Transcription Requirements for the TIMS and NS–001 Historical Archive

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Approvals:

Ames Research Center: _____

Aircraft Data Facility Manager

EOSDIS Data Systems Project Office: _____

Version 0 Aircraft Data Sets Project Manager

Jet Propulsion Laboratory: _____

TIMS Science Manager

Land Processes Distributed Active Archive Center: _____

Land Processes DAAC Scientist

1.0 Introduction

1.1 Purpose

This document describes and defines the requirements for transcription of the historical TIMS and NS–001 archive.

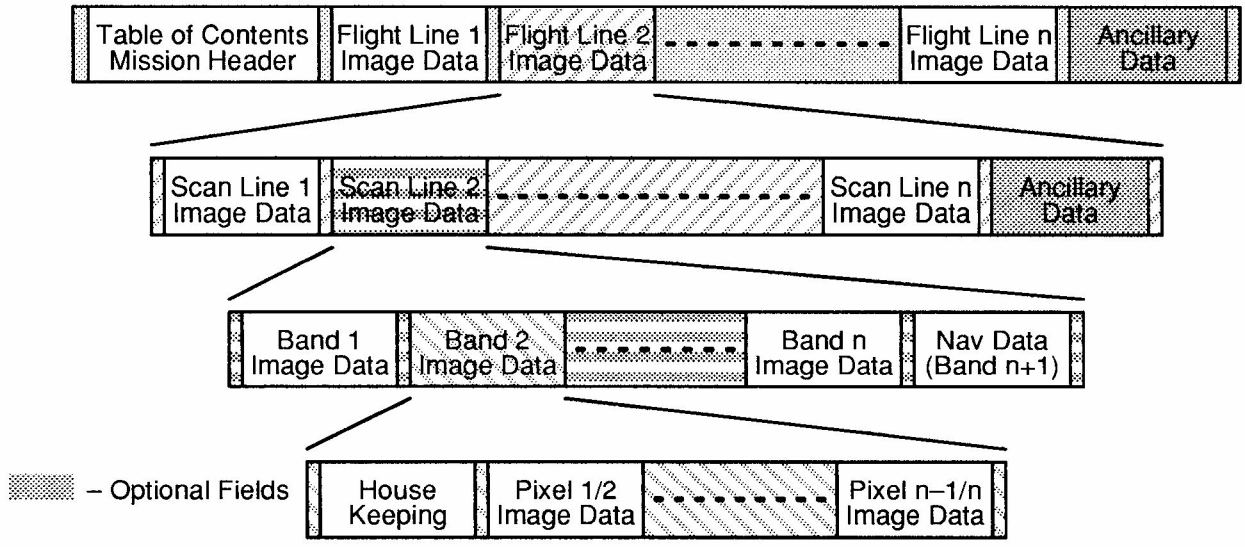
1.2 Overview of Transcription Process

The transcription process will consist of transferring existing data on 6250 BPI 9 track computers tapes onto 3480 cartridge tape, merging image and navigation data in the process. Descriptive metadata and browse images will generated at the same time as the transcription.

2.0 Archive Data Formats

2.1 Overview

The data from a single flight (mission) will be transferred from multiple 6250 tapes onto a single 3480 tape. A Table–of–Contents/Mission Header will be placed at the beginning of each tape, and will describe the image data that follows. A diagram of the format is shown below:



2.2 Media

The image and navigation data shall be archived on IBM–compatible double length (.5 mil thickness, 1100 feet long) 3480 cartridge tapes using IDRC data compression.

2.3 ANSI Standard Tape Labels

The tapes shall use ANSI Standard labeling for volume and file identification. The ANSI label implementation is as follows:

Volume Header Label (VOL1)

BP	Field Name	Length	Description/Usage
1–3	Label Identifier	3	"VOL"
4	Label Number	1	"1"
5–10	Volume Identifier	6	user/operator supplied
11	Volume Accessibility	1	blank
12–37	Reserved	13	blank
*38–51	Owner Identifier	14	user name (usercode running program)
52–79	Reserved	28	blank
*80	Label Standard Version	1	version of standard (EDC ANSI routines use 3)

First File Header Label (HDR1)

BP	Field Name	Length	Description/Usage
1–3	Label Identifier	3	"HDR"
4	Label Number	1	"1"
5–21	File Identifier	17	filename
22–27	File Set Identifier	6	volume ID
28–31	File Section Number	4	always 1 for unspanned files
32–35	File Sequence Number	4	sequence number within file set
36–39	Generation Number	4	unused ("0")
40–41	Generation Version	2	unused ("0")
42–47	Creation Date	6	date of tape write
48–53	Expiration Date	6	unused ("0")
54	File Accessibility	1	blank
55–60	Block Count	6	"000000"
61–73	System Code	13	hostname
74–80	Reserved	7	blank

Second File Header Label (HDR2)

BP	Field Name	Length	Description/Usage
1–3	Label Identifier	3	"HDR"
4	Label Number	1	"2"
5	Record Format	1	"F" for fixed, "D" for variable
6–10	Block Length	5	maximum number of characters per block
11–15	Record Length	5	record length (fixed) or maximum record length (variable)
16–50	Reserved	35	blank
51–52	Offset Length	2	"00"
53–80	Reserved	28	blank

First End of File Label (EOF1)

BP	Field Name	Length	Description/Usage
1–3	Label Identifier	3	"EOF"
4	Label Number	1	"1"
5–21	File Identifier	17	filename
22–27	File Set Identifier	6	volume ID
28–31	File Section Number	4	always 1 for unspanned files
32–35	File Sequence Number	4	sequence number within file set
36–39	Generation Number	4	unused ("0")
40–41	Generation Version	2	unused ("0")
42–47	Creation Date	6	date of tape write
48–53	Expiration Date	6	unused ("0")
54	File Accessibility	1	blank
55–60	Block Count	6	number of data blocks in file section
61–73	System Code	13	hostname
74–80	Reserved	7	blank

Second End of File Label (EOF2)

BP	Field Name	Length	Description/Usage
1–3	Label Identifier	3	"EOF"
4	Label Number	1	"1"
5	Record Format	1	"F" for fixed, "D" for variable
6–10	Block Length	5	maximum number of characters per block
11–15	Record Length	5	record length (fixed) or maximum record length (variable)
16–50	Reserved	35	blank
51–52	Offset Length	2	"00"
53–80	Reserved	28	blank

First End of Volume Label (EOV1)

BP	Field Name	Length	Description/Usage
1–3	Label Identifier	3	"EOV"
4	Label Number	1	"1"
5–21	File Identifier	17	filename
22–27	File Set Identifier	6	volume ID
28–31	File Section Number	4	always 1 for unspanned files
32–35	File Sequence Number	4	sequence number within file set
36–39	Generation Number	4	unused ("0")
40–41	Generation Version	2	unused ("0")
42–47	Creation Date	6	date of tape write
48–53	Expiration Date	6	unused ("0")
54	File Accessibility	1	blank
55–60	Block Count	6	number of data blocks in file section
61–73	System Code	13	hostname
74–80	Reserved	7	blank

Second End of Volume Label (EOV2)

BP	Field Name	Length	Description/Usage
1–3	Label Identifier	3	"EOV"
4	Label Number	1	"2"
5	Record Format	1	"F" for fixed, "D" for variable
6–10	Block Length	5	maximum number of characters per block
11–15	Record Length	5	record length (fixed) or maximum record length (variable)
16–50	Reserved	35	blank
51–52	Offset Length	2	"00"
53–80	Reserved	28	blank

2.4 Table of Contents/Mission Header

Each tape shall have an ASCII Table–of–Contents/Mission Header describing the data contained on the tape. The format and definition is as follows:

BP	Field Name	Length	Description/Usage
1–10	Flight ID	10	i.e. – 92–123 (ER–2), 92–001–02 (C–130B), ?? (SSC Learjet)
11–19	Date	9	date of flight in DD–MMM–YY format
20	spacer	1	blank
21–23	Tail Number	3	aircraft tail number (706, 707, 708, etc.)
24	spacer	1	blank
25–30	Aircraft Name	6	name of aircraft (ER–2, U–2/ER–2, C–130B, Learjet, etc.)
31	spacer	1	blank
32–34	Scanner Number	3	sensor ID number
35	spacer	1	blank
36–60	Scanner Name	25	072 – NS–001/TMS; 074 – Old Daedalus/TMS; 080 – Old Daedalus/MAMS; 086 – TIMS; 090 – Old Daedalus/AOCI; 108 – MODIS Airborne Simulator; 101 – New Daedalus/TMS; 102 – New Daedalus/MAMS; 103 – New Daedalus/AOCI
61	spacer	1	blank
62–64	Number of Flightlines	3	number of flightlines on the tape
65–80	spacer	21	blank
81	carriage return	1	
82	line feed	1	
83–112	Decomm Date	30	decomm date (from current archive tape) in HP–1000 date/time format HH:MM [AM/PM] DDD., DD MMM., YYYY (i.e. – 08:33 AM Thu., 10 Mar., 1992)
113–122	spacer	10	blank
123–152	Archive Tape Date	30	creation date of archive tape (from current archive tape)
153–162	spacer	10	blank
163	carriage return	1	
164	line feed	1	
... Flightline Information:			
165–166	Flightline Number	flightline number (on tape)	
167	spacer	1	blank
168–184	Site Name	17	site name or number
185	spacer	1	blank
186–190	Number of Scanlines	5	number of scan lines in image
191–195	spacer	5	blank
196–244	Comments	50	comments, i.e. – no nav data, IR only, data quality, etc.
245	carriage return	1	
246	line feed	1	
... additional 80 character records for each additional flightline ...			
n+1	control–Z	1	end–of–text

... remainder of record is zero filled (ASCII null character)

All fields contain ASCII characters, left justified, blank fill on right.

2.5 Image/Navigation Data Format

Image and navigation data shall be combined on the transcribed archive tape in a pseudo–band$_{n+1}$ of image data. The navigation data shall be time–matched to the corresponding image samples/scans, with linearly–interpolated values being used between actual navigation data samples. Missing or corrupted data fields shall be set to zero. The format for the navigation data stored in the band$_{n+1}$ position is as follows:

Byte No.	Parameter Description
1	Status: 0 = no navigation data for this record; 1 = navigation data present, time is same as scanline time; 2 = linearly interpolated navigation data values
2–5	filler
Location of left–most and right–most pixels:	
Latitude of left–most pixel	
6	Sign: + = northern hemisphere; – = southern hemisphere
7	Latitude degrees
8	Latitude tenths and hundredths (of a degree)
9	Latitude thousandths and ten thousandths (of a degree)
10	Latitude hundred thousandths and millionths (of a degree)
Longitude of left–most pixel	
11	Sign: + = east; – = west
12	Longitude degrees
13	Longitude tenths and hundredths (of a degree)
14	Longitude thousandths and ten thousandths (of a degree)
15	Longitude hundred thousandths and millionths (of a degree)
Latitude of right–most pixel	
16	Sign: + = northern hemisphere; – = southern hemisphere
17	Latitude degrees
18	Latitude tenths and hundredths (of a degree)
19	Latitude thousandths and ten thousandths (of a degree)
20	Latitude hundred thousandths and millionths (of a degree)
Longitude of right–most pixel	
21	Sign: + = east; – = west
22	Longitude degrees
23	Longitude tenths and hundredths (of a degree)
24	Longitude thousandths and ten thousandths (of a degree)
25	Longitude hundred thousandths and millionths (of a degree)
Scanner parameters:	
26–27	Number of pixels per line (16 bit integer)
28–29	Pixel number to immediate left of nadir (16 bit integer)
30–31	Pixel number to immediate right of nadir (16 bit integer)
Viewing angle	
32	Degrees
33	Tenths and hundredths (of a degree)
34	Thousandths and ten thousandths (of a degree)
35	Hundred thousandths and millionths (of a degree)

Byte No.	Parameter Description
Instantaneous filed of view (angle)	
36	Degrees
37	Tenths and hundredths (of a degree)
38	Thousandths and ten thousandths (of a degree)
39	Hundred thousandths and millionths (of a degree)
40–50	filler
Navigation parameters used to compute pixel location:	
Aircraft latitude	
51	Sign: + = northern hemisphere; – = southern hemisphere
52	Latitude degrees
53	Latitude tenths and hundredths (of a degree)
54	Latitude thousandths and ten thousandths (of a degree)
55	Latitude hundred thousandths and millionths (of a degree)
Aircraft longitude	
56	Sign: + = east; – = west
57	Longitude degrees
58	Longitude tenths and hundredths (of a degree)
59	Longitude thousandths and ten thousandths (of a degree)
60	Longitude hundred thousandths and millionths (of a degree)
Aircraft pitch angle	
61	Sign: + = east; – = west; 0 = not recorded
62	Degrees
63	Tenths and hundredths (of a degree)
64	Thousandths and ten thousandths (of a degree)
65	Hundred thousandths and millionths (of a degree)
Aircraft roll angle	
66	Sign: + = east; – = west; 0 = not recorded
67	Degrees
68	Tenths and hundredths (of a degree)
69	Thousandths and ten thousandths (of a degree)
70	Hundred thousandths and millionths (of a degree)
True heading	
71	Sign: + = between 0° and 180°; – = between 180° and 360°; 0 = not recorded
72	Degrees
73	Tenths and hundredths (of a degree)
74	Thousandths and ten thousandths (of a degree)
75	Hundred thousandths and millionths (of a degree)
76–77	Pressure altitude in meters (16 bit integer); 21337 indicates altitude is over 21336 m (70000 ft)
78–79	Radar altitude in meters (16 bit integer); 21337 indicates altitude is over 21336 m (70000 ft)
80–100	filler

Byte No.	Parameter Description
Other navigation data:	
101–102	True air speed in meters per 10 seconds (16 bit integer)
103–104	Ground speed in meters per 10 seconds (16 bit integer)
105–106	North–south velocity in meters per 10 seconds (16 bit integer)
107–108	East–west velocity in meters per 10 seconds (16 bit integer)
109–110	Vertical velocity in meters per 10 seconds (16 bit integer)
111–112	Outside air temperature in degreesx10 (16 bit integer)
113–114	Drift angle in degreesx10 (16 bit integer)
115–116	Wind speed in meters per 10 seconds (16 bit integer)
117–118	Wind angle in degreesx10 (16 bit integer)
119–120	Time to go in secondsx10 (16 bit integer)
121–122	Distance to go in kilometersx10 (16 bit integer)
123–124	Cross track distance in kilometersx10 (16 bit integer)
125–126	Cross track angle in degreesx10 (16 bit integer)
*127–128	Drift angle in degreesx10 (16 bit integer)
129–130	Total air temperature in centigrade degreesx10 (16 bit integer)
131–132	Outside air temperature in centigrade degreesx10 (16 bit integer)
133–134	Hygrometer (dewpoint) in centigrade degreesx10 (16 bit integer)
135–end of record	filler/ancillary data

3.0 Metadata Format

3.1 Overview

Descriptive and production control metadata will be extracted from the image data, sensor housekeeping, and navigation data during the transcription process. The descriptive metadata will encompass most of the PLDS metadata, and the production control metadata will be compatible with EDC systems such as DORRAN, GLIS, and the Version 0 IMS. The IMS will be populated from the EDC [DAAC] production database [DORRAN].

3.2 Media

Metadata shall be recorded on 8 mm Exabyte tape, in a format compatible with SUN Microsystems OEM 8 mm tape drives and software drivers.

3.3 Metadata Definitions

The metadata is defined as follows:

Field	Length	Description
Record ID	6	Unique reference ID assigned to image data record
Project Name	20	project of campaign name (if any)
Site Name/Number	15	site name or number
GMT Date/Time	14	time that data was acquired referenced to GMT in JJJ/HH:MM:SS.T format (Julian day/hours:minutes:seconds/tenths)
Start Location	9	start location latitude and longitude corner points in ±DD–MM–SS (+ = north or east, – = south or west)
Stop Location	9	stop location latitude and longitude corner points in ±DD–MM–SS (+ = north or east, – = south or west)
Cloud Cover	2	percent cloud cover
Data Quality	15	comments from flight summary report or flight log
Facility	3	"ARC" or "SSC"

Field	Length	Description
Platform	5	aircraft flying sensor (ER–2, Lear, C–130B, etc.)
Mission/Flight Number	10	mission or flight number (i.e. – 92–123, ER–2; 92–001–02, c–130B , etc.)
Radar Altitude	5	radar altitude (above ground level) in feet, if available
Pressure Altitude	5	pressure altitude (above sea level) in feet, if available
Flightline/Run Number	5	flight line and run number in FF–RR format (flightline–run)
Number of Scanlines	5	number of scanlines in image
Scan Rate	4	scan rate in Hz (##.# format)
Nadir Pixel Size	5	range of nadir pixel size in MN–MX format (minimum–maximum)
Comments	20	comments from flight summary report or flight log
Accession Number	11	reference number(s) to corresponding aerial photography in #####–##### format
Sensor Name/Revision	11	name and revision of sensor in NNNNNN/RRRR format (name/revision)
Requester List	1000	list of requesters and affiliations
Browse ID	6	unique ID of corresponding browse image
Tape Location ID	6	tape storage location
EDC Management Code	6	unique ID assigned to image data record in EDC archive management system
Creation Date	17	time and date image data record was created in HH:MM:SS, DD–MM–YY format
Principal Investigator(s)	100	principal investigator(s) and affiliations
Corresponding Data	3	identifies corresponding aircraft data sets available from the DAAC, A = AVIRIS, T = TIMS, N = NS–001, L = TMS (aerial photography assumed)
Status Code	3	identifies problems with data, I = IR scene only; M = missing bands; N = no corresponding navigation data, corrupt navigation data, or incomplete navigation data; O = other problems (see comment field)

4.0 Browse Images

4.1 Overview

Browse images are a spatially and spectrally reduced representation of the image data. Additionally, the images are contrast–enhanced through use of a decorrelation–stretch (D–stretch) algorithm.

4.2 Media

Browse images shall be recorded on 8 mm Exabyte tape, in a format compatible with SUN Microsystems OEM 8 mm tape drives and software drivers.

4.3 Subsampling

Browse images shall be 4:1 spatially subsampled by rejection of the first three out of four scanlines and three out of four pixels across each scanline (75% reduction in data content). The image will be spectrally subsampled by inclusion of only the following three bands (channels) of data:

	Color Mapping	TIMS:	NS–001
	Red	Band 5	Band 4
*	Green	Band 3	Band **3/6** (color IR/TM)
	Blue	Band 1	Band 2

4.4 Decorrelation–Stretch Processing

The D–stretch is performed by first transforming the subsampled 3–band input into a principal component representation (PC–space) using a Karhunen–Loeve transform. The data in PC–space is then translated to avoid negative values. The resultant data is used to generate a correlation matrix to determine the image statistics. These statistics are used to apply a gaussian contrast stretch to equalize the variances along each of the PC–space component axes. A 2% clip is applied to the extreme values one each end to prevent saturation. The equalized data is then inverse–transformed back into the original input space (format).

5.0 Media Transfer

5.1 Overview

Transcribed data will be transferred by media shipment on a regular basis when a sufficient amount of transcribed data has been accumulated (i.e. – once a month, once a year's worth of data has been transcribed, etc.). The transcribed image data on 3480 cartridges will be accompanied by an inventory tape on 8 mm Exabyte. The inventory tape will contain the metadata and browse images corresponding to the image data, and a listing of the data contained in the shipment. The inventory tape will be used to identify the shipment and its contents, and to load the DAAC databases (production/DORRAN and IMS/GLIS).

5.2 Inventory Tape Definition

The inventory tape shall be an 8 mm Exabyte cassette tape, with all records and files ANSI–standard labeled. The tape will contain the following information (in order):

1. Volume ID and Table of Contents describing the data contained on the tape
2. Listing of image data tapes in this shipment, including volume IDs and mission/flight numbers
3. Metadata for each image data record on 3480
4. Browse images for each image data record on 3480

5.3 Ingest Processing

Ingest processing shall consist of reading the inventory tape and each 3480 image tape to verify its contents and assess readability. The inventory tape shall be used to populate the production database, which shall then be used to populate the IMS database, along with the browse images from the inventory tape.The 3480 tapes shall be assigned new tape IDs and locations as appropriate, then stored in the DAAC archive.

5.4 Data Quality Assurance/Quality Control

Data quality shall be assessed during the transcription process by identification of archive tapes with readability problems or significant data problems. These items shall be noted appropriately in the metadata and header information. Unreadable tapes may be re–decommutated from the original HDTs to generate a clean input for transcription processing. Data quality during DAAC ingest shall be verified by determining accuracy of labeling and verifying tape readability.

LPDAAC DATA SETS PRIORITIES WORKSHEET

DATA SET/PRODUCT	BROWSE PRODUCT PRIORITY	HDF PRIORITY	MEDIA PREFERENCE
1. Landsat 1-3 MSS on WBVT	L		
2. Landsat 1-3 MSS on CCT-x	H		
3. Landsat 3-5 MSS on HDT	H		
4. Landsat 4-5 TM on HDT/CCT	H		
5. FOLD (Landsat MSS & TM)	H		
6. Landsat MSS & TM Film	L		
7. AVHRR Global HRPT & LAC	H		
8. U.S. Biweekly NDVI	M		
9. N. American Biweekly NDVI	M		
10. Eurasian 10-day NDVI	M		
11. African Biweekly NDVI	M		
12. SIR-A/B/C	M		
13. USGS Air SLAR	L		
14. NASA Airborne TIMS (w/photos)	H		
15. NASA Airborne NS-001 (w/photos)	H		
16. NASA Airborne TMS	M		
17. NASA Airborne M^2S	L		
18. NASA Airborne OCI	L		
19. NASA Airborne AVIRIS (post-1988)	H		
20. USGS DEM	L		
21. USGS DLG	L		
22. Rel. World Data Bank II DLG	L		
23. DMA DTED	L		
24. DMA Dig. Chart of the World	L		
25. Derived DEMs	L		
26. NURE	L		
27. NASA Space Photography	L		
28. USGS Aerial Photography	L		
29. Other Aerial Photography	L		
30. ERS-1 SAR	M		

DATA SET/PRODUCT	BROWSE PRODUCT PRIORITY	HDF PRIORITY	MEDIA PREFERENCE
31. JERS-1 SAR	M		
32. JERS-1 OPS	M		
33. Radarsat SAR	L		
34. Climate/Weather Data	~~H~~ L		
35. Along Track Scanning Radiometer	L		
36. SPOT	L		
37. SSM/I	L		
38. SMMR	L		
39. GAC (4-km)	L		
40. ASAS	L		
41. SEASAT (land)	L		
42 NASA AIR SAR (post-1988)	M		
43. NASA AIR SAR (pre-1988)	M		
44. Global DEM (1:100,000 **or better**)	L		
45. LU/LC	L		
46. ISCCP	L		
47. GOES/Metosat	L		
48. Ancillary Data (various)	L		
49. Calibrated Data	L		