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TOPEX/POSEIDON Project

TOPEX Ground System Software Interface Specification, Volume 2: Design (SIS-2)

Geophysical Data Record (GDR)—GDR Data

Interim Geophysical Data Record (IGDR)—GDR Data

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GDR/IGDR SIS-2 633-752-23-004
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1. INTRODUCTION

1.1. Identification

SIS 633-751-23-004 GDR Data Volume 2, Design, is a deliverable product of the TOPEX Ground System (TGS) Science Data Subsystem (SDS).

1.2. Content Overview

GDR Data is a pass file of geophysical data produced using a NASA precision orbit ephemeris (POE) and validated algorithms. It contains sea surface height, significant wave height, sigma0 and other geophysical quantities with media corrections. The IGDR Data has the same format but is different in that the IGDR Data is produced using an operational orbit ephemeris (OOE) and/or unvalidated algorithms.

1.3. Scope

This document specifies the content and structure of the GDR Data and Interim GDR (IGDR) Data. This Software Interface Specification contains the current state of format details for this interface.

This document also applies to the IGDR Data, which has the same format, but is produced using unvalidated algorithms and/or an operational orbit ephemeris.

This document supersedes the corresponding SIS Volume 1, Requirements, which will no longer be maintained.

1.4. Related Interfaces

GDR SIS, TOPEX Project Document (PD) 633-752-23-004, describes the packaging of GDR Data pass files into GDR products.

1.5. Applicable Documents

SDS Functional Design Document, PD 633-752, D-8070, Dec. 1990

SDPS Software Requirements Document, PD 633-751-21, June 1991

GDR Software Interface Specification, PD 633-752-23-004, June 1991

TOPEX Ground System Science Algorithm Specification, PD 633-708, Rev. A, Change 1, April 1991

CCSDS 301.0-B-2 Blue Book Issue 2, Apr 1990, Recommendation For Space System Data Standards: Time Code Formats

Information processing--ISO 7-bit coded character set for information interchange, ISO 646-1983

1.6. Conventions

1.6.1. Data Representation

All file headers are ASCII. All other data are binary unless noted otherwise.

Bit and byte ordering follow VAX/VMS conventions as defined in Appendix C. The term "byte" is synonymous with "octet" as used by ISO.

All text fields in headers are free-form, with variable spaces.

1.6.2. File Structure

The record format is fixed length. The VMS record attributes are "none". For block size see the GDR SIS, PD 633-752-23-004.

1.6.3. Notation

1.6.3.1. Traceability

Some data element descriptions may contain a trace code that indicates the data product in which it appears and the priority assigned to it. The code has the following format:

{[ppp:n]}

where: ppp... = data product acronym (e.g. GDR)
n = 1 - mandatory or pre-launch
2 - important or as soon as possible
3 - desirable or post-launch

1.6.3.2. Hexadecimal Values

X'nn' is a representation of a numeric value in hexadecimal.

1.6.3.3. Keyword/Value Conventions

Data in header records follow a "keyword=value" convention as shown here:

KEYWORD Assignment_symbol VALUE Stmt_Terminator

where:

KEYWORD is the leftmost component term and consists of a character string that describes the corresponding keyword.

Assignment_symbol is the ASCII equal sign character "=".

VALUE is the rightmost component term and consists of a character string containing the value of the data object described by the corresponding keyword.

Stmt_Terminator is a semicolon (;).

Unless otherwise noted in the appropriate record description, the Stmt_Terminator (;) is followed by a carriage return - line feed pair (<CR><LF>) and padded with blanks to the record length specified for the file in which the keyword=value pair is located.

1.6.4. Data Definition Terminology

File A collection of information stored as **records** and terminated with an EOF marker.

Group A conceptually useful aggregate of **records** or **elements**.

Record An organized and identifiable aggregate of related data **elements** transcribed on a storage medium.

Element A discrete, non-decomposable unit of information. An **element** has the following attributes:

Element Type	Conceptual data type. Values are:
bitfield	Contiguous sequence of bits, often used as flags.

integer	Whole number.
real	Number that can include a decimal fraction.
string	Contiguous sequence of characters.
utc	Universal Coordinated Time
time	Local time
Storage Type	Format in which an element is represented on a storage medium. Values are:
signed	Signed integer, twos-complement.
unsigned	Unsigned integer.
bit	Contiguous sequence of bits.
character	Contiguous sequence of ASCII characters.
time_ascii	Time represented by ASCII characters in format yyyy-dddThh:mm:ss.fff...
utc_binary	UTC in CCSDS day segmented binary format.
Bytes	Size of element in 8-bit bytes.
Units	Unit of measure including scale factor, "counts", or "N/A".
Minimum	Typical or approximate minimum element value.
Nominal	Typical or approximate nominal element value.
Maximum	Typical or approximate maximum element value.

2. ENVIRONMENT

2.1. Hardware Characteristics

This product will be created in a VAX/VMS environment.

2.2. Interface Medium and Characteristics

See Transfer Medium.

2.3. Input/Output Protocols

2.3.1. Device Addressing

See Transfer Method.

2.3.2. Operating System Protocols

Records are fixed-length, unformatted. Blocking is performed by the operating system.

2.3.3. Deformatting

See Conventions and individual file, record, or data element definitions for formatting or translation requirements.

2.3.4. Calling Sequence

Not applicable.

2.4. Failure Protection and Recovery

Not Applicable.

3. DATA FLOW CHARACTERISTICS

3.1. Data Volume Estimates

Minimum Size: <.1 MB

Nominal Size: .52 MB

Maximum Size: .52 MB

3.2. Generation Frequency

The generation frequency for the GDR Data is one pass file per data pass (approximately 56 minutes).

3.3. Transfer Medium

The transfer medium within TGS is shared disk storage.

See the GDR SIS, 633-752-23-004, and appropriate Interface Control Document for details on transfers to external organizations.

3.4. Transfer Method

At time of generation, this data product shall be written to the TGS common storage area, Logical_Disk_Name:[TGS_DATA.SDS.GDR] or Logical_Disk_Name:[TGS_DATA.SDS.IGDR] where "Logical_Disk_Name" is TBD (by TGS).

See the GDR SIS, 633-752-23-004, and appropriate Interface Control Document for details on transfers to external organizations.

3.5. Labeling

GDR Data files on the TGS VAX cluster conform to the following naming convention:

SDP_GDRDAT_ccc_ppp.DAT

where ccc = the TOPEX cycle number for the 10-day period in which this data was acquired and ppp = the pass number within the cycle.

For file naming conventions within GDR products, see the GDR SIS.

4. DATA PRODUCT DEFINITION

4.1. Summary Data Product Structure

This section describes the overall structure of this product and defines its major components.

File: GDR Data			
Record Group (optional)	Record Name	Size	Occurs
GDR Data Header	SFDU_Pass_File_Header	152	1
SDS_Header	Producer_Agency_Name	152	1
	Producer_Institution_Name	152	1
	Source_Name	152	1
	Sensor_Name	152	1
	SIS_Id	152	1
	Product_Create_Start_Time	152	1
	Product_Create_End_Time	152	1
	Generating_Software_Name	152	1
	Build_Id	152	1
	Operator_Note	152	1
SDP_Header	Cycle_Number	152	1
	Pass_Number	152	1
	Rev_Number	152	1
	Equator_Long	152	1
	Equator_Time	152	1
	Time_First_Pt	152	1
	Time_Last_Pt	152	1
	Time_Epoch	152	1
GDR_Specific_Header	Calib_R_Corr_C	152	1
	Calib_R_Corr_K	152	1
	POD_Qual	152	1
	Orbit_Source	152	1
	IGDR_SW_Ped	152	1
GDR_Processing_Summary	GDR_Gap_Count	152	1
	Alt_S_SDR_Records_Received	152	1
	Alt_E_SDR_Records_Received	152	1

File: GDR Data (Cont.)				
Record Group (optional)	Record Name	Size	Occurs	
	TMR_SDR_Records_Received	152	1	
	Alt_SDR_Records_Processed	152	1	
	TMR_SDR_Records_Processed	152	1	11
Alt_SDR_Specific_Header Alt_SDR_Processing_Summary	Alt_SDR_SW_Ped	152	1	
	Alt_SDR_Gap_Count	152	1	
	Alt_Sci_Frames_Received	152	1	
	Alt_Eng_Frames_Received	152	1	
	STR_Frames_Received	152	1	
	Alt_Sci_Frames_Processed	152	1	
	Alt_Eng_Frames_Processed	152	1	7
TMR_SDR_Specific_Header TMR_SDR_Processing_Summary	TMR_SDR_SW_Ped	152	1	
	TMR_SDR_Gap_Count	152	1	
	TMR_Frames_Received	152	1	
	TMR_Frames_Processed	152	1	9
	End_of_Header	152	1	
	GDR Data Record	152	3360	

4.2. File, Record and Group Descriptions

This section provides a description of each file, record, and record group.

4.2.1. GDR Data

A nominal pass file contains slightly less than one hour of data covering a ground track from min/max latitude to max/min latitude. It contains header records followed by data records and is delimited by a VMS end-of-file indication.

4.2.2. GDR Data Header

This group of fixed-length records identifies the source of the data, the span of data contained in the pass file, and the pedigree of all software and supporting data used to generate the pass file. All header entries are in ASCII and follow a "keyword=value" convention. Records are padded with ASCII spaces to maintain a fixed length equal to the length of the data record (152).

4.2.3. GDR Data Record

This fixed length record contains the geophysical values obtained from the sensor as well as flags indicating the quality of the data. There is one record per altimeter science frame, i.e., approximately one per second.

4.3. Detailed Data Product Structure

This section describes every data element included in this product.

Record Name	Element Group (optional)	Element Name	Type	Storage	Offset	Size	Occurs
SFDU_Pass_File_Header		SFDU_ClassZ_Format_Id	string	char	0	12	1
		SFDU_ClassZ_Length_Value	integer	char	12	8	1
		SFDU_ClassI_Format_Id	string	char	20	12	1
		SFDU_ClassI_Length_Value	integer	char	32	8	1
Producer_Agency_Name		Producer_Agency_Name_Keywd	string	char	**	**	1
		Producer_Agency_Name_Value	string	char	**	**	1
Producer_Institution_Name		Producer_Institution_Name_Keywd	string	char	**	**	1
		Producer_Institution_Name_Value	string	char	**	**	1
Source_Name		Source_Name_Keywd	string	char	**	**	1
		Source_Name_Value	string	char	**	**	1
Sensor_Name		Sensor_Name_Keywd	string	char	**	**	1
		Sensor_Name_Value	string	char	**	**	1
SIS_Id		SIS_Id_Keywd	string	char	**	**	1
		SIS_Id_Value	string	char	**	**	1
Product_Create_Start_Time		Product_Create_Start_Time_Keywd	string	char	**	**	1
		Product_Create_Start_Time_Value	time	time_asc	**	**	1
Product_Create_End_Time		Product_Create_End_Time_Keywd	string	char	**	**	1
		Product_Create_End_Time_Value	time	time_asc	**	**	1
Generating_Software_Name		Generating_Software_Name_Keywd	string	char	**	**	1
		Generating_Software_Name_Value	string	char	**	**	1
Build_Id		Build_Id_Keywd	string	char	**	**	1
		Build_Id_Value	string	char	**	**	1
Operator_Note		Operator_Note_Keywd	string	char	**	**	1
		Operator_Note_Value	string	char	**	**	1
Cycle_Number		Cycle_Number_Keywd	string	char	**	**	1
		Cycle_Number_Value	integer	char	**	**	1

** 'Keyword=Value' element - see text for parsing information.

Record Name	Element Group (optional)	Element Name	Type	Storage	Offset	Size	Occurs
Pass_Number		Pass_Number_Keywd	string	char	**	**	1
		Pass_Number_Value	integer	char	**	**	1
Rev_Number		Rev_Number_Keywd	string	char	**	**	1
		Rev_Number_Value	integer	char	**	**	1
Equator_Long		Equator_Long_Keywd	string	char	**	**	1
		Equator_Long_Value	real	char	**	**	1
Equator_Time		Equator_Time_Keywd	string	char	**	**	1
		Equator_Time_Value	utc	time_asc	**	**	1
Time_First_Pt		Time_First_Pt_Keywd	string	char	**	**	1
		Time_First_Pt_Value	utc	time_asc	**	**	1
Time_Last_Pt		Time_Last_Pt_Keywd	string	char	**	**	1
		Time_Last_Pt_Value	utc	time_asc	**	**	1
Time_Epoch		Time_Epoch_Keywd	string	char	**	**	1
		Time_Epoch_Value	utc	time_asc	**	**	1
Calib_R_Corr_C		Calib_R_Corr_C_Keywd	string	char	**	**	1
		Calib_R_Corr_C_Value	integer	char	**	**	1
Calib_R_Corr_K		Calib_R_Corr_K_Keywd	string	char	**	**	1
		Calib_R_Corr_K_Value	integer	char	**	**	1
POD_Qual		POD_Qual_Keywd	string	char	**	**	1
		POD_Qual_Value	string	char	**	**	1
Orbit_Source		Orbit_Source_Keywd	string	char	**	**	1
		Orbit_Source_Value	string	char	**	**	1
IGDR_SW_Ped		IGDR_SW_Ped_Keywd	string	char	**	**	1
		IGDR_SW_Ped_Value	string	char	**	**	1

** 'Keyword=Value' element - see text for parsing information.

Record Name	Element Group (optional)	Element Name	Type	Storage	Offset	Size	Occurs
GDR_Gap_Count		GDR_Gap_Count_Keywd	string	char	**	**	1
		GDR_Gap_Count_Value	integer	char	**	**	1
Alt_S_SDR_Records_Received		Alt_S_SDR_Records_Received_Keywd	string	char	**	**	1
		Alt_S_SDR_Records_Received_Value	integer	char	**	**	1
Alt_E_SDR_Records_Received		Alt_E_SDR_Records_Received_Keywd	string	char	**	**	1
		Alt_E_SDR_Records_Received_Value	integer	char	**	**	1
TMR_SDR_Records_Received		TMR_SDR_Records_Received_Keywd	string	char	**	**	1
		TMR_SDR_Records_Received_Value	integer	char	**	**	1
Alt_SDR_Records_Processed		Alt_SDR_Records_Processed_Keywd	string	char	**	**	1
		Alt_SDR_Records_Processed_Value	integer	char	**	**	1
TMR_SDR_Records_Processed		TMR_SDR_Records_Processed_Keywd	string	char	**	**	1
		TMR_SDR_Records_Processed_Value	integer	char	**	**	1
Alt_SDR_SW_Ped		Alt_SDR_SW_Ped_Keywd	string	char	**	**	1
		Alt_SDR_SW_Ped_Value	string	char	**	**	1
Alt_SDR_Gap_Count		Alt_SDR_Gap_Count_Keywd	string	char	**	**	1
		Alt_SDR_Gap_Count_Value	integer	char	**	**	1
Alt_Sci_Frames_Received		Alt_Sci_Frames_Received_Keywd	string	char	**	**	1
		Alt_Sci_Frames_Received_Value	integer	char	**	**	1
Alt_Eng_Frames_Received		Alt_Eng_Frames_Received_Keywd	string	char	**	**	1
		Alt_Eng_Frames_Received_Value	integer	char	**	**	1
STR_Frames_Received		STR_Frames_Received_Keywd	string	char	**	**	1
		STR_Frames_Received_Value	integer	char	**	**	1
Alt_Sci_Frames_Processed		Alt_Sci_Frames_Processed_Keywd	string	char	**	**	1
		Alt_Sci_Frames_Processed_Value	integer	char	**	**	1
Alt_Eng_Frames_Processed		Alt_Eng_Frames_Processed_Keywd	string	char	**	**	1

** 'Keyword=Value' element - see text for parsing information.

Record Name	Element Group (optional)	Element Name	Type	Storage	Offset	Size	Occurs
		Alt_Eng_Frames_Processed_Value	integer	char	**	**	1
TMR_SDR_SW_Ped		TMR_SDR_SW_Ped_Keywd	string	char	**	**	1
		TMR_SDR_SW_Ped_Value	string	char	**	**	1
TMR_SDR_Gap_Count		TMR_SDR_Gap_Count_Keywd	string	char	**	**	1
		TMR_SDR_Gap_Count_Value	integer	char	**	**	1
TMR_Frames_Received		TMR_Frames_Received_Keywd	string	char	**	**	1
		TMR_Frames_Received_Value	integer	char	**	**	1
TMR_Frames_Processed		TMR_Frames_Processed_Keywd	string	char	**	**	1
		TMR_Frames_Processed_Value	integer	char	**	**	1
End_of_Header		End_of_Header_Keywd	string	char	**	**	1
GDR Data Record		Time_Past_Epoch	utc	utc_bin	0	8	1
		Time_Shift_Midframe	integer	signed	8	4	1
		Sat_Alt	integer	signed	12	4	1
		Latitude	integer	signed	16	4	1
		Longitude	integer	signed	20	4	1
		Sea_Surf_Hght	integer	signed	24	4	1
		Mean_Sea_Surf	integer	signed	28	4	1
		Geoid	integer	signed	32	4	1
		Net_Time_Tag_Corr	integer	signed	36	2	1
		Sat_Alt_Hi_Rate	integer	signed	38	2	10
		SS_Hght_Hi_Rate	integer	signed	58	2	10
		SS_RMS	integer	unsigned	78	2	1
		Dry_Tropo	integer	signed	80	2	1
		Wet_Tropo_FMO	integer	signed	82	2	1
		Wet_Tropo_Rad	integer	signed	84	2	1
		Iono_Corr	integer	signed	86	2	1
		EM_Bias_Corr_K	integer	signed	88	2	1
		EM_Bias_Corr_C	integer	signed	90	2	1
		DR(SWH/Att)_K	integer	signed	92	2	1
		DR(SWH/Att)_C	integer	signed	94	2	1
		Net_Instr_R_Corr_K	integer	signed	96	2	1

** 'Keyword=Value' element - see text for parsing information.

Record Name	Element Group (optional)	Element Name	Type	Storage	Offset	Size	Occurs
		Net_Instr_R_Corr_C	integer	signed	98	2	1
		Sigma0_K	integer	unsigned	100	2	1
		Sigma0_C	integer	unsigned	102	2	1
		AGC_K	integer	unsigned	104	2	1
		AGC_C	integer	unsigned	106	2	1
		Net_Instr_AGC_Corr_K	integer	signed	108	2	1
		Net_Instr_AGC_Corr_C	integer	signed	110	2	1
		Cross_Trk_Surf_Grad	integer	signed	112	2	1
		Ocean_Tide	integer	signed	114	2	1
		Solid_Earth_Tide	integer	signed	116	2	1
		Tb_18	integer	signed	118	2	1
		Tb_21	integer	signed	120	2	1
		Tb_37	integer	signed	122	2	1
		SSH_Bad	bitfield	bit	124	2	1
		Iono_Bad	bitfield	bit	126	2	1
		AGC_RMS_K	integer	unsigned	128	1	1
		AGC_RMS_C	integer	unsigned	129	1	1
		Atmos_Sigma0_Corr	integer	unsigned	130	1	1
		Current_Mode	bitfield	bit	131	1	2
		Off_Nadir_Angle	integer	unsigned	133	1	1
		SS_Pts_Avg	integer	unsigned	134	1	1
		SWH_K	integer	unsigned	135	1	1
		SWH_C	integer	unsigned	136	1	1
		SWH_RMS_K	integer	unsigned	137	1	1
		SWH_RMS_C	integer	unsigned	138	1	1
		Net_Instr_SWH_Corr_K	integer	signed	139	1	1
		Net_Instr_SWH_Corr_C	integer	signed	140	1	1
		SWH_Pts_Avg	integer	unsigned	141	1	1
		AGC_Pts_Avg	integer	unsigned	142	1	1
		Pole_Tide	integer	signed	143	1	1
		Tidal_Loading	integer	signed	144	1	1
		Instr_State	bitfield	bit	145	1	1
		Geo_Bad	bitfield	bit	146	1	1
		Alt_Bad1	bitfield	bit	147	1	1
		Alt_Bad2	bitfield	bit	148	1	1
		PFLAG	integer	unsigned	149	1	1
		Gate_Index	bitfield	bit	150	1	1
		Spare	integer	signed	151	1	1

** 'Keyword=Value' element - see text for parsing information.

4.4. Element Definitions

This section provides a definition for each data element.

4.4.1. AGC_C

Automatic Gain Control C band, 1/frame fit as specified in algorithm s1019A, corrected by s1023. {[GDR:1]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 2
Units: .01 dB
Minimum Val: 0
Nominal Val: N/A
Maximum Val: 6400

4.4.2. AGC_K

Automatic Gain Control, K band, 1/frame fit as specified in algorithm s1019A, corrected by s1023. {[GDR:1]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 2
Units: .01 dB
Minimum Val: 0
Nominal Val: N/A
Maximum Val: 6400

4.4.3. AGC_Pts_Avg

The actual number of points (for the primary channel, see Instr_State) which were used in producing the 1/frame average. This value is output by algorithm s1019A. {[GDR:2]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 1
Units: counts
Minimum Val: 0
Nominal Val: 20
Maximum Val: 20

4.4.4. AGC_RMS_C

RMS of high rate Alt AGC_C data about AGC_C value. This value is output by algorithm s1019A. {[GDR:2]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 1
Units: .01 dB
Minimum Val: 0
Nominal Val: N/A
Maximum Val: 255

4.4.5. AGC_RMS_K

RMS of high rate Alt AGC_K data about AGC_K value. This value is output by algorithm s1019A. {[GDR:2]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 1
Units: .01 dB
Minimum Val: 0
Nominal Val: N/A
Maximum Val: 255

4.4.6. Alt_Bad1

This set of flags indicates problems were detected with the original ranges, the high rate waveforms, altimeter sensor corrections, or the compressed sea surface height output. These flags are output by algorithm g1080. Bits are defined as follows:

Bit	Definition
0	Sum of Ku Range Blunder Flags limit check 0 - Good 1 - Problem detected
1	Sum of C Range Blunder Flags limit check 0 - Good 1 - Problem detected
2	Sum of Hi Rate Waveform Flags limit check 0 - Good 1 - Problem detected
3	'OR' of Ku Range, Waveform and Other Flags 0 - Good 1 - Problem detected
4	'OR' of C Range, Waveform and Other Flags

	0 - Good
	1 - Problem detected
5	GDR Compress RMS Flag (g1071)
	0 - Good
	1 - RMS threshold exceeded
6	Iono Bad Sum Flag
	0 - Iono_Bad flags indicate no errors
	1 - Iono_Bad flags indicate errors
7	Total Range Correction Flag
	0 - Ku and C range corrections OK
	1 - Ku and/or C range correction error.

See algorithm g1080 for more details. {[GDR:1,2]}

Element Type: bitfield
Storage Type: bit
Number of Bytes: 1
Units: N/A
Minimum Val: 0
Nominal Val: 0
Maximum Val: X'FF'

4.4.7. Alt_Bad2

This set of flags indicates if altimeter limits were set, any of the pointing/seastate conditions were invalid, sigma0 was out of limits, or there were problems with the original data. These flags are output by algorithm g1080. Bits are defined as follows:

Bit	Definition
0	Limit Byte Flag
	0 - No altimeter limits exceeded
	1 - Altimeter limit(s) exceeded
1	Ku Range Correction Reliability (s1037)
	0 - Correction is reliable
	1 - Correction is not reliable
2	C Range Correction Reliability (s1037)
	0 - Correction is reliable
	1 - Correction is not reliable
3	SWH Correction Reliability (s1051)
	0 - Ku and C correction are reliable
	1 - Ku and/or C correction not reliable
4	AGC Correction Reliability (s1045)
	0 - Ku and C correction are reliable
	1 - Correction not reliable
5	Ku Sigma0 Limit (g1050)
	0 - Good value
	1 - Value out of limit

6 Engineering Data Flag Sum (t4109)
0 - No errors detected
1 - Error(s) detected
7 Science Data Flag Sum (t4109)
0 - No errors detected
1 - Error(s) detected.

See algorithm g1080 for more details. {[GDR:1,2]}

Element Type: bitfield
Storage Type: bit
Number of Bytes: 1
Units: N/A
Minimum Val: 0
Nominal Val: 0
Maximum Val: X'FF'

4.4.8. Alt_E_SDR_Records_Received_Keywd

The Alt_E_SDR_Records_Received_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Alt_E_SDR_Records_Received_Value.

Element Type: string
Storage Type: character
Number of Bytes: 28
Units: N/A
Minimum Val: N/A
Nominal Val: Alt_Eng_SDR_Records_Received
Maximum Val: N/A

4.4.9. Alt_E_SDR_Records_Received_Value

Number of Alt Eng SDR records received by the IGDR processor in the Alt SDR Data file for the current pass.

Element Type: integer
Storage Type: character
Number of Bytes: 3
Units: counts
Minimum Val: 1
Nominal Val: 422
Maximum Val: 440

4.4.10. Alt_Eng_Frames_Processed_Keywd

The Alt_Eng_Frames_Processed_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Alt_Eng_Frames_Processed_Value.

Element Type: string
Storage Type: character
Number of Bytes: 24
Units: N/A
Minimum Val: N/A
Nominal Val: Alt_Eng_Frames_Processed
Maximum Val: N/A

4.4.11. Alt_Eng_Frames_Processed_Value

Number of altimeter engineering frames processed to the Alt SDR Data records for the current pass.

Element Type: integer
Storage Type: character
Number of Bytes: 4
Units: counts
Minimum Val: 1
Nominal Val: 422
Maximum Val: 440

4.4.12. Alt_Eng_Frames_Received_Keywd

The Alt_Eng_Frames_Received_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Alt_Eng_Frames_Received_Value.

Element Type: string
Storage Type: character
Number of Bytes: 23
Units: N/A
Minimum Val: N/A
Nominal Val: Alt_Eng_Frames_Received
Maximum Val: N/A

4.4.13. Alt_Eng_Frames_Received_Value

Number of altimeter engineering telemetry frames received by the Alt SDR processor from the Alt Eng Frames file for the current pass.

Element Type: integer
Storage Type: character
Number of Bytes: 3
Units: counts
Minimum Val: 1
Nominal Val: 422
Maximum Val: 440

4.4.14. Alt_SDR_Gap_Count_Keywd

The Alt_SDR_Gap_Count_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Alt_SDR_Gap_Count_Value.

Element Type: string
Storage Type: character
Number of Bytes: 17
Units: N/A
Minimum Val: N/A
Nominal Val: Alt_SDR_Gap_Count
Maximum Val: N/A

4.4.15. Alt_SDR_Gap_Count_Value

Number of gaps identified during generation of the Alt SDR Data file. A gap is defined as missing science data in the Alt SDR Data file for a period of at least 5 seconds.

Element Type: integer
Storage Type: character
Number of Bytes: 3
Units: counts
Minimum Val: 0
Nominal Val: 0
Maximum Val: 999

4.4.16. Alt_SDR_Records_Processed_Keywd

The Alt_SDR_Records_Processed_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Alt_SDR_Records_Processed_Value.

Element Type: string
Storage Type: character
Number of Bytes: 25
Units: N/A
Minimum Val: N/A

Nominal Val: Alt_SDR_Records_Processed
Maximum Val: N/A

4.4.17. Alt_SDR_Records_Processed_Value

Number of Alt Sci SDR records processed to (I)GDR Data records for the current pass.

Element Type: integer
Storage Type: character
Number of Bytes: 4
Units: counts
Minimum Val: 1
Nominal Val: 3360
Maximum Val: 3600

4.4.18. Alt_SDR_SW_Ped_Keywd

The Alt_SDR_SW_Ped_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Alt_SDR_SW_Ped_Value.

Element Type: string
Storage Type: character
Number of Bytes: 14
Units: N/A
Minimum Val: N/A
Nominal Val: Alt_SDR_SW_Ped
Maximum Val: N/A

4.4.19. Alt_SDR_SW_Ped_Value

Information on the version of the Alt SDR processing software used to generate these data.

Element Type: string
Storage Type: character
Number of Bytes: 18
Units: N/A
Minimum Val: 633-755/1991-01-01
Nominal Val: N/A
Maximum Val: 633-755/9999-12-31

4.4.20. Alt_S_SDR_Records_Received_Keywd

The Alt_S_SDR_Records_Received_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Alt_S_SDR_Records_Received_Value.

Element Type: string
Storage Type: character
Number of Bytes: 28
Units: N/A
Minimum Val: N/A
Nominal Val: Alt_Sci_SDR_Records_Received
Maximum Val: N/A

4.4.21. Alt_S_SDR_Records_Received_Value

Number of Alt Sci SDR records received by the IGDR processor in the Alt SDR Data file for the current pass.

Element Type: integer
Storage Type: character
Number of Bytes: 4
Units: counts
Minimum Val: 1
Nominal Val: 3376
Maximum Val: 3600

4.4.22. Alt_Sci_Frames_Processed_Keywd

The Alt_Sci_Frames_Processed_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Alt_Sci_Frames_Processed_Value.

Element Type: string
Storage Type: character
Number of Bytes: 24
Units: N/A
Minimum Val: N/A
Nominal Val: Alt_Sci_Frames_Processed
Maximum Val: N/A

4.4.23. Alt_Sci_Frames_Processed_Value

Number of altimeter science frames processed to the Alt SDR Data records for the current pass.

Element Type: integer
Storage Type: character
Number of Bytes: 4
Units: counts
Minimum Val: 1
Nominal Val: 3376
Maximum Val: 3600

4.4.24. Alt_Sci_Frames_Received_Keywd

The Alt_Sci_Frames_Received_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Alt_Sci_Frames_Received_Value.

Element Type: string
Storage Type: character
Number of Bytes: 23
Units: N/A
Minimum Val: N/A
Nominal Val: Alt_Sci_Frames_Received
Maximum Val: N/A

4.4.25. Alt_Sci_Frames_Received_Value

Number of altimeter science telemetry frames received by the Alt SDR processor in the Alt Sci Frames file for the current pass.

Element Type: integer
Storage Type: character
Number of Bytes: 4
Units: counts
Minimum Val: 1
Nominal Val: 3376
Maximum Val: 3600

4.4.26. Atmos_Sigma0_Corr

Atmospheric attenuation correction to Sigma0 (assumed to be same at C & K). This was added to Sigma0 derived from AGC to produce true Sigma0. This value is output by algorithm g1260. {[GDR:2,3]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 1
Units: .01 dB
Minimum Val: 0
Nominal Val: 70

Maximum Val: 170

4.4.27. Build_Id_Keywd

The Build_Id_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Build_Id_Value.

Element Type: string
Storage Type: character
Number of Bytes: 8
Units: N/A
Minimum Val: N/A
Nominal Val: Build_Id
Maximum Val: N/A

4.4.28. Build_Id_Value

The Build_Id_Value provides the identifier of the Release Description Document (RDD) that corresponds to the software build used to create this product.

Element Type: string
Storage Type: character
Number of Bytes: 18
Units: N/A
Minimum Val: 633-755/1991-01-01
Nominal Val: N/A
Maximum Val: 633-755/9999-12-31

4.4.29. Calib_R_Corr_C_Keywd

The Calib_R_Corr_C_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Calib_R_Corr_C_Value.

Element Type: string
Storage Type: character
Number of Bytes: 14
Units: N/A
Minimum Val: N/A
Nominal Val: Calib_R_Corr_C
Maximum Val: N/A

4.4.30. Calib_R_Corr_C_Value

Altimeter bias C band correction from Calibration Correction to Range algorithm (s1041).

Element Type: integer
Storage Type: character
Number of Bytes: 6
Units: millimeters
Minimum Val: -99999
Nominal Val: N/A
Maximum Val: 99999

4.4.31. Calib_R_Corr_K_Keywd

The Calib_R_Corr_K_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Calib_R_Corr_K_Value.

Element Type: string
Storage Type: character
Number of Bytes: 14
Units: N/A
Minimum Val: N/A
Nominal Val: Calib_R_Corr_K
Maximum Val: N/A

4.4.32. Calib_R_Corr_K_Value

Altimeter bias Ku band correction from Calibration Correction to Range algorithm (s1041).

Element Type: integer
Storage Type: character
Number of Bytes: 6
Units: millimeters
Minimum Val: -99999
Nominal Val: N/A
Maximum Val: 99999

4.4.33. Cross_Trk_Surf_Grad

Cross track gradient of the sea surface height at the measurement point from the high resolution mean sea surface used for Mean_Sea_Surf. This value is output by algorithm g1065. {[GDR:3]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: mm/km
Minimum Val: -2000
Nominal Val: N/A
Maximum Val: 2000

4.4.34. Current_Mode

Byte indicating the altimeter current mode for the first or second half frame. This byte is a direct pass-thru from telemetry. Bits are defined as follows:

Bit	Definition
0-3	Mode: 0011 - Standby 0110 - Cal-I 1100 - Cal-II 1001 - Coarse Acquisition 1010 - Coarse Track 0101 - Fine Acquisition 1111 - Fine Track
4	0 - EML Track 1 - Threshold Track
5	0 - AGC Gate 1 - Primary Max/3
6	High Variability Flag
7	Hi/Lo Rate Waveform Assignment 0 - Ku/C 1 - C/Ku.

{[GDR:1]}

Element Type: bitfield
Storage Type: bit
Number of Bytes: 1
Units: N/A
Minimum Val: 0
Nominal Val: X'0F'
Maximum Val: X'FF'

4.4.35. Cycle_Number_Keywd

The Cycle_Number_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Cycle_Number_Value.

Element Type: string
Storage Type: character
Number of Bytes: 12
Units: N/A
Minimum Val: N/A
Nominal Val: Cycle_Number
Maximum Val: N/A

4.4.36. Cycle_Number_Value

The number of the repeat cycle in which this Pass_Number occurs. The Cycle_Number and Pass_Number together uniquely identify a segment of data.

Element Type: integer
Storage Type: character
Number of Bytes: 3
Units: counts
Minimum Val: 0
Nominal Val: N/A
Maximum Val: 999

4.4.37. DR(SWH/Att)_C

Correction to altimeter tracker range for SWH and attitude effects at C band. Value is added to instrument range to get correct range. This value is output by algorithm s1037. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: millimeters
Minimum Val: -400
Nominal Val: N/A
Maximum Val: 400

4.4.38. DR(SWH/Att)_K

Correction to altimeter tracker range for SWH and attitude effects at K band. Value is added to instrument range to get correct range. This value is output by algorithm s1037. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: millimeters
Minimum Val: -400
Nominal Val: N/A
Maximum Val: 400

4.4.39. Dry_Tropo

Range correction for dry tropospheric delay, 1/frame, = 2.27 mm/mb times the surface pressure in millibars (hectopascals). Value (negative) is added to instrument range to get correct range. This value is output by algorithm g1055. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: millimeters
Minimum Val: -2500
Nominal Val: -2270
Maximum Val: -2000

4.4.40. EM_Bias_Corr_C

Range correction for EM bias, 1/frame, C band. Value is added to instrument range to get correct range. This value is output by algorithm g1064. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: millimeters
Minimum Val: -1200
Nominal Val: N/A
Maximum Val: 0

4.4.41. EM_Bias_Corr_K

Range correction for EM bias, 1/frame, K band. Value is added to instrument range to get correct range. This value is output by algorithm g1064. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2

Units: millimeters
Minimum Val: -1200
Nominal Val: N/A
Maximum Val: 0

4.4.42. End_of_Header_Keywd

A string indicating the end of the header.

Element Type: string
Storage Type: character
Number of Bytes: 13
Units: N/A
Minimum Val: N/A
Nominal Val: End_of_Header
Maximum Val: N/A

4.4.43. Equator_Long_Keywd

The Equator_Long_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Equator_Long_Value.

Element Type: string
Storage Type: character
Number of Bytes: 17
Units: N/A
Minimum Val: N/A
Nominal Val: Equator_Longitude
Maximum Val: N/A

4.4.44. Equator_Long_Value

East longitude at which this pass crosses the Equator. (Information may not be valid to the full indicated precision, since it is calculated from a predicted orbit.)

Element Type: real
Storage Type: character
Number of Bytes: 10
Units: degrees
Minimum Val: 0.000000
Nominal Val: N/A
Maximum Val: 359.999999

4.4.45. Equator_Time_Keywd

The Equator_Time_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Equator_Time_Value.

Element Type: string
Storage Type: character
Number of Bytes: 12
Units: N/A
Minimum Val: N/A
Nominal Val: Equator_Time
Maximum Val: N/A

4.4.46. Equator_Time_Value

UTC date and time at which this pass crosses the Equator. Given in standard format YYYY-DDDTHH:MM:SS[.FFFFFF], where the number of digits of fractional seconds may be different for different data products (information may only be valid to the nearest second, since it is calculated from a predicted orbit).

Element Type: utc
Storage Type: time_ascii
Number of Bytes: 24
Units: UTC
Minimum Val: 1991-001T00:00:00[.000000]
Nominal Val: N/A
Maximum Val: 9999-366T23:59:60[.999999]

4.4.47. GDR_Gap_Count_Keywd

The GDR_Gap_Count_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object GDR_Gap_Count_Value.

Element Type: string
Storage Type: character
Number of Bytes: 13
Units: N/A
Minimum Val: N/A
Nominal Val: GDR_Gap_Count
Maximum Val: N/A

4.4.48. GDR_Gap_Count_Value

Number of gaps identified during generation of GDR Data file. A gap is defined as missing data in the GDR Data file for a period of at least 5 seconds.

Element Type: integer
Storage Type: character
Number of Bytes: 3
Units: counts
Minimum Val: 0
Nominal Val: 0
Maximum Val: 999

4.4.49. Gate_Index

Byte indicating the gate index for both primary and secondary altimeter channels. The value for each gate index ranges from 1 to 5 (modified by SDS from the range 0-4 in the telemetry). Bits 0-3 are a binary representation of the gate index for the primary channel. Bits 4-7 represent the gate index for the secondary channel. These values are output by algorithm t3117. {[GDR:1]}

Element Type: bitfield
Storage Type: bit
Number of Bytes: 1
Units: N/A
Minimum Val: X'11'
Nominal Val: N/A
Maximum Val: X'55'

4.4.50. Generating_Software_Name_Keywd

The Generating_Software_Name_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Generating_Software_Name_Keywd.

Element Type: string
Storage Type: character
Number of Bytes: 24
Units: N/A
Minimum Val: N/A
Nominal Val: Generating_Software_Name
Maximum Val: N/A

4.4.51. Generating_Software_Name_Value

The Generating_Software_Name_Value specifies the name of the program generating the data product. The format for this element is:

sss_xxxxxxxxxxxxxxxxxxxx.EXE

where sss = is a 3-character Id for the generating program set (SDP) and xxx...x = 3-20 character name of program.

Element Type: string
Storage Type: character
Number of Bytes: 28
Units: N/A
Minimum Val: N/A
Nominal Val: SDP_xxxxxxxxxxxxxxxxxxGEN.EXE
Maximum Val: N/A

4.4.52. Geo_Bad

These flags indicate the state of the land flags and some other geophysical conditions. These flags are output by algorithm g1080. Bits are defined as follows:

Bit	Definition
0	Deep Water Flag (not defined if bit 1 = 1) 0 - Deep water 1 - Shallow water
1	Altimeter Surface Flag 0 - Water 1 - Land
2	TMR Surface Flag 0 - Water 1 - Land
3	Rain/Excess Liquid Flag 0 - No rain/excess liquid detected 1 - Rain/excess liquid detected
4	Ocean and Earth Tide Flag 0 - Valid tides 1 - Invalid tide(s)
5-6	Brightness Temperature Quality Flag 00 - All channels in interp mode 01 - 1 channel in prox mode 10 - 2 or more channels in prox mode 11 - 1 or more channels with bad quality

7	TMR Ice Flag 0 - No ice detected 1 - Ice detected.

{[GDR:1]}

Element Type: bitfield
Storage Type: bit
Number of Bytes: 1
Units: N/A
Minimum Val: 0
Nominal Val: 0
Maximum Val: X'FF'

4.4.53. Geoid

Value of geoid height (equipotential surface) above the reference ellipsoid at the measurement point. For TOPEX/POSEIDON it includes the "permanent tide" (geoid tide). This value is output by algorithm g1065. {[GDR:2]}

Element Type: integer
Storage Type: signed
Number of Bytes: 4
Units: millimeters
Minimum Val: -200000
Nominal Val: N/A
Maximum Val: 200000

4.4.54. IGDR_SW_Ped_Keywd

The IGDR_SW_Ped_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object IGDR_SW_Ped_Value.

Element Type: string
Storage Type: character
Number of Bytes: 11
Units: N/A
Minimum Val: N/A
Nominal Val: IGDR_SW_Ped
Maximum Val: N/A

4.4.55. IGDR_SW_Ped_Value

Information on the version of the IGDR processing software used to generate these data.

Element Type: string
Storage Type: character
Number of Bytes: 18
Units: N/A
Minimum Val: 633-755/1991-01-01
Nominal Val: N/A
Maximum Val: 633-755/9999-12-23

4.4.56. Instr_State

These flags indicate various states of the altimeter and TMR. These flags are output by algorithm g1080. Bits are defined as follows:

Bit	Definition
0	C Band Status 0 - C band on 1 - C band off
1	C Bandwidth 0 - 320 MHz 1 - 100 MHz
2	Ku Band Status 0 - Ku band on 1 - Ku band off
3	Altimeter Operating 0 - Altimeter A operating 1 - Altimeter B operating
4	Spare
5	TMR21A Status 0 - TMR21A on 1 - TMR21A off
6	TMR21B Status 0 - TMR21B off 1 - TMR21B on
7	CG Attitude/Temp Range Correction 0 - Valid 1 - Invalid (not applied).

[Note: If Ku is on (bit 2 = 0) it is primary, else C is primary.] {[GDR:1,2]}

Element Type: bitfield
Storage Type: bit
Number of Bytes: 1
Units: N/A
Minimum Val: 0
Nominal Val: 0

Maximum Val: X'FF'

4.4.57. Iono_Bad

Flags to indicate that the computed ionospheric correction is out of range. These flags are output by algorithm g1080. For TOPEX, indicates that either the derived value was out of range or that only one band was operating. Each high rate point is flagged. 1 = Bad, 0 = OK. Bits are defined as follows:

Bit	Definition
0-9	Flags corresponding to 10 hi rate range values
10-15	Spares.

{[GDR:2]}

Element Type: bitfield
Storage Type: bit
Number of Bytes: 2
Units: N/A
Minimum Val: 0
Nominal Val: 0
Maximum Val: X'03FF'

4.4.58. Iono_Corr

Range correction for ionospheric delay at K band, 1/frame. For TOPEX, value is obtained from dual frequency data. Value (negative) is added to instrument range to get correct range. For TOPEX, which has high rate ionospheric correction, the value is the trimmed average of the high rate data. This value is output by algorithm g1073. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: millimeters
Minimum Val: -32768
Nominal Val: N/A
Maximum Val: 0

4.4.59. Latitude

Geodetic latitude of measurement point from orbit determination at Time_Past_Epoch. This value is output by algorithm t6009. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 4
Units: microdegrees
Minimum Val: -90000000
Nominal Val: N/A
Maximum Val: 90000000

4.4.60. Longitude

East longitude of measurement point from orbit determination at Time_Past_Epoch. This value is output by algorithm t6009. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 4
Units: microdegrees
Minimum Val: 0
Nominal Val: N/A
Maximum Val: 359999999

4.4.61. Mean_Sea_Surf

Value of sea surface height above the reference ellipsoid at the measurement point from a high resolution mean sea surface. This value is output by algorithm g1065. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 4
Units: millimeters
Minimum Val: -200000
Nominal Val: N/A
Maximum Val: 200000

4.4.62. Net_Instr_AGC_Corr_C

Net instrument AGC correction added to C band. This correction also applies directly to sigma0. This value is output by algorithm s1023. {[GDR:2,3]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: .01 dB

Minimum Val: -32768
Nominal Val: N/A
Maximum Val: 32767

4.4.63. Net_Instr_AGC_Corr_K

Net instrument AGC correction added to K band. This correction also applies directly to sigma0. This value is output by algorithm s1023. {[GDR:2,3]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: .01 dB
Minimum Val: -32768
Nominal Val: N/A
Maximum Val: 32767

4.4.64. Net_Instr_R_Corr_C

Net (summed) instrument range correction, 1/frame, C band. Value is added to instrument range to get correct range. This value is output by algorithm s1022. {[GDR:1,2]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: millimeters
Minimum Val: -5000
Nominal Val: N/A
Maximum Val: -2000

4.4.65. Net_Instr_R_Corr_K

Net (summed) instrument range correction, 1/frame, K band. Value is added to instrument range to get correct range. This value is output by algorithm s1022. {[GDR:1,2]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: millimeters
Minimum Val: -5000
Nominal Val: N/A
Maximum Val: -2000

4.4.66. Net_Instr_SWH_Corr_C

Net (summed) instrument SWH correction added to C band. This value is output by algorithm s1024. {[GDR:1,2]}

Element Type: integer
Storage Type: signed
Number of Bytes: 1
Units: 0.1 meters
Minimum Val: -128
Nominal Val: N/A
Maximum Val: 127

4.4.67. Net_Instr_SWH_Corr_K

Net (summed) instrument SWH correction added to K band. This value is output by algorithm s1024. {[GDR:1,2]}

Element Type: integer
Storage Type: signed
Number of Bytes: 1
Units: 0.1 meters
Minimum Val: -128
Nominal Val: N/A
Maximum Val: 127

4.4.68. Net_Time_Tag_Corr

Net time tag correction = Alt internal delay (~+/-100 microseconds) + height delay (pulse travel time) (~4.45 milliseconds). Alt internal delay is the difference between Alt frame time tag and the time at which the reported Alt measurement is valid. This is NOT just the electronic delay. This value is output by algorithm t1120. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: microseconds
Minimum Val: 4000
Nominal Val: 4450
Maximum Val: 4900

4.4.69. Ocean_Tide

Height of the elastic ocean tide (i.e., the sum of the ocean tide and the loading tide) from a model. For TOPEX/POSEIDON the model

includes equilibrium values for long period constituents and dynamical model solutions for short periods. The permanent tide (zero frequency) is not included. The Ocean_Tide is output by algorithm g1061. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: millimeters
Minimum Val: -32768
Nominal Val: N/A
Maximum Val: 32767

4.4.70. Off_Nadir_Angle

Cone angle between altimeter electrical axis and nadir, used in computing altimeter corrections involving attitude. This angle is obtained from waveform data. Nadir is defined as the normal to the reflecting surface. This value is output by algorithm s5134. {[GDR:1]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 1
Units: centidegrees
Minimum Val: 0
Nominal Val: 0
Maximum Val: 100

4.4.71. Operator_Note_Keywd

The Operator_Note_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Operator_Note_Value.

Element Type: string
Storage Type: character
Number of Bytes: 13
Units: N/A
Minimum Val: N/A
Nominal Val: Operator_Note
Maximum Val: N/A

4.4.72. Operator_Note_Value

The Operator_Note_Value is a text field which provides miscellaneous notes or comments. {[GDR:3]}

Element Type: string
Storage Type: character
Number of Bytes: 60
Units: N/A
Minimum Val: N/A
Nominal Val: N/A
Maximum Val: N/A

4.4.73. Orbit_Source_Keywd

The Orbit_Source_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Orbit_Source_Value.

Element Type: string
Storage Type: character
Number of Bytes: 12
Units: N/A
Minimum Val: N/A
Nominal Val: Orbit_Source
Maximum Val: N/A

4.4.74. Orbit_Source_Value

Information on the source, date, version, etc. of the orbit used in producing these data.

Element Type: string
Storage Type: character
Number of Bytes: 20
Units: N/A
Minimum Val: N/A
Nominal Val: N/A
Maximum Val: N/A

4.4.75. PFLAG

This flag defines the quality of the Dry_Tropo range correction due to the quality of the calculated surface pressure. This value is output by algorithm g1055. (The flag is more fully defined in the specification for the CNES Surface Met Data file, SIS 633-751-23-008.) TBD [CNES]. {[GDR:2]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 1

Units: N/A
Minimum Val: 0
Nominal Val: 0
Maximum Val: 9

4.4.76. POD_Qual_Keywd

The POD_Qual_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object POD_Qual_Value.

Element Type: string
Storage Type: character
Number of Bytes: 11
Units: N/A
Minimum Val: N/A
Nominal Val: POD_Quality
Maximum Val: N/A

4.4.77. POD_Qual_Value

This consists of flags and/or pointers to detailed information about the quality of the Precision Orbit Determination used to produce the GDR. For TOPEX/POSEIDON if the data are an IGDR, this field shall contain "Interim GDR". For other values, see POE SIS 633-772-23-002 (header).

Element Type: string
Storage Type: character
Number of Bytes: 32
Units: N/A
Minimum Val: N/A
Nominal Val: N/A
Maximum Val: N/A

4.4.78. Pass_Number_Keywd

The Pass_Number_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Pass_Number_Value.

Element Type: string
Storage Type: character
Number of Bytes: 11
Units: N/A
Minimum Val: N/A
Nominal Val: Pass_Number

Maximum Val: N/A

4.4.79. Pass_Number_Value

Each half rev of the repeating orbit, from max/min to min/max latitude, is assigned a unique number. The numbers run from 1 to twice the number of revs in a repeat cycle. This number is used to facilitate the sorting of data for science applications.

Element Type: integer
Storage Type: character
Number of Bytes: 3
Units: counts
Minimum Val: 1
Nominal Val: N/A
Maximum Val: 254

4.4.80. Pole_Tide

Geocentric pole tide height (Wahr, 1985) based on computations using polar location values from the POE. This field is zero for the IGDR Data. This value is output by algorithm g1063. {[GDR:3]}

Element Type: integer
Storage Type: signed
Number of Bytes: 1
Units: millimeters
Minimum Val: -128
Nominal Val: N/A
Maximum Val: 127

4.4.81. Producer_Agency_Name_Keywd

The Producer_Agency_Name_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Producer_Agency_Name_Value.

Element Type: string
Storage Type: character
Number of Bytes: 20
Units: N/A
Minimum Val: N/A
Nominal Val: Producer_Agency_Name
Maximum Val: N/A

4.4.82. Producer_Agency_Name_Value

The Producer_Agency_Name_Value provides the name of the government agency producing the data product.

Element Type: string
Storage Type: character
Number of Bytes: 4
Units: N/A
Minimum Val: CNES
Nominal Val: <depends on data product>
Maximum Val: NASA

4.4.83. Producer_Institution_Name_Keywd

The Producer_Institution_Name_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Producer_Institution_Name_Value.

Element Type: string
Storage Type: character
Number of Bytes: 25
Units: N/A
Minimum Val: N/A
Nominal Val: Producer_Institution_Name
Maximum Val: N/A

4.4.84. Producer_Institution_Name_Value

The Producer_Institution_Name_Value identifies a university, research center, NASA or CNES center or other institution associated with the production of a data set.

Element Type: string
Storage Type: character
Number of Bytes: 3
Units: N/A
Minimum Val: CLS
Nominal Val: N/A
Maximum Val: JPL

4.4.85. Product_Create_End_Time_Keywd

The Product_Create_End_Time_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Product_Create_End_Time_Value.

Element Type: string
Storage Type: character
Number of Bytes: 23
Units: N/A
Minimum Val: N/A
Nominal Val: Product_Create_End_Time
Maximum Val: N/A

4.4.86. Product_Create_End_Time_Value

The Product_Create_End_Time_Value specifies the data product generation end time in CCSDS ASCII time format.

Element Type: time
Storage Type: time_ascii
Number of Bytes: 17
Units: Local Time
Minimum Val: 1990-001T00:00:00
Nominal Val: N/A
Maximum Val: 9999-366T23:59:60

4.4.87. Product_Create_Start_Time_Keywd

The Product_Create_Start_Time_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Product_Create_Start_Time_Value.

Element Type: string
Storage Type: character
Number of Bytes: 25
Units: N/A
Minimum Val: N/A
Nominal Val: Product_Create_Start_Time
Maximum Val: N/A

4.4.88. Product_Create_Start_Time_Value

The Product_Create_Start_Time_Value specifies the data product generation start time in CCSDS ASCII time format.

Element Type: time
Storage Type: time_ascii
Number of Bytes: 17
Units: Local Time
Minimum Val: 1990-001T00:00:00
Nominal Val: N/A
Maximum Val: 9999-366T23:59:60

4.4.89. Rev_Number_Keywd

The Rev_Number_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Rev_Number_Value.

Element Type: string
Storage Type: character
Number of Bytes: 10
Units: N/A
Minimum Val: N/A
Nominal Val: Rev_Number
Maximum Val: N/A

4.4.90. Rev_Number_Value

Revolution (orbit) number counted from launch (into rev 0), incremented at the ascending node, during which this pass begins.

Element Type: integer
Storage Type: character
Number of Bytes: 5
Units: counts
Minimum Val: 0
Nominal Val: N/A
Maximum Val: 99999

4.4.91. SFDU_ClassI_Format_Id

The SFDU_ClassI_Format_Id is the TYPE identifier which is part of the fundamental structure used to build SFDUs, comprising a TYPE, a LENGTH, and a VALUE field, and referred to as a TYPE-LENGTH-VALUE Object (TLVO). The TYPE and LENGTH fields together make up a fixed-length "label" followed by a variable length VALUE field.

The TYPE field has four subfields:

The first subfield (octets 0-3) identifies the agency with registration responsibility for the data description information contained in octets 8-11, in this instance NJPL.

The second subfield (octet 4) contains the Version ID which identifies the structure and coding of the label. In this case, Version=1, which indicates that the LENGTH field is a decimal number 8 octets in length with leading zeros as necessary.

The third subfield (octet 5) is used to classify the type of data contained within the VALUE field. Class=I indicates that the VALUE field contains application data.

The last subfield of the TYPE field (octets 8-11) contains an ID of the data description information which includes the definition of the format and parsing rules, as well as the semantic meaning of the value field. This value is assigned by the JPL SFDU Control Authority, and is a mechanism by which the format specified in this specification is registered as an SFDU. This subfield has been assigned the value T001 for the Alt SDR Data SIS, T002 for the TMR SDR Data SIS and T003 for the GDR Data SIS.

Element Type: string
Storage Type: character
Number of Bytes: 12
Units: N/A
Minimum Val: N/A
Nominal Val: NJPL1I00xxxx
Maximum Val: N/A

4.4.92. SFDU_ClassI_Length_Value

Length in bytes of header and data following the SFDU I label in a pass file. The nominal value is approximately 05552448 for Alt SDR Data, 00513400 for GDR Data and 00062872 for TMR SDR Data.

Element Type: integer
Storage Type: character
Number of Bytes: 8
Units: counts
Minimum Val: 00005152
Nominal Val: N/A
Maximum Val: 05600000

4.4.93. SFDU_ClassZ_Format_Id

The SFDU_ClassZ_Format_Id is the TYPE identifier which is part of the fundamental structure used to build SFDUs, comprising a TYPE, a LENGTH, and a VALUE field, and referred to as a TYPE-LENGTH-VALUE Object (TLVO). The TYPE and LENGTH fields together make up a fixed-length "label" followed by a variable length VALUE field.

The TYPE field has four subfields:

The first subfield (octets 0-3) identifies the agency with registration responsibility for the data description information contained in octets 8-11, in this instance CCSDS.

The second subfield (octet 4) contains the Version ID which identifies the structure and coding of the label. In this case, Version=1, which indicates that the LENGTH field is a decimal number 8 octets in length with leading zeros as necessary.

The third subfield (octet 5) is used to classify the type of data contained within the VALUE field. Class=Z indicates the start of a data unit that is composed of one or more TLVOs.

The last subfield of the TYPE field (octets 8-11) contains an ID of the data description information which includes the definition of the format and parsing rules, as well as the semantic meaning of the value field.

Element Type: string
Storage Type: character
Number of Bytes: 12
Units: N/A
Minimum Val: N/A
Nominal Val: CCSD1Z000001
Maximum Val: N/A

4.4.94. SFDU_ClassZ_Length_Value

The SFDU_ClassZ_Length_Value specifies the length of SFDU Class Z data description.

Element Type: integer
Storage Type: character
Number of Bytes: 8
Units: counts
Minimum Val: 00005152
Nominal Val: N/A
Maximum Val: 05500000

4.4.95. SIS_Id_Keywd

The SIS_Id_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object SIS_Id_Value.

Element Type: string
Storage Type: character
Number of Bytes: 6
Units: N/A
Minimum Val: N/A
Nominal Val: SIS_Id

Maximum Val: N/A

4.4.96. SIS_Id_Value

The SIS_Id_Value provides the document and version date of the Software Interface Specification that describes this data product. The format for this element is:

xxx-xxx-xx-xxx/YYYY-MM-DD

where the value to the left of the diagonal is the project document number of the SIS describing the data product and the right value is the document date, e.g., 633-751-23-004/1990-10-01.

Element Type: string
Storage Type: character
Number of Bytes: 25
Units: N/A
Minimum Val: 633-751-23-001/1990-10-01
Nominal Val: N/A
Maximum Val: 633-752-23-021/9999-12-31

4.4.97. SSH_Bad

Flags to indicate if individual 10/frame sea surface height points are believed to be invalid as described in algorithm g1047. Flags are set to zero for good data. These flags are output by algorithm g1080. Bits are defined as follows:

Bit	Definition
0-9	Flags corresponding to 10 SSH points
10-15	Spares.

{[GDR:3]}

Element Type: bitfield
Storage Type: bit
Number of Bytes: 2
Units: N/A
Minimum Val: 0
Nominal Val: 0
Maximum Val: X'03FF'

4.4.98. SS_Hght_Hi_Rate

Differences (to reduce storage) from the fitted/averaged observation value, Sea_Surf_Hght, of height of sea surface above the reference ellipsoid at a rate of 10 heights per record. Individual heights have been corrected for all instrument and atmospheric effects. If high rate points are bad or missing, they are flagged in SSH_Bad. These values are output by algorithm g1066. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: millimeters
Minimum Val: -32768
Nominal Val: N/A
Maximum Val: 32767

4.4.99. SS_Pts_Avg

Number of data points actually used in fitted Sea_Surf_Hght. Required to be at least TBD [6 or 5; was 6 for Geosat]. If the number of good points is less than required, the available points are averaged in order to provide a height to remove from the high rate data for storage purposes. However, this average is not valid at Time_Past_Epoch. This value is output by algorithm g1071. {[GDR:2]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 1
Units: counts
Minimum Val: 0
Nominal Val: 10
Maximum Val: 10

4.4.100. SS_RMS

Root Mean Square of SS_Hght_Hi_Rate about the fit or average used to obtain Sea_Surf_Hght. This value is output by algorithm g1071. {[GDR:2]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 2
Units: millimeters
Minimum Val: 0
Nominal Val: N/A

Maximum Val: 32767

4.4.101. STR_Frames_Received_Keywd

The STR_Frames_Received_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object STR_Frames_Received_Value.

Element Type: string
Storage Type: character
Number of Bytes: 19
Units: N/A
Minimum Val: N/A
Nominal Val: STR_Frames_Received
Maximum Val: N/A

4.4.102. STR_Frames_Received_Value

Number of satellite engineering telemetry frames received in the SDS STR file for the current pass.

Element Type: integer
Storage Type: character
Number of Bytes: 2
Units: counts
Minimum Val: 1
Nominal Val: 52
Maximum Val: 52

4.4.103. SWH_C

Significant Wave Height, 1/frame fit as specified in algorithm s1019S, corrected, C band. This value is output by algorithm s1024. {[GDR:1]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 1
Units: 0.1 meters
Minimum Val: 0
Nominal Val: N/A
Maximum Val: 255

4.4.104. SWH_K

Significant Wave Height, 1/frame fit as specified in algorithm s1019S, corrected, K band. This value is output by algorithm s1024. {[GDR:1]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 1
Units: 0.1 meters
Minimum Val: 0
Nominal Val: N/A
Maximum Val: 255

4.4.105. SWH_Pts_Avg

The actual number of points (for the primary channel, see Instr_State) which were used in producing 1/frame average. This value is output by algorithm s1019S. {[GDR:2]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 1
Units: counts
Minimum Val: 0
Nominal Val: 10
Maximum Val: 10

4.4.106. SWH_RMS_C

RMS of high rate Alt SWH_C data about SWH_C value. This value is output by algorithm s1019S. {[GDR:2]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 1
Units: 0.1 meters
Minimum Val: 0
Nominal Val: N/A
Maximum Val: 255

4.4.107. SWH_RMS_K

RMS of high rate Alt SWH_K data about SWH_K value. This value is output by algorithm s1019S. {[GDR:2]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 1
Units: 0.1 meters
Minimum Val: 0
Nominal Val: N/A
Maximum Val: 255

4.4.108. Sat_Alt

Altitude of satellite center of mass above the reference ellipsoid measured along the normal to the ellipsoid from orbit determination at Time_Past_Epoch. This value is output by algorithm t6009. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 4
Units: millimeters
Minimum Val: 1200000000
Nominal Val: 1336000000
Maximum Val: 1400000000

4.4.109. Sat_Alt_Hi_Rate

The difference of the satellite altitude at each of the high rate height points from Sat_Alt. These values are needed to do orbit replacement without having the original orbit and software. This value is output by algorithm t6009. {[GDR:2,3]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: millimeters
Minimum Val: -32768
Nominal Val: N/A
Maximum Val: 32767

4.4.110. Sea_Surf_Hght

Height of sea surface above reference ellipsoid from a fit, corrected for sensor and media effects, to high rate data. Value valid at Time_Past_Epoch, Latitude, Longitude. If the number of good high-rate points is less than the limit for SS_Pts_Avg, this will be the average (See SS_Pts_Avg). This value is output by algorithm g1071. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 4
Units: millimeters
Minimum Val: -200000
Nominal Val: 0
Maximum Val: 200000

4.4.111. Sensor_Name_Keywd

The Sensor_Name_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Sensor_Name_Value.

Element Type: string
Storage Type: character
Number of Bytes: 11
Units: N/A
Minimum Val: N/A
Nominal Val: Sensor_Name
Maximum Val: N/A

4.4.112. Sensor_Name_Value

The Sensor_Name_Value provides the name of the instrument or hardware used to acquire the data.

Element Type: string
Storage Type: character
Number of Bytes: 30
Units: N/A
Minimum Val: ALT>Altimeter
Nominal Val: <depends on data product>
Maximum Val: TMR>TOPEX Microwave Radiometer

4.4.113. Sigma0_C

Sigma0 computed from 1/frame AGC_C, corrected. This value is output by algorithm g1260. {[GDR:1]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 2
Units: .01 dB
Minimum Val: 0
Nominal Val: N/A
Maximum Val: 32767

4.4.114. Sigma0_K

Sigma0 computed from 1/frame AGC_K, corrected. This value is output by algorithm g1260. {[GDR:1]}

Element Type: integer
Storage Type: unsigned
Number of Bytes: 2
Units: .01 dB
Minimum Val: 0
Nominal Val: N/A
Maximum Val: 32767

4.4.115. Solid_Earth_Tide

Height of the solid earth tide from a model. This tide height is calculated using Cartwright tables and a reference epoch and consists of the second and third degree constituents. The permanent tide (zero frequency) is not included. The Solid_Earth_Tide is output by algorithm g1062. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: millimeters
Minimum Val: -32768
Nominal Val: N/A
Maximum Val: 32767

4.4.116. Source_Name_Keywd

The Source_Name_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Source_Name_Value.

Element Type: string
Storage Type: character
Number of Bytes: 11
Units: N/A
Minimum Val: N/A
Nominal Val: Source_Name
Maximum Val: N/A

4.4.117. Source_Name_Value

The Source_Name_Value refers to the spacecraft, instrument, etc. which contains the sensors.

Element Type: string
Storage Type: character
Number of Bytes: 14
Units: N/A
Minimum Val: N/A
Nominal Val: TOPEX/POSEIDON
Maximum Val: multiple

4.4.118. Spare

Spare.

Element Type: integer
Storage Type: signed
Number of Bytes: 1
Units: N/A
Minimum Val: -128
Nominal Val: N/A
Maximum Val: 127

4.4.119. TMR_Frames_Processed_Keywd

The TMR_Frames_Processed_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object TMR_Frames_Processed_Value.

Element Type: string
Storage Type: character
Number of Bytes: 20
Units: N/A
Minimum Val: N/A
Nominal Val: TMR_Frames_Processed
Maximum Val: N/A

4.4.120. TMR_Frames_Processed_Value

Number of TMR minor frames processed to TMR SDR Data records for the current pass.

Element Type: integer
Storage Type: character
Number of Bytes: 3

Units: counts
Minimum Val: 1
Nominal Val: 248
Maximum Val: 248

4.4.121. TMR_Frames_Received_Keywd

The TMR_Frames_Received_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object TMR_Frames_Received_Value.

Element Type: string
Storage Type: character
Number of Bytes: 19
Units: N/A
Minimum Val: N/A
Nominal Val: TMR_Frames_Received
Maximum Val: N/A

4.4.122. TMR_Frames_Received_Value

Number of TMR minor frames received by the TMR SDR processor in TMR Frames file for the current pass.

Element Type: integer
Storage Type: character
Number of Bytes: 3
Units: counts
Minimum Val: 0
Nominal Val: 248
Maximum Val: 248

4.4.123. TMR_SDR_Gap_Count_Keywd

The TMR_SDR_Gap_Count_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object TMR_SDR_Gap_Count_Value.

Element Type: string
Storage Type: character
Number of Bytes: 17
Units: N/A
Minimum Val: N/A
Nominal Val: TMR_SDR_Gap_Count
Maximum Val: N/A

4.4.124. TMR_SDR_Gap_Count_Value

Number of gaps identified during generation of the TMR SDR Data file. A gap is defined as missing data in the TMR SDR Data file for a period of at least 30 seconds.

Element Type: integer
Storage Type: character
Number of Bytes: 3
Units: counts
Minimum Val: 0
Nominal Val: 0
Maximum Val: 120

4.4.125. TMR_SDR_Records_Processed_Keywd

The TMR_SDR_Records_Processed_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object TMR_SDR_Records_Processed_Value.

Element Type: string
Storage Type: character
Number of Bytes: 25
Units: N/A
Minimum Val: N/A
Nominal Val: TMR_SDR_Records_Processed
Maximum Val: N/A

4.4.126. TMR_SDR_Records_Processed_Value

Number of TMR SDR records processed to (I)GDR Data records for the current pass.

Element Type: integer
Storage Type: character
Number of Bytes: 4
Units: counts
Minimum Val: 1
Nominal Val: 240
Maximum Val: 240

4.4.127. TMR_SDR_Records_Received_Keywd

The TMR_SDR_Records_Received_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object TMR_SDR_Records_Received_Value.

Element Type: string
Storage Type: character
Number of Bytes: 24
Units: N/A
Minimum Val: N/A
Nominal Val: TMR_SDR_Records_Received
Maximum Val: N/A

4.4.128. TMR_SDR_Records_Received_Value

Number of records received by the IGDR processor in the TMR SDR Data file for the current pass.

Element Type: integer
Storage Type: character
Number of Bytes: 3
Units: counts
Minimum Val: 0
Nominal Val: 248
Maximum Val: 248

4.4.129. TMR_SDR_SW_Ped_Keywd

The TMR_SDR_SW_Ped_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object TMR_SDR_SW_Ped_Value.

Element Type: string
Storage Type: character
Number of Bytes: 14
Units: N/A
Minimum Val: N/A
Nominal Val: TMR_SDR_SW_Ped
Maximum Val: N/A

4.4.130. TMR_SDR_SW_Ped_Value

Information on the version of the TMR SDR processing software used to generate these data.

Element Type: string
Storage Type: character
Number of Bytes: 18
Units: N/A
Minimum Val: 633-755/1991-01-01
Nominal Val: N/A
Maximum Val: 633-755/9999-12-31

4.4.131. Tb_18

Corrected brightness temperature, 18 GHz. This value is interpolated by algorithm g1256 from values output by algorithm s2350. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: .01 Kelvins
Minimum Val: 12000
Nominal Val: N/A
Maximum Val: 20000

4.4.132. Tb_21

Corrected brightness temperature, 21 GHz. This value is interpolated by algorithm g1256 from values output by algorithm s2350. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: .01 Kelvins
Minimum Val: 0
Nominal Val: N/A
Maximum Val: 23000

4.4.133. Tb_37

Corrected brightness temperature, 37 GHz. This value is interpolated by algorithm g1256 from values output by algorithm s2350. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: .01 Kelvins
Minimum Val: 15000
Nominal Val: N/A
Maximum Val: 25000

4.4.134. Tidal_Loading

Ocean loading effect on tide. For TOPEX/POSEIDON this value is also included in Ocean_Tide. This value is output by algorithm g1061. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 1
Units: millimeters
Minimum Val: -128
Nominal Val: N/A
Maximum Val: 127

4.4.135. Time_Epoch_Keywd

The Time_Epoch_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Time_Epoch_Value.

Element Type: string
Storage Type: character
Number of Bytes: 10
Units: N/A
Minimum Val: N/A
Nominal Val: Time_Epoch
Maximum Val: N/A

4.4.136. Time_Epoch_Value

Zero point of time from which data times are measured. Given in standard format YYYY-DDDTHH:MM:SS.FFFFFF to the nearest microsecond. Preferred zero point is January 1, 1958 00:00:00.000000 (CCSDS standard).

Element Type: utc
Storage Type: time_ascii
Number of Bytes: 24
Units: UTC
Minimum Val: 1958-001T00:00:00.000000
Nominal Val: 1958-001T00:00:00.000000
Maximum Val: 1992-001T00:00:00.000000

4.4.137. Time_First_Pt_Keywd

The Time_First_Pt_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Time_First_Pt_Value.

Element Type: string
Storage Type: character
Number of Bytes: 13
Units: N/A
Minimum Val: N/A
Nominal Val: Time_First_Pt
Maximum Val: N/A

4.4.138. Time_First_Pt_Value

UTC time of first data point in the current pass. Given in standard format YYYY-DDDTHH:MM:SS[.FFFFFF].

Element Type: utc
Storage Type: time_ascii
Number of Bytes: 24
Units: UTC
Minimum Val: 1991-001T00:00:00[.000000]
Nominal Val: N/A
Maximum Val: 9999-366T23:59:60[.999999]

4.4.139. Time_Last_Pt_Keywd

The Time_Last_Pt_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Time_Last_Pt_Value.

Element Type: string
Storage Type: character
Number of Bytes: 12
Units: N/A
Minimum Val: N/A
Nominal Val: Time_Last_Pt
Maximum Val: N/A

4.4.140. Time_Last_Pt_Value

UTC time of the last data point in the current pass. Given in standard format YYYY-DDDTHH:MM:SS[.FFFFFF].

Element Type: utc
Storage Type: time_ascii
Number of Bytes: 24
Units: UTC
Minimum Val: 1991-001T00:00:00[.000000]
Nominal Val: N/A
Maximum Val: 9999-366T23:59:60[.999999]

4.4.141. Time_Past_Epoch

Time elapsed between Time_Epoch_Value and the observation being time tagged. Elapsed time includes leap seconds. This value is output by algorithm t1120. Representation is CCSDS day segmented binary. See Appendix D for more details. {[GDR:1]}

Element Type: utc
Storage Type: utc_binary
Number of Bytes: 8
Units: UTC
Minimum Val: 0
Nominal Val: N/A
Maximum Val: N/A

4.4.142. Time_Shift_Midframe

The frame time shift from the first height in a science data frame to the middle of the frame. Added to the corrected altimeter science frame time tag to produce Time_Past_Epoch_AltSci. This value is output by algorithm t1165. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 4
Units: microseconds
Minimum Val: 500000
Nominal Val: 530000
Maximum Val: 560000

4.4.143. Wet_Tropo_FMO

Range correction for wet tropospheric delay as obtained from models of water vapor from French Met Office, via the Surface Met Data file. This value is output by algorithm g1055. {[GDR:3]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2

Units: millimeters
Minimum Val: -700
Nominal Val: N/A
Maximum Val: 0

4.4.144. Wet_Tropo_Rad

Range correction for wet tropospheric delay as obtained from radiometer data, 1/frame. (Same for K and C.) Value (negative) is added to instrument range to get correct range. This value is output by algorithm g1257. {[GDR:1]}

Element Type: integer
Storage Type: signed
Number of Bytes: 2
Units: millimeters
Minimum Val: -700
Nominal Val: N/A
Maximum Val: 0

APPENDIX A - ACRONYMS

AGC	Automatic Gain Control
Alt	NASA Altimeter
ANSI	American National Standards Institute
ASCII	American Standard Code for Information Interchange (restricted to International Use positions of ISO 646)
CCSDS	Consultative Committee on Space Data Systems
CRC	Cyclic Redundancy Check
DEC	Digital Equipment Corporation
FDD	Functional Design Document
FRD	Functional Requirements Document
GDR	Geophysical Data Record
ICD	Interface Control Document
IGDR	Interim Geophysical Data Record
ISO	International Organization for Standardization
JPL	Jet Propulsion Laboratory
N/A	Not applicable
NASA	National Aeronautics and Space Administration
NODS	NASA Ocean Data System
PD	Project Document
POD	Precision Orbit Determination
POE	Precision Orbit Ephemeris
RDD	Release Description Document
RMS	Root Mean Square
SDDS	Science Data Distribution Subsystem
SDM	Science Data Management program set
SDMS	Science Data Management Subsystem
SDP	Science Data Processing program set
SDPS	Science Data Processing Subsystem
SDR	Sensor Data Record
SDS	Science Data Subsystem
SDT	Science Data Team
SFDU	Standard Formatted Data Unit
SIS	Software Interface Specification
SRD	Software Requirements Document
SSH	Sea Surface Height
STR	Selected Telemetry Record
SWH	Significant Wave Height
TBD	To Be Determined
TBS	To Be Supplied
TGS	TOPEX Ground System
TLVO	Type-Length-Value Object (SFDU)
TMR	TOPEX Microwave Radiometer
UTC	Coordinated Universal Time
VAX	trademark for DEC line of 32-bit computers
VMS	trademark for VAX Virtual Memory operating System

APPENDIX B - PRODUCT EXAMPLE

```
CCSD1Z000001nnnnnnnnCCSD1I00T003mmmmmmmm;<CR><LF>
Producer_Agency_Name       = NASA;<CR><LF>
Producer_Institution_Name = JPL;<CR><LF>
Source_Name = TOPEX/POSEIDON;<CR><LF>
Sensor_Name = ALT>Altimeter;<CR><LF>
SIS_Id = 633-751-23-004/1991-06-13;<CR><LF>
Product_Create_Start_Time = 1992-123T12:34:56;<CR><LF>
Product_Create_End_Time   = 1992-123T13:54:32;<CR><LF>
Generating_Software_Name  = SDP_GDRGEN.EXE;<CR><LF>
Build_Id = 633-755/1993-01-15;<CR><LF>
Operator_Note =                                          ;<CR><LF>
Cycle_Number =  12;<CR><LF>
Pass_Number  = 123;<CR><LF>
Rev_Number   =  1647;<CR><LF>
Equator_Longitude = 123.456789;<CR><LF>
Equator_Time      = 1992-012T21:02:53.230000;<CR><LF>
Time_First_Pt     = 1992-012T20:34:12.345678;<CR><LF>
Time_Last_Pt      = 1992-012T21:30:21.876543;<CR><LF>
Time_Epoch        = 1958-001T00:00:00.000000;<CR><LF>
Calib_R_Corr_C = -42;<CR><LF>
Calib_R_Corr_K = -23;<CR><LF>
POD_Qual      = [TBD];<CR><LF>
Orbit_Source = [TBD];<CR><LF>
IGDR_SW_Ped = 633-755/1992-10-10;<CR><LF>
GDR_Gap_Count =  14;<CR><LF>
Alt_Sci_SDR_Records_Received  = 3325;<CR><LF>
Alt_Eng_SDR_Records_Received  = 417;<CR><LF>
TMR_SDR_Records_Received  =  241;<CR><LF>
Alt_SDR_Records_Processed = 3320;<CR><LF>
TMR_SDR_Records_Processed = 240;<CR><LF>
Alt_SDR_SW_Ped = 633-755/1992-05-10;<CR><LF>
Alt_SDR_Gap_Count = 3;<CR><LF>
Alt_Sci_Frames_Received  = 3340;<CR><LF>
Alt_Eng_Frames_Received  =  415;<CR><LF>
STR_Frames_Received      =  51;<CR><LF>
Alt_Sci_Frames_Processed = 3325;<CR><LF>
Alt_Eng_Frames_Processed = 411;<CR><LF>
TMR_SDR_SW_Ped = 633-755/1992-05-10;<CR><LF>
TMR_SDR_Gap_Count =   5;<CR><LF>
TMR_Frames_Received  =  231;<CR><LF>
TMR_Frames_Processed =  221;<CR><LF>
End_of_Header;<CR><LF>
[GDR Data record - 152 data bytes]
[GDR Data record - 152 data bytes]
   ...
[GDR Data record - 152 data bytes]
<EOF>
```

Note: There are always the same number of header records (41 in this example). Each record (plus the 40 byte SFDU label pair) is padded on the right with ASCII spaces to fill out the record to 152 bytes. mmmmmmmmm is the total number of bytes in the file, following the initial 40 byte SFDU labels. nnnnnnnn = mmmmmmmm+20. Thus, the total number of bytes in the file is mmmmmmmm+40 = (Alt_SDR_Records_Processed + 41 + 1) * 152.

APPENDIX C - VAX DATA FORMATS

All SDS files are generated on Digital Equipment Corporation (DEC) VAX/VMS computers, and hence contain data which are organized according to the VAX data formats. This appendix summarizes those data formats which are relevant to SDS files.

C.1 VAX Addressing

The basic addressable unit is the 8-bit byte. Multi-byte quantities are addressed by the least significant byte, and hence bytes are stored in order of increasing significance.

C.2 VAX Data Types

C.2.1 Byte

A byte is eight contiguous bits starting on an addressable byte boundary. The bits are numbered from right to left 0 through 7.

```
7          0
+----------+
|          | :A
+----------+
```

A byte is specified by its address A. When interpreted as a signed integer, a byte is a twos' complement integer with bits of increasing significance ranging from bit 0 through bit 6, with bit 7 the sign bit. The value of the integer is in the range -128 through +127. For the purpose of addition, subtraction, and comparison, VAX instructions also provide direct support for the interpretation of a byte as an unsigned integer with bits of increasing significance ranging from bit 0 through bit 7. The value of the unsigned integer is in the range 0 through 255.

C.2.2 Word

A word is two contiguous bytes starting on an arbitrary byte boundary. The 16 bits are numbered from right to left 0 through 15.

```
15                    0
+---------------------+
|                     | :A
+---------------------+
```

A word is specified by its address, A, which is the address of the byte containing bit 0. When interpreted as a signed integer, a word is a twos' complement integer with bits of increasing

significance ranging from bit 0 through bit 14, with bit 15 the sign bit. The value of the integer is in the range -32768 through +32767. For the purpose of addition, subtraction, and comparison, VAX instructions also provide direct support for the interpretation of a word as an unsigned integer with bits of increasing significance ranging from bit 0 through bit 15. The value of the unsigned integer is in the range 0 through 65535.

C.2.3 Longword

A longword is four contiguous bytes starting on an arbitrary byte boundary. The 32 bits are numbered from right to left 0 through 31.

```
31                                        0
+-----------------------------------------+
|                                         | :A
+-----------------------------------------+
```

A longword is specified by its address, A, which is the address of the byte containing bit 0. When interpreted as a signed integer, a longword is a twos' complement integer with bits of increasing significance ranging from bit 0 through bit 30, with bit 31 the sign bit. The value of the integer is in the range -2147483648 through +2147483647. For the purpose of addition, subtraction, and comparison, VAX instructions also provide direct support for the interpretation of a word as an unsigned integer with bits of increasing significance ranging from bit 0 through bit 31. The value of the unsigned integer is in the range 0 through 4294967295.

APPENDIX D - CCSDS DAY SEGMENTED TIME CODE

D.1 T-Field

For the segmented binary time code described herein, the T-Field consists of a selected number of contiguous time segments. Each segment represents the state of a binary counter, cascaded with the adjacent counters, which rolls over at a modulo specified for each counter.

The segmented binary day count code Recommendation is as follows:

			OPTIONAL
Segment Width	day	millisec	microsec
(bits)	16 or 24	32	16

Each segment above is a right-adjusted binary counter. The CCSDS recommended day segment is a continuous counter of days from 1958 January 1 starting with 0, but other Agency-defined epochs may be accommodated as a level 2 code.

The microseconds segment is optional. Since this code is UTC-based, the leap second correction must be made.

D.2 P-Field

Bit 0 = 0

Bits 1-3 = time code identification = 100

Bit 4 = epoch identification:

0 -- 1958 Jan 1 epoch (Level 1) (used by SDS)
1 -- Agency-defined epoch (Level 2)

Bit 5 = length of day segment:

0 -- 16-bit day segment (used by SDS)
1 -- 24-bit day segment

Bits 6-7 = resolution (number of optional subsecond segments):

00 -- millisecond
01 -- microsecond

10 -- reserved for future use
11 -- reserved for future use

For all SDS data products, the P-Field is:

Bit 0	=	0
Bits 1-3	=	100
Bit 4	=	0
Bit 5	=	0
Bits 6-7	=	01

Since the P-Field is specified in this document, it is omitted from the time codes in the data product.

D.3 SDS Version of Time Format

Thus the form of day segmented binary time codes used by SDS is:

```
                                  15                    0
                 days since       +--------------------+
            1958-001T00:00:00     |                    | :A
                                  +--------------------+

            31                                          0
milliseconds +-----------------------------------------+
 of day      |                                         | :A+2
            +-----------------------------------------+

                                  15                    0
              microseconds        +--------------------+
            of milliseconds       |                    | :A+6
                                  +--------------------+
```

APPENDIX B

PD 633-752-23-004

Software Interface Specification (SIS-2)

Geophysical Data Record (GDR)

Interim Geophysical Data Record (IGDR)

633-752-23-004

TOPEX/POSEIDON Project

TOPEX Ground System Software Interface Specifications Volume 2: Design (SIS-2)

Geophysical Data Record (GDR)

Interim Geophysical Data Record (IGDR)

June 1991

Jet Propulsion Laboratory
California Institute of Technology

JPL D-8594

633-752-23-004

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S. Rosell	264-686		
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J. Wilson	264-355		

TGS Design Team Library		
TOPEX Project Library	(5)	*
Vellum Files	(2)	*

* - comb bound; all others 3-hole for SIS binder

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1 INTRODUCTION

1.1 Identification

SIS 633-752-23-004, Geophysical Data Record (GDR/IGDR) Software Interface Specification, Volume 2, Design, is a deliverable document of the TOPEX Ground System (TGS) Science Data Subsystem (SDS).

1.2 Content Overview

This Software Interface Specification (SIS) specifies the form and content of the Geophysical Data Records (GDRs) to be produced by the TOPEX Ground System at the Jet Propulsion Laboratory for the TOPEX/POSEIDON mission. This SIS also applies to Interim Geophysical Data Records (IGDRs).

The GDR is the primary data product for research purposes. It includes the altimeter height measurements of global sea level, the measurement locations based on precision orbit ephemeris, and associated corrections.

Each GDR consists of multiple GDR Data pass files preceded by an ASCII header which provides information about the entire product.

The IGDR is identical in structure to the GDR. It is generated based on unverified algorithms and/or the operational orbit ephemeris.

1.3 Scope

This document specifies the format, content and structure of the Geophysical Data Record (GDR) and Interim GDR (IGDR) and is applicable to all I/GDRs produced during the TOPEX/POSEIDON mission.

This document supersedes the corresponding SIS Volume 1, Requirements, which will no longer be maintained.

1.4 Related Interfaces

This SIS includes the detailed definition for the GDR package header. The content and structure of the GDR Data pass files are described in the GDR Data SIS, Volume 2, Design, TOPEX Project Document(PD) 633-751-23-004.

1.5 Applicable Documents

[1] MOS FDD, PD 633-704, Rev. C, July 5, 1990.

[2] GDR Data SIS, Volume 2, Design, PD 633-751-23-004.

[3] Recommendation for Space Data System Standards: Standard Formatted Data Units -- Structure and Construction Rules, CCSDS 620.0-R-1, Nov. 1989.

[4] Standard Formatted Data Units: Product Aggregation Aspects, Green Book, Issue-1, CCSDS 620.0-G-1, Nov. 1989.

[5] File Structure and Labeling of Magnetic Tapes for Information Interchange, ANS X3.27-1978.

[6] Information processing -- File structure and labelling of magnetic tapes for information interchange, ISO 1001-1979.

[7] Guide to VMS Files and Devices, App. B, Apr. 1988.

[8] TOPEX/POSEIDON Interface Control Document, TGS to CNES/SSDP, 633-712B, Rev. 2.0, May 16, 1991.

[9] TOPEX/POSEIDON Interface Control Document, TGS to Goddard Space Flight Center (GSFC) Wallops Flight Facility (WFF), 633-712J, Rev. 2.0, August 15, 1990.

[10] SDMS SRD (Preliminary), PD 633-752-21, March 4, 1991.

[11] SDS Functional Requirements Document, 633-751, Rev. A, May 17, 1990.

[12] CCSDS 301.0-B-2 Blue Book Issue 2, Apr 1990, Recommendation For Space System Data Standards: Time Code Formats.

[13] NSSDC Directory Interchange Format Manual: 88-19, Version 1.0, July 13, 1988.

[14] Planetary Data System Data Dictionary Document, JPL Document D-6184, February 16, 1990, Version 2.0.

[15] Recorded Magnetic Tape (6250 CPI, Group Coded Recording), ANS X3.54-1976.

1.6 Conventions

1.6.1 Data Representation

All file headers are ASCII.

Bit and byte ordering follows VAX/VMS conventions as defined in [7] unless noted otherwise.

All ASCII character fields are left justified with trailing blanks unless otherwise noted.

Data elements of type "time" have the form

YYYY-DDDThh:mm:ss

in accordance with CCSDS recommended ASCII Time Code B format for data interchange [12].

1.6.2 File Structure

The format, content and sequence of volume labels, file labels, and file structures for the GDR comply with ISO standard labels, data and record formats supported by the VMS operating system, and described in ISO 1001-1979[6].

Each volume is bracketed by VMS-supported ANSI VOL/EOV labels. All files are bracketed by HDR1/HDR2 and EOF1/EOF2 labels[7].

SFDU Structure. The header file is packaged in Standard Formatted Data Unit (SFDU) structures as described in Appendix D.

1.6.3 Notation

1.6.3.1 Traceability

Some data element descriptions may contain a trace code that indicates the data product in which it appears and the priority assigned to it. The code has the following format:

{[ppp:n]}

where: ppp... = data product acronym (e.g. GDR)
n = 1 - mandatory or pre-launch
2 - important or as soon as possible
3 - desirable or post-launch

1.6.3.2 Hexadecimal Values

X'nn' is a representation of a numeric value in hexadecimal.

1.6.3.3 Keyword/Value Conventions

Data in header records follows a "keyword=value" convention as shown here:

KEYWORD Assignment_symbol VALUE Stmt_Terminator

where:

KEYWORD is the leftmost component term and consists of a character string that describes the corresponding keyword.

Assignment_symbol is the ASCII equal sign character "=".

VALUE is the rightmost component term and consists of a character string containing the value of the data object described by the corresponding keyword.

Stmt_Terminator is a semicolon (;).

Unless otherwise noted in the appropriate record description, the Stmt_Terminator (;) is followed by a carriage return - line feed pair (<CR><LF>) and padded with blanks to the record length specified for the file in which the keyword=value pair is located.

1.6.4 Data Definition Terminology

File A collection of information stored as **records** and terminated with an EOF marker.

Group A conceptually useful aggregate of **records** or **elements**.

Record An organized and identifiable aggregate of related data **elements** transcribed on a storage medium.

Element A discrete, non-decomposable unit of information. An **element** has the following attributes:

Element Type	Conceptual data type. Values are:
bitfield	Contiguous sequence of bits, often used as flags.

integer	Whole number.
real	Number that can include a decimal fraction.
string	Contiguous sequence of characters.
utc	Universal Coordinated Time
time	Local time
Storage Type	Format in which an element is represented on a storage medium. Values are:
signed	Signed integer, twos-complement.
unsigned	Unsigned integer.
bit	Contiguous sequence of bits.
character	Contiguous sequence of ASCII characters.
time_ascii	Time represented by ASCII characters in format yyyy-dddThh:mm:ss.fff...
utc_binary	UTC in CCSDS day segmented binary format.
Bytes	Size of element in 8-bit bytes.
Units	Unit of measure including scale factor, "counts", or "N/A".
Minimum	Typical or approximate minimum element value.
Nominal	Typical or approximate nominal element value.
Maximum	Typical or approximate maximum element value.

2 ENVIRONMENT

2.1 Hardware Characteristics

This product will be created in a VAX/VMS environment on a DEC VAX 6000-410 series CPU.

2.2 Interface Medium and Characteristics

See Transfer Medium.

2.3 Input/Output Protocols

2.3.1 Device Addressing

See Transfer Method.

2.3.2 Operating System Protocols

N/A.

2.3.3 Deformatting

See Conventions and individual file, record, or data element definitions for formatting or translation requirements.

2.3.4 Calling Sequence

N/A.

2.4 Failure Protection and Recovery

Normal magnetic tape generation and handling procedures will be used to ensure the integrity of the tape products. If a tape product cannot be used, due to I/O errors, then a new tape product will be generated.

3 DATA FLOW CHARACTERISTICS

3.1 Data Volume Estimates

One GDR product is produced for each 9.91 day cycle of 127 orbits or 254 passes. A pass contains approximately 3360 records (one per altimeter frame) of 152 bytes. Thus a pass contains about .55 MB, and a cycle about 130 MB. Interim GDR (IGDR) packages may contain as few as one pass file.

Minimum Size: <.1 MB

Nominal Size: 130 MB

Maximum Size: 130 MB

3.2 Generation Frequency

Nominally, one GDR product is generated every 10 days at the direction of the Science Data Team (SDT). The frequency of IGDR generation is controlled by the SDT subject to project requirements.

3.3 Transfer Medium

GDRs are recorded on 9 track magnetic tapes using the 6250 CPI Group Coding Recording method as specified by ANS X3.54-1976[15].

The GDR Header file contains fixed length records of exactly 80 bytes in a 22160 byte block. Records containing less than 80 bytes are padded with blanks to complete the required record length.

GDR Data files contain fixed length records of exactly 152 bytes contained in a 32680 byte block. Records containing less than 152 bytes are padded with blanks to complete the required record length.

3.4 Transfer Method

I/GDR tapes are generated by the SDT and shipped via commercial courier service. See the appropriate ICD for details on frequency of data product exchange between external agencies and TGS subsystems.

3.5 Labeling

External tape label. Each GDR tape has affixed a written label defining its content which conforms to the standards established by SDT. For GDR data products, the external tape label is illustrated below:

```
BCN:
Description:   GDR.start_cycle/pass-end_cycle/pass;ver
ANSI Volume Id:  GDnnnn
Creation Date:
User Id:
Drive:                Source:              Target:
Cycle:
Time:                 beg:                 end:
Distribution
  To:
  Date:
```

The Description field identifies the contents of the tape. The characters GDR are followed by a period. Following the period, the starting and ending cycle and pass number combinations are separated by a hyphen. The cycle and pass numbers are padded with leading zeroes to be 3 characters wide, (e.g. cccppp-cccppp). After this is a semicolon ';' and the version number 'ver'.

For example, the label GDR.123001-123026;1 indicates that the tape contains data files beginning with CYCLE 123 PASS 1 and ending with CYCLE 123 PASS 26. Version 1 indicates that none of the data has been reprocessed.

<u>ANSI Volume Label</u>. GDR tapes have Level 2 ANSI standard magnetic tape labels. The volume identifier is in the form shown here:

GDnnnn = GDR volume identifier field
IGnnnn = IGDR volume identifier field

where nnnn is a 4-digit sequence number, zero-filled, right-justified, assigned in chronological order by SDT.

Figure C-1 illustrates the components of an ANSI-labelled tape as configured for the GDR.

SFDU labels. Each file is identified by a set of SFDU labels that conform to the SFDU structure specified in Appendix D.

Package header file names. Package header file names conform to the following convention:

GDRHDcccppp.TXT

where ccc = the TOPEX cycle number for the 10 days of data on the tape and ppp = pass number of first pass file on the tape.

Pass file names. Each pass file on the tape has a VMS-supported ANSI file name in the following format:

CcccPppp.DAT

where ccc = TOPEX cycle number
ppp = pass number from 1 to 254.

The file name and sequence of pass files on a tape are specified in the package header as iterations of the Pass_File_Reference record.

4 DATA PRODUCT DEFINITION

4.1 Summary Data Product Structure

Package Header File
Pass File 1
Pass File 2
...
Pass File n

Figure 4-1. SDS Packaged Product Tape Structure

The SDS Packaged Product Tape Structure consists of a single header file followed by one or more Pass Files. The package header file contains fixed length records, containing ASCII characters. The Pass File structure is shown in Figure 4-2.

Header Record 1
Header Record 2
...
Header Record m
Data Record 1
Data Record 2
...
Data Record n

Figure 4-2. SDS Pass File Structure

Each pass file contains fixed length records. Header records contain ASCII characters, while data records are binary. The record length within a pass file is the same for both header and data records. Each pass file is as described in the respective SIS.

4.2 File, Record and Group Descriptions

This section provides a description of each file, record, and record group.

4.2.1 GDR

The GDR is a tape product composed of a single header file (GDR Header) followed by 1 to 254 GDR Data pass files delimited by EOFs and ANSI file labels. A decomposition of the records and elements composing the GDR, and detailed data definitions are contained in Sections 4.3 and 4.4. GDRs generated in the Observational Phase contain a maximum of 254 pass files covering a complete 10 day cycle. Interim GDR products (IGDRs) may contain as few as 1 pass file.

4.2.2 GDR Header

A single GDR Header file is included with each GDR tape, providing summary information on the pass files that follow it on the tape. It conforms to SFDU structure and construction rules for "packaging supplementary data ... with space science data to create data products...", as recommended by the Consultative Committee for Space Data Systems (CCSDS)[3]. Each header record is padded on the right with spaces so that all records in the header are the same length.

4.2.3 GDR Data

This pass file contains slightly less than one hour of data covering a ground track from min/max latitude to max/min latitude. It contains a header and is delimited by a VMS end-of-file indication.

4.3 Detailed Data Product Structure

Table 4-1 shows the overall structure of the I/GDR Header file including record groups (aggregates of records) and their component records. Table 4-2 shows the physical structure of each record and its component elements. Corresponding information for the pass files is contained in the I/GDR Data SIS [2].

Table 4-1. Summary Data Product Description -- Package Header

File: GDR Header			
Record Group (optional)	Record Name	Size	Occurs
	SFDU_Package_Header_Label		
SDS_Header	Producer_Agency_Name	80	1
	Producer_Institution_Name	80	1
	Source_Name	80	1
	Sensor_Name	80	1
	SIS_Id	80	1
	Product_Create_Start_Time	80	1
	Product_Create_End_Time	80	1
	Generating_Software_Name	80	1
	Build_Id	80	1
	Operator_Note	80	1
Package_Header	Pass_File_Data_Type	80	1
	Start_Cycle_Number	80	1
	End_Cycle_Number	80	1
	Package_Data_Start_Time	80	1
	Package_Data_End_Time	80	1
	Start_Pass_Number	80	1
	End_Pass_Number	80	1
	Pass_Count	80	1
	SFDU_ClassR_Label	80	1
SFDU_ClassR_Data_Description	Pass_File_Protocol	80	1
	Pass_File_Delimiter	80	1
	Pass_File_Type	80	1
	Pass_File_Reference	80	1

Table 4-2. Detailed Header file Structure

Record Name	Element Group (optional)	Element Name	Type	Storage	Offset	Size	Occurs
SFDU_Package_Header_Label*		SFDU_ClassZ_Format_Id	string	char	0	12	1
		SFDU_ClassZ_Length_Value	integer	char	0	8	1
		SFDU_ClassK_Format_Id	string	char	0	12	1
		SFDU_ClassK_Length_Value	integer	char	0	8	1
Producer_Agency_Name		Producer_Agency_Name_Keywd	string	char	**	**	1
		Producer_Agency_Name_Value	string	char	**	**	1
Producer_Institution_Name		Producer_Institution_Name_Keywd	string	char	**	**	1
		Producer_Institution_Name_Value	string	char	**	**	1
Source_Name		Source_Name_Keywd	string	char	**	**	1
		Source_Name_Value	string	char	**	**	1
Sensor_Name		Sensor_Name_Keywd	string	char	**	**	1
		Sensor_Name_Value	string	char	**	**	1
SIS_Id		SIS_Id_Keywd	string	char	**	**	1
		SIS_Id_Value	string	char	**	**	1
Product_Create_Start_Time		Product_Create_Start_Time_Keywd	string	char	**	**	1
		Product_Create_Start_Time_Value	time	time_asc	**	**	1
Product_Create_End_Time		Product_Create_End_Time_Keywd	string	char	**	**	1
		Product_Create_End_Time_Value	time	time_asc	**	**	1
Generating_Software_Name		Generating_Software_Name_Keywd	string	char	**	**	1
		Generating_Software_Name_Value	string	char	**	**	1
Build_Id		Build_Id_Keywd	string	char	**	**	1
		Build_Id_Value	string	char	**	**	1
Operator_Note		Operator_Note_Keywd	string	char	**	**	1
		Operator_Note_Value	string	char	**	**	1
Pass_File_Data_Type		Pass_File_Data_Type_Keywd	string	char	**	**	1
		Pass_File_Data_Type_Value	string	char	**	**	1

* All records are 80 characters in length. Records less than 80 characters are padded with blanks to 80 characters.

** 'Keyword=Value' element - see text for parsing information.

Table 4-2. Detailed Header file Structure (cont.)

Record Name	Element Group (optional)	Element Name	Type	Storage	Offset	Size	Occur
Start_Cycle_Number		Start_Cycle_Number_Keywd Start_Cycle_Number_Value	string integer	char char	** **	** **	
End_Cycle_Number		End_Cycle_Number_Keywd End_Cycle_Number_Value	string integer	char char	** **	** **	
Package_Data_Start_Time		Package_Data_Start_Time_Keywd Package_Data_Start_Time_Value	string utc	char time_asc	** **	** **	
Package_Data_End_Time		Package_Data_End_Time_Keywd Package_Data_End_Time_Value	string utc	char time_asc	** **	** **	
Start_Pass_Number		Start_Pass_Number_Keywd Start_Pass_Number_Value	string integer	char char	** **	** **	
End_Pass_Number		End_Pass_Number_Keywd End_Pass_Number_Value	string integer	char char	** **	** **	
Pass_Count		Pass_Count_Keywd Pass_Count_Value	string integer	char char	** **	** **	
SFDU_ClassR_Label*		SFDU_ClassR_Format_Id SFDU_ClassR_Length_Value	string integer	char char	0 12	12 8	
Pass_File_Protocol		Protocol_Keywd Protocol_Value	string string	char char	** **	** **	
Pass_File_Delimiter		Delimiter_Keywd Delimiter_Value	string string	char char	** **	** **	
Pass_File_Type		Type_Keywd Type_Value	string string	char char	** **	** **	
Pass_File_Reference		Reference_Keywd Reference_Value	string string	char char	** **	** **	254 254

* All records are 80 characters in length. Records less than 80 characters are padded with blanks to 80 characters.

** 'Keyword=Value' element - see text for parsing information.

4.4 Element Definitions

This section provides a definition for each data element.

4.4.1 Build_Id_Keywd

The Build_Id_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Build_Id_Value.

Element Type:	string
Storage Type:	character
Number of Bytes:	8
Units:	N/A
Minimum Val:	N/A
Nominal Val:	Build_Id
Maximum Val:	N/A

4.4.2 Build_Id_Value

The Build_Id element provides the identifier of the Release Description Document (RDD) that corresponds to the software build. It contains the SDS RDD document number and version date.

Element Type:	string
Storage Type:	character
Number of Bytes:	18
Units:	N/A
Minimum Val:	633-755/1990-01-01
Nominal Val:	633-755/yyyy-mm-dd
Maximum Val:	633-755/9999-12-31

4.4.3 Delimiter_Keywd

The Delimiter_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Delimiter_Value.

Element Type:	string
Storage Type:	character
Number of Bytes:	9
Units:	N/A
Minimum Val:	N/A
Nominal Val:	Delimiter
Maximum Val:	N/A

4.4.4 Delimiter_Value

The Delimiter_Value describes the method by which the pass files are delimited.

Element Type: string
Storage Type: character
Number of Bytes: 3
Units: N/A
Minimum Val: N/A
Nominal Val: EOF
Maximum Val: N/A

4.4.5 End_Cycle_Number_Keywd

The End_Cycle_Number_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object End_Cycle_Number_Value.

Element Type: string
Storage Type: character
Number of Bytes: 16
Units: N/A
Minimum Val: N/A
Nominal Val: End_Cycle_Number
Maximum Val: N/A

4.4.6 End_Cycle_Number_Value

The End_Cycle_Number_Value provides the cycle number assigned to the last period that a specified volume of data is collected.

Element Type: integer
Storage Type: character
Number of Bytes: 3
Units: counts
Minimum Val: 0
Nominal Val: N/A
Maximum Val: 999

4.4.7 End_Pass_Number_Keywd

The End_Pass_Number_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object End_Pass_Number_Value.

Element Type: string
Storage Type: character
Number of Bytes: 15
Units: N/A
Minimum Val: N/A
Nominal Val: End_Pass_Number
Maximum Val: N/A

4.4.8 End_Pass_Number_Value

The End_Pass_Number_Value specifies the number of the final pass in the package. A pass is a half satellite revolution from min/max to max/min latitude. 254 passes nominally occur within a 10 day cycle.

Element Type: integer
Storage Type: character
Number of Bytes: 3
Units: counts
Minimum Val: 1
Nominal Val: 254
Maximum Val: 254

4.4.9 Generating_Software_Name_Keywd

The Generating_Software_Name_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Generating_Software_Name_Value.

Element Type: string
Storage Type: character
Number of Bytes: 24
Units: N/A
Minimum Val: N/A
Nominal Val: Generating_Software_Name
Maximum Val: N/A

4.4.10 Generating_Software_Name_Value

The Generating_Software_Name_Value specifies the name of the program generating the data product. The format for this element is:

sss_xxxxxxxxxxxxxxxxxxxx.EXE

where sss = is a 3-character Id for the generating Program Set (SDM or SDP) and xxx...x = 3-20 character name of program.

Element Type: string
Storage Type: character
Number of Bytes: 28
Units: N/A
Minimum Val: N/A
Nominal Val: sss_xxx...x.EXE
Maximum Val: N/A

4.4.11 Operator_Note_Keywd

The Operator_Note_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Operator_Note_Value.

Element Type: string
Storage Type: character
Number of Bytes: 13
Units: N/A
Minimum Val: N/A
Nominal Val: Operator_Note
Maximum Val: N/A

4.4.12 Operator_Note_Value

The Operator_Note_Value is a text field which provides miscellaneous notes or comments provided by the Operations staff.

Element Type: string
Storage Type: character
Number of Bytes: 60
Units: N/A
Minimum Val: N/A
Nominal Val: N/A
Maximum Val: N/A

4.4.13 Package_Data_End_Time_Keywd

The Package_Data_End_Time_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Package_Data_End_Time_Value.

Element Type: string

Storage Type: character
Number of Bytes: 21
Units: N/A
Minimum Val: N/A
Nominal Val: Package_Data_End_Time
Maximum Val: N/A

4.4.14 Package_Data_End_Time_Value

The Package_Data_End_Time_Value provides the UTC time of the last data point (last record) in the last pass file in a package. The format for this element is CCSDS ASCII time format B.

Element Type: utc
Storage Type: time_ascii
Number of Bytes: 17
Units: seconds
Minimum Val: 1990-001T00:00:00
Nominal Val: N/A
Maximum Val: 9999-366T23:59:60

4.4.15 Package_Data_Start_Time_Keywd

The Package_Data_Start_Time_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Package_Data_Start_Time_Value.

Element Type: string
Storage Type: character
Number of Bytes: 23
Units: N/A
Minimum Val: N/A
Nominal Val: Package_Data_Start_Time
Maximum Val: N/A

4.4.16 Package_Data_Start_Time_Value

The Package_Data_Start_Time provides the UTC time of the first data point (first record) in the first pass file in a package. The format for this element is CCSDS ASCII time format B.

Element Type: utc
Storage Type: time_ascii
Number of Bytes: 17
Units: seconds

Minimum Val: 1990-001T00:00:00
Nominal Val: N/A
Maximum Val: 9999-366T23:59:60

4.4.17 Pass_Count_Keywd

The Pass_Count_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Pass_Count_Value.

Element Type: string
Storage Type: character
Number of Bytes: 10
Units: N/A
Minimum Val: N/A
Nominal Val: Pass_Count
Maximum Val: N/A

4.4.18 Pass_Count_Value

The Pass_Count_Value specifies the total number of pass files in a package product. This total is equal to the number of Reference_Value statements in the Class R SFDU.

Element Type: integer
Storage Type: character
Number of Bytes: 3
Units: counts
Minimum Val: 1
Nominal Val: 254
Maximum Val: 254

4.4.19 Pass_File_Data_Type_Keywd

The Pass_File_Data_Type_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Pass_File_Data_Type_Value.

Element Type: string
Storage Type: character
Number of Bytes: 19
Units: N/A
Minimum Val: N/A
Nominal Val: Pass_File_Data_Type
Maximum Val: N/A

4.4.20 Pass_File_Data_Type_Value

The Pass_File_Data_Type specifies the type of data that constitutes a particular package product. Valid types are GDR, IGDR, AltSDR, and TMRSDR.

Element Type:	string
Storage Type:	character
Number of Bytes:	6
Units:	N/A
Minimum Val:	AltSDR
Nominal Val:	<product dependent>
Maximum Val:	TMRSDR

4.4.21 Producer_Agency_Name_Keywd

The Producer_Agency_Name_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Producer_Agency_Name_Value.

Element Type:	string
Storage Type:	character
Number of Bytes:	20
Units:	N/A
Minimum Val:	N/A
Nominal Val:	Producer_Agency_Name
Maximum Val:	N/A

4.4.22 Producer_Agency_Name_Value

The Producer_Agency_Name_Value provides the name of the government agency producing the data product.

Element Type:	string
Storage Type:	character
Number of Bytes:	4
Units:	N/A
Minimum Val:	N/A
Nominal Val:	NASA
Maximum Val:	N/A

4.4.23 Producer_Institution_Name_Keywd

The Producer_Institution_Name_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Producer_Institution_Name_Value.

Element Type: string
Storage Type: character
Number of Bytes: 25
Units: N/A
Minimum Val: N/A
Nominal Val: Producer_Institution_Name
Maximum Val: N/A

4.4.24 Producer_Institution_Name_Value

The Producer_Institution_Name_Value identifies a university, research center, NASA center or other institution associated with the production of a data set.

Element Type: string
Storage Type: character
Number of Bytes: 3
Units: N/A
Minimum Val: N/A
Nominal Val: JPL
Maximum Val: N/A

4.4.25 Product_Create_End_Time_Keywd

The Product_Create_End_Time_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Product_Create_End_Time_Value.

Element Type: string
Storage Type: character
Number of Bytes: 23
Units: N/A
Minimum Val: N/A
Nominal Val: Product_Create_End_Time
Maximum Val: N/A

4.4.26 Product_Create_End_Time_Value

The Product_Create_End_Time specifies the local time of the end of the activity which generated the data product in CCSDS ASCII time format B.

Element Type:	time
Storage Type:	time_ascii
Number of Bytes:	17
Units:	seconds
Minimum Val:	1990-001T00:00:00
Nominal Val:	N/A
Maximum Val:	9999-366T23:59:59

4.4.27 Product_Create_Start_Time_Keywd

The Product_Create_Start_Time_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Product_Create_Start_Time_Value.

Element Type:	string
Storage Type:	character
Number of Bytes:	25
Units:	N/A
Minimum Val:	N/A
Nominal Val:	Product_Create_Start_Time
Maximum Val:	N/A

4.4.28 Product_Create_Start_Time_Value

The Product_Create_Start_Time_Value specifies the local time of the start of the activity which generated the data product in CCSDS ASCII time format B.

Element Type:	time
Storage Type:	time_ascii
Number of Bytes:	17
Units:	seconds
Minimum Val:	1990-001T00:00:00
Nominal Val:	N/A
Maximum Val:	9999-366T23:59:59

4.4.29 Protocol_Keywd

The Protocol_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Protocol_Value.

Element Type:	string
Storage Type:	character
Number of Bytes:	8
Units:	N/A
Minimum Val:	N/A
Nominal Val:	Protocol
Maximum Val:	N/A

4.4.30 Protocol_Value

The Protocol_Value specifies the format of the data object. The value NONE indicates a non-CCSDS protocol.

Element Type:	string
Storage Type:	character
Number of Bytes:	4
Units:	N/A
Minimum Val:	N/A
Nominal Val:	NONE
Maximum Val:	N/A

4.4.31 Reference_Keywd

The Reference_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Reference_Value.

Element Type:	string
Storage Type:	character
Number of Bytes:	9
Units:	N/A
Minimum Val:	N/A
Nominal Val:	Reference
Maximum Val:	N/A

4.4.32 Reference_Value

The Reference_Value provides the names of the pass files with ANSI file name specifications in accordance with VAX/VMS Magnetic

Tape User's Guide. The total number of "REFERENCE=" statements is equal to the Pass_Count_Value.

Element Type:	string
Storage Type:	character
Number of Bytes:	12
Units:	N/A
Minimum Val:	C000P001.DAT
Nominal Val:	CcccPppp.DAT
Maximum Val:	C999P254.DAT

4.4.33 SFDU_ClassK_Format_Id

The SFDU_ClassK_Format_Id is part of the fundamental structure used to build SFDUs, comprising a TYPE, a LENGTH, and a VALUE field, and referred to as a TYPE-LENGTH-VALUE-Object (TLVO). The TYPE and LENGTH field together make up a fixed-length "label" followed by a variable length VALUE field.

The TYPE field has four sub-fields:

The first sub-field (octets 0-3) identifies the agency with registration responsibility for the data description information contained in octets 8-11, in this instance NJPL.

The second sub-field (octet 4) contains the Version ID which identifies the structure and coding of the label. In this case, Version = 1, which indicates that the LENGTH field (SFDU_ClassK_Length_Value) is a decimal number 8 octets in length with leading zeros as necessary.

The third sub-field (octet 5) is used to classify the type of data contained within the VALUE field (SFDU_ClassK_Data_Description). CLASS K indicates that the kind of data contained within the VALUE field of the TLVO is of a specific type, e.g., supplementary data, metadata, or catalog data.

Octets 6-7 are spares.

The last sub-field of the TYPE field (octets 8-11) contains the Data Description Identifier (DDI). The DDI is a registration number assigned by the Control Authority (identified in Octets 0-3) that associates the K Class TLVO with a Software Interface Specification that specifies the definition of the format and parsing rules for the K Class object, as well as the semantic meaning of the value field. The DDI registration numbers and

their associated data products are as follows: T004 specifies the I/GDR SIS-2 (TOPEX PD 633-752-23-004), T005 specifies the TMR SDR SIS-2 (TOPEX PD 633-752-23-005), and T006 specifies the Alt SDR SIS-2 (TOPEX PD 633-752-23-021).

Element Type: string
Storage Type: character
Number of Bytes: 12
Units: N/A
Minimum Val: NJPL1K00T004
Nominal Val: N/A
Maximum Val: NJPL1K00T006

4.4.34 SFDU_ClassK_Length_Value

The SFDU_ClassK_Length_Value specifies the length of the SFDU_ClassK VALUE field: SFDU_ClassK_Data_Description.

Element Type: integer
Storage Type: character
Number of Bytes: 8
Units: octets
Minimum Val: N/A
Nominal Val: 00001480
Maximum Val: N/A

4.4.35 SFDU_ClassR_Format_Id

The SFDU_ClassR_Format_Id is the TYPE field of a Class R TLVO object. An R Class SFDU specifies the details of the aggregation of the pass files into a data product. Its format is like that described for SFDU_ClassK_Format_Id, with the following exceptions:

The Class ID (Octet 5) is R, which indicates that the value field (SFDU_ClassR_Data_Description) contains parameters to be used in aggregating the pass files into a data product.

The DDI (Octets 8-11) of "0003" specifies that the value field... "consists of one or more 'parameter=value' expressions, the left hand side being one of a list of CCSDS defined names. The right hand side is either one of a list of CCSDS defined reserved words or a string." [3, pp. 11-12]

Element Type: string

Storage Type: character
Number of Bytes: 12
Units: N/A
Minimum Val: N/A
Nominal Val: CCSD1R000003
Maximum Val: N/A

4.4.36 SFDU_ClassR_Length_Value

The SFDU_ClassR_Length_Value specifies the length of the SFDU ClassR VALUE field: SFDU_ClassR_Data_Description.

Element Type: integer
Storage Type: character
Number of Bytes: 8
Units: octets
Minimum Val: 00000380
Nominal Val: N/A
Maximum Val: 00020620

4.4.37 SFDU_ClassZ_Format_Id

The SFDU_ClassZ_Format_Id is part of the fundamental structure used to build SFDUs, comprising a TYPE, a LENGTH, and a VALUE field, and referred to as a TYPE-LENGTH-VALUE Object (TLVO). The TYPE and LENGTH field together make up a fixed-length "label" followed by a variable length VALUE field.

The TYPE field has four sub-fields:

The first subfield (octets 0-3) identifies the agency with registration responsibility for the data description information contained in octets 8-11, in this instance CCSDS.

The second subfield (octet 4) contains the Version ID which identifies the structure and coding of the label. In this case, Version=1, which indicates that the LENGTH field is a decimal number 8 octets in length with leading zeros as necessary.

The third subfield (octet 5) is used to classify the type of data contained within the VALUE field. Class=Z indicates the start of a data unit that comprises one or more TLVOs.

Octets 6-7 are spares.

The last subfield of the TYPE field (octets 8-11) contains the Data Description Identifier (DDI) which specifies the definition of the format and parsing rules, as well as the semantic meaning of the VALUE field. A DDI of "0001 indicates that the value field is composed of one or more TLVOs and the LENGTH is the sum of all the lengths of all the TLVOs included within its VALUE field."[3]

Element Type: string
Storage Type: character
Number of Bytes: 12
Units: N/A
Minimum Val: N/A
Nominal Val: CCSD1Z000001
Maximum Val: N/A

4.4.38 SFDU_ClassZ_Length_Value

The SFDU_ClassZ_Length_Value specifies the length of the SFDU Class Z VALUE field: SFDU_ClassZ_Data_Description.

Element Type: integer
Storage Type: character
Number of Bytes: 8
Units: octets
Minimum Val: 00005152
Nominal Val: N/A
Maximum Val: 05500000

4.4.39 SIS_Id_Keywd

The SIS_Id_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object SIS_Id_Value.

Element Type: string
Storage Type: character
Number of Bytes: 6
Units: N/A
Minimum Val: N/A
Nominal Val: SIS_Id
Maximum Val: N/A

4.4.40 SIS_Id_Value

The SIS_Id_Value provides the document and version number of the Software Interface Specification that describes this data product. The format for this element is:

xxx-xxx-xx-xxx/YYYY-MM-DD

where the value to the left of the slant is the project document number of the SIS describing the data product and the right value is the document date, e.g., 633-752-23-004/1990-10-01. Valid inputs for the data product value are as follows:

633-752-23-021 = Alt SDR SIS
633-751-23-001 = Alt SDR Data SIS
633-752-23-005 = TMR SDR SIS
633-751-23-005 = TMR SDR Data SIS
633-752-23-004 = I/GDR SIS
633-751-23-004 = I/GDR Data SIS
633-751-23-008 = Surface Met Data SIS

Element Type:	string
Storage Type:	character
Number of Bytes:	25
Units:	N/A
Minimum Val:	633-751-23-001/1990-10-01
Nominal Val:	633-75x-23-xxx/yyyy-mm-dd
Maximum Val:	633-752-23-021/9999-12-31

4.4.41 Sensor_Name_Keywd

The Sensor_Name_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Sensor_Name_Value.

Element Type:	string
Storage Type:	character
Number of Bytes:	11
Units:	N/A
Minimum Val:	N/A
Nominal Val:	Sensor_Name
Maximum Val:	N/A

4.4.42 Sensor_Name_Value

The Sensor_Name_Value provides the name of the instrument or hardware used to acquire the data. The portion preceding the ">" character is the short name; the portion following is the full name. Valid inputs are ALT>Altimeter or TMR>TOPEX Microwave Radiometer.

Element Type: string
Storage Type: character
Number of Bytes: 13
Units: N/A
Minimum Val: ALT>Altimeter
Nominal Val: <sensor dependent>
Maximum Val: TMR>TOPEX Microwave Radiometer

4.4.43 Source_Name_Keywd

The Source_Name_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Source_Name_Value.

Element Type: string
Storage Type: character
Number of Bytes: 11
Units: N/A
Minimum Val: N/A
Nominal Val: Source_Name
Maximum Val: N/A

4.4.44 Source_Name_Value

The Source_Name_Value refers to the spacecraft, instrument, etc. which contains the sensors.

Element Type: string
Storage Type: character
Number of Bytes: 14
Units: N/A
Minimum Val: N/A
Nominal Val: TOPEX/POSEIDON
Maximum Val: N/A

4.4.45 Start_Cycle_Number_Keywd

The Start_Cycle_Number_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Start_Cycle_Number_Value.

Element Type:	string
Storage Type:	character
Number of Bytes:	18
Units:	N/A
Minimum Val:	N/A
Nominal Val:	Start_Cycle_Number
Maximum Val:	N/A

4.4.46 Start_Cycle_Number_Value

The Start_Cycle_Number_Value provides the cycle number assigned to the first period that a specified volume of data is collected.

Element Type:	integer
Storage Type:	character
Number of Bytes:	3
Units:	counts
Minimum Val:	0
Nominal Val:	N/A
Maximum Val:	999

4.4.47 Start_Pass_Number_Keywd

The Start_Pass_Number_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Start_Pass_Number_Value.

Element Type:	string
Storage Type:	character
Number of Bytes:	17
Units:	N/A
Minimum Val:	N/A
Nominal Val:	Start_Pass_Number
Maximum Val:	N/A

4.4.48 Start_Pass_Number_Value

The Start_Pass_Number_Value specifies the number of the first pass (half-satellite revolutions from min/max to max/min) within a 10-day cycle.

Element Type: integer
Storage Type: character
Number of Bytes: 3
Units: N/A
Minimum Val: 1
Nominal Val: N/A
Maximum Val: 254

4.4.49 Type_Keywd

The Type_Keywd is the leftmost string in a "Keyword=Value" statement that describes the corresponding data object Type_Value.

Element Type: string
Storage Type: character
Number of Bytes: 4
Units: N/A
Minimum Val: N/A
Nominal Val: Type
Maximum Val: N/A

4.4.50 Type_Value

The Type_Value provides a standard CCSDS 12-byte TYPE field for SFDU processable objects. The first subfield (Octets 0-3) identifies JPL as the Control Authority. The Class ID of "I" indicates that the pass files will follow the SFDU_ClassR_Data_Description. The last sub-field (Octets 8-11) contains the Data Description Identifier (DDI) supplied by the JPL Control Authority. The DDI registration numbers and their associated data products are as follows: T001 specifies the I/GDR Data SIS-2 (TOPEX PD 633-751-23-004), T002 specifies the TMR SDR Data SIS-2 (TOPEX PD 633-751-23-005), and T003 specifies the ALT SDR Data SIS (TOPEX PD 633-751-23-021).

Element Type: string
Storage Type: character
Number of Bytes: 12
Units: N/A

Minimum Val: NJPL1I00T001
Nominal Val: <depends on data type>
Maximum Val: NJPL1I00T003

APPENDIX A - ACRONYMS

Alt	NASA Altimeter
Alt SDR	Altimeter Sensor Data Record
ANS	American National Standard
ANSI	American National Standards Institute
ASCII	American Standard Code for Information Interchange (restricted to International Use positions of ISO 646)
CCSDS	Consultative Committee on Space Data Systems
CNES	Centre National d' Etudes Spatiales
EOF	End of File
EOV	End of Volume
EU	Engineering Unit
FDD	Functional Design Document
FRD	Functional Requirements Document
GDR	Geophysical Data Record
ICD	Interface Control Document
IGDR	Interim Geophysical Data Record
ISO	International Organization for Standardization
JPL	Jet Propulsion Laboratory
MB	megabytes
MOS	Mission Operations System
N/A	Not applicable
NASA	National Aeronautics and Space Administration
NODS	NASA Ocean Data System
NSSDC	National Space Science Data Center
PD	Project Document
PDS	Planetary Data System
POD	Precision Orbit Determination
POE	Precision Orbit Ephemeris
RDD	Release Description Document
SDDS	Science Data Distribution Subsystem
SDMS	Science Data Management Subsystem
SDS	Science Data Subsystem
SDT	Science Data Team
SFDU	Standard Formatted Data Unit
SIS	Software Interface Specification
SRD	Software Requirements Document
TBD	To Be Determined
TBS	To Be Supplied
TGS	TOPEX Ground System
TLVO	Type-Length-Value Object (SFDU)
TMR SDR	TOPEX Microwave Radiometer Sensor Data Record
UTC	Coordinated Universal Time
VAX	trademark for DEC line of 32-bit computers
VMS	trademark for VAX Virtual Memory operating System
WFF	Wallops Flight Facility

APPENDIX B - PRODUCT EXAMPLE

```
I/GDR Header file
     CCSD1Z000001nnnnnnnnCCSD1K00T004mmmmmmmm;<CR><LF>
     Producer_Agency_Name       = NASA;<CR><LF>
     Producer_Institution_Name = JPL;<CR><LF>
     Source_Name = TOPEX/POSEIDON;<CR><LF>
     Sensor_Name = ALT>Altimeter;<CR><LF>
     SIS_Id    =    633-752-23-004/1991-02-10;<CR><LF>
     Product_Create_Start_Time = 1992-123T12:34:56;<CR><LF>
     Product_Create_End_Time    = 1992-123T13:54:32;<CR><LF>
     Generating_Software_Name    =  SDM_PACKSDSPRD.EXE;<CR><LF>
     Build_Id = 633-755/1993-01-15;<CR><LF>
     Operator_Note =                                        ;<CR><LF>
     Pass_File_Data_Type = GDR;<CR><LF>
     Start_Cycle_Number = 123;<CR><LF>
     End_Cycle_Number = 123;<CR><LF>
     Package_Data_Start_Time= 1992-012T01:23:45;<CR><LF>
     Package_Data_End_Time  = 1992-012T23:54:32;<CR><LF>
     Start_Pass_Number = 1;<CR><LF>
     End_Pass_Number    = 254;<CR><LF>
     Pass_Count         = 254;<CR><LF>
     CCSD1R000003pppppppp;<CR><LF>
     Protocol=NONE;<CR><LF>
     Delimiter=EOF;<CR><LF>
     Type=NJPL1I00T001;<CR><LF>
     Reference=C123P001.DAT;<CR><LF>
     Reference=C123P002.DAT;<CR><LF>
     Reference=C123P003.DAT;<CR><LF>
     Reference=C123P004.DAT;<CR><LF>
        ...
     Reference=C123P254.DAT;<CR><LF>
     <EOF>
I/GDR  Data files
```

Notes:

1) mmmmmmmm = the number of bytes following the mmmmmmmm to the end of the file
   nnnnnnnn = the number of bytes following the nnnnnnnn to the end of the file. nnnnnnnn = mmmmmmmm + 20
   pppppppp = the number of bytes following the pppppppp to the end of the file
   = (Pass_Count + 4) * 80 - 20

2) For a description of pass files included in this product, see [2].

3) All header file records less than 80 bytes are padded with blanks to complete the required record length of 80 bytes.

4) In this example, the position of "=" symbol is for ease in reading paired values. Any software designed to read header records should parse rather than assume fixed format.

APPENDIX C - SDS PRODUCT TAPE CONFIGURATION

Beginning of Tape Mark	
ANSI VOL1 Label ANSI HDR1 Label ANSI HDR2 Label Tape Mark (TM)	Logical file 1
Data File 1 Tape Mark (TM)	
ANSI EOF1 Label ANSI EOF2 Label Tape Mark (TM)	
ANSI HDR1 Label ANSI HDR2 Label Tape Mark (TM)	Logical file 2
Data File 2 Tape Mark (TM)	
ANSI EOF1 Label ANSI EOF2 Label Tape Mark (TM)	
...	
ANSI HDR1 Label ANSI HDR2 Label Tape Mark (TM)	Logical file n
Data File n Tape Mark (TM)	
ANSI EOF1 Label ANSI EOF2 Label Tape Mark (TM) Tape Mark (TM)	
End of Tape Mark	

Figure C-1. ANSI-labelled Magnetic Tape: Multi-file Single Volume Configuration

Figure C-1 shows the configuration of an ANSI-labeled magnetic for this data product. Each product is composed of multiple files contained on a single volume bracketed by VOL/EOV Labels. Each data file is bracketed by HDR1/HDR2 and EOF1 and EOF2 labels. Each logical file on the tape actually consists of three physical files:

1 an ANSI File Header Label set that delimits and describes the files its precedes (ANSI HDR1 Label/ANSI HDR2 Label);

2 a data file;

3 an ANSI Trailer Label set (ANSI EOF1 Label/ANSI EOF2 Label)

APPENDIX D - SFDU STRUCTURE

Figure D-1 depicts the SFDU structure for this data product. The basic SFDU element is called a TYPE-LENGTH-VALUE object (TLVO) and is composed of a 12-byte TYPE, an 8-byte LENGTH, and a variable length VALUE field.

The TYPE and LENGTH field together make up a fixed-length "label" which is followed by a variable length VALUE field containing various forms of data and information. Each SFDU label contains a Class ID which describes the kind of data contained in the VALUE field.

An SFDU with a Class Id = Z indicates that its VALUE field is made up of one or more TLVOs. As shown in Figure D-1, the package header file is composed of a K Class TLVO and an R Class TLVO object embedded within a Z Class TLVO.

An SFDU with a Class Id = K indicates that the VALUE field of this TLVO contains attribute information about the pass files in the package as shown in Figure D-1. The keyword=value format for the Class K values follows the Keyword/Value Conventions described in Section 1.6.3.3. The keywords used in the Class K SFDU are derived from one of the following sources listed in order of priority:

1)NSSDC Directory Interchange Format Manual [13]
2)PDS Data Dictionary Document [14],
3)PDS-derived, i.e. constructed using the PDS nomenclature standard [14].

An SFDU with a Class Id = R indicates that the pass files are aggregated into a single data product and to specify the details of the aggregation. The VALUE field contains keywords that are formatted similar to the K Class TLVO keywords. The keywords are SFDU-reserved words (DELIMITER, REFERENCE, TYPE, and PROTOCOL) that explain the details of the aggregation, in particular, the delimitation technique used for the data units. The DELIMITER keyword specifies the delimitation technique used for pass files following the first one. The REFERENCE keyword provides pointers to the pass file path names. Class R Object parameters are described in [4].

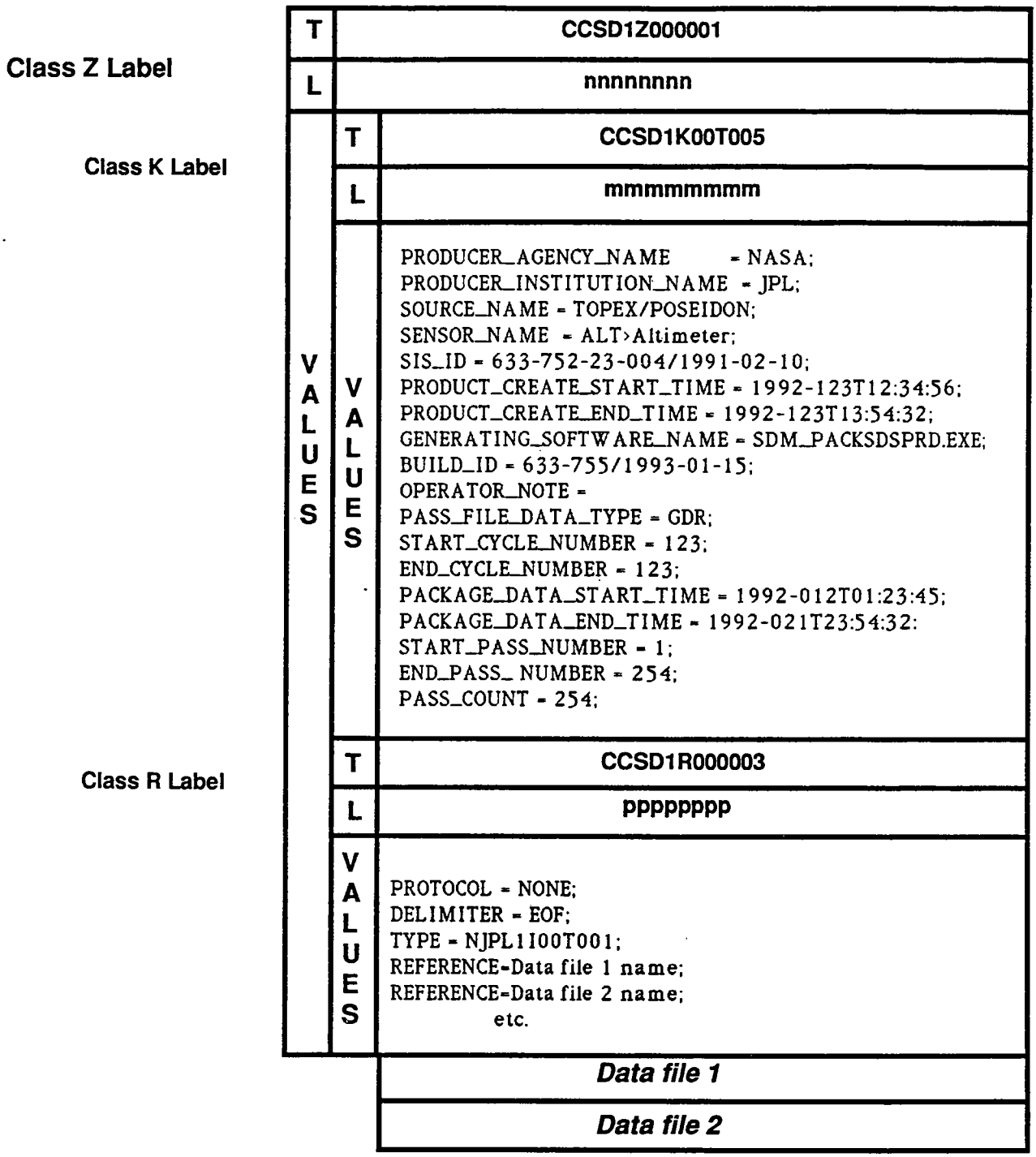

Figure D-1. SFDU Structure Example

APPENDIX C

GDR Data Items Listings

(1) By Group

(2) By GDR Data Record order

GDR DATA
SIS Cross Reference

Seq # in GDR Record	SIS Sec 4.4 Number	Element Name	Element Type	Units
**GROUP: Correction				
39	26	Atmos_Sigma0_Corr	integer	.01_dB
20	37	DR(SWH/Att)_C	integer	millimeters
19	38	DR(SWH/Att)_K	integer	millimeters
13	39	Dry_Tropo	integer	millimeters
18	40	EM_Bias_Corr_C	integer	millimeters
17	41	EM_Bias_Corr_K	integer	millimeters
16	58	Iono_Corr	integer	millimeters
28	62	Net_Instr_AGC_Corr_C	integer	.01_dB
27	63	Net_Instr_AGC_Corr_K	integer	.01_dB
22	64	Net_Instr_R_Corr_C	integer	millimeters
21	65	Net_Instr_R_Corr_K	integer	millimeters
48	66	Net_Instr_SWH_Corr_C	integer	0.1_meters
47	67	Net_Instr_SWH_Corr_K	integer	0.1_meters
14	143	Wet_Tropo_FMO	integer	millimeters
15	144	Wet_Tropo_Rad	integer	millimeters
**GROUP: Flag				
55	6	Alt_Bad1	bitfield	N/A
56	7	Alt_Bad2	bitfield	N/A
40	34	Current_Mode	bitfield	N/A
58	49	Gate_Index	bitfield	N/A
54	52	Geo_Bad	bitfield	N/A
53	56	Instr_State	bitfield	N/A
36	57	Iono_Bad	bitfield	N/A
57	75	PFLAG	integer	N/A
35	97	SSH_Bad	bitfield	N/A
**GROUP: Geophys Field				
29	33	Cross_Trk_Surf_Grad	integer	mm/km
8	53	Geoid	integer	millimeters
7	61	Mean_Sea_Surf	integer	millimeters
**GROUP: Geophys Tide				
30	69	Ocean_Tide	integer	millimeters
51	80	Pole_Tide	integer	millimeters
31	115	Solid_Earth_Tide	integer	millimeters
52	134	Tidal_Loading	integer	millimeters
**GROUP: Height				
11	98	SS_Hght_Hi_Rate	integer	millimeters
42	99	SS_Pts_Avg	integer	counts
12	100	SS_RMS	integer	millimeters
3	108	Sat_Alt	integer	millimeters
10	109	Sat_Alt_Hi_Rate	integer	millimeters
6	110	Sea_Surf_Hght	integer	millimeters

GDR DATA
SIS Cross Reference

Seq # in GDR Record	SIS Sec 4.4 Number	Element Name	Element Type	Units
**GROUP: Other Alt				
26	1	AGC_C	integer	.01_dB
25	2	AGC_K	integer	.01_dB
50	3	AGC_Pts_Avg	integer	counts
38	4	AGC_RMS_C	integer	.01_dB
37	5	AGC_RMS_K	integer	.01_dB
41	70	Off_Nadir_Angle	integer	centidegrees
44	103	SWH_C	integer	0.1_meters
43	104	SWH_K	integer	0.1_meters
49	105	SWH_Pts_Avg	integer	counts
46	106	SWH_RMS_C	integer	0.1_meters
45	107	SWH_RMS_K	integer	0.1_meters
24	113	Sigma0_C	integer	.01_dB
23	114	Sigma0_K	integer	.01_dB
59	118	Spare	integer	N/A
**GROUP: TMR				
32	131	Tb_18	integer	.01_Kelvins
33	132	Tb_21	integer	.01_Kelvins
34	133	Tb_37	integer	.01_Kelvins
**GROUP: Time & Locatn				
4	59	Latitude	integer	microdegrees
5	60	Longitude	integer	microdegrees
9	68	Net_Time_Tag_Corr	integer	microseconds
1	141	Time_Past_Epoch	utc	UTC
2	142	Time_Shift_Midframe	integer	microseconds

GDR DATA
SIS Cross Reference

Seq # in GDR Record	SIS Sec 4.4 Number	Element Name	"Group"	Units
1	141	Time_Past_Epoch	Time & Locatn	UTC
2	142	Time_Shift_Midframe	Time & Locatn	microseconds
3	108	Sat_Alt	Height	millimeters
4	59	Latitude	Time & Locatn	microdegrees
5	60	Longitude	Time & Locatn	microdegrees
6	110	Sea_Surf_Hght	Height	millimeters
7	61	Mean_Sea_Surf	Geophys Field	millimeters
8	53	Geoid	Geophys Field	millimeters
9	68	Net_Time_Tag_Corr	Time & Locatn	microseconds
10	109	Sat_Alt_Hi_Rate	Height	millimeters
11	98	SS_Hght_Hi_Rate	Height	millimeters
12	100	SS_RMS	Height	millimeters
13	39	Dry_Tropo	Correction	millimeters
14	143	Wet_Tropo_FMO	Correction	millimeters
15	144	Wet_Tropo_Rad	Correction	millimeters
16	58	Iono_Corr	Correction	millimeters
17	41	EM_Bias_Corr_K	Correction	millimeters
18	40	EM_Bias_Corr_C	Correction	millimeters
19	38	DR(SWH/Att)_K	Correction	millimeters
20	37	DR(SWH/Att)_C	Correction	millimeters
21	65	Net_Instr_R_Corr_K	Correction	millimeters
22	64	Net_Instr_R_Corr_C	Correction	millimeters
23	114	Sigma0_K	Other Alt	.01_dB
24	113	Sigma0_C	Other Alt	.01_dB
25	2	AGC_K	Other Alt	.01_dB
26	1	AGC_C	Other Alt	.01_dB
27	63	Net_Instr_AGC_Corr_K	Correction	.01_dB
28	62	Net_Instr_AGC_Corr_C	Correction	.01_dB
29	33	Cross_Trk_Surf_Grad	Geophys Field	mm/km
30	69	Ocean_Tide	Geophys Tide	millimeters
31	115	Solid_Earth_Tide	Geophys Tide	millimeters
32	131	Tb_18	TMR	.01_Kelvins
33	132	Tb_21	TMR	.01_Kelvins
34	133	Tb_37	TMR	.01_Kelvins
35	97	SSH_Bad	Flag	N/A
36	57	Iono_Bad	Flag	N/A
37	5	AGC_RMS_K	Other Alt	.01_dB
38	4	AGC_RMS_C	Other Alt	.01_dB
39	26	Atmos_Sigma0_Corr	Correction	.01_dB
40	34	Current_Mode	Flag	N/A
41	70	Off_Nadir_Angle	Other Alt	centidegrees
42	99	SS_Pts_Avg	Height	counts
43	104	SWH_K	Other Alt	0.1_meters
44	103	SWH_C	Other Alt	0.1_meters
45	107	SWH_RMS_K	Other Alt	0.1_meters
46	106	SWH_RMS_C	Other Alt	0.1_meters
47	67	Net_Instr_SWH_Corr_K	Correction	0.1_meters
48	66	Net_Instr_SWH_Corr_C	Correction	0.1_meters
49	105	SWH_Pts_Avg	Other Alt	counts

GDR DATA
SIS Cross Reference

Seq # in GDR Record	SIS Sec 4.4 Number	Element Name	"Group"	Units
50	3	AGC_Pts_Avg	Other Alt	counts
51	80	Pole_Tide	Geophys Tide	millimeters
52	134	Tidal_Loading	Geophys Tide	millimeters
53	56	Instr_State	Flag	N/A
54	52	Geo_Bad	Flag	N/A
55	6	Alt_Bad1	Flag	N/A
56	7	Alt_Bad2	Flag	N/A
57	75	PFLAG	Flag	N/A
58	49	Gate_Index	Flag	N/A
59	118	Spare	Other Alt	N/A