



European space agency
agence spatiale européenne

ANNEX B
SAR.FDC
CCT and EXABYTE

Document:	ER-IS-EPO-GS-5902.2
Issue:	2.1
Date:	October 2, 1995
Prepared by:	Ola Gråbak _____
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1. INTRODUCTION

Sar Fast Delivery Copy

Acronym: **SAR.FDC**

Copy of ERS-2.SAR.UI16 product.

The ESA SAR.FDC format is based on the general definition of the same CEOS format (ref. ER-IS-EPO-GS-5902).

1.1 General Structure

The tape contains the following four files :

Volume Directory File Leader File Data Set File Null Volume File

1.2 Files Description

1.2.1 Volume Directory File:

Volume Descriptor Record	360 bytes
Leader File Pointer Record	360 bytes
Data Set File Pointer Record	360 bytes
Text Record	360 bytes

1.2.2 Leader File:

File Descriptor Record	720 bytes
Facility Related Data Record MPH+SPH Type	2048 bytes
Facility Related Data Record PCS Quality Type	12288 bytes

1.2.3 Data Set File:

File Descriptor Record	10012 bytes
Image Data Records	10012 bytes

1.2.4 Null Volume File:

Volume Descriptor Record	360 bytes
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1.2.5 Notation conventions :

- \$ - the use of the "\$" (dollar sign) in the documentation denotes a requirement for the blank character (ie. the ASCII or EBCDIC space character).
- (n) - this expression is used to denote the contents of an integer binary field which will vary depending on the product type or data origin and will have to be supplied by the facility generating the tape.
- <.....> - this expression is used to denote the contents of a field, which will vary depending on the product type or data origin and will have to be supplied by the facility generating the tape.
- <\$...\$> - this expression is used to denote a blank field.

1.2.6 File Class

	Class Code	Data Type
"8\$BIT\$ASCII\$ONLY\$\$\$\$\$\$\$\$\$\$\$\$"	"ASCO"	ASCII only data
"EBCDIC\$ONLY\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$"	"EBCO"	EBCDIC only
"BCD\$ONLY\$"	"BCDO"	BCD only
"BINARY\$ONLY\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$"	"BINO"	binary only data
"MIXED\$BINARY\$AND\$ASCII\$\$\$\$\$\$"	"MBAA"	binary & ASCII
"MIXED\$BINARY\$AND\$EBCDIC\$\$\$\$\$"	"MBAE"	binary & EBCDIC
"MIXED\$BINARY\$AND\$BCD\$\$\$\$\$\$\$\$"	"MBAB"	binary & BCD
"UNDEFINED,\$ETC.\$\$\$\$\$\$\$\$\$\$\$\$\$"	"UNDF"	undefined
"COMPLEX\$"	"COMP"	complex
"REAL\$"	"REAL"	floating point

1.2.7 Data Interpretation

	Format	Length
"INTEGER*1\$"	"I*1\$"	1 byte wide
"INTEGER*2\$"	"I*2\$"	2 byte wide
"INTEGER*4\$"	"I*4\$"	4 byte wide

- one, two and four byte two's complement integer representation

"SIGNED\$INTEGER*1\$\$\$\$\$\$\$\$\$\$\$\$"	"IS1\$"	1 byte wide
"SIGNED\$INTEGER*2\$\$\$\$\$\$\$\$\$\$\$\$"	"IS2\$"	2 byte wide
"SIGNED\$INTEGER*4\$\$\$\$\$\$\$\$\$\$\$\$"	"IS4\$"	4 byte wide

- one, two and four byte signed integer with the most significant bit used to denote sign

"UNSIGNED\$INTEGER*1\$\$\$\$\$\$\$\$\$\$\$\$"	"IU1\$"	1 byte wide
"UNSIGNED\$INTEGER*2\$\$\$\$\$\$\$\$\$\$\$\$"	"IU2\$"	2 byte wide
"UNSIGNED\$INTEGER*4\$\$\$\$\$\$\$\$\$\$\$\$"	"IU4\$"	4 byte wide

- one, two and four byte un-signed integer with the most significant bit used as part of the pixel value, the pixel is always positive.

"REAL*2\$"	"R*2\$"	2 byte wide
"REAL*4\$"	"R*4\$"	4 byte wide
"REAL*8\$"	"R*8\$"	8 byte wide

- two, four and eight byte two's complement floating point representation with the exponent denoted in two's complement binary. (note that the REAL*8 representation is the same as double precision.)

"REAL*2\$HEXADECIMAL\$\$\$\$\$\$\$\$\$\$\$\$"	"R*2H"	2 byte wide
"REAL*4\$HEXADECIMAL\$\$\$\$\$\$\$\$\$\$\$\$"	"R*4H"	4 byte wide
"REAL*8\$HEXADECIMAL\$\$\$\$\$\$\$\$\$\$\$\$"	"R*8H"	8 byte wide

- two, four eight byte hexadecimal floating point representation with the exponent denoted as a hexadecimal exponent. (note that the REAL*8.representation is the same as double precision.)

"COMPLEX*4\$"	"C*4\$"	4 byte wide
"COMPLEX*8\$"	"C*8\$"	8 byte wide

- four byte field with the first half (two bytes) containing the two's complement floating point representation value of the real component and the second half containing the imaginary component. Similarly for the eight byte type, with each half of the field containing the real and imaginary pairs.

"COMPLEX\$INTEGER*2\$\$\$\$\$\$\$\$\$\$\$\$"	"CI*2"	2 byte wide
"COMPLEX\$INTEGER*4\$\$\$\$\$\$\$\$\$\$\$\$"	"CI*4"	4 byte wide
"COMPLEX\$INTEGER*8\$\$\$\$\$\$\$\$\$\$\$\$~"	"CI*8"	8 byte wide

- similar to the complex floating point representation above except that each component is stored as a two's complement integer.

"COMPLEX\$\$SIGNED\$INTEGER*2\$\$\$\$"	"CIS2"	2 byte wide
"COMPLEX\$\$SIGNED\$INTEGER*4\$\$\$\$"	"CIS4"	4 byte wide
"COMPLEX\$\$SIGNED\$INTEGER*8\$\$\$\$"	"CIS8"	8 byte wide

- similar to the complex floating point representation above except that each component is stored as a signed integer.

"COMPLEX*4\$HEXADECIMAL\$\$\$\$\$\$"	"C*4H"	4 byte wide
"COMPLEX*8\$HEXADECIMAL\$\$\$\$\$\$"	"C*8H"	8 byte wide

- same as the floating point complex notation above except that the representation follows the hexadecimal conventions.

1.2.8 Records in products

Volume Directory File

	CEOS Codes
VOLUME DESCRIPTOR RECORD	192,192,18,18
FILE POINTER RECORD	219,192,18,18
TEXT RECORD	18,63,18,18

Leader File

FILE DESCRIPTOR RECORD	63,192,18,18
FACILITY RELATED DATA RECORD MPH+SPH TYPE	10,200,31,50
FACILITY RELATED DATA RECORD PCS QUALITY TYPE	10,200,31,50

SAR Data File

FILE DESCRIPTOR RECORD	63,192,18,18
PROCESSED DATA RECORD	50,11,31,20

Null Volume

NULL VOLUME DESCRIPTOR RECORD	192,192,63,18
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1.3 Note:

Fields not provided are filled with blanks or meaningless values as -9999999.9999999 in case, for instance, of fields whose format is F16.7.

WARNING: Please be aware that the field "Example with FDC product" in the following tables, contains only an EXAMPLE of what can be found in a product.

2. VOLUME DIRECTORY FILE FORMAT DEFINITION

Table 1

VOLUME DESCRIPTOR RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Record Sequence Number	1	
2	5	B1	1st record sub-type code	192	
3	6	B1	Record type code	192	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC Flag	A	
8	15-16	A2	Blanks		
9	17-28	A12	Format control document	CCB-CCT-0002	
10	29-30	A2	Superstructure format control document	A	
11	31-32	A2	Superstructure record format revision	A	
12	33-44	A12	Logical volume generating facility software release and revision level	E1SAR-FDC-01	
13	45-60	A16	ID of physical volume containing this volume descriptor		
14	61-76	A16	Logical volume identifier (centre frame latitude and longitude, deg/1000)		
15	77-92	A16	Volume set identifier product generation date, (YYYYMMDDhhmmssdd, dd=deci-secs)	19940119 8312500	
16	93-94	I2	Total number of physical volumes in the logical volume	1	
17	95-96	I2	Physical volume sequence number of the first tape within the logical volume	1	
18	97-98	I2	Physical volume sequence number of the last tape within the logical volume	1	
19	99-100	I2	Physical volume sequence number of current tape within the logical volume	1	
20	101-104	I4	First referenced file number in this physical volume within the logical volume.	1	
21	105-108	I4	Logical volume number within volume set	1	
22	109-112	I4	Logical volume number within physical volume	1	
23	113-120	A8	Logical volume creation date (YYYYMMDD)	19950614	
24	121-128	A8	Logical volume creation time (HHMMSSDD, DD=deci-seconds)	114921	
25	129-140	A12	Logical volume generation country	ITALY	
26	141-148	A8	Logical volume generating agency	ESA	
27	149-160	A12	Logical volume generating facility	ESRIN	
28	161-164	I4	Number of file pointer records in volume directory	2	
29	165-168	I4	Number of records in volume directory	4	
30	169-260	A92	Volume descriptor spare segment (always blanks filled)	1	
31	261-360	A100	Local use segment		

Table 2

LEADER FILE POINTER RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Record sequence number	2	
2	5-5	B1	1st record sub-type code	219	
3	6-6	B1	Record type code	192	
4	7-7	B1	2nd record sub-type code	18	
5	8-8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC Flag	A	
8	15-16	A2	Blanks		
9	17-20	I4	Referenced file number	1	
10	21-36	A16	Referenced file name	ERS1.SAR.FDCLEAD	
11	37-64	A28	Referenced file class	SARLEADER FILE	
12	65-68	A4	Referenced file class code	SARL	
13	69-96	A28	Referenced file data type	MIXED BINARY AND ASCII	
14	97-100	A4	Referenced file data type code	MBAA	
15	101-108	I8	Number of records in referenced file	3	
16	109-116	I8	Referenced file 1-st record length	720	
17	117-124	I8	Referenced file maximum record length	12288	
18	125-136	A12	Referenced file record length type	VARIABLE LEN	
19	137-140	A4	Referenced file record length type code	VARE	
20	141-142	I2	Referenced file physical volume start number,	1	
21	143-144	I2	Referenced file physical volume end number	1	
22	145-152	I8	Referenced file portion start, 1st record number for this physical volume	1	
23	153-160	I8	Referenced file portion end, last record number for this physical volume	3	
24	161-260	A100	File pointer spare segment		
25	261-360	A100	Local use segment	CEOS-HARM-01 01-NOV-1994	

Table 3

DATA FILE POINTER RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Record number	3	
2	5	B1	1-st record subtype code	219	
3	6	B1	Record type code	192	
4	7	B1	2-nd subtype code	18	
5	8	B1	3-rd subtype code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC flag for referenced file	A	
8	15-16	A2	Blank		
9	17-20	I4	Referenced file number	2	
10	21-36	A16	Referenced file name	ERS1.SAR.FDCIMGY	
11	37-64	A28	Referenced file class	IMAGERY OPTIONS FILE	
12	65-68	A4	Referenced file class code	IMOP	
13	69-96	A28	Referenced file data type	MIXED BINARY AND ASCII	
14	97-100	A4	Referenced file data type code	MBAA	
15	101-108	I8	Number of records in referenced file	6301	
16	109-116	I8	Referenced file 1-st record length	10012	
17	117-124	I8	Referenced file maximum record length	10012	
18	125-136	A12	Referenced file record length type	FIXED LENGTH	
19	137-140	A4	Referenced file record length type code	FIXD	
20	141-142	I2	Referenced file physical volume start number	1	
21	143-144	I2	Referenced file physical volume end number	1	
22	145-152	I8	Referenced file portion start, 1-st record number for this physical volume	1	
23	153-160	I8	Referenced file portion end, last record number for this physical volume	6301	
24	161-260	A100	File pointer spare segment		
25	261-360	A100	Local use segment		

Table 4

TEXT RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Record number	4	
2	5-5	B1	1st record sub-type code	18	
3	6-6	B1	Record type code	63	
4	7-7	B1	2nd record sub-type code	18	
5	8-8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC Flag	A	
8	15-16	A2	Continuation flag (*)		
9	17-56	A40	Product type specifier		
10	57-116	A60	Location and date/time of product creation	ESRIN-FRASCATI 31-JAN-1994 15:45:56.830	
11	117-156	A40	Physical volume identification		
12	157-196	A40	Scene identification		
13	197-236	A40	Scene location		
14	237-256	A20	<i>Spare</i>		
15	257-360	A104	<i>Spare</i>		

(*) this field is set to "C&" if information is continued on the next page text record (if any).

3. LEADER FILE FORMAT DEFINITION

Table 5 SARLEADER FILE - FILE DESCRIPTOR RECORD FIXED SEGMENT) DEFINITION

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Record Sequence Number	1	
2	5	B1	1st record sub-type code	63	
3	6	B1	Record type code	192	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	720	
7	13-14	A2	ASCII/EBCDIC Flag	A	
8	15-16	A2	Blanks		
9	17-28	A12	Format control document ID for this data file format	CEOS-SAR-CCT	
10	29-30	A2	Format control document revision level	A	
11	31-32	A2	File design descriptor revision letter	A	
12	33-44	A12	Generating software release and revision level	E1SAR-FDC-01	
13	45-48	I4	File number	2	
14	49-64	A16	File name	ERS1.SAR.FDC	
15	65-68	A4	Record requence and location type flag	FSEQ	
16	69-76	I8	Sequence number location	1	
17	77-80	I4	Sequence number field length	4	
18	81-84	A4	Record code and location type flag	FTYP	
19	85-92	I8	Record code location	5	
20	93-96	I4	Record code field length	4	
21	97-100	A4	Record length and location type flag	FLGT	
22	101-108	I8	Record length location	9	
23	109-112	I4	Record length field length	4	
24	113-113	A1	<i>Reserved</i>		
25	114-114	A1	<i>Reserved</i>		
26	115-115	A1	<i>Reserved</i>		
27	116-116	A1	<i>Reserved</i>		
28	117-180	A64	Reserved segment		

SARLEADER FILE - FILE DESCRIPTOR RECORD VARIABLE SEGMENT

29	181-186	I6	Number of data set summary records	0	
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30	187-192	I6	Data set summary record length	0	
31	193-198	I6	Number of map projection data records	0	
32	199-204	I6	Map projection record length	0	
33	205-210	I6	Number of platform pos. data records	0	
34	211-216	I6	Platform position record length	0	
35	217-222	I6	Number of attitude data records	0	
36	223-228	I6	Attitude data record length	0	
37	229-234	I6	Number of radiometric data records	0	
38	235-240	I6	Radiometric record length	0	
39	241-246	I6	Number of rad. compensation records	0	
40	247-252	I6	Radiometric compensation rec. length	0	
41	253-258	I6	Number of data quality summary records	0	
42	259-264	I6	Data quality summary record length	0	
43	265-270	I6	Number of data histograms records	0	
44	271-276	I6	Data histogram record length	0	
45	277-282	I6	Number of range spectra records	0	
46	283-288	I6	Range spectra record length	0	
47	289-294	I6	Number of DEM descriptor records	0	
48	295-300	I6	DEM descriptor record length	0	
49	301-306	I6	Number of radar par. update records	0	
50	307-312	I6	Radar par. update record length	0	
51	313-318	I6	Number of annotation data records	0	
52	319-324	I6	Annotation data record length	0	
53	325-330	I6	Number of Det.processing records	0	
54	331-336	I6	Det.processing record length	0	
55	337-342	I6	Number of calibration records	0	
56	343-348	I6	Calibration record length	0	
57	349-354	I6	Number of GCP records	0	
58	355-360	I6	GCP record length	0	
59	361-366	I6	<i>Spare</i>		
60	367-372	I6	<i>Spare</i>		
61	373-378	I6	<i>Spare</i>		
62	379-384	I6	<i>Spare</i>		
63	385-390	I6	<i>Spare</i>		
64	391-396	I6	<i>Spare</i>		
65	397-402	I6	<i>Spare</i>		
66	403-408	I6	<i>Spare</i>		
67	409-414	I6	<i>Spare</i>		
68	415-420	I6	<i>Spare</i>		
69	421-426	I6	Number of facility data records	2	

70	427-432	I6	Facility data record maximum length	12288	
71	433-720	A2	Blanks		

Table 6

FDC FACILITY DATA RECORD MPH&SPH TYPE DEFINITION

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Sequence number	2	
2	5	B	1st record sub-type code	A	
3	6	B	Record type code	C8	
4	7	B	2nd record sub-type code	1F	
5	8	B	3rd record sub-type code	32	
6	9-12	B4	Record length	2048	
7	13-76	A64	Name of this facility related data record	FACILITY RELATED	
8	77-93	17B1	Product identifier		
9	94-105	I12	Type of Product	1	
10	106-117	I12	Spacecraft	1	
11	118-141	A24	UTC of subsatellite point at beginning of product	19-JAN-1994 8:34:25.003	
12	142-153	I12	Station Identifier	5	
13	154-165	I12	Product Confidence Data	2304	
14	166-189	A24	UTC time when MPH was generated;	31-JAN-1994 15:45:56.830	
15	190-201	I12	Size of Specific Product Header in bytes	260	
16	202-213	I12	Number of product data set records	6300	
17	214-225	I12	Size of each product data set record in bytes	10004	
18	226-237	I12	Subsystem that generated the product.	0	
19	238-249	I12	OBRC flag used for SAR products only	1	
20	250-273	A24	UTC reference time	19-JAN-1994 14:38:51.161	
21	274-285	I12	Reference binary time of satellite clock	3121480003	
22	286-297	I12	Step length of satellite clock in nanoseconds	3906250	
23	298-305	A8	Software version used to generate product		
24	306-317	I12	Threshold table version number.	2009	
25	318-329	I12	<i>Spare</i>		
26	330-353	A24	UTC time of ascending node	19-JAN-1994 7:36:9.030	

Ascending node state vector in earth fixed reference system

27	354-365	I12	State vector; X 10-2m	-519933131	
28	366-377	I12	State vector; Y 10-2m	-492105990	
29	378-389	I12	State vector; Z 10-2m	417	

30	390-401	I12	State vector; X velocity 10-5m/s	-111217185	
31	402-413	I12	State vector; Y velocity 10-5m/s	118760643	
32	414-425	I12	State vector; Z velocity 10-5m/s	738127867	
33	426-437	I12	Product confidence data subsatellite track heading, relative to North	1608	
34	438-449	I12	Mid-azimuth position of product	193178	
35	450-461	I12	Number of PRF code changes for test	0	
36	462-473	I12	Number of sampling window time changes	1	
37	474-485	I12	Sum of number of calibration sub-system and receiver gain changes	0	
38	486-497	I12	Number of missing lines	0	
39	498-509	I12	Spare	0	
40	510-521	I12	3-dB pulse width of chirp replica cross-correlation pixels function	1083	
41	522-533	I12	First side lobe level of point chirp replica cross-correlation function	-12909	
42	534-545	I12	ISLR of chirp replica cross-correlation function	-10944	
43	546-557	I12	Doppler centroid confidence measure.	56	
44	558-569	I12	Doppler ambiguity confidence measure.	430	
45	570-581	I12	Mean of I input data	-138	
46	582-593	I12	Mean of Q input data	-149	
47	594-605	I12	Standard Deviation of I input data	4302	
48	606-617	I12	Standard Deviation of Q input data	4274	
49	618-629	I12	Geodetic latitude of the first pixel of the first line of the scene product.	-28364	
50	630-641	I12	East longitude of the first pixel of the first of the first line of the scene product	21701	
51	642-653	I12	Geodetic latitude of the last pixel of the first line of the scene product	-28138	
52	654-665	I12	East longitude of the last pixel of the first pixel of the first line of the scene product	20716	
53	666-677	I12	Geodetic latitude of the last pixel of the last line of the scene product	-29020	
54	678-689	I12	East longitude of the last pixel of the last line of the scene product	20459	
55	690-701	I12	Geodetic latitude of the first pixel of the last line of the scene product	-29249	
56	702-713	I12	East longitude of the first pixel of the last line of the scene product	21454	
57	714-725	I12	Geodetic latitude of the centre pixel of the scene product	-28694	
58	726-737	I12	East longitude of the centre pixel of the scene product	21082	
59	738-749	I12	Origin of used chirp	0	
60	750-761	I12	Chirp extraction index	31	
61	762-773	I12	Chirp amplitude coefficient-constant	100000	
62	774-785	I12	Chirp amplitude coefficient-linear	0	
63	786-797	I12	Chirp amplitude coefficient-quadratic	0	
64	798-809	I12	Chirp amplitude coefficient-cubic	0	
65	810-821	I12	Chirp amplitude coefficient-quartic	0	
66	822-833	I12	Chirp phase coefficient-constant	0	
67	834-845	I12	Chirp phase coefficient-constant	0	
68	846-857	I12	Chirp phase coefficient-quadratic	209441	
69	858-869	I12	Chirp phase coefficient-cubic	0	

70	870-881	I12	I mean for raw data correction	15500	
71	882-893	I12	Q mean for raw data correction	15500	
72	894-905	I12	I/Q Std Ratio for raw data correction	969	
73	906-917	I12	Output pixel bit length	16	
74	918-929	I12	16- to 8-bit conversion coefficient-constant	0	
75	930-941	I12	16- to 8-bit conversion coefficient-linear	0	
76	942-953	I12	16- to 8-bit conversion coefficient-quadratic	0	
77	954-965	I12	Calibration system gain	11	
78	966-977	I12	Receiver gain	15	
79	978-989	I12	Clutter noise estimate	0	
80	990-1001	I12	<i>Spare</i>	0	
81	1002-1013	I12	Range pixel spacing	20000	
82	1014-1025	I12	Azimuth pixel spacing	16024	
83	1026-1037	I12	Pulse repetition frequency	1679878	
84	1038-1049	I12	2-way slant range time of the first processed range cell	5542894	
85	1050-1061	I12	Doppler centroid value at near range	762256	
86	1062-1073	I12	Slope of Doppler centroid over 2-way slant range time	-326521	
87	1074-1085	I12	Azimuth FM rate at near range	-2160844	
88	1086-1097	I12	Slope of azimuth FM rate over 2-way slant range time	370065696	
89	1098-1109	I12	Doppler ambiguity number	0	
90	1110-1121	I12	Calibration coefficient (antenna), Constant term	1000	
91	1122-1133	I12	Calibration coefficient (antenna), Linear term	1000000	
92	1134-1145	I12	Calibration coefficient (antenna), Quadratic term	1000000000	
93	1146-1157	I12	Calibration coefficient (antenna), Spare term	0	
94	1158-1169	I12	Calibration coefficient (antenna), Spare term	0	
95	1170-1181	I12	EXT SAR parameter table identifier	2009	
96	1182-1193	I12	Datation improvement	0	
97	1194-1205	I12	SARFDP Static Transfer Function Table Identifier	0	
98	1206-1217	I12	SARFDP Parameter Database Identifier	1005	
99	1218-1229	I12	Output image mean	1167310	
100	1230-1241	I12	Output image standard deviation	518255	
101	1242-1253	I12	Range compression scalar gain	353000	
102	1254-1265	I12	Azimuth FFT scalar gain	2500	
103	1266-1277	I12	Azimuth compression scalar gain	800000000	
104	1278-1289	I12	Overall processing gain	113975992	
105	1290-2048	A759	Spare Blanks		

Table 7

FDC FACILITY RELATED DATA RECORD PCS QUALITY TYPE DEFINITION

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1 - 4	B4	Record sequence number	3	
2	5	B1	1-st record sub-type code	10	
3	6	B1	Record-type code	200	
4	7	B1	2 nd record sub-type code	31	
5	8	B1	3 rd record sub-type code	50	
6	9-12	B4	Length of this record	12288	
7	13-76	A64	Name of this facility related data record	FACILITY RELATED DATA RECORD [ESA GENERAL TYPE]	
8	77-12288	B	ESA reserved		

4. DATA SET FILE FORMAT DEFINITION

Table 8 SAR DATA FILE - FILE DESCRIPTOR RECORD (FIXED SEGMENT) DEFINITION

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Record sequence number	1	
2	5	B1	1st record sub-type code	63	
3	6	B1	Record sub-type code	192	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	10012	
7	13-14	A2	ASCII/EBCDIC flag	A	
8	15-16	A2	Blanks		
9	17-28	A12	Format control document ID for this data file format	CEOS-SAR-CCT	
10	29-30	A2	Format control document revision level	A	
11	31-32	A2	File design descriptor revision letter	A	
12	33-44	A12	Generating software release and revision level	E1SAR-FDC-01	
13	45-48	I4	File number	2	
14	49-64	A16	File name	ERS.SAR.FDC	
15	65-68	A4	Record sequence and location type flag	FSEQ	
16	69-76	I8	Sequence number location	1	
17	77-80	I4	Sequence number field length	4	
18	81-84	A4	Record code and location type flag	FTYP	
19	85-92	I8	Record code location	5	
20	93-96	I4	Record code field length	4	
21	97-100	A4	Record length and location type flag	FLGT	
22	101-108	I8	Record length location	9	
23	109-112	I4	Record length field length	4	
24	113	A1	<i>Reserved</i>		
25	114	A1	<i>Reserved</i>		
26	115	A1	<i>Reserved</i>		
27	116	A1	<i>Reserved</i>		
28	117-180	A64	Reserved segment		

SAR DATA IMAGERY OPTIONS FILE, FILE DESCRIPTOR RECORD (VARIABLE SEGMENT)

29	181-186	I6	Number of SAR DATA records (nominal)	6300	
----	---------	----	--------------------------------------	------	--

30	187-192	I6	SAR DATA record length	10012	bytes
31	193-216	A24	Reserved		

SAMPLE GROUP DATA

32	217-220	I4	Number of bits per sample	16	
33	221-224	I4	Number of samples per data group (or pixels)	1	
34	225-228	I4	Number of bytes per data group(or pixels)	2	
35	229-232	A4	Justification and order of samples within data group		

SAR RELATED DATA IN THE RECORD

36	233-236	I4	Number of SAR channels in this file	1	
37	237-244	I8	Number of lines per data set (nominal)	6300	
38	245-248	I4	Number of left border pixels per line	0	
39	249-256	I8	Total number of data groups per line per SAR channel	5000	
40	257-260	I4	Number of right border pixels per line	0	
41	261-264	I4	Number of top border lines	0	
42	265-268	I4	Number of bottom border lines	0	
43	269-272	A4	Interleaving indicator	BSQ	

RECORD DATA IN THE FILE

44	273-274	I2	Number of physical records per line	1	
45	275-276	I2	Number of physical records per multi-channel line	1	
46	277-280	I4	Number of bytes of prefix data per record	0	
47	281-288	I8	Number of bytes of SAR data(or pixel data) per record(nominal)	10000	
48	289-292	I4	Number of bytes of suffix data per record	0	
49	293-296	A4	<i>Reserved</i>		
50	297-304	A4	<i>Reserved</i>		
51	305-312	A8	<i>Reserved</i>		
52	313-320	A8	<i>Reserved</i>		
53	321-328	A8	<i>Reserved</i>		
54	329-336	A8	<i>Reserved</i>		
55	337-340	A4	<i>Reserved</i>		
56	341-368	A28	Blanks		
57	369-376	A8	<i>Reserved</i>		
58	377-384	A8	<i>Reserved</i>		
59	385-392	A8	<i>Reserved</i>		
60	393-400	A28	<i>Reserved</i>		

61	401-428	A4	SAR Data format type identifier	UNSIGNED INTEGER	
62	429-432	A4	SAR Data format type code	U12	
63	433-436	I4	Number of left fill bits within pixel	0	
64	437-440	I4	Number of right fill bits within pixel	0	
65	441-448	I8	Maximum data range of pixel	63535	

Table 9

IMAGERY OPTIONS FILE - PROCESSED DATA RECORD DEFINITION

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Record sequence number	2	
2	5	B1	1-st record sub-type code	50	
3	6	B1	Record type code	10	
4	7	B1	2-nd record sub-type code	31	
5	8	B1	3-rd record sub-type code	50	
6	9-12	B4	Length of this record	10012	
7	13-14	B2	First sample of image line	n	
8	15-16	B2	Second sample of image line	n	
	
5006	10011-10012	B2	Last sample of image line	n	

5. NULL VOLUME FORMAT DEFINITION

Table 10

NULL VOLUME DESCRIPTOR RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Record sequence number	1	
2	5	B1	1st record sub-type code	192	
3	6	B1	Record sub-type code	192	
4	7	B1	2nd record sub-type code	63	
5	8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC flag	A	
8	15-16	A2	Blanks		
9	17-28	A12	Format control document	CCB-CCT-0002	
10	29-30	A2	Superstructure format control document	A	
11	31-32	A2	Superstructure record format revision	A	
12	33-44	A12	Logical volume generating facility software release and revision level	E1SAR-FDC-01	
13	45-60	A16	ID of physical volume containing this volume descriptor		
14	61-76	A16	Logical volume identifier		
15	77-92	A16	Volume set identifier	1994011908342500	
16	93-94	I2	Total number of physical volumes in the logical volume	1	
17	95-96	I2	Physical volume sequence number of the first tape within the logical volume	1	
18	97-98	I2	Physical volume sequence number of the last tape within the logical volume	1	
19	99-100	I2	Physical volume sequence number of the current tape within the logical volume	1	
20	101	I4	First referenced file number in this physical volume within the logical volume	1	
21	105-108	I4	Logical volume within a volume set	1	
22	109-112	I4	Logical volume number within physical volume	1	
23	113-120	A8	Logical volume creation date (YYYYMMDD)	19950614	
24	121-128	A8	Logical volume creation time (hhmmssdd, dd-deci-seconds)	114921	
25	129-140	A12	Logical volume generation country	ITALY	
26	141-148	A8	Logical volume generating agency	ESA	
27	149-160	A12	Logical volume generating facility	ESRIN	
28	161-164	I4	Number of file pointer records in volume directory	2	
29	165-168	I4	Number of records in volume directory	4	
30	169-260	A92	Volume descriptor spare segment (always blank filled)		
31	261-360	A100	Local use segment		



European space agency
agence spatiale européenne

ANNEX B
SAR.FDC
CCT and EXABYTE

Document:	ER-IS-EPO-GS-5902.2
Issue:	2.1
Date:	October 2, 1995
Prepared by:	Ola Gråbak _____
Checked by:	Ola Gråbak _____



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1. INTRODUCTION

Sar Fast Delivery Copy

Acronym: SAR.FDC

Copy of ERS-2.SAR.UI16 product.

The ESA SAR.FDC format is based on the general definition of the same CEOS format (ref. ER-IS-EPO-GS-5902).

1.1 General Structure

The tape contains the following four files :

Volume Directory File Leader File Data Set File Null Volume File

1.2 Files Description

1.2.1 Volume Directory File:

Volume Descriptor Record	360 bytes
Leader File Pointer Record	360 bytes
Data Set File Pointer Record	360 bytes
Text Record	360 bytes

1.2.2 Leader File:

File Descriptor Record	720 bytes
Facility Related Data Record MPH+SPH Type	2048 bytes
Facility Related Data Record PCS Quality Type	12288 bytes

1.2.3 Data Set File:

File Descriptor Record	10012 bytes
Image Data Records	10012 bytes

1.2.4 Null Volume File:

Volume Descriptor Record	360 bytes
--------------------------	-----------

1.2.5 Notation conventions :

- \$ - the use of the "\$" (dollar sign) in the documentation denotes a requirement for the blank character (ie. the ASCII or EBCDIC space character).
- (n) - this expression is used to denote the contents of an integer binary field which will vary depending on the product type or data origin and will have to be supplied by the facility generating the tape.
- <.....> - this expression is used to denote the contents of a field, which will vary depending on the product type or data origin and will have to be supplied by the facility generating the tape.
- <\$...\$> - this expression is used to denote a blank field.

1.2.6 File Class

	Class Code	Data Type
"8\$BIT\$ASCII\$ONLY\$\$\$\$\$\$\$\$\$\$\$\$"	"ASCO"	ASCII only data
"EBCDIC\$ONLY\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$"	"EBCO"	EBCDIC only
"BCD\$ONLY\$"	"BCDO"	BCD only
"BINARY\$ONLY\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$"	"BINO"	binary only data
"MIXED\$BINARY\$AND\$ASCII\$\$\$\$\$\$"	"MBAA"	binary & ASCII
"MIXED\$BINARY\$AND\$EBCDIC\$\$\$\$\$"	"MBAE"	binary & EBCDIC
"MIXED\$BINARY\$AND\$BCD\$\$\$\$\$\$\$\$"	"MBAB"	binary & BCD
"UNDEFINED,\$ETC.\$\$\$\$\$\$\$\$\$\$\$\$\$"	"UNDF"	undefined
"COMPLEX\$"	"COMP"	complex
"REAL\$"	"REAL"	floating point

1.2.7 Data Interpretation

	Format	Length
"INTEGER*1\$"	"I*1\$"	1 byte wide
"INTEGER*2\$"	"I*2\$"	2 byte wide
"INTEGER*4\$"	"I*4\$"	4 byte wide

- one, two and four byte two's complement integer representation

"SIGNED\$INTEGER*1\$\$\$\$\$\$\$\$\$\$"	"IS1\$"	1 byte wide
"SIGNED\$INTEGER*2\$\$\$\$\$\$\$\$\$\$"	"IS2\$"	2 byte wide
"SIGNED\$INTEGER*4\$\$\$\$\$\$\$\$\$\$"	"IS4\$"	4 byte wide

- one, two and four byte signed integer with the most significant bit used to denote sign

"UNSIGNED\$INTEGER*1\$\$\$\$\$\$\$\$\$\$"	"IU1\$"	1 byte wide
"UNSIGNED\$INTEGER*2\$\$\$\$\$\$\$\$\$\$"	"IU2\$"	2 byte wide
"UNSIGNED\$INTEGER*4\$\$\$\$\$\$\$\$\$\$"	"IU4\$"	4 byte wide

- one, two and four byte un -signed integer with the most significant bit used as part of the pixel value, the pixel is always positive.

"REAL*2\$"	"R*2\$"	2 byte wide
"REAL*4\$"	"R*4\$"	4 byte wide
"REAL*8\$"	"R*8\$"	8 byte wide

- two, four and eight byte two's complement floating point representation with the exponent denoted in two's complement binary. (note that the REAL*8 representation is the same as double precision.)

"REAL*2\$HEXADECIMAL\$\$\$\$\$\$\$\$\$\$"	"R*2H"	2 byte wide
"REAL*4\$HEXADECIMAL\$\$\$\$\$\$\$\$\$\$"	"R*4H"	4 byte wide
"REAL*8\$HEXADECIMAL\$\$\$\$\$\$\$\$\$\$"	"R*8H"	8 byte wide

- two, four eight byte hexadecimal floating point representation with the exponent denoted as a hexadecimal exponent. (note that the REAL*8. representation is the same as double precision.)

"COMPLEX*4\$"	"C*4\$"	4 byte wide
"COMPLEX*8\$"	"C*8\$"	8 byte wide

- four byte field with the first half (two bytes) containing the two's complement floating point representation value of the real component and the second half containing the imaginary component. Similarly for the eight byte type, with each half of the field containing the real and imaginary pairs.

"COMPLEX\$INTEGER*2\$\$\$\$\$\$\$\$\$\$"	"CI*2"	2 byte wide
"COMPLEX\$INTEGER*4\$\$\$\$\$\$\$\$\$\$"	"CI*4"	4 byte wide
"COMPLEX\$INTEGER*8\$\$\$\$\$\$\$\$\$\$~"	"CI*8"	8 byte wide

- similar to the complex floating point representation above except that each component is stored as a two's complement integer.

"COMPLEX\$SIGNED\$INTEGER*2\$\$\$\$\$"	"CIS2"	2 byte wide
"COMPLEX\$SIGNED\$INTEGER*4\$\$\$\$\$"	"CIS4"	4 byte wide
"COMPLEX\$SIGNED\$INTEGER*8\$\$\$\$\$"	"CIS8"	8 byte wide

- similar to the complex floating point representation above except that each component is stored as a signed integer.

"COMPLEX*4\$HEXADECIMAL\$\$\$\$\$\$"	"C*4H"	4 byte wide
"COMPLEX*8\$HEXADECIMAL\$\$\$\$\$\$"	"C*8H"	8 byte wide

- same as the floating point complex notation above except that the representation follows the hexadecimal conventions.

1.2.8 Records in products

Volume Directory File

	CEOS Codes
VOLUME DESCRIPTOR RECORD	192,192,18,18
FILE POINTER RECORD	219,192,18,18
TEXT RECORD	18,63,18,18

Leader File

FILE DESCRIPTOR RECORD	63,192,18,18
FACILITY RELATED DATA RECORD MPH+SPH TYPE	10,200,31,50
FACILITY RELATED DATA RECORD PCS QUALITY TYPE	10,200,31,50

SAR Data File

FILE DESCRIPTOR RECORD	63,192,18,18
PROCESSED DATA RECORD	50,11,31,20

Null Volume

NULL VOLUME DESCRIPTOR RECORD	192,192,63,18
-------------------------------	---------------

1.3 Note:

Fields not provided are filled with blanks or meaningless values as -9999999.9999999 in case, for instance, of fields whose format is F16.7.

WARNING: Please be aware that the field "Example with FDC product" in the following tables, contains only an EXAMPLE of what can be found in a product.

2. VOLUME DIRECTORY FILE FORMAT DEFINITION

Table 1

VOLUME DESCRIPTOR RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Record Sequence Number	1	
2	5	B1	1st record sub-type code	192	
3	6	B1	Record type code	192	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC Flag	A	
8	15-16	A2	Blanks		
9	17-28	A12	Format control document	CCB-CCT-0002	
10	29-30	A2	Superstructure format control document	A	
11	31-32	A2	Superstructure record format revision	A	
12	33-44	A12	Logical volume generating facility software release and revision level	E1SAR-FDC-01	
13	45-60	A16	ID of physical volume containing this volume descriptor		
14	61-76	A16	Logical volume identifier (centre frame latitude and longitude, deg/1000)		
15	77-92	A16	Volume set identifier product generation date, (YYYYMMDDhhmmssdd, dd=deci-secs)	19940119 8312500	
16	93-94	I2	Total number of physical volumes in the logical volume	1	
17	95-96	I2	Physical volume sequence number of the first tape within the logical volume	1	
18	97-98	I2	Physical volume sequence number of the last tape within the logical volume	1	
19	99-100	I2	Physical volume sequence number of current tape within the logical volume	1	
20	101-104	I4	First referenced file number in this physical volume within the logical volume.	1	
21	105-108	I4	Logical volume number within volume set	1	
22	109-112	I4	Logical volume number within physical volume	1	
23	113-120	A8	Logical volume creation date (YYYYMMDD)	19950614	
24	121-128	A8	Logical volume creation time (HHMMSSDD, DD=deci-seconds)	114921	
25	129-140	A12	Logical volume generation country	ITALY	
26	141-148	A8	Logical volume generating agency	ESA	
27	149-160	A12	Logical volume generating facility	ESRIN	
28	161-164	I4	Number of file pointer records in volume directory	2	
29	165-168	I4	Number of records in volume directory	4	
30	169-260	A92	Volume descriptor spare segment (always blanks filled)	1	
31	261-360	A100	Local use segment		

Table 2

LEADER FILE POINTER RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Record sequence number	2	
2	5-5	B1	1st record sub-type code	219	
3	6-6	B1	Record type code	192	
4	7-7	B1	2nd record sub-type code	18	
5	8-8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC Flag	A	
8	15-16	A2	Blanks		
9	17-20	I4	Referenced file number	1	
10	21-36	A16	Referenced file name	ERS1.SAR.FDCLEAD	
11	37-64	A28	Referenced file class	SARLEADER FILE	
12	65-68	A4	Referenced file class code	SARL	
13	69-96	A28	Referenced file data type	MIXED BINARY AND ASCII	
14	97-100	A4	Referenced file data type code	MBAA	
15	101-108	I8	Number of records in referenced file	3	
16	109-116	I8	Referenced file 1-st record length	720	
17	117-124	I8	Referenced file maximum record length	12288	
18	125-136	A12	Referenced file record length type	VARIABLE LEN	
19	137-140	A4	Referenced file record length type code	VARE	
20	141-142	I2	Referenced file physical volume start number,	1	
21	143-144	I2	Referenced file physical volume end number	1	
22	145-152	I8	Referenced file portion start, 1st record number for this physical volume	1	
23	153-160	I8	Referenced file portion end, last record number for this physical volume	3	
24	161-260	A100	File pointer spare segment		
25	261-360	A100	Local use segment	CEOS-HARM-01 01-NOV-1994	

Table 3

DATA FILE POINTER RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Record number	3	
2	5	B1	1-st record subtype code	219	
3	6	B1	Record type code	192	
4	7	B1	2-nd subtype code	18	
5	8	B1	3-rd subtype code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC flag for referenced file	A	
8	15-16	A2	Blank		
9	17-20	I4	Referenced file number	2	
10	21-36	A16	Referenced file name	ERS1.SAR.FDCIMGY	
11	37-64	A28	Referenced file class	IMAGERY OPTIONS FILE	
12	65-68	A4	Referenced file class code	IMOP	
13	69-96	A28	Referenced file data type	MIXED BINARY AND ASCII	
14	97-100	A4	Referenced file data type code	MBAA	
15	101-108	I8	Number of records in referenced file	6301	
16	109-116	I8	Referenced file 1-st record length	10012	
17	117-124	I8	Referenced file maximum record length	10012	
18	125-136	A12	Referenced file record length type	FIXED LENGTH	
19	137-140	A4	Referenced file record length type code	FIXD	
20	141-142	I2	Referenced file physical volume start number	1	
21	143-144	I2	Referenced file physical volume end number	1	
22	145-152	I8	Referenced file portion start, 1-st record number for this physical volume	1	
23	153-160	I8	Referenced file portion end, last record number for this physical volume	6301	
24	161-260	A100	File pointer spare segment		
25	261-360	A100	Local use segment		

Table 4

TEXT RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Record number	4	
2	5-5	B1	1st record sub-type code	18	
3	6-6	B1	Record type code	63	
4	7-7	B1	2nd record sub-type code	18	
5	8-8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC Flag	A	
8	15-16	A2	Continuation flag (*)		
9	17-56	A40	Product type specifier		
10	57-116	A60	Location and date/time of product creation	ESRIN-FRASCATI 31-JAN-1994 15:45:56.830	
11	117-156	A40	Physical volume identification		
12	157-196	A40	Scene identification		
13	197-236	A40	Scene location		
14	237-256	A20	<i>Spares</i>		
15	257-360	A104	<i>Spares</i>		

(*) this field is set to "C&" if information is continued on the next page text record (if any).

3. LEADER FILE FORMAT DEFINITION

Table 5 SARLEADER FILE - FILE DESCRIPTOR RECORD FIXED SEGMENT) DEFINITION

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Record Sequence Number	1	
2	5	B1	1st record sub-type code	63	
3	6	B1	Record type code	192	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	720	
7	13-14	A2	ASCII/EBCDIC Flag	A	
8	15-16	A2	Blanks		
9	17-28	A12	Format control document ID for this data file format	CEOS-SAR-CCT	
10	29-30	A2	Format control document revision level	A	
11	31-32	A2	File design descriptor revision letter	A	
12	33-44	A12	Generating software release and revision level	E1SAR-FDC-01	
13	45-48	I4	File number	2	
14	49-64	A16	File name	ERS1.SAR.FDC	
15	65-68	A4	Record requence and location type flag	FSEQ	
16	69-76	I8	Sequence number location	1	
17	77-80	I4	Sequence number field length	4	
18	81-84	A4	Record code and location type flag	FTYP	
19	85-92	I8	Record code location	5	
20	93-96	I4	Record code field length	4	
21	97-100	A4	Record length and location type flag	FLGT	
22	101-108	I8	Record length location	9	
23	109-112	I4	Record length field length	4	
24	113-113	A1	Reserved		
25	114-114	A1	Reserved		
26	115-115	A1	Reserved		
27	116-116	A1	Reserved		
28	117-180	A64	Reserved segment		

SARLEADER FILE - FILE DESCRIPTOR RECORD VARIABLE SEGMENT

29	181-186	I6	Number of data set summary records	0	
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30	187-192	I6	Data set summary record length	0	
31	193-198	I6	Number of map projection data records	0	
32	199-204	I6	Map projection record length	0	
33	205-210	I6	Number of platform pos. data records	0	
34	211-216	I6	Platform position record length	0	
35	217-222	I6	Number of attitude data records	0	
36	223-228	I6	Attitude data record length	0	
37	229-234	I6	Number of radiometric data records	0	
38	235-240	I6	Radiometric record length	0	
39	241-246	I6	Number of rad. compensation records	0	
40	247-252	I6	Radiometric compensation rec. length	0	
41	253-258	I6	Number of data quality summary records	0	
42	259-264	I6	Data quality summary record length	0	
43	265-270	I6	Number of data histograms records	0	
44	271-276	I6	Data histogram record length	0	
45	277-282	I6	Number of range spectra records	0	
46	283-288	I6	Range spectra record length	0	
47	289-294	I6	Number of DEM descriptor records	0	
48	295-300	I6	DEM descriptor record length	0	
49	301-306	I6	Number of radar par. update records	0	
50	307-312	I6	Radar par. update record length	0	
51	313-318	I6	Number of annotation data records	0	
52	319-324	I6	Annotation data record length	0	
53	325-330	I6	Number of Det.processing records	0	
54	331-336	I6	Det.processing record length	0	
55	337-342	I6	Number of calibration records	0	
56	343-348	I6	Calibration record length	0	
57	349-354	I6	Number of GCP records	0	
58	355-360	I6	GCP record length	0	
59	361-366	I6	<i>Spare</i>		
60	367-372	I6	<i>Spare</i>		
61	373-378	I6	<i>Spare</i>		
62	379-384	I6	<i>Spare</i>		
63	385-390	I6	<i>Spare</i>		
64	391-396	I6	<i>Spare</i>		
65	397-402	I6	<i>Spare</i>		
66	403-408	I6	<i>Spare</i>		
67	409-414	I6	<i>Spare</i>		
68	415-420	I6	<i>Spare</i>		
69	421-426	I6	Number of facility data records	2	

70	427-432	I6	Facility data record maximum length	12288	
71	433-720	A2	Blanks		

Table 6

FDC FACILITY DATA RECORD MPH&SPH TYPE DEFINITION

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Sequence number	2	
2	5	B	1st record sub-type code	A	
3	6	B	Record type code	C8	
4	7	B	2nd record sub-type code	1F	
5	8	B	3rd record sub-type code	32	
6	9-12	B4	Record length	2048	
7	13-76	A64	Name of this facility related data record	FACILITY RELATED	
8	77-93	17B1	Product identifier		
9	94-105	I12	Type of Product	1	
10	106-117	I12	Spacecraft	1	
11	118-141	A24	UTC of subsatellite point at beginning of product	19-JAN-1994 8:34:25.003	
12	142-153	I12	Station Identifier	5	
13	154-165	I12	Product Confidence Data	2304	
14	166-189	A24	UTC time when MPH was generated;	31-JAN-1994 15:45:56.830	
15	190-201	I12	Size of Specific Product Header in bytes	260	
16	202-213	I12	Number of product data set records	6300	
17	214-225	I12	Size of each product data set record in bytes	10004	
18	226-237	I12	Subsystem that generated the product.	0	
19	238-249	I12	OBRC flag used for SAR products only	1	
20	250-273	A24	UTC reference time	19-JAN-1994 14:38:51.161	
21	274-285	I12	Reference binary time of satellite clock	3121480003	
22	286-297	I12	Step length of satellite clock in nanoseconds	3906250	
23	298-305	A8	Software version used to generate product		
24	306-317	I12	Threshold table version number.	2009	
25	318-329	I12	<i>Spare</i>		
26	330-353	A24	UTC time of ascending node	19-JAN-1994 7:36:9.030	

Ascending node state vector in earth fixed reference system

27	354-365	I12	State vector; X	10-2m	-519933131	
28	366-377	I12	State vector; Y	10-2m	-492105990	
29	378-389	I12	State vector; Z	10-2m	417	

30	390-401	I12	State vector; X velocity 10-5m/s	-111217185	
31	402-413	I12	State vector; Y velocity 10-5m/s	118760643	
32	414-425	I12	State vector; Z velocity 10-5m/s	738127867	
33	426-437	I12	Product confidence data subsatellite track heading, relative to North	1608	
34	438-449	I12	Mid-azimuth position of product	193178	
35	450-461	I12	Number of PRF code changes for test	0	
36	462-473	I12	Number of sampling window time changes	1	
37	474-485	I12	Sum of number of calibration sub-system and receiver gain changes	0	
38	486-497	I12	Number of missing lines	0	
39	498-509	I12	Spare	0	
40	510-521	I12	3-dB pulse width of chirp replica cross-correlation pixels function	1083	
41	522-533	I12	First side lobe level of point chirp replica cross-correlation function	-12909	
42	534-545	I12	ISLR of chirp replica cross-correlation function	-10944	
43	546-557	I12	Doppler centroid confidence measure.	56	
44	558-569	I12	Doppler ambiguity confidence measure.	430	
45	570-581	I12	Mean of I input data	-138	
46	582-593	I12	Mean of Q input data	-149	
47	594-605	I12	Standard Deviation of I input data	4302	
48	606-617	I12	Standard Deviation of Q input data	4274	
49	618-629	I12	Geodetic latitude of the first pixel of the first line of the scene product.	-28364	
50	630-641	I12	East longitude of the first pixel of the first of the first line of the scene product	21701	
51	642-653	I12	Geodetic latitude of the last pixel of the first line of the scene product	-28138	
52	654-665	I12	East longitude of the last pixel of the first pixel of the first line of the scene product	20716	
53	666-677	I12	Geodetic latitude of the last pixel of the last line of the scene product	-29020	
54	678-689	I12	East longitude of the last pixel of the last line of the scene product	20459	
55	690-701	I12	Geodetic latitude of the first pixel of the last line of the scene product	-29249	
56	702-713	I12	East longitude of the first pixel of the last line of the scene product	21454	
57	714-725	I12	Geodetic latitude of the centre pixel of the scene product	-28694	
58	726-737	I12	East longitude of the centre pixel of the scene product	21082	
59	738-749	I12	Origin of used chirp	0	
60	750-761	I12	Chirp extraction index	31	
61	762-773	I12	Chirp amplitude coefficient-constant	100000	
62	774-785	I12	Chirp amplitude coefficient-linear	0	
63	786-797	I12	Chirp amplitude coefficient-quadratic	0	
64	798-809	I12	Chirp amplitude coefficient-cubic	0	
65	810-821	I12	Chirp amplitude coefficient-quartic	0	
66	822-833	I12	Chirp phase coefficient-constant	0	
67	834-845	I12	Chirp phase coefficient-constant	0	
68	846-857	I12	Chirp phase coefficient-quadratic	209441	
69	858-869	I12	Chirp phase coefficient-cubic	0	

70	870-881	I12	I mean for raw data correction	15500	
71	882-893	I12	Q mean for raw data correction	15500	
72	894-905	I12	I/Q Std Ratio for raw data correction	969	
73	906-917	I12	Output pixel bit length	16	
74	918-929	I12	16- to 8-bit conversion coefficient-constant	0	
75	930-941	I12	16- to 8-bit conversion coefficient-linear	0	
76	942-953	I12	16- to 8-bit conversion coefficient-quadratic	0	
77	954-965	I12	Calibration system gain	11	
78	966-977	I12	Receiver gain	15	
79	978-989	I12	Clutter noise estimate	0	
80	990-1001	I12	<i>Spare</i>	0	
81	1002-1013	I12	Range pixel spacing	20000	
82	1014-1025	I12	Azimuth pixel spacing	16024	
83	1026-1037	I12	Pulse repetition frequency	1679878	
84	1038-1049	I12	2-way slant range time of the first processed range cell	5542894	
85	1050-1061	I12	Doppler centroid value at near range	762256	
86	1062-1073	I12	Slope of Doppler centroid over 2-way slant range time	-326521	
87	1074-1085	I12	Azimuth FM rate at near range	-2160844	
88	1086-1097	I12	Slope of azimuth FM rate over 2-way slant range time	370065696	
89	1098-1109	I12	Doppler ambiguity number	0	
90	1110-1121	I12	Calibration coefficient (antenna), Constant term	1000	
91	1122-1133	I12	Calibration coefficient (antenna), Linear term	1000000	
92	1134-1145	I12	Calibration coefficient (antenna), Quadratic term	1000000000	
93	1146-1157	I12	Calibration coefficient (antenna), Spare term	0	
94	1158-1169	I12	Calibration coefficient (antenna), Spare term	0	
95	1170-1181	I12	EXT SAR parameter table identifier	2009	
96	1182-1193	I12	Datation improvement	0	
97	1194-1205	I12	SARFDP Static Transfer Function Table Identifier	0	
98	1206-1217	I12	SARFDP Parameter Database Identifier	1005	
99	1218-1229	I12	Output image mean	1167310	
100	1230-1241	I12	Output image standard deviation	518255	
101	1242-1253	I12	Range compression scalar gain	353000	
102	1254-1265	I12	Azimuth FFT scalar gain	2500	
103	1266-1277	I12	Azimuth compression scalar gain	800000000	
104	1278-1289	I12	Overall processing gain	113975992	
105	1290-2048	A759	Spare Blanks		

Table 7

FDC FACILITY RELATED DATA RECORD PCS QUALITY TYPE DEFINITION

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1 - 4	B4	Record sequence number	3	
2	5	B1	1-st record sub-type code	10	
3	6	B1	Record-type code	200	
4	7	B1	2 nd record sub-type code	31	
5	8	B1	3 rd record sub-type code	50	
6	9-12	B4	Length of this record	12288	
7	13-76	A64	Name of this facility related data record	FACILITY RELATED DATA RECORD [ESA GENERAL TYPE]	
8	77-12288	B	ESA reserved		

4. DATA SET FILE FORMAT DEFINITION

Table 8 SAR DATA FILE - FILE DESCRIPTOR RECORD (FIXED SEGMENT) DEFINITION

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Record sequence number	1	
2	5	B1	1st record sub-type code	63	
3	6	B1	Record sub-type code	192	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	10012	
7	13-14	A2	ASCII/EBCDIC flag	A	
8	15-16	A2	Blanks		
9	17-28	A12	Format control document ID for this data file format	CEOS-SAR-CCT	
10	29-30	A2	Format control document revision level	A	
11	31-32	A2	File design descriptor revision letter	A	
12	33-44	A12	Generating software release and revision level	E1SAR-FDC-01	
13	45-48	I4	File number	2	
14	49-64	A16	File name	ERS.SAR.FDC	
15	65-68	A4	Record sequence and location type flag	FSEQ	
16	69-76	I8	Sequence number location	1	
17	77-80	I4	Sequence number field length	4	
18	81-84	A4	Record code and location type flag	FTYP	
19	85-92	I8	Record code location	5	
20	93-96	I4	Record code field length	4	
21	97-100	A4	Record length and location type flag	FLGT	
22	101-108	I8	Record length location	9	
23	109-112	I4	Record length field length	4	
24	113	A1	Reserved		
25	114	A1	Reserved		
26	115	A1	Reserved		
27	116	A1	Reserved		
28	117-180	A64	Reserved segment		

SAR DATA IMAGERY OPTIONS FILE, FILE DESCRIPTOR RECORD (VARIABLE SEGMENT)

29	181-186	I6	Number of SAR DATA records (nominal)	6300	
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30	187-192	I6	SAR DATA record length	10012	bytes
31	193-216	A24	Reserved		

SAMPLE GROUP DATA

32	217-220	I4	Number of bits per sample	16	
33	221-224	I4	Number of samples per data group (or pixels)	1	
34	225-228	I4	Number of bytes per data group(or pixels)	2	
35	229-232	A4	Justification and order of samples within data group		

SAR RELATED DATA IN THE RECORD

36	233-236	I4	Number of SAR channels in this file	1	
37	237-244	I8	Number of lines per data set (nominal)	6300	
38	245-248	I4	Number of left border pixels per line	0	
39	249-256	I8	Total number of data groups per line per SAR channel	5000	
40	257-260	I4	Number of right border pixels per line	0	
41	261-264	I4	Number of top border lines	0	
42	265-268	I4	Number of bottom border lines	0	
43	269-272	A4	Interleaving indicator	BSQ	

RECORD DATA IN THE FILE

44	273-274	I2	Number of physical records per line	1	
45	275-276	I2	Number of physical records per multi-channel line	1	
46	277-280	I4	Number of bytes of prefix data per record	0	
47	281-288	I8	Number of bytes of SAR data(or pixel data) per record(nominal)	10000	
48	289-292	I4	Number of bytes of suffix data per record	0	
49	293-296	A4	<i>Reserved</i>		
50	297-304	A4	<i>Reserved</i>		
51	305-312	A8	<i>Reserved</i>		
52	313-320	A8	<i>Reserved</i>		
53	321-328	A8	<i>Reserved</i>		
54	329-336	A8	<i>Reserved</i>		
55	337-340	A4	<i>Reserved</i>		
56	341-368	A28	Blanks		
57	369-376	A8	<i>Reserved</i>		
58	377-384	A8	<i>Reserved</i>		
59	385-392	A8	<i>Reserved</i>		
60	393-400	A28	<i>Reserved</i>		

61	401-428	A4	SAR Data format type identifier	UNSIGNED INTEGER	
62	429-432	A4	SAR Data format type code	U12	
63	433-436	I4	Number of left fill bits within pixel	0	
64	437-440	I4	Number of right fill bits within pixel	0	
65	441-448	I8	Maximum data range of pixel	63535	

Table 9

IMAGERY OPTIONS FILE - PROCESSED DATA RECORD DEFINITION

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Record sequence number	2	
2	5	B1	1-st record sub-type code	50	
3	6	B1	Record type code	10	
4	7	B1	2-nd record sub-type code	31	
5	8	B1	3-rd record sub-type code	50	
6	9-12	B4	Length of this record	10012	
7	13-14	B2	First sample of image line	n	
8	15-16	B2	Second sample of image line	n	
	
5006	10011-10012	B2	Last sample of image line	n	

5. NULL VOLUME FORMAT DEFINITION

Table 10

NULL VOLUME DESCRIPTOR RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE with FDC product	UNITS
1	1-4	B4	Record sequence number	1	
2	5	B1	1st record sub-type code	192	
3	6	B1	Record sub-type code	192	
4	7	B1	2nd record sub-type code	63	
5	8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC flag	A	
8	15-16	A2	Blanks		
9	17-28	A12	Format control document	CCB-CCT-0002	
10	29-30	A2	Superstructure format control document	A	
11	31-32	A2	Superstructure record format revision	A	
12	33-44	A12	Logical volume generating facility software release and revision level	E1SAR-FDC-01	
13	45-60	A16	ID of physical volume containing this volume descriptor		
14	61-76	A16	Logical volume identifier		
15	77-92	A16	Volume set identifier	1994011908342500	
16	93-94	I2	Total number of physical volumes in the logical volume	1	
17	95-96	I2	Physical volume sequence number of the first tape within the logical volume	1	
18	97-98	I2	Physical volume sequence number of the last tape within the logical volume	1	
19	99-100	I2	Physical volume sequence number of the current tape within the logical volume	1	
20	101	I4	First referenced file number in this physical volume within the logical volume	1	
21	105-108	I4	Logical volume within a volume set	1	
22	109-112	I4	Logical volume number within physical volume	1	
23	113-120	A8	Logical volume creation date (YYYYMMDD)	19950614	
24	121-128	A8	Logical volume creation time (hhmmssdd, dd-deci-seconds)	114921	
25	129-140	A12	Logical volume generation country	ITALY	
26	141-148	A8	Logical volume generating agency	ESA	
27	149-160	A12	Logical volume generating facility	ESRIN	
28	161-164	I4	Number of file pointer records in volume directory	2	
29	165-168	I4	Number of records in volume directory	4	
30	169-260	A92	Volume descriptor spare segment (always blank filled)		
31	261-360	A100	Local use segment		