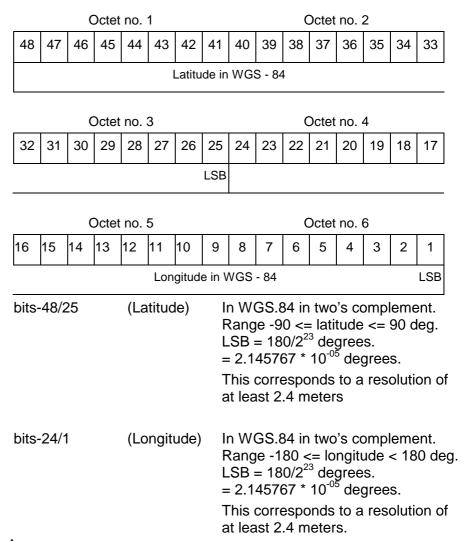
NOTES

- 1. NC is set to one when the aircraft will not fly the path described by the TCP data.
- 2. TCP numbers start from zero.
- 3. LT = Lateral Type
- 4. VT = Vertical Type
- 5. TOV gives the estimated time before reaching the point. It is defined as the absolute time from midnight.
- 6. TOV is meaningful only if TOA is set to 1.

5.2.18 Data Item I021/130, Position in WGS-84 Co-ordinates

Definition: Position in WGS-84 Co-ordinates. **Format:** Six-octet fixed length Data Item.

Structure:



Encoding Rule:

This Item is optional. If a position in WGS.84 coordinates is transmitted, either 1021/130 or 1021/131 shall be sent.

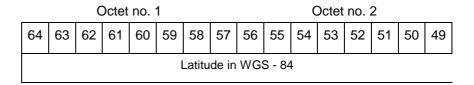
NOTE - Positive longitude indicates East. Positive latitude indicates North.

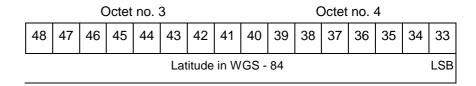
5.2.19 Data Item I021/131, High-Resolution Position in WGS-84 Co-ordinates

Definition: Position in WGS-84 Co-ordinates in high resolution.

Format: Eight-octet fixed length Data Item.

Structure:





		(Octet	no.	5					(Octet	no.	6		
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
	1	I			L	ongit	ude ii	n WG	SS - 8	4		I			

		(Octe	t no.	7					(Octet	no.	8		
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Longitude in WGS - 84												LSB			

bits-64/33 (Latitude) In WGS.84 in two's complement.

Range -90 <= latitude <= 90 deg. LSB = $180/2^{30}$ degrees. = $1.6764 * 10^{-07}$ degrees.

This corresponds to a resolution of

at least 2 centimeters.

(Longitude) bits-32/1 In WGS.84 in two's complement.

Range -180 <= longitude < 180 deg. LSB = $180/2^{30}$ degrees = $1.6764 * 10^{-07}$ degrees.

This corresponds to a resolution of

at least 2 centimeters.

Encoding Rule:

This Item is optional. If a position in WGS.84 coordinates is transmitted, either 1021/130 or 1021/131 shall be sent.

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

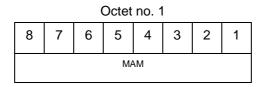
5.2.20 Data Item I021/132, Message Amplitude

Definition: Amplitude, in dBm, of ADS-B messages received by the ground

station, coded in two's complement.

Format : One-Octet fixed length data item.

Structure:



bits-8/1 (MAM) Message Amplitude LSB = 1 dBm

NOTE - The value gives the amplitude of the latest received squitter.

Encoding Rule:

This Item is optional.

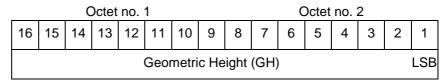
5.2.21 Data Item I021/140, Geometric Height

Definition: Minimum height from a plane tangent to the earth's ellipsoid,

defined by WGS-84, in two's complement form.

Format : Two-Octet fixed length data item.

Structure:



Encoding Rule:

This Item is optional.

NOTES

- 1. LSB is required to be less than 10 ft by ICAO.
- 2. A value of '0111111111111111' indicates that the aircraft transmits a "greater than" indication.

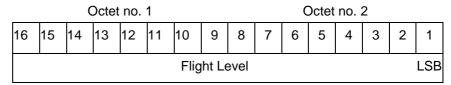
5.2.22 Data Item I021/145, Flight Level

Definition: Flight Level from barometric measurements, not QNH corrected,

in two's complement form.

Format : Two-Octet fixed length data item.

Structure:



bit 16/1

-15 FL <= Flight Level <= 1500 FL (LSB) = 1/4 FL

Encoding Rule:

This Item is optional.

5.2.23 Data Item I021/146, Intermediate State Selected Altitude

Definition: The short-term vertical intent as described by either the FMS

selected altitude, the Altitude Control Panel Selected Altitude, or the current aircraft altitude according to the aircraft's mode of

flight.

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
SAS	S So	urce						Altit	ude	•			•	•	LSB
bit-	16			(S/	AS)		=	1 0 p	lo so provi	ourc ded	ability e inf	orm			led
bit-	15/1	4		(Sc	ourc	e)	=	00		Unl	knov	vn			
							=	: 01			craft tude		ude	(Но	lding
							=	: 10			U/M tude		Sele	cted	
							=	: 11		FM	S Se	elect	ed A	Altitu	de
bits	i- 13/	/1		(Al	titud	e)	L	SB=	25ft		o's c	·			

Encoding Rule:

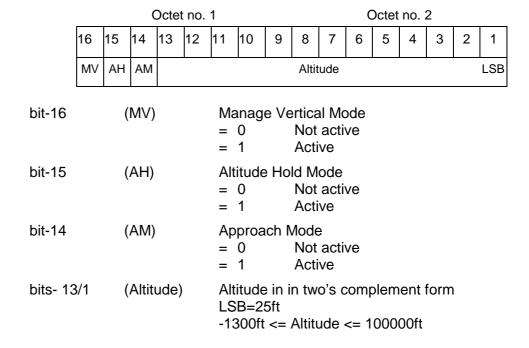
5.2.24 Data Item I021/148, Final State Selected Altitude

Definition: The vertical intent value that corresponds with the ATC cleared

altitude, as derived from the Altitude Control Panel (FCU/MCP).

Format : Two-Octet fixed length data item.

Structure:



Encoding Rule:

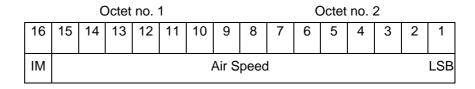
NOTE - This item will not be transmitted for the technology "1090 MHz Extended Squitter".

5.2.25 Data Item I021/150, Air Speed

Definition: Calculated Air Speed (Element of Air Vector).

Format : Two-Octet fixed length data item.

Structure:



bits-15/1 Air Speed (IAS or Mach) if IAS, LSB =
$$2^{-14}$$
 NM/s if Mach, LSB = 0.001

Encoding Rule:

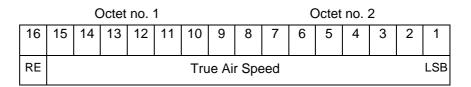
This Item is optional.

5.2.26 Data Item I021/151 True Airspeed

Definition: True Air Speed.

Format : Two-Octet fixed length data item.

Structure:



bit-16 (RE) "Range Exceeded" Indicator

= 0 Value in defined range

= 1 Value exceeds defined range

bits-15/1 True Air Speed

(LSB) = 1 knot

NOTE - The RE-Bit, if set, indicates that the value to be transmitted is beyond the range defined for this specific data item and the applied technology. In this case the True Air Speed contains the maximum value that can be downloaded from the aircraft avionics and the RE-bit indicates that the actual value is greater than the value contained in the field.

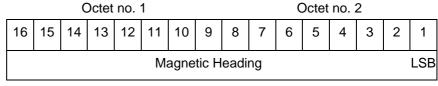
Encoding Rule:

5.2.27 Data Item I021/152, Magnetic Heading

Definition: Magnetic Heading (Element of Air Vector).

Format : Two-Octet fixed length data item.

Structure:



bits-16/1 Magnetic Heading

(LSB) = $360^{\circ}/2^{16}$ (approx. 0.0055)

Encoding Rule:

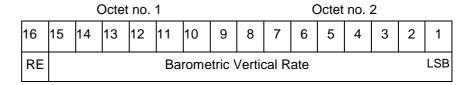
This Item is optional.

5.2.28 Data Item I021/155, Barometric Vertical Rate

Definition: Barometric Vertical Rate, in two's complement form.

Format: Two-Octet fixed length data item.

Structure:



bit-16 (RE) "Range Exceeded" Indicator

= 0 Value in defined range

= 1 Value exceeds defined range

bits-15/1 Barometric Vertical Rate

(LSB) = 6.25 feet/minute

NOTE - The RE-Bit, if set, indicates that the value to be transmitted is beyond the range defined for this specific data item and the applied technology. In this case the Barometric Vertical Rate contains the maximum value that can be downloaded from the aircraft avionics and the RE-bit indicates that the actual value is greater than the value contained in the field.

Encoding Rule:

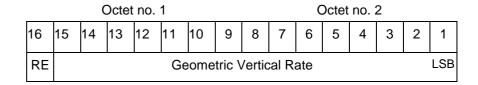
5.2.29 Data Item I021/157, Geometric Vertical Rate

Definition: Geometric Vertical Rate, in two's complement form, with reference

to WGS-84.

Format : Two-Octet fixed length data item.

Structure:



bit-16 (RE) "Range Exceeded" Indicator

= 0 Value in defined range

= 1 Value exceeds defined range

bits-15/1 Geometric Vertical Rate

(LSB) = 6.25 feet/minute

NOTE - The RE-Bit, if set, indicates that the value to be transmitted is beyond the range defined for this specific data item and the applied technology. In this case the Geometric Vertical Rate contains the maximum value that can be downloaded from the aircraft avionics and the RE-bit indicates that the actual value is greater than the value contained in the field.

Encoding Rule:

This Item is optional.

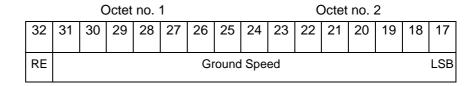
Edition: 1.8 Released Issue Page 37

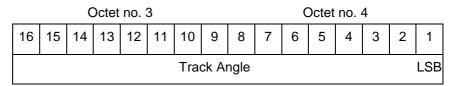
5.2.30 Data Item I021/160, Ground Vector

Definition: Ground Speed and Track Angle elements of Ground Vector.

Format : Four-Octet fixed length data item.

Structure:





bit-16 (RE) "Range Exceeded" Indicator

= 0 Value in defined range

= 1 Value exceeds defined range

bits-31/17 Ground Speed referenced to WGS-84

(LSB) = 2^{-14} NM/s $\cong 0.22$ kt $0 \le$ Ground Speed < 2 NM/s

bits-16/1 Track Angle clockwise reference to "True North"

(LSB) = $360^{\circ}/2^{16}$ (approx. 0.0055°)

NOTE - The RE-Bit, if set, indicates that the value to be transmitted is beyond the range defined for this specific data item and the applied technology. In this case the Ground Speed contains the maximum value that can be downloaded from the aircraft avionics and the RE-bit indicates that the actual value is greater than the value contained in the field.

Encoding Rule:

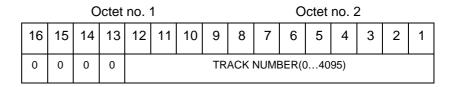
5.2.31 Data Item I021/161, Track Number

Definition: An integer value representing a unique reference to a track

record within a particular track file.

Format: Two-octet fixed length Data Item.

Structure:



bits-16/13 Spare bits set to zero bits-12/1 Track number

Encoding Rule: This item is optional.

5.2.32 Data Item I021/165, Track Angle Rate

Definition: Rate of Turn, in two's complement form.

Format : 2-Byte 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
0	0	0	0	0	0	TAR								LSB	

bits-16/11 Spare bits set to zero

bits-10/1 (TAR) Track Angle Rate

(LSB) = 1/32 %Maximum value = 16 %s

Encoding Rule:

This Item is optional.

NOTES

- 1. A positive value represents a right turn, whereas a negative value represents a left turn.
- 2. "Maximum value" means Maximum value or above.
- 3. This item will not be transmitted for the technology "1090 MHz Extended Squitter".

5.2.33 Data Item I021/170, Target Identification

Definition: Target (aircraft or vehicle) identification in 8 characters, as

reported by the target.

Format: Six-octet fixed length Data Item.

Structure:

			Octe	t no.	1						Octe	t no.	2		
48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
	Character 1								acte	r 2			С	hara	cter 3

			Octe	t no.	3						Octe	et no.	4		
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
	Character 4									Char	acte	r 5			

			Octet	no.	5						Octe	t no.	. 6		
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Cha	racte	er 6			(Chara	acter	7				Cha	racte	r 8	

bits-48/1

Characters 1-8 (coded on 6 Bits each) defining target identification when flight plan is available or the registration marking when no flight plan is available. Coding rules are provided in [6] Section 3.1.2.9.1.2 and Table 3-9.

Encoding Rule:

5.2.34 Data Item I021/200, Target Status

Definition: Status of the target

Format: One-octet fixed length Data Item

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
0	0	0		PS		Ø	8

bits-8/6 Spare bits set to zero

bits-5/3 (PS) Priority Status

= 0 No emergency / not reported

= 1 General emergency

= 2 Lifeguard / medical emergency

= 3 Minimum fuel

= 4 No communications

= 5 Unlawful interference

= 6 "Downed" Aircraft

bits-2/1 (SS) Surveillance Status

= 0 No condition reported

= 1 Permanent Alert (Emergency condition)

= 2 Temporary Alert (change in Mode 3/A Code other than emergency)

= 3 SPI set

Encoding Rule:

5.2.35 Data Item I021/210, MOPS Version

Definition: Identification of the MOPS version used by a/c to supply ADS-B information.

Format: One-octet fixed length Data Item

Structure:

		Oc	tet r	าด. 1			
8	7	6	5	4	3	2	1
0	VNS		VN			LTT	

Bit-8 Spare bit set to 0

Bit-7 (VNS): Version Not Supported

= 0 The MOPS Version is supported by the GS
 = 1 The MOPS Version is not supported by the

GS

Bits-6/4 (VN): Version Number

This sub-field shall contain a value describing the MOPS used by each aircraft. Currently defined:

= 0 DO-260 [Ref. 8] = 1 DO-260A [Ref. 9]

Bits-3/1 (LTT): Link Technology Type

= 0 Other = 1 UAT

= 2 1090 ES

= 3 VDL 4

= 4-7 Not assigned

NOTE - Bit 7 (VNS) when set to 1 indicates that the aircraft transmits a MOPS Version indication that is not supported by the Ground Station. However, since MOPS versions are supposed to be backwards compatible, the GS has attempted to interpret the message and achieved a credible result. The fact that the MOPS version received is not supported by the GS is submitted as additional information to subsequent processing systems.

Encoding Rule:

5.2.36 Data Item I021/220, Met Information

Definition: Meteorological information.

Format: Compound data item consisting of a one byte primary sub-field,

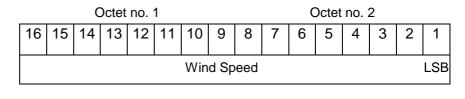
followed by up to four fixed length data fields.

Structure of **Primary Subfield:**

Octet no. 1												
8	7	6	5	4	3	2	1					
WS	WD	TMP	TRB	0	0	0	FX					

bit-8	(WS)	= 0 = 1	Wind Speed Absence of Subfield #1 Presence of Subfield #1
bit-7	(WD)	= 0 = 1	Wind Direction Absence of Subfield #2 Presence of Subfield #2
bit-6	(TMP)	= 0 = 1	Temperature Absence of Subfield #3 Presence of Subfield #3
bit-5	(TRB)	= 0 = 1	Turbulence Absence of Subfield #4 Presence of Subfield #4
bits-4/2		Spare	bits set to zero
bit-1	FX	Extens = 0	sion indicator no extension

Structure of I021/220 - Subfield #1: Wind Speed

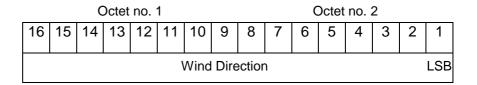


extension

bits-8/1 Wind Speed

(LSB) = 1 knot
0 <= Wind Speed <= 300

Structure of I021/220 - Subfield #2: Wind Direction

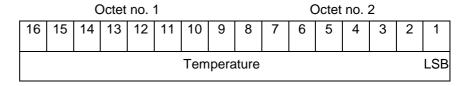


bits-16/1 Wind Direction

(LSB) = 1 degree

1 <= Wind Direction <= 360

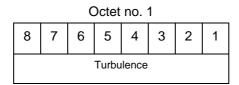
Structure of I021/220 - Subfield #3: Temperature



bits-16/1 Temperature in degrees celsius, in two's complement form

(LSB) = $0.25 \, \text{C}$ -100 $\, \text{C} <= \text{Temperature} <= 100 \, \text{C}$

Structure of I021/220 - Subfield #4: Turbulence



bits-8/1 Turbulence

Integer between 0 and 15 inclusive

Encoding Rule:

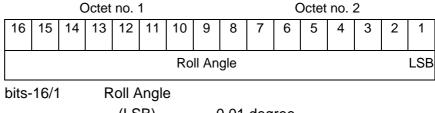
5.2.37 Data Item I021/230, Roll Angle

Definition: The roll angle, in two's complement form, of an aircraft executing a

turn.

Format : A two byte fixed length data item.

Structure:



(LSB) = 0.01 degree -180 <= Roll Angle <= 180

NOTE - Negative Value indicates "Left Wing Down".

NOTE - Resolution provided by the technology "1090 MHz Extended Squitter"

is 1 degree.

Encoding Rule:

5.2.38 Data Item I021/250, Mode S MB Data

Definition: Mode S Comm B data as extracted from the aircraft

transponder.

Format: Repetitive Data Item starting with a one-octet Field Repetition

Indicator (REP) followed by at least one BDS message comprising one seven octet BDS register and one octet BDS

code.

Structure:

Octet no. 1											
72	71	70	69	68	67	66	65				
REI	Ρ			•	•	•					

	Octet no. 2									Octet no. 3						
64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	
MSB MB																

			Octe	t no.	4				Octet no. 5						
48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
	DATA														

			Octe	t no.	6				Octet no. 7						
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

			Octe	t no.	8						Oct	et no	. 9		
16 15 14 13 12 11 10 9									7	6	5	4	3	2	1
					BDS	31			BD	S2					

bits-72/65	(REP)	Repetition factor
bits-64/9	(MB Data)	56-bit message conveying Mode S Comm B message data
bits-8/5	(BDS1)	Comm B Data Buffer Store 1 Address
bits-4/1	(BDS2)	Comm B Data Buffer Store 2 Address

Encoding Rule:

This item shall be present in every ASTERIX record provided BDS data has been extracted in the last reporting period.

NOTES

- 1. For the transmission of BDS20, item 170 **should be** used.
- 2. For the transmission of BDS30, item 260 is used.

5.2.39 Data Item I021/260, ACAS Resolution Advisory Report

Definition: Currently active Resolution Advisory (RA), if any, generated by the

ACAS associated with the transponder transmitting the RA

message and threat identity data.

Format: Seven-octet fixed length Data Item.

Structure:

Octet no. 1						Octet no. 2							
56 55 54	53	52	51	50	49	48	47	46	45	44	43	42	41
Octet no. 3						Oct	et no	4					
40 39 38	37	36	35	34	33	32	31	30	29	28	27	26	25
					P	RA							
Octet no. 5						Oct	et no	. 6					
24 23 22	21	20	19	18	17	16	15	14	13	12	11	10	9
						Oct	et 7						
						8	7	6	5	4	3	2	1
bits-56/1	(A	NRA)							onve				e e
						AC	AS R	Resou	ulutio	n Adv	visory	/.	

Encoding Rule:

This item shall be present when a Resolution Advisory is active.

NOTES

1. Refer to ICAO SARPs for ACAS for detailed explanations [Ref. 10].

5.2.40 Data Item I021/271, Surface Capabilities and Characteristics

Definition: Operational capabilities of the aircraft while on the ground.

Format: Variable Length Data Item, comprising a primary subfield of one-octet,

followed by an one-octet extents if necessary.

Structure of Primary Subfield: Surface Capabilites

	Octet no. 1											
8	7	6	5	4	3	2	1					
	-					_	-					
0	0	POA	CDTI/	B2	RAS	IDENT	FX					
			S	low								

bits-8/7		Spare bits set to zero
bit-6	(POA)	Position Offset Applied = 0 Position transmitted is not ADS-B position reference point = 1 Position transmitted is the ADS-B position reference point
bit-5	(CDTI/S)	Cockpit Display of Traffic Information Surface = 0 CDTI not operational = 1 CDTI operational
bit-4	(B2 low)	Class B2 transmit power less than 70 Watts = 0 ≥ 70 Watts = 1 < 70 Watts
bit-3	(RAS)	Receiving ATC Services = 0 Aircraft not receiving ATC-services = 1 Aircraft receiving ATC services
bit-2	(IDENT)	Setting of "IDENT"-switch = 0 IDENT switch not active = 1 IDENT switch active
bit-1	FX	Extension indicator = 0 no extension = 1 extension into first extent

Structure of I021/271 first extent: Length / Width of Aircraft

	Octet no. 1											
8	7	6	5	4	3	2	1					
0	0 0 0 0 L+W											

bits-8/5 Spare bits set to zero

bits-4/1 Length and width of the aircraft

NOTE - The length and width of the aircraft are encoded as described in the ADS-B MASPS DO-242A [Ref. 4]

Encoding Rule:

This item is optional.

NOTE - This data item is a variant of the "Extended length data field" as described in ASTERIX part1. The LSB in the first extent is not used as FX-bit.

5.2.41 Data Item I021/295, Data Ages

Definition: Ages of the data provided.

Format: Compound Data Item, comprising a primary subfield of up to five

octets, followed by the indicated subfields.

Structure of **Primary Subfield:**

	Octet no. 1											
32	31	30	29	28	27	26	25					
AOS	TRD	МЗА	QI	TI	MAM	GH	FX					
Octet no. 2												
24	23	22	21	20	19	18	17					
FL	ISA	FSA	AS	TAS	МН	BVR	FX					
		C	Octet	no.	3							
16	15	14	13	12	11	10	9					
GVR	GV	TAR	TI	TS	MET	ROA	FX					
	Octet no. 4											
8	7	6	5	4	3	2	1					
۸ D ۸	222	^	^	^	^	^	ΓV					

bit-32	(AOS)	Subfield #1: Aircraft Operational Status age = 0 Absence of Subfield #1 = 1 Presence of Subfield #1
bit-31	(TRD)	Subfield #2: Target Report Descriptor age = 0 Absence of Subfield #2 = 1 Presence of Subfield #2
bit-30	(M3A)	Subfield #3: Mode 3/A Code age = 0 Absence of Subfield #3 = 1 Presence of Subfield #3
bit-29	(QI)	Subfield #4: Quality Indicators age = 0 Absence of Subfield #4 = 1 Presence of Subfield #4
bit-28	(TI)	Subfield #5: Trajectory Intent age = 0 Absence of Subfield #5 = 1 Presence of Subfield #5
bit-27	(MAM)	Subfield #6: Message Amplitude age = 0 Absence of Subfield #6 = 1 Presence of Subfield #6
bit-26	(GH)	Subfield #7: Geometric Height age = 0 Absence of Subfield #7 = 1 Presence of Subfield #7
bit-25	FX	Extension indicator = 0 no extension = 1 extension
bit-24	(FL)	Subfield #8: Flight Level age = 0 Absence of Subfield #8 = 1 Presence of Subfield #8
bit-23	(ISA)	Subfield #9: Intermediate State Selected Altitude age = 0 Absence of Subfield #9 = 1 Presence of Subfield #9
bit-22	(FSA)	Subfield #10: Final State Selected Altitude age = 0 Absence of Subfield #10 = 1 Presence of Subfield #10
bit-21	(AS)	Subfield #11: Air Speed age = 0 Absence of Subfield #11 = 1 Presence of Subfield #11
bit-20	(TAS)	Subfield #12: True Air Speed age = 0 Absence of Subfield #12 = 1 Presence of Subfield #12
bit-19	(MH)	Subfield #13: Magnetic Heading age = 0 Absence of Subfield #13 = 1 Presence of Subfield #13
bit-18	(BVR)	Subfield #14: Barometric Vertical Rate age = 0 Absence of Subfield #14 = 1 Presence of Subfield #14
bit-17	FX	Extension indicator = 0 no extension = 1 extension

Subfield #15: Geometric Vertical Rate age = 0 Absence of Subfield #15 bit-16 (GVR)

= 0 = 1

Presence of Subfield #15

Structure of I021/295 - Subfield # 1:

Aircraft Operational Status Age

Octet no. 1

8	7	6	5	4	3	2	1	
	•		AOS	,			LSB	
bits	-8/1			(AC	OS)		ii	age of the latest received information transmitted in item 021/008.
bit-	1			(LS	B)			: 0.1 s Maximum value =25.5 s

Structure of I021/295 - Subfield # 2:

Target Report Descriptor Age

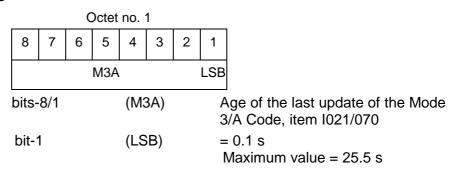
Octet no. 1 6 5 4 3 8 7 2 1 **TRD** LSB bits-8/1 (TRD) Age of the last update of the Target Report Descriptor, item 1021/040

bit-1 (LSB) = 0.1 s

Maximum value = 25.5 s

Structure of I021/295 - Subfield # 3:

Mode 3/A Age



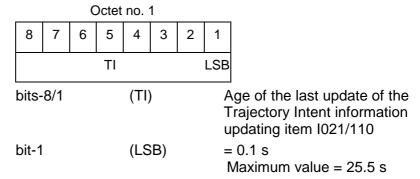
Structure of I021/295 - Subfield # 4:

Quality Indicators Age

			(Octet	no.	1			
	8	7	6	5	4	3	2	1	
				QI				LSB	
	bits-8/1 (QI)							r	age of the latest information eceived to update the Quality andicators, item I021/090
bit-1 (LSB)				B)		= 0.1 s Maximum value = 25.5 s			

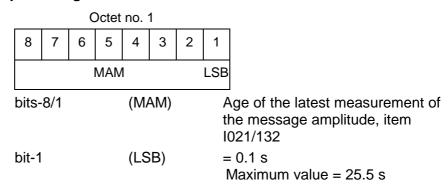
Structure of I021/295 - Subfield # 5:

Trajectory Intent Age



Structure of I021/295 - Subfield # 6:

Message Amplitude Age



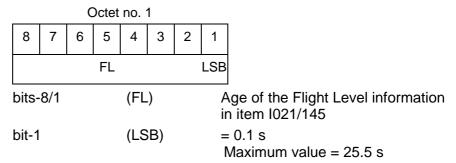
Structure of I021/295 - Subfield #7

Geometric Height Age

_	_							
		(Octet	no.	1			
8	7	6	5	4	3	2	1	
GH								
bits-	8/1			(Gł	H)			age of the information contained in em 021/140
bit-1 (LSB)				· 0.1 s Maximum value = 25.5 s				

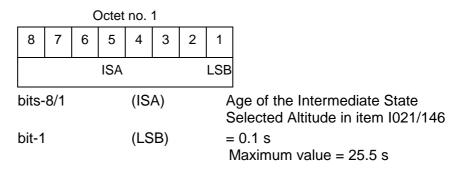
Structure of I021/295 - Subfield #8

Flight Level age



Structure of I021/295 - Subfield # 9:

Intermediate State Selected Altitude Age



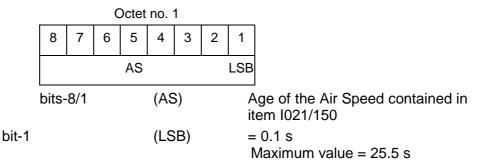
Structure of I021/295 - Subfield # 10

Final State Selected Altitude Age

		C	Octet	no.	1					
8	7	6	5	4	3	2	1			
FSA					<u> </u>	LSB				
bits-8/1 (FSA)								age of the Final State Selected		
bit-1 (LSB)					B)		= 0.1 s Maximum value = 25.5 s			

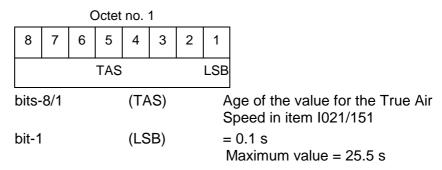
Structure of I021/295 - Subfield # 11:

Air Speed Age



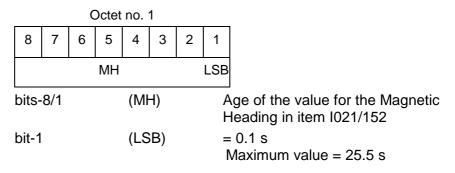
Structure of I021/295 - Subfield # 12:

True Air Speed Age



Structure of I021/295 - Subfield # 13:

Magnetic Heading Age



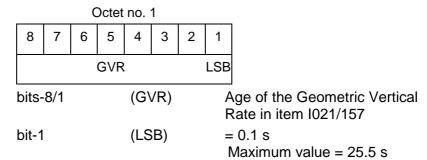
Structure of I021/295 - Subfield # 14:

Barometric Vertical Rate Age

		C	Octet	no.	1			
8	7	6	5	4	3	2	1	
	ı		BVR				LSB	
bits-8/1 (BVR)								ge of the Barometric Vertical atte contained in I021/155
bit-1 (L			(LS	B)			0.1 s ∕laximum value = 25.5 s	

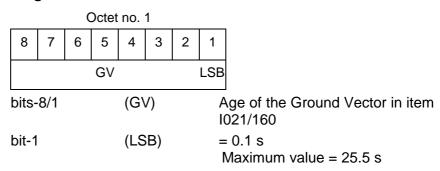
Structure of I021/295 - Subfield # 15:

Geometric Vertical Rate Age



Structure of I021/295 - Subfield # 16:

Ground Vector Age



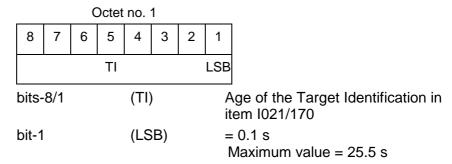
Structure of I021/295 - Subfield # 17:

Track Angle Rate Age

		(Octet	no.	1			
8	7	6	5	4	3	2	1	
TAR							LSB	
bits-8/1 (TAR)								age of item I021/165 Track Angle
bit-1 (LSB)				B)			: 0.1 s Maximum value = 25.5 s	

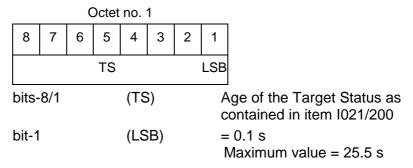
Structure of I021/295 - Subfield # 18:

Target Identification Age



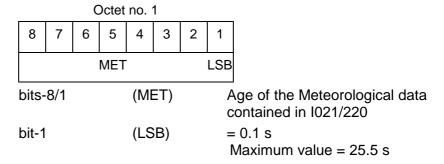
Structure of I021/295 - Subfield # 19:

Target Status Age



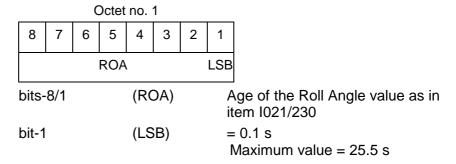
Structure of I021/295 - Subfield # 20:

Met Information Age



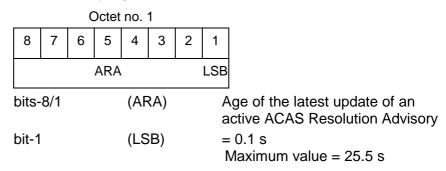
Structure of I021/295 - Subfield # 21:

Roll Angle Age



Structure of I021/295 - Subfield # 22:

ACAS Resolution Advisory Age



Structure of I021/295 - Subfield # 23:

Surface Capabilities and Characteristics Age

		C	Octet	no.	1			
8	7	6	5	4	3	2	1	
SCC							LSB	
bits-8/1 (SCC)							r	age of the latest information eceived on the surface apabilities and characteristics of the respective target
bit-1 (LSB)							=	: 0.1 s Maximum value = 25.5 s

- **NOTE -** In all the subfields, the age is the time delay since the latest update received from the target.
- **NOTE** In all the subfields, the maximum value indicates "maximum value or above".

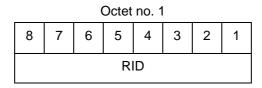
Encoding Rule:

5.2.42 Data Item I021/400, Receiver ID

Definition: Designator of Ground Station in Distributed System.

Format : One-octet fixed length Data Item.

Structure:



bits-8/1 (RID) Receiver ID

Encoding Rule:

5.3 User Application Profile for Category 021

The following User Application Profile shall be used for the transmission of ADS-B reports.

Table 2 - ADS-B Reports UAP

FRN	Data Item	Information	Length
1	1021/010	Data Source Identification	2
2	1021/040	Target Report Descriptor	2+
3	1021/161	Track Number	2
4	1021/015	Service Identification	1
5	1021/071	Time of Applicability for Position	3
6	1021/130	Position in WGS-84 co-ordinates	6
7	1021/131	Position in WGS-84 co-ordinates, high res.	8
FX	-	Field extension indicator	-
8	1021/072	Time of Applicability for Velocity	3
9	1021/150	Air Speed	2
10	1021/151	True Air Speed	2
11	1021/080	Target Address	3
12	1021/073	Time of Message Reception of Position	3
13	1021/074	Time of Message Reception of Position-High Precision	4
14	1021/075	Time of Message Reception of Velocity	3
FX	102 1/07 3	Field extension indicator	-
15		Time of Message Reception of Velocity-High	4
13	1021/076	Precision	_
16	1021/140	Geometric Height	2
17	1021/090	Quality Indicators	1+
18	1021/210	MOPS Version	1
19	1021/070	Mode 3/A Code	2
20	1021/230	Roll Angle	2
21	1021/145	Flight Level	2
FX	-	Field extension indicator	-
22	1021/152	Magnetic Heading	2
23	1021/200	Target Status	1
24	1021/155	Barometric Vertical Rate	2
25	1021/157	Geometric Vertical Rate	2
26	1021/160	Ground Vector	4
27	1021/165	Track Angle Rate	2
28	1021/077	Time of Report Transmission	3
FX	-	Field extension indicator	-

Edition: 1.8 Released Issue Page 61

FRN	Data Item	Information	Length
29	1021/170	Target Identification	6
30	1021/020	Emitter Category	1
31	1021/220	Met Information	1+
32	1021/146	Intermediate State Selected Altitude	2
33	1021/148	Final State Selected Altitude	2
34	1021/110	Trajectory Intent	1+
35	1021/016	Service Management	1
FX	-	Field extension indicator	-
36	1021/008	Aircraft Operational Status	1
37	1021/271	Surface Capabilities and Characteristics	1+
38	1021/132	Message Amplitude	1
39	1021/250	Mode S MB Data	1+N*8
40	1021/260	ACAS Resolution Advisory Report	7
41	1021/400	Receiver ID	1
42	1021/295	Data Ages	1+
FX	-	Field extension indicator	-
43	-	Not Used	-
44	-	Not Used	-
45	-	Not Used	-
46	-	Not Used	-
47	-	Not Used	-
48	RE	Reserved Expansion Field	1+
49	SP	Special Purpose Field	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.