EUROCONTROL Specification for Surveillance Data Exchange

ASTERIX Part 4 Category 048

Monoradar Target Reports

Appendix A: Reserved Expansion Field

DOCUMENT IDENTIFIER : EUROCONTROL-SPEC-0149-4A

Edition Number	**:**	**1.7**
Edition Date	**:**	**01/09/2014**
Status	**:**	**Released Issue**
Intended for	**:**	**General Public**
Category	**:**	**EUROCONTROL Specification**

DOCUMENT CHARACTERISTICS

TITLE		
EUROCONTROL Specification for Surveillance Data Exchange – ASTERIX Part 4 Appendix A Category 048: Monoradar Target Reports – REF		
	Publications Reference:	SPEC-0149-4A
	ISBN Number:	978-2-87497-028-3
Document Identifier	**Edition Number:**	1.7
EUROCONTROL-SPEC-0149-4A	**Edition Date:**	01/09/2014

Abstract

This document specifies the contents of the Reserved Expansion Field for ASTERIX Category 048 messages used for the transmission of Monoradar Target Reports.

Keywords

Data Exchange	Messages	SAC	SIC
Data Category	Data Field	Data Block	Data Item
ASTERIX	UAP	REF	Monoradar Targets

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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 please refer to Part 1.

DOCUMENT CHANGE RECORD

The following table records the complete history of the successive editions of the present document.

EDITION	DATE	REASON FOR CHANGE	SECTIONS PAGES AFFECTED
1.0	January 2003	Creation	All
0.11	March 2003	Modification of the release numbering Modification of the size of the “length field” Correction of item MD5	
1.1	June 2005	Status of document: “Released Issue” Document ID Sheet Updated Document Approval Sheet updated Editorial “Cleanup”	 ii iii All
1.2	July 2005	Category added on title page	i
1.3	April 2007	Document ID-Sheet updated Signature Page updated Editorial “clean-up”	
1.4	June 2011	Signature Page updated Mode 5-New added Extended encoding of Mode 4 information added	iii 2.4 2.5
1.5	July 2012	Signature Page updated X-Pulse definition updated Subfield #8 (FOM) added to M5N	iii 2.3 2.4 2.4
1.6	November 2012	V, G, L bits added to MD5, SF#5 Mode 1 Code V, G, L bits added to M5N, SF#5 Mode 1 Code	2.3 2.4
1.7	September 2014	Layout changed Data Item “Radar Plot Characteristics” added	All 2.6

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EXECUTIVE SUMMARY

1. INTRODUCTION

1.1 Scope

This document describes the encoding of information in the Reserved Expansion Field of Monoradar Target Reports from ASTERIX Cat 048.

2. DESCRIPTION OF THE CONTENT OF RESERVED EXPANSION FIELD

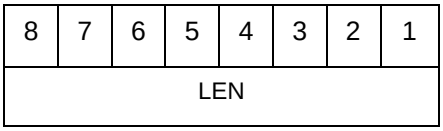
2.1 Length Indicator

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

Format : One-octet fixed length Data Item

Structure:

Octet no. 1



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
MD5	M5N	M4E	RPC	0	0	0	0

bit 8 (MD5)
= 0 Mode 5 Data/Reports, Extended Mode 1 Code and X Pulse are not present in the REF
= 1 Mode 5 Data/Reports and Extended Mode 1 Code and X Pulse are present in the REF

bit 7 (M5N)
= 0 New Encoding for Mode 5 Data/Reports, Extended Mode 1 Code and X Pulse is not present in the REF
= 1 New Encoding for Mode 5 Data/Reports, Extended Mode 1 Code and X Pulse is present in the REF

bit 6 (M4E)
= 0 Extended Encoding for Mode 4 is not present in the REF
= 1 Extended Encoding for Mode 4 is present in the REF

bit 5 (RPC)
= 0 Radar Plot Characteristics is not present in the REF
= 1 Radar Plot Characteristics is present in the REF

bits 4/1 Spare bits set to 0

Encoding Rule :
This item shall be present in every REF

2.3 MD5

Definition: Mode 5 Data/Reports, Extended Mode 1 Code and X pulse

Format: Compound data item comprising one primary subfield of one octet, followed by up to 7 subfields

Note: In 2011 NATO has modified the format of the National Origin information available in subfield 2 of the Mode 5 data item in this Reserved Expansion Field. The information for National Origin and Mission Code were combined into a 11-bit long field. In order to maintain backwards compatibility and to ease the use of the new layout, the original Mode 5 data item was copied and the layout of subfield #2 adapted. The new layout is reflected in the data item M5N and shall be used by equipment prepared for the new National Origin system.
Equipment certified to the previous encoding shall continue to use the data item MD5 corresponding to the 5-bit National Origin / 6-bit Mission Code.

Structure of Primary Subfield of Compound Data Item*:*

Octet no. 1

8	7	6	5	4	3	2	1
SUM	PMN	POS	GA	EM1	TOS	XP	FX

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

bit-7, octet 1 (PMN) Subfield #2: Mode 5 PIN/ National Origin/Mission Code
=0 Absence of Subfield #2
=1 Presence of Subfield #2

bit-6, octet 1 (POS) Subfield #3: Mode 5 Reported Position
=0 Absence of Subfield #3
=1 Presence of Subfield #3

bit-5, octet 1 (GA) Subfield #4: Mode 5 GNSS-derived Altitude
=0 Absence of Subfield #4
=1 Presence of Subfield #4

bit-4, octet 1 (EM1) Subfield #5: Extended Mode 1 Code in Octal Representation
=0 Absence of Subfield #5
=1 Presence of Subfield #5

bit-3, octet 1 (TOS) Subfield #6: Time Offset for POS and GA.
=0 Absence of Subfield #6
=1 Presence of Subfield #6

bit-2, octet 1 (XP) Subfield #7: X Pulse Presence
=0 Absence of Subfield #7
=1 Presence of Subfield #7

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

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/report
= 1 Authenticated Mode 5 Data reply/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 Mode C altitude not present or not from Mode 5 reply/report
= 1 Mode C altitude from Mode 5 reply/report

bit-1 Spare bit set to 0

Notes:

1. The flags M2, M3, MC refer to the contents of data items I048/050, I048/070 and I048/090 respectively. The flag M1 refers to the contents of data item I048/055, Mode 1 Code in Octal Representation, and to the contents of the Subfield #5 (Extended Mode 1 Code in Octal Representation).
2. If an authenticated Mode 5 reply/report is received with the Emergency bit set, then the Military Emergency bit (ME) in Data Item I048/020, Target Report Descriptor, shall be set.
3. If an authenticated Mode 5 reply/report is received with the Identification of Position bit set, then the Special Position Identification bit (SPI) in Data Item I048/020, Target Report Descriptor, shall be set.

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

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	NAT				(LSB)	0	0	MIS					(LSB)

bits-32/31	(spare)	spare bits set to 0
bits-30/17	(PIN)	PIN Code
bits-16/14	(spare)	spare bits set to 0
bits-13/9	(NAT)	National Origin
bits-8/7	(spare)	spare bits set to 0
bits-6/1	(MIS)	Mission Code

Structure of Subfield #3*:*
Mode 5 Reported Position

Octet no. 1 Octet no. 2

48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
Latitude in WGS 84															

Octet no. 3 Octet no. 4

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
							(LSB)	Longitude in WGS 84							

Octet no. 5 Octet no. 6

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
															(LSB)

bits-48/25 (LAT) Latitude in WGS 84

bits-24/1 (LON) Longitude in WGS 84

Notes : Latitude in WGS 84 is expressed as a 24-bit two's complement number.
Range -90° ≤ latitude ≤ 90°. Sign convention: North is positive.
LSB = $180/2^{23}$ degrees = $2.145767*10^{-05}$ degrees

Longitude in WGS 84 is expressed as a 24-bit two's complement number.
Range -180° ≤ longitude < 180°. Sign convention: East is positive.
LSB = $180/2^{23}$ degrees = $2.145767*10^{-05}$ degrees

The resolution implied by the LSB is better than the resolution with which Mode 5 position reports are transmitted from aircraft transponders using currently defined formats.

Structure of Subfield #4*:*
Mode 5 GNSS-derived Altitude

Octet no. 1 Octet no. 2

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
0	RES	GA													(LSB)

bit-16 (spare) spare bit set to 0

bit-15 (RES) Resolution with which the GNSS-derived Altitude (GA) is reported.
=0 GA reported in 100 ft increments,
=1 GA reported in 25 ft increments.

bits-14/1 (GA) GNSS-derived Altitude of target, expressed as height above WGS 84 ellipsoid. GA is coded as a 14-bit two's complement binary number with an LSB of 25 ft. irrespective of the setting of RES. The minimum value of GA that can be reported is -1000 ft.

Structure of Subfield #5:
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	G	L	0	Extended Mode 1 Code											
				A4	A2	A1	B4	B2	B1	C4	C2	C1	D4	D2	D1

bit-16 (V) = 0 Code not validated (see note 2)
= 1 Code validated (see note 2)

bit-15 (G) = 0 Default
= 1 Garbled code

bit-14 (L) = 0 Mode-3/A code derived from the reply of the transponder
= 1 Mode-3/A code not extracted during the last scan

bit-13 (spare) spare bit, set to “0”

bits-12/1 (EM1) Extended Mode 1 Code in octal representation

Note 1: 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 2: For reasons of backwards compatibility the logic for the setting of the V-bit was inverted compared to other similar data items.

Structure of Subfield #6 of Compound Data Item:
Time Offset for POS and GA

Octet no. 1

8	7	6	5	4	3	2	1
TOS							(LSB)

bits-8/1 (TOS) Time Offset coded as a twos complement number with an LSB of 1/128 s. The time at which the Mode 5 Reported Position (Subfield #3) and Mode 5 GNSS-derived Altitude (Subfield #4) are valid is given by Time of Day (I048/140) plus Time Offset.

Note:

TOS shall be assumed to be zero if Subfield #6 is not present.

Structure of Subfield #7 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 #7 (X Pulse Presence)**:**

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

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

Encoding Rule:

When the Reserved Expansion Field is used to transmit MD5, it shall be sent when at least one of the following conditions is satisfied:

1. The target represented by the Monoradar Target Report has been interrogated in Mode 5.
2. A non-zero Extended Mode 1 Code is received.
3. An X-pulse is present in a Mode 5 reply/report.

If condition 1 is satisfied, then Subfield #1 (Mode 5 Summary) shall be present.

If condition 2 is satisfied then Subfield #5 (Extended Mode 1 Code in Octal Representation) shall be present.

If condition 3 is satisfied, then Subfield #7 (X Pulse Presence) shall be present.

2.4 M5N

Definition: Mode 5 Data/Reports, Extended Mode 1 Code and X pulse following the updated NATO format for the National Origin code

Format: Compound data item comprising of a primary subfield of up to two octets, followed by the indicated subfields.

Encoding Rule : for data item M5N

When the REF is used to transmit M5N, it shall be sent when at least one of the following conditions is satisfied:

1. The target represented by the Monoradar Target Report has been interrogated in Mode 5.
2. A non-zero Extended Mode 1 Code is received.
3. An X-pulse is present in a Mode 5 reply/report.

If condition 1 is satisfied, then Subfield #1 (Mode 5 Summary) shall be present.

If condition 2 is satisfied then Subfield #5 (Extended Mode 1 Code in Octal Representation) shall be present.

If condition 3 is satisfied, then Subfield #7 (X Pulse Presence) shall be present.

Note: In 2011 NATO has modified the format of the National Origin information available in subfield 2 of the Mode 5 data item in this Reserved Expansion Field. The information for National Origin and Mission Code were combined into a 11-bit long field. In order to maintain backwards compatibility and to ease the use of the new layout, the original Mode 5 data item was copied and the layout of subfield #2 adapted. The new layout is reflected in the data item M5N and shall be used by equipment prepared for the new National Origin system.
Equipment certified to the previous encoding shall continue to use the data item MD5 corresponding to the 5-bit National Origin / 6-bit Mission Code.

Structure of Primary Subfield of Compound Data Item*:*

Octet no. 1

16	15	14	13	12	11	10	9
SUM	PMN	POS	GA	EM1	TOS	XP	FX

Octet no. 2

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

bit-16, octet 1 (SUM) Subfield #1: Mode 5 Summary
=0 Absence of Subfield #1
=1 Presence of Subfield #1

bit-15, octet 1 (PMN) Subfield #2: Mode 5 PIN/ National Origin
=0 Absence of Subfield #2
=1 Presence of Subfield #2

bit-14, octet 1 (POS) Subfield #3: Mode 5 Reported Position
=0 Absence of Subfield #3
=1 Presence of Subfield #3

bit-13, octet 1 (GA) Subfield #4: Mode 5 GNSS-derived Altitude
=0 Absence of Subfield #4
=1 Presence of Subfield #4

bit-12, octet 1 (EM1) Subfield #5: Extended Mode 1 Code in Octal Representation
=0 Absence of Subfield #5
=1 Presence of Subfield #5

bit-11, octet 1 (TOS) Subfield #6: Time Offset for POS and GA.
=0 Absence of Subfield #6
=1 Presence of Subfield #6

bit-10, octet 1 (XP) Subfield #7: X Pulse Presence
=0 Absence of Subfield #7
=1 Presence of Subfield #7

bit-9, octet 1 (FX) = 0 End of Primary Subfield
= 1 Extension of Primary Subfield into next octet

bit-8, octet 2	(FOM)	Subfield #8: Figure of Merit =0 Absence of Subfield #8 =1 Presence of Subfield #8
bits-7/2, octet 2	(spare)	Spare bits, set to 0
bit-1, octet 2	(FX)	= 0 End of Primary Subfield = 1 Extension of Primary Subfield 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	0

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 Mode C altitude not present or not from Mode 5 reply/report
= 1 Mode C altitude from Mode 5 reply/report

bit-1 Spare bit set to 0

Notes:

4. The flags M2, M3, MC refer to the contents of data items I048/050, I048/070 and I048/090 respectively. The flag M1 refers to the contents of data item I048/055, Mode 1 Code in Octal Representation, and to the contents of the Subfield #5 (Extended Mode 1 Code in Octal Representation).
5. If an authenticated Mode 5 reply/report is received with the Emergency bit set, then the Military Emergency bit (ME) in Data Item I048/020, Target Report Descriptor, shall be set.
6. If an authenticated Mode 5 reply/report is received with the Identification of Position bit set, then the Special Position Identification bit (SPI) in Data Item I048/020, Target Report Descriptor, 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*:*
Mode 5 Reported Position

Octet no. 1 Octet no. 2

48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
Latitude in WGS 84															

Octet no. 3 Octet no. 4

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
							(LSB)	Longitude in WGS 84							

Octet no. 5 Octet no. 6

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
															(LSB)

bits-48/25 (LAT) Latitude in WGS 84

bits-24/1 (LON) Longitude in WGS 84

Notes : Latitude in WGS 84 is expressed as a 24-bit two's complement number.
Range -90° ≤ latitude ≤ 90°. Sign convention: North is positive.
LSB = $180/2^{23}$ degrees = $2.145767*10^{-05}$ degrees

Longitude in WGS 84 is expressed as a 24-bit two's complement number.
Range -180° ≤ longitude < 180°. Sign convention: East is positive.
LSB = $180/2^{23}$ degrees = $2.145767*10^{-05}$ degrees

The resolution implied by the LSB is better than the resolution with which Mode 5 position reports are transmitted from aircraft transponders using currently defined formats.

Structure of Subfield #4*:*
Mode 5 GNSS-derived Altitude

Octet no. 1 Octet no. 2

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
0	RES	GA													(LSB)

bit-16	(spare)	spare bit set to 0
bit-15	(RES)	Resolution with which the GNSS-derived Altitude (GA) is reported. =0 GA reported in 100 ft increments, =1 GA reported in 25 ft increments.
bits-14/1	(GA)	GNSS-derived Altitude of target, expressed as height above WGS 84 ellipsoid. GA is coded as a 14-bit two's complement binary number with an LSB of 25 ft. irrespective of the setting of RES. The minimum value of GA that can be reported is -1000 ft.

Structure of Subfield #5:
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	G	L	0	Extended Mode 1 Code											
				A4	A2	A1	B4	B2	B1	C4	C2	C1	D4	D2	D1

bit-16	(V)	= 0 Code not validated (see Note 2) = 1 Code validated (see Note 2)
bit-15	(G)	= 0 Default = 1 Garbled code
bit-14	(L)	= 0 Mode-3/A code derived from the reply of the transponder = 1 Mode-3/A code not extracted during the last scan
bit-13	(spare)	spare bit, set to “0”
bits-12/1	(EM1)	Extended Mode 1 Code in octal representation

Note 1: 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 2: For reasons of backwards compatibility the logic for the setting of the V-bit was inverted compared to other similar data items.

Structure of Subfield #6 of Compound Data Item:
Time Offset for POS and GA

Octet no. 1

8	7	6	5	4	3	2	1
TOS							(LSB)

bits-8/1 (TOS) Time Offset coded as a twos complement number with an LSB of 1/128 s. The time at which the Mode 5 Reported Position (Subfield #3) and Mode 5 GNSS-derived Altitude (Subfield #4) are valid is given by Time of Day (I048/140) plus Time Offset.

Note:

TOS shall be assumed to be zero if Subfield #6 is not present.

Structure of Subfield #7 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 #7 (X Pulse Presence)**:**

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

1. In a combined Mode 1 and Mode 2 reply/report: in this case the X5 bit and the X2 bit shall be set;
2. In a combined Mode 3 and Mode C reply/report: in this case the X5 bit and the X3 bit shall be set;
3. In a Mode 5 PIN data reply/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 #8 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

2.5 M4E

Definition: Extended encoding of the Mode 4 interrogation result

Format: Variable length Data Item comprising a first part of one-octet, followed by one-octet extents as necessary.

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
0	0	0	0	0	FOE/FRI		FX

Bits 8/4	(spare)	spare bits, set to 0
Bits 3/2	(FOE/FRI)	Indication Foe/Friend (Mode4) = 00 No Mode 4 identification = 01 possibly friendly target = 10 probably friendly target = 11 friendly target
Bit-1	(FX)	= 0 End of Data Item = 1 Extension into first extent

Encoding Rule :

This item is optional and shall be used if the IFF interrogator is capable to encode the extended Mode 4 interpretation.

IFF interrogators not capable of using the extended Mode 4 encoding shall instead use data item I048/020, 1st extension.

2.6 Radar Plot Characteristics

Definition: Extension to data item I048/130 for primary reports

Format: Compound Data Item comprising a first part of one-octet extensible, followed by the indicated subfields.

Structure of Primary Subfield of Compound Data Item*:*

Octet no. 1

8	7	6	5	4	3	2	1
SCO	SCR	RW	AR	0	0	0	FX

bit-8	(SCO)	Subfield #1: Score =0 Absence of Subfield #1 =1 Presence of Subfield #1
bit-7	(SCR)	Subfield #2: Signal/Clutter Ratio =0 Absence of Subfield #2 =1 Presence of Subfield #2
bit-6	(RW)	Subfield #3: Range Width =0 Absence of Subfield #3 =1 Presence of Subfield #3
bit-5	(AR)	Subfield #4: Ambiguous Range =0 Absence of Subfield #4 =1 Presence of Subfield #4
Bits-4/2	(spare)	Spare bits, set to 0
bit-1	(FX)	= 0 End of Primary Subfield = 1 Extension of Primary

Structure of Subfield #1 of Compound Data Item: Score

The score describes the number of raw responses used to create the plot.

Octet no. 1

8	7	6	5	4	3	2	1
SCO							

bits-8/1 (SCO) Score

Structure of Subfield #2: Signal / Clutter Ratio

The Signal / Clutter Ratio describes the difference in signal strength between the signal constituting the raw plot and the signal of the clutter.

Octet no. 1 Octet no. 2

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
SCR															LSB

bits-16/1 (SCR) Signal to Clutter Ratio
LSB = 0.1 db
0.1 db < SCR < 2550

Structure of Subfield #3: Range Width

The Range Width defines the difference in range between the closest proximity to the radar of the raw response and the point farthest away from the radar.

Octet no. 1 Octet no. 2

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
RW															LSB

bits-16/1 (RW) Range Width
LSB = 1/256 NM
Max. value: 256 NM

Structure of Subfield #4: Ambiguous Range

The Ambiguous Range describes the Pulse Repetition Interval of the radar in range.

Octet no. 1 Octet no. 2

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
AR															LSB

bits-16/1 (AR) Ambiguous Range
LSB = 1/256 NM
Max. value: 256 NM

Encoding Rule :
This item is optional.

Encoding Rule for the REF:

The Reserved Expansion Field is optional.