AFGWC Defense Meteorological Satellite Program (DMSP) Simple Format Users' Guide

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1. Scope

This document details the DMSP "Simple" data format (as implemented in Oct 96) used to transfer DMSP data from AFGWC to Fleet Numerical Meteorology and Oceanography Center (FNMOC), the National Geophysical Data Center (NGDC), and the Defense Meteorological Satellite Program (DMSP) System Program Office (SPO).

2. Data File Formats

Three possible DMSP data types exist for transmission from AFGWC to the external users identified in Section 1. These include Stored Data Smooth (SDS), Stored Data Fine (SDF), and the Special Sensor Package (SSP). At the end user's option, all files begin with a 256-byte Distributed Processing System (DPS) Long ASCII Header (DLAH) followed by a 512-byte Simple header defining the subsequent data in the file. Following the transmission header is a sequence of documentation and satellite data blocks for each line of received data. The SDS format contains visible and IR imagery from the DMSP Operational Line Scan (OLS) sensor at 1.5 nm resolution. The SDF format contains either visible, IR, or both at 0.3 nm resolution. The SSP format contains data from the DMSP mission sensors (e.g., SSM/I, SSM/T, SSM/T-2, etc. as available on each satellite). Table 2-1 provides data element definitions of these formats. For details on the original formats as played back from the spacecraft, refer to IS-YD-821C, DMSP Data Specifications, 28 Apr 93.

Table 2-1: DMSP Data Element Definitions

Identifier	Units	Line Length (bytes)	Accuracy	Values	Resolution	Description
DMSP SDS:						SDS Imagery
Light	Pixels	1465	1.5 nm	00-3F Hex	6 Bit	Light (VIS)
Thermal	Pixels	1465	1.5 nm	00-FF Hex	8 Bit	Thermal (IR)
Doc Data DMSP	Bytes	512	N/A	Table 2-5	N/A	Documentation Data
SDF:						SDF Imagery
Light	Pixels	7324	0.3 nm	00-3F Hex	6 Bit	Light (VIS)
Thermal	Pixels	7324	0.3 nm	00-3F Hex	6 Bit	Thermal (IR)
Doc Data DMSP	Bytes	512	N/A	Table 2-9	N/A	Documentation Data
SSP:						Special Sensor Data
Light	Bytes	3102	N/A	Table 2-7	N/A	Light CH (VIS)
Thermal	Bytes	3102	N/A	Table 2-8	N/A	Thermal CH (IR)
Doc Data	Bytes	512	N/A	Table 2-6	N/A	Documentation Data

2.1. DPS Long ASCII Header (DLAH) Format

For users of the Navy's DPS software, the DLAH is attached to the beginning of the Simple file as received from AFGWC's Satellite Data Handling System (SDHS) Ingest Subsystem (IS). It is generated external from the IS as a requirement for the DPS

system. It is 256 bytes long and contains ASCII fields identifying the file contents and information needed for routing to external customers.

The format for the DLAH is shown in Table 2-2. Each line ends with a carriage return and a line feed. Additionally, spaces are added between line 18 and 19 to pad the DLAH to 256 bytes.

NGDC is currently the only user not receiving the DLAH.

Table 2-2. DLAH Format

Line	Description	Contents (ASCII)	Remarks
1	Start of Header	"BEGIN"	
2	Message Originator	"KGWC"	
3	Filename as Received from SDHS	f##_dddhhmm_tt.dat (e.g. "f12_3101300_DS.dat") f##=satellite ID ddd=Julian data data received by SDHS hh=hour (UTC) recieved mm=minute received tt= data type	Possible data types: MS=Mission Sensor Data DS=Smooth OLS Data TF=Thermal Fine OLS LF=Light Fine OLS IF=Interleaved Fine OLS (Note: Reships to SDHS will have "dat" replaced with "RS#", where # is the number of the reship
4	ICAO	"FSAT" for FNMOC "DMSP" for Aerospace	DLAH header not added to NGDC files.
5	Precedence	"P"	
6	Classification	"U"	
7	Product Category	"00"	Not Used
8	Product Subcategory	"000"	Not Used
9	User Defined	"0000"	Not Used
10	Time DLAH Created	YYYYMMDDHHMMSS (e.g., "19961105130501") YYYY=Year MM=Month DD=Day HH=Hour (UTC) MM=Minutes SS=Seconds	This is a time stamp inserted by the NAVAF server when it is creating the DLAH for transmission. It is slightly after the time the file was received by the server from SDHS but slightly before it is transmitted externally.
11	CLAS Modifier	"NONE"	Required Line
12	Satellite ID	"SATID f##" f## same as in line 3	
13	Data Type	"Data_type ols" for OLS "Data_type ssp" for SSP	
14	Beginning Orbit Rev Number	"Start_orbit 12345"	Currently Not Used
15	Ending Orbit Rev Number	"End_orbit 12345"	Currently Not Used
16	Data Start Time	"Data_start jjjhhmmss"	Currently Not Used
17	Data Stop Time	"Data_stop jjjhhmmss"	Currently Not Used
18	Ship Time	"Ship_time jjjhhmmss"	Currently Not Used
19	End of Header	"END"	

2.2. Simple Header Format

The Simple header consists of the first 512 bytes of the file received from the SDHS IS and immediately follows the DLAH (if present). Most of this information is only for internal use by SDHS and other AFGWC systems. Table 2-3 shows the format of this header. Only those items of interest to external users are explicitly shown.

Table 2-3. DMSP Simple Header Format

Byte	Contents	Data Type	Units/Range	Accuracy	Precision	Description
1-148	Internal Use Only	N/A	N/A	N/A	N/A	N/A
149-308	Ephemeris Record	See Table 2-3	See Table 2-4	See Table 2-3	See Table 2-3	See Table 2-4
309-399	Internal Use Only	N/A	N/A	N/A	N/A	N/A
400-403	Start Fiducial	I*4	Seconds, 0 to 86400	1 sec	.5 sec	Elapsed time in seconds from 00 Zulu. (Since stored data is played back in reverse, this time is actually later than the stop fiducial time.) This field is extracted directly from the satellite schedule.
404-407	Stop Fiducial	I*4	Seconds, 0 to 86400	1 sec	.5 sec	Elapsed time in seconds from 00 Zulu. (Since stored data is played back in reverse, this time is actually earlier than the start fiducial time.) This field is extracted directly from the satellite schedule.
408-424	Scheduled Time	C*17	ASCII, Time (e.g., DDMMMYYYYHH:MM:SS DD = 1...31 MMM = JAN, FEB, ... , DEC YYYY = 0000 ... 9999 HH = 00 ... 23 MM, SS = 00 ... 59)	+/- 1 sec	1 sec	17-character date and time representing scheduled time of readout.
425-430	Satellite ID	C*6	ASCII, WXnnnn (Where "nnnn" indicates specific satellite, e.g., 1544=F10, 2546=F11, 3545=F12, 4547=F13)	N/A	N/A	6-character satellite identification
431-432	Rec Day	C*2	ASCII, Day (e.g., 01 to 31)	+/- 0	1	Day of month received by SDHS IS.
433-434	Rec Month	C*2	ASCII, Month (e.g., 01 to 12)	+/- 0	1	Month received by SDHS IS.
435-438	Rec Year	C*4	ASCII, Year (e.g., 0000 to 9999)	+/- 0	1	4-character year received by SDHS IS.
440-512	Spare	N/A	N/A	N/A	N/A	N/A

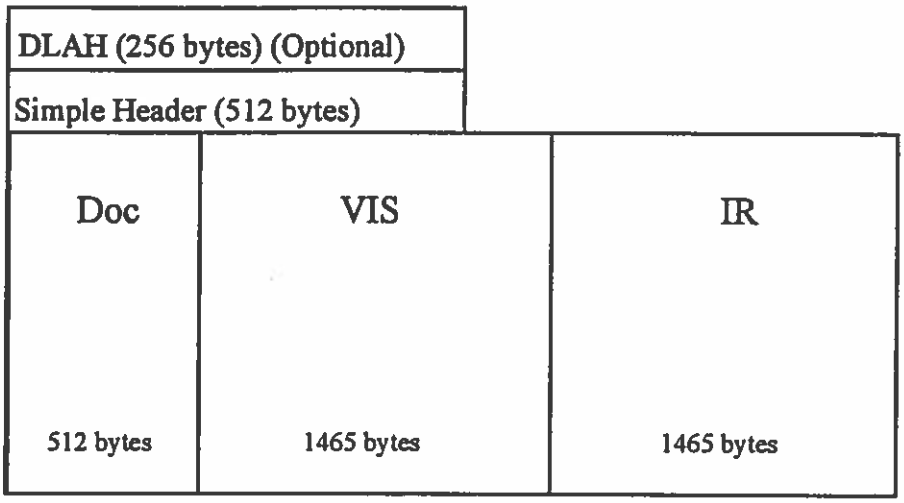
Table 2-4. Polar Ephemeris Data Set (Source: USSPACECOM 2-line Element Set)

Field	Field Description	Data Type	Limit / Range of Values
1-6	Polar Satellite ID	C*6	ASCII, WXnnnn (Where "nnnn" indicates specific satellite, e.g., 1544=F10, 2546=F11, 3545=F12, 4547=F13)
7-8	Polar Satellite Year	I*2	00 to 99
9-16	Julian Day	R*8	1.0 to 366.0
17-24	Mean Motion (Revs / day)	R*8	14.013 to 14.5
25-32	Mean Motion Radians (radians/min)	R*8	0.06114300 to .06326818
33-40	Anomalistic Mean Motion	R*8	0.0 to 6.283183
41-48	First Derivative of Mean Motion	R*8	0.0 to 0.02345200
49-56	First Derivative of Mean Motion Radians	R*8	0.0 to 0.00000007106
57-64	Inclination Angle	R*8	1.719847 to 1.733111
65-72	Right Ascension of Ascending Node	R*8	0.0 to 6.283183
73-80	First Derivative of Right Ascension of Ascending Node	R*8	0.0000113 to 0.0000338
81-88	Argument of Perigee	R*8	0.0 to 6.283183
89-96	Mean Anomaly	R*8	0.0 to 6.283183
97-104	First Derivative of Mean Anomaly	R*8	-0.00003400 to 0.00003599
105-112	Eccentricity	R*8	0.0 to 0.01
113-120	Mean Longitude	R*8	0.0 to 18.849550
121-128	A_0 is the mean semi-major axis of orbit at epoch	R*8	1.11399 to 1.13965
129-136	$P0=A0 (1 - E0^2)$ where E0 is the eccentricity of orbit at epoch	R*8	1.11388 to 1.13965
137-144	Q0=A0 (1 - E0) where E0 is the eccentricity of orbit at epoch	R*8	1.10285 to 1.13965
145-148	Epoch Revolution	I*4	0 to 99999
149-152	Start Revolution	I*4	0 to 99999
153-160	R8 Filler	R*8	N/A

2.3. DMSP SDS Data Formats

DMSP SDS data are received by SDHSU IS in scanline format. Each scan consists of the documentation data, one line of VIS imagery, one line of IR imagery, and DMSP Mission Sensor data. VIS imagery consists of 1465 6-bit pixels and stored in an 8-bit byte and left justified. IR imagery consists of 1465 8-bit pixels stored as 8-bit bytes. No geometric or radiometric calibrations are performed on the data. The imagery, with its associated documentation data, shall be transmitted as shown in Figure 2-1. The format of the DMSP SDS documentation data is shown in Table 2-5.

Figure 2-1. DMSP SDS Transfer Format



Total bytes per record = 3442 bytes
Doc - Simple DMSP SDS OLS Documentation Data
VIS - Visual data, 8 bits per sample (6-bit data stored in most significant bits)
IR- Infrared data, 8 bits per sample

Table 2-5. DMSP SDS Documentation Data Format

Byte	Source/Frame	Contents	Units Stored
1-4	Decom Output	Data type	ASCII "DMSI"
5-6	Subsync Frame	Satellite ID	Hexadecimal Value*
7-8	Decom Output	Data Valid Flag	1 = Valid, -1=Fill
9-10	Decom Output	Calibration Flag	0 = N/A, 1 = Valid, -1 = Invalid
11-12	Decom Output	ECC Flag	0 = N/A, 1 = Valid, -1 = Invalid
13-16	Decom Output	Line Counter	Hexadecimal Value
17-38	N/A	Spares	N/A
39-40	Decom Output	Timecode Type	ASCII TT**
41-44	Subsync Frame	ETC Timecode	Hexadecimal Value*
45-46	Decom Output (ZBits)	Satellite Altitude	Nautical Miles (hex)
47-48	Decom Output (ZBits)	Latitude	Radians*8192 (hex)
49-50	Decom Output (ZBits)	Longitude	Radians*8192 (hex)
51-52	Decom Output (ZBits)	Crossing Angle	Radians*8192 (hex)
53-56	Subsync Frame	Ephemeris Timecode	Hexadecimal Value*
57-68	N/A	Spares	N/A
69-70	Decom Output	Pixels/Line, VIS	Hexadecimal Value
71-72	Decom Output	Pixels/Line, IR	Hexadecimal Value
73-98	N/A	Spares	N/A
99-100	Decom Output	Bits/Pixel, VIS	Hexadecimal Value

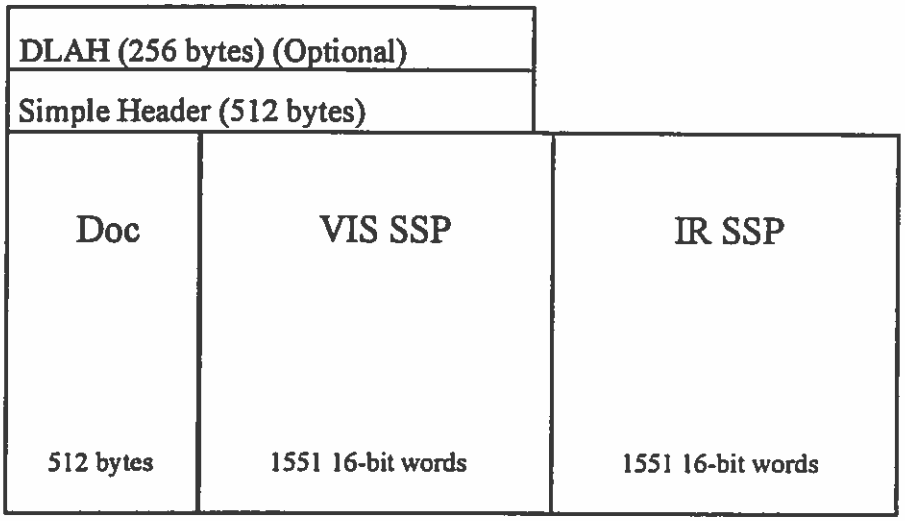
101-102	Decom Output	Bits/Pixel, IR	Hexadecimal Value
103-256	N/A	Spares	N/A
257-258	VIS Linesync Fr	Q1-Q5; 5 Bits	Hexadecimal Value*
259-260	VIS Subsync Fr	Q1-Q6; 6 Bits	Hexadecimal Value*
261-262	N/A	Reserved	N/A
263-266	VIS Subsync Fr	E1-E27; 27 Bits	Hexadecimal Value*
267-268	VIS Subsync Fr	G1-G9; 9 Bits	Hexadecimal Value*
269-270	VIS Subsync Fr	M1-M4; 4 Bits	Hexadecimal Value*
271-272	VIS Subsync Fr	P1-P8; 8 Bits	Hexadecimal Value*
273-274	VIS Subsync Fr	I1-I4; 4 Bits	Hexadecimal Value*
275-276	VIS Subsync Fr	H0-H8; 9 Bits	Hexadecimal Value*
277-278	VIS Subsync Fr	Y1-Y4; 4 Bits	Hexadecimal Value*
279-280	VIS Subsync Fr	C0-C8; 9 Bits	Hexadecimal Value*
281-284	VIS Subsync Fr	Z1-Z32; 32 Bits	Hexadecimal Value*
285-286	N/A	Spares	N/A
287-288	IR Linesync Fr	Q1-Q5; 5 Bits	Hexadecimal Value*
289-290	IR Subsync Fr	Q1-Q6; 6 Bits	Hexadecimal Value*
291-292	N/A	Reserved	N/A
293-296	IR Subsync Fr	E1-E27; 27 Bits	Hexadecimal Value*
297-298	IR Subsync Fr	G1-G9; 9 Bits	Hexadecimal Value*
299-300	IR Subsync Fr	M1-M4; 4 Bits	Hexadecimal Value*
301-302	IR Subsync Fr	P1-P8; 8 Bits	Hexadecimal Value*
303-304	IR Subsync Fr	I1-I4; 4 Bits	Hexadecimal Value*
305-306	IR Subsync Fr	H0-H8; 9 Bits	Hexadecimal Value*
307-308	IR Subsync Fr	Y1-Y4; 4 Bits	Hexadecimal Value*
309-310	IR Subsync Fr	C0-C8; 9 Bits	Hexadecimal Value*
311-314	IR Subsync Fr	Z1-Z32; 32 Bits	Hexadecimal Value*
315-512	N/A	Spares	N/A

*See IS-YD-821C.
**TT = Ten twenty-fourths (1/1024th of a second)

2.4. DMSP SSP Data Format

The DMSP special sensor package is comprised of a subset of the DMSP documentation data and a raw, packed set of SSP data-bits. SSP data are received in both the light and thermal data streams as 12-bit words packed into a 16-bit word, right justified. A single light scanline contains a maximum of 16,092 bits. A single thermal scanline contains a maximum of 18,684 bits. The first 288 bits of both the thermal and light SSP message are 16-bit words, the remaining SSP data are 12-bit words. SDHS IS packages both the 16 and 12-bit values into 16-bit, right-justified words resulting in 1335 words of SSP data in the light scan and 1551 words into the thermal scan. For flexibility purposes, the light and thermal SSP scanline lengths are set to the thermal maximum length of 1551 words, or 3102 bytes each. No further manipulation is performed on the SSP data package. The SSP data package and its associated DMSP documentation data shall be transmitted as shown in Figure 2-2. The format of the subset of DMSP documentation data is shown in Table 2-6. The formats of the light and thermal SSP data are given in Table 2-7 and Table 2-8, respectively.

Figure 2-2. DMSP Mission Sensor Transfer Format



Total bytes per record = 6716 bytes
Doc - Simple DMSP SDS Mission Sensor (SSP) Documentation Data
VIS SSP- Mission Sensor Data from Visual data stream (3102 bytes)
IR SSP- Mission Sensor Data from Infrared data stream (3102 bytes)

Table 2-6. DMSP Mission Sensor Documentation Data Format

Byte	Source/Frame	Contents	Units Stored
1-4	Decom Output	Data type	ASCII "DMMS"
5-6	Subsync Frame	Satellite ID	Hexadecimal Value*
7-8	Decom Output	Data Valid Flag	1 = Valid, -1 = Fill
9-10	Decom Output	Calibration Flag	0 = N/A, 1 = Valid, -1 = Invalid
11-12	Decom Output	ECC Flag	0 = N/A, 1 = Valid, -1 = Invalid
13-16	Decom Output	Line Counter	Hexadecimal Value
17-38	N/A	Spares	N/A
39-40	Decom Output	Timecode Type	ASCII TT**
41-44	Subsync Frame	ETC Timecode	Hexadecimal Value*
45-46	Decom Output (ZBits)	Satellite Altitude	Nautical Miles (hex)
47-48	Decom Output (ZBits)	Latitude	Radians*8192 (hex)
49-50	Decom Output (ZBits)	Longitude	Radians*8192 (hex)
51-52	Decom Output (ZBits)	Crossing Angle	Radians*8192 (hex)
53-56	Subsync Frame	Ephemeris Timecode	Hexadecimal Value*
57-68	N/A	Spares	N/A
69-70	Decom Output	Max word count, VIS	Hexadecimal Value***
71-72	Decom Output	Max word count, IR	Hexadecimal Value***
73-256	N/A	Spares	N/A
257-260	Visual Subsync	Visual ZBits word 1	Hexadecimal Value*
261-264	Visual Subsync	Visual ZBits word 2	Hexadecimal Value*
265-268	Visual Subsync	Visual ZBits word 3	Hexadecimal Value*
269-272	Visual Subsync	Visual ZBits word 4	Hexadecimal Value*
273-276	Visual Subsync	Visual ZBits word 5	Hexadecimal Value*
277-280	Infrared Subsync	Infrared ZBits word 1	Hexadecimal Value*
281-284	Infrared Subsync	Infrared ZBits word 2	Hexadecimal Value*

285-288	Infrared Subsync	Infrared ZBits word 3	Hexadecimal Value*
289-292	Infrared Subsync	Infrared ZBits word 4	Hexadecimal Value*
293-296	Infrared Subsync	Infrared ZBits word 5	Hexadecimal Value*
297-306	N/A	Spares	N/A
307-308	Decom Output	Visual word count	Actual (hex)***
309-310	Decom Output	Infrared word count	Actual (hex)***
311-512	N/A	Spare	N/A

*See IS-YD-821C.
**TT = Ten twenty-fourths (1/1024th of a second)
***Word count values represent the number of 36-bit SSP data words for a channel. Multiply this value by three to obtain the number of 12-bit words within the SSP data storage area.

Table 2-7. Light (Visual) SSP Data Format

Byte	Contents	Units Stored
1-8	VIS SSP Sync	Hexadecimal Value *
9-12	VIS SSP Timecode	Hexadecimal Value*
13-36	VIS SSP Format Words	Hexadecimal Value*
37-3102	VIS SSP Data	Hexadecimal Value*

Note: Special Sensor Data package (SSP) data are stored as 12-bit values within a 16-bit word. Three 12-bit values are required to reconstruct a 36-bit Mission Sensor Word.
*See IS-YD-821C.

Table 2-8. Thermal (Infrared) SSP Data Format

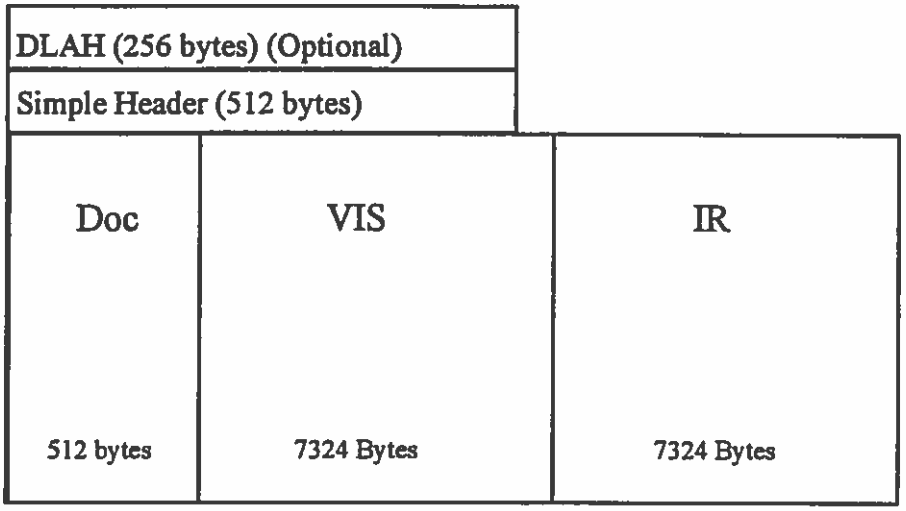
Byte	Contents	Units Stored
1-8	IR SSP Sync	Hexadecimal Value*
9-12	IR SSP Timecode	Hexadecimal Value*
13-36	IR SSP Format Words	Hexadecimal Value*
37-3102	IR SSP Data	Hexadecimal Value*

Note: Special Sensor Data package (SSP) data are stored as 12-bit values within a 16-bit word. Three 12-bit values are required to reconstruct a 36-bit Mission Sensor Word.
*See IS-YD-821C.

2.5. DMSP SDF Data Format

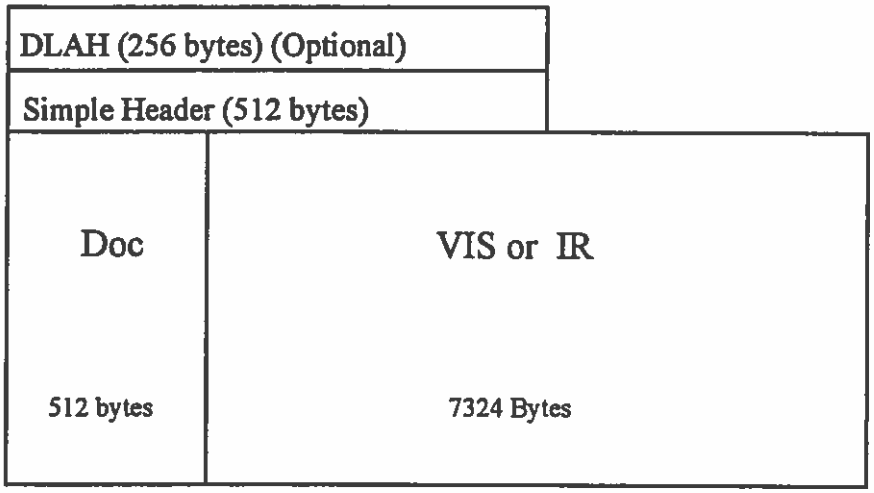
DMSP SDF data are received in scanline format. The imagery is received in either interleaved or non-interleaved mode. In SDF interleaved mode, each scan consists of documentation data, one line of VIS imagery, and one line of IR imagery. In SDF non-interleaved mode, a scan consists of documentation data, and a single line of imagery, either VIS or IR. Both imagery line lengths vary from 7322 to 7324 6-bit pixels, left justified. SDHS shall transmit a fixed line length of 7324 pixels for SDF imagery. No geometric or radiometric calibrations are performed on the data. SDF data shall be transmitted in either interleaved or non-interleaved format. An example of an SDF interleaved transmission is shown in Figure 2-3. An example of an SDF non-interleaved transmission is shown in Figure 2-4. The format of the DMSP SDF documentation data is shown in Table 2-9.

Figure 2-3. DMSP SDF Interleaved Transfer Format



Total bytes per record = 15160 bytes
Doc - Simple DMSP SDF Interleaved Fine Documentation Data
VIS - Visual Data, 8 bits per sample (6-bit data in most significant bits)
IR - Infrared Data, 8 bits per sample (6-bit data in most significant bits)

Figure 2-4. DMSP SDF Non-Interleaved Transfer Format



Total bytes per record = 7836 bytes
Doc - Simple DMSP SDF Non-interleaved Fine Documentation Data
VIS - Visual Data, 8 bits per sample (6-bit data in most significant bits)
IR - Infrared Data, 8 bits per sample (6-bit data in most significant bits)

Table 2-9. DMSP SDF Documentation Data Format

Byte	Source/Frame	Contents	Units Stored
1-4	Decom Output	Data type	ASCII "DMFI", "DMFV", or "DMFT" (Interleaved, Visual, or Thermal)
5-6	Subsync Frame	Satellite ID	Hexadecimal Value*
7-8	Decom Output	Data Valid Flag	1 = Valid, -1 = Fill
9-10	Decom Output	Calibration Flag	0 = N/A, 1 = Valid, -1 = Invalid
11-12	Decom Output	ECC Flag	0 = N/A, 1 = Valid, -1 = Invalid
13-16	Decom Output	Line Counter	Hexadecimal Value
17-38	N/A	Spares	N/A
39-40	Decom Output	Timecode Type	ASCII TT**
41-44	Subsync Frame	ETC Timecode	Hexadecimal Value*
45-46	Decom Output (ZBits)	Satellite Altitude	Nautical Miles (hex)
47-48	Decom Output (ZBits)	Latitude	Radians*8192 (hex)
49-50	Decom Output (ZBits)	Longitude	Radians*8192 (hex)
51-52	Decom Output (ZBits)	Crossing Angle	Radians*8192 (hex)
53-56	Subsync Frame	Ephemeris Timecode	Hexadecimal Value*
57-68	N/A	Spares	N/A
69-70	Decom Output	Pixels/Line, VIS	Hexadecimal Value
1-72	Decom Output	Pixels/Line, IR	Hexadecimal Value
73-98	N/A	Spares	N/A
99-100	Decom Output	Bits/Pixel, VIS	Hexadecimal Value
101-102	Decom Output	Bits/Pixel, IR	Hexadecimal Value
103-256	N/A	Spares	N/A
257-258	VIS Linesync Fr	Q1-Q4; 4 Bits	Hexadecimal Value*
259-260	VIS Subsync Fr	Q1-Q6; 6 Bits	Hexadecimal Value*
261-262	VIS Ln/Subsync Fr	RR/RR/U; 5 Bits	Hexadecimal Value*
263-266	VIS Subsync Fr	E1-E27; 27 Bits	Hexadecimal Value*
267-268	VIS Subsync Fr	G1-G9; 9 Bits	Hexadecimal Value*
269-270	VIS Subsync Fr	M1-M4; 4 Bits	Hexadecimal Value*
271-272	VIS Subsync Fr	P1-P8; 8 Bits	Hexadecimal Value*
273-274	VIS Subsync Fr	I1-I4; 4 Bits	Hexadecimal Value*
275-276	VIS Subsync Fr	H0-H8; 9 Bits	Hexadecimal Value*
277-278	VIS Subsync Fr	Y1-Y4; 4 Bits	Hexadecimal Value*
279-280	VIS Subsync Fr	C0-C8; 9 Bits	Hexadecimal Value*
281-284	VIS Subsync Fr	Z1-Z32; 32 Bits	Hexadecimal Value*
285-286	N/A	Spares	N/A
287-288	IR Linesync Fr	Q1-Q4; 4 Bits	Hexadecimal Value*
289-290	IR Subsync Fr	Q1-Q6; 6 Bits	Hexadecimal Value*
291-292	IR Ln/Subsync Fr	RR/RR/U; 5 Bits	Hexadecimal Value*
293-296	IR Subsync Fr	E1-E27; 27 Bits	Hexadecimal Value*
297-298	IR Subsync Fr	G1-G9; 9 Bits	Hexadecimal Value*
299-300	IR Subsync Fr	M1-M4; 4 Bits	Hexadecimal Value*
301-302	IR Subsync Fr	P1-P8; 8 Bits	Hexadecimal Value*
303-304	IR Subsync Fr	I1-I4; 4 Bits	Hexadecimal Value*
305-306	IR Subsync Fr	H0-H8; 9 Bits	Hexadecimal Value*
307-308	IR Subsync Fr	Y1-Y4; 4 Bits	Hexadecimal Value*

309-310	IR Subsync Fr	C0-C8; 9 Bits	Hexadecimal Value*
311-314	IR Subsync Fr	Z1-Z32; 32 Bits	Hexadecimal Value*
315-512	N/A	Spares	N/A

*See IS-YD-821C.

**TT = Ten twenty-fourths (1/1024th of a second)