EUROCONTROL Specification for Surveillance Data Exchange ASTERIX

Part 2b Category 34
Mono Radar Service Messages

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EUROCONTROL Specification for Surveillance Data Exchange ASTERIX Part 2b Category 034 Monoradar Service Messages

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Abstract

This document describes the application of ASTERIX to the transmission of Monoradar Service Messages.

Keywords

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Data Item	Category 34	UAP

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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	DATE	REASON FOR CHANGE	SECTIONS PAGES AFFECTED
Released Ed 1.0	November 1997	Adoption by the EUROCONTROL Permanent Commission	
Working Draft Ed 1.1	May 1998	• I034/070 renamed, types added; I034/110 types added.	See respective Data Items
Draft Ed 1.2	October 1998	• Introduction modified to keep in line with Part 1; • Two sentences added in General Principles; • The title of the document amended by replacing Radar with Surveillance; I034/050 & I034/060 shortened.	1. 4.2 & 4.3 ALL See respective Data Items
Draft Ed 1.21	January 1999	• 1.1.3 and 1.2 suppressed; • Editorial corrections; Reserved Expansion Indicator added in UAP.	ALL 5.3
Draft Ed 1.22	February 1999	• Editorial corrections; • I034/070 & I034/110 types reviewed. •	See respective Data Item
Draft Ed 1.23	March 1999	• Correction in I034/090 LSB	See respective Data Item
Proposed Ed 1.24	September 1999	• Editorial corrections; • Modifications in encoding rules and notes of I034/050, I034/060, I034/100, I034/110; • Coding modifications of I034/070 and I034/110.	See respective Data Item
Proposed Ed 1.26	November 2000	• Sector Crossing Messages made optional. • Items 050 and 060 made optional.	4.3 See respective Data Items
1.27	May 2007	• Document ID-sheet updated • Signature Page updated	ID-Sheet Sign. Page 5.2.2

		• Reference to ASTERIX website added	
Released Ed 1.28	March 2021	• Document migrated to new template • Signature Page updated. • Definitions updated • Abbreviations updated • Data Item I034/000: new message type 5 • Data Item I034/070: new message counts	All Sign. Page 3.1 3.2 5.2.1 5.2.8
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1. INTRODUCTION

1.1 Scope

1.1.1 This document describes the message structure for the transmission of monoradar service messages, from a radar station (conventional Secondary Surveillance Radar (SSR), monopulse, Mode S, conventional primary radar or primary radar using Moving Target Detection (MTD) processing), to one or more Surveillance Data Processing (SDP) Systems.

1.1.2 Monoradar service messages are data out of Data Category 034.

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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 SUR.ET1.ST05.2000-STD-01-01. All Purpose Structured EUROCONTROL Surveillance Information Exchange - ASTERIX. Edition 3.0, Released Issue, 07 December 2020.
2. EUROCONTROL Standard SUR.ET1.1000-STD-01-01. Radar Surveillance in En-Route Airspace and Major Terminal Areas.

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3. DEFINITIONS, ACRONYMS AND ABBREVIATIONS

3.1 Definitions

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

ASTERIX Message	Unit of ASTERIX information including the data to be exchanged between ASTERIX users. An ASTERIX Message may be an ASTERIX Data Block or an ASTERIX Record.
Catalogue of Data Items:	List of all the possible Data Items of each Data Category describing the Data Items by their reference, structure and size.
ASTERIX Data Block:	Unit of information seen by the application as a discrete entity by its contents. An ASTERIX Data Block contains a Data Category (CAT) identifier, a Length Indicator (LEN) and one or more Data Record(s) containing data of the same Category. This principle is used for Categories defined until and including Edition 2.1 of Part 1.
Data Category:	Classification of the data in order to permit inter-alia an easy identification.
Data Field:	Physical implementation for the purpose of communication of a Data Item, it is associated with a unique Field Reference Number (FRN) giving the sequence of Data Items in a Data Record in line with the UAP.
Data Item:	The main unit of information in each Data Category.
Data Record:	A collection of transmitted Data Items of the same Category preceded by a Field Specification field (FSPEC), signalling the presence/absence of the various Data Items.
Standard Data Item:	A standardised Data Item usable within the standard ASTERIX Categories.
Subitem:	The main unit of information in each Standard Data Item.
Element:	The smallest unit of information in each Subitem.
User Application Profile:	The mechanism describing the way an ASTERIX record is composed.
Part	The ASTERIX Library is sub-divided into several Parts. Part 1 (this specification) contains the basic ASTERIX rules and principles. Parts 2 and above contain the Category specifications or other additional information.

3.2 Acronyms and Abbreviations

For the purposes of this EUROCONTROL Standard Document the following shall apply:

ASTERIX	All Purpose STructured Eurocontrol suRveillance Information EXchange
CAT	Data Category
FRN	Field Reference Number
FSPEC	Field Specification
FX	Field Extension Indicator
ICAO	International Civil Aviation Organization
LEN	Length Indicator
LSB	Least Significant Bit
MSSR	Monopulse Secondary Surveillance Radar
MTD	Moving Target Detection
NM	Nautical Mile, unit of distance (1852 metres)
PSR	Primary Surveillance Radar
RDP	Radar Data Processing (System)
RDPC	Radar Data Processing Chain
REP	Field Repetition Indicator
s	second, unit of time
SAC	System Area Code
SDP	Surveillance Data Processing (system)
SIC	System Identification Code
SP	Special Purpose Indicator
SSR	Secondary Surveillance Radar
SUR-SG	Surveillance Steering Group
SURT	Surveillance Team
UAP	User Application Profile (see Definitions)
UTC	Co-ordinated Universal Time

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4. GENERAL PRINCIPLES

4.1 General

The transmission of monoradar information shall require the transmission of two types of messages:

- data messages or radar target reports containing plot or track information (not covered by this document);
- radar service messages used to signal status information of the radar station to the user systems.

4.2 Time Management

Time Management principles apply only to conventional rotating antennas.

4.2.1 Definition

The sector time stamp shall be consistent with the reported sector azimuth.

4.2.2 Requirements for Time Stamping

- The timestamping shall comply with the Coordinated Universal Time (UTC) as specified in ICAO Annex 5. It shall be used to time stamp radar data.

4.3 North Marker and Sector Crossing Messages

This paragraph only applies to conventional rotating antennas.

At every north crossing one and only one North Marker Message shall be transmitted. The highest priority shall be given to the transmission of the North Marker Message; this shall not be delayed by the plot processing activities.

Sector Crossing Messages are optional messages. When used, they shall always be thirty-two per revolution.

4.4 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.

4.5 Definitions and Addressing Concepts

In order to address radar sources in an unambiguous way, a simple abstract model for concepts like sensors or radar systems has been designed.

4.5.1 Radar Sensor

In the framework of Category 034 a Radar Sensor is a detection/measurement device, either of the Primary (PSR) or Secondary Surveillance Radar (SSR, MSSR) type, which uses a single rotating antenna assembly.

4.5.2 Radar System

In the framework of Category 034 a Radar System is a construction, consisting of either one single sensor or a combination of two sensors of different types. In the case of combined sensors it is assumed that the respective antenna subsystems are configured, such that:

- a coincidence in target detection is guaranteed;
- a single co-ordinate reference point is used.

4.5.3 Combination of Target Reports

The Radar Data Combiner is a function which combines (merges) the digitized target reports (plots) from two sensors constituting one Radar System.

4.5.4 Addressing Concepts: Assigning SAC/SIC Codes

By convention a dedicated and unambiguous SAC/SIC code shall be assigned to every Radar System.

EXAMPLES

1. A back-to-back configuration of two PSRs with an on-mounted SSR antenna each, is considered as two Radar Systems, being addressed via two SAC/SIC codes.
2. A main tower carrying a combined PSR/SSR radar station, supplemented with a standby tower at several hundreds of meters from the main tower and supporting a single back-up SSR station, shall be considered as two independent Radar Systems. It is irrelevant whether both radar systems are synchronized or not, and in addition whether only one Radar System at a time transmits its data or both Radar Systems simultaneously.
3. Two distinct radar heads, located at close distance, whose data is processed in a time-exclusive way by the same plot processor equipment may be considered as a single Radar System, using a single SAC/SIC address, provided that:
   - the same geographical reference point is used, irrespective of whether the data of head#1 or head#2 is selected;
   - the access lines to the site carry only the data of one head at a time.

Where the above conditions are not simultaneously met, it is imperative to assign two SAC/SIC codes.

4.6 Radar Service Messages

4.6.1 Types of Radar Target Reports

Seven types of radar service messages have been identified:

- Sector Crossing Messages;
- North Marker Messages;
- Geographical Filtering Messages;
- Jamming Strobe Messages;
- Solar Storm Messages;
- SSR Jamming Strobe Messages;
- Mode S Jamming Strobe Messages.

4.6.1.1 Sector Crossing Messages

4.6.1.1.1 When Sector Crossing messages are used, the transmission of 32 messages shall be synchronised (possibly with some delay) with the antenna rotation.

4.6.1.1.2 Sector crossing messages shall be time-stamped. The time information should be the time at which the antenna has crossed the azimuth defining the beginning of the sector, and not the time of transmission of the message.

4.6.1.1.3 By convention, the sector 0 crossing message shall signal the crossing of the North azimuth. It may contain more information than other sector crossing messages.

4.6.1.2 North Marker Messages

4.6.1.2.1 These messages shall signal, independently of the sector crossing messages and as quickly as possible, the crossing of the local geographical North azimuth by the antenna.

4.6.1.2.2 The North marker message shall not replace the sector 0 crossing message. The transmission of the sector 0 crossing messages can be delayed like other sector crossing messages.

4.6.1.3 Geographical Filtering Messages

These messages shall be sent to inform the user system(s) on the activation and the de-activation of geographical selective plots or tracks filtering processes.

4.6.1.4 Jamming Strobe Messages

These messages shall be sent to indicate an area where jamming strobe has been detected.

4.6.1.5 Solar Storm Messages

These messages shall be sent to indicate an area that is affected by a solar storm.

4.6.1.6 SSR Jamming Strobe Messages

These messages shall be sent to indicate an area where SSR jamming strobe has been detected.

4.6.1.7 Mode S Jamming Strobe Messages

These messages shall be sent to indicate an area where Mode S jamming strobe has been detected.

4.6.2 User Application Profile and Data Blocks

A single User Application Profile (UAP) is defined and shall be used whether plot or track information is provided by the radar.

Data Blocks containing radar target reports shall have the following layout.

CAT = 034	**LEN**	**FSPEC**	Items of the first record		**FSPEC**	Items of the last record

where:

- Data Category (CAT) = 034, is a one-octet field indicating that the Data Block contains radar service messages;
- 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.

4.7 Composition of Messages

Messages shall be composed of Data Items assembled in the order defined by the Field Reference Number (FRN) in the associated UAP.

When sent, items shall always be transmitted in a Record with the corresponding FSPEC bits set to one.

5. LAYOUT OF RADAR SERVICE MESSAGES

5.1 Standard Data Items

The standardised Data Items which shall be used for the transmission of radar service messages are defined in Table 1 and described in the following pages.

Table 1 - Standard Data Items of Category 034

Data Item Ref. No.	Description	System Units
I034/000	Message Type	N.A.
I034/010	Data Source Identifier	N.A.
I034/020	Sector Number	360°/(2^8)
I034/030	Time of Day	1/128 s
I034/041	Antenna Rotation Period	1/128 s
I034/050	System Configuration & Status	N.A.
I034/060	System Processing Mode	N.A.
I034/070	Message Count Values	N.A.
I034/090	Collimation Error	Range: 1/128 NM Azimuth: 360°/(2^{14})
I034/100	Generic Polar Window	RHO: 1/256 NM THETA: 360°/(2^{16})
I034/110	Data Filter	N.A.
I034/120	3D-position of source	Height : 1 m Latitude: 180°/(2^{23}) Longitude: 180°/(2^{23})

5.2 Description of Standard Data Items

5.2.1 Data Item I034/000, Message Type

Definition : This Data Item allows for a more convenient handling of the messages at the receiver side by further defining the type of transaction.

Format : One-octet fixed length Data Item.

Structure:

Octet no. 1

8	7	6	5	4	3	2	1
MESSAGE TYPE							

bits-8/1 Message Type

Encoding Rule:

This data item shall be present in every ASTERIX record.

NOTES

1. In applications where transactions of various types are exchanged, the Message Type Data Item facilitates the proper message handling at the receiver side.
2. All Message Type values are reserved for common standard use.
3. The following set of Message Types are standardised for Category 034 records:
   - 001 North Marker message
   - 002 Sector crossing message
   - 003 Geographical filtering message
   - 004 Jamming Strobe message
   - 005 Solar Storm Message
   - 006 SSR Jamming Strobe Message
   - 007 Mode S Jamming Strobe Message
4. The list of items present for each message type is defined in the following table.

   M stands for mandatory, O for optional, X for never present.

Table 2 Message Types

Type Item	001 North Marker	002 Sector Crossing	003 Geographical Filtering	004 Jamming Strobe	005 Solar Storm	006 SSR Jamming Strobe	007 Mode S Jamming Strobe
I034/000 Message Type	M	M	M	M	M	M	M
I034/010 Data Source Identifier	M	M	M	M	M	M	M
I034/020 Sector Number	X	M	X	X	X	X	X
I034/030 Time of Day	M	M	O	O	O	O	O
I034/041 Antenna Rotation Period	O	X	X	X	X	X	X
I034/050 System Configuration & Status	O	O	X	X	X	X	X
I034/060 System Processing Mode	O	O	X	X	X	X	X
I034/070 Message Count Values	O	O	X	X	X	X	X
I034/090 Collimation Error	O	O	X	X	X	X	X
I034/100 Generic Polar Window	X	X	O	M	M	M	M
I034/110 Data Filter	X	X	M	X	X	X	X
I034/120 3D-position of source	O	X	X	X	X	X	X

5.2.2 Data Item I034/010, Data Source Identifier

Definition: Identification of the radar station from which the data are received.

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
SAC								SIC							

bits-16/9 (SAC) System Area Code

bits-8/1 (SIC) System Identification Code

Encoding Rule:

See table in I034/000.

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 I034/020, Sector Number

Definition : Eight most significant bits of the antenna azimuth defining a particular azimuth sector.

Format : One-octet fixed length Data Item.

Structure:

Octet no. 1							
8	7	6	5	4	3	2	1
SECTOR NUMBER							LSB

bit-1 (LSB) = $360°/(2^8)$ = approx. 1.41°

Encoding Rule:

See Table in I034/000.

5.2.4 Data Item I034/030, Time of Day

Definition : Absolute time stamping expressed as UTC time.

Format : Three-octet fixed length Data Item.

Structure:

Octet no. 1

24	23	22	21	20	19	18	17
TIME							

Octet no. 2 Octet no. 3

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

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

Encoding Rule:

See Table in I034/000.

For the message types where this data item is mandatory, it shall be sent, except in case of failure of all sources of time stamping. Every radar station using ASTERIX shall be equipped with at least one synchronised time source. The time information, coded in three octets, shall reflect the exact time of an event (crossing of the azimuth defining the beginning of a sector by the antenna), expressed as a number of 1/128 s elapsed since last midnight.

NOTES

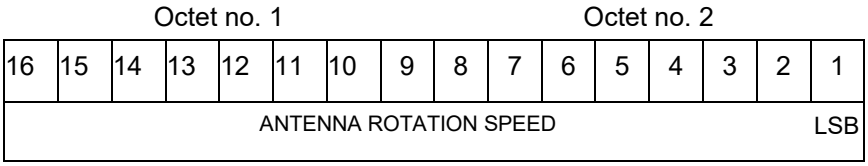
1. The time of day value is reset to zero each day at midnight.

5.2.5 Data Item I034/041, Antenna Rotation Speed

Definition : Antenna rotation period as measured between two consecutive North crossings or as averaged during a period of time.

Format : Two-octet fixed length Data Item.

Structure:



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

Encoding Rule:

See table in I034/000.

NOTE - This item represents the antenna rotation period as measured by the radar station between two consecutive North crossings, or a calculated antenna rotation speed as averaged during a period of time, or during a number of antenna rotation scans.

5.2.6 Data Item I034/050, System Configuration and Status

Definition : Information concerning the configuration and status of a System.

Format : Compound Data Item, comprising an extensible primary subfield (initially one octet; one octet extents), followed by a variable number of secondary subfields.

Structure of Primary Subfield:

Octet no. 1

8	7	6	5	4	3	2	1
COM	0	0	PSR	SSR	MDS	0	FX

bit-8	(COM)	Subfield #1: Common Part = 0 Absence of Subfield #1 = 1 Presence of Subfield #1
bit-7	(Spare)	Subfield #2: Spare Subfield
bit-6	(Spare)	Subfield #3: Spare Subfield
bit-5	(PSR)	Subfield #4: Specific Status for PSR Sensor = 0 Absence of Subfield #4 = 1 Presence of Subfield #4
bit-4	(SSR)	Subfield #5: Specific Status for SSR Sensor = 0 Absence of Subfield #5 = 1 Presence of Subfield #5
bit-3	(MDS)	Subfield #6: Specific Status for Mode S Sensor = 0 Absence of Subfield #6 = 1 Presence of Subfield #6
bit-2	(Spare)	Subfield #7: Spare Subfield
bit-1	(FX)	= 0 End of Primary Subfield = 1 Extension of Primary Subfield into next octet

Structure of COM Subfield:

The first Secondary Subfield (COM) contains the status of the common elements of a System.

Octet no. 1

8	7	6	5	4	3	2	1
NOGO	RDPC	RDPR	OVL RDP	OVL XMT	MSC	TSV	0

bit-8	(NOGO)	Operational Release Status of the System = 0 System is released for operational use = 1 Operational use of System is inhibited, i.e. the data shall be discarded by an operational SDPS
bit-7	(RDPC)	Radar Data Processor Chain Selection Status = 0 RDPC-1 selected = 1 RDPC-2 selected
bit-6	(RDPR)	Event to signal a reset/restart of the selected Radar Data Processor Chain, i.e. expect a new assignment of track numbers = 0 Default situation = 1 Reset of RDPC
bit-5	(OVL RDP)	Radar Data Processor Overload Indicator = 0 Default, no overload = 1 Overload in RDP
bit-4	(OVL XMT)	Transmission Subsystem Overload Status = 0 Default, no overload = 1 Overload in transmission subsystem
bit-3	(MSC)	Monitoring System Connected Status = 0 Monitoring system connected = 1 Monitoring system disconnected
bit-2	(TSV)	Time Source Validity = 0 valid = 1 invalid
bit-1	(Spare)	Spare bit set to zero

NOTES

1. A time source is considered as valid when either externally synchronised or running on a local oscillator within the required accuracy of UTC.
2. Bit-6 (RDPR) is sent only once after the event.

Structure of PSR Subfield:
Specific Status information for a PSR sensor

Octet no. 1

8	7	6	5	4	3	2	1
ANT	CH-A/B		OVL	MSC	0	0	0

bit-8	(ANT)	Selected antenna = 0 antenna 1 = 1 antenna 2
bits-7/6	(CH-A/B)	Channel A/B selection status = 00 No channel selected = 01 Channel A only selected = 10 Channel B only selected = 11 Diversity mode ; Channel A and B selected
bit-5	(OVL)	Overload condition = 0 No overload = 1 Overload
bit-4	(MSC)	Monitoring System Connected Status: = 0 Monitoring system connected = 1 Monitoring system disconnected
bits-3/1	(Spare)	Spare bits set to 0

Structure of SSR Subfield:
Specific Status information for a SSR sensor

Octet no. 1

8	7	6	5	4	3	2	1
ANT	CH-A/B		OVL	MSC	0	0	0

bit-8	(ANT)	Selected antenna = 0 antenna 1 = 1 antenna 2
bits-7/6	(CH-A/B)	Channel A/B selection status = 00 No channel selected = 01 Channel A only selected = 10 Channel B only selected = 11 Invalid combination
bit-5	(OVL)	Overload condition = 0 No overload = 1 Overload
bit-4	(MSC)	Monitoring System Connected Status: = 0 Monitoring system connected = 1 Monitoring system disconnected
bits-3/1	(Spare)	Spare bits set to 0

Structure of MDS Subfield:
Specific Status information for a Mode S sensor

Octet no. 1								Octet no. 2							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
ANT	CH-A/B		OVL SUR	MSC	SCF	DLF	OVL SCF	OVL DLF	0	0	0	0	0	0	0

bit-16	(ANT)	Selected antenna = 0 antenna 1 = 1 antenna 2
bits-15/14	(CH-A/B)	Channel A/B selection status for surveillance = 00 No channel selected = 01 Channel A only selected = 10 Channel B only selected = 11 Illegal combination
bit-13	(OVL SUR)	Overload condition = 0 No overload = 1 Overload
bit-12	(MSC)	Monitoring System Connected Status: = 0 Monitoring system connected = 1 Monitoring system disconnected
bit-11	(SCF)	Channel A/B selection status for Surveillance Co-ordination Function = 0 Channel A in use = 1 Channel B in use
bit-10	(DLF)	Channel A/B selection status for Data Link Function = 0 Channel A in use = 1 Channel B in use
bit-9	(OVL SCF)	Overload in Surveillance Co-ordination Function = 0 No overload = 1 Overload
bit-8	(OVL DLF)	Overload in Data Link Function = 0 No overload = 1 Overload
bits 7/1	(Spare)	Spare bits set to 0

Encoding Rule:

See Table in I034/000

5.2.7 Data Item I034/060, System Processing Mode

Definition : Status concerning the processing options, in use during the last antenna revolution, for the various Sensors, composing the System.

Format : Compound Data Item, comprising an extensible primary subfield (initially one octet; one octet extents), followed by a variable number of secondary subfields.

Structure of Primary Subfield:

Octet no. 1

8	7	6	5	4	3	2	1
COM	0	0	PSR	SSR	MDS	0	FX

bit-8	(COM)	Subfield #1: Common Part = 0 Absence of Subfield #1 = 1 Presence of Subfield #1
bit-7	(Spare)	Subfield #2: Spare Subfield
bit-6	(Spare)	Subfield #3: Spare Subfield
bit-5	(PSR)	Subfield #4: Specific Processing Mode information for PSR Sensor = 0 Absence of Subfield #4 = 1 Presence of Subfield #4
bit-4	(SSR)	Subfield #5: Specific Processing Mode information for SSR Sensor = 0 Absence of Subfield #5 = 1 Presence of Subfield #5
bit-3	(MDS)	Subfield #6: Specific Processing Mode information for Mode S Sensor = 0 Absence of Subfield #6 = 1 Presence of Subfield #6
bit-2	(Spare)	Subfield #7: Spare Subfield
bit-1	(FX)	= 0 End of Primary Subfield = 1 Extension of Primary Subfield into next octet

Structure of COM Subfield:

The first Secondary Subfield (COM) defines the processing modes of the common elements of a System.

Octet no. 1

8	7	6	5	4	3	2	1
0	RED-RDP			RED-XMT			0

bit-8	(Spare)	Spare bit set to zero
bits7/5	(RED-RDP)	Reduction Steps in use for an overload of the RDP = 000 No reduction active = 001 Reduction step 1 active = 010 Reduction step 2 active = 011 Reduction step 3 active = 100 Reduction step 4 active = 101 Reduction step 5 active = 110 Reduction step 6 active = 111 Reduction step 7 active
bits-4/2	(RED-XMT)	Reduction Steps in use for an overload of the Transmission subsystem = 000 No reduction active = 001 Reduction step 1 active = 010 Reduction step 2 active = 011 Reduction step 3 active = 100 Reduction step 4 active = 101 Reduction step 5 active = 110 Reduction step 6 active = 111 Reduction step 7 active
bit-1	(Spare)	Spare bit set to zero

Structure of PSR Subfield:
Specific Processing Mode information for a PSR sensor

Octet no. 1

8	7	6	5	4	3	2	1
POL	RED-RAD			STC		0	0

bit-8	(POL)	Polarization in use by PSR = 0 Linear polarization = 1 Circular polarization
bits-7/5	(RED-RAD)	Reduction Steps in use as result of an overload within the PSR subsystem = 000 No reduction active = 001 Reduction step 1 active = 010 Reduction step 2 active = 011 Reduction step 3 active = 100 Reduction step 4 active = 101 Reduction step 5 active = 110 Reduction step 6 active = 111 Reduction step 7 active
bits-4/3	(STC)	Sensitivity Time Control Map in use = 00 STC Map-1 = 01 STC Map-2 = 10 STC Map-3 = 11 STC Map-4
bits-2/1	(Spare)	Spare bits set to zero

Structure of SSR Subfield:
Specific Processing Mode information for a SSR sensor

Octet no. 1

8	7	6	5	4	3	2	1
RED-RAD			0	0	0	0	0

bits-8/6	(RED-RAD)	Reduction Steps in use as result of an overload within the SSR subsystem = 000 No reduction active = 001 Reduction step 1 active = 010 Reduction step 2 active = 011 Reduction step 3 active = 100 Reduction step 4 active = 101 Reduction step 5 active = 110 Reduction step 6 active = 111 Reduction step 7 active
bits-5/1	(Spare)	Spare bits set to zero

Structure of MDS Subfield:
Specific Processing Mode information for a Mode S Sensor

Octet no. 1

8	7	6	5	4	3	2	1
RED-RAD			CLU	0	0	0	0

bits-8/6	(RED-RAD)	Reduction Steps in use as result of an overload within the Mode S subsystem = 000 No reduction active = 001 Reduction step 1 active = 010 Reduction step 2 active = 011 Reduction step 3 active = 100 Reduction step 4 active = 101 Reduction step 5 active = 110 Reduction step 6 active = 111 Reduction step 7 active
bit-5	(CLU)	Cluster State = 0 Autonomous = 1 Not autonomous
bits-4/1	(Spare)	Spare bits set to zero

Encoding Rule:

See Table in I034/000.

NOTE - Applicable to all defined secondary subfields. The actual mapping between the up to seven data reduction steps and their associated data reduction measures is not subject to standardisation.

5.2.8 Data Item I034/070, Message Count Values

Definition : Message Count values, according the various types of messages. The values are collected for the last completed antenna revolution, counted between two North crossings unless otherwise stated in the TYP definition below.

Format : Repetitive Data Item, starting with a one-octet Field Repetition Indicator (REP) followed by at least one message counter of two-octet length.

Structure:

Octet no. 1

24	23	22	21	20	19	18	17
REP							

Octet no. 2 Octet no. 3

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

bits-24/17 (REP) Number of counters following

bits16/12 (TYP) Type of message counter, encoded as follows
= 0 No detection (number of misses)
= 1 Single PSR target reports
= 2 Single SSR target reports (Non-Mode S)
= 3 SSR+PSR target reports (Non-Mode S)
= 4 Single All-Call target reports (Mode S)
= 5 Single Roll-Call target reports (Mode S)
= 6 All-Call + PSR (Mode S) target reports
= 7 Roll-Call + PSR (Mode S) target reports
= 8 Filter for Weather data
= 9 Filter for Jamming Strobe
= 10 Filter for PSR data
= 11 Filter for SSR/Mode S data
= 12 Filter for SSR/Mode S+PSR data
= 13 Filter for Enhanced Surveillance data
= 14 Filter for PSR+Enhanced Surveillance
= 15 Filter for PSR+Enhanced Surveillance + SSR/Mode S data not in Area of Prime Interest
= 16 Filter for PSR+Enhanced Surveillance + all SSR/Mode S data
= 17 Re-Interrogations (**per sector**)
= 18 BDS Swap and wrong DF replies (**per sector**)
= 19 Mode A/C FRUIT (**per sector**)
= 20 Mode S FRUIT (**per sector**)

bits-11/1 (COUNTER) 11-bit counter value

Encoding Rule:

See Table in I034/000.

5.2.9 Data Item I034/090, Collimation Error

Definition : Averaged difference in range and in azimuth for the primary target position with respect to the SSR target position as calculated by the radar station.

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
RANGE ERROR							LSB	AZIMUTH ERROR							LSB

bit-9 (LSB) = 1/128 NM

bit-1 (LSB) = $360°/(2^{14})$ = approx. 0.022°

Encoding Rule:

See Table in I034/000.

NOTE - Negative values are coded in two’s complement form.

5.2.10 Data Item I034/100, Generic Polar Window

Definition : Geographical window defined in polar co-ordinates.

Format : Eight-octet fixed length Data Item.

Structure:

Octet no. 1 — Octet no. 2

64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
RHO-START															LSB

Octet no. 3 — Octet no. 4

48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
RHO-END															LSB

Octet no. 5 — Octet no. 6

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
THETA-START															LSB

Octet no. 7 — Octet no. 8

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

bit-49 (LSB) = 1/256 NM.
Max. Range = 256 NM

bit-33 (LSB) = 1/256 NM.
Max. Range = 256 NM

bit-17 (LSB) = $360°/(2^{16})$ = approx. 0.0055°

bit-1 (LSB) = $360°/(2^{16})$ = approx. 0.0055°

Examples of Geographical windows:

Polar Cell	Rho_start	Rho_end	Theta_start	Theta_end
Azimuth Sector	0	256 NM	Theta_start	Theta_end
Range Ring	Rho_start	Rho_end	0	360°
Total Coverage	0	256 NM	0	360°

Encoding Rule:

See Table in I034/000.

This data item shall be sent when:

- indicating a geographical filtering,
- indicating a jamming strobe area
- indicating an area affected by a solar storm.

5.2.11 Data Item I034/110 Data Filter

Definition : Data Filter, which allows suppression of individual data types.

Format : One octet fixed length Data Item.

Structure: Structure:

Octet no. 1

8	7	6	5	4	3	2	1
TYP							

bits 8/1 (TYP)
= 0 invalid value
= 1 Filter for Weather data
= 2 Filter for Jamming Strobe
= 3 Filter for PSR data
= 4 Filter for SSR/Mode S data
= 5 Filter for SSR/Mode S + PSR data
= 6 Enhanced Surveillance data
= 7 Filter for PSR+Enhanced Surveillance data
= 8 Filter for PSR+Enhanced Surveillance + SSR/Mode S data not in Area of Prime Interest
= 9 Filter for PSR+Enhanced Surveillance + all SSR/Mode S data

Encoding Rule:

See Table in I034/000.

See also encoding rules for I034/100.

NOTES

1. This Data Item is often used in conjunction with I034/100 and represents a Data Filter for a specific geographical subarea. A Data Source may have zero, one or multiple data filters active at any time.
2. If I034/110 is not accompanied with I034/100, then the Data Filter is valid throughout the total area of coverage.

5.2.12 Data Item I034/120 3D-Position Of Data Source.

Definition : 3D-Position of Data Source in WGS 84 Co-ordinates.

Format : Eight-octet fixed length Data Item.

Structure:

Octet no. 1 Octet no. 2

64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
Height in WGS 84															LSB

Octet no. 3 Octet no. 4

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

Octet no. 5 Octet no.6

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

Octet 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-64/49	(Height of Data Source)	Signed Height of the Data Source, expressed in meters above WGS 84 reference ellipsoid.
Bit-49	(LSB)	= 1 metre
Bits-48/25	(Latitude)	Latitude in WGS 84 expressed in two's complement Range: -90<= latitude<= 90degrees
Bit 25	(LSB)	= $180/2^{23}$ degrees = $2.145767*10^{-05}$ degrees This corresponds to an accuracy of at least 2.3844 metres
Bits-24/1	(Longitude)	Longitude in WGS 84 expressed in two's complement Range: -180 < = longitude<180 degrees
Bit-1	(LSB)	= $180/2^{23}$ degrees = $2.145767*10^{-05}$ degrees This corresponds to an accuracy of at least 2.3844 metres

Encoding Rule:

See Table in I034/000.

5.3 Standard User Application Profile

The following standard UAP shown in Table 3 shall be used for the transmission of radar service messages:

Table 3 - Standard UAP for Radar Service Messages

FRN	Data Item	Data Item Description	Length in Octets
1	I034/010	Data Source Identifier	2
2	I034/000	Message Type	1
3	I034/030	Time-of-Day	3
4	I034/020	Sector Number	1
5	I034/041	Antenna Rotation Period	2
6	I034/050	System Configuration and Status	1+
7	I034/060	System Processing Mode	1+
FX	N/A.	Field Extension Indicator	N/A.
8	I034/070	Message Count Values	(1+2*N)
9	I034/100	Generic Polar Window	8
10	I034/110	Data Filter	1
11	I034/120	3D-Position of Data Source	8
12	I034/090	Collimation Error	2
13	RE-Data Item	Reserved Expansion Field	1+1+
14	SP-Data Item	Special Purpose Field	1+1+
FX	N/A.	Field Extension Indicator	n.a.

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.

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