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LANDSAT 7 ETM+ LEVEL 1 PRODUCT OUTPUT FILES DATA FORMAT CONTROL BOOK (DFCB)

Version 7

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Executive Summary

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 Production 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 References).

This Data Format Control Book (DFCB) is maintained and controlled by the Landsat 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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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 National Land Archive Production System (NLAPS) Data Format (NDF). NDF specifications are also described at http://edc.usgs.gov/guides/images/landsat_tm/nlapsgeo2.html.

The HDF L1 product formats are primarily derived from the formats of the Level 0Rp (L0Rp) products 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 References). [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 lR (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 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, GeoTIFF, or NDF format L1G image and associated data accommodated by the format; or HDF L1G image and metadata

Level 1G gap-filled product — L1 product that includes radiometric and geometric corrections; The missing image pixels are filled with a coregistered scene(s) resulting in a fully populated 'wall-to-wall' image product; this product includes a gap mask for each requested band

Level 1Gt—L1 Terrain Correction includes radiometric, geometric, as well as the use of a digital elevation model (DEM) to correct parallax error due to local topographic relief. For locations outside the U.S., accuracy of the terrain corrected product will depend upon the availability of local GCPs, as well as the resolution of the best available DEM

Level 1P (L1P)— includes radiometric and geometric correction, as well as the use of ground control points (GCPs) to improve accuracy. For locations outside the U.S., accuracy of the precision-corrected product will depend upon the availability of local GCPs. The National Land Archive Production System (NLAPS) processes all Level 1P products

Level 1T (L1T) — includes radiometric, geometric, and precision correction, as well as the use of a digital elevation model (DEM) to correct parallax error due to local topographic relief. For locations outside the U.S., the accuracy of the terrain-corrected product will depend upon the availability of local ground control points (GCPs), as well as the resolution of the best available DEM. The National Land Archive Production System (NLAPS) processes all Level 1T products

Gap Mask—The gap mask files that accompany a Landsat 7 ETM+ SLC-off or gap-filled product are bit mask images showing the locations of the image gaps (areas that fall between ETM+ scans)

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. Each X-band data link is separated 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 0R 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 archive for archiving in subinterval form. The two formats of data are united when a Landsat 7 0R 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 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 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.

Table 2-1 through Table 2-5 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.

Component	L1G	L1P	L1T
Level 1 image file (for each requested band)	X	X	X
Header file (for each requested band group)	X	X	X
Level 1 Metadata file	X	X	X
Gap Mask	SLC-off & Gap-filled	SLC-off	SLC-off

Table 2-1. FAST-L7A Product Components

Component	L1G	L1P	L1T
Level 1 image file (for each requested band)	X	X	X
Level 1 Metadata file	X	X	X
Gap Mask	SLC-off & Gap-filled	SLC-off	SLC-off

Table 2-2. GeoTIFF Product Components

Component	L1R	L1G	L1P	L1T
Level 1 image file (for each requested band)	X	X	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			
Level 1 Metadata file	X	X	X	X
Geolocation table	X			
HDF directory file	X	X	X	X
Gap Mask		SLC-Off & Gap-filled	SLC-off	SLC-off

Table 2-3. HDF Product Components

Component	L1G	L1P	L1T
Level 1 image file (for each requested band)	X	X	X
Header file (for each requested band group)	X	X	X
Level 1 Metadata file	X	X	X
Work order report file	X	X	X
History and processing parameters file	X	X	X
DEM header file			Optional
DEM data file			Optional
Gap Mask	SLC-Off & Gap-filled	SLC-off	SLC-off

Table 2-4. NDF Product Components

2.1 FAST-L7A

The file naming convention for the FAST-L7A product files is L7fpppprrr_rrrYYYYMMDD_AAA.FST

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

Table 2-5. FAST-L7A File Naming Convention

2.1.1 Level 1 Image File

Each Level 1 image file contains only one ETM+ band of image pixels. There are no header records within the Level 1 image file, nor are there prefix or suffix data in the individual image records. Image data are unblocked. The Level 1 image files are 8-bit unsigned integers.

2.1.2 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.

2.1.3 Level 1 Metadata File

Please refer to Section 2.3.2 for Level 1 Metadata File details.

2.1.4 Gap Mask

The gap mask file is created during product generation and contains the location of all pixels affected by the original SLC-off scene gaps, without any interpolation and/or gap-fill data. The gap masks are 8-bit images having dimensions identical to the corresponding image band files, to simplify data access and viewing. The gap mask

uses code 0 to represent no data and codes 1 - 6 to identify the source image for each filled pixel. Table 3-10 Gap Mask Codes list the data that the gap mask codes correspond to. To avoid expanding the product size dramatically, the gap mask image files are compressed using the GNU Zip utility.

The file naming convention for the gap mask files is L7Gpppprrr_rrrYYYYMMDD_AAA.TIF.gz.

L7	=	Landsat 7 mission
G	=	Gap mask
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
.TIF	=	GeoTIFF file extension
.gz	=	GNU zip

Table 2-6. Gap Mask File Naming Convention

2.2 GeoTIFF

The file naming convention for the GeoTIFF product is L7fpppprrr_rrrYYYYMMDD_AAA.TIF

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 MTL = Level 1 metadata
.TIF	=	GeoTIFF file extension

Table 2-7. GeoTIFF Product Naming Convention Level 1 Metadata File

2.2.1 Level 1 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, scan line, uncompressed, and 8-bit unsigned integers.

2.2.2 Level 1 Metadata File

Please refer to Section 2.3.2 for Level 1 Metadata File details.

2.2.3 Gap Mask

Please refer to Section 2.1.4 for Gap Mask details.

2.3 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 L7fpppprrr_rrrYYYYMMDD_AAA.XXX

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)

Table 2-8. HDF Naming Convention

The CPF file naming convention is L7CPFYYYYMMDD_YYYYMMDD_nn

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

Table 2-9. CPF Naming Convention Table

2.3.1 Level 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 an Intel Linux platform, which is a big-endian byte order machine.

2.3.2 Level 1 Metadata File

The Level 1 metadata file is created during product generation and contains information specific to the product ordered. This file also contains all applicable image description information from the L0Rp metadata and the Landsat 7 Processing System (LPS) L0Ra metadata provided with the L0Rp product. This file is described in detail in Section 3.3.2.

2.3.3 Ancillary Data Files

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 2-3 for a complete listing of which files are included with each product. These files are described in detail in Section 3.3.3.

2.3.4 Gap Mask

Please refer to Section 2.1.4 for Gap Mask details.

2.4 NLAPS Data Format (NDF)

The product composition for geometrically and radiometrically corrected Landsat data includes up to eight file types. These types include one or more Level 1 image files, header files, a work order report file, a Gap Mask a history and processing parameters file and some optional DEM header and data files. In band sequential (BSQ) format, each band of satellite imagery is stored in a separate file (i.e., scan lines are sequentially written to the same image file).

One or more image header files describe the product delivered and provide necessary information for further processing. One or more image files contain the binary image data. If a digital elevation model (DEM) is used for terrain correction, a DEM header and DEM image file may be included as well. Also, each NDF product includes a correction processing report file (formerly known as a work order) and a history file indicating processing parameters.

The file naming convention for the NDF product files is LE7PPPRRRSSYYDDDMV.XX

L	=	L = Landsat
E	=	E = ETM+
7	=	7 = Landsat 7 Mission
PPP	=	Starting WRS path
RRR	=	Starting WRS row
SS	=	WRS row offset (used for “shifted” scenes) 00 = No shift
YY	=	Last two digits of year of acquisition
DDD	=	Day of year (DOY) of acquisition
M	=	Instrument mode:5 = ETM+
V	=	0 = Multiplexer (MUX)
.XX	=	I1 = ETM + band (1 – 9) 1 = band 1 2 = band 2 3 = band 3 4 = band 4 5 = band 5 6 = band 6, low 7 = band 7 8 = band 8 9 = band 6, high H1 = Product header # (1,2 or 3) WO = Job report file HI = Job history file DH = DEM header (optional) DD = DEM data (optional)

Table 2-10. NDF Naming Convention

2.4.1 Level 1 Image File

The Level 1 image files contain the raw image pixels. There are no header records within the file, nor are there any prefix and/or suffix data to the individual image records. If the Level 1 image file is part of a BSQ product, then it contains information for only one band, and the image lines for that band are stored sequentially.

2.4.2 Header File

The first file on each volume, a Read-Me-First file, contains header data. It is in American Standard Code for Information Interchange (ASCII), to ANSI and ISO

standards. The image header files contain information describing the image data in the image. The header is intended to be easy to read and uses only ASCII-text to represent information (i.e., there is no binary information in the header).

In order to accommodate multi-resolution products, one header file is written for each resolution in the output product. This is in contrast to previous versions of the NDF format in which all data files in the same volume (data set) were required to have the same pixel spacing and pixel format, with different resolutions requiring a separate volume set.

2.4.3 Level 1 Metadata File

Please refer to Section 2.3.2 for Level 1 Metadata File details.

2.4.4 Gap Mask

Please refer to Section 2.1.4 for Gap Mask details.

2.4.5 Work Order Report File

This file contains information specific to the history and processing parameters used to process the NDF product. <SMALL>

2.4.6 History Processing Parameters File

A processing history file is found in each NLAPS data product. This file provides documentation about the original customer request and the processing parameters used to produce the NLAPS digital product.

2.4.7 DEM Header File (optional)

The image and DEM header files contain information describing the image data in the image or DEM files. This format is more general than earlier versions of Fast Format headers but is enhanced by additional sensors, DEM data, and non-satellite imagery information. The header is intended to be easy to read and uses only ASCII-text to represent information (i.e., there is no binary information in the header).

2.4.8 DEM Data File (optional)

The image and DEM files contain the raw image pixels or elevation samples. There are no header records within the file, nor are there any prefix and/or suffix data to the individual image records. If the image file is part of a BSQ product, then it contains information for only one band, and the image lines for that band are stored sequentially.

Section 3 Level 1 Output File Formats

3.1 FAST-L7A File Formats

3.1.1 Level 1 Image File

Each Earth image band in the requested product is 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.

3.1.2 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.

Table 3-1 through Table 3-3 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.

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	8	A8	REQbIDb=
	2	9	28	A20	Data producer-defined request number that uniquely identifies each product. USGS products use: NNNYYMMDDSSSS_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 starting location in: ppp/rrrffssbbbbbb format where ppp = path / = / rrr = row ff = fraction ss = subscene
	5	52	70	A19	bACQUISITIONbDATEb=
	6	71	78	A8	First scene acquisition date in yyyymmdd 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/rrrffssbbbbbb format where ppp = path / = / rrr = row ff = fraction ss = subscene
	21	212	230	A19	bACQUISITIONbDATEb=
	22	231	238	A8	Last scene acquisition date in yyyymmdd format
	23	239	239	1X	Blank fill
	24	240	240	A1	Carriage return
4	25	241	251	A11	SATELLITEb=
	26	252	261	A10	Last scene satellite name: LANDSAT7
	27	262	270	A9	bSENSORb=
	28	271	280	A10	Last scene sensor name: ETM+
	29	281	294	A14	bSENSORbMODEb=
	30	295	300	A6	Last scene sensor mode: NORMAL
	31	301	313	A13	bLOOKbANGLEb=
	32	314	319	F6.2	Last scene off-nadir angle in degrees: 0.0
	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
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=

Line	Field	Start Byte	End Byte	Format	Description
	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 ORBITbORIENTEDbbbb USERbORIENTEDbbbbb (NLAPS only) TRUENORTHbORIENTED (NLAPS only)
	68	673	687	A15	bPRODUCTbSIZEb=
	69	688	697	A10	Product size: SUBSCENEbb <375 scans, <1 scene FULLbSCENE =375 scans, =1 scene MULTISCENE >375 scans, >1 scene
	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)
	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	/
	81	823	824	I2	Number of volumes in tape set (for multi-volume product): N/A
	82	825	842	A18	bPIXELSbPERbLINEb=
	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
	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	bRECbSIZEbb=

Line	Field	Start Byte	End Byte	Format	Description
	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
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
1	1	1	50	A50	BIASESbANDbGAINSbINbASCENDINGbBANDbNUMBERbORDERbbb
	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

Line	Field	Start Byte	End Byte	Format	Description
	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 3-1. Administrative Record for Panchromatic Band

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	50	A50	BIASESbANDbGAINSbINbASCENDINGbBANDbNUMBERbORDERbbb
	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
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

Line	Field	Start Byte	End Byte	Format	Description
	63	1520	1520	A1	Carriage return
20	64	1521	1535	15X	Blank fill
	65	1536	1536	A1	Carriage return

Table 3-2. Radiometric Record for Panchromatic Band

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
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

Line	Field	Start Byte	End Byte	Format	Description
	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
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)

Line	Field	Start Byte	End Byte	Format	Description
	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 3-3. Geometric Record for Panchromatic Band

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	8	A8	REQbIDb=
	2	9	28	A20	Data producer-defined request number that uniquely identifies each product. USGS products use: NNNYYMMDDSSSS_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 starting location in: ppp/rrrffssbbbbbb format where ppp = path / = / rrr = row ff = fraction ss = subscene
	5	52	70	A19	bACQUISITIONbDATEb=
	6	71	78	A8	First scene acquisition date in yyyymmdd 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/rrrffssbbbbbb format where ppp = path / = / rrr = row ff = fraction ss = subscene
	21	212	230	A19	bACQUISITIONbDATEb=
	22	231	238	A8	Last scene acquisition date in yyyymmdd format
	23	239	239	1X	Blank fill
	24	240	240	A1	Carriage return
4	25	241	251	A11	SATELLITEb=
	26	252	261	A10	Last scene satellite Name: LANDSAT7
	27	262	270	A9	SENSORb=
	28	271	280	A10	Last scene sensor Name: ETM+
	29	281	294	A14	bSENSORbMODEb=
	30	295	300	A6	Last scene sensor Mode: NORMAL
	31	301	313	A13	bLOOKbANGLEb=
	32	314	319	F6.2	Last scene off-nadir angle in degrees: 0.0
	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
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=

Line	Field	Start Byte	End Byte	Format	Description
	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 ORBITbORIENTEDbbbb USERbORIENTEDbbbbb (NLAPS only) TRUENORTHbORIENTED (NLAPS only)
	68	673	687	A15	bPRODUCTbSIZEb=
	69	688	697	A10	Product size: SUBSCENEbb <375 scans, <1 scene FULLbSCENE =375 scans, =1 scene MULTISCENE >375 scans, >1 scene
	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)
	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	/
	81	823	824	I2	Number of volumes in tape set (for multivolume product): N/A
	82	825	842	A18	bPIXELSbPERbLINEb=
	83	843	847	I5	Number of pixels per product line for VNIR and SWIR bands
	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	bRECbSIZEbb=
	95	932	940	I9	Length of physical file record in bytes per VNIR and SWIR bands
	96	941	953	A13	bPIXELbSIZEb=
	97	954	959	F6.2	Pixel size in meters for VNIR and SWIR bands
	98	960	960	A1	Carriage return

Line	Field	Start Byte	End Byte	Format	Description
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 VNIR and SWIR bands group:123457 (or subset)
	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
	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 3-4. Administrative Record for VNIR and SWIR Bands

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	50	A50	BIASESbANDbGAINSbINbASCENDINGbBANDbNUMBERbORDERbbb
	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
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 3-5. Radiometric Record for VNIR and SWIR Bands

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
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)

Line	Field	Start Byte	End Byte	Format	Description
	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
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

Line	Field	Start Byte	End Byte	Format	Description
	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 3-6. Geometric Record for VNIR and SWIR Bands

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	8	A8	REQbIDb=
	2	9	28	A20	Data producer-defined request number that uniquely identifies each product. USGS products use: NNNYYMMDDSSSS_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 starting location in: ppp/rrrffssbbbbbb format where ppp = path / = / rrr = row ff = fraction ss = subscene
	5	52	70	A19	bACQUISITIONbDATEb=
	6	71	78	A8	First scene acquisition date in yyyymmdd 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/rrrffssbbbbbb format where ppp = path / = / rrr = row ff = fraction ss = subscene
	21	212	230	A19	bACQUISITIONbDATEb=
	22	231	238	A8	Last scene acquisition date in yyyymmdd format
	23	239	239	1X	Blank fill
	24	240	240	A1	Carriage return
4	25	241	251	A11	SATELLITEb=
	26	252	261	A10	Last scene satellite Name: LANDSAT7
	27	262	270	A9	bSENSORb=
	28	271	280	A10	Last scene sensor Name: ETM+
	29	281	294	A14	bSENSORbMODEb=
	30	295	300	A6	Last scene sensor Mode: NORMAL
	31	301	313	A13	bLOOKbANGLEb=
	32	314	319	F6.2	Last scene off-nadir angle in degrees: 0.0
	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
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=

Line	Field	Start Byte	End Byte	Format	Description
	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 ORBITbORIENTEDbbbb USERbORIENTEDbbbbb (NLAPS only) TRUENORTHbORIENTED (NLAPS only)
	68	673	687	A15	PRODUCTbSIZEb=
	69	688	697	A10	Product size: SUBSCENEbb <375 scans, <1 scene FULLbSCENE =375 scans, =1 scene MULTISCENE >375 scans, >1 scene
	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)
	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	/
	81	823	824	I2	Number of volumes in tape set (for multivolume product): N/A
	82	825	842	A18	bPIXELSbPERbLINEb=
	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	/
	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	bRECbSIZEbb=

Line	Field	Start Byte	End Byte	Format	Description
	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
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 3-7. Administrative Record for Thermal Bands

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	50	A50	BIASESbANDbGAINSbINbASCENDINGbBANDbNUMBERbORDERb bb
	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
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

Line	Field	Start Byte	End Byte	Format	Description
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 3-8. Radiometric Record for Thermal Bands

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
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

Line	Field	Start Byte	End Byte	Format	Description
	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
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

Line	Field	Start Byte	End Byte	Format	Description
					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 3-9. Geometric Record for Thermal Bands

3.1.3 Level 1 Metadata File

Please refer to Section 3.3.2 for Level 1 Metadata File details.

3.1.4 Gap Mask

The gap masks are 8-bit images having dimensions identical to the corresponding image band files to simplify data access and viewing. The gap masks use a code to identify fill pixels. The gap mask uses code 0 to represent no data and codes 1 - 6 to identify which pixels are filled. Table 3-10 Gap Mask Codes list the data that they correspond to.

Value	Meaning
0	No Data
1	Primary Scene
2	Fill Scene 1
3	Fill Scene 2
4	Fill Scene 3
5	Fill Scene 4
6	Fill Scene 5

Table 3-10 Gap Mask Codes

3.2 GeoTIFF File Formats

3.2.1 Level 1 Image File

The description of an image in GeoTIFF requires tags and keys as described in Applicable Document 5 (See References). These tags and keys will be included in the Level 1 Image Files and are automatically detected and read by TIFF readers. They are described in the following subsections.

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.

3.2.1.1 GeoTIFF Tags

TIFF tags convey metadata information about the image. 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 tie points 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 L1G 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.

3.2.1.2 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	RasterPixelIsArea
	2	RasterPixelIsPoint
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
Universal Transverse Mercator (UTM)		
GTModelTypeGeoKey	1	ModelTypeProjected (Projection Coordinate System)
GTRasterTypeGeoKey	1	RasterPixelIsArea
	2	RasterPixelIsPoint
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
GTModelTypeGeoKey	1	ModelTypeProjected (Projection Coordinate System)
GTRasterTypeGeoKey	1	RasterPixelIsArea
	2	RasterPixelIsPoint
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

Valid Keys	Possible Values	Meaning
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
GTModelTypeGeoKey	1	ModelTypeProjected (Projection Coordinate System)
GTRasterTypeGeoKey	1	RasterPixelIsArea
	2	RasterPixelIsPoint
GT CitationGeoKey	(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
ProjLin earUnitsGeoKey	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
GTModelTypeGeoKey	1	ModelTypeProjected (Projection Coordinate System)
GTRasterTypeGeoKey	1	RasterPixelIsArea
	2	RasterPixelIsPoint
GTCitationGeoKey	(ASCII, 17)	ASCII reference to public documentation
GeographicTypeGeoKey	4326	GCS_WGS_84
GeogLinearUnitsGeoKey	9001	Linear_Meter

Valid Keys	Possible Values	Meaning
	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
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	RasterPixelIsArea
	2	RasterPixelIsPoint
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

Table 3-11. GeoTIFF Keys

3.2.2 Level 1 Metadata File

Please refer to Section 3.3.2 for Level 1 Metadata File details.

3.2.3 Gap Mask

Please refer to Section 3.1.4 for Gap Mask details.

3.3 HDF File Formats

3.3.1 Level 1 Image File

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.

3.3.1.1 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.

3.3.1.2 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. Vgroup 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 Vgroup. This information is stored in the HDF data directory.
The Vgroup used to relate the different data objects that make up a complete L1 product are presented in Table 3-12.

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
Product_Metadata	Metadata	L71ppprrr_rrrYYYYMMDD.MTA L72ppprrr_rrrYYYYMMDD.MTA L71ppprrr_rrrYYYYMMDD.MTL	Vdata Vdata Vdata	LPS metadata format 1 LPS metadata format 2 Level 1-product-specific metadata
CPF	Correction_Data	L7CPFYYYYMMDD_YYYYMMDD_nn	Vdata	IAS CPF

Table 3-12. Vgroup Definitions: Level 1R 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

Table 3-13. Vgroup Definitions: Level 1G Product

3.3.2 Level 1 Metadata File

The Level 1 metadata file is created during product generation and contains information specific to the product ordered. Table 3-14 lists the full contents of the Level 1 metadata file. This file contains all applicable image description information from the L0Rp metadata file and the Landsat 7 Data Processing System (LPS) metadata provided with the L0Rp product.

Vdata Name: L71ppprrr_rrrYYYYMMDD.MTL
Vdata Class: LPGS_Metadata
Interlace Type: FULL_INTERLACE
Bytes Per Logical Record: 65535
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	USGS products use: "NNNYYMMDDSSSS_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	Data producer-defined request number that uniquely identifies each product. USGS products use a 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" through "9"	LPS processor number
DATEHOUR_CONTACT_PERIOD	7	= "YYDOYHH"	Date and hour of contact period
SUBINTERVAL_NUMBER	2	= "00" through "99"	Subinterval number within contact period
END_GROUP	18	= METADATA_FILE_INFO	End of metadata information group
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"	Identifier to inform user of orbital

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
		= “PREDICTIVE”	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
GAP_FILL_ACQ_DATE	56	= (YYYY-MM-DD,YYYY-MM-DD,YYYY-MM-DD,YYYY-MM-DD,YYYY-MM-DD)	Acquisition date of input scenes used for scan gap-fill. (Up to 5 input scenes) Note: Only included with gap-filled products.
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)
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)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
			(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)
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_	14	= -132000000.000 through	NLAPS projection Y coordinate for

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
PAN		132000000.000 Units are feet or meters	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)
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

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
			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	"L71ppprrr_rrrYYYYMMDD_B10.XXX" (XXX = L1R, L1G, TIF, or FST)	L1-generated external element file name for band 1, if part of product
BAND2_FILE_NAME	29	"L71ppprrr_rrrYYYYMMDD_B20.XXX" (XXX = L1R, L1G, TIF, or FST)	L1-generated external element file name for band 2, if part of product
BAND3_FILE_NAME	29	"L71ppprrr_rrrYYYYMMDD_B30.XXX" (XXX = L1R, L1G, TIF, or FST)	L1-generated external element file name for band 3, if part of product
BAND4_FILE_NAME	29	"L71ppprrr_rrrYYYYMMDD_B40.XXX" (XXX = L1R, L1G, TIF, or FST)	L1-generated external element file name for band 4, if part of product
BAND5_FILE_NAME	29	"L71ppprrr_rrrYYYYMMDD_B50.XXX" (XXX = L1R, L1G, TIF, or FST)	L1-generated external element file name for band 5, if part of product
BAND61_FILE_NAME	29	"L71ppprrr_rrrYYYYMMDD_B61.XXX" (XXX = L1R, L1G, TIF, or FST)	L1-generated external element file name for band 6 format 1, if part of product
BAND62_FILE_NAME	29	"L72ppprrr_rrrYYYYMMDD_B62.XXX" (XXX = L1R, L1G, TIF, or FST)	L1-generated external element file name for band 6 format 2, if part of product
BAND7_FILE_NAME	29	"L72ppprrr_rrrYYYYMMDD_B70.XXX" (XXX = L1R, L1G, TIF, or FST)	L1-generated external element file name for band 7, if part of product
BAND8_FILE_NAME	29	"L72ppprrr_rrrYYYYMMDD_B80.XXX" (XXX = L1R, L1G, TIF, or FST)	L1-generated external element file name for band 8, if part of product
IC_DATA_F1_FILE_NAME	29	"L71ppprrr_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	"L72ppprrr_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	"L71ppprrr_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	"L72ppprrr_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	"L71ppprrr_rrrYYYYMMDD_MSD.XXX" (XXX = L1R)	L1-generated external element file name for consensus MSCD (1R product only)
PCD_FILE_NAME	29	"L71ppprrr_rrrYYYYMMDD_PCD.XXX" (XXX = L1R)	L1-generated external element file name for consensus PCD (1R product only)
METADATA_LPS1_FILE_NAME	29	"L71ppprrr_rrrYYYYMMDD_MTA.XXX" (XXX = L1R)	L1-generated external element file name for LPS format 1 metadata (1R product only)
METADATA_LPS2_FILE_NAME	29	"L72ppprrr_rrrYYYYMMDD_MTA.XXX" (XXX = L1R)	L1-generated external element file name for LPS format 2 metadata (1R product only)
METADATA_L1_FILE_NAME	29	"L71ppprrr_rrrYYYYMMDD_MTL.XXX" (XXX = L1R, L1G, TIF, or FST)	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. NLAPS is populating the metadata file with the CPF used during processing.
GEOLOCATION_FILE_NAME	29	"L71ppprrr_rrrYYYYMMDD_GEO.XXX" (XXX = L1R)	L1-generated external element file name for geolocation table (1R product only)
HDF_DIR_FILE_NAME	29	"L71ppprrr_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

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
			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.
LMIN_ BAND2	7	= NNN.NNN	Minimum achievable spectral radiance value for band 2, if part of product (w/(m^2 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 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 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 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 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 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 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 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 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 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,

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
			if part of product (w/(m^2 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 sr micron)). Also, the spectral radiance corresponding to QCALMAX_BAND7.
LMIN_ BAND7	7	= NNN.NNN	Minimum achievable spectral radiance value for band 7, if part of product (w/(m^2 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 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 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)).
QCALMIN_BAND62	5	= NNN.N	Minimum possible pixel value for

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
			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
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)	Presence and direction of gain change for band 1, if part of product

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
		= "-" (for high to low)	
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.
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.	Sun azimuth angle in degrees for image center location at image center acquisition time

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
		Leading zeros are not required.	
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. NLAPS: 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. NLAPS: 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. NLAPS: 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. NLAPS: BAND_AVERAGE = NASA REFERENCE_DETECTOR = CCRS
STRIPING_BAND5	20	= "NONE" = "BAND_AVERAGE" = "REFERENCE_DETECTOR"	Indicator of type of striping correction applied for band 5 image, if part of product. NLAPS: 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. NLAPS: 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. NLAPS: 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. NLAPS: BAND_AVERAGE = NASA REFERENCE_DETECTOR =

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
			CCRS
STRIPING_BAND8	20	= "NONE" = "BAND_AVERAGE" = "REFERENCE_DETECTOR"	Indicator of type of striping correction applied for band 8 image, if part of product. NLAPS: 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
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
SCAN_GAP_INTERPOLATION	4	= 00.0 - 15.0	Maximum scan gap width to fill by interpolation, in units of ETM+ 30 meter detectors/pixels. Note: Only included with single SLC-Off and gap-filled products.
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*	Map projection used in creating image * NLAPS only

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
		= "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*	
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	= -1.0×10^8 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 AKC projection
END_GROUP	14	AKC_PARAMETERS	End of AKC 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 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	= -1.0×10^8 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 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	= -1.0×10^8 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 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_O	11	= -90.0 to +90.0	Latitude of projection origin

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
RIGIN			
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
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

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
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

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
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
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_GEODETIC	12	= -180.0 to +180.0	Longitude of first point defining central geodetic line of projection
LATITUDE_FIRST_POINT_GEODETIC	11	= -90.0 to +90.0	Latitude of first point defining central geodetic line of projection
LONGITUDE_SECOND_POINT_GEODETIC	12	= -180.0 to +180.0	Longitude of second point defining central geodetic line of projection
LATITUDE_SECOND_POINT_GEODETIC	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

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
			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	= -1.0×10^8 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 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	= -1.0×10^8 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 PC projection
END_GROUP	13	PC_PARAMETERS	End of PC 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 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

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
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	= $-1.0x10^8$ 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 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
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

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
			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
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 3-14. Level 1 Metadata File

3.3.3 Ancillary Data Files

3.3.3.1 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 gain image data; the format 2

file is provided with products that include bands 6 high gain through 8. These data are subset to correspond to the user-requested product (i.e., by band and product size).

3.3.3.2 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 subset to correspond to the user-requested product size. The file structure for the consensus MSCD is described in Applicable Document 4 (See References) 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

3.3.3.3 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 with errors corrected according to L1 processing algorithms. This consensus PCD file will not be subsetted. The file structure for the consensus PCD is described in Applicable Document 4 (See References) with the exception of the L1-assigned Vdata Name and Vdata class, which are described below.

Vdata Name: L71ppprrr_rrrYYYYMMDD.PCD
Vdata Class: LPGS_PCD

3.3.3.4 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 (See References), with the exception of the L1-assigned Vdata Name and Vdata class, which are described below.

Vdata Name: L7fppprrr_rrrYYYYMMDD.ONN
Vdata Class: LPGS_SLO

3.3.3.5 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 the L0Rp product file. A complete description of this file currently exists in the Landsat 7 System Calibration Parameter File Definition (See References).

3.3.3.6 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 (See References), with the exception of the L1-assigned Vdata Name and Vdata class, which are described below.

Vdata Name: L71ppprrr_rrrYYYYMMDD.GEO
Vdata Class: Index

3.3.3.7 LPS Metadata File

The LPS metadata files are included with the L1R output product without modification from 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 (See References), with the exception of the L1-assigned Vdata Name, which is described below.

Vdata Name: L7fppprrr_rrrYYYYMMDD.MTA

3.3.4 Gap Mask

Please refer to Section 3.1.4 for Gap Mask description.

3.4 NLAPS Data Format (NDF)

3.4.1 Level 1 Image File

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 L1G image is radiometrically corrected and resampled for geometric correction and registration to geographic map projections.

3.4.2 Header File

The Image Header File contains information describing image data. The header file is an ASCII text file. Information in the header file consists of keyword/value entries in the format: <keyword> = <value1> [,<value2>,<value3>,...,<valueN>];

The characters "," and ";" serve as value and entry delimiters, respectively, whereas "=" separates the keyword field from value field(s). These special characters are not to be used in keyword and value fields. In rare instances when these special characters are

required in keyword and value fields, the desired field must be enclosed in double quotes (i.e.,"<field>", where the <field> contains the above-mentioned special character(s).

In the rare event that the double quote character is required in a field, it is represented by a backslash, followed by a double quote (e.g., "\""). A backslash in a field is denoted by two consecutive backslashes (e.g., "\\").

The first and last characters of keywords and values are non-blank characters. <Keywords> are unique and are single tokens. Words in keyword fields are connected by underscores. An example of a keyword is "BITS_PER_PIXEL".

Where possible, each entry in the <value> field is a single token. The keyword in the first entry of the header is “NDF_REVISION". All other header entries can appear in any order, except for the keyword "END_OF_HDR", which has no parameters and presents the end of a header. A semicolon also terminates this entry.

Each keyword starts at the beginning of a new line. Any number, including zero, or white spaces may appear outside the keyword and value fields. White spaces refer to space, tab, carriage-return (CR), and line-feed (LF) characters.

Only required parameters are entered in the file. Those parameters that are not required may not be included. For example, NDF files containing mosaicked DEM data will not have BAND1-RADIOMETRIC_GAINS/BIAS entries. A parameter with a specified default value may not be included if it is to take on its default value.

Within the parameter tables, the following notation is used: <type> specifies the type or format of data to be used as a keyword value [optional type] specifies the type or format of optional data for a keyword value| represents "or", used for specifying alternative keyword values "<character>" specifies that the <character> must be included as part of the keyword value or value list, and the character set includes: _ , / = ; .

KEYWORD	DESCRIPTION
NDF_REVISION	Format version code <m>"."<nn>. This document describes version "2.00"
DATA_SET_TYPE	Type of data. Format of data type: <company>”_”<sensor>|<data type>[FMT<nnn>] Valid types are: “EDC_MSS”, “EDC_TM”, “EDC_ETM+”, and “NLAPS_DEM”
PRODUCT_NUMBER	Product order number in <NNNYYMMDDSSSSdddd> format with NNN = Node, YY = year, MM = month, DD = day, SSSS = Sequence Number, and dddd = unit number.
PIXEL_FORMAT	Format of pixel. Valid values are: "BIT", "BYTE", "2BYTEINT", "4BYTEINT", "REAL", "DOUBLE". Note that integers may be signed or unsigned.
PIXEL_ORDER	Valid values are: "NOT_INVERTED", "[<n>-]BYTE_INVERTED", "[<n>-]BIT_INVERTED". An example is: "BYTE_INVERTED". Default value is "NOT_INVERTED".

BITS_PER_PIXEL	Number of bits per pixel. Integer format.
PIXELS_PER_LINE	Number of pixels per line. Integer format.
LINES_PER_DATA_FILE	Number of data lines for each data/image file. For example, for a 3-band BIL imagery data file. the value of LINES_PER_DATA_FILE will equal the number of lines in each band multiplied by 3. Integer format. For BSQ imagery, the value of LINES_PER_DATA_FILE will equal the number of lines in each band.
DATA_ORIENTATION	Data orientation in <position>"/" <direction> formatc. Valid values are: "UPPER_LEFT/RIGHT", "UPPER_LEFT/BOT", "UPPER_RIGHT/LEFT", "UPPER_RIGHT/BOT", "BOTTOM_LEFT/RIGHT", "BOTTOM_LEFT/TOP", "BOTTOM_RIGHT/LEFT", "BOTTOM_RIGHT/TOP".
NUMBER_OF_DATA_FILES	Total number of image/data files. Header, work order report and history files are excluded. Integer format.
DATA_FILE_INTERLEAVING	Interleaving type. Valid values are: "BSQ".
TAPE_SPANNING_FLAG	Tape spanning flag for images that span multiple volumes in <n>"/"<m> format, where <n> is the current volume number and <m> is the total number of volumes.
START_LINE_NUMBER	First data/image line number on this volume (for multiple volumes). Integer format.
START_DATA_FILE	First data file number on this volume (for multiple volumes). Integer format.
LINES_PER_VOLUME	Number of data lines on this volume (for multiple volumes). Integer format.
BLOCKING_FACTOR	Blocking factor. Number of data records per block. Integer format. Default is "1".
RECORD_SIZE	Length of physical record in bytes. Integer format.
UPPER_LEFT_CORNER	<Longitude>"," <Latitude>"," <Easting>", "<Northing> where Longitude and Latitude represent geodetic coordinates in <DDDMMSS>"."<SSSSC> format with DDD = degrees, MM = minutes, SS.SSSS = seconds, and C = "N", "S", "E" or "W". Easting and Northing are expressed in meters, in F13.3 format. These 4 measurements are taken at the center of the upper-left-most pixel. An example of longitude: 5 degrees, 13 min., 12.7 sec. west of prime meridian will be expressed as "0051312.7000W". An example of latitude: 18 degrees, 12 min., 54.7 sec. north of the equator will be expressed as "0181254.7000N".
UPPER_RIGHT_CORNER	<Longitude>"," <Latitude>", "<Easting>","<Northing>. The format is similar to that of UPPER_LEFT_CORNER. These 4 measurements are taken at the center of the upper-right-most pixel.
LOWER_RIGHT_CORNER	<Longitude>"," <Latitude>", "<Easting>","<Northing>. The format is similar to that of UPPER_LEFT_CORNER. These 4 measurements are taken at the center of the lower-right-most pixel.
LOWER_LEFT_CORNER	<Longitude>"," <Latitude>", "<Easting>","<Northing>. The format is similar to that of UPPER_LEFT_CORNER. These 4 measurements are taken at the center of the lower_left-most pixel.
REFERENCE_POINT	Valid values are: "SCENE_CENTER", "NONE".
REFERENCE_POSITION	<Longitude>","<Latitude>", "<Easting>", "<Northing>", "<Pixel #>","<Line #>. Used to geographically reference the image to the ground. The longitude, latitude, easting and northing formats are the same as those in UPPER_LEFT_CORNER. Pixel # and Line # refer to reference point pixel and line numbers respectively, with the first pixel in the image being 1,1. They both have F9.2 formats and can be negative. Integer line/pixel numbers correspond to the center of a

	pixel.
REFERENCE_OFFSET	<x-offset>","<y-offset>. Horizontal offset of the true reference point from the nominal WRS scene center in units of whole pixels. Both are F9.2 format.
ORIENTATION	Orientation angle in degrees measured clockwise from grid (map) North. May be negative. F11.6 format.
MAP_PROJECTION_NAME	Map projection name, as specified in GCTP documentationa.
USGS_PROJECTION_NUMBER	USGS supported projection number, as specified in GCTP documentationa.
USGS_MAP_ZONE	USGS map zone code, for UTM and State Plane Cartographic System. (Negative numbers are used to indicate southern hemisphere for UTM zone).
USGS_PROJECTION_ PARAMETERS	USGS map projection parametersa. There are 15 PARAMETERS parameters, all with the same format (D26.15).
HORIZONTAL_DATUM	Name of the horizontal datum used, Valid values are: “NAD27”, “NAD83”, “WGS84”, “ELLIPSOID”. See Appendix 6.
EARTH_ELLIPSOID_ SEMI-MAJOR_AXIS	Semi-major axis of Earth ellipsoid. F11.3 format, in meters.
EARTH_ELLIPSOID_ SEMI-MINOR_AXIS	Semi-minor axis of Earth ellipsoid. F11.3 format, in meters.
EARTH_ELLIPSOID_ ORIGIN_OFFSET	<x-offset>","<y-offset>","<z-offset> x-, y- & z-offsets of Earth ellipsoid in meters. F11.3 format.
EARTH_ELLIPSOID_ ROTATION_OFFSET	<x-plane offset>","<y-plane offset>", "<z-plane offset> Angular offset from x-plane, y-plane & z-plane of Earth ellipsoid in degrees. F9.6 format.
WRS	WRS Path/Row in <ppp>"/"<rrr.n> format, where n is the fractional row value.
ACQUISITION_DATE/TIME	UTC date and time of acquisition of reference point in ISO-compliant format:YYYY-MM-DDThh:mm:ssZ. ©
SATELLITE	Satellite number. Valid values are "LANDSAT_"<m>, where m is an integer 1 – 5 or 7.
SATELLITE_INSTRUMENT	Instrument type: <SSSSSS>, where <SSSSSS> is the sensor type. Valid values are: "MSS", "TM", and ETM+.
PRODUCT_SIZE	Valid values are: "FULL_SCENE", "SUBSCENE", "MULTI_SCENE".
PIXEL_SPACING	<Horizontal pixel size>","<vertical pixel size>. Horizontal and vertical pixel size in PIXEL_SPACING_UNITS. F9.4 format.
PIXEL_SPACING_UNITS	Units of measure: "METERS"
PROCESSING_LEVEL	Processing level. For ETM+, TM & MSS, valid values are: "01", "02", "03", "04", "05", "06", "07", "08", "09", "10". These correspond to the standard Landsat processing levels.
RESAMPLING	Resampling kernel. Valid values are: "NN", "BL", "CC", "KD16","SINC8", "SINC16", "NONE", <user-defined>, where <user-defined> is an unique name for an user-definable kernel.
PROCESSING_DATE/TIME	Processing date.time in ISO-compliant format: YYYY-MM-DDThh:mm:ss. In local system time. ©
PROCESSING_SOFTWARE	Processing software version: "NLAPS_"<xx>" where xx = software version number.
SUN_ELEVATION	Sun elevation in degrees at the reference point (acquisition time). F6.2 format.
SUN_AZIMUTH	Sun azimuth in degrees at the reference point (acquisition time). F6.2 format.
NUMBER_OF_BANDS_ IN_VOLUME	Number of bands in the volume. Integer format.

3.4.3 Level 1 Metadata File

Please refer to Section 3.3.2 for Level 1 Metadata File details.

3.4.4 Gap Mask

Please refer to Section 3.1.4 for Gap Mask details.

3.4.5 Work Order Report File

The Work Order Report File provides a record of the work executed in to a DORRAN Product Order. This file is in ASCII format and contains information relative to the processing performed and the parameters used (e.g., latitudes and longitudes specified in degrees and heights specified in meters).

The Correction Processing Report File provides a record of the work executed in response to a DORRAN Product Order. It is in ASCII format for easy readability, and contains the following information: (Notes describing units and/or formats are used for latitude, longitude, heights, dates, etc.)

- Product order information
- Processing stage reports:
    - Name of processing stage
    - Start and completion date/time of processing stage
    - Summary/status information
- Processing stages may include:
    - Ingest
    - Precision Modeling
    - DEM Ingest
    - DEM Processing
    - Apply Despike Filter
    - Apply Deband Filter
    - Image Correction
    - Geometric Quality Assessment
    - Radiometric Quality Assessment
    - Product Formatting

Summary Information (e.g., Work Order start and stop date/times and total CPU time)

NLAPS CORRECTION PROCESSING REPORT (Example)

NLAPS Version: 4_3_00e14
Work Order: 011040402008500001 Priority: 9
Satellite: Landsat-7 Sensor: ETM+
Camera Number: N/A Sensor Mode: N/A

Input Data Ident: /diskIngest2/temp/01104040200850001/L71EDC1102226
Input Media Type: Disk File Number: N/A
Orbit Number: 98151

Processing Level: Systematic Geocorrection Resampling: CC
Map Projection: UTM Zone: 18
Earth Ellipsoid: NAD83 Panel Effect: FALSE
Product Orient.: Satellite

Projection Params:
6.378137000000000e+06 6.356752314140000e+06 0.000000000000000e+00
0.000000000000000e+00 0.000000000000000e+00 0.000000000000000e+00
0.000000000000000e+00 0.000000000000000e+00 0.000000000000000e+00
0.000000000000000e+00 0.000000000000000e+00 0.000000000000000e+00
0.000000000000000e+00 0.000000000000000e+00 0.000000000000000e+00
Line Spacing: 030.0 Pixel Spacing: 030.0

Path/Strip no.: 014 Start Row no.: 029.0
End Row no.: N/A

Image Lines: 6000 Image Pixels: 6493
Image Orientation: 10.46 deg from N Output Bands: 123456789
Viewing Angle: 0.04 deg

Scene center lat: 44.606 deg Scene center long: -73.516 deg
Sun Elevation: 54.09 deg Sun Azimuth: 139.84 deg
Scene center date: 2002 08 14 Scene center time: 15:26:51.9275

Output Media: Disk Output Product Id: N/A
Product Format: NDF Interleaving : BSQ
Catalogued: FALSE

Completion date: 2004 04 07 Completion time: 10:59:52

Termination Status: Successful Completion

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DETAILED PROCESSING RESULTS

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RADIOMETRIC CORRECTION

Algorithm: NASA

Band	Ref Detector	DN to Radiance gain	offset	Default Abs Calib?
1	15	0.778740	-6.97873	FALSE
2	12	0.798819	-7.19882	FALSE
3	8	0.621653	-5.62164	FALSE
4	7	0.969291	-6.06931	FALSE
5	14	0.126220	-1.12622	FALSE
6	8	0.067087	-0.06708	FALSE
7	10	0.043898	-0.39389	FALSE
8	27	0.975591	-5.67560	FALSE
9	8	0.037205	3.162800	FALSE

Band 1 Coefficients (Qcal = (Q - offset) / gain):

Gain Mode: HIGH

Detector	Forward		Backward	
	gain	offset	gain	offset
1	0.960342	6.911600	0.960342	6.906810
2	0.950054	7.094850	0.950054	7.090060
3	0.950495	6.740320	0.950495	6.735530
4	0.951127	6.574330	0.951127	6.569540
5	0.948987	6.653630	0.948987	6.648840
6	0.952194	6.498690	0.952194	6.493900
7	0.962207	6.228640	0.962207	6.223850
8	0.960842	6.117060	0.960842	6.112280
9	0.957314	6.066810	0.957314	6.062020
10	0.957566	5.990210	0.957566	5.985420
11	0.958945	6.083820	0.958945	6.079030
12	0.949041	6.329580	0.949041	6.324790
13	0.955021	6.502640	0.955021	6.497850
14	0.943699	6.743620	0.943699	6.738830
15	0.953371	6.724250	0.953371	6.719460
16	0.954400	6.630990	0.954400	6.626210

Band 2 Coefficients (Qcal = (Q - offset) / gain):

Gain Mode: HIGH

Detector	Forward		Backward	
	gain	offset	gain	offset
1	0.938977	6.804560	0.938977	6.794900
2	0.949396	6.920310	0.949396	6.910650
3	0.944009	7.010020	0.944009	7.000360
4	0.950580	6.783130	0.950580	6.773470
5	0.946023	6.838120	0.946023	6.828450
6	0.948274	6.569570	0.948274	6.559910
7	0.969289	6.107580	0.969289	6.097910
8	0.949267	6.283690	0.949267	6.274020
9	0.951517	6.304300	0.951517	6.294640
10	0.956479	6.160860	0.956479	6.151200
11	0.956445	6.198250	0.956445	6.188590
12	0.951680	6.352280	0.951680	6.342620
13	0.959374	6.442400	0.959374	6.432740
14	0.941859	6.725560	0.941859	6.715900
15	0.950497	6.748920	0.950497	6.739260
16	0.954122	6.620250	0.954122	6.610590

Band 3 Coefficients (Qcal = (Q - offset) / gain):

Gain Mode: HIGH

Detector	Forward	Backward

	gain	offset	gain	offset
1	0.949206	6.226510	0.949206	6.220700
2	0.943181	6.432940	0.943181	6.427130
3	0.952270	6.269500	0.952270	6.263690
4	0.951920	6.134450	0.951920	6.128640
5	0.959897	5.942650	0.959897	5.936840
6	0.950786	5.930450	0.950786	5.924640
7	0.962914	5.731090	0.962914	5.725280
8	0.953018	5.876670	0.953018	5.870860
9	0.961008	5.718920	0.961008	5.713110
10	0.971431	5.582900	0.971431	5.577090
11	0.969670	5.563450	0.969670	5.557640
12	0.956630	5.878110	0.956630	5.872300
13	0.954672	6.059720	0.954672	6.053910
14	0.950138	6.240570	0.950138	6.234760
15	0.950500	6.094960	0.950500	6.089150
16	0.956894	6.032850	0.956894	6.027040

Band 4 Coefficients (Qcal = (Q - offset) / gain):

Gain Mode: LOW

Detector	Forward		Backward	
	gain	offset	gain	offset
1	0.976442	3.720750	0.976442	3.717350
2	0.957020	4.007190	0.957020	4.003790
3	0.966064	3.901490	0.966064	3.898090
4	0.964053	3.792050	0.964053	3.788660
5	0.965949	3.866010	0.965949	3.862620
6	0.957106	3.893960	0.957106	3.890560
7	0.965585	3.907260	0.965585	3.903870
8	0.958357	4.108360	0.958357	4.104960
9	0.974503	3.687160	0.974503	3.683770
10	0.964873	4.039750	0.964873	4.036360
11	0.968608	3.921370	0.968608	3.917980
12	0.971872	3.793350	0.971872	3.789950
13	0.956386	3.873310	0.956386	3.869920
14	0.975008	3.590030	0.975008	3.586640
15	0.968432	3.918960	0.968432	3.915570
16	0.972345	3.802490	0.972345	3.799090

Band 5 Coefficients (Qcal = (Q - offset) / gain):

Gain Mode: HIGH

Detector	Forward		Backward	
	gain	offset	gain	offset
1	0.956878	6.845350	0.956878	6.846000
2	0.952391	6.580580	0.952391	6.581230
3	0.953862	6.532760	0.953862	6.533410
4	0.948992	6.581110	0.948992	6.581770

5	0.950334	6.656560	0.950334	6.657210
6	0.957422	6.291610	0.957422	6.292260
7	0.969421	6.152000	0.969421	6.152650
8	0.963388	6.262720	0.963388	6.263370
9	0.963532	6.283690	0.963532	6.284340
10	0.955747	6.487410	0.955747	6.488060
11	0.958770	6.043970	0.958770	6.044620
12	0.965507	6.331850	0.965507	6.332500
13	0.957685	6.478740	0.957685	6.479390
14	0.960680	6.491520	0.960680	6.492170
15	0.957745	6.694090	0.957745	6.694740
16	0.954045	6.535280	0.954045	6.535930

Band 6 Coefficients (Qcal = (Q - offset) / gain):

Gain Mode: LOW

Detector	Forward		Backward	
	gain	offset	gain	offset
1	0.870418	25.57510	0.870418	25.57510
2	0.886202	23.79930	0.886202	23.79930
3	0.866645	25.77130	0.866645	25.77130
4	0.866342	25.80510	0.866342	25.80510
5	0.848437	27.61710	0.848437	27.61710
6	0.888179	23.53360	0.888179	23.53360
7	0.844112	28.16340	0.844112	28.16340
8	0.829109	29.72180	0.829109	29.72180

Band 7 Coefficients (Qcal = (Q - offset) / gain):

Gain Mode: HIGH

Detector	Forward		Backward	
	gain	offset	gain	offset
1	0.952655	6.607460	0.952655	6.604560
2	0.951307	6.762070	0.951307	6.759170
3	0.967407	6.496610	0.967407	6.493710
4	0.934655	6.813100	0.934655	6.810200
5	0.956428	6.686220	0.956428	6.683320
6	0.969594	6.414570	0.969594	6.411660
7	0.958988	6.596020	0.958988	6.593120
8	0.957245	6.639880	0.957245	6.636980
9	0.957737	6.616630	0.957737	6.613720
10	0.963618	6.555470	0.963618	6.552560
11	0.962342	6.487730	0.962342	6.484820
12	0.963907	6.376260	0.963907	6.373360
13	0.952484	6.762800	0.952484	6.759900
14	0.960749	6.572720	0.960749	6.569810
15	0.952178	6.596520	0.952178	6.593620
16	0.953834	6.589930	0.953834	6.587030

Band 8 Coefficients (Qcal = (Q - offset) / gain):

Gain Mode: LOW

Detector	Forward		Backward	
	gain	offset	gain	offset
1	0.964709	2.826960	0.964709	2.845710
2	0.970803	2.785030	0.970803	2.803780
3	0.972036	2.743200	0.972036	2.761950
4	0.970357	2.834090	0.970357	2.852840
5	0.958969	2.972800	0.958969	2.991550
6	0.964357	2.759510	0.964357	2.778260
7	0.961783	2.925370	0.961783	2.944120
8	0.972680	2.798340	0.972680	2.817090
9	0.957847	2.806570	0.957847	2.825320
10	0.965939	2.875220	0.965939	2.893970
11	0.962840	2.684110	0.962840	2.702860
12	0.966757	2.760600	0.966757	2.779350
13	0.965707	2.622820	0.965707	2.641570
14	0.971471	2.631110	0.971471	2.649860
15	0.956927	2.788130	0.956927	2.806880
16	0.969073	2.812460	0.969073	2.831210
17	0.969899	2.722760	0.969899	2.741510
18	0.959891	2.720960	0.959891	2.739710
19	0.962085	2.720210	0.962085	2.738960
20	0.965646	2.895460	0.965646	2.914210
21	0.957737	2.705020	0.957737	2.723770
22	0.961982	2.868510	0.961982	2.887260
23	0.956571	2.875140	0.956571	2.893890
24	0.955884	3.019800	0.955884	3.038560
25	0.970123	2.863860	0.970123	2.882610
26	0.961514	2.848950	0.961514	2.867700
27	0.968385	2.906220	0.968385	2.924970
28	0.963180	2.969760	0.963180	2.988510
29	0.967447	2.881960	0.967447	2.900710
30	0.957820	2.913660	0.957820	2.932410
31	0.970579	2.740050	0.970579	2.758800
32	0.959493	2.841540	0.959493	2.860290

Band 9 Coefficients (Qcal = (Q - offset) / gain):

Gain Mode: HIGH

Detector	Forward		Backward	
	gain	offset	gain	offset
1	0.947788	2.699390	0.947788	2.699390
2	0.963305	0.934474	0.963305	0.934474
3	0.939856	3.345010	0.939856	3.345010
4	0.940573	3.112050	0.940573	3.112050
5	0.922160	5.059160	0.922160	5.059160
6	0.968277	0.278725	0.968277	0.278725
7	0.914321	6.026500	0.914321	6.026500
8	0.897260	7.725360	0.897260	7.725360

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DEM PROCESSING

Elevation Correction Applied: None

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RADIOMETRIC QUALITY ASSESSMENT

NOTE:
Mean, Std.Dev, Striping are in DN's (Digital Numbers).

Band	Chip Location		Chip Size		Mean	Std Dev	Striping
	Line	Pixel	Lines	Pixels			
1	1197.60	1268.00	128	128	101.33	1.531	0.0812
1	2394.20	2535.00	128	128	83.59	0.670	0.0582
1	3590.80	3802.00	128	128	95.35	0.585	0.0615
1	4787.40	5069.00	128	128	82.55	0.452	0.0663
2	1197.60	1268.00	128	128	74.63	2.158	0.1624
2	2394.20	2535.00	128	128	60.67	0.381	0.0851
2	3590.80	3802.00	128	128	63.76	0.506	0.1104
2	4787.40	5069.00	128	128	57.97	0.337	0.0749
3	1197.60	1268.00	128	128	62.47	3.483	0.2812
3	2394.20	2535.00	128	128	45.47	0.577	0.1072
3	3590.80	3802.00	128	128	50.61	0.570	0.0931
3	4787.40	5069.00	128	128	43.27	0.435	0.1155
4	1197.60	1268.00	128	128	94.72	12.800	1.1561
4	2394.20	2535.00	128	128	97.79	2.287	0.1293
4	3590.80	3802.00	128	128	20.81	0.582	0.0597
4	4787.40	5069.00	128	128	96.79	2.788	0.2992
5	1197.60	1268.00	128	128	92.25	4.370	0.3518
5	2394.20	2535.00	128	128	77.51	2.278	0.3962
5	3590.80	3802.00	128	128	16.54	0.501	0.1131
5	4787.40	5069.00	128	128	72.43	1.233	0.1374
6	599.20	634.40	128	128	137.22	1.435	0.0872
6	1197.40	1267.80	128	128	134.95	1.371	0.1068
6	1795.60	1901.20	128	128	128.01	0.640	0.0911
6	2393.80	2534.60	128	128	132.40	0.397	0.0545
7	1197.60	1268.00	128	128	45.98	4.676	0.4085
7	2394.20	2535.00	128	128	34.81	1.049	0.1295
7	3590.80	3802.00	128	128	13.76	0.552	0.0429
7	4787.40	5069.00	128	128	32.09	0.605	0.0810
8	2394.40	2536.80	128	128	72.69	2.105	0.1232
8	4787.80	5072.60	128	128	62.70	0.970	0.1193
8	7181.20	7608.40	128	128	51.94	2.993	0.2572
8	9574.60	10144.20	128	128	65.19	1.088	0.1292
9	599.20	634.40	128	128	160.83	2.589	0.1269
9	1197.40	1267.80	128	128	156.77	2.398	0.1775
9	1795.60	1901.20	128	128	144.03	1.142	0.1157
9	2393.80	2534.60	128	128	152.35	0.671	0.0941

```
================================================================================

                                PRODUCT FORMATTING
                                ------------------

Product Scene Center Location (lat/long)   :  44.606   -73.516
Product Scene Center Date/Time (yyyy mm dd): 2002  8 14  15:26:51.9275

Product Extent:

  Lat:       45.57  ---------------------------------- Lat:       45.22
  Long:     -74.51                                    Long:     -72.07
  North: 5046390.96                                   North: 5011043.46
  East:   538302.56                                   East:   729828.04
  |                                                          |
  |                                                          |
  |                                                          |
  |                                                          |
  |                                                          |
  |                                                          |
  Lat:       43.98                                    Lat:       43.63
  Long:     -74.93                                    Long:     -72.56
  North: 4869409.85                                   North: 4834062.35
  East:   505639.33  ---------------------------------- East:   697164.82

================================================================================

                                EXECUTION INFORMATION
                                ---------------------

Stage           Start                   End                     CPU
--------------------------------------------------------------------------------
Ingest          Wed Apr  7 10:36:25 2004   Wed Apr  7 10:40:44 2004    137.74
ImCorr          Wed Apr  7 10:41:07 2004   Wed Apr  7 10:58:31 2004   1366.28
RadQa           Wed Apr  7 10:58:32 2004   Wed Apr  7 10:58:33 2004      0.67
Output          Wed Apr  7 10:58:36 2004   Wed Apr  7 10:59:46 2004     16.50
Catalog         Wed Apr  7 10:59:46 2004   Wed Apr  7 10:59:47 2004      0.61

                                    ---------
                                        1521.80
```

3.4.6 History Processing Parameters File

See References (Document 7) for detailed file format description.

3.4.7 DEM Header File (optional)

The Image Header File contains information describing image data. The header file is an ASCII text file. Header examples are listed below to demonstrate how the metadata appear in the first file of each digital product.

ETM+ NLAPS DEM Header Example:

NDF_REVISION=2.00;
DATA_SET_TYPE=NLAPS_DEM;
PRODUCT_NUMBER=ndfetm;
PIXEL_FORMAT=2BYTEINT;
PIXEL_ORDER=NOT_INVERTED;
BITS_PER_PIXEL=16;
PIXELS_PER_LINE=9048;
LINES_PER_DATA_FILE=8577;
DATA_ORIENTATION=UPPER_LEFT/RIGHT;
NUMBER_OF_DATA_FILES=1;
DATA_FILE_INTERLEAVING=BSQ;
TAPE_SPANNING_FLAG=1/1;
START_LINE_NUMBER=1;
START_DATA_FILE=1;
LINES_PER_VOLUME=8577;
BLOCKING_FACTOR=1;
RECORD_SIZE=9048;
UPPER_LEFT_CORNER=0990225.1489W,0424435.5517N,496700.000,4732300.000;
UPPER_RIGHT_CORNER=0961642.3389W,0424239.1292N,722875.000,4732300.000;
LOWER_RIGHT_CORNER=0962131.5257W,0404654.7399N,722875.000,4517900.000;
LOWER_LEFT_CORNER=0990220.8586W,0404843.5776N,496700.000,4517900.000;
REFERENCE_POINT=SCENE_CENTER;
REFERENCE_POSITION=0974044.7685W,0414612.5447N,609787.500,4625100.000,4524.50,4289.00;
REFERENCE_OFFSET=207.83,12.21;
ORIENTATION=0.015359;
MAP_PROJECTION_NAME=UTM;
USGS_PROJECTION_NUMBER=1;
USGS_MAP_ZONE=14;
USGS_PROJECTION_PARAMETERS=0.000000000000000,0.000000000000000,0.000000000000000,0
.000000000000000,0.000000000000000,0.000000000000000,0.000000000000000,0.000000000000000,
0.000000000000000,0.000000000000000,0.000000000000000,0.000000000000000,0.000000000000000,
0.000000000000000,0.000000000000000;
HORIZONTAL_DATUM=WGS84;
EARTH_ELLIPSOID_SEMI-MAJOR_AXIS=6378137.000;
EARTH_ELLIPSOID_SEMI-MINOR_AXIS=6356752.314;
EARTH_ELLIPSOID_ORIGIN_OFFSET=0.000,0.000,0.000;
EARTH_ELLIPSOID_ROTATION_OFFSET=0.000000,0.000000,0.000000;
PRODUCT_SIZE=FULL_SCENE;
PIXEL_SPACING=25.0000,25.0000;
PIXEL_SPACING_UNITS=METERS;
RESAMPLING=BL;
PROCESSING_DATE/TIME=1999-11-23T15:19:52;
PROCESSING_SOFTWARE=NLAPS_4_1_0;
NUMBER_OF_BANDS_IN_VOLUME=1;
DEM_NAME=DEM;
UNIT_OF_ELEVATION_MEASURE=METERS;
VERTICAL_DATUM=SEA_LEVEL;
END_OF_HDR;

3.4.8 DEM Data File (optional)

The DEM file contains elevation samples. There are no header records within the files nor are there any prefix and/or suffix data to the individual image records. The DEM data file is in the same pixel spacing as the satellite data when all bands are the same

resolution. The DEM data file will be of the same resolution as the reflective bands when satellite data is multi-resolution. The data file is 16-bits per pixel.

Section 4 Product Packaging

L1R and L1G products are available on 8-mm tape, DLT, CD-ROM, DVD-R and via electronic transfer. The following sections provide information on each of the distribution methods for the available L1 product formats.

4.1 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.TIF, README.FST, and README.NDF. 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-L7A, 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 2.

4.2 Digital Linear Tape (DLT)

Data products may be supplied on Digital Linear Tape (DLT). This includes a family of devices and media including DLT-IV, DLT8000, and SDLT. At this time, DLT-IV devices (DLT4000 and DLT-7000) are no longer available from vendors. There are however, a large number of existing DLT-IV devices in use. New tape devices include DLT8000 and Super DLT (SDLT). Both are “read compatible” with media written using DLT-IV devices.

Data is written using the UNIX tar (tape archive) utility format (per IEEE POSIX standard 1003.1), thus preserving directory structure and file names. The no-swap device and a fixed blocking factor of 20 512-byte blocks are used to maximize portability between platforms. The root directory must contain a README and summary file, which describes product content, and a set of files or subdirectories. Depending on the distribution technique, orders with only one scene may place all files in the root directory. However, if there are multiple scene units, there must be one subdirectory for each product ordered. Product subdirectories are labeled with a unique name and referenced in the summary file. All of the files associated with a product exist at a common level within the product subdirectory.

Product orders with large scenes or a number of scene units may exceed the capacity of the media. If this occurs, distribution systems span scene units across multiple volumes; a copy of the HDF directory file is included on all output volumes for user convenience. If a FAST-L7A product must be written to more than one DLT, relevant header records will be replicated.

The DLT tape label will include the following information: Mission indicator (which is L7 or Landsat 7), start path, start row, end row, acquisition date and product. In addition, the DLT format is suggested to avoid confusion (ex: DLT7000, DLT8000, SDLT)

4.3 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-L7A 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 2.

4.4 DVD-R

Data products on DVD-R (Digital Video Disk write once) are mastered using ISO 9660 Interchange level 2, the international standard for file formatting a DVD-R. Rock Ridge and Joliet extensions are present on the CD-ROM. No file unpacking is required. The files are ready for processing using HDF or other software tools. DVD-R products are mastered using single sided, single layered technology providing a capacity of 4.7 gigabytes. This configuration will be compatible with most DVD-ROM readers.

The root directory contains a README and summary file, which describes product content, and a set of files or subdirectories. Depending on the distribution technique, orders with only one scene may place all files in the root directory. However, if there are multiple scene units, there must be one subdirectory for each product ordered. Product subdirectories are labeled with a unique name and referenced in the summary file. All of the files associated with a product exist at a common level within the product subdirectory.

Product orders with large scenes or a number of scene units may exceed the capacity of the media. If this occurs, distribution systems span scene units across multiple volumes; a copy of the HDF directory file is included on all output volumes for user convenience. If a FAST-L7A product must be written to more than one DVD-R, relevant header records will be replicated.

The DVD-R label will include the following information: order and unit number, scene identifiers (granule or entity id), Mission indicator (which is L7 or Landsat 7), start path, start row, end row, acquisition date and product type.

4.5 Electronic Transfer

Products available via electronic transfer will also include the L1 volume descriptor (read-me file) with the same filenames as listed above. Electronic data transfer uses UNIX FTP. File Transfer Protocol (FTP), as described in RFC 959, is an internet standard for file transfers that support retrieval of files from a remote server. This distribution method may not be available to all end users by all distribution systems. In some cases special high-speed network requirements must be arranged. Various strategies and procedures to access data may vary significantly between distribution systems.

When FTP service is available, data will be stored using the following standard. The home or initial login directory contains a set of files or subdirectories. Depending on the distribution technique, orders with only one scene may place all files in the home directory. However, if there are multiple scene units, there must be one subdirectory for each product ordered. The product subdirectories are labeled with a unique name. All of the files associated with a product exist at a common level within the product subdirectory.

Section 5 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.

5.1 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.

5.2 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 0R distribution product (L0Rp) 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 0R 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, Vdata, and Vgroup. 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 0R 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 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.

5.3 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).

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-1. L1G Fast-L7A Projection Parameters

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

Table A-2. USGS Projection Parameters – Projection Transformation Package Projection Parameters

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							

Table A-3. USGS Projection Parameters - Projection Transformation Package Projection Parameters Elements 9-15

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

Table A-4. USGS Projection Parameters Key

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 Abbreviations and Acronyms

API	Application Programming Interface
ASCII	American Standard Code for Information Interchange
BSQ	Band Sequential
CCB	Configuration Control Board
CCR	Configuration Change Request
CD-ROM	Compact Disc Read-Only Memory
CPF	Calibration Parameter File
DEM	Digital Elevation Model
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
GCP	Ground Control Point
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 Reformatted Archive
L0Rp	Level 0 Reformatted Product
L1	Level 1
L1G	Level 1 Geometrically Corrected
L1P	Level 1 Precision Corrected
L1R	Level 1 Radiometrically Corrected
L1T	Level 1 Terrain Corrected
LASP	Laboratory for Atmospheric and Space Physics
LCC	Lambert Conformal Conic
LCCR	Landsat 7 Configuration Control Board
LGS	Landsat Ground 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 Production 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
SLO	Scan Line Offset
SOM	Space Oblique Mercator
SWIR	Short-Wave Infrared
TIFF	Tagged Image File Format
TM	Transverse 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

References

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 (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 (http://pds.jpl.nasa.gov/stdref/chap12.htm)

7. National Land Archive Production System (NLAPS) Systematic Format Description Document – US Geological Survey Format Specifications for Geometrically Corrected Landsat Level 1 Digital Data Products, July 2000