DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE GLOBAL WEATHER CENTRAL (AWS)
OFFUTT AIR FORCE BASE, NEBRASKA

20 Nov 1995

MEMORANDUM FOR Commanding Officer
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Fleet Numerical Meteorology and Oceanography Center
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FROM: HQ AFGWC/DOX
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SUBJECT: Specification for DMSP SIMPLE Data Format for NAVAF METSAT Phase I

1. The data format specification for the DMSP SIMPLE format is attached. This information has been extracted from the Interface Requirements Specification for the Satellite Data Handling System (SDHS) Ingest Subsystem (IS) Data Format Interface to the Cloud Depiction and Forecast System II (CDFS), 5 Jul 1994. Although this is the interface between SDHS and CDFS II, the data format is the same that will be transmitted to FNMOC and NGDC, excluding any additional header information which may be appended for external transmission. The additional header format will be determined by the Interface Control Working Group (ICWG) as the NAVAF IFS is updated.

2. Based on the current SDHSU schedule, the earliest time we can begin continuous operational transmission of DMSP data will be early May 96. However, the SDHS IS will undergo Final Qualification Testing as early as late Jan 96. This may be a possible opportunity to transmit test shipments of DMSP data, since the ATM connection should be in place.

3. If you have any questions, contact Capt Shaw at DSN 271-5984, commercial (402) 294-5984.

Donald L Wilson

DONALD L. WILSON, Major, USAF
Chief, Plans Branch

Attachment:
SDHS Ingest Subsystem (IS) to CDFS II Data Formats

cc:
HQ AWS/XOO (LCDR Vann)
SMC/CIE (Lt Jeter)
NGDC (Dr. Kroehl, Capt Davis)

10.0 SDHS INGEST SUBSYSTEM (IS) TO CDFS II DATA FORMATS

10.1 Scope

This appendix details the formats of data transferred between the SDHS IS and the CDFS II.

10.2 Data File Transfer Formats

The data file transfer format for the interface between the SDHS IS and the CDFS II is shown in Figure 10.2-1. A file transfer shall begin with a 512-byte transmission header defining the subsequent data transfer, followed by a sequence of blocks that contain individual data types for each line of received data. Refer to Figure 10.2-2 for the format of the transmission header. Note that bytes 257-416 of the transmission header shall contain the polar ephemeris data set as shown in Figure 10.2-3. These 160 bytes contain data necessary to perform earth curvature corrections on polar orbiting satellite data.

Data blocks may contain imagery data, documentation data, SSP data, Orbit and Attitude (O&A) data, grid, or the MANAM data. Imagery data shall be stored in either 8-bit bytes or 16-bit words (2 bytes). If the data type contains 8-bits or less per pixel, it shall be stored in an 8-bit byte and left justified defined as the most significant bits of the 8-bit byte. If the data type contains more than 8-bits per pixel, a single pixel value shall be stored in 16 bits (2 bytes) and right justified defined as the least significant bits of the 16-bit word.

The first block of each line shall contain 512 bytes of documentation data. The first 256 bytes of the documentation data are generic and shall be filled in for all data types for all satellites, as long as they are applicable to the satellite type. Refer to Figure 10.2-4 for the generic documentation data format. The remaining 256 bytes shall be satellite/data type specific.

Individual data type formats are defined in subsequent paragraphs.

Transmission Header			
Line 1, Block 1 Doc Data	Block 2	Block 3	Block *n* (Max = 16)
Line 2, Block 1 Doc Data	Block 2	Block 3	Block *n*
Line *n*, Block 1 Doc Data	Block 2	Block 3	Block *n*

Figure 10.2-1 SDHS IS/CDFS II Data File Transfer Format

BYTE	VALUE	UNITS STORED	CONTENTS	DEFINITION
1-4	Data Type Identifier	ASCII	DMSI	DMSP Smooth - DOC/IR/VIS Interleaved
			DMMS	DMSP Mission Sensor Data (with subset of OLS DOC)
			DMFI	DMSP Fine - DOC/IR/VIS Interleaved
			DMFV	DMSP Fine - DOC/VIS Non-Interleaved
			DMFT	DMSP Fine - DOC/IR Non-Interleaved
			GMSO	GMS DOC/VIS/IR Data
			GMOA	GMS O&A Data
			GMMN	GMS MANAM Data
			GOES	GOES-NEXT - GVAR DOC/VIS/IR Data
			GOOA	GOES-NEXT O&A Data
			METO	Meteosat DOC/VIS/IR Data
			MEID	Meteosat Interpretation Data
			MEGD	Meteosat Gridpoint Data
			TIGC	TIROS GAC DOC/VIS/IR Data
			TILC	TIROS LAC DOC/VIS/IR Data
			TITP	TIROS TIP Data
5-6	SAT ID	HEX	0-F	SAT ID from data stream if applicable
7-169	Spare	N/A	N/A	N/A
170-171	# Lines	HEX	0-FFFF	Number of data lines in transfer
172-173	# Blocks	HEX	0-FFFF	Number of data blocks/line (Max=16)
174-175	# Bytes	HEX	0200	Block 1 Size (512 Bytes-Doc Data)
176-177	# Bytes	HEX	0-FFFF	Block 2 Size (Bytes)
178-179	# Bytes	HEX	0-FFFF	Block 3 Size (Bytes)
180-181	# Bytes	HEX	0-FFFF	Block 4 Size (Bytes)
182-183	# Bytes	HEX	0-FFFF	Block 5 Size (Bytes)
184-185	# Bytes	HEX	0-FFFF	Block 6 Size (Bytes)
186-187	# Bytes	HEX	0-FFFF	Block 7 Size (Bytes)
188-189	# Bytes	HEX	0-FFFF	Block 8 Size (Bytes)
190-191	# Bytes	HEX	0-FFFF	Block 9 Size (Bytes)
192-193	# Bytes	HEX	0-FFFF	Block 10 Size (Bytes)
194-195	# Bytes	HEX	0-FFFF	Block 11 Size (Bytes)
196-197	# Bytes	HEX	0-FFFF	Block 12 Size (Bytes)
198-199	# Bytes	HEX	0-FFFF	Block 13 Size (Bytes)
200-201	# Bytes	HEX	0-FFFF	Block 14 Size (Bytes)
202-203	# Bytes	HEX	0-FFFF	Block 15 Size (Bytes)
204-205	# Bytes	HEX	0-FFFF	Block 16 Size (Bytes)
206-256	Spare			
257-416	*Ephemeris	ASCII	Variable	160-byte polar ephemeris data set (See figure 10.2-3)
417-500	Spare	N/A	N/A	N/A
501-512	Reserved	TBD	TBD	Reserved for file parsing information

* Applies to polar satellites only. This field will be undefined for non-polar satellites.

Figure 10.2-2 SDHS IS/CDFS II Transmission Header Format

FIELD	FIELD DESCRIPTION
1-6	Polar Satellite ID
7-8	Polar Satellite Year
9-16	Julian Day
17-24	Mean Motion
25-32	Mean Motion Radians
33-40	Anomalistic Mean Motion
41-48	First Derivative of Mean Motion
49-56	First Derivative of Mean Motion Radians
57-64	Inclination Angle
65-72	Right Ascension of Ascending Node
73-80	First Derivative of Right Ascension of Ascending Node
81-88	Argument of Perigee
89-96	Mean Anomaly
97-104	First Derivative of Mean Anomaly
105-112	Eccentricity
113-120	Mean Longitude
121-128	A_0 is the mean semi-major axis of orbit at epoch
129-136	$P_0=A_0\ (1 - E_0^2)$ where E_0 is the eccentricity of orbit at epoch
137-144	$Q_0=A_0\ (1 - E_0)$ where E_0 is the eccentricity of orbit at epoch
145-148	Epoch Revolution
149-152	Start Revolution
153-160	R8 Filler

Figure 10.2-3 Polar Ephemeris Data Set

Byte	Contents	Units Stored
1-4	Data type	ASCII (Same as Header)
5-6	Satellite ID	Hexadecimal Value
7-8	Data Valid Flag	1=Valid, -1=Fill
9-10	Calibration Flag	0=N/A, 1=Valid, -1=Invalid
11-12	ECC Flag	0=N/A, 1=Valid, -1=Invalid
13-16	Line Counter	Hexadecimal Value
17-38	Spare	N/A
39-40	Timecode Type	ASCII MM or TT; M=Millisecs, T=1/1024th sec
41-44	ETC Timecode	Hexadecimal Value
45-46	Satellite Altitude	Nautical Miles (hex)
47-48	Latitude	Radians * 8192 (hex)
49-50	Longitude	Radians * 8192 (hex)
51-52	Crossing Angle	Radians * 8192 (hex)
53-54	EPH TIMECODE (from Z bits)	Hexadecimal Value
55-68	Spare	N/A
69-70	Valid Pixels/Block 2	Hexadecimal Value
71-72	Valid Pixels/Block 3	Hexadecimal Value
73-74	Valid Pixels/Block 4	Hexadecimal Value
75-76	Valid Pixels/Block 5	Hexadecimal Value
77-78	Valid Pixels/Block 6	Hexadecimal Value
79-80	Valid Pixels/Block 7	Hexadecimal Value
81-82	Valid Pixels/Block 8	Hexadecimal Value
83-84	Valid Pixels/Block 9	Hexadecimal Value
85-86	Valid Pixels/Block 10	Hexadecimal Value
87-88	Valid Pixels/Block 11	Hexadecimal Value
89-90	Valid Pixels/Block 12	Hexadecimal Value
91-92	Valid Pixels/Block 13	Hexadecimal Value
93-94	Valid Pixels/Block 14	Hexadecimal Value
95-96	Valid Pixels/Block 15	Hexadecimal Value
97-98	Valid Pixels/Block 16	Hexadecimal Value
99-100	Bits/Pixel Block 2	Hexadecimal Value
101-102	Bits/Pixel Block 3	Hexadecimal Value
103-104	Bits/Pixel Block 4	Hexadecimal Value
105-106	Bits/Pixel Block 5	Hexadecimal Value
107-108	Bits/Pixel Block 6	Hexadecimal Value
109-110	Bits/Pixel Block 7	Hexadecimal Value
111-112	Bits/Pixel Block 8	Hexadecimal Value
113-114	Bits/Pixel Block 9	Hexadecimal Value
115-116	Bits/Pixel Block 10	Hexadecimal Value
117-118	Bits/Pixel Block 11	Hexadecimal Value
119-120	Bits/Pixel Block 12	Hexadecimal Value
121-122	Bits/Pixel Block 13	Hexadecimal Value
123-124	Bits/Pixel Block 14	Hexadecimal Value
125-126	Bits/Pixel Block 15	Hexadecimal Value
127-128	Bits/Pixel Block 16	Hexadecimal Value
129-256	Spare	N/A
257-512	Reserved for Satellite Specific Doc Data	Variable

Figure 10.2-4 SDHS IS/CDFS II Generic Documentation Data Format

10.2.1 DMSP SDS Data Formats

DMSP Stored Data Smooth (SDS) data are received in scanline format. Each scan consists of the documentation data, one channel of VIS imagery, one channel of IR imagery, and DMSP Mission Sensor data.

VIS imagery consists of 1465 6-bit pixels, left justified, and IR imagery consists of 1465 8-bit pixels. No geometric or radiometric calibrations are performed on the data. The imagery, with its associated documentation data, shall be transmitted to CDFS II as shown in Figure 10.2.1-1. The format of the DMSP SDS documentation data is shown in Figure 10.2.1-2.

The DMSP Mission Sensor data 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 VIS and IR data streams as 12-bit words packed into a 16-bit word, right justified. A single VIS scanline contains a maximum of 16,092 bits. A single IR scanline contains a maximum of 18,684 bits. The first 288 bits of both the IR and VIS SSP message are 16-bit words, the remaining SSP data are 12-bit words. SDHS IS shall pack both the 16 and 12-bit values into 16-bit words resulting in 1335 words of SSP data in the VIS scan and 1551 words into the IR scan. For flexibility purposes, the VIS and IR SSP scanline lengths are set to the IR maximum length of 1551 words, or 3102 bytes. No further manipulation is performed on the Mission Sensor data package. The Mission Sensor data package and its associated DMSP documentation data shall be transmitted to the CDFS II as shown in Figure 10.2.1-3. The format of the subset of DMSP documentation data is shown in Figure 10.2.1-4.

10.2.2 DMSP SDF Data Formats

DMSP Stored Data Fine (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 channel of VIS imagery, and one channel of IR imagery. In SDF non-interleaved mode, a scan consists of documentation data, and a single channel 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 from SDHS IS to the CDFS II in either interleaved or non-interleaved format. An example of an SDF interleaved transmission to CDFS II is shown in Figure 10.2.2-1. An example of an SDF non-interleaved transmission to CDFS II is shown in Figure 10.2.2-2. The format of the DMSP SDF documentation data is shown in Figure 10.2.2-3.

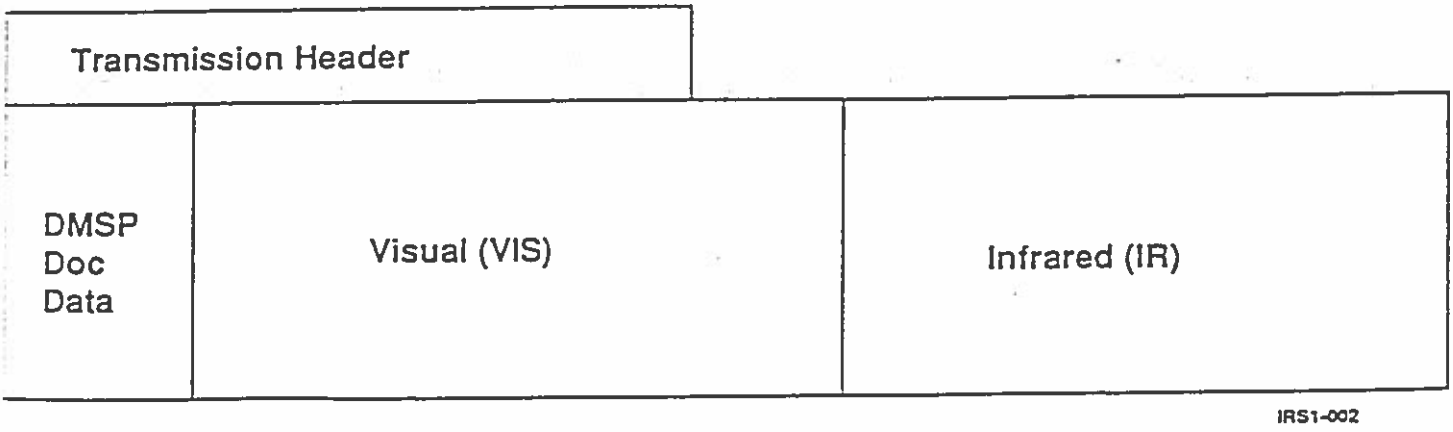

Figure 10.2.1-1 DMSP OLS Smooth Transfer Format

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	Subsync Frame	Satellite Altitude	Nautical Miles (hex)
47-48	Subsync Frame	Latitude	Radians*8192 (hex)
49-50	Subsync Frame	Longitude	Radians*8192 (hex)
51-52	Subsync Frame	Crossing Angle	Radians*8192 (hex)
53-54	Subsync Frame	Ephemeris Timecode	Hexadecimal Value
55-68	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

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

Figure 10.2.1-2 DMSP SDS Documentation Data Format

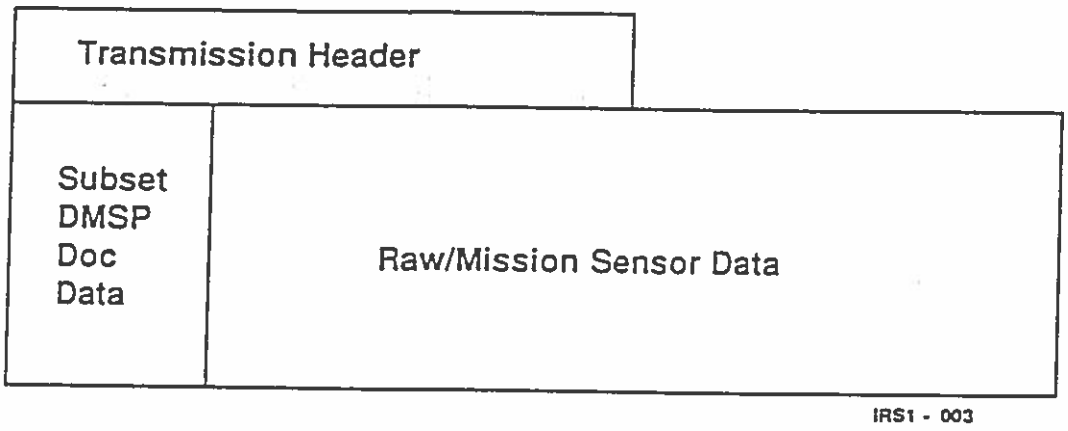

Figure 10.2.1-3 DMSP Mission Sensor Transfer Format

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	Subsync Frame	Satellite Altitude	Nautical Miles (hex)
47-48	Subsync Frame	Latitude	Radians*8192 (hex)
49-50	Subsync Frame	Longitude	Radians*8192 (hex)
51-52	Subsync Frame	Crossing Angle	Radians*8192 (hex)
53-54	Subsync Frame	Ephemeris Timecode	Hexadecimal Value
55-68	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	See IS-YD-821
261-264	Visual Subsync	Visual Zbits word 2	See IS-YD-821
265-268	Visual Subsync	Visual Zbits word 3	See IS-YD-821
269-272	Visual Subsync	Visual Zbits word 4	See IS-YD-821
273-276	Visual Subsync	Visual Zbits word 5	See IS-YD-821
277-280	Infrared Subsync	Infrared Zbits word 1	See IS-YD-821
281-284	Infrared Subsync	Infrared Zbits word 2	See IS-YD-821
285-288	Infrared Subsync	Infrared Zbits word 3	See IS-YD-821
289-292	Infrared Subsync	Infrared Zbits word 4	See IS-YD-821
293-296	Infrared Subsync	Infrared Zbits word 5	See IS-YD-821
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

**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.

Figure 10.2.1-4 DMSP Mission Sensor Documentation Data Format

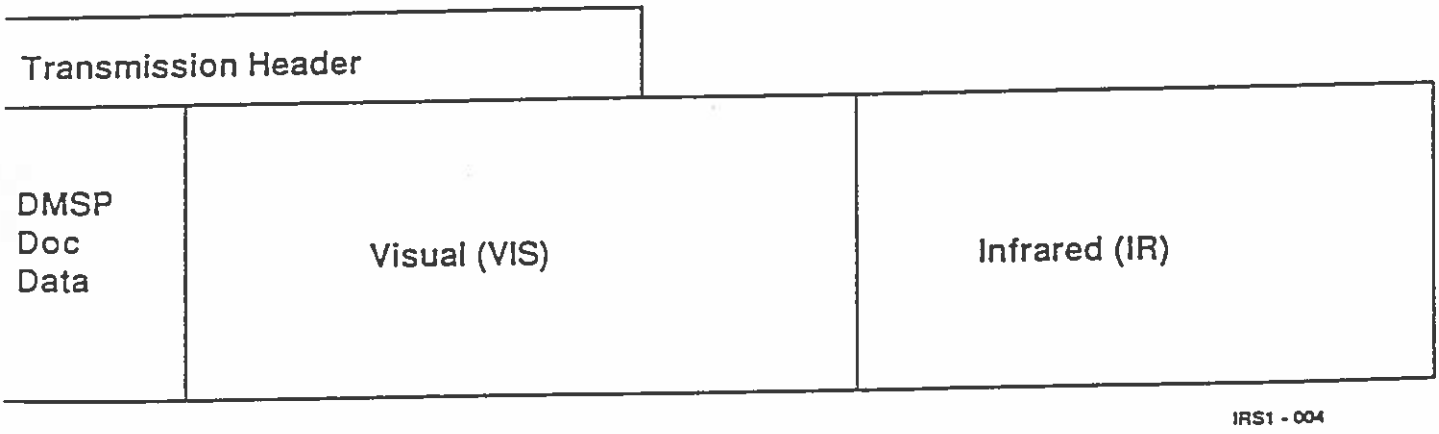

Figure 10.2.2-1 DMSP SDF Interleaved Transfer Format

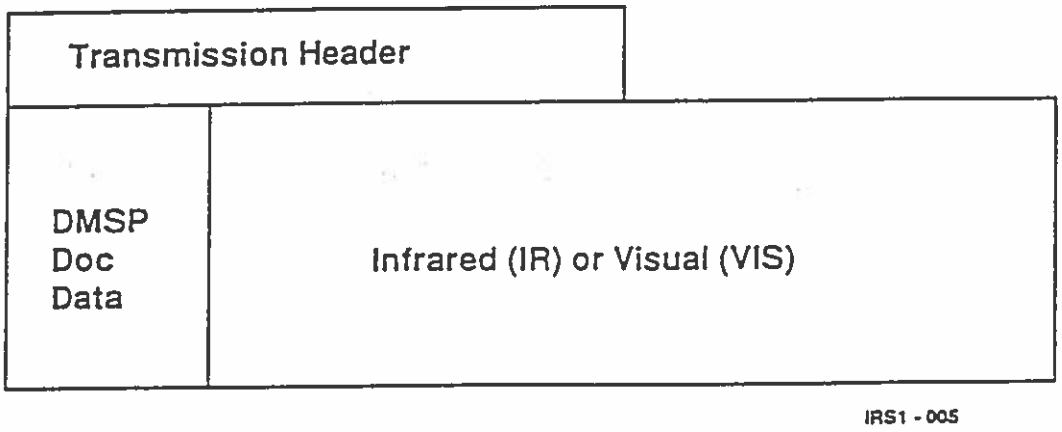

Figure 10.2.2-2 DMSP SDF Non-Interleaved Transfer Format

Byte	Source/Frame	Contents	Units Stored
1-4	Decom Output	Data type	ASCII DMFI
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	Subsync Frame	Satellite Altitude	Nautical Miles (hex)
47-48	Subsync Frame	Latitude	Radians*8192 (hex)
49-50	Subsync Frame	Longitude	Radians*8192 (hex)
51-52	Subsync Frame	Crossing Angle	Radians*8192 (hex)
53-54	Subsync Frame	Ephemeris Timecode	Hexadecimal Value
55-68	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-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

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

Figure 10.2.2-3 DMSP SDF Documentation Data Format