EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

EUROCONTROL

EUROCONTROL STANDARD DOCUMENT

FOR

RADAR DATA EXCHANGE

Part 1

All Purpose Structured Eurocontrol Radar Information Exchange (ASTERIX)

SUR.ET1.ST05.2000-STD-01-01

Edition	**:**	**1.0**
Edition Date	**:**	**November 1997**
Status	**:**	**Released Issue**
Class	**:**	**General Public**

EUROPEAN AIR TRAFFIC CONTROL HARMONISATION AND INTEGRATION PROGRAMME

DOCUMENT IDENTIFICATION SHEET

DOCUMENT DESCRIPTION

Document Title

Radar Data Exchange - Part 1
All Purpose Structured Eurocontrol Radar Information Exchange
(ASTERIX)

EWP DELIVERABLE REFERENCE NUMBER

PROGRAMME REFERENCE INDEX	**EDITION :** 1.0
SUR.ET1.ST05.2000-STD-01-01	**EDITION DATE :** November 1997

Abstract

This document presents the general structure of the ASTERIX format.

Keywords

Data Exchange	Messages	SAC	SIC
Data Category	Data Field	Data Block	Data Item
ASTERIX	UAP		

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DOCUMENT STATUS AND TYPE

STATUS		CATEGORY		CLASSIFICATION	
Working Draft	☐	Executive Task	☐	General Public	☑
Draft	☐	Specialist Task	☐	EATCHIP	☐
Proposed Issue	☐	Lower Layer Task	☑	Restricted	☐
Released Issue	☑				

ELECTRONIC BACKUP

INTERNAL REFERENCE NAME : ASTERIX - Part 1

HOST SYSTEM	MEDIA	SOFTWARE(S)
Microsoft Windows	Type : Hard disk	
	Media Identification :	

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DOCUMENT APPROVAL

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

AUTHORITY	NAME AND SIGNATURE	DATE
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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
Proposed	May 1997	• New format and numbering to comply with the EATCHIP Document Configuration rules. • The “S” in SAC/SIC renamed System instead of Source, to allow for both source and destination codes.	ALL
Released	November 1997	Adoption by the Eurocontrol Permanent Commission	

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FOREWORD

1 Responsible Body

This Standard has been developed and is maintained by the Surveillance Task Force on Radar Data Exchange (STFRDE) of the European Air Traffic Control Harmonisation and Integration Programme (EATCHIP).

2 EATCHIP Work Programme Document

This Standard is identified as deliverable 02 in the EATCHIP Work Programme Document (EWPD), Surveillance Domain, Executive Task 01, Specialist Task 05.

3 Approval of the Standard

3.1 This Standard is adopted in accordance with the procedures outlined in the Directives for Eurocontrol Standardisation, Ref. 000 - 2 - 93.

3.2 This Standard becomes effective upon adoption by the Permanent Commission of Eurocontrol.

4 Technical Corrigenda and Amendments

This Standard is kept under review by the responsible body who, when changes or corrections are necessary, will prepare the required amendments or technical corrigenda. The procedure for the maintenance of this Standard is laid down in Annex H of the Directives for the Uniform Drafting and Presentation of Eurocontrol Standard Documents Ref. 000 - 1 - 92.

5 Editorial Conventions

5.1 The format of this Standard complies with the Directives for the Uniform Drafting and Presentation of Eurocontrol Standard Documents.

5.2 The following practice has been adhered to in order to indicate at a glance the status of each statement:

- Normative Elements have been printed in light face roman text;
- *Recommended Elements* have been printed in light face italics, the status being indicated by the prefix **Recommendation.**

5.3 The following editorial practice has been followed in the writing of specifications:

- for Normative Elements the operative verb "shall" is used;
- for *Recommended Elements* the operative verb "should" is used.

5.4 Any information which is essential to the understanding of a particular indent will be integrated within the text as a note. It will not contain specifications and will be placed immediately after the indent to which it refers.

6 Relationship to Other Standard Documents

This Standard is related to the Eurocontrol Standard for Radar Surveillance in En-Route Airspace and Major Terminal Areas, Ref. 006 - 95.

7 Status of Annexes to This Document

There are three Annexes to this Part of the Standard Document, the status of each being defined as follows:

- Annex A Normative
- Annex B Informative
- Annex C Informative.

8 Language Used

The original version of this Standard Document is in the English language.

1. INTRODUCTION

1.1 Purpose

1.1.1 General

The present Eurocontrol Standard describes the message structure, known by the acronym **ASTERIX**, standing for **A**ll Purpose **ST**ructured **Eurocontrol R**adar **I**nformation E**X**change, devised by the Study Group on the Exchange of radar related data between processors of ATC systems, this group was a subgroup of the former Radar Systems Specialist Panel (RSSP), whose responsibilities have been taken over by the EATCHIP Surveillance Team as from April 1994. ASTERIX was approved by the former RSSP at their 15th Meeting held on 1/4 July 1986.

1.1.2 Notification of Differences

Eurocontrol Member States and other States making use of this Standard are required to notify the Agency of any differences between their National Standard for the exchange of radar data and this Eurocontrol Standard and any amendments thereto.

Further, States are invited to keep the Agency currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified.

A specific request for notification of differences will be sent to States immediately after the adoption of each amendment to this Standard.

Differences notified by States will be published as a supplement to this Standard.

1.1.3 Structure of The Eurocontrol Standard for Radar Data Exchange

This Eurocontrol Standard for Radar Data Exchange contains the following Parts:

Part 1: All Purpose Structured Eurocontrol Radar Information Exchange-ASTERIX

This Part contains the specifications and the conventions used in the framework of ASTERIX.

Part 2a: Transmission of Monoradar Target Reports

This Part describes the standard application of ASTERIX for the transmission of monoradar target reports (plots, tracks) from a radar station to one or more RDP system(s).

Part 2b: Transmission of Monoradar Service Messages

This Part describes the standard application of ASTERIX for the transmission of monoradar service messages from a radar station to one or more RDP system(s).

Part 3: Transmission of Monoradar Derived Weather Information

This Part describes the standard application of ASTERIX for the transmission of relatively simple meteorological images of precipitation areas of various intensity levels from a radar station to one or more RDP system(s).

NOTE - Other Parts will be added to this Eurocontrol Standard as new applications using the ASTERIX message structure are identified and deemed suitable to be standardised.

1.2 Scope

1.2.1 ASTERIX is an application/presentation protocol responsible for data definition and data assembly developed to support radar data transmission and exchanges.

Its purpose is to allow a meaningful transfer of information between two application entities using a mutually agreed representation of the data to be exchanged.

1.2.2 The ASTERIX Standard refers to the Presentation and Application layers (layers six and seven) as defined by the Open Systems Interconnection (OSI) Reference Model (International Standards Organization (ISO) Standard 7498)[Ref. 1].

1.2.3 The definition of the lower telecommunication support layers (layers one to five) is definitively out of the scope of the ASTERIX Standard. Transmission of ASTERIX coded radar information can make use of any available communication medium, for instance a packet switched Wide Area Network (WAN) as well as a Local Area Network (LAN).

1.2.4 The lower telecommunication protocol levels will be agreed between the partners of the data exchange.

1.2. 5 In order to ease the exchange of data between different systems (e.g. potential network interconnection) it is advisable to apply standard telecommunication protocols (e.g. X.25 for WANs) [Ref. 2] simultaneously with ASTERIX.

1.2.6 The ASTERIX Standard, as a Presentation protocol, defines the structure of the data to be exchanged over the communication medium, from the encoding of every bit of information up to the organisation of the data within a block of data.

1.2.7 The ASTERIX Standard does not specify the whole of the Application layer and leaves some freedom for choices usually made at this level. These then can be agreed between the partners of the data exchange. For example, ASTERIX does not fix the type of radar related data provided or received by a system (e.g. plots or tracks, conventional or monopulse Secondary Surveillance Radar (SSR), conventional or Moving Target Detection (MTD) Primary radar).

1.2.8 Considering however that there is information common to all systems (position, Mode- A Code and Mode- C Code information), ASTERIX specifies minimum requirements at the Application level, so as to ease data exchanges between heterogeneous applications.

1.2.9 The communication between two different systems (even located in different countries) is thus made possible, based on a core of commonly used radar related data, transferred in the same way by the ASTERIX Presentation layer.

1.2.10 This Part of the Eurocontrol Standard shall be effective across all Member States from December 1997.

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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. ISO Standard 7498. Information Processing Systems - Open Systems Interconnection - Basic Reference Model. 1984

2. CCITT Recommendation X.121. International Numbering Plan For Public Data Networks. 1988[1)].

3. CCITT Recommendation X.25. Interface between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for Terminals Operating in the Packet-Mode and Connected to Public Data Networks by Dedicated Circuit. 1988.

4. Eurocontrol Standard 000-1-92. Directives for the Uniform Drafting and Presentation of Eurocontrol Standard Documents. 1992.

[1)] CCITT is the International Telegraph and Telephone Consultative Committee

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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:

3.1.1	**Calculated Item:**	A piece of information (e.g. the position of a target) derived from the raw radar information through an intermediate processing such as transformation of coordinates, tracking, code conversion, etc.
3.1.2	**Catalogue of Data Items:**	List of all the possible Data Items of each Data Category describing the Data Items by their reference, structure, size and units (where applicable).
3.1.3	**Data Block:**	Unit of information seen by the application as a discrete entity by its contents. A Data Block contains one or more Record(s) containing data of the same category.
3.1.4	**Data Category:**	Classification of the data in order to permit inter alia an easy identification.
3.1.5	**Data Field:**	Physical implementation for the purpose of communication of a Data Item, it is associated with a unique Field Reference Number and is the smallest unit of transmitted information.
3.1.6	**Data Item:**	The smallest unit of information in each Data Category.
3.1.7	**Measured Item:**	A piece of information (e.g. the position of a target) directly derived from the radar information and transmitted without any intermediate processing.
3.1.8	**Record:**	A collection of transmitted Data Fields of the same category preceeded by a Field Specification field, signalling the presence/absence of the various Data Fields
3.1.9	**Track Information Service:**	Distribution of track data related items according to user/server type of interface.
3.1.10	**User Application Profile:**	The mechanism for assigning Data Items to Data Fields, and containing all necessary information which needs to be standardised for the successful encoding and decoding of the messages.

3.2 Acronyms and Abbreviations

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

°	Degree (angle)
ARTAS	ATC Radar Tracker And Server
ASTERIX	**A**ll Purpose **ST**ructured **Eurocontrol R**adar **I**nformation E**X**change
ATC	Air Traffic Control
ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Services
BCD	Binary Coded Decimal
CAT	Data Category
CCITT	The International Telegraph and Telephone Consultative Committee
DCC	Data Country Code
DCE	Data Circuit-Terminating Equipment
DLC	Data Link Control
DTE	Data Terminal Equipment
EATCHIP	European Air Traffic Control Harmonisation and Integration Programme
EWPD	EATCHIP Work Programme Document
f	Scaling factor
FL	Flight Level, unit of altitude (expressed in 100's of feet)
FRN	Field Reference Number
FSPEC	Field Specification
FX	Field Extension Indicator
HDLC	High-level Data Link Control
ICAO	International Civil Aviation Organization
ISO	International Standards Organization
kt	knot = NM/hour, unit of speed
LAN	Local Area Network
LAR	Terminal Area Radar (Netherlands)
LEN	Length Indicator
LSB	Least Significant Bit

min	minute, unit of time (60 seconds)
ms	millisecond, unit of time
MSB	Most Significant Bit
MSSR	Monopulse Secondary Surveillance Radar
MTD	Moving Target Detection
NM	Nautical Mile, unit of distance (6 080 feet)
OFS	Ordered Field Sequencing (organisation of the Data Fields in a Record)
OSI	Open Systems Interconnection
PSR	Primary Surveillance Radar
RDP	Radar Data Processing (system)
REP	Field Repetition Indicator
RFS	Random Field Sequencing (organisation of the Data Fields in a Record)
RS	Random Sequence Indicator
RSSP	Radar Systems Specialist Panel
s	second, unit of time
SAC	System Area Code
SIC	System Identification Code
SP	Special Purpose Indicator
SSR	Secondary Surveillance Radar
STFRDE	Surveillance Task Force on Radar Data Exchange
SURT	Surveillance Team (EATCHIP)
TAR	Terminal Area Radar
UAP	User Application Profile (see Definitions)
UTC	Coordinated Universal Time
WAN	Wide Area Network
WGS 84	World Geodetic System 84

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4. DESCRIPTION AND PRINCIPLES OF ASTERIX

4.1 Characteristics of the Data

4.1.1 The message structure ASTERIX shall be used to exchange radar related data which are characterised by:

- relatively large amounts of data;
- some natural redundancy, target reports being repeated every few seconds;
- real-time data, implying short transmission delays.

4.1.2 **Recommendation** *It should be possible to use the ASTERIX message structure for the exchange of other categories of highly dynamic, time triggered data between various* Air *Traffic Services (ATS) units.*

4.2 Organisation of the Data

The radar related data exchanged between the users shall be organised as shown in Figure 1.

4.2.1 Data Categories

4.2.1.1 The data exchanged over the communication medium between the different users shall be classified into Data Categories.

4.2.1.2 Those categories which define the type of data exchanged shall be standardised and be the same for all users of ASTERIX.

4.2.1.3 The purpose of such a classification shall be to:

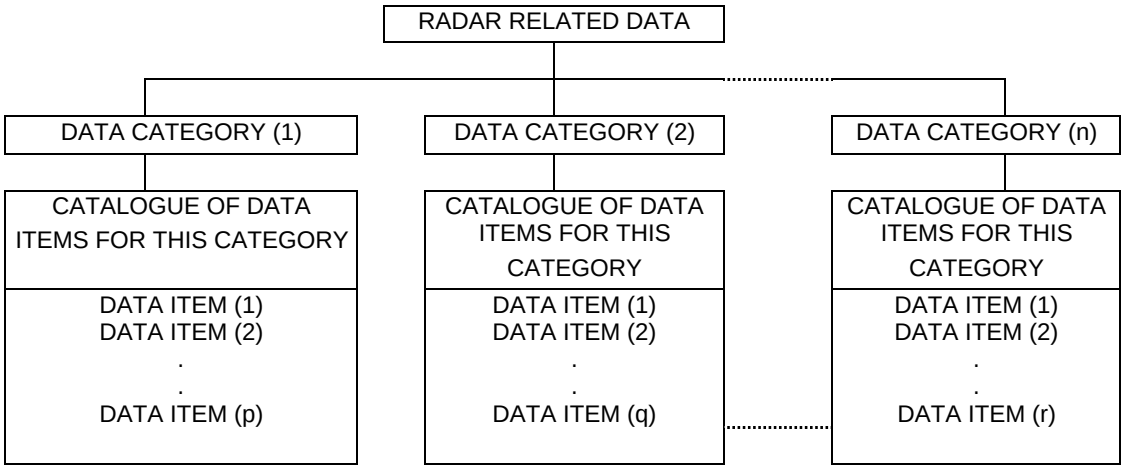
- allow easy identification of the data;
- facilitate the dispatching of the data to the appropriate application task in the receiving unit;
- establish a certain hierarchy among the data based on their priority.

4.2.1.4 Up to 256 Data Categories can be defined and their usage shall be as follows:

- Data Categories 000 to 127 for standard civil and military applications;
- Data Categories 128 to 240 reserved for special military applications;
- Data Categories 241 to 255 used for both civil and military non-standard applications.

4.2.1.5 The definition of the Data Categories so far standardised shall be as defined in Annex A

4.2.1.6 ***Recommendation*** *The list of standardised Data Categories should be reviewed and updated from time to time by the EATCHIP Surveillance Team to enable new requirements to be included.*



	USER APPLICATION PROFILE							
	DATA FIELD (1)	DATA FIELD (2)	DATA FIELD (3)	DATA FIELD (4)	DATA FIELD (5)	DATA FIELD (6)	DATA FIELD (7)	DATA FIELD (8)
DATA ITEM (1)		x						
DATA ITEM (2)						x		
DATA ITEM (3)	x							
DATA ITEM (4)				x				
DATA ITEM (5)								
...								
DATA ITEM (x)			x					
DATA ITEM (x + 1)								x
...								
DATA ITEM (q)					x			

Figure 1 - Organisation of the Data

4.2.2 Data Items and Catalogue of Data Items

4.2.2.1 A Data Item is the smallest unit of information defined and standardised. For each Data Category, a Catalogue of Data Items shall be standardised.

4.2.2.2 Applications involving the exchange of information out of a given Data Category, shall exclusively make use of the Data Items standardised in such Catalogue(s) of Data Items.

4.2.2.3 Each Data Item shall be given a unique reference which unambiguously identifies this item in the relevant catalogue.

4.2.2.4 The Data Item symbolic reference shall consist of an eight-character reference of the form **Innn/AAp**, where:

- I indicates that this represents a Data Item;
- nnn is a three digit decimal number which indicates the Data Category to which this Data Item belongs (000 to 255);
- AA is a two digit decimal number which indicates the type of data (position, speed, etc.);
- p is a one digit decimal number which may indicate up to 10 different representations of the Data Item.

4.2.2.5 Where applicable, the system units shall also be standardised.

4.2.3 Data Fields

4.2.3.1 For the purpose of communication, the various Data Items shall be assigned to Data Fields, each having a length of an integral number of octets and referenced by a Field Reference Number (FRN).

4.2.3.2 The correspondence between Data Items and Data Fields shall be standardised for each relevant application by the User Application Profile (UAP) concerning this application.

4.2.4 User Application Profile

4.2.4.1 The UAP is the mechanism whereby the correspondence between Data Items and Data Fields shall be standardised for each application making use of the ASTERIX message structure.

4.2.4.2 The UAP shall be considered as a control table attached to the message assembly/disassembly programs resident in the relevant processing systems. It essentially defines which of the catalogued Data Items will be used, their length (where applicable), their assignment to the Data Fields and any specific requirements which need to be standardised for the successful transmission and interpretation of the messages.

NOTE - With this mechanism, it is easy to optimise the transmission efficiency without program modification by taking into account the frequency of occurrence of specific Data Items. Furthermore, it enables a choice to be made between various representations of the same logical piece of information.

4.3 The General Message Structure

4.3.1 General

The application data to be transmitted over the communication medium shall consist of either one or a concatenation of consecutive Data Blocks.

4.3.2 The Data Block

4.3.2.1 A Data Block shall consist of:

- a one-octet field Data Category (CAT) indicating to which category the data transmitted belongs;
- a two-octet field Length Indicator (LEN) indicating the total length (in octets) of the Data Block, including the CAT and LEN fields;
- one or more Record(s) containing data of the same category.

NOTE - The Data Block structure is depicted in Figure 2.

4.3.2.2 Each Record is of variable length but aligned on an octet boundary. The length of a Data Block is thus variable but shall always be a multiple of an octet.

4.3.2.3 The maximum size of a Data Block shall be mutually agreed between data sources and users.

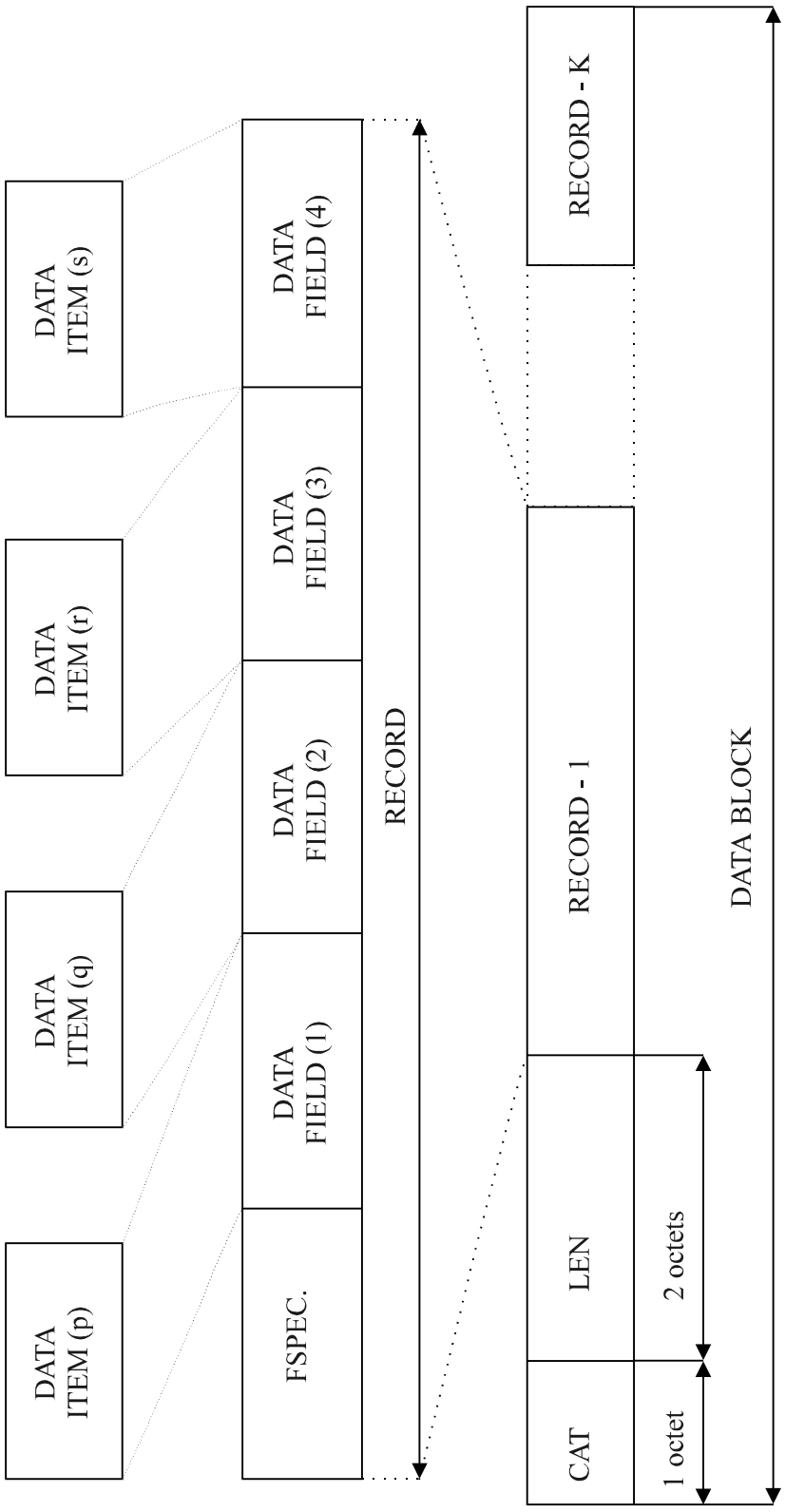


Figure 2 Data Block Structure

4.3.3 The Record

4.3.3.1 A Record shall contain the information of the same Data Category needed by a given application and shall consist of:

- a Field Specification (FSPEC) field of variable length, indicating which Data Fields are present in the Record and in which order;
- a variable number of Data Fields, having either an implicit or an explicit length. Each Data Field is associated with one and only one Data Item, as defined by the UAP.

4.3.3.2 Each Data Field shall have a defined format as specified in the Catalogue of Data Items.

4.3.3.3 The length of a Record is implicit from its structure and shall always be a multiple of an octet.

4.3.4 Data Field Formats

4.3.4.1 Standard Data Fields

4.3.4.1.1 Standard Data Fields are depicted in Figure 3 and shall have either an implicit or an explicit length (multiple of an octet) depending on the Data Item assigned to each of them.

4.3.4.1.1.1 Implicit Length Data Fields

The length of such Data Fields shall be either fixed or variable, as defined below:

- Fixed length Data Fields, comprising a fixed number of octets.
- Extended length Data Fields, being of a variable length, containing a primary part of predetermined length, immediately followed by a number of secondary parts, each of predetermined length. The presence of the next following secondary part being indicated by the setting to one of the Least Significant Bit (LSB) of the last octet of the preceding part (either the primary part or a secondary part). This bit which is reserved for that purpose is called the Field Extension Indicator (FX).
- Repetitive Data Fields, being of a variable length, comprising a one-octet Field Repetition Indicator (REP) signalling the presence of N consecutive sub-fields each of the same pre-determined length.

4.3.4.1.1.2 Explicit Length Data Fields

These Data Fields shall start with a one-octet length indicator giving the total field length in octets including the length indicator itself.

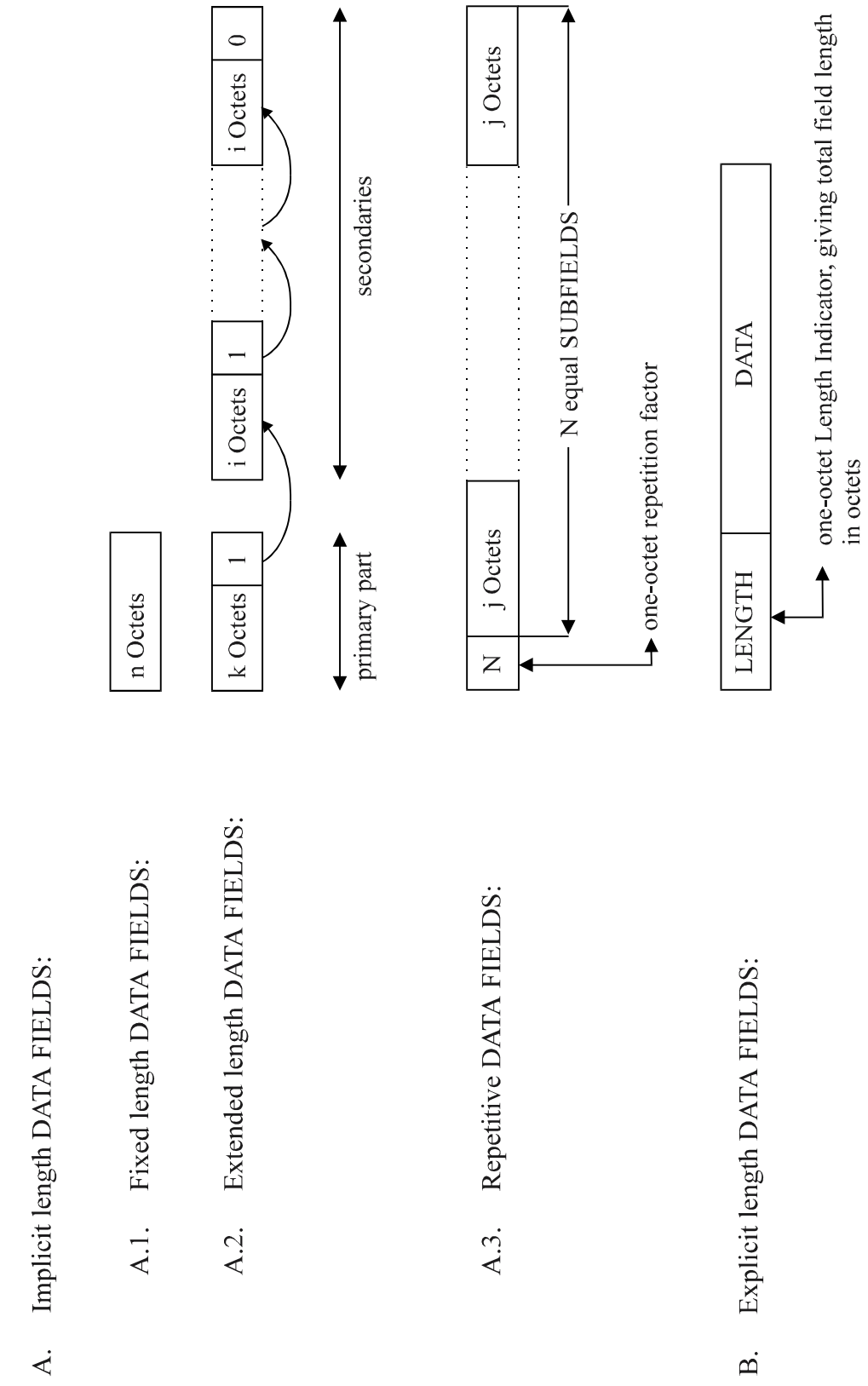


Figure 3 Standard Data Fields Types

4.3.4.2 Non-Standard Data Fields

4.3.4.2.1. This is a special feature allowing a user subgroup to exchange a variable length field which shall be transparent to non-interested users.

4.3.4.2.2 The first octet shall contain the explicit length of the field expressed in octets and including the length indicator itself. The following Data Field may contain information such as a Data Item not yet specified in the Catalogue of Data Items or awaiting specification, a text string for operator communication, test data, etc.

4.3.4.2.3 The contents of such a Data Field shall be agreed between the users concerned, while those not concerned may skip the data.

4.3.5 Field Organisation

4.3.5.1 General

In order to achieve maximum transmission efficiency the ASTERIX message structure allows the packing of Data Fields in a way to achieve the shortest possible Data Blocks. This shall be achieved by carefully sequencing the Data Fields within a Record.

Two complementary field sequencing methods are foreseen to allow for the desired flexibility.

4.3.5.2 The Ordered Field Sequencing Organisation

4.3.5.2.1 The Ordered Field Sequencing (OFS) organisation shall be the standard method of Record composition.

4.3.5.2.2 In the OFS organisation the Record structure shall be the following:

- the leading part of the Record is a variable length field FSPEC. The FSPEC being considered as a table of contents, in the form of a bit sequence, where every individual bit signals the presence or absence of a well defined Data Field assigned to it;
- the FSPEC field is immediately followed by a variable number of contiguous Data Fields in the order of increasing FRN.

4.3.5.2.3 The relationship between the FSPEC bits, Data Fields and Data Items shall be established in the UAP.

4.3.5.2.4 The minimum length of the FSPEC field shall be one octet, which allows the composition of Records consisting of any combination of Data Fields with FRNs from one up to and including seven.

4.3.5.2.5 When Data Fields with FRNs greater than seven have to be transmitted the FSPEC extension mechanism shall be used. This is achieved by assigning a special meaning to the LSB of any FSPEC octet. The LSB, when set to one, signals the continuation of the FSPEC field with at least one further octet, until finally an octet is encountered with the LSB set to zero. The LSB in the FSPEC field is called the Field Extension Indicator (FX).

NOTE - For illustrative purposes two examples of OFS Record structures are shown in Figure 4. The first example contains a Record with a single-octet FSPEC, whereas the second one highlights a case with a multi-octet FSPEC.

4.3.5.2.6 The OFS organisation allows for a flexible and compact Record composition providing that the number of different Data Items which might be exchanged is limited. In applications where the status of a process is described by and communicated with a high number of Data Items, all with significantly different update frequencies, the OFS efficiency decreases rapidly. The occasional presence of one or more Data Fields with a high FRN (infrequently transmitted Data Items) would result in an unwanted lengthy FSPEC field. For this reason and in order to maintain flexibility and efficiency in all situations, the OFS organisation shall be supplemented with a Random Field Sequencing (RFS) organisation whose method of application is described in the next subparagraph.

4.3.5.3 The Random Field Sequencing Organisation

4.3.5.3.1 The RFS organisation shall allow the FSPEC field to be kept short, even if Data Fields with a low rank order (i.e. high FRN) have to be occasionally exchanged.

NOTE - The RFS organised field is a collection of Data Fields which in contrast to the OFS organisation, can occur in any order.

4.3.5.3.2 The RFS organised field is depicted in Figure 5 and shall be structured as follows:

- the first octet provides the number, N, of Data Fields following;
- N fields in any arbitrary order each consisting of a one-octet FRN immediately followed by the contents of the Data Item associated with the preceding FRN.

4.3.5.3.3 A sequence of Data Fields, thus assembled as an RFS organised field shall require only a single bit to be reserved in the FSPEC. This bit is called the Random Sequence Indicator (RS-bit) and signals the presence or absence of an RFS organised field.

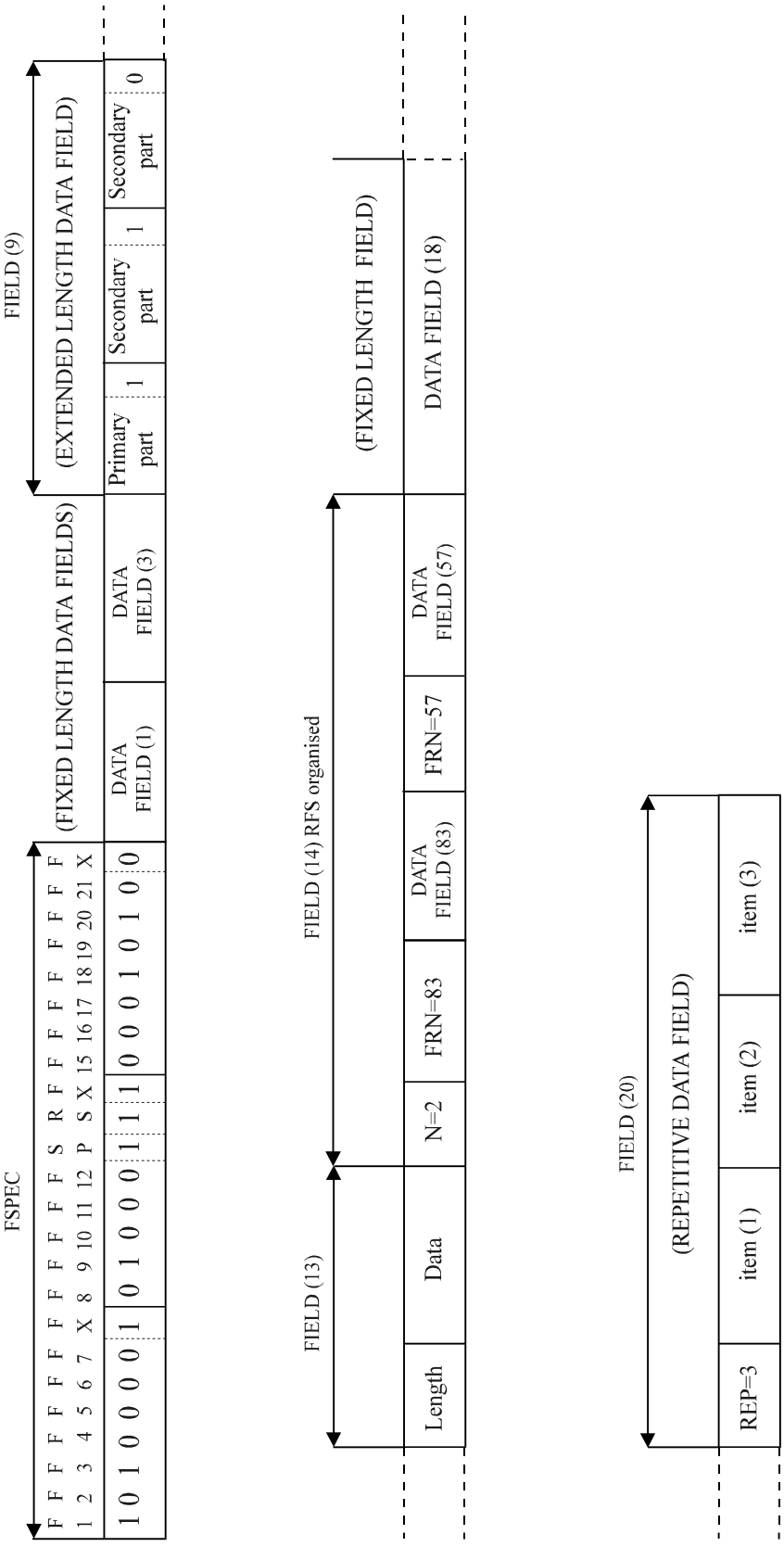


Figure 4 Ordered Field Sequencing Organisation

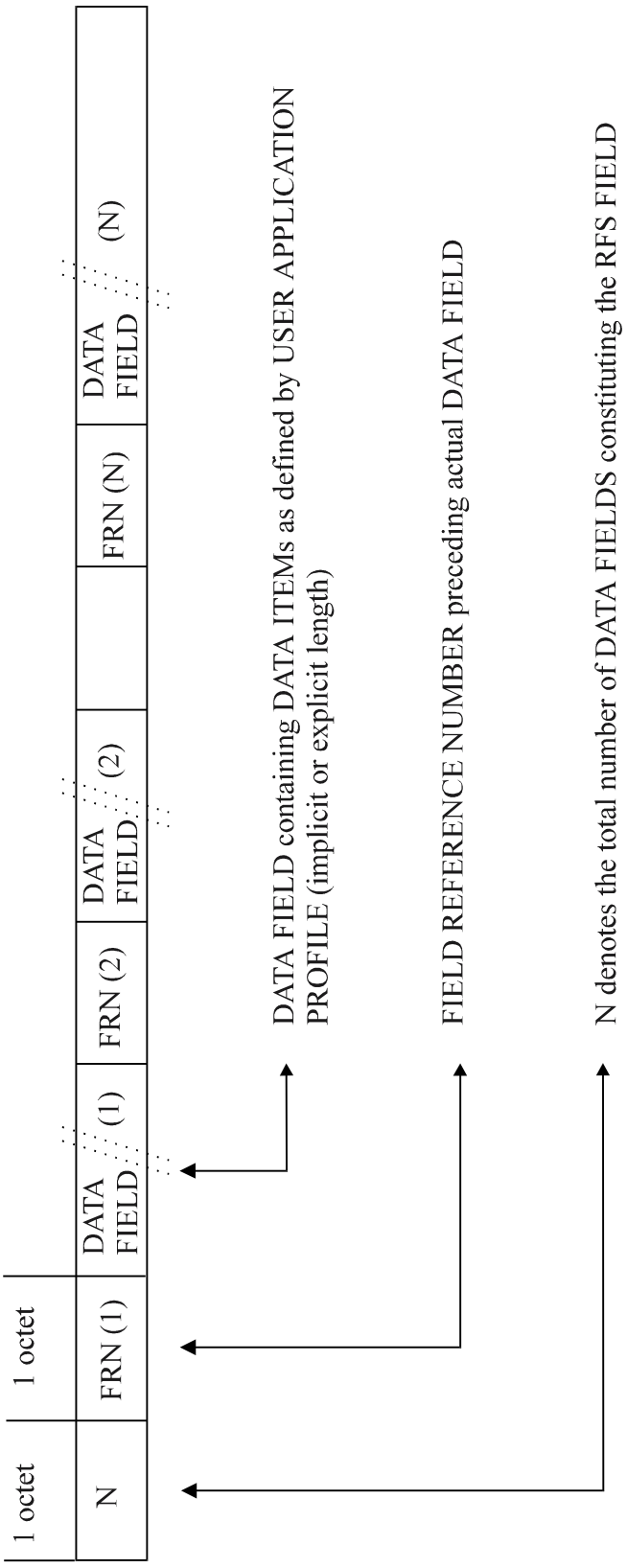


Figure 5 Random Field Sequencing Organisation

4.3.6 Overall Record Assembly Strategy

4.3.6.1 An efficient Record assembly strategy using ASTERIX shall be as follows:

- Data Fields with an FRN inferior to the FRN of the RS-bit always use the OFS organisation, i.e. their presence is signalled in the FSPEC by setting the corresponding bit to one.
- Data Fields exchanged with an FRN exceeding the FRN of the RS-bit can use an extended FSPEC, or be assembled in an RFS field, or a mixture of both, whichever yields the most compact Record composition. In any case an RFS organized field, when used, shall only contain Data Fields with FRNs exceeding that of the RS-bit itself.

4.3.6.2 A special feature called the Special Purpose field completes the ASTERIX Record assembly mechanism and is intended to provide an escape mechanism for the exceptional exchange of non-standard information. When this feature is used, a Special Purpose Indicator, (the SP-bit) shall be reserved in the FSPEC field.

NOTE - In order to illustrate all elements of ASTERIX Record composition an example is depicted in Figure 6 where FSPEC bit-13 is dedicated to the SP feature, whereas bit-14 is used to indicate the presence of an RFS organized field, carrying Data Fields 83 and 53 in that order.

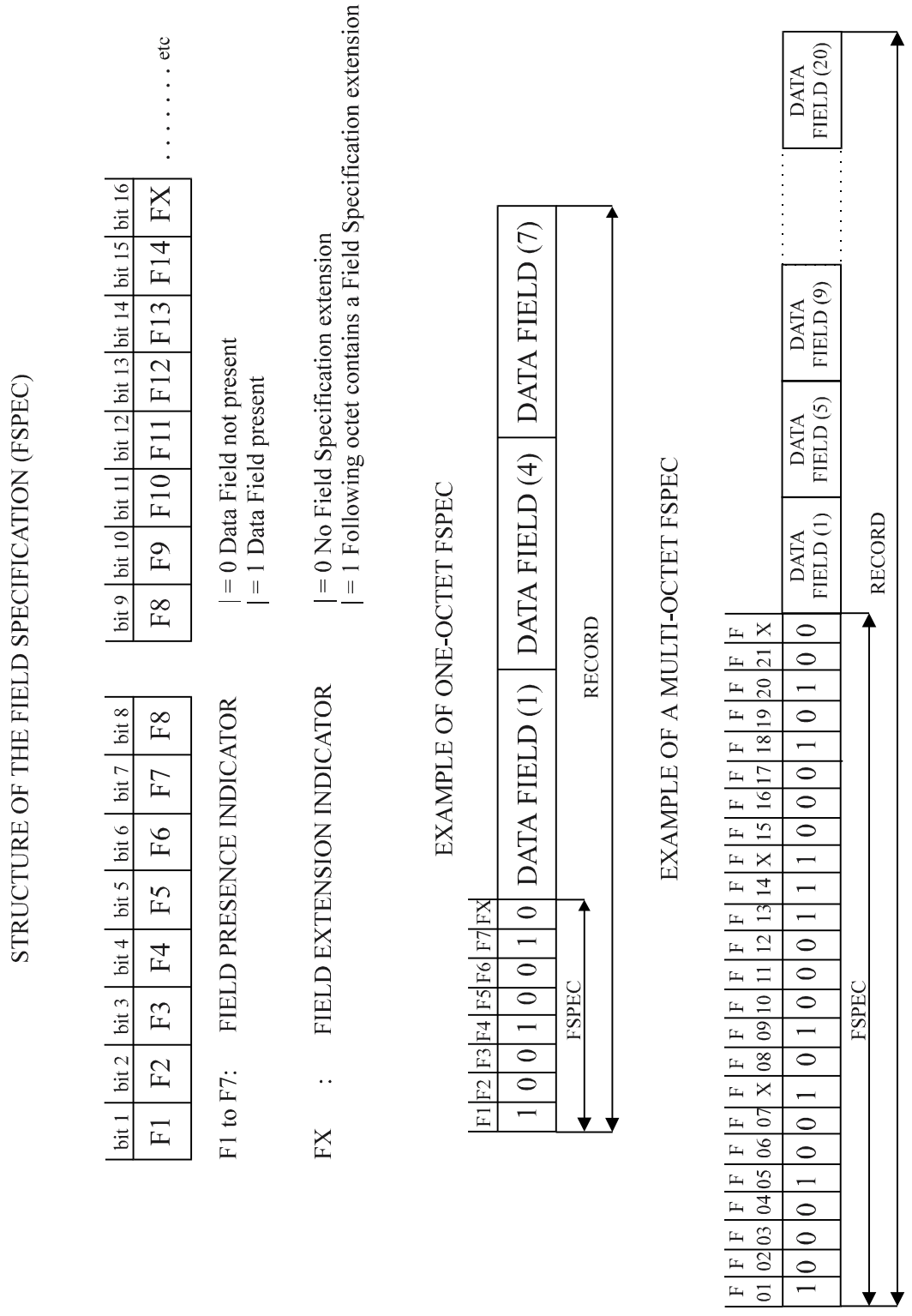


Figure 6 Overall Record Structure

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5. CONVENTIONS

5.1 Bit Numbering

5.1.1 All bit positions within a one octet field shall be numbered right to left from one to eight.

5.1.2 For an n-octet field, the bit positions shall be numbered right to left from one to nx8, the most significant bits being in octet one (the left most octet).

5.1.3 With an FSPEC field the following exceptions for bit positions shall apply:

- in a one-octet FSPEC the bits will be numbered left to right from one to eight;
- in a p-octet FSPEC the bits will be numbered left to right from one to px8.

5.1.4 Data shall be presented to the application at the receiving end in the same order as generated at the transmitting end.

5.2 Binary Values

Negative values shall be represented in two's complement form, i.e. the left most or Most Significant Bit (MSB) being zero for positive values and one for negative values.

5.3 Time Management in Radar Data Transmission Applications

5.3.1 General

Two areas of applications shall be distinguished:

- transmission of data from a radar station to processing centres;
- exchange of composite synthetic traffic pictures (track and/or plots) between track information servers and processing centres.

5.3.2 Data Transmission from Radar Stations to Processing Centres

5.3.2.1 When absolute time stamping is performed at the radar site, it shall be expressed as Coordinated Universal Time (UTC) time. There exist various implementation options for time management:

- either every plot or track is individually time-stamped;
- or a number of sector messages (at least 16 per revolution) is provided with a time stamp.

Every individual plot detection time is then derived at the receiver end via a suitable interpolation technique (azimuth difference with regard to last sector message, last sector crossing time and antenna rotation period).

5.3.2.2 Recommendation *Time stamping should be applied at the data source itself.*

5.3.3 Exchange of Composite Traffic Pictures Between Track Information Servers and Processing Centres

For the exchange of traffic pictures, different alternative time stamping implementations shall be as follows:

- either all tracks have their own individual time stamp;
- or, due to the fact that more often all tracks are calculated for a common reference time, a special timing record is provided preceding the first track. For this case the tracks themselves do not need a time stamp;
- or, the whole traffic picture is sliced into a number of track batches, with each batch containing all tracks in a geographical sub-area. All tracks within a sub-area will have the same time reference. The time reference of the batch of a neighbouring sub-area will show a small time-offset (picture renewal time/number of batches). In this situation every batch is preceded by a synchronization record providing the time reference of all tracks within the batch, or alternatively every Data Block contains a time record as the first Record within the Data Block.

5.4 Projection Systems and Geographic Coordinates

Recommendation *Although it would be possible to transform the 'local' geographic coordinates to latitude and longitude information referenced to a common ellipsoid, each ASTERIX user should transmit its information in its own system of coordinates and transform the information received from other ASTERIX users to its own system of coordinates.*

NOTE - At present the geographic coordinates used are generally not coherent because different projection systems referenced to different ellipsoids are used. This will no longer be the case as from 1st January 1998 when the World Geodetic System 84 (WGS 84) becomes operational.

6. ASTERIX ADDRESSING SCHEME

6.1 General

In order to avoid ambiguity, every system (e.g. radar sensor, radar data processing system, server) shall have a unique identification within the community of States participating in the ASTERIX radar data exchange.

6.2 Syntax

The ASTERIX System Identifier format shall be composed of two subfields as illustrated below:

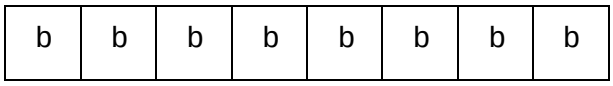
	Field Name	Element Type	Field Size
SAC	System Area Code	Binary	one octet
SIC	System Identification Code	Binary	one octet

6.3 Formats

6.3.1 System Area Code (SAC)

6.3.1.1 The SAC field shall consist of an eight-bit number assigned to a geographical area or a country.

6.3.1.3 The SAC field format shall be as illustrated below:

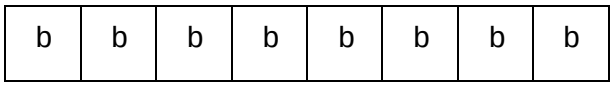


where b represents a binary digit.

6.3.2 System Identification Code (SIC)

6.3.2.1 The SIC shall consist of an eight-bit number assigned to every system (radar station, processing system, server, etc.) located in the geographical area or country defined by the SAC.

6.3.2.2 The SIC field format shall be as illustrated below:



where b represents a binary digit.

6.4 Assignment of the Systems Identifiers

6.4.1 System Area Codes

6.4.1.1 One SAC shall be assigned to each country.

6.4.1.2 **Recommendation** *When needed, more than one SAC should be assigned to a single country, for example to differentiate between civil and military applications.*

6.4.1.3 Assignment of SACs shall be coordinated by the STFRDE.

NOTE - The initial list of SACs is contained in Table 2.

Table 2 - System Area Codes

SAC (Hexa)	Country/ Geographical Area	Binary Representation	SAC (Hexa)	Country/ Geographical Area	Binary Representation
00			48		
02	Greece	0000 0010	50		
04	The Netherlands	0000 0100	52		
06	Belgium	0000 0110	54		
08	France	0000 1000	56		
10			58		
12	Monaco	0001 0010	60	Poland	0110 0000
14	Spain	0001 0100	62	Germany	0110 0010
16	Hungary	0001 0110	64		
18			66		
19	Croatia	0001 1001	68	Portugal	0110 1000
20	Yugoslavia	0010 0000	70	Luxembourg	0111 0000
22	Italy	0010 0010	72	Ireland	0111 0010
24			74	Iceland	0111 0100
26	Rumania	0010 0110	76		
28	Switzerland	0010 1000	78	Malta	0111 1000
30	Slovak Republic	0011 0000	80	Cyprus	1000 0000
31	Czech Republic	0011 0001			
32	Austria	0011 0010	82		
34	United Kingdom	0011 0100	84	Bulgaria	1000 0100
35	United Kingdom	0011 0101	86	Turkey	1000 0110
36			88		
38	Denmark	0011 1000	90		
40	Sweden	0100 0000	92		
42	Norway	0100 0010	93	Republic of Slovenia	1001 0011
44	Finland	0100 0100	94		
46	Lithuania	0100 0110	96		
47	Latvia	0100 0111	98		

6.4.2 System Identification Codes

6.4.2.1 The individual SICs shall be assigned by the National Administration concerned within the area identified by the SAC and will be published in the ASTERIX Standard as soon as they are notified to the Surveillance Task Force on Radar Data Exchange.

6.4.2.2 Within one geographical area or country identified by a SAC, up to 256 individual codes (SICs) can be assigned.

NOTE - Allocated SICs are contained in Annex B.

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ANNEX A. (NORMATIVE)
LIST OF ASTERIX DATA CATEGORIES

A.1 Any updates to the following list of standardised Data Categories shall be subject to the approval of the Surveillance Task Force for Radar Data Exchange (ASTERIX).

NOTE - Table 1 shows the currently specified Data Categories and, where an application using the ASTERIX message structure exists, in which Part of this Eurocontrol Standard the description of the standardised Data Category and Data Items can be found.

Table 1 - Standardised Data Categories

Category	Type of Data Transmitted	Part
000	Time synchronisation messages	-
001	Radar target reports from a radar surveillance system to an RDP system (plots, tracks or a combination of both)	2a
002	Radar service messages	2b
003	Distribution of synthetic air traffic data	-
...		
008	Monoradar derived weather information	3
009	Multisensor derived weather information	-
...		
016	Enhanced surveillance data from a Mode- S ground station	-
...		
030	Exchange of air situation pictures[1)]	-
031	Sensor Information Messages[1)]	-
032	Information provided by users to ARTAS[1)]	-
...		
127		
128	)	
...	) Reserved for special military applications	
240	)	
241	Technical messages	-
...		
252	Session and service control messages[1)]	-
253	Remote station monitoring and control information[2)]	-
254	Up-line memory dump information[2)]	-
255	Down-line program load information[2)]	-

NOTES

1. Reserved for ARTAS applications
2. Provisional

A.2 Brief Description of each of the Categories

A.2.1 Category 000, Time Synchronisation Messages

Time synchronisation messages are used, for example, to provide efficient time stamp information when composite traffic pictures are exchanged between processing systems.

A.2.2 Category 001, Radar Target Reports From a Radar Surveillance System to a Radar Data Processing (RDP) System

Radar target reports are transactions containing parameters transmitted from a radar surveillance system to an RDP system. Either plot or track messages or a combination of both may be transmitted. The data flow is unidirectional from the radar station to the user system(s).

A.2.3 Category 002, Radar Service Messages

The transmission of Category 002 data allows a radar station to inform its users about its present hardware configuration and processing status. The data flow is unidirectional from the radar station to the end user system(s) and represents those data elements necessary for the proper handling of the radar surveillance data at the user side.

A.2.4 Category 003, Distribution of Synthetic Air Traffic Data

This category is devised to distribute synthetic traffic situation pictures between RDP systems for display at a controller position. The traffic situation pictures are basically established by a mono/multi radar tracking process, possibly further supplemented with the association of flight plan data (fully labelled traffic pictures). The latter feature allows the implementation of automatic coordination processes via screen to screen communications, even between working positions located in different ATC centres.

A.2.5 Category 008, Monoradar Derived Weather Information

These are relatively simple meteorological images of precipitation zones detected by radars. Precipitation zones are represented in one of three ways:

- shaded areas of polar vectors;
- shaded areas of parallel vectors of various orientations;
- contours.

The data flow is unidirectional from the radar station to the user system(s).

A.2.6 Category 009, Multisensor Derived Weather Information

This allows the transmission of composite weather pictures produced by a data processing system from the information provided by a number of individual radars, generally used for ATC purposes.

A.2.7 Category 016, Enhanced Surveillance Data From a Mode-S Ground Station

Comparable to Category 001, this Data Category covers radar target reports from a Mode-S radar surveillance system to an RDP system. Either plot or track messages may be transmitted. The data flow is unidirectional from the Mode-S radar station to the user system(s).

A.2.8 Category 030, Exchange of Air Situation Pictures.

(Reserved for ATC Radar Tracker and Server (ARTAS) Applications)

This Data Category comprises all items available in an ARTAS track data base possibly transmitted in the frame of a Track Information Service. The subset of items provided to each user depends on the item selection made during the service definition.

A.2.9 Category 031, Sensor Information Messages

(Reserved for ARTAS Applications)

This category permits the exchange of information related to the surveillance sensors used by ARTAS.

A.2.10 Category 032, Information Provided by Users to ARTAS

(Reserved for ARTAS Applications)

This Data Category is reserved for the transmission of data from users to ARTAS. Such information relates to the track enrichment, i.e. the addition of supplementary information (e.g. flight plan related data) to the ARTAS radar tracks.

A.2.11 Category 241, Technical Messages

Technical messages are application dependent messages which are used by a data sink (i.e. an end-user RDP system) to communicate its requirements to one or more data source(s) (i.e. track server). These messages can be used to exchange standard filter table(s) between data sinks and sources. Data provided by a track server can thus be filtered according to the particular requirements of end-user RDP systems, on the basis of filtering criteria such as geographical filtering, height layering, track status and/or category and weather data filtering. In addition, these messages can be used to impose data reduction actions in order to achieve an autonomous flow control for the distribution of track server data.

A.2.12 Category 252, Session and Service Control Messages

(Reserved for ARTAS Applications)

This Data Category is devised to permit the setting-up of connections between ARTAS and its users, and to define the Track Information Service to be provided by ARTAS.

A.2.13 Category 253, Remote Station Monitoring and Control Information

This Data Category is reserved for the exchange of information between radar station(s) and a remote, possibly central, monitoring and control system. Since this Data Category is highly application and manufacturer dependent, no attempt to standardise its use or the Data Items (if any) comprised therein has been made.

A.2.14 Category 254, Up-line Memory Dump Information

This Data Category is highly application and manufacturer dependent, no attempt to standardise its use or the Data Items (if any) comprised therein has been made.

A.2.15 Category 255, Down-line Program Load Information

This Data Category is highly application and manufacturer dependent, no attempt to standardise its use or the Data Items (if any) comprised therein has been made.

ANNEX B. (INFORMATIVE)
LIST OF SYSTEM IDENTIFICATION CODES

This Annex consists of Tables that identify the System Identification Codes of radar sources and sinks, as they have been defined by National Administrations concerned. The current list of Tables is as follows:

Table No.	Table Title
B-1	System Identification Codes for the Netherlands
B-2	System Identification Codes for Belgium
B-3	System Identification Codes for France
B-4	System Identification Codes for Spain
B-5	System Identification Codes for Italy
B-6	System Identification Codes for Switzerland
B-7	System Identification Codes for the United Kingdom
B-8	System Identification Codes for Norway
B-9	System Identification Codes for Germany
B-10	System Identification Codes for Ireland
B-11	System Identification Codes for Austria
B-12	System Identification Codes for Denmark
B-13	System Identification Codes for the Republic of Slovenia
B-14	System Identification Codes for Portugal

Table B-1 - System Identification Codes for The Netherlands

SIC (Decimal)	Radar Data Source	Radar Type	Code (Binary)
Civil Radars			
000	Herwijnen, main	PSR/MSSR	0000 0000
001	Herwijnen, standby	SSR	0000 0001
002	Herwijnen	Weather Radar	0000 0010
010	Den Helder	MSSR	0000 1010
020	Schiphol TAR4	PSR/MSSR	0001 0100
021	Schiphol TAR1	SSR	0001 0101
030	Eelde	MSSR	0001 1110
040	Beek	PSR/SSR	0010 1000
Processing Systems			
060	ARTAS - APP on AAA-lan		0011 1100
070	ARTAS - ACC on AAA-lan		0100 0110
080	ARTAS - OPERATIONAL		0101 0000
090	ARTAS - TEST		0101 1010
100	Weather Processor - ACC (future replacement of RSAP 002/075)		0110 0100
101	Weather Processor - APP (future replacement of RSAP 002/065)		0110 0101
Militairy Radars			
150	Nieuw Milligen	PSR/MSSR (3D)	1001 0110
160	Wier	PSR/MSSR (3D)	1010 0000
UAC Maastricht			
240	MADAP ONL		1111 0000
241	MADAP STB		1111 0001

Table B-2 - System Identification Codes for Belgium

SIC (Decimal)	Radar Data System	Radar Type	Code (Binary)
001	Brussels	TAR	0000 0001
002	Brussels	MSSR	0000 0010
003	Bertem		0000 0011
004	Bertem		0000 0100
005	Saint Hubert		0000 0101
006	Saint Hubert		0000 0110

Table B-3 - System Identification Codes for France

SIC (Decimal)	Radar Data System	Radar Type	Code (Binary)
000	Orly	Mode S Ex	0000 0000
001	Chaumont - Cirfontaines	MSSR	0000 0001
002	Tours - Monthodon	MSSR	0000 0010
003	Auch - Lias	MSSR	0000 0011
004	Grenoble - Fours	MSSR	0000 0100
005	Mont Ventoux	MSSR	0000 0101
006	Bordeaux - Lestiac	MSSR	0000 0110
007	Paris Sud - Palaiseau	MSSR	0000 0111
008	Grasse - Le Haut Montet	MSSR	0000 1000
009	Paris Nord - Coubron	MSSR	0000 1001
016	Bretagne	MSSR	0001 0000
017	Limoges - Mont de Blond	MSSR	0001 0001
018	Le Grand Ballon	MSSR	0001 0010
019	Avranches - Gathemo	MSSR	0001 0011
020	Boulogne - Vaudrigheim	MSSR	0001 0100
021	Nevers - Le Télégraphe	MSSR	0001 0101
022	Mont Incudine	MSSR	0001 0110
023	Montpellier - Les Plans	MSSR	0001 0111
024	Biarritz - Artzamendi	MSSR	0001 1000
025	La Roche sur Yon - Saint Michel Mont Mercure	MSSR	0011 1001
032	Rouen	Mode S Ex	0010 0000
048	Nice	PSR	0011 0000
049	Toulouse	PSR	0011 0001
050	Lyon	PSR	0011 0010
051	Bordeaux	PSR	0011 0011
052	Marseille	PSR	0011 0100
053	Bâle	PSR	0011 0101
054	Orly	PSR	0011 0110
055	Roissy	PSR	0011 0111
056	Roissy	PSR	0011 1000
057	Strasbourg STAR 2000	PSR	0011 1001

NOTE - Mode S Ex represents Mode S Experimental

Table B-4 - System Identification Codes for Spain

SIC (Decimal)	Radar Data System	Radar Type	Code (Binary)
Radars in Terminal Areas			
001	Madrid 1	PSR/SSR	0000 0001
002	Madrid 2	PSR/MSSR	0000 0010
003	Santiago	PSR/MSSR	0000 0011
065	Málaga	PSR/MSSR	0100 0001
066	Sevilla	PSR/MSSR	0100 0010
129	Barcelona	PSR/MSSR	1000 0001
130	Valencia	PSR/MSSR	1000 0010
131	Palma de Mallorca	PSR/SSR	1000 0011
193	Gran Canaria	PSR/MSSR	1100 0001
194	Tenerife Sur	PSR/MSSR	1100 0010
197	Lanzarotte	MSSR	1100 0101
Radars in En-Route Airspace			
004	Alcolea	SSR	0000 0100
005	Cancho Blanco	SSR	0000 0101
006	Espiñeiras	SSR	0000 0110
007	Solórzano	MSSR	0000 0111
008	Valdespina	SSR	0000 1000
009	Villanubla	MSSR	0000 1001
010	As Pontes	MSSR	0000 1010
011	Monflorite	MSSR	0000 1011
067	El Judio	SSR	0100 0011
132	Begas	MSSR	1000 0100
133	Randa	SSR	1000 0101
134	Sierra Espuña	MSSR	1000 0110
135	Turrillas	MSSR	1000 0111
195	Peñas del Chache	SSR	1100 0011
196	Isla de La Palma	SSR	1100 0100

Table B-5 - System Identification Codes for Italy

SIC (Decimal)	Radar Data System	Radar Type	Code (Binary)
001	Monte Lesima	PSR/MSSR	0000 0001
002	Lambro	PSR/MSSR	0000 0010
003	Peschiera	PSR/MSSR	0000 0011
004	Ravenna	PSR/MSSR	0000 0100
005	Poggio Lecceta	PSR/SSR	0000 0101
006	Fiumicino 33K (OPS)	PSR/MSSR	0000 0110
007	Maccarese 44K (OPS)	PSR/MSSR	0000 0111
008	Monte Codi	PSR/SSR	0000 1000
009	Monte Stella	PSR/SSR	0000 1001
010	Brindisi Casale	PSR/SSR	0000 1010
011	Masseria Orimini	PSR/MSSR	0000 1011
012	Ustica	PSR/SSR	0000 1100
013	Palermo 33A	PSR/SSR	0000 1101
014	Fiumicino 33K (PSA)	PSR/MSSR	0000 1110
015	Maccarese 44K (PSA)	PSR/MSSR	0000 1111
Air Traffic Control Centres			
128	Milano CRAV		1000 0000
129	Padova CRAV		1000 0001
130	Brindisi CRAV		1000 0010
131	Roma CRAV (OPS)		1000 0011
132	ROMA CRAV (PSA)		1000 0100

Table B-6 - System Identification Codes for Switzerland

SIC (Decimal)	Radar Data System	Radar Type	Code (Binary)
000	Lägern	PSR/MSSR	0000 0000
001	Cointrin main	MSSR	0000 0001
002	Holberg	MSSR	0000 0010
003	La Dôle	PSR/MSSR	0000 0011
006	TG	MSSR	0000 0110
011	Cointrin aux.	MSSR	0000 1011
012	Holberg aux.	MSSR	0000 1100

Table B-7 - System Identification Codes for United Kingdom

SIC (Decimal)	Radar Data System
Plot Extracted Radar Data Services[1)]	
001 to 003	St. Annes
004 to 007	Allans Hill
008 to 011	Clee Hill
012 to 015	Mt. Gabriel
016 to 020	Lowther Hill
021 to 024	Abbotsinch
025 to 028	Northern North Sea
029 to 032	Irish Sea
033 to 036	Ventnor
037 to 040	Debden
041 to 044	Claxby
045 to 048	Heathrow
049 to 052	Pease Pottage
053 to 056	Great Dun Fell
057 to 060	TSF (TEE)
061 to 064	RSRE
065 to 068	Cromer
069 to 072	Sumburgh
073 to 076	Saxa Vord
077 to 080	Stornoway
081 to 085	Burrington
086 to 090	Aberdeen
091 to 094	Jersey
095 to 098	Tiree
099 to 100	Guernsey

1) Spare codes have been allocated, to cater for future requirements

Table B-7 (continued) - System Identification Codes for United Kingdom

SIC (Decimal	Airport Operators	Code (Binary)
120	Edinburgh (Provisional)	0111 1000
130	Gatwick Primary / SSR only or combined	1000 0010
131	Gatwick Assigned Mode : Pease Pottage	1000 0011
132	Gatwick Assigned Mode : Heathrow	1000 0100
140	Glasgow Primary / SSR only or combined	1000 1100
141	Glasgow Assigned Mode : Lowther Hill	1000 1101
150	Heathrow Primary / SSR only or combined	1001 0110
151	Heathrow Assigned Mode : Heathrow Control	1001 0111
153	Heathrow Assigned Mode : Pease Pottage	1001 1001
154	Heathrow Assigned Mode : Debden	1001 1010
160	Manchester Head No. 1 Primary / SSR or combined	1010 0000
161	Manchester Head No. 1 Assigned Mode : St Annes	1010 0001
162	Manchester Head No. 1 Assigned Mode : Clee Hill	1010 0010
163	Manchester Head No. 1 Assigned Mode : Head 2	1010 0011
164	Manchester Head No. 2 Primary / SSR or combined	1010 0100
165	Manchester Head No. 2 Assigned Mode : St Annes	1010 0101
166	Manchester Head No. 2 Assigned Mode : Clee Hill	1010 0110
167	Manchester Head No. 2 Assigned Mode : Head 1	1010 0111
170	Stansted Primary / SSR or combined	1010 1010
171	Stansted Assigned Mode : Debden	1010 1011
172	Stansted Assigned Mode : Heathrow	1010 1100
180	TSF Primary / SSR only or combined	1011 0100
181	TSF Assigned Mode : TSF (RRP)	1011 0101
182	TSF Assigned Mode : Pease Pottage	1011 0110
183	TSF Assigned Mode : Heathrow	1011 0111
190	Belfast (Provisional)	1011 1110

Table B-7 (concluded) - System Identification Codes for United Kingdom

SIC (Decimal)	Radar Data System	Code (Binary)
	Air Traffic Control Centres	
	London	
200	Operational RMCDS A	1100 1000
201	Operational RMCDS B	1100 1001
	NERC	
205	Operational RMCDS A	1100 1101
206	Operational RMCDS B	1100 1110
207	TDU RMCDS A	1100 1111
208	TDU RMCDS B	1101 0000
210	Manchester	1101 0010
215	Scottish	1101 0111
220	New Scottish	1101 1100
	NERC Internal	
225	Operational Multi Radar Processor	1110 0001
226	TDU Multi Radar Processor	1110 0010
227	TDU Scenario Simulator	1110 0011

Table B-8 - System Identification Codes for Norway

SIC (Decimal)	Radar Data System	Radar Type	Code (Binary)
002	Tromso - Channel 0	MSSR	0000 0010
003	Tromso - Channel 1	MSSR	0000 0011
004	Haukåsen - Channel 0	PSR/MSSR	0000 0100
005	Haukåsen - Channel 1	PSR/MSSR	0000 0101
006	Bodo - Channel 0	MSSR	0000 0110
007	Bodo - Channel 1	MSSR	0000 0111
008	Bodo - TAR - Channel 0	TAR	0000 1000
009	Bodo - TAR - Channel 1	TAR	0000 1001
010	Vega - Channel 0	MSSR	0000 1010
011	Vega - Channel 1	MSSR	0000 1011
012	Tolga - Channel 0	MSSR	0000 1100
013	Tolga - Channel 1	MSSR	0000 1101
014	Vaernes - Channel 0	TAR	0000 1110
015	Vaernes - Channel 1	TAR	0000 1111
016	Evje - Channel 0	MSSR	0001 0000
017	Evje - Channel 1	MSSR	0001 0001
018	Ålesund - Channel 0	MSSR	0001 0010
019	Ålesund - Channel 1	MSSR	0001 0011
020	Mobile Radar	MSSR	0001 0100
022	Flesland - Channel 0	MSSR	0001 0110
023	Flesland - Channel 1	MSSR	0001 0111
024	Gullfaks C - Channel 0	SSR	0001 1000
025	Gullfaks C - Channel 1	SSR	0001 1001
026	Gardermoen	TAR	0001 1010
027	Gardermoen	TAR	0001 1011
028	Stavanger - Channel 0	TAR	0001 1100
029	Stavenger - Channel 1	TAR	0001 1101
Processing Systems			
128	Oslo - ATCC - RDPA		1000 0000
129	Oslo - ATCC - RDPB		1000 0001

Table B-9 - System Identification Codes for Germany

SIC (Decimal)	Radar Data System	Radar Type	Code (Binary)
Airport Radars			
001	Hamburg	PSR/MSSR	0000 0001
002	Bremen	PSR/MSSR	0000 0010
003	Hannover	PSR/MSSR	0000 0011
004	Berlin Tegel	PSR/MSSR	0000 0100
005	Berlin Schönefeld	PSR/MSSR	0000 0101
006	Münster - Osnabrück	PSR/MSSR	0000 0110
007	Leipzig	PSR/MSSR	0000 0111
008	Düsseldorf	PSR/MSSR	0000 1000
009	Dresden	PSR/MSSR	0000 1001
010	Köln/Bonn	PSR/MSSR	0000 1010
011	Frankfurt Nord	PSR/MSSR	0000 1011
012	Frankfurt Süd	PSR/MSSR	0000 1100
013	Nürnberg	PSR/MSSR	0000 1101
014	Stuttgart	PSR/MSSR	0000 1110
015	München Nord	PSR/MSSR	0000 1111
016	München Süd	PSR/MSSR	0001 0000
Long Range Radars			
032	Boostedt	MSSR	0010 0000
033	Wanna	PSR/MSSR	0010 0001
034	Neubrandenburg	MSSR	0010 0010
035	Schmocksberg	PSR/MSSR	0001 0011
036	Deister	PSR/MSSR	0010 0100
037	Auersberg	PSR/MSSR	0010 0101
038	Lüdenscheid	MSSR	0010 0110
039	Neunkirchen	PSR/MSSR	0010 0111
040	Mittersberg	MSSR	0010 1000
041	Pfälzer Wald	MSSR	0010 1001
042	Grosshager Forst	PSR/MSSR	0010 1010
043	Gosheim	MSSR	0010 1011
048	Götzenhaim	Mode-S + stand alone MSSR	0011 0000
Monitoring and Control			
061	WAST Bremen		0011 1101
062	WAST Berlin		0011 1110
063	WAST Düsseldorf		0011 1111
064	WAST Frankfurt		0100 0000
065	WAST München		0100 0001
255	Test		1111 1111

NOTE - WAST = Wartungsstützpunkte

Table B-10 - System Identification Codes for Ireland

SIC (Decimal)	Radar Data System		Radar Type	Code (Binary)
000	Dooncarton	Channel A	MSSR	0000 0000
001	Dooncarton	Channel B	MSSR	0000 0001
002	Dublin Head 1	Channel A	PSR/MSSR	0000 0010
003	Dublin Head 1	Channel B	PSR/MSSR	0000 0011
004	Dublin Head 2	Channel A	PSR/MSSR	0000 0100
005	Dublin Head 2	Channel B	PSR/MSSR	0000 0101
006	Woodcock Hill	Channel A	MSSR	0000 0110
007	Woodcock Hill	Channel B	MSSR	0000 0111
008	Shannon	Channel A	PSR/MSSR	0000 1000
009	Shannon	Channel B	PSR/MSSR	0000 1001
010	Cork	Channel A	PSR	0000 1010
011	Cork	Channel B	PSR	0000 1011
012	Mt Gabriel Hd 1	Channel A	MSSR	0000 1100
013	Mt Gabriel Hd 1	Channel B	MSSR	0000 1101
014	Mt Gabriel Hd 2	Channel A	MSSR	0000 1110
015	Mt Gabriel Hd 2	Channel B	MSSR	0000 1111

Table B-11 - System Identification Codes for Austria

SIC (Decimal)	Radar Data System	Radar Type	Code (Binary)
000	Linz	TAR	0000 0000
001 to 006	Reserved for military radar-heads		
007	Salzburg	TAR	0000 0111
008	Koralpe	MRR	0000 1000
009	Buschberg	MRR	0000 1001
010	Feichtberg	MRR	0000 1010
011	Vienna - Schwechat	TAR	0000 1011
012	Graz	TAR	0000 1100
013	Reserved for MRR Roßkofol (planned)		0000 1101
014	Reserved for Innsbruck (planned)		0000 1110
015 to 031	Reserved for other ATC-radars or channels		
032 to 127	Reserved for other direct data sources		
128 to 255	Reserved for Data Processing Systems, WAN-nodes and channels within (to be defined later)		

Table B-12 - System Identification Codes for Denmark

SIC (Decimal)	Radar Data System	Radar Type	Code (Binary)
000	Multi Radar Tracking	CATCAS MRT	0000 0000
005	Kastrup	PSR/MSSR	0000 0101
010	Roskilde	PSR/MSSR	0000 1010
011	Weather Channel	Weather Channel	0000 1011
015	Esbjerg	MSSR	0000 1111
020	Aalborg	PSR/SSR	0001 0100
025	Skrydstrup	PSR/SSR	0001 1001
030	Skagen	PSR/SSR	0001 1110
035	Tirstrup	PSR/MSSR	0010 0011
Processing Systems			
050	CATCAS		0011 0010
060	ARTAS - DK		0011 1100
070	Weather Processor		0100 0110

Table B-13 - System Identification Codes for the Republic of Slovenia

SIC (Decimal)	Radar Data System	Radar Type	Code (Binary)
000	Brnik - Channel A	TAR/MSSR	0000 0000
001	Brnik - Channel B	TAR/MSSR	0000 0001
002	Reserved for LR - Channel A	PSR/MSSR	0000 0010
003	Reserved for LR - Channel B	PSR/MSSR	0000 0011
004	Ljubljana	RMCDE - A	0000 0100
005	Ljubljana	RMCDE - B	0000 0101
006	Ljubljana	RDPS - A	0000 0110
007	Ljubljana	RDPS - B	0000 0111
008/010	Reserved for Military Radars		
011/012	Reserved for Weather Radars		

Table B-14 - System Identification Codes for Portugal

SIC (Decimal)	Radar Data System	Radar Type	Code (Binary)
001	Montejunto	TAR	0000 0001
002	Lisbon		0000 0010
003	Foia		0000 0011
004	Porto Santo		0000 0100
Processing Systems			
005	Lisbon - RDP 1st Chain		0000 0101
006	Lisbon - RDP 2nd Chain		0000 0110
230	Recording Subsystem		1110 0110
231	Recording Subsystem		1110 0111
250	Faro System		1111 1010
251	Faro - RDP 1st Chain		1111 1011
252	Faro - RDP 3rd Chain		1111 1100
253	RASS1 (Evaluation Tool)		1111 1101
254	RASS2 (Evaluation Tool)		1111 1110

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ANNEX C. (INFORMATIVE) COMMUNICATION SUPPORT

This Annex can only be considered as guidance material for point-to-point radar data exchanges (e.g. between a radar station and an RDP system).

C.1 Minimum Requirements for a Data Link Control Procedure

C.1.1 There is a definite requirement to use a Data Link Control (DLC) procedure to support the exchange of radar related data using the ASTERIX message structure.

C.1.2 Such a DLC should:

- provide for error detection;
- enable a transparent flow of data;
- provide for synchronous data transmission.

C.1.3 A standard, bit-oriented DLC procedure, such as High-level Data Link Control (HDLC), should be used to exchange radar related data.

C.1.4 Taking into account that most of the messages are repetitive and have therefore some natural redundancy, error recovery should be at the option of the users.

C.1.5 Error detection should be a prerequisite.

C.1.6 In the cases where error recovery is required, the full HDLC Link Access Protocol Balanced procedure as defined in CCITT Recommendation X.25 should be implemented [Ref. 2].

C.1.7 In the cases where only error detection is required, a common subset of HDLC as described hereafter should be implemented.

C.2 Common Subset of HDLC

C.2.1 The data link control procedure to be used should conform to reference 3.

C.2.2 The following basic features of HDLC should be implemented as a minimum:

- automatic zero insertion and deletion;
- automatic flag insertion between messages;
- cyclic redundancy check generation and detection;
- abort sequence generation and checking.

C.3 Information Field Length

C.3.1 The information field of each HDLC frame may contain more than one Data Block, even of different categories.

C.3.2 In order to achieve the maximum data throughput and minimum transmission delay, the size of the frame information field should be dynamically determined by transmission parameters such as:

- traffic load;
- line capacity;
- line quality.