# EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION



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

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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.

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#### **TABLE OF CONTENTS**

DOC	UMENT IDENTIFICATION SHEETii	İ
DOC	UMENT APPROVALiii	İ
DOC	UMENT CHANGE RECORDiv	,
TABL	LE OF CONTENTSv	,
EXEC	CUTIVE SUMMARY1	
1.	INTRODUCTION	2
1.1	Scope	. 2
2.	DESCRIPTION OF THE CONTENT OF RESERVED EXPANSION FIELD	3
2.1	Length Indicator	. 3
2.2	Items indicator	. 4
2.3	Barometric Pressure Setting 'BPS'	. 5
2.4	Selected Heading 'SelH'	6
2.5	Navigation Mode 'NAV'	. 7
2.6	GPS Antenna Offset 'GAO'	8
2.7	Surface Ground Vector 'SGV'	9
2.8	Aircraft Status 'STA'	10
2.9	True North Heading 'TNH'	11

#### **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											
			LE	EN								

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:

$\sim$	ctet		4
	$T\Delta T$	rw	

BPS	SelH	NAV	GAO	SGV	STA	TNH	0	
bi	it 8			(BF	PS)		= 0	Barometric Pressure Setting is not present in the REF
							= 1	Barometric Pressure Setting is present in the REF
b	it 7			(Se	elH)		= 0	Selected Heading is not present in the REF
							= 1	Selected Heading is present in the REF
b	it 6			(N	٩V)		= 0	Navigation Mode is not present in the REF
							= 1	Navigation Mode is present in the REF
b	it 5			(G	AO)		= 0	GPS Antenna Offset is not present in the REF
							= 1	GPS Antenna Offset is present in the REF
b	it 4			(SC	GV)		= 0	Surface Ground Vector is not present in the REF
							= 1	Surface Ground Vector is present in the REF
b	it 3			(S	ΓΑ)		= 0	Aircraft Status Information is not present in the REF
							= 1	Aircraft Status Information is present in the REF
b	it 2			(T)	NH)		= 0	True North Heading is not present in the REF
							= 1	True North Heading is present in the REF

Spare bit set to 0

#### **Encoding Rule:**

This item shall be present in every REF

bits 1

#### 2.3 Barometric Pressure Setting 'BPS'

**Definition**: Barometric Pressure Setting **Format**: 2-Octet fixed length data item.

Structure:

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

 $0mb \le BPS \le 409.5 mb$ 

**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.

#### 2.4 Selected Heading 'SelH'

**Definition**: Selected Heading

**Format**: 2-Octet fixed length data item.

Structure:

			Octe	t 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).

#### 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	
AΡ	٧/N	ΔН	ΔM	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

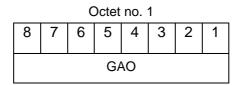
NOTE: This data-item should only be transmitted if an ADS-B indication has been received that the mode bits have been "actively populated".by the avionics (1090 ES version 2 (as defined in I021/210) BDS 6,2, subtype 1, bit 47: "Status of MCP / FCU Mode Bits")

#### 2.6 GPS Antenna Offset 'GAO'

**Definition**: GPS Antenna Offset

**Format**: 1-Octet fixed length data item.

Structure:



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)

#### 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					GS	SS					LSB	FX

Octet no. 3

8	7	6	5	4	3	2	1
	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

#### 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

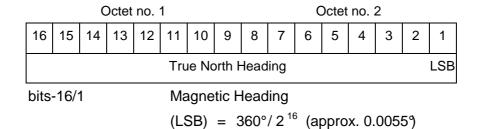
bit-8 (ES) = 0Target is not 1090 ES IN capable Target is 1090 ES IN capable = 1 bit-7 (UAT) = 0Target is not UAT IN capable = 1 Target is UAT IN capable Spare bits set to 0 bits-6/2 spare bit-1 FX-bit End of Data Item = 0Extension into second subfield = 1

#### 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**



**NOTE -** Magnetic Heading is defined in I021/152.