

Level 1 Product Output Files Data Format Control Book

Volume 5, Book 2

Revision 5

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Preface

This Data Format Control Book (DFCB) is maintained and controlled by the Landsat 7 Configuration Control Board (LCCB) and may be updated or revised only on approval by the LCCB. Comments and questions regarding this DFCB should be directed to

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1297	N/A	Section 4.2.2
1348	27	Section 3, Section 4
1400	N/A	Table 4.1-3, Table 4.1-6, Table 4.1-9
1401	N/A	Table 4.1-2, Table 4.1-5, Table 4.1.8
1402	28	Entire Document
1460	26	Table 4.3-1
1461	25	Table 4.3-1

Abstract

This Data Format Control Book (DFCB) presents detailed data formats of the output files generated by the Image Assessment System (IAS), the Level 1 Product Generation System (LPGS), and the National Land Archive Processing System (NLAPS). These Level 1 processing systems produce Level 1 output files from Level 0R images based on user requests. Images in the following formats are possible from the various Level 1 processing systems: Hierarchical Data Format (HDF), FAST-Landsat 7 (FAST-L7A), Geographic Tagged Image File Format (GeoTIFF), or NLAPS Data Format (NDF). IAS and LPGS do not generate products in NDF format. The NDF format is described in the *NLAPS Systematic Format Description Document* (see Section 2).

Keywords: *Data Format Control Book (DFCB), Earth Resources Observation System (EROS), EOSDIS Core System (ECS), FAST format, Geographic Tagged Image File Format (GeoTIFF), Hierarchical Data Format (HDF), NLAPS Data Format (NDF), Landsat 7, Level 1 Product, Image Assessment System (IAS), National Land Archive Processing System (NLAPS), Level 1 Product Generation System (LPGS)*

Change Information Page

List of Effective Pages			
Page Number		Issue	
i-vii		Revision 1	
1-1 through 1-4		Revision 1	
2-1		Revision 1	
3-1 through 3-5		Revision 1	
4-1 through 4-59		Revision 1	
5-1		Revision 1	
6-1 through 6-2		Revision 1	
A-1 through A-5		Revision 1	
B-1 through B-4		Revision 1	
AB-1 through AB-3		Revision 1	

Contents

PREFACE.....	III
ABSTRACT.....	IV
CHANGE INFORMATION PAGE.....	V
CONTENTS.....	VI
SECTION 1 - INTRODUCTION.....	1-1
1.1 PURPOSE.....	1-1
1.2 SCOPE.....	1-1
1.3 INTENDED USERS.....	1-1
1.4 DEFINITIONS	1-1
1.5 LORp PRE-ARCHIVE PROCESSING.....	1-3
SECTION 2 - APPLICABLE DOCUMENTS.....	2-1
SECTION 3 - OVERVIEW OF LEVEL 1 OUTPUT FILES	3-1
3.1 FAST-L7A	3-2
3.1.1 Header File	3-2
3.1.2 Level 1 Metadata File	3-2
3.1.3 Image File	3-3
3.2 GEOTIFF.....	3-3
3.2.1 Level 1 Metadata File	3-3
3.2.2 Image File	3-3
3.3 HDF	3-4
3.3.1 Image File	3-5
3.3.2 Ancillary Data.....	3-5
SECTION 4 - LEVEL 1 OUTPUT FILE FORMATS	4-1
4.1 FAST-L7A FILE FORMATS	4-1
4.1.1 Header File	4-1
4.1.2 Level 1 Metadata File	4-1
4.2 GEOTIFF FILE FORMATS.....	4-29
4.2.1 GeoTIFF Tags.....	4-29
4.2.2 GeoTIFF Keys.....	4-30
4.2.3 Level 1 Metadata File	4-33
4.3 HDF FILE FORMATS	4-34
4.3.1 Image Files.....	4-34
4.3.2 Internal Calibrator Data Files.....	4-34
4.3.3 Mirror Scan Correction Data File	4-34
4.3.4 Payload Correction Data File.....	4-34
4.3.5 Scan Line Offsets.....	4-35
4.3.6 Calibration Parameter File.....	4-35
4.3.7 Geolocation Table File	4-35
4.3.8 LPS Metadata File	4-35
4.3.9 Level 1 Metadata File	4-36
4.3.10 HDF Directory File.....	4-36

4.3.11	<i>Vgroup Definitions</i>	4-36
SECTION 5 - PRODUCT PACKAGING		5-1
5.1	8-MM TAPE	5-1
5.2	CD-ROM.....	5-1
5.3	ELECTRONIC TRANSFER.....	5-1
SECTION 6 - SOFTWARE TOOLS		6-1
6.1	NCSA HDF LIBRARIES	6-1
6.2	HDF LIBRARIES.....	6-1
6.3	ODL PARSER.....	6-2
APPENDIX A - PROJECTION PARAMETERS		A-1
APPENDIX B - SAMPLE READ-ME FILE		B-1
ABBREVIATIONS AND ACRONYMS		AB-1

Section 1 - Introduction

1.1 Purpose

This Data Format Control Book (DFCB) provides the user with a high-level description of the Landsat 7 Level 1 (L1) distribution product, product packaging, and viewing tools.

1.2 Scope

This DFCB describes the formats and data contents of the L1 output files. The formats discussed are Hierarchical Data Format (HDF), FAST-Landsat 7 (FAST-L7A), Geographic Tagged Image File Format (GeoTIFF), and NLAPS Data Format (NDF). Detailed NDF specifications are described in the *NLAPS Systematic Format Description Document* (see Section 2).

The HDF L1 product formats are primarily derived from the formats of the Level 0Rp (L0Rp) products so as to cause less impact on the user community and to provide general consistency in output. The L0Rp product formats are described in the *Landsat 7 System Zero-R Distribution Product Data Format Control Book, Volume 5, Book 1* (See Section 2). [Note: L1 customers are advised to obtain a copy of Book 1 because related tables are referenced in Book 2 to describe L1R output files.] In addition, the output files defined in this DFCB are based on the already established FAST and GeoTIFF standards. The Landsat 7 L1 products will be in FAST-L7A format. This is the FAST-C format modified to accommodate the features of the Enhanced Thematic Mapper Plus (ETM+) instrument.

The file formats contained in this DFCB are applicable to the product generated by L1 producing systems operated at the USGS EROS Data Center.

1.3 Intended Users

This document is intended as a guide to recipients of L1 products. This document contains detailed information on the L1 output data file formats to allow users on both sides to proceed with independent development of L1 processing capability. It also provides detailed information on the packaging of the L1 product.

1.4 Definitions

Level 0Rp (L0Rp) digital image—Spatially reformatted, demultiplexed, and, unrectified subinterval data

Level 0Rp (L0Rp) product—L0Rp digital image plus radiometric, calibration, attitude, and ephemeris data, consisting of the following files in HDF:

- L0Rp digital image (one file per band)
- Internal calibrator (IC) data—Calibration data file containing all the calibration data received on a major frame basis subset to the product size ordered

- Mirror scan correction data (MSCD)—Scan direction and error information subset to the product size ordered
- Payload correction data (PCD)—Information on spacecraft attitude and ephemeris, including quality indicators for the entire subinterval from which the product is derived
- Metadata—Descriptive information about the L0Rp image and names of appended files associated with the image
- Calibration parameter file (CPF)—Formatted file containing radiometric and geometric correction parameters
- Scan line offsets—Information on actual starting and ending pixel positions for valid image data on a line-by-line basis
- Geolocation table—File containing scene corner coordinates and product-specific scene line numbers for bands
- HDF directory—File containing all the pointers, file size information, and data objects required to process the L0Rp product

Level 1R (L1R) digital image—Radiometrically corrected but not geometrically resampled

Level 1R (L1R) product—L1 product distributed by the PDS to the customer, and consisting of the following in HDF:

- L1R digital image (one image file per band)
- IC data—Calibration data file containing all the calibration data received on a major frame basis subset to the product size ordered
- Consensus MSCD—Scan direction and error information subset to the product size ordered
- Consensus PCD—Information on spacecraft attitude and ephemeris, including quality indicators for the entire subinterval from which the product is derived
- Metadata—Descriptive information about the L0 and L1 digital images and names of appended files associated with the images
- CPF—Formatted file containing radiometric and geometric correction parameters
- Scan line offsets—Information on actual starting and ending pixel positions for valid image data on a line-by-line basis
- Geolocation table—File containing scene corner coordinates and product-specific scene line numbers for bands
- HDF directory— The directory file contains all the pointers, file size information, and data objects required to open and process the L1 product using the HDF library and interface routines

Consensus File—A single file created from the two original files included with the L0Rp product and with errors corrected

Level 1G (L1G) digital image—Radiometrically corrected and resampled for geometric correction and registration to a geographic map projection

Level 1G (L1G) product—L1 product distributed by the PDS to the customer; includes, for all requested bands, FAST-L7A or GeoTIFF format L1G image and associated data accommodated by the format; or HDF L1G image and metadata

Interval—Time duration between the start and stop of an imaging operation (observation) of the Landsat 7 ETM+ instrument

Subinterval—Segment of time corresponding to a portion of an observation within a single Landsat 7 contact period

Worldwide Reference System (WRS) scene—Digital image that covers an area equivalent to one of the 57,784 scene centers (233 paths by 248 rows areas) defined by the WRS structure

1.5 L0Rp Pre-Archive Processing

A basic knowledge of the pre-archive ground processing will enable the user to better understand the L1 product.

The Landsat Ground Station (LGS) acquires ETM+ wideband data directly from the Landsat 7 spacecraft by way of two 150-megabits-per-second (Mbps) X-band return links, separates each X-band data into two 75-Mbps channels (I and Q), and transmits the acquired wideband data over four 75-Mbps LGS output channels to the Landsat Processing System (LPS). The LPS records all wideband data, at real-time rates, into its wideband data stores. An I-Q channel pair represents a complete data set. One channel holds bands 1 through 6 low gain, and the second holds bands 7 and 8 and a high-gain form of band 6.

The LPS retrieves and processes each channel of raw wideband data, at lower than real-time rates, into separate accumulations of Earth image data, calibration data, MSCD, and PCD. Channel accumulations represented by bands 1 through 6-low and 6-high through 8 become formats 1 and 2, respectively. PCD and MSCD are generated twice, once for each format. Their contents should be identical but are not guaranteed to be identical.

The LPS spatially reformats Earth imagery and calibration data into L0Ra data. This involves shifting pixels by integer amounts to account for the alternating forward-reverse scanning pattern of the ETM+ sensor, the odd-even detector arrangement within each band, and the detector offsets inherent to the focal plane array engineering design. All LPS OR corrections are reversible; the pixel shift parameters used are documented in the Image Assessment System (IAS) CPF.

During LPS processing, format 1 bands are duplicated, aligned, and used to assess cloud cover content and to generate scene-based browse data. Cloud cover scores are generated on a scene-by-scene and quadrant-by-quadrant basis. Metadata are generated for the entire subinterval and on a scene-by-scene basis. The image data, PCD, MSCD, calibration data, and metadata are

structured into HDF for each format and sent to the Earth Resources Observation System (EROS) Data Center primary and secondary archives for archiving in subinterval form. The two formats of data are united when a Landsat 7 OR product is ordered. The browse files are sent to EDC search and order systems separately for use as an online aid to ordering.

Section 2 - Applicable Documents

The following documents provide additional detail and reference information regarding the format of the Level 1 output files.

1. U.S. Geological Survey (USGS)/EROS Data Center (EDC), LPS-112-1, *Landsat 7 System Zero-R Distribution Product Data Format Control Book, Volume 5, Book 1, Revision 6*, October 1999
2. U.S. Geological Survey (USGS)/EROS Data Center (EDC), *National Land Archive Production System (NLAPS) Systematic Format Description Document*, July 2000
3. U.S. Geological Survey (USGS)/EROS Data Center (EDC), IAS-207, *Landsat-7 System Calibration Parameter File Definition, Revision 4*, January 2000
4. —, 505-10-36, *Earth Science Data and Information System (ESDIS) Project Mission Specific Requirements for the Landsat 7 Mission Level 1 Processing*, November 1998
5. GeoTIFF Specification, Revision 1.0
(available at <http://www.remotesensing.org/geotiff/spec/geotiffhome.html>)
6. Jet Propulsion Laboratory, California Institute of Technology, “Object Description Language Specification and Usage,” Chapter 12 of *Planetary Data System Standards Reference*, Version 3.2, July 24, 1995
(available at <http://pds.jpl.nasa.gov/stdref/chap12.htm>)

Section 3 - Overview of Level 1 Output Files

The L1R digital image is very similar to the L0Rp digital image, except that the L1R image data are radiometrically corrected. In addition, the format 1 and format 2 PCD files are combined into one consensus file, as are the format 1 and format 2 MSCD files. The consensus file is a single file created from the two original files included with the L0Rp product and with errors corrected. The L1R product is available in HDF only. The L1G digital image is radiometrically and geometrically corrected and is available in four format options: FAST-L7A, GeoTIFF, HDF, and NDF. Detailed NDF specifications are described in the NLAPS Systematic Format Description Document.

Tables 3-1 through 3-3 detail the L1 product components for each format. The number of bands ordered by the user determines the number of components in a specific product.

Table 3-1. FAST-L7A Product Components

Component	L1G
Header file (for each requested band group)	X
L1 digital image (for each requested band)	X
Metadata file	X

Table 3-2. GeoTIFF Product Components

Component	L1G
L1 digital image (for each requested band)	X
Metadata file	X

Table 3-3. HDF Product Components

Component	L1R	L1G
L1 digital image (for each requested band)	X	X
IC data—format 1 (for bands 1 through 6 low)	X	
IC data—format 2 (for bands 6 high through 8)	X	
Scan line offsets—format 1 (for bands 1 through 6 low)	X	
Scan line offsets—format 2 (for bands 6 high through 8)	X	
MSCD (consensus)	X	
PCD (consensus)	X	
CPF	X	
Metadata file (LPS)—format 1	X	
Metadata file (LPS)—format 2	X	
Metadata file	X	X
Geolocation table	X	
HDF directory file	X	X

3.1 FAST-L7A

The file naming convention for the FAST-L7A product files is

L7fpprrr_rrrYYYYMMDD_AAA.FST

where

L7 = Landsat 7 mission

f = ETM+ format (1 or 2) (data not pertaining to a specific format defaults to 1)

ppp = starting path of the product

rrr_rrr = starting and ending rows of the product

YYYYMMDD = acquisition date of the image

AAA = file type:

B10 = band 1

B20 = band 2

B30 = band 3

B40 = band 4

B50 = band 5

B61 = band 6L

B62 = band 6H

B70 = band 7

B80 = band 8

HPN= panchromatic band header file

HRF = VNIR/ SWIR bands header file

HTM = thermal bands header file

MTL = Level 1 metadata

FST = FAST file extension

3.1.1 Header File

The first file that should be read is a read-me-first file that contains header data in American Standard Code for Information Interchange (ASCII). Each band group [panchromatic, visible near infrared/shortwave infrared (VNIR/SWIR), and thermal] has a specific header file. Alphanumeric fields are left justified and numeric fields are right justified. All processing options and map projection information for the product are also contained in this file.

3.1.2 Level 1 Metadata File

The Level 1 metadata file is created during product generation and contains information specific to the product ordered. This file contains all applicable image description information from the L0Rp metadata and the Landsat 7 Data Processing System (LPS) metadata provided with the L0Rp product.

3.1.3 Image File

Each image file contains only one ETM+ band of image pixels. There are no header records within the image file, nor are there prefix or suffix data in the individual image records. Image data are unblocked. The image files are 8-bit unsigned integers.

3.2 GeoTIFF

The file naming convention for the GeoTIFF product is

L7fppprrr_rrrYYYYMMDD_AAA.TIF

where

L7 = Landsat 7 mission

f = ETM+ format (1 or 2)

ppp = starting path of the product

rrr_rrr = starting and ending rows of the product

YYYYMMDD = acquisition date of the image

AAA = file type:

B10 = band 1

B20 = band 2

B30 = band 3

B40 = band 4

B50 = band 5

B61 = band 6L

B62 = band 6H

B70 = band 7

B80 = band 8

MTL = Level 1 metadata

TIF = GeoTIFF file extension

3.2.1 Level 1 Metadata File

The Level 1 metadata file is created during product generation and contains information specific to the product ordered. This file contains all applicable image description information from the LORp metadata and the Landsat 7 Data Processing System (LPS) metadata provided with the LORp product.

3.2.2 Image File

GeoTIFF defines a set of public domain TIFF tags that describe all cartographic and geodetic information associated with geographic TIFF imagery. GeoTIFF is a means for tying a raster image to a known model space or map projection and for describing those projections. A metadata format provides geographic information to associate with the image data, but the TIFF

file structure allows both the metadata and the image data to be encoded into the same file. The GeoTIFF file is grayscale, scanline, uncompressed, and 8-bit unsigned integers.

3.3 HDF

The L1R and L1G HDF products are packaged and distributed as a collection of external elements with an HDF directory. External elements are distinguished by the fact that they exist as separate files and contain only data. Information about their HDF structure and interrelationships can be found in the HDF directory.

The file naming convention for the HDF product files (except the CPF) is

L7fpprrr_rrrYYYYMMDD_AAA.XXX

where

L7 = Landsat 7 mission

f = ETM+ format (1 or 2) (data not pertaining to a specific format defaults to 1)

ppp = starting path of the product

rrr_rrr = starting and ending rows of the product

YYYYMMDD = acquisition date of the image

AAA = file type:

B10 = band 1

B20 = band 2

B30 = band 3

B40 = band 4

B50 = band 5

B61 = band 6L

B62 = band 6H

B70 = band 7

B80 = band 8

CAL = internal calibrator

GEO = geolocation

HDF = HDF directory

MSD = consensus MSCD

MTA = LPS metadata

MTL = Level 1 metadata

PCD = consensus PCD

SLO = scan line offset

XXX = product type (L1R or L1G)

The CPF file naming convention is

L7CPFYYYYMMDD_YYYYMMDD_nn

where

L7	=	Landsat 7 mission
CPF	=	calibration parameter file
YYYY	=	starting year of the CPF
MM	=	starting month of the CPF
DD	=	starting day of the CPF
_	=	separator
YYYY	=	ending year of the CPF
MM	=	ending month of the CPF
DD	=	ending day of the CPF
_	=	separator
nn	=	01-99

3.3.1 Image File

Each requested image band is self-contained in a single file. The L1R image files are in absolute units scaled to 16 bits. The L1G images are 8-bit unsigned integers that exploit the full 0-255 numeric range. Note that the L1R image files are constructed on a Silicon Graphics, Inc. (SGI), Origin 2000 platform, which is a big-endian byte order machine.

3.3.2 Ancillary Data

The remaining files included with the HDF product include the IC data, scan line offsets, MSCD, PCD, CPF, metadata, geolocation table, and HDF directory file. See Table 3-3 for a complete listing of which files are included with each product. These files are described in detail in Section 4.3

Section 4 - Level 1 Output File Formats

4.1 FAST-L7A File Formats

4.1.1 Header File

There is one header file for each band group in the product. The three possible band groups are panchromatic, VNIR/SWIR, and thermal. The header file for each band group contains three 1536-byte ASCII records: administrative, radiometric, and geometric. The administrative record, the first record in each header file, contains information that identifies the product, the image, and the data specifically needed to ingest the imagery for each particular band. To import the image data, it is necessary to read the entries in the administrative record.

The second record is the radiometric record that contains the coefficients needed to convert the image digital values into at-satellite spectral radiance for each particular band.

The third record is the geometric record that contains the image geodetic location information. To align the imagery to other data sources, it is necessary to read the entries in the geometric record for each particular band.

Tables 4.1-1 through 4.1-9 describe the formats of the three records for each of the three band groups (panchromatic, VNIR/SWIR, and thermal). The tables include the start and end bytes, the Fortran format statement, and a brief description of each field. In the Fortran format statements

A = character data

D = double precision data

F = floating data

all N/A fields are blank filled and are maintained in the records for historical consistency with the FAST-C format. The “b” in the descriptions indicates a space.

Fields 79, 81, 91, and 93 of the administrative record refer to products that span multiple tapes and are, therefore, not applicable to the L1 products distributed by the PDS.

Field 106 of the administrative record is the Bands Present field for each particular band group. It is necessary to count the number of non-blank entries in the Bands Present field to get the count of the number of bands. Each character (byte) in this field has an ASCII character with the band label, usually a number. For ETM+, the values are 8 for the panchromatic band; 1, 2, 3, 4, 5, and 7 for the VNIR/SWIR bands, and L and H for the thermal bands. The sequence terminates with blanks.

4.1.2 Level 1 Metadata File

The Level 1 metadata file is created during product generation and contains information specific to the product ordered. Table 4.3-1 lists the full contents of the Level 1 metadata file. This file contains all applicable image description information from the LORp metadata and the Landsat 7 Data Processing System (LPS) metadata provided with the LORp product.

Table 4.1-1 – Administrative Record for Panchromatic Band (1 of 4)

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	8	A8	"REQbIDb="
	2	9	28	A20	Request Number in "NNNYMMDDSSSS_UUUUU" format >where: > NNNYYMMDDSSSS = 13-digit DORRAN order number > NNN = Node indicator > YY = Year > MM = Month > DD = Day > SSSS = Sequence number for the day > UUUUU = 5-digit DORRAN unit number
	3	29	34	A6	"bLOCb="
	4	35	51	A17	First scene starting location in "ppp/rrrffssbbbbb" format. path/row/fraction/subscene
	5	52	70	A19	"bACQUISITIONbDATEb="
	6	71	78	A8	First scene acquisition date in yyymmdd format
	7	79	79	1X	Blank fill
	8	80	80	A1	Carriage return
2	9	81	91	A11	"SATELLITEb="
	10	92	101	A10	First scene satellite name: LANDSAT7
	11	102	110	A9	"bSENSORb="
	12	111	120	A10	First scene sensor name: ETM+
	13	121	134	A14	"bSENSORbMODEb="
	14	135	140	A6	First scene sensor mode: NORMAL
	15	141	153	A13	"bLOOKbANGLEb="
	16	154	159	F6.2	First scene off-nadir angle in degrees: 0.0
	17	160	160	A1	Carriage return
3	18	161	183	23X	Blank fill
	19	184	194	A11	"bLOCATIONb="
	20	195	211	A17	Last scene ending location in "ppp/rrrffssbbbbb" format. path/row/fraction/subscene
	21	212	230	A19	"bACQUISITIONbDATEb="
	22	231	238	A8	N/A
	23	239	239	1X	Blank fill
	24	240	240	A1	Carriage return
4	25	241	251	A11	"SATELLITEb="
	26	252	261	A10	N/A
	27	262	270	A9	"bSENSORb="
	28	271	280	A10	N/A
	29	281	294	A14	"bSENSORbMODEb="
	30	295	300	A6	N/A
	31	301	313	A13	"bLOOKbANGLEb="
	32	314	319	F6.2	N/A
	33	320	320	A1	Carriage return
5	34	321	343	23X	Blank fill
	35	344	354	A11	"bLOCATIONb="
	36	355	371	A17	N/A
	37	372	390	A19	"bACQUISITIONbDATEb="
	38	391	398	A8	N/A
	39	399	399	1X	Blank fill
	40	400	400	A1	Carriage return

Table 4.1-1 – Administrative Record for Panchromatic Band (2 of 4)

Line	Field	Start Byte	End Byte	Format	Description
6	41	401	411	A11	"SATELLITEb="
	42	412	421	A10	N/A
	43	422	430	A9	"bSENSORb="
	44	431	440	A10	N/A
	45	441	454	A14	"bSENSORbMODEb="
	46	455	460	A6	N/A
	47	461	473	A13	"bLOOKbANGLEb=v
	48	474	479	F6.2	N/A
	49	480	480	A1	Carriage return
7	50	481	503	23X	Blank fill
	51	504	514	A11	"bLOCATIONb="
	52	515	531	A17	N/A
	53	532	550	A19	"bACQUISITIONbDATEb="
	54	551	558	A8	N/A
	55	559	559	1X	Blank fill
	56	560	560	A1	Carriage return
	57	561	571	A11	"SATELLITEb="
8	58	572	581	A10	N/A
	59	582	590	A9	"bSENSORb="
	60	591	600	A10	N/A
	61	601	614	A14	"bSENSORbMODEb="
	62	615	620	A6	N/A
	63	621	633	A13	"bLOOKbANGLEb="
	64	634	639	F6.2	N/A
	65	640	640	A1	Carriage return
	66	641	654	A14	"PRODUCTbTYPEb="
9	67	655	672	A18	Product type: 'MAPbORIENTEDbbbbbb' 'ORBITbORIENTEDbbbb' 'USERbORIENTEDbbbbbb' (NLAPS only) 'TRUENORTHbORIENTED' (NLAPS only)
	68	673	687	A15	"bPRODUCTbSIZEb="
	69	688	697	A10	Product size: 'FULLbSCENE' 'SUBSCENEbb' 'MULTISCENE'
	70	698	719	22X	Blank fill
	71	720	720	A1	Carriage return
	72	721	740	A20	"TYPEbOFbPROCESSINGb="
10	73	741	751	A11	Type of processing used: 'SYSTEMATICb' 'PRECISIONbb' (NLAPS only) 'TERRAINbbbb' (NLAPS only)

Table 4.1-1 – Administrative Record for Panchromatic Band (3 of 4)

Line	Field	Start Byte	End Byte	Format	Description
	74	752	764	A13	"bRESAMPLINGb="
	75	765	766	A2	Resampling algorithm used: "NN" Nearest Neighbor "CC" Cubic Convolution "MF" Modulation Transfer Function (LPGS only) "BI" Bilinear (NLAPS only) "KD" Kaiser Damped (NLAPS only) "16" 16 Point Sinc (NLAPS only) "8b" 8 Point Sinc (NLAPS only) "DW" Damped Window (NLAPS only)
	76	767	799	33X	Blank fill
	77	800	800	A1	Carriage return
11	78	801	819	A19	"VOLUMEb###bINbSETb="
	79	820	821	I2	Tape volume number in tape set (for multi-volume product): N/A
	80	822	822	A1	"I"
	81	823	824	I2	Number of volumes in tape set (for multi-volume product): N/A
	82	825	842	A18	"bPIXELbPERbLINEb="
	83	843	847	I5	Number of pixels per product line for pan band
	84	848	864	A17	"bLINESbPERbBANDb="
	85	865	869	I5	Number of lines per pan band
	86	870	870	A1	"I"
	87	871	875	I5	Number of lines in output product
	88	876	879	4X	Blank fill
	89	880	880	A1	Carriage return
12	90	881	894	A14	"STARTbLINEb#b="
	91	895	899	I5	First product line number on this volume (for multivolume product): N/A
	92	900	917	A18	"bBLOCKINGbFACTORb="
	93	918	919	I2	Tape blocking factor: N/A
	94	920	931	A12	"bRECbSIZEb="
	95	932	940	I9	Length of physical file record in bytes per pan band
	96	941	953	A13	"bPIXELbSIZEb="
	97	954	959	F6.2	Pixel size in meters for pan band
	98	960	960	A1	Carriage return
13	99	961	983	A23	"OUTPUTbBITSbPERbPIXELb="
	100	984	985	I2	Output bits per pixel: 8
	101	986	1011	A26	"bACQUIREDbBITSbPERbPIXELb="
	102	1012	1013	I2	Acquired bits per pixel: 8
	103	1014	1039	26X	Blank fill
	104	1040	1040	A1	Carriage return
14	105	1041	1055	A15	"BANDSbPRESENTb="
	106	1056	1087	A32	Image bands present for the pan band group: 8
	107	1088	1119	32X	Blank fill
	108	1120	1120	A1	Carriage return
15	109	1121	1130	A10	"FILENAMEb="
	110	1131	1159	A29	Filename for first band
	111	1160	1169	A10	"FILENAMEb="
	112	1170	1198	A29	Filename for second band (N/A)
	113	1199	1199	1X	Blank fill
	114	1200	1200	A1	Carriage return

Table 4.1-1 – Administrative Record for Panchromatic Band (4 of 4)

Line	Field	Start Byte	End Byte	Format	Description
16	115	1201	1210	A10	"FILENAMEb="
	116	1211	1239	A29	Filename for third band (N/A)
	117	1240	1249	A10	"FILENAMEb="
	117	1250	1278	A29	Filename for fourth band (N/A)
	119	1279	1279	1X	Blank fill
	120	1280	1280	A1	Carriage return
17	121	1281	1290	A10	"FILENAMEb="
	122	1291	1319	A29	Filename for fifth band (N/A)
	123	1320	1329	A10	"FILENAMEb="
	124	1330	1358	A29	Filename for sixth band (N/A)
	125	1359	1359	1X	Blank fill
	126	1360	1360	A1	Carriage return
18	127	1361	1439	79X	Blank fill
	128	1440	1440	A1	Carriage return
19	129	1441	1519	79X	Blank fill
	130	1520	1520	A1	Carriage return
20	131	1521	1532	12X	"REVbbbbbbbbb"
	132	1533	1535	A3	Format version code: L7A
	133	1536	1536	A1	Carriage return

Table 4.1-2 – Radiometric Record for Panchromatic Band (1 of 2)

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	50	A50	"BIASESbANDbGAINSbINbASCENDINGbBANDbNUMBERbORDER bbb"
	2	51	79	29X	Blank fill
	3	80	80	A1	Carriage return
2	4	81	104	D24.15	Bias for first band
	5	105	105	1X	Blank fill
	6	106	129	D24.15	Gain for first band
	7	130	159	30X	Blank fill
	8	160	160	A1	Carriage return
3	9	161	184	D24.15	Bias for second band
	10	185	185	1X	Blank fill
	11	186	209	D24.15	Gain for second band
	12	210	239	30X	Blank fill
	13	240	240	A1	Carriage return
4	14	241	264	D24.15	Bias for third band
	15	265	265	1X	Blank fill
	16	266	289	D24.15	Gain for third band
	17	290	319	30X	Blank fill
	18	320	320	A1	Carriage return
5	19	321	344	D24.15	Bias for fourth band
	20	345	345	1X	Blank fill
	21	346	369	D24.15	Gain for fourth band
	22	370	399	30X	Blank fill
	23	400	400	A1	Carriage return
6	24	401	424	D24.15	Bias for fifth band
	25	425	425	1X	Blank fill
	26	426	449	D24.15	Gain for fifth band
	27	450	479	30X	Blank fill
	28	480	480	A1	Carriage return
7	29	481	504	D24.15	Bias for sixth band
	30	505	505	1X	Blank fill
	31	506	529	D24.15	Gain for sixth band
	32	530	559	30X	Blank fill
	33	560	560	A1	Carriage return
8	34	561	584	D24.15	Bias for seventh band
	35	585	585	1X	Blank fill
	36	586	609	D24.15	Gain for seventh band
	37	610	639	30X	Blank fill
	38	640	640	A1	Carriage return
9	39	641	664	D24.15	Bias for eighth band
	40	665	665	1X	Blank fill
	41	666	689	D24.15	Gain for eighth band
	42	690	719	30X	Blank fill
	43	720	720	A1	Carriage return
10	44	721	799	79X	Blank fill
	45	800	800	A1	Carriage return

Table 4.1-2 – Radiometric Record for Panchromatic Band (2 of 2)

Line	Field	Start Byte	End Byte	Format	Description
11	46	801	879	79X	Blank fill
	47	880	880	A1	Carriage return
12	48	881	959	79X	Blank fill
	49	960	960	A1	Carriage return
13	50	961	1039	79X	Blank fill
	51	1040	1040	A1	Carriage return
14	52	1041	1119	79X	Blank fill
	53	1120	1120	A1	Carriage return
15	54	1121	1199	79X	Blank fill
	55	1200	1200	A1	Carriage return
16	56	1201	1279	79X	Blank fill
	57	1280	1280	A1	Carriage return
17	58	1281	1359	79X	Blank fill
	59	1360	1360	A1	Carriage return
18	60	1361	1439	79X	Blank fill
	61	1440	1440	A1	Carriage return
19	62	1441	1519	79X	Blank fill
	63	1520	1520	A1	Carriage return
20	64	1521	1535	15X	Blank fill
	65	1536	1536	A1	Carriage return

Table 4.1-3 – Geometric Record for Panchromatic Band (1 of 3)

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	14	A14	"GEOMETRICbDATA"
	2	15	31	A17	"bMAPbPROJECTIONb="
	3	32	35	A4	Map projection name (see Appendix A for list of mnemonics)
	4	36	47	A12	"bELLIPSOIDb="
	5	48	65	A18	Earth ellipsoid used
	6	66	73	A8	"bDATUMB="
	7	74	79	A6	Datum name
	8	80	80	A1	Carriage return
2	9	81	108	A28	"USGSbPROJECTIONbPARAMETERSb="
	10	109	109	1X	Blank fill
	11	110	133	D24.15	USGS projection parameter #1: Semi-major axis
	12	134	134	1X	Blank fill
	13	135	158	D24.15	USGS projection parameter #2: Semi-minor axis
	14	159	159	1X	Blank fill
	15	160	160	A1	Carriage return
3	16	161	184	D24.15	USGS projection parameter #3
	17	185	185	1X	Blank fill
	18	186	209	D24.15	USGS projection parameter #4
	19	210	210	1X	Blank fill
	20	211	234	D24.15	USGS projection parameter #5
	21	235	239	5X	Blank fill
	22	240	240	A1	Carriage return
4	23	241	264	D24.15	USGS projection parameter #6
	24	265	265	1X	Blank fill
	25	266	289	D24.15	USGS projection parameter #7
	26	290	290	1X	Blank fill
	27	291	314	D24.15	USGS projection parameter #8
	28	315	319	5X	Blank fill
	29	320	320	A1	Carriage return
5	30	321	344	D24.15	USGS projection parameter #9
	31	345	345	1X	Blank fill
	32	346	369	D24.15	USGS projection parameter #10
	33	370	370	1X	Blank fill
	34	371	394	D24.15	USGS projection parameter #11
	35	395	399	5X	Blank fill
	36	400	400	A1	Carriage return
6	37	401	424	D24.15	USGS projection parameter #12
	38	425	425	1X	Blank fill
	39	426	449	D24.15	USGS projection parameter #13
	40	450	450	1X	Blank fill
	41	451	474	D24.15	USGS projection parameter #14
	42	475	479	5X	Blank fill
	43	480	480	A1	Carriage return
7	44	481	504	D24.15	USGS projection parameter #15
	45	505	505	A1	Blank fill
	46	506	520	A15	"USGSbMAPbZONEb="
	47	521	526	I6	Zone Number
	48	527	559	33X	Blank fill
	49	560	560	A1	Carriage return

Table 4.1-3 – Geometric Record for Panchromatic Band (2 of 3)

Line	Field	Start Byte	End Byte	Format	Description
8	50	561	564	A4	"ULb="
	51	565	565	1X	Blank fill
	52	566	578	A13	Geodetic longitude of upper left corner of product. Longitude is expressed as degrees, minutes, seconds. For example, 5 degrees, 15 minutes, 13.2 seconds west of the prime meridian is expressed as "0051513.2000W"
	53	579	579	1X	Blank fill
	54	580	591	A12	Geodetic latitude of upper left corner of product. Latitude is expressed as degrees, minutes, seconds. For example, 9 degrees, 4 minutes, 24.2334 seconds north of the equator is expressed as "090424.2334N"
	55	592	592	1X	Blank fill
	56	593	605	F13.3	Easting of upper left corner of product in projection units (meters only)
	57	606	606	1X	Blank fill
	58	607	619	F13.3	Northing of upper left corner of product in projection units (meters only)
	59	620	639	20X	Blank fill
	60	640	640	A1	Carriage return
9	61	641	644	A4	"URb="
	62	645	645	1X	Blank fill
	63	646	658	A13	Geodetic longitude of upper right corner of product
	64	659	659	1X	Blank fill
	65	660	671	A12	Geodetic latitude of upper right corner of product
	66	672	672	1X	Blank fill
	67	673	685	F13.3	Easting of upper right corner of product in projection units (meters only)
	68	686	686	1X	Blank fill
	69	687	699	F13.3	Northing of upper right corner of product in projection units (meters only)
	70	700	719	20X	Blank fill
	71	720	720	A1	Carriage return
10	72	721	724	A4	"LRb="
	73	725	725	1X	Blank fill
	74	726	738	A13	Geodetic longitude of lower right corner of product
	75	739	739	1X	Blank fill
	76	740	751	A12	Geodetic latitude of lower right corner of product
	77	752	752	1X	Blank fill
	78	753	765	F13.3	Easting of lower right corner of product in projection units (meters only)
	79	766	766	1X	Blank fill
	80	767	779	F13.3	Northing of lower right corner of product in projection units (meters only)
	81	780	799	20X	Blank fill
	82	800	800	A1	Carriage return
11	83	801	804	A4	"LLb="
	84	805	805	1X	Blank fill
	85	806	818	A13	Geodetic longitude of lower left corner of product
	86	819	819	1X	Blank fill
	87	820	831	A12	Geodetic latitude of lower left corner of product
	88	832	832	1X	Blank fill
	89	833	845	F13.3	Easting of lower left corner of product in projection units (meters only)
	90	846	846	1X	Blank fill
	91	847	859	F13.3	Northing of lower left corner of product in projection units (meters only)
	92	860	879	20X	Blank fill
	93	880	880	A1	Carriage return

Table 4.1-3 – Geometric Record for Panchromatic Band (3 of 3)

Line	Field	Start Byte	End Byte	Format	Description
12	94	881	888	A8	"CENTERb="
	95	889	889	1X	Blank fill
	96	890	902	A13	Product center geodetic longitude expressed in degrees, minutes, seconds, as above. This is the true center of the input imagery from which the product was made, and does not necessarily fall inside the product
	97	903	903	1X	Blank fill
	98	904	915	A12	Product center geodetic latitude expressed in degrees, minutes, seconds, as above. This is the true center of the input imagery from which the product was made, and does not necessarily fall inside the product
	99	916	916	1X	Blank fill
	100	917	929	F13.3	Product center Easting in projection units (meters only)
	101	930	930	1X	Blank fill
	102	931	943	F13.3	Product center Northing in projection units (meters only)
	103	944	944	1X	Blank fill
	104	945	949	I5	Product center pixel number measured from the product upper left corner, rounded to nearest whole pixel
	105	950	950	1X	Blank fill
	106	951	955	I5	Product center line number measured from the product upper left corner, rounded to nearest whole pixel
	107	956	959	4X	Blank fill
	108	960	960	A1	Carriage return
13	109	961	968	A8	"OFFSETb="
	110	969	974	I6	Horizontal offset of the true product from the nominal product center calculated in meters. Calculated as an average (may be negative).
	111	975	994	20A	"bORIENTATIONbANGLEb="
	112	995	1000	F6.2	Nominal (path-oriented) orientation angle in degrees (may be negative) referenced from North Up (map-oriented). North Up (map-oriented) orientation angle will always have a value of 0.0.
	113	1001	1039	39X	Blank fill
	114	1040	1040	A1	Carriage return
14	115	1041	1061	21A	"SUNbELEVATIONbANGLEb="
	116	1062	1065	F4.1	Sun elevation angle in degrees at product center
	117	1066	1085	A20	"bSUNbAZIMUTHbANGLEb="
	118	1086	1090	F5.1	Sun azimuth in degrees at product center
	119	1091	1119	29X	Blank fill
	120	1120	1120	A1	Carriage return
15	121	1121	1199	79X	Blank fill
	122	1200	1200	A1	Carriage return
16	123	1201	1279	79X	Blank fill
	124	1280	1280	A1	Carriage return
17	125	1281	1359	79X	Blank fill
	126	1360	1360	A1	Carriage return
18	127	1361	1439	79X	Blank fill
	128	1440	1440	A1	Carriage return
19	129	1441	1519	79X	Blank fill
	130	1520	1520	A1	Carriage return
20	131	1521	1535	15X	Blank fill
	132	1536	1536	A1	Carriage return

Table 4.1-4 – Administrative Record for VNIR and SWIR Bands (1 of 4)

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	8	A8	"REQbIDb="
	2	9	28	A20	Request number in "NNNYMMDDSSSS_UUUUUb"format where: > NNNYYMMDDSSSS = 13-digit DORRAN order number > NNN = Node indicator > YY = Year > MM = Month > DD = Day > SSSS = Sequence number for the day > UUUUU = 5-digit DORRAN unit number
	3	29	34	A6	"bLOCb="
	4	35	51	A17	First scene location path/row in "ppp/rrrrfssbbbbb" format path/row/fraction/subscene
	5	52	70	A19	"bACQUISITIONbDATEb="
	6	71	78	A8	First scene acquisition date in yyymmdd format
	7	79	79	1X	Blank fill
	8	80	80	A1	Carriage return
2	9	81	91	A11	"SATELLITEb="
	10	92	101	A10	First scene satellite Name: LANDSAT7
	11	102	110	A9	"bSENSORb="
	12	111	120	A10	First scene sensor Name: ETM+
	13	121	134	A14	"bSENSORbMODEb="
	14	135	140	A6	First scene sensor Mode: NORMAL
	15	141	153	A13	"bLOOKbANGLEb="
	16	154	159	F6.2	First scene off-nadir angle in degrees: 0.0
	17	160	160	A1	Carriage return
3	18	161	183	23X	Blank fill
	19	184	194	A11	"bLOCATIONb="
	20	195	211	A17	Last scene ending location in "ppp/rrrrfssbbbbb" format. path/row/fraction/subscene
	21	212	230	A19	"bACQUISITIONbDATEb="
	22	231	238	A8	N/A
	23	239	239	1X	Blank fill
	24	240	240	A1	Carriage return
4	25	241	251	A11	"SATELLITEb="
	26	252	261	A10	N/A
	27	262	270	A9	"bSENSORb="
	28	271	280	A10	N/A
	29	281	294	A14	"bSENSORbMODEb="
	30	295	300	A6	N/A
	31	301	313	A13	"bLOOKbANGLEb="
	32	314	319	F6.2	N/A
	33	320	320	A1	Carriage return
5	34	321	343	23X	Blank fill
	35	344	354	A11	"bLOCATIONb="
	36	355	371	A17	N/A
	37	372	390	A19	"bACQUISITIONbDATEb="
	38	391	398	A8	N/A
	39	399	399	1X	Blank fill
	40	400	400	A1	Carriage return

Table 4.1-4 – Administrative Record for VNIR and SWIR Bands (2 of 4)

Line	Field	Start Byte	End Byte	Format	Description
6	41	401	411	A11	"SATELLITEb="
	42	412	421	A10	N/A
	43	422	430	A9	"bSENSORb="
	44	431	440	A10	N/A
	45	441	454	A14	"bSENSORbMODEb="
	46	455	460	A6	N/A
	47	461	473	A13	"bLOOKbANGLEb="
	48	474	479	F6.2	N/A
	49	480	480	A1	Carriage return
7	50	481	503	23X	Blank fill
	51	504	514	A11	"bLOCATIONb="
	52	515	531	A17	N/A
	53	532	550	A19	"bACQUISITIONbDATEb="
	54	551	558	A8	N/A
	55	559	559	1X	Blank fill
	56	560	560	A1	Carriage return
8	57	561	571	A11	"SATELLITEb="
	58	572	581	A10	N/A
	59	582	590	A9	"bSENSORb="
	60	591	600	A10	N/A
	61	601	614	A14	"bSENSORbMODEb="
	62	615	620	A6	N/A
	63	621	633	A13	"bLOOKbANGLEb="
	64	634	639	F6.2	N/A
	65	640	640	A1	Carriage return
9	66	641	654	A14	"PRODUCTbTYPEb="
	67	655	672	A18	Product type: 'MAPbORIENTEDbbbbbb' 'ORBITbORIENTEDbbbbbb' 'USERbORIENTEDbbbbbb' (NLAPS only) 'TRUENORTHbORIENTED' (NLAPS only)
	68	673	687	A15	"bPRODUCTbSIZEb="
	69	688	697	A10	Product size: 'FULLbSCENE' 'SUBSCENEbb' 'MULTISCENE'
	70	698	719	22X	Blank fill
	71	720	720	A1	Carriage return
10	72	721	740	A20	"TYPEbOFbPROCESSINGb="
	73	741	751	A11	Type of processing used: 'SYSTEMATICb' 'PRECISIONbb' (NLAPS only) 'TERRAINbbbb' (NLAPS only)

Table 4.1-4 – Administrative Record for VNIR and SWIR Bands (3 of 4)

Line	Field	Start Byte	End Byte	Format	Description
	74	752	764	A13	"bRESAMPLINGb="
	75	765	766	A2	Resampling algorithm used: "NN" Nearest Neighbor "CC" Cubic Convolution "MF" Modulation Transfer Function (LPGS only) "BI" Bilinear (NLAPS only) "KD" Kaiser Damped (NLAPS only) "16" 16 Point Sinc (NLAPS only) "8b" 8 Point Sinc (NLAPS only) "DW" Damped Window (NLAPS only)
	76	767	799	33X	Blank fill
	77	800	800	A1	Carriage return
11	78	801	819	A19	"VOLUMEb###bINbSETb="
	79	820	821	I2	Tape volume number in tape set (for multivolume product): N/A
	80	822	822	A1	"I"
	81	823	824	I2	Number of volumes in tape set (for multivolume product): N/A
	82	825	842	A18	"bPIXELs bPER bLINEb="
	83	843	847	I5	Number of pixels per product line for VNIR and SWIR bands
	84	848	864	A17	"bLINES bPER bBANDb="
	85	865	869	I5	Number of lines per VNIR and SWIR bands
	86	870	870	A1	"I"
	87	871	875	I5	Number of lines in output product
	88	876	879	4X	Blank fill
	89	880	880	A1	Carriage return
12	90	881	894	A14	"START bLINEb#b="
	91	895	899	I5	First product line number on this volume (for multivolume product): N/A
	92	900	917	A18	"bBLOCKING bFACTORb="
	93	918	919	I2	Tape blocking factor: N/A
	94	920	931	A12	"bRECB SIZEb="
	95	932	940	I9	Length of physical file record in bytes per VNIR and SWIR bands
	96	941	953	A13	"bPIXEL bSIZEb="
	97	954	959	F6.2	Pixel size in meters for VNIR and SWIR bands
	98	960	960	A1	Carriage return
13	99	961	983	A23	"OUTPUT bBITS bPER bPIXELb="
	100	984	985	I2	Output bits per pixel: 8
	101	986	1011	A26	"bACQUIRED bBITS bPER bPIXELb="
	102	1012	1013	I2	Acquired bits per pixel: 8
	103	1014	1039	26X	Blank fill
	104	1040	1040	A1	Carriage return
14	105	1041	1055	A15	"BANDS bPRESENTb="
	106	1056	1087	A32	Image bands present for the VNIR and SWIR bands group:123457 (or subset)
	107	1088	1119	32X	Blank fill
	108	1120	1120	A1	Carriage return

Table 4.1-4 – Administrative Record for VNIR and SWIR Bands (4 of 4)

Line	Field	Start Byte	End Byte	Format	Description
15	109	1121	1130	A10	"FILENAMEb="
	110	1131	1159	A29	Filename for first band
	111	1160	1169	A10	"FILENAMEb="
	112	1170	1198	A29	Filename for second band
	113	1199	1199	1X	Blank fill
	114	1200	1200	A1	Carriage return
16	115	1201	1210	A10	"FILENAMEb="
	116	1211	1239	A29	Filename for third band
	117	1240	1249	A10	"FILENAMEb="
	117	1250	1278	A29	Filename for fourth band
	119	1279	1279	1X	Blank fill
	120	1280	1280	A1	Carriage return
17	121	1281	1290	A10	"FILENAMEb="
	122	1291	1319	A29	Filename for fifth band
	123	1320	1329	A10	"FILENAMEb="
	124	1330	1358	A29	Filename for sixth band
	125	1359	1359	1X	Blank fill
	126	1360	1360	A1	Carriage return
18	127	1361	1439	79X	Blank fill
	128	1440	1440	A1	Carriage return
19	129	1441	1519	79X	Blank fill
	130	1520	1520	A1	Carriage return
20	131	1521	1532	12X	"REVbbbbbbbbb"
	132	1533	1535	A3	Format version code: L7A
	133	1536	1536	A1	Carriage return

Table 4.1-5 – Radiometric Record for VNIR and SWIR Bands (1 of 2)

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	50	A50	"BIASESbANDbGAINSbINbASCENDINGbBANDbNUMBERbORDER bbb
	2	51	79	29X	Blank fill
	3	80	80	A1	Carriage return
2	4	81	104	D24.15	Bias for first band
	5	105	105	1X	Blank fill
	6	106	129	D24.15	Gain for first band
	7	130	159	30X	Blank fill
	8	160	160	A1	Carriage return
3	9	161	184	D24.15	Bias for second band
	10	185	185	1X	Blank fill
	11	186	209	D24.15	Gain for second band
	12	210	239	30X	Blank fill
	13	240	240	A1	Carriage return
4	14	241	264	D24.15	Bias for third band
	15	265	265	1X	Blank fill
	16	266	289	D24.15	Gain for third band
	17	290	319	30X	Blank fill
	18	320	320	A1	Carriage return
5	19	321	344	D24.15	Bias for fourth band
	20	345	345	1X	Blank fill
	21	346	369	D24.15	Gain for fourth band
	22	370	399	30X	Blank fill
	23	400	400	A1	Carriage return
6	24	401	424	D24.15	Bias for fifth band
	25	425	425	1X	Blank fill
	26	426	449	D24.15	Gain for fifth band
	27	450	479	30X	Blank fill
	28	480	480	A1	Carriage return
7	29	481	504	D24.15	Bias for sixth band
	30	505	505	1X	Blank fill
	31	506	529	D24.15	Gain for sixth band
	32	530	559	30X	Blank fill
	33	560	560	A1	Carriage return
8	34	561	584	D24.15	Bias for seventh band
	35	585	585	1X	Blank fill
	36	586	609	D24.15	Gain for seventh band
	37	610	639	30X	Blank fill
	38	640	640	A1	Carriage return
9	39	641	664	D24.15	Bias for eighth band
	40	665	665	1X	Blank fill
	41	666	689	D24.15	Gain for eighth band
	42	690	719	30X	Blank fill
	43	720	720	A1	Carriage return
10	44	721	799	79X	Blank fill
	45	800	800	A1	Carriage return
11	46	801	879	79X	Blank fill
	47	880	880	A1	Carriage return

Table 4.1-5 – Radiometric Record for VNIR and SWIR Bands (2 of 2)

Line	Field	Start Byte	End Byte	Format	Description
12	48	881	959	79X	Blank fill
	49	960	960	A1	Carriage return
13	50	961	1039	79X	Blank fill
	51	1040	1040	A1	Carriage return
14	52	1041	1119	79X	Blank fill
	53	1120	1120	A1	Carriage return
15	54	1121	1199	79X	Blank fill
	55	1200	1200	A1	Carriage return
16	56	1201	1279	79X	Blank fill
	57	1280	1280	A1	Carriage return
17	58	1281	1359	79X	Blank fill
	59	1360	1360	A1	Carriage return
18	60	1361	1439	79X	Blank fill
	61	1440	1440	A1	Carriage return
19	62	1441	1519	79X	Blank fill
	63	1520	1520	A1	Carriage return
20	64	1521	1535	15X	Blank fill
	65	1536	1536	A1	Carriage return

Table 4.1-6 – Geometric Record for VNIR and SWIR Bands (1 of 3)

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	14	A14	"GEOMETRICbDATA"
	2	15	31	A17	"bMAPbPROJECTIONb="
	3	32	35	A4	Map projection name (see Appendix A for list of mnemonics)
	4	36	47	A12	"bELLIPSOIDb="
	5	48	65	A18	Earth ellipsoid used
	6	66	73	A8	"bDATUMB="
	7	74	79	A6	Datum name
	8	80	80	A1	Carriage return
2	9	81	108	A28	"USGSbPROJECTIONbPARAMETERSb="
	10	109	109	1X	Blank fill
	11	110	133	D24.15	USGS projection parameter #1: Semi-major axis
	12	134	134	1X	Blank fill
	13	135	158	D24.15	USGS projection parameter #2: Semi-minor axis
	14	159	159	1X	Blank fill
	15	160	160	A1	Carriage return
3	16	161	184	D24.15	USGS projection parameter #3
	17	185	185	1X	Blank fill
	18	186	209	D24.15	USGS projection parameter #4
	19	210	210	1X	Blank fill
	20	211	234	D24.15	USGS projection parameter #5
	21	235	239	5X	Blank fill
	22	240	240	A1	Carriage return
4	23	241	264	D24.15	USGS projection parameter #6
	24	265	265	1X	Blank fill
	25	266	289	D24.15	USGS projection parameter #7
	26	290	290	1X	Blank fill
	27	291	314	D24.15	USGS projection parameter #8
	28	315	319	5X	Blank fill
	29	320	320	A1	Carriage return
5	30	321	344	D24.15	USGS projection parameter #9
	31	345	345	1X	Blank fill
	32	346	369	D24.15	USGS projection parameter #10
	33	370	370	1X	Blank fill
	34	371	394	D24.15	USGS projection parameter #11
	35	395	399	5X	Blank fill
	36	400	400	A1	Carriage return
6	37	401	424	D24.15	USGS projection parameter #12
	38	425	425	1X	Blank fill
	39	426	449	D24.15	USGS projection parameter #13
	40	450	450	1X	Blank fill
	41	451	474	D24.15	USGS projection parameter #14
	42	475	479	5X	Blank fill
	43	480	480	A1	Carriage return
7	44	481	504	D24.15	USGS projection parameter #15
	45	505	505	A1	Blank fill
	46	506	520	A15	"USGSbMAPbZONEb="
	47	521	526	I6	Zone Number
	48	527	559	33X	Blank fill

Table 4.1-6 – Geometric Record for VNIR and SWIR Bands (2 of 3)

Line	Field	Start Byte	End Byte	Format	Description
	49	560	560	A1	Carriage return
8	50	561	564	A4	"ULb="
	51	565	565	1X	Blank fill
	52	566	578	A13	Geodetic longitude of upper left corner expressed as degrees, minutes, seconds. For example, 5 degrees, 15 minutes, 13.2 seconds west of the prime meridian is expressed as "0051513.2000W"
	53	579	579	1X	Blank fill
	54	580	591	A12	Geodetic latitude of upper left corner expressed as degrees, minutes, seconds. For example, 9 degrees, 4 minutes, 24.2334 seconds north of the equator is expressed as "090424.2334N"
	55	592	592	1X	Blank fill
	56	593	605	F13.3	Easting of upper left corner of product in projection units (meters only)
	57	606	606	1X	Blank fill
	58	607	619	F13.3	Northing of upper left corner of product in projection units (meters only)
	59	620	639	20X	Blank fill
	60	640	640	A1	Carriage return
9	61	641	644	A4	"URb="
	62	645	645	1X	Blank fill
	63	646	658	A13	Geodetic longitude of upper right corner of product
	64	659	659	1X	Blank fill
	65	660	671	A12	Geodetic Latitude of upper right corner of product
	66	672	672	1X	Blank fill
	67	673	685	F13.3	Easting of upper right corner of product in projection units (meters only)
	68	686	686	1X	Blank fill
	69	687	699	F13.3	Northing of upper right corner of product in projection units (meters only)
	70	700	719	20X	Blank fill
	71	720	720	A1	Carriage return
10	72	721	724	A4	"LRb="
	73	725	725	1X	Blank fill
	74	726	738	A13	Geodetic longitude of lower right corner of product
	75	739	739	1X	Blank fill
	76	740	751	A12	Geodetic latitude of lower right corner of product
	77	752	752	1X	Blank fill
	78	753	765	F13.3	Easting of lower right corner of product in projection units (meters only)
	79	766	766	1X	Blank fill
	80	767	779	F13.3	Northing of lower right corner of product in projection units (meters only)
	81	780	799	20X	Blank fill
	82	800	800	A1	Carriage return
11	83	801	804	A4	"LLb="
	84	805	805	1X	Blank fill
	85	806	818	A13	Geodetic longitude of lower left corner of product
	86	819	819	1X	Blank fill
	87	820	831	A12	Geodetic latitude of lower left corner of product
	88	832	832	1X	Blank fill
	89	833	845	F13.3	Easting of lower left corner of product in projection units (meters only)
	90	846	846	1X	Blank fill
	91	847	859	F13.3	Northing of lower left corner of product in projection units (meters only)
	92	860	879	20X	Blank fill

Table 4.1-6 – Geometric Record for VNIR and SWIR Bands (3 of 3)

Line	Field	Start Byte	End Byte	Format	Description
	93	880	880	A1	Carriage return
12	94	881	888	A8	"CENTERb="
	95	889	889	1X	Blank fill
	96	890	902	A13	Product center geodetic longitude expressed in degrees, minutes, seconds. This is the true center of the input imagery from which the product was made, and does not necessarily fall inside the product
	97	903	903	1X	Blank fill
	98	904	915	A12	Product center geodetic latitude expressed in degrees, minutes, seconds. This is the true center of the input imagery from which the product was made, and does not necessarily fall inside the product
	99	916	916	1X	Blank fill
	100	917	929	F13.3	Product center Easting in projection units (meters only)
	101	930	930	1X	Blank fill
	102	931	943	F13.3	Product center Northing in projection units (meters only)
	103	944	944	1X	Blank fill
	104	945	949	I5	Product center pixel number measured from the product upper left corner, rounded to nearest whole pixel
	105	950	950	1X	Blank fill
	106	951	955	I5	Product center line number measured from the product upper left corner, rounded to nearest whole pixel
	107	956	959	4X	Blank fill
	108	960	960	A1	Carriage return
13	109	961	968	A8	"OFFSETb="
	110	969	974	I6	Horizontal offset of the true product from the nominal product center calculated in meters. Calculated as an average (may be negative).
	111	975	994	20A	"bORIENTATIONbANGLEb="
	112	995	1000	F6.2	Nominal (path-oriented) orientation angle in degrees (may be negative) referenced from North Up (map-oriented). North Up (map-oriented) orientation angle will always have a value of 0.0.
	113	1001	1039	39X	Blank fill
	114	1040	1040	A1	Carriage return
14	115	1041	1061	21A	"SUNbELEVATIONbANGLEb="
	116	1062	1065	F4.1	Sun elevation angle in degrees at product center
	117	1066	1085	A20	"bSUNbAZIMUTHbANGLEb="
	118	1086	1090	F5.1	Sun azimuth in degrees at product center
	119	1091	1119	29X	Blank fill
	120	1120	1120	A1	Carriage return
15	121	1121	1199	79X	Blank fill
	122	1200	1200	A1	Carriage return
16	123	1201	1279	79X	Blank fill
	124	1280	1280	A1	Carriage return
17	125	1281	1359	79X	Blank fill
	126	1360	1360	A1	Carriage return
18	127	1361	1439	79X	Blank fill
	128	1440	1440	A1	Carriage return
19	129	1441	1519	79X	Blank fill
	130	1520	1520	A1	Carriage return
20	131	1521	1535	15X	Blank fill
	132	1536	1536	A1	Carriage return

Table 4.1-7 – Administrative Record for Thermal Bands (1 of 4)

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	8	A8	"REQbIDb="
	2	9	28	A20	Request number in "NNNYMMDDSSSS_UUUUUb"format >where: > NNNYMMDDSSSS = 13-digit DORRAN order number > NNN = Node indicator > YY = Year > MM = Month > DD = Day > SSSS = Sequence number for the day > UUUUU = 5-digit DORRAN unit number
	3	29	34	A6	"bLOCb="
	4	35	51	A17	First scene location path/row in "ppp/rrrrfssbbbbb" format path/row/fraction/subscene
	5	52	70	A19	"bACQUISITIONbDATEb="
	6	71	78	A8	First scene acquisition date in yyymmdd format
	7	79	79	1X	Blank fill
	8	80	80	A1	Carriage return
2	9	81	91	A11	"SATELLITEb="
	10	92	101	A10	First scene satellite Name: LANDSAT7
	11	102	110	A9	"bSENSORb="
	12	111	120	A10	First scene sensor Name: ETM+
	13	121	134	A14	"bSENSORbMODEb="
	14	135	140	A6	First scene sensor Mode: NORMAL
	15	141	153	A13	"bLOOKbANGLEb="
	16	154	159	F6.2	First scene off-nadir angle in degrees: 0.0
	17	160	160	A1	Carriage return
3	18	161	183	23X	Blank fill
	19	184	194	A11	"bLOCATIONb="
	20	195	211	A17	Last scene location path/row in "ppp/rrrrfssbbbbb" format path/row/fraction/subscene
	21	212	230	A19	"bACQUISITIONbDATEb="
	22	231	238	A8	N/A
	23	239	239	1X	Blank fill
	24	240	240	A1	Carriage return
4	25	241	251	A11	"SATELLITEb="
	26	252	261	A10	N/A
	27	262	270	A9	"bSENSORb="
	28	271	280	A10	N/A
	29	281	294	A14	"bSENSORbMODEb="
	30	295	300	A6	N/A
	31	301	313	A13	"bLOOKbANGLEb="
	32	314	319	F6.2	N/A
	33	320	320	A1	Carriage return
5	34	321	343	23X	Blank fill
	35	344	354	A11	"bLOCATIONb="
	36	355	371	A17	N/A
	37	372	390	A19	"bACQUISITIONbDATEb="
	38	391	398	A8	N/A
	39	399	399	1X	Blank fill
	40	400	400	A1	Carriage return

Table 4.1-7 – Administrative Record for Thermal Bands (2 of 4)

Line	Field	Start Byte	End Byte	Format	Description
6	41	401	411	A11	"SATELLITEb="
	42	412	421	A10	N/A
	43	422	430	A9	"bSENSORb="
	44	431	440	A10	N/A
	45	441	454	A14	"bSENSORbMODEb="
	46	455	460	A6	N/A
	47	461	473	A13	"bLOOKbANGLEb="
	48	474	479	F6.2	N/A
	49	480	480	A1	Carriage return
7	50	481	503	23X	Blank fill
	51	504	514	A11	"bLOCATIONb="
	52	515	531	A17	N/A
	53	532	550	A19	"bACQUISITIONbDATEb="
	54	551	558	A8	N/A
	55	559	559	1X	Blank fill
	56	560	560	A1	Carriage return
8	57	561	571	A11	"SATELLITEb="
	58	572	581	A10	N/A
	59	582	590	A9	"bSENSORb="
	60	591	600	A10	N/A
	61	601	614	A14	"bSENSORbMODEb="
	62	615	620	A6	N/A
	63	621	633	A13	"bLOOKbANGLEb="
	64	634	639	F6.2	N/A
	65	640	640	A1	Carriage return
9	66	641	654	A14	"PRODUCTbTYPEb="
	67	655	672	A18	Product type: 'MAPbORIENTEDbbbbbb' 'ORBITbORIENTEDbbbbbb' 'USERbORIENTEDbbbbbb' (NLAPS only) 'TRUENORTHbORIENTED' (NLAPS only)
	68	673	687	A15	"bPRODUCTbSIZEb="
	69	688	697	A10	Product size: 'FULLbSCENE' 'SUBSCENEbb' 'MULTISCENE'
	70	698	719	22X	Blank fill
	71	720	720	A1	Carriage return
10	72	721	740	A20	"TYPEbOFbPROCESSINGb="
	73	741	751	A11	Type of processing used: 'SYSTEMATICb' 'PRECISIONbb' (NLAPS only) 'TERRAINbbbb' (NLAPS only)

Table 4.1-7 – Administrative Record for Thermal Bands (3 of 4)

Line	Field	Start Byte	End Byte	Format	Description
	74	752	764	A13	"bRESAMPLINGb="
	75	765	766	A2	Resampling algorithm used: "NN" Nearest Neighbor "CC" Cubic Convolution "MF" Modulation Transfer Function (LPGS only) "BI" Bilinear (NLAPS only) "KD" Kaiser Damped (NLAPS only) "16" 16 Point Sinc (NLAPS only) "8b" 8 Point Sinc (NLAPS only) "DW" Damped Window (NLAPS only)
	76	767	799	33X	Blank fill
	77	800	800	A1	Carriage return
11	78	801	819	A19	"VOLUMEb###bINbSETb="
	79	820	821	I2	Tape volume number in tape set (for multivolume product): N/A
	80	822	822	A1	"I"
	81	823	824	I2	Number of volumes in tape set (for multivolume product): N/A
	82	825	842	A18	"bPIXELs bPERbLINEb="
	83	843	847	I5	Number of pixels per product line for thermal band
	84	848	864	A17	"bLINESbPERbBANDb="
	85	865	869	I5	Number of lines per thermal band
	86	870	870	A1	"I"
	87	871	875	I5	Number of lines in output product
	88	876	879	4X	Blank fill
	89	880	880	A1	Carriage return
12	90	881	894	A14	"STARTbLINEb#b="
	91	895	899	I5	First product line number on this volume (for multivolume product): N/A
	92	900	917	A18	"bBLOCKINGbFACTORb="
	93	918	919	I2	Tape blocking factor: N/A
	94	920	931	A12	"bRECBbSIZEbb="
	95	932	940	I9	Length of physical file record in bytes per thermal band
	96	941	953	A13	"bPIXELbSIZEb="
	97	954	959	F6.2	Pixel size in meters for thermal band
	98	960	960	A1	Carriage return
13	99	961	983	A23	"OUTPUTbBITSbPERbPIXELb="
	100	984	985	I2	Output bits per pixel: 8
	101	986	1011	A26	"bACQUIREDbBITSbPERbPIXELb="
	102	1012	1013	I2	Acquired bits per pixel: 8
	103	1014	1039	26X	Blank fill
	104	1040	1040	A1	Carriage return
14	105	1041	1055	A15	"BANDSbPRESENTb="
	106	1056	1087	A32	Image bands present for the thermal band group: LH (or subset)
	107	1088	1119	32X	Blank fill
	108	1120	1120	A1	Carriage return

Table 4.1-7 – Administrative Record for Thermal Bands (4 of 4)

Line	Field	Start Byte	End Byte	Format	Description
15	109	1121	1130	A10	"FILENAMEb="
	110	1131	1159	A29	Filename for first band
	111	1160	1169	A10	"FILENAMEb="
	112	1170	1198	A29	Filename for second band
	113	1199	1199	1X	Blank fill
	114	1200	1200	A1	Carriage return
16	115	1201	1210	A10	"FILENAMEb="
	116	1211	1239	A29	Filename for third band
	117	1240	1249	A10	"FILENAMEb="
	117	1250	1278	A29	Filename for fourth band
	119	1279	1279	1X	Blank fill
	120	1280	1280	A1	Carriage return
17	121	1281	1290	A10	"FILENAMEb="
	122	1291	1319	A29	Filename for fifth band
	123	1320	1329	A10	"FILENAMEb="
	124	1330	1358	A29	Filename for sixth band
	125	1359	1359	1X	Blank fill
	126	1360	1360	A1	Carriage return
18	127	1361	1439	79X	Blank fill
	128	1440	1440	A1	Carriage return
19	129	1441	1519	79X	Blank fill
	130	1520	1520	A1	Carriage return
20	131	1521	1532	12X	"REVbbbbbbbbb"
	132	1533	1535	A3	Format version code: L7A
	133	1536	1536	A1	Carriage return

Table 4.1-8 – Radiometric Record for Thermal Bands (1 of 2)

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	50	A50	"BIASESbANDbGAINSbINbASCENDINGbBANDbNUMBERbORDER bbb
	2	51	79	29X	Blank fill
	3	80	80	A1	Carriage return
2	4	81	104	D24.15	Bias for first band
	5	105	105	1X	Blank fill
	6	106	129	D24.15	Gain for first band
	7	130	159	30X	Blank fill
	8	160	160	A1	Carriage return
3	9	161	184	D24.15	Bias for second band
	10	185	185	1X	Blank fill
	11	186	209	D24.15	Gain for second band
	12	210	239	30X	Blank fill
	13	240	240	A1	Carriage return
4	14	241	264	D24.15	Bias for third band
	15	265	265	1X	Blank fill
	16	266	289	D24.15	Gain for third band
	17	290	319	30X	Blank fill
	18	320	320	A1	Carriage return
5	19	321	344	D24.15	Bias for fourth band
	20	345	345	1X	Blank fill
	21	346	369	D24.15	Gain for fourth band
	22	370	399	30X	Blank fill
	23	400	400	A1	Carriage return
6	24	401	424	D24.15	Bias for fifth band
	25	425	425	1X	Blank fill
	26	426	449	D24.15	Gain for fifth band
	27	450	479	30X	Blank fill
	28	480	480	A1	Carriage return
7	29	481	504	D24.15	Bias for sixth band
	30	505	505	1X	Blank fill
	31	506	529	D24.15	Gain for sixth band
	32	530	559	30X	Blank fill
	33	560	560	A1	Carriage return
8	34	561	584	D24.15	Bias for seventh band
	35	585	585	1X	Blank fill
	36	586	609	D24.15	Gain for seventh band
	37	610	639	30X	Blank fill
	38	640	640	A1	Carriage return
9	39	641	664	D24.15	Bias for eighth band
	40	665	665	1X	Blank fill
	41	666	689	D24.15	Gain for eighth band
	42	690	719	30X	Blank fill
	43	720	720	A1	Carriage return
10	44	721	799	79X	Blank fill
	45	800	800	A1	Carriage return
11	46	801	879	79X	Blank fill
	47	880	880	A1	Carriage return

Table 4.1-8 – Radiometric Record for Thermal Bands (2 of 2)

Line	Field	Start Byte	End Byte	Format	Description
12	48	881	959	79X	Blank fill
	49	960	960	A1	Carriage return
13	50	961	1039	79X	Blank fill
	51	1040	1040	A1	Carriage return
14	52	1041	1119	79X	Blank fill
	53	1120	1120	A1	Carriage return
15	54	1121	1199	79X	Blank fill
	55	1200	1200	A1	Carriage return
16	56	1201	1279	79X	Blank fill
	57	1280	1280	A1	Carriage return
17	58	1281	1359	79X	Blank fill
	59	1360	1360	A1	Carriage return
18	60	1361	1439	79X	Blank fill
	61	1440	1440	A1	Carriage return
19	62	1441	1519	79X	Blank fill
	63	1520	1520	A1	Carriage return
20	64	1521	1535	15X	Blank fill
	65	1536	1536	A1	Carriage return

Table 4.1-9 – Geometric Record for Thermal Bands (1 of 3)

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	14	A14	"GEOMETRICbDATA"
	2	15	31	A17	"bMAPbPROJECTIONb="
	3	32	35	A4	Map projection name (see Appendix A for list of mnemonics)
	4	36	47	A12	"bELLIPSOIDb="
	5	48	65	A18	Earth ellipsoid used
	6	66	73	A8	"bDATUMB="
	7	74	79	A6	Datum name
	8	80	80	A1	Carriage return
2	9	81	108	A28	"USGSbPROJECTIONbPARAMETERSb="
	10	109	109	1X	Blank fill
	11	110	133	D24.15	USGS projection parameter #1: Semi-major axis
	12	134	134	1X	Blank fill
	13	135	158	D24.15	USGS projection parameter #2: Semi-minor axis
	14	159	159	1X	Blank fill
	15	160	160	A1	Carriage return
3	16	161	184	D24.15	USGS projection parameter #3
	17	185	185	1X	Blank fill
	18	186	209	D24.15	USGS projection parameter #4
	19	210	210	1X	Blank fill
	20	211	234	D24.15	USGS projection parameter #5
	21	235	239	5X	Blank fill
	22	240	240	A1	Carriage return
4	23	241	264	D24.15	USGS projection parameter #6
	24	265	265	1X	Blank fill
	25	266	289	D24.15	USGS projection parameter #7
	26	290	290	1X	Blank fill
	27	291	314	D24.15	USGS projection parameter #8
	28	315	319	5X	Blank fill
	29	320	320	A1	Carriage return
5	30	321	344	D24.15	USGS projection parameter #9
	31	345	345	1X	Blank fill
	32	346	369	D24.15	USGS projection parameter #10
	33	370	370	1X	Blank fill
	34	371	394	D24.15	USGS projection parameter #11
	35	395	399	5X	Blank fill
	36	400	400	A1	Carriage return
6	37	401	424	D24.15	USGS projection parameter #12
	38	425	425	1X	Blank fill
	39	426	449	D24.15	USGS projection parameter #13
	40	450	450	1X	Blank fill
	41	451	474	D24.15	USGS projection parameter #14
	42	475	479	5X	Blank fill
	43	480	480	A1	Carriage return
7	44	481	504	D24.15	USGS projection parameter #15
	45	505	505	A1	Blank fill
	46	506	520	A15	"USGSbMAPbZONEb="
	47	521	526	I6	" ZONE Number
	48	527	559	33X	Blank fill

Table 4.1-9 – Geometric Record for Thermal Bands (2 of 3)

Line	Field	Start Byte	End Byte	Format	Description
	49	560	560	A1	Carriage return
8	50	561	564	A4	"ULb="
	51	565	565	1X	Blank fill
	52	566	578	A13	Geodetic longitude of upper left corner expressed as degrees, minutes, seconds. For example, 5 degrees, 15 minutes, 13.2 seconds west of the prime meridian is expressed as "0051513.2000W"
	53	579	579	1X	Blank fill
	54	580	591	A12	Geodetic latitude of upper left corner expressed as degrees, minutes, seconds. For example, 9 degrees, 4 minutes, 24.2334 seconds north of the equator is expressed as "090424.2334N"
	55	592	592	1X	Blank fill
	56	593	605	F13.3	Easting of upper left corner of product in projection units (meters only)
	57	606	606	1X	Blank fill
	58	607	619	F13.3	Northing of upper left corner of product in projection units (meters only)
	59	620	639	20X	Blank fill
	60	640	640	A1	Carriage return
9	61	641	644	A4	"URb="
	62	645	645	1X	Blank fill
	63	646	658	A13	Geodetic longitude of upper right corner of product
	64	659	659	1X	Blank fill
	65	660	671	A12	Geodetic latitude of upper right corner of product
	66	672	672	1X	Blank fill
	67	673	685	F13.3	Easting of upper right corner of product in projection units (meters only)
	68	686	686	1X	Blank fill
	69	687	699	F13.3	Northing of upper right corner of product in projection units (meters only)
	70	700	719	20X	Blank fill
	71	720	720	A1	Carriage return
10	72	721	724	A4	"LRb="
	73	725	725	1X	Blank fill
	74	726	738	A13	Geodetic longitude of lower right corner of product
	75	739	739	1X	Blank fill
	76	740	751	A12	Geodetic latitude of lower right corner of product
	77	752	752	1X	Blank fill
	78	753	765	F13.3	Easting of lower right corner of product in projection units (meters only)
	79	766	766	1X	Blank fill
	80	767	779	F13.3	Northing of lower right corner of product in projection units (meters only)
	81	780	799	20X	Blank fill
	82	800	800	A1	Carriage return
11	83	801	804	A4	"LLb="
	84	805	805	1X	Blank fill
	85	806	818	A13	Geodetic longitude of lower left corner of product
	86	819	819	1X	Blank fill
	87	820	831	A12	Geodetic latitude of lower left corner of product
	88	832	832	1X	Blank fill
	89	833	845	F13.3	Easting of lower left corner of product in projection units (meters only)
	90	846	846	1X	Blank fill
	91	847	859	F13.3	Northing of lower left corner of product in projection units (meters only)
	92	860	879	20X	Blank fill

Table 4.1-9 – Geometric Record for Thermal Bands (3 of 3)

Line	Field	Start Byte	End Byte	Format	Description
	93	880	880	A1	Carriage return
12	94	881	888	A8	"CENTERb="
	95	889	889	1X	Blank fill
	96	890	902	A13	Product center geodetic longitude expressed in degrees, minutes, seconds. This is the true center of the input imagery from which the product was made, and does not necessarily fall inside the product
	97	903	903	1X	Blank fill
	98	904	915	A12	Product center geodetic latitude expressed in degrees, minutes, seconds. This is the true center of the input imagery from which the product was made, and does not necessarily fall inside the product
	99	916	916	1X	Blank fill
	100	917	929	F13.3	Product center easting in projection units (meters only)
	101	930	930	1X	Blank fill
	102	931	943	F13.3	Product center northing in projection units (meters only)
	103	944	944	1X	Blank fill
	104	945	949	I5	Product center pixel number measured from the product upper left corner, rounded to nearest whole pixel
	105	950	950	1X	Blank fill
	106	951	955	I5	Product center line number measured from the product upper left corner, rounded to nearest whole pixel
	107	956	959	4X	Blank fill
	108	960	960	A1	Carriage return
13	109	961	968	A8	"OFFSETb="
	110	969	974	I6	Horizontal offset of the true product from the nominal product center calculated in meters Calculated as an average (may be negative) .
	111	975	994	20A	"bORIENTATIONbANGLEb="
	112	995	1000	F6.2	Nominal (path-oriented) orientation angle in degrees (may be negative) referenced from North Up (map-oriented). North Up (map-oriented) orientation angle will always have a value of 0.0.
	113	1001	1039	39X	Blank fill
	114	1040	1040	A1	Carriage return
14	115	1041	1061	21A	"SUNbELEVATIONbANGLEb="
	116	1062	1065	F4.1	Sun elevation angle in degrees at product center
	117	1066	1085	A20	"bSUNbAZIMUTHbANGLEb="
	118	1086	1090	F5.1	Sun azimuth in degrees at product center
	119	1091	1119	29X	Blank fill
	120	1120	1120	A1	Carriage return
15	121	1121	1199	79X	Blank fill
	122	1200	1200	A1	Carriage return
16	123	1201	1279	79X	Blank fill
	124	1280	1280	A1	Carriage return
17	125	1281	1359	79X	Blank fill
	126	1360	1360	A1	Carriage return
18	127	1361	1439	79X	Blank fill
	128	1440	1440	A1	Carriage return
19	129	1441	1519	79X	Blank fill
	130	1520	1520	A1	Carriage return
20	131	1521	1535	15X	Blank fill
	132	1536	1536	A1	Carriage return

4.2 GeoTIFF File Formats

The description of an image in GeoTIFF requires tags and keys as described in Applicable Document 5, Section 2. These tags and keys will be included in the image files and are automatically detected and read by TIFF readers. They are described in the following subsections.

4.2.1 GeoTIFF Tags

TIFF tags convey information about the image and are TIFF's version of metadata. The tags describe the image with information the TIFF reader needs to control the appearance of the image on the user's screen. The TIFF tags are in the same file as the TIFF image.

A complete description of the raster data requires georeferencing of the data, which is accomplished through the use of tags. L7 Level 1 production systems uses the transformation raster and model space tiepoints and scaling parameters. ModelTiepointTag and ModelPixelScaleTag are used for this purpose.

ModelTiepointTag

Tag = 33922

Type = DOUBLE

N = 6*K, K = number of tiepoints

Alias: GeoreferenceTag

Owner: Intergraph

This tag stores the raster-to-model tiepoint pairs in the order

ModelTiepointTag = (... , I, J, K, X, Y, Z...),

where (I, J, K) is the point at location (I, J) in raster space with pixel-value K, and (X, Y, Z) is a vector in model space.

The raster image is georeferenced by specifying its location, size, and orientation in the model coordinate space. Because the relationship between the raster space and the model space often will be an exact, affine transformation, the relationship can be defined using one set of tiepoints and the ModelPixelScaleTag, which gives the vertical and horizontal raster grid cell size.

ModelPixelScaleTag:

Tag = 33550

Type = DOUBLE

N = 3

Owner: SoftDesk

This tag is used to specify the size of raster pixel spacing in the model space units, when the raster space can be embedded in the model space coordinate system without rotation, and consists of the following three values:

ModelPixelScaleTag = (ScaleX, ScaleY, ScaleZ)

where ScaleX and ScaleY give the horizontal and vertical spacing of raster pixels and ScaleZ is used to map the pixel value of a digital elevation model into the correct Z-scale. Scale Z will not be used for Level 1 data since it is only systematically corrected and not corrected for elevation.

A single tiepoint in the ModelTiepointTag, together with the ModelPixelScaleTag, completely determines the relationship between raster and model space.

4.2.2 GeoTIFF Keys

In addition to tags, the description of a projection in GeoTIFF requires the use of keys. The keys necessary to define the projections supported by the L1 production systems, and their possible values, are listed below.

Valid Keys	Possible Values	Meaning
Transverse Mercator (TM)		
GTModelTypeGeoKey	1	ModelTypeProjected (Projection Coordinate System)
GTRasterTypeGeoKey	1	RasterPixellsArea
	2	RasterPixellsPoint
GTCitationGeoKey	(ASCII, 17)	ASCII reference to public documentation
GeographicTypeGeoKey	4326	GCS_WGS_84
GeogLinearUnitsGeoKey	9001	Linear_Meter
	9002	Linear_Foot
GeogAngularUnitsGeoKey	9102	Angular_Degree
ProjectedCSTypeGeoKey	20000 - 32760	EPSG Projection System Codes (see Applicable Document 7 for values)
	32767	User defined
ProjectionGeoKey	10000 - 19999	EPSG/POSC Projection Codes (see Applicable Document 7 for values)
	32767	User defined
ProjNatOriginLatGeoKey		Value in units of GeogAngularUnits
ProjScaleAtNatOriginGeoKey		Value entered as a ratio
ProjCenterLongGeoKey		Value entered in units of GeogAngularUnits
ProjLinearUnitsGeoKey	9001	Linear_Meter
	9002	Linear_Foot
ProjFalseNorthingGeoKey		Value entered in units of ProjLinearUnits
ProjFalseEastingGeoKey		Value entered in units of ProjLinearUnits

Valid Keys	Possible Values	Meaning
Universal Transverse Mercator (UTM)		
GTMModelTypeGeoKey	1	ModelTypeProjected (Projection Coordinate System)
GTRasterTypeGeoKey	1	RasterPixellsArea
	2	RasterPixellsPoint
GTCitationGeoKey	(ASCII, 17)	ASCII reference to public documentation
GeogLinearUnitsGeoKey	9001	Linear_Meter
	9002	Linear_Foot
GeogAngularUnitsGeoKey	9102	Angular_Degree
ProjectedCSTypeGeoKey	20000 - 32760	EPSG Projection System Codes (see Applicable Document 7 for values)
	32767	User defined
Oblique Mercator, Type B (OMB)		
ProjCoordTransGeoKey	3	CT_ObliqueMercator
GTMModelTypeGeoKey	1	ModelTypeProjected (Projection Coordinate System)
GTRasterTypeGeoKey	1	RasterPixellsArea
	2	RasterPixellsPoint
GTCitationGeoKey	(ASCII, 17)	ASCII reference to public documentation
GeographicTypeGeoKey	4326	GCS_WGS_84
GeogLinearUnitsGeoKey	9001	Linear_Meter
	9002	Linear_Foot
GeogAngularUnitsGeoKey	9102	Angular_Degree
GeogAzimuthUnitsGeoKey	9102	Angular_Degree
ProjectedCSTypeGeoKey	20000 - 32760	EPSG Projection System Codes (see Applicable Document 7 for values)
	32767	User defined
ProjectionGeoKey	10000 - 19999	EPSG/POSC Projection Codes (see Applicable Document 7 for values)
	32767	User defined
ProjLinearUnitsGeoKey	9001	Linear_Meter
	9002	Linear_Foot
ProjAzimuthAngleGeoKey		Value in units of GeogAngularUnits
ProjScaleAtNatOriginGeoKey		Value entered as a ratio
ProjCenterLatGeoKey		Value in units of GeogAngularUnits
ProjCenterLongGeoKey		Value in units of GeogAngularUnits
ProjFalseNorthingGeoKey		Value entered in units of ProjLinearUnits
ProjFalseEastingGeoKey		Value entered in units of ProjLinearUnits
Lambert Conformal Conic (LCC)		
ProjCoordTransGeoKey	8	CT_LambertConfConic_2SP
GTMModelTypeGeoKey	1	ModelTypeProjected (Projection Coordinate System)

Valid Keys	Possible Values	Meaning
GTRasterTypeGeoKey	1	RasterPixellsArea
	2	RasterPixellsPoint
GTCitationGeoKey	(ASCII, 17)	ASCII reference to public documentation
GeographicTypeGeoKey	4326	GCS_WGS_84
GeogLinearUnitsGeoKey	9001	Linear_Meter
	9002	Linear_Foot
GeogAngularUnitsGeoKey	9102	Angular_Degree
ProjectedCSTypeGeoKey	20000 - 32760	EPSG Projection System Codes (see Applicable Document 7 for values)
	32767	User defined
ProjectionGeoKey	10000 - 19999	EPSG/POSC Projection Codes (see Applicable Document 7 for values)
	32767	User defined
ProjLinearUnitsGeoKey	9001	Linear_Meter
	9002	Linear_Foot
ProjStdParallel1GeoKey		Value in units of GeogAngularUnits
ProjStdParallel2GeoKey		Value in units of GeogAngularUnits
ProjFalseOriginLongGeoKey		Value in units of GeogAngularUnits (default to 0)
ProjFalseOriginLatGeoKey		Value in units of GeogAngularUnits (default to 0)
ProjNatOriginLatGeoKey		Value in units of GeogAngularUnits
ProjNatOriginLongGeoKey		Value in units of GeogAngularUnits (IAS/LPGS)
ProjCenterLongGeoKey		Value in units of GeogAngularUnits (NLAPS)
ProjFalseNorthingGeoKey		Value entered in units of ProjLinearUnits
ProjFalseEastingGeoKey		Value entered in units of ProjLinearUnits
Polar Stereographic (PS)		
ProjCoordTransGeoKey	15	CT_PolarStereographic
GTRasterTypeGeoKey	1	ModelTypeProjected (Projection Coordinate System)
GTRasterTypeGeoKey	1	RasterPixellsArea
	2	RasterPixellsPoint
GTCitationGeoKey	(ASCII, 17)	ASCII reference to public documentation
GeographicTypeGeoKey	4326	GCS_WGS_84
GeogLinearUnitsGeoKey	9001	Linear_Meter
	9002	Linear_Foot
GeogAngularUnitsGeoKey	9102	Angular_Degree
ProjectedCSTypeGeoKey	20000 - 32760	EPSG Projection System Codes (see Applicable Document 7 for values)
	32767	User defined
ProjectionGeoKey	10000 - 19999	EPSG/POSC Projection Codes (see Applicable Document 7 for values)

Valid Keys	Possible Values	Meaning
	32767	User defined
ProjLinearUnitsGeoKey	9001	Linear_Meter
	9002	Linear_Foot
ProjStraightVertPoleLongGeoKey		Value in units of GeogAngularUnits
ProjNatOriginLatGeoKey		Value in units of GeogAngularUnits
ProjFalseNorthingGeoKey		Value entered in units of ProjLinearUnits
ProjFalseEastingGeoKey		Value entered in units of ProjLinearUnits
Polyconic (PC)		
ProjCoordTransGeoKey	22	CT_Polyconic
GTModelTypeGeoKey	1	ModelTypeProjected (Projection Coordinate System)
GTRasterTypeGeoKey	1	RasterPixellsArea
	2	RasterPixellsPoint
GTCitationGeoKey	(ASCII, 17)	ASCII reference to public documentation
GeographicTypeGeoKey	4326	GCS_WGS_84
GeogLinearUnitsGeoKey	9001	Linear_Meter
	9002	Linear_Foot
GeogAngularUnitsGeoKey	9102	Angular_Degree
ProjectedCSTypeGeoKey	20000 - 32760	EPSG Projection System Codes (see Applicable Document 7 for values)
	32767	User defined
ProjectionGeoKey	10000 - 19999	EPSG/POSC Projection Codes (see Applicable Document 7 for values)
	32767	User defined
ProjCenterLatGeoKey		Value in units of GeogAngularUnits
ProjCenterLongGeoKey		Value in units of GeogAngularUnits
ProjFalseNorthingGeoKey		Value entered in units of ProjLinearUnits
ProjFalseEastingGeoKey		Value entered in units of ProjLinearUnits
ProjLinearUnitsGeokey	9001	Linear_Meter
	9002	Linear_Foot

4.2.3 Level 1 Metadata File

The Level 1 metadata file is created during product generation and contains information specific to the product ordered. Table 4.3-1 lists the full contents of the Level 1 metadata file. This file contains all applicable image description information from the LORp metadata and the Landsat 7 Data Processing System (LPS) metadata provided with the LORp product.

4.3 HDF File Formats

4.3.1 Image Files

Each Earth image band in the requested product is contained in a separate file. The data are laid out in a scan line sequential format in descending detector order (i.e., detector 16 followed by detector 15 and so forth for the 30-m bands). The L1R image is radiometrically corrected but not geometrically resampled. The L1G image is radiometrically corrected and resampled for geometric correction and registration to geographic map projections.

4.3.2 Internal Calibrator Data Files

The IC data files are included only with the L1R output product. The IC data for format 1 consist of scan-line-ordered internal lamp and shutter data for bands 1 through 5 and blackbody radiance and shutter data for band 6L. IC data for format 2 consist of scan-line-ordered internal lamp and shutter data for bands 7 and 8 and black body radiance and shutter data for band 6H. The data are collected once per scan and structured in a band sequential format in detector descending order. The IC data format 1 file is provided with products that include bands 1 through 6 low image data; the format 2 file is provided with products that include bands 6 high through 8. These data are subsetting to correspond to the user-requested product (i.e., by band and product size).

4.3.3 Mirror Scan Correction Data File

The consensus MSCD data file is included only with the L1R output product. Each logical record consists of three data values—the first half scan error, the second half scan error, and the scan line direction, along with scan quality information. This information, which usually applies to the previous scan, is used to compute deviations from nominal scan mirror profiles as measured on the ground and reported in the CPF. One consensus MSCD file is provided. A consensus MSCD file is a single MSCD file, created from the two original files included with the L0Rp product, with errors corrected according to L1 processing algorithms. These data are subsetting to correspond to the user-requested product size. The file structure for the consensus MSCD is described in Applicable Document 4, Section 2 with the exception of the L1-assigned Vdata Name and Vdata class, which are described below.

Vdata Name: "L71ppprrr_rrrYYYYMMDD.MSD"
Vdata Class: LPGS_MSCD

4.3.4 Payload Correction Data File

The consensus PCD data file is included only with the L1R output product. This file consists of attitude and ephemeris profiles as well as high-frequency jitter measurements. One consensus PCD file is provided. A consensus PCD file is a single PCD file created from the two original files included with the L0Rp product and with errors corrected according to L1 processing algorithms. This consensus PCD file will not be subsetting. The file structure for the consensus PCD is described in Applicable Document 4, Section 2 with the exception of the L1-assigned Vdata Name and Vdata class, which are described below.

Vdata Name: "L71pppprrr_rrrYYYYMMDD.PCD"
--

Vdata Class: LPGS_PCD

4.3.5 Scan Line Offsets

The scan line offsets are included only with the L1R output product. The scan line offsets represent the actual starting and ending pixel positions for valid (nonzero fill) Earth image data on a data-line-by-data-line basis. The scan line offset format 1 file is provided with products that include bands 1 through 6 low image data; the format 2 file is provided with products that include bands 6 high through 8. These data are subsetted to correspond to the user-requested product (i.e., by band and product size). The file structure for the scan line offset is described in Applicable Document 4, Section 2 with the exception of the L1-assigned Vdata Name and Vdata class, which are described below.

Vdata Name: "L7fpppprrr_rrrYYYYMMDD.ONN"
--

Vdata Class: LPGS_SLO

4.3.6 Calibration Parameter File

The CPF is a formatted file containing radiometric and geometric processing parameters required for L1 processing. It is provided only with the L1R product, without modification from what was provided with the L0Rp product. A complete description of this file currently exists in the *Landsat 7 System Calibration Parameter File Definition* (See Section 2).

4.3.7 Geolocation Table File

The geolocation table file contains scene corner coordinates and their product-specific scan line numbers and is included only with the L1R product. The file structure for the geolocation table is described in Applicable Document 4, Section 2 with the exception of the L1-assigned Vdata Name and Vdata class, which are described below.

Vdata Name: "L71pppprrr_rrrYYYYMMDD.GEO"
--

Vdata Class: Index

4.3.8 LPS Metadata File

The LPS metadata files are included with the L1R output product without modification from what was provided with the L0Rp product. The metadata format 1 and format 2 files are provided with all L1R products.

Some information in the LPS metadata file pertains to parent subintervals of the L1 product and may not be applicable to L1 products. The file structure for the LPS metadata is described in Applicable Document 4, Section 2 with the exception of the L1-assigned Vdata Name, which is described below.

Vdata Name: "L7fpppprrr_rrrYYYYMMDD.MTA"
--

4.3.9 Level 1 Metadata File

The Level 1 metadata file is created during product generation and contains information specific to the product ordered. Table 4.3-1 lists the full contents of the Level 1 metadata file. This file contains all applicable image description information from the Earth Observing System (EOS) Data and Information System (EOSDIS) Core System (ECS) metadata and the Landsat 7 Data Processing System (LPS) metadata provided with the L0Rp product.

4.3.10 HDF Directory File

The directory file contains all the pointers, file size information, and data objects required to open and process the L1 product using the HDF library and interface routines.

4.3.11 Vgroup Definitions

The Vgroup structure was designed to associate related HDF data objects. Any HDF data object [e.g., Vdata, scientific data sets (SDSs), and attributes] can be included in an HDF Vgroup definition. Vgroups employ Vgroup names and Vgroup classes for characterizing a collection of data objects and for searching activities. Three classes are recognized for the L1 HDF product: image data, correction data, and metadata.

The HDF Vgroup interface consists of routines for accessing and getting information about the L1 product Vgroups. This information is stored in the HDF data directory.

The Vgroups used to relate the different data objects that make up a complete L1 product are presented in Tables 4.3-2 and 4.3-3.

Table 4.3-1 – Level 1 Metadata File (1 of 21)

Vdata Name: "L71ppprrr_rrrYYYYMMDD.MTL"			
Vdata Class: LPGS_Metadata			
Interlace Type: FULL_INTERLACE			
Bytes Per Logical Record: 65536			
Number of Records: One record.			
Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
GROUP	18	= L1_METADATA_FILE	Beginning of first level ODL group. It indicates start of L1 metadata file level group
GROUP	18	= METADATA_FILE_INFO	Beginning of metadata file information group
REQUEST_ID	20	ASCII string indicating the request number in the format: NNNNYYYYMMDDSSSS_UUUUUU where, NNNNYYYYMMDDSSSS = 13-digit DORRAN order number NNN = Node indicator YY = Year MM = Month DD = Day SSSS = Sequence number for the day UUUUU = 5-digit DORRAN unit number	Unique product generation request ID generated by DORRAN
PRODUCT_CREATION_TIME	20	= YYYY-MM-DDThh:mm:ssZ where YYYY = 4-digit Julian year MM = month number of Julian year (01-12) DD = day of Julian month (01-31) T indicates start of time information in ODL ASCII time code format hh = hours (00-23) mm = minutes (00-59) ss = seconds (00-59) Z indicates "Zulu" time (same as GMT)	L1 system date and time when metadata file for L1 product set was created. For ease of human readability, this date and time are presented in ODL ASCII format. Time is expressed as UTC (also known as GMT). Insertion of additional characters "T" and "Z" is required to meet ODL ASCII format
STATION_ID	3	= EDC	Unique 3-letter code identifying originating ground station
LANDSAT7_XBAND	1	= 0, 1, 2, or 3 (0 = unknown)	Landsat 7 X-band used to downlink data to LGS
GROUND_STATION	3	= NNN	Ground station that received data
LPS_PROCESSOR_NUMBER	1	= 1-9	LPS processor number
DATEHOUR_CONTACT_PERIOD	7	= YYDOYHH	Date and hour of contact period
SUBINTERVAL_NUMBER	2	= 00-99	Subinterval number within contact period
END_GROUP	18	= METADATA_FILE_INFO	End of metadata information group

Table 4.3-1 – Level 1 Metadata File (2 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
GROUP	16	= PRODUCT_METADATA	Beginning of product metadata group
PRODUCT_TYPE	3	= L1G = L1R = L1P (NLAPS only) = L1T (NLAPS only)	Identifier to inform user of product type
PROCESSING_SOFTWARE	15	= SYSTEM_VERSION where SYSTEM = IAS, LPGS, NLAPS VERSION = version of software	L1 processing system and software version. Examples: • IAS_4.5 • LPGS_4.3 NLAPS_4.1.9
EPHEMERIS_TYPE	10	= DEFINITIVE = PREDICTIVE	Identifier to inform user of orbital ephemeris type used. If field is not present then the user should assume "PREDICTIVE" in all cases (1G product only)
SPACECRAFT_ID	8	= Landsat7	Name of satellite platform
SENSOR_ID	4	= ETM+	Name of imaging sensor
ACQUISITION_DATE	20	= YYYY-MM-DD	Date image was acquired
WRS_PATH	3	= NNN, where NNN = path number (001-233)	WRS path value for product
STARTING_ROW	3	= NNN, where NNN = row of first full or partial scene in product (001-248)	Starting WRS row
ENDING_ROW	3	= NNN, where NNN = row of last full or partial scene in product (001-248)	Ending WRS row
BAND_COMBINATION	9	= NNNNNNNNN, where NNNNNNNNN = e.g., 123456678 for all bands present, 123-----8 for bands 1, 2, 3, 8. A '-' is a position holder for absent bands	L1-generated indicator of bands present for product ordered. First 6 is format 1, band 6. Second 6 is format 2, band 6
PRODUCT_UL_CORNER_LAT	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision) Positive (+) value indicates North latitude; negative (-) value indicates South latitude	Latitude value for upper left corner of product (L1 systems recalculate for 1G product) (NLAPS bands 1-5, 7 only)
PRODUCT_UL_CORNER_LON	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision) Positive (+) value indicates East longitude; negative (-) value indicates West longitude	Longitude value for upper left corner of product (L1 systems recalculate for 1G product) (NLAPS bands 1-5, 7 only)
PRODUCT_UR_CORNER_LAT	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	Latitude value for upper right corner of product (L1 systems recalculate for 1G product) (NLAPS bands 1-5, 7 only)
PRODUCT_UR_CORNER_LON	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	Longitude value for upper right corner of product (L1 systems recalculate for 1G product) (NLAPS bands 1-5, 7 only)
PRODUCT_LL_CORNER_LAT	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	Latitude value for lower left corner of product (L1 systems recalculate for 1G product) (NLAPS bands 1-5, 7 only)
PRODUCT_LL_CORNER_LON	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	Longitude value for lower left corner of product (L1 systems recalculate for 1G product) (NLAPS bands 1-5, 7 only)
PRODUCT_LR_CORNER_LAT	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	Latitude value for lower right corner of product (L1 systems recalculate for 1G product) (NLAPS bands 1-5, 7 only)

Table 4.3-1 – Level 1 Metadata File (3 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
PRODUCT_LR_CORNER_LON	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	Longitude value for lower right corner of product (L1 systems recalculate for 1G product) (NLAPS bands 1-5, 7 only)
PRODUCT_UL_CORNER_MAPX	14	= -132000000.000 through 132000000.000 Units are feet or meters	Projection X coordinate for upper left corner of product (L1 systems calculated, 1G only) (NLAPS bands 1-5, 7 only)
PRODUCT_UL_CORNER_MAPY	14	= -132000000.000 through 132000000.000 Units are feet or meters	Projection Y coordinate for upper left corner of product (L1 systems calculated, 1G only) (NLAPS bands 1-5, 7 only)
PRODUCT_UR_CORNER_MAPX	14	= -132000000.000 through 132000000.000 Units are feet or meters	Projection X coordinate for upper right corner of product (L1 systems calculated, 1G only) (NLAPS bands 1-5, 7 only)
PRODUCT_UR_CORNER_MAPY	14	= -132000000.000 through 132000000.000 Units are feet or meters	Projection Y coordinate for upper right corner of product (L1 systems calculated, 1G only) (NLAPS bands 1-5, 7 only)
PRODUCT_LL_CORNER_MAPX	14	= -132000000.000 through 132000000.000 Units are feet or meters	Projection X coordinate for lower left corner of product (L1 systems calculated, 1G only) (NLAPS bands 1-5, 7 only)
PRODUCT_LL_CORNER_MAPY	14	= -132000000.000 through 132000000.000 Units are feet or meters	Projection Y coordinate for lower left corner of product (L1 systems calculated, 1G only) (NLAPS bands 1-5, 7 only)
PRODUCT_LR_CORNER_MAPX	14	= -132000000.000 through 132000000.000 Units are feet or meters	Projection X coordinate for lower right corner of product (L1 systems calculated, 1G only) (NLAPS bands 1-5, 7 only)
PRODUCT_LR_CORNER_MAPY	14	= -132000000.000 through 132000000.000 Units are feet or meters	Projection Y coordinate for lower right corner of product (L1 systems calculated, 1G only) (NLAPS bands 1-5, 7 only)
PRODUCT_UL_CORNER_LAT_PAN	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision) Positive (+) value indicates North latitude; negative (-) value indicates South latitude	NLAPS latitude value for upper left corner of product band 8 (Not included with IAS and LPGS)
PRODUCT_UL_CORNER_LON_PAN	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision) Positive (+) value indicates East longitude; negative (-) value indicates West longitude	NLAPS longitude value for upper left corner of product band 8 (Not included with IAS and LPGS)
PRODUCT_UR_CORNER_LAT_PAN	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	NLAPS latitude value for upper right corner of product band 8 (Not included with IAS and LPGS)
PRODUCT_UR_CORNER_LON_PAN	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	NLAPS longitude value for upper right corner of product band 8 (Not included with IAS and LPGS)
PRODUCT_LL_CORNER_LAT_PAN	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	NLAPS latitude value for lower left corner of product band 8 (Not included with IAS and LPGS)
PRODUCT_LL_CORNER_LON_PAN	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	NLAPS longitude value for lower left corner of product band 8 (Not included with IAS and LPGS)
PRODUCT_LR_CORNER_LAT_PAN	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	NLAPS latitude value for lower right corner of product band 8 (Not included with IAS and LPGS)

Table 4.3-1 – Level 1 Metadata File (4 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
PRODUCT_LR_CORNER_LON_PAN	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	NLAPS longitude value for lower right corner of product band 8 (Not included with IAS and LPGS)
PRODUCT_UL_CORNER_MAPX_PAN	14	= -132000000.000 through 132000000.000 Units are feet or meters	NLAPS projection X coordinate for upper left corner of product band 8 (Not included with IAS and LPGS)
PRODUCT_UL_CORNER_MAPY_PAN	14	= -132000000.000 through 132000000.000 Units are feet or meters	NLAPS projection Y coordinate for upper left corner of product band 8 (Not included with IAS and LPGS)
PRODUCT_UR_CORNER_MAPX_PAN	14	= -132000000.000 through 132000000.000 Units are feet or meters	NLAPS projection X coordinate for upper right corner of product band 8 (Not included with IAS and LPGS)
PRODUCT_UR_CORNER_MAPY_PAN	14	= -132000000.000 through 132000000.000 Units are feet or meters	NLAPS projection Y coordinate for upper right corner of product band 8 (Not included with IAS and LPGS)
PRODUCT_LL_CORNER_MAPX_PAN	14	= -132000000.000 through 132000000.000 Units are feet or meters	NLAPS projection X coordinate for lower left corner of product band 8 (Not included with IAS and LPGS)
PRODUCT_LL_CORNER_MAPY_PAN	14	= -132000000.000 through 132000000.000 Units are feet or meters	NLAPS projection Y coordinate for lower left corner of product band 8 (Not included with IAS and LPGS)
PRODUCT_LR_CORNER_MAPX_PAN	14	= -132000000.000 through 132000000.000 Units are feet or meters	NLAPS projection X coordinate for lower right corner of product band 8 (Not included with IAS and LPGS)
PRODUCT_LR_CORNER_MAPY_PAN	14	= -132000000.000 through 132000000.000 Units are feet or meters	NLAPS projection Y coordinate for lower right corner of product band 8 (Not included with IAS and LPGS)
PRODUCT_UL_CORNER_LAT_THM	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision) Positive (+) value indicates North latitude; negative (-) value indicates South latitude	NLAPS latitude value for upper left corner of product bands 61, 62 (Not included with IAS and LPGS)
PRODUCT_UL_CORNER_LON_THM	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision) Positive (+) value indicates East longitude; negative (-) value indicates West longitude	NLAPS longitude value for upper left corner of product bands 61, 62 (Not included with IAS and LPGS)
PRODUCT_UR_CORNER_LAT_THM	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	NLAPS latitude value for upper right corner of product bands 61, 62 (Not included with IAS and LPGS)
PRODUCT_UR_CORNER_LON_THM	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	NLAPS longitude value for upper right corner of product bands 61, 62 (Not included with IAS and LPGS)
PRODUCT_LL_CORNER_LAT_THM	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	NLAPS latitude value for lower left corner of product bands 61, 62 (Not included with IAS and LPGS)
PRODUCT_LL_CORNER_LON_THM	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	NLAPS longitude value for lower left corner of product bands 61, 62 (Not included with IAS and LPGS)
PRODUCT_LR_CORNER_LAT_THM	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	NLAPS latitude value for lower right corner of product bands 61, 62 (Not included with IAS and LPGS)
PRODUCT_LR_CORNER_LON_THM	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	NLAPS longitude value for lower right corner of product bands 61, 62 (Not included with IAS and LPGS)
PRODUCT_UL_CORNER_MAPX_THM	14	= -132000000.000 through 132000000.000 Units are feet or meters	NLAPS projection X coordinate for upper left corner of product bands 61, 62 (Not included with IAS and LPGS)

Table 4.3-1 – Level 1 Metadata File (5 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
PRODUCT_UL_CORNER_MAPY_THM	14	= -132000000.000 through 132000000.000 Units are feet or meters	NLAPS projection Y coordinate for upper left corner of product bands 61, 62 (Not included with IAS and LPGS)
PRODUCT_UR_CORNER_MAPX_THM	14	= -132000000.000 through 132000000.000 Units are feet or meters	NLAPS projection X coordinate for upper right corner of product bands 61, 62 (Not included with IAS and LPGS)
PRODUCT_UR_CORNER_MAPY_THM	14	= -132000000.000 through 132000000.000 Units are feet or meters	NLAPS projection Y coordinate for upper right corner of product bands 61, 62 (Not included with IAS and LPGS)
PRODUCT_LL_CORNER_MAPX_THM	14	= -132000000.000 through 132000000.000 Units are feet or meters	NLAPS projection X coordinate for lower left corner of product bands 61, 62 (Not included with IAS and LPGS)
PRODUCT_LL_CORNER_MAPY_THM	14	= -132000000.000 through 132000000.000 Units are feet or meters	NLAPS projection Y coordinate for lower left corner of product bands 61, 62 (Not included with IAS and LPGS)
PRODUCT_LR_CORNER_MAPX_THM	14	= -132000000.000 through 132000000.000 Units are feet or meters	NLAPS projection X coordinate for lower right corner of product bands 61, 62 (Not included with IAS and LPGS)
PRODUCT_LR_CORNER_MAPY_THM	14	= -132000000.000 through 132000000.000 Units are feet or meters	NLAPS projection Y coordinate for lower right corner of product bands 61, 62 (Not included with IAS and LPGS)
PRODUCT_SAMPLES_PAN	6		Product samples for the panchromatic band
PRODUCT_LINES_PAN	6		Product lines for the panchromatic band
PRODUCT_SAMPLES_REF	6		Product samples for the reflective bands
PRODUCT_LINES_REF	6		Product lines for the reflective bands
PRODUCT_SAMPLES_THM	6		Product samples for the thermal bands
PRODUCT_LINES_THM	6		Product lines for the thermal bands
BAND1_FILE_NAME	29	L71pprrr_rrrYYYYMMDD_B10.XXX (XXX = L1R, L1G, GTF, or FF7)	L1-generated external element file name for band 1, if part of product
BAND2_FILE_NAME	29	L71pprrr_rrrYYYYMMDD_B20.XXX (XXX = L1R, L1G, GTF, or FF7)	L1-generated external element file name for band 2, if part of product
BAND3_FILE_NAME	29	L71pprrr_rrrYYYYMMDD_B30.XXX (XXX = L1R, L1G, GTF, or FF7)	L1-generated external element file name for band 3, if part of product
BAND4_FILE_NAME	29	L71pprrr_rrrYYYYMMDD_B40.XXX (XXX = L1R, L1G, GTF, or FF7)	L1-generated external element file name for band 4, if part of product
BAND5_FILE_NAME	29	L71pprrr_rrrYYYYMMDD_B50.XXX (XXX = L1R, L1G, GTF, or FF7)	L1-generated external element file name for band 5, if part of product
BAND61_FILE_NAME	29	L71pprrr_rrrYYYYMMDD_B61.XXX (XXX = L1R, L1G, GTF, or FF7)	L1-generated external element file name for band 6 format 1, if part of product
BAND62_FILE_NAME	29	L72pprrr_rrrYYYYMMDD_B62.XXX (XXX = L1R, L1G, GTF, or FF7)	L1-generated external element file name for band 6 format 2, if part of product
BAND7_FILE_NAME	29	L72pprrr_rrrYYYYMMDD_B70.XXX (XXX = L1R, L1G, GTF, or FF7)	L1-generated external element file name for band 7, if part of product
BAND8_FILE_NAME	29	L72pprrr_rrrYYYYMMDD_B80.XXX (XXX = L1R, L1G, GTF, or FF7)	L1-generated external element file name for band 8, if part of product

Table 4.3-1 – Level 1 Metadata File (6 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
IC_DATA_F1_FILE_NAME	29	L71pppprrr_rrrYYYYMMDD_CAL.XXX (XXX = L1R)	L1-generated external element file name for format 1 internal calibrator data (1R product only) if part of product
IC_DATA_F2_FILE_NAME	29	L72pppprrr_rrrYYYYMMDD_CAL.XXX (XXX = L1R)	L1-generated external element file name for format 2 internal calibrator data (1R product only) if part of product
SCAN_SHIFTS_F1_FILE_NAME	29	L71pppprrr_rrrYYYYMMDD_SLO.XXX (XXX = L1R)	L1-generated external element file name for format 1 scan line shifts (1R product only) if part of product
SCAN_SHIFTS_F2_FILE_NAME	29	L72pppprrr_rrrYYYYMMDD_SLO.XXX (XXX = L1R)	L1-generated external element file name for format 2 scan line shifts (1R product only) if part of product
MSCD_FILE_NAME	29	L71pppprrr_rrrYYYYMMDD_MSD.XXX (XXX = L1R)	L1-generated external element file name for consensus MSCD (1R product only)
PCD_FILE_NAME	29	L71pppprrr_rrrYYYYMMDD_PCD.XXX (XXX = L1R)	L1-generated external element file name for consensus PCD (1R product only)
METADATA_LPS1_FILE_NAME	29	L71pppprrr_rrrYYYYMMDD_MTA.XXX (XXX = L1R)	L1-generated external element file name for LPS format 1 metadata (1R product only)
METADATA_LPS2_FILE_NAME	29	L72pppprrr_rrrYYYYMMDD_MTA.XXX (XXX = L1R)	L1-generated external element file name for LPS format 2 metadata (1R product only)
METADATA_L1_FILE_NAME	29	L71pppprrr_rrrYYYYMMDD_MTL.XXX (XXX = L1R, L1G, GTF, or FF7)	L1-generated external element file name for L1 metadata
CPF_FILE_NAME	25	L7CPFYYYYMMDD_YYYYMMDD_nn where YYYYMMDD = effective start date and effective end date, respectively nn = incrementing version number within a 90-day period (00-99)	Archive-generated external element file name for IAS CPF
GEOLOCATION_FILE_NAME	29	L71pppprrr_rrrYYYYMMDD_GEO.XXX (XXX = L1R)	L1-generated external element file name for geolocation table (1R product only)
HDF_DIR_FILE_NAME	29	L71pppprrr_rrrYYYYMMDD_HDF.XXX (XXX = L1R or L1G)	L1-generated file name for HDF directory file (HDF products only)
END_GROUP	16	= PRODUCT_METADATA	End of product metadata group
GROUP	16	= MIN_MAX_RADIANCE	Beginning of the min/max radiance group (1G product only)
LMAX_BAND1	7	= NNN.NNN	Maximum achievable spectral radiance value for band 1, if part of product (w/(m ² sr micron)). Also, the spectral radiance corresponding to QCALMAX_BAND1.
LMIN_BAND1	7	= NNN.NNN	Minimum achievable spectral radiance value for band 1, if part of product (w/(m ² sr micron)). Also, the spectral radiance corresponding to QCALMIN_BAND1.
LMAX_BAND2	7	= NNN.NNN	Maximum achievable spectral radiance value for band 2, if part of product (w/(m ² sr micron)). Also, the spectral radiance corresponding to QCALMAX_BAND2.

Table 4.3-1 – Level 1 Metadata File (7 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
LMIN_BAND2	7	= NNN.NNN	Minimum achievable spectral radiance value for band 2, if part of product ($w/(m^2 \text{ sr micron})$). Also, the spectral radiance corresponding to QCALMIN_BAND2.
LMAX_BAND3	7	= NNN.NNN	Maximum achievable spectral radiance value for band 3, if part of product ($w/(m^2 \text{ sr micron})$). Also, the spectral radiance corresponding to QCALMAX_BAND3.
LMIN_BAND3	7	= NNN.NNN	Minimum achievable spectral radiance value for band 3, if part of product ($w/(m^2 \text{ sr micron})$). Also, the spectral radiance corresponding to QCALMIN_BAND3.
LMAX_BAND4	7	= NNN.NNN	Maximum achievable spectral radiance value for band 4, if part of product ($w/(m^2 \text{ sr micron})$). Also, the spectral radiance corresponding to QCALMAX_BAND4.
LMIN_BAND4	7	= NNN.NNN	Minimum achievable spectral radiance value for band 4, if part of product ($w/(m^2 \text{ sr micron})$). Also, the spectral radiance corresponding to QCALMIN_BAND4.
LMAX_BAND5	7	= NNN.NNN	Maximum achievable spectral radiance value for band 5, if part of product ($w/(m^2 \text{ sr micron})$). Also, the spectral radiance corresponding to QCALMAX_BAND5.
LMIN_BAND5	7	= NNN.NNN	Minimum achievable spectral radiance value for band 5, if part of product ($w/(m^2 \text{ sr micron})$). Also, the spectral radiance corresponding to QCALMIN_BAND5.
LMAX_BAND61	7	= NNN.NNN	Maximum achievable spectral radiance value for band 6 format 1, if part of product ($w/(m^2 \text{ sr micron})$). Also, the spectral radiance corresponding to QCALMAX_BAND61.
LMIN_BAND61	7	= NNN.NNN	Minimum achievable spectral radiance value for band 6 format 1, if part of product ($w/(m^2 \text{ sr micron})$). Also, the spectral radiance corresponding to QCALMIN_BAND61.
LMAX_BAND62	7	= NNN.NNN	Maximum achievable spectral radiance value for band 6 format 2, if part of product ($w/(m^2 \text{ sr micron})$). Also, the spectral radiance corresponding to QCALMAX_BAND62.
LMIN_BAND62	7	= NNN.NNN	Minimum achievable spectral radiance value for band 6 format 2, if part of product ($w/(m^2 \text{ sr micron})$). Also, the spectral radiance corresponding to QCALMIN_BAND62.
LMAX_BAND7	7	= NNN.NNN	Maximum achievable spectral radiance value for band 7, if part of product ($w/(m^2 \text{ sr micron})$). Also, the spectral radiance corresponding to QCALMAX_BAND7.

Table 4.3-1 – Level 1 Metadata File (8 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
LMIN_BAND7	7	= NNN.NNN	Minimum achievable spectral radiance value for band 7, if part of product ($w/(m^2 \text{ sr micron})$). Also, the spectral radiance corresponding to QCALMIN_BAND7.
LMAX_BAND8	7	= NNN.NNN	Maximum achievable spectral radiance value for band 8, if part of product ($w/(m^2 \text{ sr micron})$). Also, the spectral radiance corresponding to QCALMAX_BAND8.
LMIN_BAND8	7	= NNN.NNN	Minimum achievable spectral radiance value for band 8, if part of product ($w/(m^2 \text{ sr micron})$). Also, the spectral radiance corresponding to QCALMIN_BAND8.
END_GROUP	16	= MIN_MAX_RADIANCE	End of the min/max radiance group
GROUP	19	= MIN_MAX_PIXEL_VALUE	Beginning of the min/max pixel value group (1G product only)
QCALMAX_BAND1	5	= NNN.N	Maximum possible pixel value for band 1, if part of product (Digital Number (DN)).
QCALMIN_BAND1	5	= NNN.N	Minimum possible pixel value for band 1, if part of product (Digital Number (DN)).
QCALMAX_BAND2	5	= NNN.N	Maximum possible pixel value for band 2, if part of product (Digital Number (DN)).
QCALMIN_BAND2	5	= NNN.N	Minimum possible pixel value for band 2, if part of product (Digital Number (DN)).
QCALMAX_BAND3	5	= NNN.N	Maximum possible pixel value for band 3, if part of product (Digital Number (DN)).
QCALMIN_BAND3	5	= NNN.N	Minimum possible pixel value for band 3, if part of product (Digital Number (DN)).
QCALMAX_BAND4	5	= NNN.N	Maximum possible pixel value for band 4, if part of product (Digital Number (DN)).
QCALMIN_BAND4	5	= NNN.N	Minimum possible pixel value for band 4, if part of product (Digital Number (DN)).
QCALMAX_BAND5	5	= NNN.N	Maximum possible pixel value for band 5, if part of product (Digital Number (DN)).
QCALMIN_BAND5	5	= NNN.N	Minimum possible pixel value for band 5, if part of product (Digital Number (DN)).
QCALMAX_BAND61	5	= NNN.N	Maximum possible pixel value for band 6 format 1, if part of product (Digital Number (DN)).
QCALMIN_BAND61	5	= NNN.N	Minimum possible pixel value for band 6 format 1, if part of product (Digital Number (DN)).
QCALMAX_BAND62	5	= NNN.N	Maximum possible pixel value for band 6 format 2, if part of product (Digital Number (DN)).

Table 4.3-1 – Level 1 Metadata File (9 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
QCALMIN_BAND62	5	= NNN.N	Minimum possible pixel value for band 6 format 2, if part of product (Digital Number (DN)).
QCALMAX_BAND7	5	= NNN.N	Maximum possible pixel value for band 7, if part of product (Digital Number (DN)).
QCALMIN_BAND7	5	= NNN.N	Minimum possible pixel value for band 7, if part of product (Digital Number (DN)).
QCALMAX_BAND8	5	= NNN.N	Maximum possible pixel value for band 8, if part of product (Digital Number (DN)).
QCALMIN_BAND8	5	= NNN.N	Minimum possible pixel value for band 8, if part of product (Digital Number (DN)).
END_GROUP	19	= MIN_MAX_PIXEL_VALUE	End of the min/max pixel value group
GROUP	18	= PRODUCT_PARAMETERS	Beginning of product parameters group (both 1R and 1G products)
CORRECTION_METHOD_GAIN_BAND1	3	= CPF (for CPF gains) = IC (for IC gains)	Correction method used by L1 in creating image for band 1, if part of product
CORRECTION_METHOD_GAIN_BAND2	3	= CPF (for CPF gains) = IC (for IC gains)	Correction method used by L1 in creating image for band 2, if part of product
CORRECTION_METHOD_GAIN_BAND3	3	= CPF (for CPF gains) = IC (for IC gains)	Correction method used by L1 in creating image for band 3, if part of product
CORRECTION_METHOD_GAIN_BAND4	3	= CPF (for CPF gains) = IC (for IC gains)	Correction method used by L1 in creating image for band 4, if part of product
CORRECTION_METHOD_GAIN_BAND5	3	= CPF (for CPF gains) = IC (for IC gains)	Correction method used by L1 in creating image for band 5, if part of product
CORRECTION_METHOD_GAIN_BAND61	3	= CPF (for CPF gains) = IC (for IC gains)	Correction method used by L1 in creating image for band 6 format 1, if part of product
CORRECTION_METHOD_GAIN_BAND62	3	= CPF (for CPF gains) = IC (for IC gains)	Correction method used by L1 in creating image for band 6 format 2, if part of product
CORRECTION_METHOD_GAIN_BAND7	3	= CPF (for CPF gains) = IC (for IC gains)	Correction method used by L1 in creating image for band 7, if part of product
CORRECTION_METHOD_GAIN_BAND8	3	= CPF (for CPF gains) = IC (for IC gains)	Correction method used by L1 in creating image for band 8, if part of product
CORRECTION_METHOD_BIAS	3	= CPF (for CPF gains) = IC (for IC gains)	Correction method used by L1 in creating image
BAND1_GAIN	1	= L (for low gain) = H (for high gain)	Gain state for band 1's first data line, if part of product
BAND2_GAIN	1	= L (for low gain) = H (for high gain)	Gain state for band 2's first data line, if part of product
BAND3_GAIN	1	= L (for low gain) = H (for high gain)	Gain state for band 3's first data line, if part of product
BAND4_GAIN	1	= L (for low gain) = H (for high gain)	Gain state for band 4's first data line, if part of product

Table 4.3-1 – Level 1 Metadata File (10 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
BAND5_GAIN	1	= L (for low gain) = H (for high gain)	Gain state for band 5's first data line, if part of product
BAND6_GAIN1	1	= L (for low gain) = H (for high gain)	Gain state for band 6's first data line, if part of product-format 1
BAND6_GAIN2	1	= L (for low gain) = H (for high gain)	Gain state for band 6's first data line, if part of product-format 2
BAND7_GAIN	1	= L (for low gain) = H (for high gain)	Gain state for band 7's first data line, if part of product
BAND8_GAIN	1	= L (for low gain) = H (for high gain)	Gain state for band 8's first data line, if part of product
BAND1_GAIN_CHANGE	1	= 0 (for no gain change) = + (for low to high) = - (for high to low)	Presence and direction of gain change for band 1, if part of product
BAND2_GAIN_CHANGE	1	= 0 (for no gain change) = + (for low to high) = - (for high to low)	Presence and direction of gain change for band 2, if part of product
BAND3_GAIN_CHANGE	1	= 0 (for no gain change) = + (for low to high) = - (for high to low)	Presence and direction of gain change for band 3, if part of product
BAND4_GAIN_CHANGE	1	= 0 (for no gain change) = + (for low to high) = - (for high to low)	Presence and direction of gain change for band 4, if part of product
BAND5_GAIN_CHANGE	1	= 0 (for no gain change) = + (for low to high) = - (for high to low)	Presence and direction of gain change for band 5, if part of product
BAND6_GAIN_CHANGE1	1	= 0 (for no gain change) = + (for low to high) = - (for high to low)	Presence and direction of gain change for band 6 format 1, if part of product
BAND6_GAIN_CHANGE2	1	= 0 (for no gain change) = + (for low to high) = - (for high to low)	Presence and direction of gain change for band 6 format 2, if part of product
BAND7_GAIN_CHANGE	1	= 0 (for no gain change) = + (for low to high) = - (for high to low)	Presence and direction of gain change for band 7, if part of product
BAND8_GAIN_CHANGE	1	= 0 (for no gain change) = + (for low to high) = - (for high to low)	Presence and direction of gain change for band 8, if part of product
BAND1_SL_GAIN_CHANGE	1-5	= 0 (for no gain change) = 1-12000 (for the scan line number)	Scan line number where the first change in band gain was detected. Physical change actually occurred in the previous scan.
BAND2_SL_GAIN_CHANGE	1-5	= 0 (for no gain change) = 1-12000 (for the scan line number)	Scan line number where the first change in band gain was detected. Physical change actually occurred in the previous scan.
BAND3_SL_GAIN_CHANGE	1-5	= 0 (for no gain change) = 1-12000 (for the scan line number)	Scan line number where the first change in band gain was detected. Physical change actually occurred in the previous scan.
BAND4_SL_GAIN_CHANGE	1-5	= 0 (for no gain change) = 1-12000 (for the scan line number)	Scan line number where the first change in band gain was detected. Physical change actually occurred in the previous scan.
BAND5_SL_GAIN_CHANGE	1-5	= 0 (for no gain change) = 1-12000 (for the scan line number)	Scan line number where the first change in band gain was detected. Physical change actually occurred in the previous scan.

Table 4.3-1 – Level 1 Metadata File (11 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
BAND6_SL_GAIN_CHANGE1	1-5	= 0 (for no gain change) = 1-12000 (for the scan line number)	Scan line number where the first change in band gain was detected. Physical change actually occurred in the previous scan.
BAND6_SL_GAIN_CHANGE2	1-5	= 0 (for no gain change) = 1-12000 (for the scan line number)	Scan line number where the first change in band gain was detected. Physical change actually occurred in the previous scan.
BAND7_SL_GAIN_CHANGE	1-5	= 0 (for no gain change) = 1-12000 (for the scan line number)	Scan line number where the first change in band gain was detected. Physical change actually occurred in the previous scan.
BAND8_SL_GAIN_CHANGE	1-5	= 0 (for no gain change) = 1-12000 (for the scan line number)	Scan line number where the first change in band gain was detected. Physical change actually occurred in the previous scan.
SUN_AZIMUTH	12	= -180.0000000 through 180.0000000 degrees (with 7-digit precision) A positive value indicates angles to the east or clockwise from north. A negative value (-) indicates angles to the west or counterclockwise from north. Leading zeros are not required.	Sun azimuth angle in degrees for image center location at image center acquisition time
SUN_ELEVATION	11	= -90.0000000 through 90.0000000 degrees (with 7-digit precision) A positive value indicates a daytime scene. A negative value (-) indicates a nighttime scene. Leading zeros are not required.	Sun elevation angle in degrees for image center location at image center acquisition time
OUTPUT_FORMAT	10	= FORMAT_VERSION where FORMAT = HDF, NDF, GEOTIFF, FASTL7A VERSION = output format version	Output format and output format version of image. Examples: - HDF_4r1 - NDF_2.00 - GEOTIFF - FASTL7A NOTE: no version included for GEOTIFF and FASTL7A
END_GROUP	18	= PRODUCT_PARAMETERS	End of product parameters group
GROUP	19	= CORRECTIONS_APPLIED	Beginning of corrections applied group
STRIPING_BAND1	20	= NONE = BAND_AVERAGE = REFERENCE_DETECTOR	Indicator of type of striping correction applied for band 1 image, if part of product. <u>NLAPS</u> : BAND_AVERAGE = NASA REFERENCE_DETECTOR = CCRS
STRIPING_BAND2	20	= NONE = BAND_AVERAGE = REFERENCE_DETECTOR	Indicator of type of striping correction applied for band 2 image, if part of product. <u>NLAPS</u> : BAND_AVERAGE = NASA REFERENCE_DETECTOR = CCRS
STRIPING_BAND3	20	= NONE = BAND_AVERAGE = REFERENCE_DETECTOR	Indicator of type of striping correction applied for band 3 image, if part of product. <u>NLAPS</u> : BAND_AVERAGE = NASA REFERENCE_DETECTOR = CCRS
STRIPING_BAND4	20	= NONE = BAND_AVERAGE = REFERENCE_DETECTOR	Indicator of type of striping correction applied for band 4 image, if part of product. <u>NLAPS</u> : BAND_AVERAGE = NASA REFERENCE_DETECTOR = CCRS

Table 4.3-1 – Level 1 Metadata File (12 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
STRIPING_BAND5	20	= NONE = BAND_AVERAGE = REFERENCE_DETECTOR	Indicator of type of striping correction applied for band 5 image, if part of product. <u>NLAPS</u> : BAND_AVERAGE = NASA REFERENCE_DETECTOR = CCRS
STRIPING_BAND61	20	= NONE = BAND_AVERAGE = REFERENCE_DETECTOR	Indicator of type of striping correction applied for band 6 format 1 image, if part of product. <u>NLAPS</u> : BAND_AVERAGE = NASA REFERENCE_DETECTOR = CCRS
STRIPING_BAND62	20	= NONE = BAND_AVERAGE = REFERENCE_DETECTOR	Indicator of type of striping correction applied for band 6 format 2 image, if part of product. <u>NLAPS</u> : BAND_AVERAGE = NASA REFERENCE_DETECTOR = CCRS
STRIPING_BAND7	20	= NONE = BAND_AVERAGE = REFERENCE_DETECTOR	Indicator of type of striping correction applied for band 7 image, if part of product. <u>NLAPS</u> : BAND_AVERAGE = NASA REFERENCE_DETECTOR = CCRS
STRIPING_BAND8	20	= NONE = BAND_AVERAGE = REFERENCE_DETECTOR	Indicator of type of striping correction applied for band 8 image, if part of product. <u>NLAPS</u> : BAND_AVERAGE = NASA REFERENCE_DETECTOR = CCRS
BANDING	1	= Y or N	Indicator of whether image was corrected for banding
COHERENT_NOISE	1	= Y or N	Indicator of whether image was corrected for coherent noise (band 8 only)
MEMORY_EFFECT	1	= Y or N	Indicator of whether image was corrected for memory effect
SCAN_CORRELATED_SHIFT	1	= Y or N	Indicator of whether image was corrected for scan correlated shift
INOPERABLE_DETECTORS	1	= Y or N	Indicator of whether image was corrected for inoperable detectors
DROPPED_LINES	1	= Y or N	Indicator of whether image was corrected for dropped lines
END_GROUP	19	= CORRECTIONS_APPLIED	End of corrections applied group
GROUP	21	= PROJECTION_PARAMETERS	Beginning of projection parameters group (1G product only)
REFERENCE_DATUM	5	= WGS84	Datum used in creating image
REFERENCE_ELLIPSOID	5	= WGS84	Ellipsoid used in creating image
GRID_CELL_SIZE_PAN	6	= 5.00 through 60.000 meters, in increments of 0.001 meters 14.25 – 60.00 (IAS/LPGS) 5.00 – 50.00 (NLAPS)	Grid cell size used in creating image for pan band, if part of product
GRID_CELL_SIZE_THM	6	= 10.0 through 100.00 meters, in increments of 0.001 meters 25.00 – 60.00 (IAS/LPGS) 10.00 – 100.00 (NLAPS)	Grid cell size used in creating image for thermal bands, if part of product
GRID_CELL_SIZE_REF	6	= 10.00 through 60.000 meters, in increments of 0.001 meters 25.00 – 60.00 (IAS/LPGS) 10.00 – 50.00 (NLAPS)	Grid cell size used in creating image for VNIR/SWIR bands, if part of product
ORIENTATION	3	= NOM Nominal Path = NUP North Up = TN True North* = USR User*	Orientation used in creating image * NLAPS Only

Table 4.3-1 – Level 1 Metadata File (13 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
RESAMPLING_OPTION	3	= NN Nearest Neighbor = CC Cubic Convolution = MTF Modulation Transfer Function* = BI Bilinear** = KD Kaiser Damped** = 16 16 Point Sinc** = 8 8 Point Sinc** = DW Damped Window**	Resampling option used in creating image * IAS/LPGS Only ** NLAPS Only
MAP_PROJECTION	4	= AKC Alaska Conformal* = AEA Albers Equal Area* = AZIM Azimuthal* = EQC Equidistant Conic (Type A & B)* = EQUI Equirectangular* = GVNP General Vertical Near Side Perspective* = GNOM Gnomonic* = HAMM Hammer* = IGH Interrupted Goodes Homolosine* = IM Interrupted Mollweide* = LAEA Lambert Azimuthal Equal Area* = LCC Lambert Conformal Conic = MERC Mercator* = MCYL Miller Cylindrical* = MOLL Mollweide* = OEA Oblated Equal Area* = OM Oblique Mercator (Type A & B) = ORTH Orthographic* = PC Polyconic = PS Polar Stereographic = ROBN Robinson* = SINU Sinusoidal* = SOM Space Oblique Mercator (Type A* & B) = STPL State Plane* = STRG Stereographic* = TM Transverse Mercator (Gauss-Krueger) = UTM Universal Transverse Mercator = VDGR Van Der Grinten* = WIV Wagner IV* = WVII Wagner VII*	Map projection used in creating image * NLAPS only
END_GROUP	21	= PROJECTION_PARAMETERS	End of projection parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of AKC
GROUP	14	AKC_PARAMETERS	Beginning of AKC parameters group
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for AKC projection
END_GROUP	14	AKC_PARAMETERS	End of AKC parameters group

Table 4.3-1 – Level 1 Metadata File (14 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of AEA
GROUP	14	AEA_PARAMETERS	Beginning of AEA parameters group
LATITUDE_OF_FIRST_STANDARD_PARALLEL	11	= -90.0 to +90.0	Latitude of first standard parallel
LATITUDE_OF_SECOND_STANDARD_PARALLEL	11	= -90.0 to +90.0	Latitude of second standard parallel
LONGITUDE_OF_CENTRAL_MERIDIAN	12	= -180.0 to +180.0	Longitude of central meridian
LATITUDE_OF_PROJECTION_ORIGIN	11	= -90.0 to +90.0	Latitude of projection origin
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for AEA projection
END_GROUP	14	AEA_PARAMETERS	End of AEA parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of AZIM
GROUP	15	AZIM_PARAMETERS	Beginning of AZIM parameters group
LONGITUDE_OF_CENTER	12	= -180.0 to +180.0	Longitude of center of projection
LATITUDE_OF_CENTER	11	= -90.0 to +90.0	Latitude of center of projection
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for AZIM projection
END_GROUP	15	AZIM_PARAMETERS	End of AZIM parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of EQC
GROUP	14	EQC_PARAMETERS	Beginning of EQC parameters group
LONGITUDE_OF_CENTRAL_MERIDIAN	12	= -180.0 to +180.0	Longitude of central meridian
LATITUDE_OF_PROJECTION_ORIGIN	11	= -90.0 to +90.0	Latitude of projection origin
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for EQC projection
EQC_TYPE	1	= A or B	Value used to indicate type of EQC projection
END_GROUP	14	EQC_PARAMETERS	End of EQC parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of EQCA
GROUP	15	EQCA_PARAMETERS	Beginning of EQCA parameters group
LATITUDE_OF_STANDARD_PARALLEL	11	= -90.0 to +90.0	Latitude of standard parallel
END_GROUP	15	EQCA_PARAMETERS	End of EQCA parameters group

Table 4.3-1 – Level 1 Metadata File (15 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of EQCB
GROUP	15	EQCB_PARAMETERS	Beginning of EQCB parameters group
LATITUDE_OF_FIRST_STANDARD_PARALLEL	11	= -90.0 to +90.0	Latitude of first standard parallel
LATITUDE_OF_SECOND_STANDARD_PARALLEL	11	= -90.0 to +90.0	Latitude of second standard parallel
END_GROUP	15	EQCB_PARAMETERS	End of EQCB parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of EQUI
GROUP	15	EQUI_PARAMETERS	Beginning of EQUI parameters group
LONGITUDE_OF_CENTRAL_MERIDIAN	12	= -180.0 to +180.0	Longitude of central meridian
LATITUDE_OF_TRUE_SCALE	11	= -90.0 to +90.0	Latitude of true scale
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for EQUI projection
END_GROUP	15	EQUI_PARAMETERS	End of EQUI parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of GNOM
GROUP	15	GNOM_PARAMETERS	Beginning of GNOM parameters group
LONGITUDE_OF_CENTER	12	= -180.0 to +180.0	Longitude of center of projection
LATITUDE_OF_CENTER	11	= -90.0 to +90.0	Latitude of center of projection
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for GNOM projection
END_GROUP	15	GNOM_PARAMETERS	End of GNOM parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of GVNP
GROUP	15	GVNP_PARAMETERS	Beginning of GVNP parameters group
HEIGHT	38	= 0 to	Height of perspective point in meters
LONGITUDE_OF_CENTER	12	= -180.0 to +180.0	Longitude of center of projection
LATITUDE_OF_CENTER	11	= -90.0 to +90.0	Latitude of center of projection
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for GVNP projection
END_GROUP	15	GVNP_PARAMETERS	End of GVNP parameters group

Table 4.3-1 – Level 1 Metadata File (16 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of HAMM
GROUP	15	HAMM_PARAMETERS	Beginning of HAMM parameters group
LONGITUDE_OF_CENTRAL_MERIDIAN	12	= -180.0 to +180.0	Longitude of central meridian
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for HAMM projection
END_GROUP	15	HAMM_PARAMETERS	End of HAMM parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of LAEA
GROUP	15	LAEA_PARAMETERS	Beginning of LAEA parameters group
LONGITUDE_OF_CENTER	12	= -180.0 to +180.0	Longitude of center of projection
LATITUDE_OF_CENTER	11	= -90.0 to +90.0	Latitude of center of projection
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for LAEA projection
END_GROUP	15	LAEA_PARAMETERS	End of LAEA parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of LCC
GROUP	14	LCC_PARAMETERS	Beginning of LCC parameters group
LATITUDE_OF_FIRST_STANDARD_PARALLEL	11	= -90.0 to +90.0	Latitude of first standard parallel
LATITUDE_OF_SECOND_STANDARD_PARALLEL	11	= -90.0 to +90.0	Latitude of second standard parallel
LONGITUDE_OF_CENTRAL_MERIDIAN	12	= -180.0 to +180.0	Longitude of central meridian
LATITUDE_OF_PROJECTION_ORIGIN	11	= -90.0 to +90.0	Latitude of projection origin
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for LCC projection
END_GROUP	14	LCC_PARAMETERS	End of LCC parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of MERC
GROUP	15	MERC_PARAMETERS	Beginning of MERC parameters group
LONGITUDE_OF_CENTRAL_MERIDIAN	12	= -180.0 to +180.0	Longitude of central meridian
LATITUDE_OF_TRUE_SCALE	11	= -90.0 to +90.0	Latitude of true scale
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for MERC projection
END_GROUP	15	MERC_PARAMETERS	End of MERC parameters group

Table 4.3-1 – Level 1 Metadata File (17 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of MCYL
GROUP	15	MCYL_PARAMETERS	Beginning of MCYL parameters group
LONGITUDE_OF_CENTRAL_MERIDIAN	12	= -180.0 to +180.0	Longitude of central meridian
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for MCYL projection
END_GROUP	15	MCYL_PARAMETERS	End of MCYL parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of MOLL
GROUP	15	MOLL_PARAMETERS	Beginning of MOLL parameters group
LONGITUDE_OF_CENTRAL_MERIDIAN	12	= -180.0 to +180.0	Longitude of central meridian
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for MOLL projection
END_GROUP	15	MOLL_PARAMETERS	End of MOLL parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of OEA
GROUP	14	OEA_PARAMETERS	Beginning of OEA parameters group
HORIZONTAL_FLATNESS			Horizontal flatness of the oblong region
VERTICAL_FLATNESS			Vertical flatness of the oblong region
LONGITUDE_OF_CENTER	12	= -180.0 to +180.0	Longitude of center of projection
LATITUDE_OF_CENTER	11	= -90.0 to +90.0	Latitude of center of projection
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for OEA projection
ANGLE		= 0 to 360	Direction of an axis of the oblong region
END_GROUP	14	OEA_PARAMETERS	End of OEA parameters group
Projection parameters data (not a Level1 metadata parameter)			The following parameters are included only with products that select a map projection of OM
GROUP	13	OM_PARAMETERS	Beginning of OM parameters group
SCALE_FACTOR_AT_CENTER_OF_PROJECTION	9	= 0.0 to 2.0	Scale factor at center of projection
LATITUDE_OF_PROJECTION_ORIGIN	11	= -90.0 to +90.0	Latitude of projection origin
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for OM projection
OM_TYPE	1	= A or B	Value used to indicate type of OM projection
END_GROUP	13	OM_PARAMETERS	End of OM parameters group

Table 4.3-1 – Level 1 Metadata File (18 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
Projection parameters data (not a Level1 metadata parameter)			The following parameters are included only with products that select a map projection of OMA
GROUP	14	OMA_PARAMETERS	Beginning of OMA parameters group
LONGITUDE_FIRST_POINT_GEODETTIC	12	= -180.0 to +180.0	Longitude of first point defining central geodetic line of projection
LATITUDE_FIRST_POINT_GEODETTIC	11	= -90.0 to +90.0	Latitude of first point defining central geodetic line of projection
LONGITUDE_SECOND_POINT_GEODETTIC	12	= -180.0 to +180.0	Longitude of second point defining central geodetic line of projection
LATITUDE_SECOND_POINT_GEODETTIC	11	= -90.0 to +90.0	Latitude of second point defining central geodetic line of projection
END_GROUP	14	OMA_PARAMETERS	End of OMA parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of OMB
GROUP	14	OMB_PARAMETERS	Beginning of OMB parameters group
ANGLE_OF_AZIMUTH	12	= -180.0 to +180.0	Angle of azimuth east of north for central line of projection
LONGITUDE_ALONG_PROJECTION	12	= -180.0 to +180.0	Longitude of point along central line of projection at which angle of azimuth is measured
END_GROUP	14	OMB_PARAMETERS	End of OMB parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of ORTH
GROUP	15	ORTH_PARAMETERS	Beginning of ORTH parameters group
LONGITUDE_OF_CENTER	12	= -180.0 to +180.0	Longitude of center of projection
LATITUDE_OF_CENTER	11	= -90.0 to +90.0	Latitude of center of projection
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for ORTH projection
END_GROUP	15	ORTH_PARAMETERS	End of ORTH parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of PC
GROUP	13	PC_PARAMETERS	Beginning of PC parameters group
LONGITUDE_OF_CENTRAL_MERIDIAN	12	= -180.0 to +180.0	Longitude of central meridian
LATITUDE_OF_PROJECTION_ORIGIN	11	= -90.0 to +90.0	Latitude of projection origin
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for PC projection
END_GROUP	13	PC_PARAMETERS	End of PC parameters group

Table 4.3-1 – Level 1 Metadata File (19 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of PS
GROUP	13	PS_PARAMETERS	Beginning of PS parameters group
VERTICAL_LONGITUDE_FROM_POLE	12	= -180.0 to +180.0	Vertical longitude from pole
LATITUDE_OF_TRUE_SCALE	11	= -90.0 to +90.0	Latitude of true scale
FALSE_EASTING	18	= -1.0×10^8 to $+1.0 \times 10^8$	False easting
FALSE_NORTHING	18	= -1.0×10^8 to $+1.0 \times 10^8$	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for PS projection
END_GROUP	13	PS_PARAMETERS	End of PS parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of ROBN
GROUP	15	ROBN_PARAMETERS	Beginning of ROBN parameters group
LONGITUDE_OF_CENTRAL_MERIDIAN	12	= -180.0 to +180.0	Longitude of central meridian
FALSE_EASTING	18	= -1.0×10^8 to $+1.0 \times 10^8$	False easting
FALSE_NORTHING	18	= -1.0×10^8 to $+1.0 \times 10^8$	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for ROBN projection
END_GROUP	15	ROBN_PARAMETERS	End of ROBN parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of SINU
GROUP	15	SINU_PARAMETERS	Beginning of SINU parameters group
LONGITUDE_OF_CENTRAL_MERIDIAN	12	= -180.0 to +180.0	Longitude of central meridian
FALSE_EASTING	18	= -1.0×10^8 to $+1.0 \times 10^8$	False easting
FALSE_NORTHING	18	= -1.0×10^8 to $+1.0 \times 10^8$	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for SINU projection
END_GROUP	15	SINU_PARAMETERS	End of SINU parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of SOM
GROUP	14	SOM_PARAMETERS	Beginning of SOM parameters group
FALSE_EASTING	18	= -1.0×10^8 to $+1.0 \times 10^8$	False easting
FALSE_NORTHING	18	= -1.0×10^8 to $+1.0 \times 10^8$	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for SOM projection
SOM_TYPE	1	= A or B	Value used to indicate type of SOM projection
END_GROUP	14	SOM_PARAMETERS	End of SOM parameters group

Table 4.3-1 – Level 1 Metadata File (20 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of SOMA
GROUP	15	SOMA_PARAMETERS	Beginning of SOMA parameters group
INCLINATION_ANGLE	11	=	Inclination of orbit at ascending node
LONGITUDE_OF_ASCENDING	11	=	Longitude of ascending orbit
SATELLITE_REVOLUTION			Period of satellite revolution in minutes
LANDSAT_RATIO			Ratio to compensate for northern end of orbit
PATH_FLAG	1	= 0 or 1	End of path flag for Landsat
END_GROUP	15	SOMA_PARAMETERS	End of SOMA parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of SOMB
GROUP	15	SOMB_PARAMETERS	Beginning of SOMB parameters group
LANDSAT_NUMBER	1		Number of the Landsat satellite
PATH	3	= 1 to 233	Path number the satellite was on
END_GROUP	15	SOMB_PARAMETERS	End of SOMB parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of STRG
GROUP	15	STRG_PARAMETERS	Beginning of STRG parameters group
LONGITUDE_OF_CENTER	12	= -180.0 to +180.0	Longitude of center of projection
LATITUDE_OF_CENTER	11	= -90.0 to +90.0	Latitude of center of projection
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for STRG projection
END_GROUP	15	STRG_PARAMETERS	End of STRG parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of TM
GROUP	13	TM_PARAMETERS	Beginning of TM parameters group
SCALE_FACTOR_AT_CENTRAL_MERIDIAN	11	= 0.0 to 2.0	Scale factor at central meridian
LONGITUDE_OF_CENTRAL_MERIDIAN	12	= -180.0 to +180.0	Longitude of central meridian
LATITUDE_OF_PROJECTION_ORIGIN	11	= -90.0 to +90.0	Latitude of projection origin
FALSE_EASTING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False easting
FALSE_NORTHING	18	= -1.0x10 ⁸ to +1.0x10 ⁸	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for TM projection
END_GROUP	13	TM_PARAMETERS	End of TM parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of UTM
GROUP	14	UTM_PARAMETERS	Beginning of UTM parameters group
ZONE_NUMBER	3	= 1 to 60 or -1 to -60	Value used to indicate zone number
END_GROUP	13	UTM_PARAMETERS	End of UTM parameters group

Table 4.3-1 – Level 1 Metadata File (21 of 21)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of VDGR
GROUP	15	VDGR_PARAMETERS	Beginning of VDGR parameters group
LONGITUDE_OF_CENTRAL_MERIDIAN	12	= -180.0 to +180.0	Longitude of central meridian
LATITUDE_OF_PROJECTION_ORIGIN	11	= -90.0 to +90.0	Latitude of projection origin
FALSE_EASTING	18	= -1.0×10^8 to $+1.0 \times 10^8$	False easting
FALSE_NORTHING	18	= -1.0×10^8 to $+1.0 \times 10^8$	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for EQC projection
END_GROUP	15	VDGR_PARAMETERS	End of VDGR parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of WIV
GROUP	14	WIV_PARAMETERS	Beginning of WIV parameters group
LONGITUDE_OF_CENTRAL_MERIDIAN	12	= -180.0 to +180.0	Longitude of central meridian
FALSE_EASTING	18	= -1.0×10^8 to $+1.0 \times 10^8$	False easting
FALSE_NORTHING	18	= -1.0×10^8 to $+1.0 \times 10^8$	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for WIV projection
END_GROUP	14	WIV_PARAMETERS	End of WIV parameters group
Projection parameters data (not a Level 1 metadata parameter)			The following parameters are included only with products that select a map projection of WVII
GROUP	15	WVII_PARAMETERS	Beginning of WVII parameters group
LONGITUDE_OF_CENTRAL_MERIDIAN	12	= -180.0 to +180.0	Longitude of central meridian
FALSE_EASTING	18	= -1.0×10^8 to $+1.0 \times 10^8$	False easting
FALSE_NORTHING	18	= -1.0×10^8 to $+1.0 \times 10^8$	False northing
FALSE_EASTING_NORTHING_UNITS	6	= meters or feet	Units for false easting and northing for MOLL projection
END_GROUP	15	WVII_PARAMETERS	End of WVII parameters group
END_GROUP	148	L1_METADATA_FILE	End of Level 1 metadata file level group
END			Required standalone parameter signifying file end

*ASCII bytes

Table 4.3-2 – Vgroup Definitions: Level 1R Product (1 of 2)

Vgroup Name	Vgroup Class	Object Name	Type	Description
Scene_Data_Ref	Image_Data	L71ppprrr_rrrYYYYMMDD.B10	SDS	ETM+ band 1 data
		L71ppprrr_rrrYYYYMMDD.B20	SDS	ETM+ band 2 data
		L71ppprrr_rrrYYYYMMDD.B30	SDS	ETM+ band 3 data
		L71ppprrr_rrrYYYYMMDD.B40	SDS	ETM+ band 4 data
		L71ppprrr_rrrYYYYMMDD.B50	SDS	ETM+ band 5 data
		L72ppprrr_rrrYYYYMMDD.B70	SDS	ETM+ band 7 data
		L71ppprrr_rrrYYYYMMDD.GEO	Vdata	Geolocation table
Scene_Data_Thm	Image_Data	L71ppprrr_rrrYYYYMMDD.B60	SDS	ETM+ band 6 low gain data
		L72ppprrr_rrrYYYYMMDD.B60	SDS	ETM+ band 6 high gain data
		L71ppprrr_rrrYYYYMMDD.GEO	Vdata	Geolocation table
Scene_Data_Pan	Image_Data	L72ppprrr_rrrYYYYMMDD.B80	SDS	ETM+ band 8 data
		L71ppprrr_rrrYYYYMMDD.GEO	Vdata	Geolocation table
IC_Data_Ref	Correction_Data	L71ppprrr_rrrYYYYMMDD.C10	SDS	IC data band 1
		L71ppprrr_rrrYYYYMMDD.C20	SDS	IC data band 2
		L71ppprrr_rrrYYYYMMDD.C30	SDS	IC data band 3
		L71ppprrr_rrrYYYYMMDD.C40	SDS	IC data band 4
		L71ppprrr_rrrYYYYMMDD.C50	SDS	IC data band 5
		L72ppprrr_rrrYYYYMMDD.C70	SDS	IC data band 7
		L71ppprrr_rrrYYYYMMDD.GEO	Vdata	Geolocation table
IC_Data_Thm	Correction_Data	L71ppprrr_rrrYYYYMMDD.C60	SDS	IC data band 6 low gain
		L72ppprrr_rrrYYYYMMDD.C60	SDS	IC data band 6 high gain
		L71ppprrr_rrrYYYYMMDD.GEO	Vdata	Geolocation table
IC_Data_Pan	Correction_Data	L72ppprrr_rrrYYYYMMDD.C80	SDS	IC data band 8
		L71ppprrr_rrrYYYYMMDD.GEO	Vdata	Geolocation table
Scan_Line_Offsets_Ref	Correction_Data	L71ppprrr_rrrYYYYMMDD.O10	Vdata	Scan line offsets band 1
		L71ppprrr_rrrYYYYMMDD.O20	Vdata	Scan line offsets band 2
		L71ppprrr_rrrYYYYMMDD.O30	Vdata	Scan line offsets band 3
		L71ppprrr_rrrYYYYMMDD.O40	Vdata	Scan line offsets band 4
		L71ppprrr_rrrYYYYMMDD.O50	Vdata	Scan line offsets band 5
		L72ppprrr_rrrYYYYMMDD.O70	Vdata	Scan line offsets band 7
		L71ppprrr_rrrYYYYMMDD.GEO	Vdata	Geolocation table
Scan_Line_Offsets_Thm	Correction_Data	L71ppprrr_rrrYYYYMMDD.O60	Vdata	Scan line offsets band 6 low gain
		L72ppprrr_rrrYYYYMMDD.O60	Vdata	Scan line offsets band 6 high gain
		L71ppprrr_rrrYYYYMMDD.GEO	Vdata	Geolocation table
Scan_Line_Offsets_Pan	Correction_Data	L72ppprrr_rrrYYYYMMDD.O80	Vdata	Scan line offsets band 8
		L71ppprrr_rrrYYYYMMDD.GEO	Vdata	Geolocation table
PCD	Correction_Data	L71ppprrr_rrrYYYYMMDD.PCD	Vdata	Consensus PCD
MSCD	Correction_Data	L71ppprrr_rrrYYYYMMDD.MSD	Vdata	Consensus MSCD

Table 4.3-2 – Vgroup Definitions: Level 1R Product (2 of 2)

Vgroup Name	Vgroup Class	Object Name	Type	Description
Product_Metadata	Metadata	L71ppprrr_rrrYYYYMMDD.MTA	Vdata	LPS metadata format 1
		L72ppprrr_rrrYYYYMMDD.MTA	Vdata	LPS metadata format 2
		L71ppprrr_rrrYYYYMMDD.MTL	Vdata	Level 1-product-specific metadata
CPF	Correction_Data	L7CPFYYYYMMDD_YYYYMMDD_nn	Vdata	IAS CPF

Table 4.3-3 – Vgroup Definitions: Level 1G Product

Vgroup Name	Vgroup Class	Object Name	Type	Description
Scene_Data_Ref	Image_Data	L71ppprrr_rrrYYYYMMDD.B10	SDS	ETM+ band 1 data
		L71ppprrr_rrrYYYYMMDD.B20	SDS	ETM+ band 2 data
		L71ppprrr_rrrYYYYMMDD.B30	SDS	ETM+ band 3 data
		L71ppprrr_rrrYYYYMMDD.B40	SDS	ETM+ band 4 data
		L71ppprrr_rrrYYYYMMDD.B50	SDS	ETM+ band 5 data
		L72ppprrr_rrrYYYYMMDD.B70	SDS	ETM+ band 7 data
Scene_Data_Thm	Image_Data	L71ppprrr_rrrYYYYMMDD.B60	SDS	ETM+ band 6 low gain data
		L72ppprrr_rrrYYYYMMDD.B60	SDS	ETM+ band 6 high gain data
Scene_Data_Pan	Image_Data	L72ppprrr_rrrYYYYMMDD.B80	SDS	ETM+ band 8 data
Product_Metadata	Metadata	L71ppprrr_rrrYYYYMMDD.MTL	Vdata	Level 1-product-specific metadata

Section 5 - Product Packaging

L1R and L1G products are available on 8-millimeter (mm) tape and Compact Disc Read-Only Memory (CD-ROM). L1G products are available on 8-mm tape, CD-ROM, and via electronic transfer. The following sections provide information on each of the distribution methods for the available L1 product formats.

5.1 8-mm Tape

Tapes are available only in high-density mode. They will be created with the UNIX utility tar. The first file on 8-mm tape is the L1 volume descriptor (read-me file). The filenames for the read-me files for each of the L1 product formats is README.HDF, README.GTF, README.FF7, and README.NDF. See Appendix B for the HDF sample of the read-me file. The no-swap device and a blocking factor of 20 512-byte blocks are used to maximize portability between platforms.

The 8-mm tape labels will include at least the following information: mission indicator (i.e., Landsat 7), start path, start row, end row, acquisition date, and product type (e.g., HDF, GeoTIFF, FAST, or NDF). The path, row, and acquisition date information is supplied in the format of the naming convention of the base part of filenames as defined in Section 3.

5.2 CD-ROM

The CD-ROM format also contains the L1 volume descriptor (read-me file) with the same file names as listed in the section above. Only single scene (or less) products will be written to CD-ROM due to the size of the Band 8 file. If an HDF L1 product must be written to more than one CD, there will be an HDF directory written to each CD. If a FAST L1 product must be written to more than one CD, relevant header records will be replicated.

At least the following information will be labeled directly onto the CD-ROM: product type (e.g., HDF, GeoTIFF, FAST, or NDF), Distributed Ordering Research Reporting and Accounting Network (DORRAN) order number, DORRAN unit number, CD-ROM volume number, start path, start row, end row, acquisition date, and the United States Geological Survey (USGS) logo. The path, row, and acquisition date information is supplied in the format of the naming convention of the base part of filenames as defined in Section 3.

5.3 Electronic Transfer

Products available via electronic transfer will also include the L1 volume descriptor (read-me file) with the same filenames as listed above.

Section 6 - Software Tools

A variety of public domain software tools are available for processing the L1 distribution product in either an HDF or independent computing environment.

6.1 NCSA HDF Libraries

HDF is a library- and platform-independent data format for the storage and exchange of scientific data. It includes Fortran and C calling interfaces and utilities for analyzing and converting HDF data files. HDF is developed and supported by National Center for Supercomputing Applications (NCSA) and is available in the public domain.

The HDF library contains two parts: the base library and the multi-file library. The base library contains a general purpose interface and application-level interfaces, one for each data structure type. Each application-level interface is specifically designed to read, write, and manipulate one type. The general purpose interface contains functions, such as file input/output (I/O), error handling, memory management, and physical storage. HDF library functions can be called from C or Fortran user application programs.

HDF source code for UNIX, Virtual Memory Storage (VMS), Windows NT/95, and Macintosh is available via anonymous file transfer protocol (ftp) from <http://hdf.ncsa.uiuc.edu/obtain.html>. HDF reference manuals, user guides, release notes, and newsletters are web accessible at <http://hdf.ncsa.uiuc.edu>.

6.2 HDF Libraries

HDF-EOS is standard HDF with ECS conventions and metadata added. The principal distinction is the specification of three geolocation data types: point, grid, and swath, which allow the file contents to be queried by Earth coordinates and time using the HDF application programming interface (API). The Landsat 7 OR distribution product does not employ either of these data structures. However, any application that makes use of the HDF-EOS API will, as a consequence of linking to the API, have access to the NCSA native base libraries that can be used to access the distribution OR product.

EOSView is a file-viewing tool developed for the ECS Project to examine and verify HDF data files. This tool enables users of EOS data products to view the contents of HDF files and individual objects via straightforward product access and display tools. Supported record types for viewing and display capability include images, multidimensional arrays, text, Vdatas, and Vgroups. EOSView users see the underlying HDF structures and are prompted for which parts of the structure they wish to view.

Users of the Landsat 7 OR product may also find the Science Data Production (SDP) Toolkit useful for follow-on processing. The SDP Toolkit consists of a set of fully tested and reliable C and Fortran language functions, customized for application to ECS product generation software. Of particular interest to Landsat 7 data users is the object description language (ODL) parser,

which allows for reading, writing, and manipulating product metadata and the digital elevation model software tools.

The SDP Toolkit and HDF libraries are available via anonymous ftp from [edhs1.gsfc.nasa.gov](ftp://edhs1.gsfc.nasa.gov). Because this software was developed under a NASA contract and is intended for the use of EOS instrument teams and science investigators, access to download it is password protected. The password may be obtained by E-mail to pgstlkit@eos.hitc.com.

6.3 ODL Parser

The ODL parser (Version 1.0) incorporated into the SDP Toolkit was originally implemented by the University of Colorado's Laboratory for Atmospheric and Space Physics (LASP). The Jet Propulsion Laboratory (JPL) enhanced the ODL parser in building their Planetary Data System. This enhanced version, available via anonymous ftp from <ftp://miranda.colorado.edu> (IP address: 128.128.137.33), was modified by IAS. It is this IAS-modified version that LPGS uses.

The IAS-modified version should be particularly useful to those operating in a non-HDF-EOS environment. The software stands alone and can be used to read the L0Rp or L1 metadata external elements and the CPF.

Appendix A - Projection Parameters

This appendix contains the map projection parameters used in the Level 1 FAST-L7A L1G products (Table A-1) and the USGS Projection Parameters (Table A-2).

Table A-1 – L1G FAST-L7A Projection Parameters

Project Name	Mnemonic
Alaska Conformal	AKC*
Albers Equal Area	AEA*
Azimuthal	AZIM*
Equidistant Conic (Type A & B)	EQC*
Equirectangular	EQUI*
General Vertical Near Side Perspective	GVNP*
Gnomonic	GNOM*
Hammer	HAMM*
Interrupted Goodes Homolosine	IGH*
Interrupted Mollweide	IM*
Lambert Azimuthal Equal Area	LAEA*
Lambert Conformal Conic	LCC
Mercator	MERC*
Miller Cylindrical	MCYL*
Mollweide	MOLL*
Oblated Equal Area	OEA*
Oblique Mercator (Type A & B)	OM
Orthographic	ORTH*
Polar Stereographic	PS
Polyconic	PC
Robinson	ROBN*
Sinusoidal	SINU*
Space Oblique Mercator (Type A & B)	SOM
State Plane	STPL*
Stereographic	STRG*
Transverse Mercator (Gauss-Krueger)	TM
Universal Transverse Mercator	UTM
Van Der Grinten	VDGR*
Wagner IV	WIV*
Wagner VII	WVII*

NOTE: * = NLAPS Only

Table A-2 – USGS Projection Parameters

(A) Projection Transformation Package Projection Parameters Elements 1-8

Projection Name Mnemonic	Array Element							
	1	2	3	4	5	6	7	8
AEA	SMajor	SMinor	Stdpr1	Stdpr2	CentMer	OriginLat	FE	FN
AKC	SMajor	SMinor					FE	FN
AZIM	Sphere				CentLon	CenterLat	FE	FN
EQCA	SMajor	SMinor	Stdpar		CentMer	OriginLat	FE	FN
EQCB	SMajor	SMinor	Stdpr1	Stdpr2	CentMer	OriginLat	FE	FN
EQUI	Sphere				CentMer	TrueScale	FE	FN
GNOM	Sphere				CentLon	CenterLat	FE	FN
GVNP	Sphere		Height		CentLon	CenterLat	FE	FN
HAMM	Sphere				CentMer		FE	FN
IGH	Sphere							
IM	Sphere							
LAEA	Sphere				CentLon	CenterLat	FE	FN
LCC	SMajor	SMinor	Stdpr1	Stdpr2	CentMer	OriginLat	FE	FN
MCYL	Sphere				CentMer		FE	FN
MERC	SMajor	SMinor			CentMer	TrueScale	FE	FN
MOLL	Sphere				CentMer		FE	FN
OEA	Sphere		Shapem	Shapen	CentLon	CenterLat	FE	FN
OMA	SMajor	SMinor	Factor			OriginLat	FE	FN
OMB	SMajor	SMinor	Factor	AziAng	AzmthPt	OriginLat	FE	FN
ORTH	Sphere				CentLon	CenterLat	FE	FN
PC	SMajor	SMinor			CentMer	OriginLat	FE	FN
PS	SMajor	SMinor			LongPol	TrueScale	FE	FN
ROBN	Sphere				CentMer		FE	FN
SINU	Sphere				CentMer		FE	FN
SOM	SMajor	SMinor	Satnum	Path			FE	FN
STPL								
STRG	Sphere				CentLon	CenterLat	FE	FN
TM	SMajor	SMinor	Factor		CentMer	OriginLat	FE	FN
UTM	Lon/Z	Lat/Z						
VDGR	Sphere				CentMer	OriginLat	FE	FN
WIV	Sphere				CentMer		FE	FN
WVII	Sphere				CentMer		FE	FN

(B) Projection Transformation Package Projection Parameters Elements 9-15

Projection Name Mnemonic	Array Element						
	9	10	11	12	13	14	15
AEA							
AKC							
AZIM							
EQCA							
EQCB							
EQUI							
GNOM							
GVNP							
HAMM							
IGH							
IM							
LAEA							
LCC							
MCYL							
MERC							
MOLL							
OEA	Angle						
OMA	Long1	Lat1	Long2	Lat2			
OMB					one		
ORTH							
PC							
PS							
ROBN							
SINU							
SOM					one		
STPL							
STRG							
TM							
UTM							
VDGR							
WIV							
WVII							

Where	Lon/Z	=	Longitude of any point in the UTM zone or zero
	Lat/Z	=	Latitude of any point in the UTM zone or zero.
	SMajor	=	Semi-major axis of ellipsoid. If zero, Clarke 1866 in meters is assumed
	SMinor	=	Eccentricity squared of the ellipsoid if less than zero. If zero, a spherical form is assumed, or if greater than zero, the semi-major axis of ellipsoid
	Sphere	=	Radius of the reference sphere. If zero, 6370997 meters is used.
	Stdpar	=	Latitude of the standard parallel
	Stdpr1	=	Latitude of the first standard parallel
	Stdpr2	=	Latitude of the second standard parallel
	CentMer	=	Longitude of the central meridian
	OriginLat	=	Latitude of the projection origin
	FE	=	False easting in the same units as the semi-major axis
	FN	=	False northing in the same units as the semi-major axis
	LongPol	=	Longitude down below pole of map
	TrueScale	=	Latitude of true scale
	Factor	=	Scale factor at central meridian (TM) or center of projection (OMA/OMB)
	CentLon	=	Longitude of center of projection
	CenterLat	=	Latitude of center of projection
	Height	=	Height of perspective point
	Long1	=	Longitude of first point on center line
	Long2	=	Longitude of second point on center line
	Lat1	=	Latitude of first point on center line
	Lat2	=	Latitude of second point on center line
	AziAng	=	Azimuth angle east of north of center line
	AzmthPt	=	Longitude of point on central meridian where azimuth occurs
	Satnum	=	Landsat satellite number

Path = Landsat path number (use WRS-1 for Landsat 1, 2, and 3 and WRS-2 for Landsat 4, 5, 6, or 7)

Shapem = Oval shape parameter m

Shapen = Oval shape parameter n

Angle = Oval rotation angle

NOTES: All array elements with blank fields are set to zero. All angles (latitudes, longitudes, azimuths, etc.) are entered in packed degrees/minutes/seconds (DDDMMMSSS.SS) format.

Appendix B - Sample Read-Me File

EROS DATA CENTER
LEVEL 1 PRODUCT README: HDF FORMAT

TABLE OF CONTENTS
INTRODUCTION
FORMAT
ORGANIZATION
* DATA FILE NAMES
* README
* READING DATA
GENERAL INFORMATION and DOCUMENTATION
ORDER SUPPORT
DISCLAIMER

INTRODUCTION

This product was produced by the U.S. Geological Survey (USGS) and contains Landsat 7 data files in standard Hierarchical Data Format (HDF). The Landsat-7 satellite carries the enhanced thematic mapper plus (ETM+) sensor and is part of an ongoing mission to provide quality remote sensing data in support of research and applications activities. Information on the Landsat-7 Program, including information about the Landsat-7 satellite, the ETM+ sensor, and Landsat-7 data collection, is available in the "Landsat-7 Level-0 and Level-1 Data Sets Document." The "National Land Archive Production System (NLAPS) Systematic Format Description Document" provides an overview of multiple product formats including HDF. The HDF files are described in detail in the "Level 1 Product Output Files Data Format Control Book, Volume 5, Book 2."

Landsat-7 Level-0 and Level-1 Data Sets Document
http://eosims.cr.usgs.gov:5725/DATASET_DOCS/landsat7_dataset.html

National Land Archive Production System (NLAPS) Systematic Format Description Document
<http://edcwww.cr.usgs.gov/customer.html>

Level 1 Product Output Files Data Format Control Book
<http://edcwww.cr.usgs.gov/l7dhf/L7MM0/document.htm>

FORMAT

The Landsat-7 data are provided in HDF for radiometrically corrected (level-1R) products and for radiometrically and geometrically corrected (level-1G) products. Data may be represented in both binary and American Standard Code for Information Interchange (ASCII) formats. Bit and byte ordering follow conventions set by the Institute of Electrical and Electronics Engineers (IEEE) with the term "byte" being synonymous with octet as used by the International Organization for Standardization.

For more information on HDF structures, visit the following Web sites:

HDFinfo at: <http://www.hdfinfo.com/>
The National Center for Supercomputing Applications
HDF Home Page at: <http://hdf.ncsa.uiuc.edu/>

ORGANIZATION

The Landsat-7 data files are stored separately from the HDF directory file, which contains the file names and pointers for the data files. The level-1R and level-1G image files are in absolute radiance units scaled to 16 bits and 8 bits, respectively.

* DATA FILE NAMES

Except for the calibration parameter file, the file naming convention for HDF is as follows:

L7fpppprrr_rrrYYYYMMDD_AAA.XXX where:

L7	= the Landsat-7 mission
f	= the ETM+ data format
ppp	= the starting path of the product
rrr_rrr	= the starting and ending rows of the product
YYYYMMDD	= the acquisition date of an image
AAA	= the file type:
B10	= band 1
B20	= band 2
B30	= band 3
B40	= band 4
B50	= band 5
B61	= band 6L (low gain)
B62	= band 6H (high gain)
B70	= band 7
B80	= band 8
CAL	= internal calibrator (1R only)
GEO	= geolocation (1R only)
HDF	= HDF directory file
MSD	= consensus MSCD (1R only)
MTA	= LPS metadata (1R only)
MTL	= the metadata file
PCD	= consensus PCD (1R only)
SLO	= scan line offset (1R only)
XXX	= product type (L1R or L1G)

Calibration parameters are stored as ASCII text using an object data language syntax developed by the Jet Propulsion Laboratory. The naming convention for the calibration parameter file is derived from the file name assigned by the Image Assessment System and is annotated as follows:

L7CPFYYYYDD_YYYYDD_nn where

L7	= the Landsat-7 mission
CPF	= the calibration parameter file

The calibration parameter file is included with Level 1R products only.

* README

The README.HDF is a text file and is this document.

* READING DATA

* Delivered On Tape - Data on 8-mm, high-density (Exabyte) tapes are tarred Per Institute of Electrical and Electronics Engineers POSIX standard 1003.1,

preserving file names. To read a tar tape on a computer with a UNIX operating system, type:

```
tar -xvf /<device name>
```

Command key arguments include:

x = indicates that the data are to be read from tape
v = requests verbose output (that is, processed file names will be listed)
f = indicates that the archive name is specified

The device name is system specific and may specify a device such as a tape drive or a file path. Specific parameters depend upon local workstation configurations.

* Delivered On CDRom: Data files are not packed. ISO 9660 Level 2.
* Delivered Via File Transfer Protocol (FTP): Data files are not packed or compressed.

GENERAL INFORMATION and DOCUMENTATION

For information about the Landsat 7 Data Set, including tutorials, product standards, and software, see:

<http://landsat7.usgs.gov/>

No software is included on this product for viewing Landsat 7 data.

ORDER SUPPORT

Direct questions about orders to the USGS EROS Data Center's Customer Services at 1(800)252-4547 or contact an Earth Science Information Center (ESIC) office.

The USGS EROS Data Center is available at:

<http://edcwww.cr.usgs.gov/eros-home.html>

and Customer Services is available at:

<http://edcwww.cr.usgs.gov/customer.html>

A list of ESIC offices is available at:

http://mapping.usgs.gov/esic/esic_index.html

For information about other USGS products, see:

<http://ask.usgs.gov/>

or call 1-888-ASK USGS (275-8747).

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Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Abbreviations and Acronyms

API	application programming interface
ASCII	American Standard Code for Information Interchange
CCB	Configuration Control Board
CCR	configuration change request
CD-ROM	compact disc read-only memory
CPF	calibration parameter file
DAAC	Distributed Active Archive Center
DFCB	data format control book
DORRAN	Distributed Ordering Research Reporting and Accounting Network
ECS	EOSDIS Core System
EDC	EROS Data Center
EOS	Earth Observing System
EOSAT	Earth Observation Satellite
EOSDIS	EOS Data and Information System
EPSG	European Petroleum Survey Group
EROS	Earth Resources Observation System
ESDIS	Earth Science Data and Information System
ETM+	Enhanced Thematic Mapper Plus
FAST-L7A	FAST-Landsat 7 format
ftp	file transfer protocol
F&PRS	Functional and Performance Requirements Specification
GeoTIFF	Geographic Tagged Image File Format
GMT	Greenwich mean time
GSFC	Goddard Space Flight Center
HDF	Hierarchical Data Format
IAS	Image Assessment System
IC	internal calibrator

ICD	interface control document
I/O	input/output
JPL	Jet Propulsion Laboratory
L0Ra	Level 0 archive product
L0Rp	Level 0 distribution product reformatted
L1	Level 1
L1G	Level 1 geometrically corrected
L1R	Level 1 radiometrically corrected
LASP	Laboratory for Atmospheric and Space Physics
LCC	Lambert Conformal Conic
LCCR	Landsat 7 Configuration Control Board
LGS	Landsat Ground System
LPDS	Level 1 Product Distribution System
LPGS	Level 1 Product Generation System
LPS	Landsat Processing System
m	meter
mm	millimeter
Mbps	megabits per second
MSCD	mirror scan correction data
N/A	not applicable
NASA	National Aeronautics and Space Administration
NCSA	National Center for Supercomputing Applications
NDF	NLAPS Data Format
NLAPS	National Land Archive Processing System
ODL	object description language
OMA	Oblique Mercator, Type A
OMB	Oblique Mercator, Type B
PC	Polyconic
PCD	payload correction data

POSC	Petrotechnical Open Software Corporation
PS	Polar Stereographic
SDP	Science Data Production
SDS	scientific data set
SGI	Silicon Graphics, Inc.
SLO	scan line offset
SOM	Space Oblique Mercator
SWIR	short-wave infrared
TIFF	Tagged Image File Format
TM	Traverse Mercator
USGS	United States Geologic Survey
UTC	universal time coordinated
UTM	Universal Transverse Mercator
VMS	Virtual Memory Storage
VNIR	visible and near infrared
WRS	Worldwide Reference System
0R	zero reformatted data
Zulu	Greenwich mean time