EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

EUROCONTROL

ASTERIX Part 12
Category 021
Appendix A
Coding rules for "Reserved Expansion Field"

SUR.ET1.ST05.2000-STD-12-02

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EUROPEAN AIR TRAFFIC MANAGEMENT

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

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EXECUTIVE SUMMARY

1. INTRODUCTION

1.1 Scope

This document describes the way to encode information in the Reserved Expansion Field of ASTERIX Cat 021 (ADS-B Target Reports).

2. DESCRIPTION OF THE CONTENT OF RESERVED EXPANSION FIELD

2.1 Length Indicator

Definition : This field indicates the total length in octets of the Reserved Expansion Field (including the REF length indicator itself)

Format : One-octet fixed length Data Item

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
LEN							

bits 8-1	(LEN)	Length of REF in octets, including the Length Indicator itself.

Encoding Rule :

This item shall be present in every REF

2.2 Items indicator

Definition : This field indicates what are the items encoded in the REF
Format : One-octet fixed length Data Item
Structure:

Octet no. 1

8	7	6	5	4	3	2	1
BPS	SelH	NAV	GAO	SGV	STA	TNH	0

bit 8	(BPS)	= 0	Barometric Pressure Setting is not present in the REF
		= 1	Barometric Pressure Setting is present in the REF
bit 7	(SelH)	= 0	Selected Heading is not present in the REF
		= 1	Selected Heading is present in the REF
bit 6	(NAV)	= 0	Navigation Mode is not present in the REF
		= 1	Navigation Mode is present in the REF
bit 5	(GAO)	= 0	GPS Antenna Offset is not present in the REF
		= 1	GPS Antenna Offset is present in the REF
bit 4	(SGV)	= 0	Surface Ground Vector is not present in the REF
		= 1	Surface Ground Vector is present in the REF
bit 3	(STA)	= 0	Aircraft Status Information is not present in the REF
		= 1	Aircraft Status Information is present in the REF
bit 2	(TNH)	= 0	True North Heading is not present in the REF
		= 1	True North Heading is present in the REF
bits 1	Spare bit set to 0		

Encoding Rule :
This item shall be present in every REF

2.3 Barometric Pressure Setting ‘BPS’

Definition: Barometric Pressure Setting

Format: 2-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
0	0	0	0	BPS											LSB

bits-16/13		Spare bits, set to “0”
bits-12/1	(BPS)	Barometric Pressure Setting LSB = 0.1 millibars 0mb ≤ BPS ≤ 409.5 mb

NOTE - BPS is the barometric pressure setting of the aircraft minus 800 mb.

NOTE - A value of “0” indicates that in the aircraft a value of 800mb or less has been selected.

NOTE - A value of “409.5” indicates that in the aircraft a value of 1209.5mb or more has been selected.

Encoding Rule : This item is optional

2.4 Selected Heading ‘SelH’

Definition: Selected Heading

Format: 2-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
0	0	0	0	HRD	Stat	SelH									LSB

bits-16/13		Spare bits, set to “0”
bit-12	(HRD)	Horizontal Reference Direction 0 = True North 1 = Magnetic North
bit-11	(Stat)	Selected Heading Status 0 = Data is either unavailable or invalid. 1 = Data is available and valid.
bits-10/1	(SelH)	Selected Heading LSB = 0.703125

NOTE: On many aircraft, the ADS-B Transmitting Subsystem receives Selected Heading from a Mode Control Panel / Flight Control Unit (MCP / FCU). Users of this data are cautioned that the Selected Heading value transmitted by the ADS-B Transmitting Subsystem does not necessarily reflect the true intention of the airplane during certain flight modes (e.g., during LNAV mode).

Encoding Rule : This item is optional

2.5 Navigation Mode ‘NAV’

Definition: Navigation Mode Settings

Format: 1-Octet fixed length data item.

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
AP	VN	AH	AM	0	0	0	0

bit-8	(AP)	=1	Autopilot engaged
bit-7	(VN)	=1	VNAV Active (Vertical Navigation)
bit-6	(AH)	=1	Altitude Hold engaged
bit-5	(AM)	=1	Approach Mode active

NOTE: This data-item should only be transmitted if an ADS-B indication has been received that the mode bits have been “actively populated”.by the avionics (1090 ES version 2 (as defined in I021/210) BDS 6,2, subtype 1, bit 47: “Status of MCP / FCU Mode Bits”)

Encoding Rule : This item is optional

2.6 GPS Antenna Offset 'GAO'

Definition: GPS Antenna Offset

Format: 1-Octet fixed length data item.

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
GAO							

bits-8/1 (GAO) GPS Antenna Offset

NOTE: The value of this field is copied from the respective bits 33-40 of version 2 (as defined in I021/210) of 1090 ES BDS register 6,5 (Aircraft Operational Status)

Encoding Rule : This item is optional

2.7 Surface Ground Vector ‘SGV’

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

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

Structure of Primary Subfield

Octet no. 1 Octet no. 2

24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9
STP	HTS	HTT	HRD	GSS										LSB	FX

Octet no. 3

8	7	6	5	4	3	2	1
HGT						LSB	FX

bit-24	(STP)	= 0	Aircraft has not stopped
		= 1	Aircraft has stopped
bit-23	(HTS)	= 0	Heading/Ground Track data is not valid
		= 1	Heading/Ground Track data is valid
bit-22	(HTT)	= 0	Heading data provided
		= 1	Ground Track provided
bit-21	(HRD)	= 0	True North
		= 1	Magnetic North
bits-20/10	(GSS)		Ground speed
			LSB = 0.125 kts
bit-9	FX-bit	= 0	End of Data Item
		= 1	Extension into first extension
bits-8/2	(HGT)		Heading/Ground Track information
			LSB: 2.8125 degrees
bit-1	FX-bit	= 0	End of Data Item
		= 1	Extension into fourth subfield

Encoding Rule : This item is optional

2.8 Aircraft Status ‘STA’

Definition: This item contains flags to convey information on the status of a target.

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
ES	UAT	0	0	0	0	0	FX

bit-8	(ES)	= 0	Target is not 1090 ES IN capable
		= 1	Target is 1090 ES IN capable
bit-7	(UAT)	= 0	Target is not UAT IN capable
		= 1	Target is UAT IN capable
bits-6/2	spare		Spare bits set to 0
bit-1	FX-bit	= 0	End of Data Item
		= 1	Extension into second subfield

Encoding Rule : This item is optional

2.9 True North Heading ‘TNH’

Definition: True North Heading (Element of Air Vector).

Format: Two-Octet fixed length data item.

Structure of Primary Subfield

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

bits-16/1 Magnetic Heading

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

NOTE - Magnetic Heading is defined in I021/152.

Encoding Rule : This item is optional