EUROCONTROL

EUROCONTROL Specification for Surveillance Data Exchange ASTERIX

Part 12 Category 021
ADS-B Target Reports
Appendix A: Reserved Expansion Field

Edition: 1.5
Edition date: 21 December 2021
Reference nr: EUROCONTROL-SPEC-0149-12-A

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ASTERIX Part 12

Category 21 Appendix A

Reserved Expansion Field

DOCUMENT IDENTIFIER : EUROCONTROL-SPEC-0149-12-A

Edition Number	**:**	**1.5**
Edition Date	**:**	**22/12/2021**
Status	**:**	**Released**
Intended for	**:**	**General Public**
Category	**:**	**EUROCONTROL Specification**

DOCUMENT CHARACTERISTICS

TITLE			
EUROCONTROL Specification for Surveillance Data Exchange – ASTERIX Part 12 Category 21-A: Reserved Expansion Field			
	Publications Reference:	SPEC-0149-12-A	
	ISBN Number:	978-2-87497-028-3	
Document Identifier	**Edition Number:**	1.5	
EUROCONTROL-SPEC-0149-12-A	**Edition Date:**	22/12/2021	

Abstract

This document specifies the contents of the Reserved Expansion Field of ASTERIX Category 021 messages used for the transmission of ADS-B Target Reports.

ADS-B Versions 0, 1 and 2 are covered in full by the specification. This document contains a partial implementation of ADS-B Version 3.

Keywords

Data Exchange
Data Category
ASTERIX
Messages
Data Field
UAP
SAC
Data Block
ADS-B
SIC
Data Item

Contact Person(s)	Tel	Unit
Alexander Engel	+32-2-729 3355	DECMA/PCS/SCS/STAN

STATUS, AUDIENCE AND ACCESSIBILITY

Status		Intended for		Accessible via	
Working Draft	☐	General Public	☑	Intranet	☐
Draft	☐	EUROCONTROL	☐	Extranet	☐
Proposed Issue	☐	Restricted	☐	Internet (www.eurocontrol.int)	☑
Released Issue	☑				

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 NUMBER	EDITION DATE	REASON FOR CHANGE	PAGES AFFECTED
1.0	March 2011	Creation & internal working document	All
1.1	May 2011	Alignment with SPI-IR and DO260B enhancements	All
1.2	June 2014	EUROCONTROL Specification Layout Military Extended Squitter added Editorial updates & corrections	All MES SGV / TNH
1.3	September 2015	Corrections to field MES	MES
1.4	March 2018	Document Identifier corrected	ii
1.5	December 2021	Update of Document Characteristics Reference to applicable Part 1 added Clarification in data item GAO (Reference to ED-102A). This specification contains a partial implementation of ADS-B Version 3 as defined in EUROCAE ED-102B/RTCA DO-260C in the Aircraft Status (STA) Field.	Page ii 1.1 2.6 2.8

Publications
EUROCONTROL Headquarters
96 Rue de la Fusée
B-1130 BRUSSELS

Tel: +32 (0)2 729 4715
Fax: +32 (0)2 729 5149
E-mail: publications@eurocontrol.int

TABLE OF CONTENTS

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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).

NOTE - The list of Reference Documents can be found in the core part of the Category 021 Specification.

1.2 Applicability of Part 1

This edition of the Reserved Expansion Field partially implements ADS-B Version 3 as defined in EUROCAE ED-102B/RTCA DO-260C Ref. [11]. The implementation of the respective Data Items, in particular the use of the “Element Populated” indication, follows Edition 3.1 of Part 1 of ASTERIX. Therefore Edition 3.1 of Part 1 is the applicable document for this specification.

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	MES

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
bit-1	(MES)	= 0	Military Extended Squitters is not present in the REF
		= 1	Military Extended Squitters is present in the REF

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 hPa 0 hPa ≤ BPS ≤ 409.5 hPa

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

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

NOTE - A value of “409.5” indicates that in the aircraft a value of 1209.5 hPa 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	MFM		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
bits-4/3	(MFM)	Status of MCP/FCU Mode Bits (see Notes 2,3)	
bit-4	(MFM#EP)		Element Populated Bit
		=0	Element not populated
		=1	Element populated
bit-3	(MFM#VAL)		Value
		=0	MCP/FCU Mode Bits not populated
		=1	MCP/FCU Mode Bits populated
Bits-2/1	(Spare)	Spare Bits, set to 0	

NOTE: 1: The status of the LNAV indication is contained in Data Item I021/200, bit-7. Please also consider Note 2 to Data Item I021/200.

NOTE: 2: MFM (Status of MCP/FCU Mode Bits) is contained in the Target State and Status Message (Register 62_{16}, Format Type Code 29, Subtype Code 1) as defined in EUROCAE ED-102B/RTCA DO-260C Ref. [11] chapter 2.2.3.2.7.1.3.11. If set to “1”, MFM#VAL indicates that the bits for “AP”, “VN”, “AH”, “AM” (in I021/REF/NAV) and for LNAV (in I021/200) have been actively populated.

NOTE: 3: If MFM#VAL = 0, AP, VN, AH, and AM (in I021/REF/NAV) **shall** be set to 0 and LNAV (in I021/200) **shall** be set to 1.

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
Lateral		LSB	Longitudinal				LSB
GAO							

bits-8/1	(GAO)	GPS Antenna Offset
bits-8/6	(Lateral)	Lateral axis GAO LSB = 2 meters
bits-5/1	(Longitudinal)	Longitudinal axis GAO LSB = 2 meters

NOTE: The value of this field is copied from the respective bits 33-40 of Register 65_{16} of Version 2 and Version 3 ADS-B Systems (as defined in I021/210) (Aircraft Operational Status - Surface). The detailed definition is contained in EUROCAE Document ED-102()/RTCA DO-260() Ref. [11].
Bit-8 indicates the direction of the offset with a value of 0 indicating ‘left of centerline’ and a value of 1 indicating ‘right of centerline’.

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

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
STP	HTS	HTT	HRD	GSS										LSB	FX

bit-16	(STP)	= 0	Aircraft has not stopped
		= 1	Aircraft has stopped
bit-15	(HTS)	= 0	Heading/Ground Track data is not valid
		= 1	Heading/Ground Track data is valid
bit-14	(HTT)	= 0	Heading data provided
		= 1	Ground Track provided
bit-13	(HRD)	= 0	True North
		= 1	Magnetic North
bits-12/2	(GSS)		Ground speed
			LSB = 0.125 kts
bit-1	FX-bit	= 0	End of Data Item
		= 1	Extension into first extension

Structure of First Extension

Octet no. 3

8	7	6	5	4	3	2	1
HGT						LSB	FX

bits-8/2	(HGT)		Heading/Ground Track information
			LSB: 2.8125 degrees
bit-1	FX-bit	= 0	End of Data Item
		= 1	Extension into second extension

Encoding Rule : This item is optional

2.8 Aircraft Status ‘STA’

Definition: This item contains 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	RCE			RRL		FX

bit-8	(ES)		ES IN Capability
		= 0	Target is not 1090 ES IN capable
		= 1	Target is 1090 ES IN capable
bit-7	(UAT)		UAT IN Capability
		= 0	Target is not UAT IN capable
		= 1	Target is UAT IN capable
bits-6/4	(RCE)		Reduced Capability Equipment
bit-6	(RCE#EP)		Element Populated Bit
		= 0	Element not populated
		= 1	Element populated
bits-5/4	(RCE#VAL)		Value (see Note 1)
		= 0	Not RCE
		= 1	TABS (see Note 2)
		= 2	Reserved for future use
		= 3	Other RCE
bits-3/2	(RRL)		Reply Rate Limiting
bit-3	(RRL#EP)		Element Populated Bit
		= 0	Element not populated
		= 1	Element populated
bit-2	(RRL#VAL)		Value (see Note 3)
		= 0	Reply Rate Limiting is not active
		= 1	Reply Rate Limiting is active
bit-1	(FX)		Field Extension Indicator
		= 0	end of data item
		= 1	extension into next extension

NOTES 1: The RCE information is taken from the Capability Class field in the “Aircraft Operational Status Message (Register 65_{16})” as defined in EUROCAE ED-102B/RTCA DO-260C (Chapter A.1.4.10.3 in Ref. [11]).

NOTES 2: TABS is the “Traffic Awareness Beacon System” as defined by ETSO-C199 / TSO-C199.

NOTES 3: The RRL information is contained in the Operational Mode field in the Airborne Operational Status Message, (Register 65_{16}, Bit 29).

Structure of STA - First Extension: Additional Target Characteristics

Octet no. 1

8	7	6	5	4	3	2	1
PS3				TPW			FX

bits-8/5	(PS3)	Priority Status for Version 3 ADS-B Systems	
bit-8	(PS3#EP)		Element Populated Bit
		= 0	Element not populated
		= 1	Element populated
bits-7/5	(PS3#VAL)		Value (see Notes 1, 2)
		= 0	No emergency / not reported
		= 1	General emergency
		= 2	UAS/RPAS - Lost Link
		= 3	Minimum fuel
		= 4	No communications
		= 5	Unlawful interference
		= 6	Aircraft in Distress Automatic Activation
		= 7	Aircraft in Distress Manual Activation
bits-4/2	(TPW)	Transmit Power	
bit-4	(TPW#EP)		Element Populated Bit
		= 0	Element not populated
		= 1	Element populated
bits-3/2	(TPW#VAL)		Value (see Note 3)
		= 0	Unavailable, Unknown, or less than 70 W
		= 1	70 W
		= 2	125 W
		= 3	200W
bit-1	(FX)	Field Extension Indicator = 0 end of data item = 1 extension into next extension	

NOTES 1: For ADS-B Version 3 systems as defined in EUROCAE ED-102B/RTCA DO-260C (Ref. [11]) the values have been re-defined. PS3 **shall** be used exclusively for Version 3 ADS-B systems as defined in I021/210/VN.

NOTES 2: For ADS-B systems with a version number below 3, the PS **shall** be encoded in Data Item I021/200/PS.
However, since values have been re-defined in ADS-B Version 3, mapping is required to ensure that information is not lost. This mapping **shall** be done according to the following table:

ADS-B Version 3 (PS3)	ADS-Version < 3 (I021/200 - PS)
0 (No Emergency/not reported)	0 (No Emergency/not reported)
1 (General emergency)	1 (General emergency)
2 (UAS/RPAS Lost Link)	4 (No communication)
3 (Minimum fuel)	3 (Minimum fuel)
4 (No communication)	4 (No communication)
5 (Unlawful interference)	5 (Unlawful interference)
6 (Aircraft in distress - automatic activation)	1 (General emergency)
7 (Aircraft in distress – manual activation)	1 (General emergency)

NOTES 3: TPW#VAL is defined in EUROCAE ED-102B/DO-260C Ref. [11] “Aircraft Operational Status Message (Register 65_{16})” Bits 17-18 and indicates the nearest minimum transmit power (in Watts) at the antenna port. The nearest minimum setting in this field would be rounded down from the actual design value. For example, if the avionics is designed to transmit at 100W out of the antenna port, the encoded value in this field would be for 70W (decimal 1).

Structure of STA - Second Extension: Additional Target Characteristics

Octet no. 1

8	7	6	5	4	3	2	1
TSI			MUO		RWC		FX

bits-8/6	(TSI)	Transponder Side Indication	
bit-8	(TSI#EP)		Element Populated Bit
		= 0	Element not populated
		= 1	Element populated
bits-7/6	(TSI#VAL)		Value
		= 0	Unknown
		= 1	Transponder #1 (left/pilot side or single)
		= 2	Transponder #2 (right/co-pilot side)
		= 3	Transponder #3 (auxiliary or Back-up)
bits-5/4	(MUO)	Manned / Unmanned Operation	
bit-5	(MUO#EP)		Element Populated Bit
		= 0	Element not populated
		= 1	Element populated
bit-4	(MUO#VAL)		Value (see Note 1)
		= 0	Manned Operation
		= 1	Unmanned Operation
bits-3/2	(RWC)	Remain Well Clear Corrective Alert	
bit-3	(RWC#EP)		Element Populated Bit
		= 0	Element not populated
		= 1	Element populated
bit-2	(RWC#VAL)		Value (see Note 2)
		= 0	RWC Corrective Alert not active
		= 1	RWC Corrective Alert active
bit-1	(FX)	Field Extension Indicator	
		= 0 end of data item	
		= 1 extension into next extension	

NOTES 1: This information is taken from the “Extended Squitter Aircraft Status Message” Register 61_{16} Bit 25 as defined in EUROCAE ED-102B/RTCA DO-260C Ref. [11]. It is available for Version 3 ADS-B Systems only (refer to I021/210/VN).

NOTES 2: This information is taken from the Operational Mode field in the “Aircraft Operational Status Message (Register 65_{16} Bit 40)” as defined in EUROCAE ED-102B/RTCA DO-260C (Chapter A.1.4.10.4 in Ref. [11]). This information is available for Version 3 ADS-B systems only (refer to I021/210/VN).

Structure of STA - Third Extension: Additional Target Characteristics

<table>
<tr><th colspan="8">Octet no. 1</th></tr>
<tr><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td></tr>
<tr><td colspan="3">DAA</td><td colspan="4">DF17CA</td><td>FX</td></tr>
</table>

bits-8/6	(DAA)	Detect and Avoid Capabilities	
bit-8	(DAA#EP)		Element Populated Bit
		= 0	Element not populated
		= 1	Element populated
bits-7/6	(DAA#VAL)		Value (see Notes 1, 2)
		= 0	No RWC Capability
		= 1	RWC/RA/OCM Capability
		= 2	RWC/OCM Capability
		= 3	Invalid ASTERIX Value
bits-5/2	(DF17CA)	Transponder Capability	
bit-5	(DF17CA#EP)		Element Populated Bit
		= 0	Element not populated
		= 1	Element populated
bits-4/2	(DF17CA#VAL)		Value (see Note 3)
bit-1	(FX)	Field Extension Indicator	
		= 0 end of data item	
		= 1 extension into next extension	

NOTES 1: This information is taken from the Capability Class field in the “Aircraft Operational Status Message (Register 65_{16} Bits 23-24)” as defined in EUROCAE ED-102B/RTCA DO-260C (Chapter A.1.4.10.3 in Ref. [11]). This information is available for Version 3 ADS-B systems only (refer to I021/210/VN).

NOTES 2: The meaning of the individual values in “DAA” are described in Chapter A.1.4.10.24 in EUROCAE ED-102B/RTCA DO-260C Ref. [11].

NOTES 3: CA is transmitted in Downlink Format 17 messages. CA is defined in EUROCAE ED-73F [14] chapter 3.18.4.5 and in RTCA DO-181F [14] chapter 2.2.14.4.6 where further details on the meaning of this Element are provided. Category 021 provides this Element as a “store-and-forward” capability only.

Structure of STA - Fourth Extension: Collision Avoidance Capabilities

Octet no. 1

8	7	6	5	4	3	2	1
SVH			CATC				FX

bits-8/6	(SVH)	Sense Vertical & Horizontal (see Note 1)	
bit-8	(SVH#EP)		Element Populated Bit
		= 0	Element not populated
		= 1	Element populated
bits-7/6	(SVH#VAL)		Value
		= 0	Vertical Only
		= 1	Horizontal Only
		= 2	Blended
		= 3	Vertical Only or Horizontal Only per intruder
bits-5/2	(CATC)	CAS Type & Capability (see Note 2)	
bit-5	(CATC#EP)		Element Populated Bit
		= 0	Element not populated
		= 1	Element populated
bits-4/2	(CATC#VAL)		Value
		= 0	Active CAS (TCAS II) or no CAS
		= 1	Active CAS (not TCAS II)
		= 2	Active CAS (not TCAS II) with OCM transmit capability
		= 3	Active CAS of Junior Status
		= 4	Passive CAS with 1030 TCAS Resolution Message receive capability
		= 5	Passive CAS with only OCM receive capability
		= 6	Reserved for future use
		= 7	Reserved for future use
bit-1	(FX)	Field Extension Indicator = 0 end of data item = 1 extension into next extension	

NOTES 1: SVH is part of the CCCB (Collision Avoidance Coordination Capability Bits) in the “Aircraft Operational Status Message” Register 65_{16} Bits 33-39 as defined in EUROCAE ED-102B/RTCA DO-260C Ref. [11], Chapter 2.2.3.2.7.2.4.8.1. This information is available for Version 3 ADS-B systems only (refer to I021/210/VN).

NOTES 2: CATC is part of the CCCB (Collision Avoidance Coordination Capability Bits) in the “Aircraft Operational Status Message” Register 65_{16} Bits 33-39 as defined in EUROCAE ED-102B/RTCA DO-260C Ref. [11], Chapter 2.2.3.2.7.2.4.8.2. This information is available for Version 3 ADS-B systems only (refer to I021/210/VN).

Structure of STA - Fifth Extension: Additional Target Characteristics

Octet no. 1

8	7	6	5	4	3	2	1
TAO						0	FX

bits-8/3	(TAO)	Transponder Antenna Offset	
bit-8	(TAO#EP)		Element Populated Bit
		= 0	Element not populated
		= 1	Element populated
bits-7/3	(TAO#VAL)		Value (see Note 1)

TAO is implemented in line with the following table:

Bit-7	Bit-6	Bit-5	Bit-4	Bit-3	TAO in Metres
0	0	0	0	0	No Data
0	0	0	0	1	0 ≤ TAO ≤ 1
0	0	0	1	0	1 < TAO ≤ 2
0	0	0	1	1	2 < TAO ≤ 4
0	0	1	0	0	4 < TAO ≤ 6
*	*	*	*	*	***
1	1	1	1	0	56 < TAO ≤ 58
1	1	1	1	1	TAO > 58

bit-2	(Spare)	Spare bit, set to 0	
bit-1	FX	Field Extension Indicator	
		= 0	no extension
		= 1	extension into next extension

NOTES 1: TAO is a one-to-one copy of Message Bits 68 to 72 of the ”Aircraft Operational Status Message” (Register 65_{16}). The TAO is measured along the longitudinal axis of the aircraft from the forward end.

Encoding Rule : This item is optional. Information encoded in extensions one to five **is only available from** ADS-B Version 3 or higher (refer to I021/210/VN).

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 True North Heading
(LSB) = 360° / 2^{16} (approx. 0.0055°)

NOTE - Magnetic Heading is defined in I021/152.

Encoding Rule : This item is optional

2.10 Military Extended Squitter ‘MES’

Definition: Contents of Extended Squitters transmitted by Military Aircraft

Format: Compound data item comprising of a primary subfield of one octet extensible, followed by the indicated subfields.

NOTE: The information contained in this data item is specific to 1090MHz Extended Squitter messages transmitted by military aircraft (Mode 5 Level 2 squitter).

Structure of Primary Subfield of Compound Data Item:

Octet no. 1

8	7	6	5	4	3	2	1
SUM	PNO	EM1	XP	FOM	M2	0	FX

bit-8 (SUM) Subfield #1: Mode 5 Summary
=0 Absence of Subfield #1
=1 Presence of Subfield #1

bit-7 (PNO) Subfield #2: Mode 5 PIN/ National Origin
=0 Absence of Subfield #2
=1 Presence of Subfield #2

bit-6 (EM1) Subfield #3: Extended Mode 1 Code in Octal Representation
=0 Absence of Subfield #3
=1 Presence of Subfield #3

bit-5 (XP) Subfield #4: X Pulse Presence
=0 Absence of Subfield #4
=1 Presence of Subfield #4

bit-4 (FOM) Subfield #5: Figure of Merit
=0 Absence of Subfield #5
=1 Presence of Subfield #5

bit-3 (M2) Subfield #6: Mode 2 Code
=0 Absence of Subfield #6
=1 Presence of Subfield #6

bit-2 (spare) Spare bit, set to “0”

bit-1 (FX) = 0 End of Primary Subfield
= 1 Extension into next octet

Structure of Subfield #1*:*
Mode 5 Summary:

Octet no. 1

8	7	6	5	4	3	2	1
M5	ID	DA	M1	M2	M3	MC	PO

bit-8	(M5)	= 0 No Mode 5 interrogation = 1 Mode 5 interrogation
bit-7	(ID)	= 0 No authenticated Mode 5 ID reply/report = 1 Authenticated Mode 5 ID reply/report
bit-6	(DA)	= 0 No authenticated Mode 5 Data reply or Report = 1 Authenticated Mode 5 Data reply or Report (i.e. any valid Mode 5 reply type other than ID)
bit-5	(M1)	= 0 Mode 1 code not present or not from Mode 5 reply/report = 1 Mode 1 code from Mode 5 reply/report.
bit-4	(M2)	= 0 Mode 2 code not present or not from Mode 5 reply/report = 1 Mode 2 code from Mode 5 reply/report.
bit-3	(M3)	= 0 Mode 3 code not present or not from Mode 5 reply/report = 1 Mode 3 code from Mode 5 reply/report.
bit-2	(MC)	= 0 Flight Level not present or not from Mode 5 reply/report = 1 Flight Level from Mode 5 reply/report
bit-1	(PO)	= 0 Position not from Mode 5 report (ADS-B report) = 1 Position from Mode 5 report

Notes:

1. The flag M2 refers to the contents of Subfield #6 below, M3, MC refer to the contents of data items I021/070 and I021/145 respectively. The flag M1 refers to the contents of Subfield #3 below (Extended Mode 1 Code in Octal Representation).
2. If a Mode 5 reply/report is received with the Emergency bit set, then the Military Emergency bit (ME) in Data Item I021/200, Target Status, shall be set.
3. If a Mode 5 reply/report is received with the Identification of Position bit set, then the Special Position Identification bit (SPI) in Data Item I021/200, Target Status, shall be set.
4. If a Mode 5 report (ID or Data) is received and fulfils the authentication criteria the corresponding authentication bit shall be set.

Structure of Subfield #2*:*
Mode 5 PIN /National Origin

Octet no. 1 Octet no. 2

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
0	0	PIN													(LSB)

Octet no. 3 Octet no. 4

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
0	0	0	0	0	NO										

bits-32/31	(spare)	spare bits set to 0
bits-30/17	(PIN)	PIN Code
bits-16/12	(spare)	spare bits set to 0
bits-11/1	(NO)	National Origin Code

Structure of Subfield #3: Extended Mode 1 Code in Octal Representation

Octet 1								Octet 2							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
V	0	L	0	Extended Mode 1 Code											
				A4	A2	A1	B4	B2	B1	C4	C2	C1	D4	D2	D1

bit-16	(V)	=	0	Code validated
		=	1	Code not validated
bit-15	(spare)			Spare bit set to 0
bit-14	(L)	=	0	Mode 1 code as derived from the report of the transponder
		=	1	Smoothed Mode 1 code as provided by a local tracker
bit-13	(spare)			Spare bit set to 0
bits-12/1	(EM1)			Extended Mode 1 Code in octal representation

Note: If Subfield #1 is present, the M1 bit in Subfield #1 indicates whether the Extended Mode 1 Code is from a Mode 5 reply or a Mode 1 reply. If Subfield #1 is not present, the Extended Mode 1 Code is from a Mode 1 reply.

Note: If Subfield #3 is not present the Mode 1 Code was not reported or all Code Bits were equal to 0.

Note: The valid bit is set if the Code was only reported once for that target.

Structure of Subfield #4 of Compound Data Item: X Pulse Presence

Octet no. 1

8	7	6	5	4	3	2	1
0	0	XP	X5	XC	X3	X2	X1

bits-8/7 spare bits set to zero

bit-6	(XP)	X-pulse from Mode 5 PIN reply/report = 0 X-Pulse not present. = 1 X-pulse present.
bit-5	(X5)	X-pulse from Mode 5 Data reply or Report. = 0 X-pulse set to zero or no authenticated Data reply or Report received. = 1 X-pulse set to one (present).
bit-4	(XC)	X-pulse from Mode C reply = 0 X-pulse set to zero or no Mode C reply = 1 X-pulse set to one (present)
bit-3	(X3)	X-pulse from Mode 3/A reply = 0 X-pulse set to zero or no Mode 3/A reply = 1 X-pulse set to one (present)
bit-2	(X2)	X-pulse from Mode 2 reply = 0 X-pulse set to zero or no Mode 2 reply = 1 X-pulse set to one (present)
bit-1	(X1)	X-pulse from Mode 1 reply = 0 X-pulse set to zero or no Mode 1 reply = 1 X-pulse set to one (present)

NOTE to Subfield #4 (X Pulse Presence)**:**

Within Mode 5 reports, the X-Pulse can be set for the following cases:

1. In a combined Mode 1 and Mode 2 report: in this case the X5 bit and the X2 bit shall be set;
2. In a combined Mode 3 and Mode C report: in this case the X5 bit and the X3 bit shall be set;
3. In a Mode 5 PIN data report: in this case the X5 bit and the XP bit shall be set.

The X1 bit and the XC bit are meaningless as in Mode 1 and Mode C replies/reports the X Pulse is not defined. They are kept for compatibility reasons.

Structure of Subfield #5 of Compound Data Item: Figure of Merit

Octet no. 1

8	7	6	5	4	3	2	1
0	0	0	FOM				

bits-8/6	(spare)	spare bits set to zero
bits-5/1	(FOM)	Figure of Merit Position Accuracy as extracted and provided by a Mode 5 transponder

Structure of Subfield #6 of Compound Data Item: Mode 2 Code in Octal Representation

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

bit-16	(V)	=	0	Code validated
		=	1	Code not validated
bit-15				Spare bit set to 0
bit-14	(L)	=	0	Mode-2 code as derived from the reply of the transponder
		=	1	Smoothed Mode-2 code as provided by a local tracker
bit-13				Spare bit set to 0
bits-12/1				Mode-2 code in octal representation

Note: If Subfield 6 is not present the Mode 2 Code was no reported or all Code Bits were equal to 0.

Encoding Rule applying to the full Reserved Expansion Field:

The Reserved Expansion Field is optional. When used to transmit MES, it shall be sent when the targets are represented by Mode 5 Level 2 reports.

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