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LEVEL 1 VALIDATION PRODUCT CONTENT AND FORMAT SPECIFICATION

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LEVEL 1 VALIDATION PRODUCT
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Executive Summary

This Validation Product Content and Format Specification is maintained and controlled by the Landsat 7 Configuration Control Board (LCCB) on behalf of the Landsat Technical Working Group (LTWG) and may be updated or revised only on approval by the LCCB. Comments and questions regarding this document should be directed to:

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This Level 1 Validation Product Content and Format Specification presents detailed data formats and, where possible, field values of the output files generated by the Level 1 product generation systems employed by the Landsat 7 community. These Level 1 processing systems produce Level 1 output files from lower level (raw or Level 0R) data based on user requests. This specification documents the details of a selected standard Level 1 product to be used as a common basis for comparison and Level 1 processing system validation. Processing systems that generate and submit validation products conforming to these specifications will, upon successful comparison to the corresponding USGS-generated product, be deemed to be interoperable with the USGS Level 1 processing systems.

Keywords: Earth Resources Observation System (EROS), FAST format, Landsat 7, Level 1 Product, National Land Archive Processing System (NLAPS), Level 1 Product Generation System (LPGS)

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Section 1   Introduction

1.1   Purpose

This specification provides the user with a description of the Landsat 7 Level 1 (L1) validation product content, format, and product packaging.

1.2   Scope

This specification describes the format and data contents of the L1 validation product output files. Specified product characteristics include the map projection, datum reference, sample spacing/pixel size, product orientation, image resampling method(s), and product format. The format selected for Level 1 product validation purposes is the FAST-Landsat 7 (FAST-L7A) format. The FAST-L7A format is a variant of the heritage FAST-C format modified to accommodate the features of the Enhanced Thematic Mapper Plus (ETM+) instrument.

The file format contained in this specification is applicable to the products generated by L1 producing systems operated at the USGS EROS Data Center, including the Level 1 Product Generation System (LPGS) and the National Land Archive Processing System (NLAPS).

1.3   Intended Users

This document is intended as a guide to producers of L1 products who are seeking to have their processing systems validated by the USGS. This document contains detailed information on the L1 output data file content and format to be used by USGS data exchange analysts to compare products created by International cooperators with the corresponding USGS-generated product to verify product interoperability. It also provides information on the preferred packaging of the L1 validation products.

Section 2   Overview of Level 1 Validation Product

The Level 1 validation product is a standard FAST-L7A format Level 1G product generated with specific processing parameters to facilitate product intercomparison. In order to perform a complete radiometric and geometric validation, two versions of the product would be provided: one resampled using the nearest neighbor algorithm and a second resampled using parametric cubic convolution. In particular, the validation products are generated using the following processing options:

- Product framing = WRS-2 full scenes (specific validation scenes to be identified by USGS),
- Processing level = systematic (no ground control or terrain model used),
- Ephemeris source = definitive,
- Geodetic reference system = World Geodetic System of 1984 (WGS84),
- Map projection = Universal Transverse Mercator (UTM),
- Product orientation = map projection north up,
- Band selection = all ETM+ bands (1, 2, 3, 4, 5, 6L, 6H, 7, and 8),
- Resampling method = parametric cubic convolution (CC) with alpha = -0.5 (see reference 4), for the geometric validation product and nearest neighbor (NN) for the radiometric validation product.
- Pixel sizes must be selected so that the panchromatic band pixels are less than or equal to 15 meters, the reflective band pixels are less than or equal to 30 meters, and the thermal band pixels are less than or equal to 60 meters. Additionally, the values for the panchromatic, reflective, and thermal bands must be integer multiples of each other. For example, the following are all acceptable pixel size selections:

    o 30 meters (reflective), 60 meters (thermal), 15 meters (pan);
    o 25 meters (reflective), 50 meters (thermal), 12.5 meters (pan);
    o 28.5 meters (reflective), 57 meters (thermal), 14.25 meters (pan); and
    o 30 meters (reflective), 30 meters (thermal), 15 meters (pan).

The L1G digital image is radiometrically and geometrically corrected using the specified parameters, and is to be provided in the FAST-L7A format. Table 2-1 details the L1 product components for the FAST-L7A format.

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

Table 2-1. FAST-L7A Product Components

There are several sub-pixel location references in use for assigning pixel ground coordinates. The selection of a pixel reference location (e.g., pixel center or pixel

corner/edge) becomes particularly important when products include image bands at varying spatial resolutions. This Level 1 validation product specification does not mandate the use of a particular reference for either aligning the multi-resolution bands or for reporting the corner coordinates of the band files but the use of a pixel center reference is preferred for both aligning the panchromatic, VNIR/SWIR, and thermal bands and for reporting the band file corner coordinates.

If a pixel corner reference is used it should be applied in the manner of a neat line – that is, the corner reference should be to the outer edge of the image area. In this case, the upper left product corner would be referenced to the upper left corner of the upper left pixel, the lower right product corner would be referenced to the lower right corner of the lower right pixel, and so forth. By adhering to this convention, it will be possible to infer the combination of band alignment and corner reporting references (e.g., align centers/report centers, align edges/report edges, align edges/report centers, align centers/report edges) in use for a particular product by analyzing the corner coordinate, pixel spacing, and line/sample number information provided in the FAST-L7A header files.

As suggested above, some processing systems used a mixture of pixel corner and pixel center references. For example, the NLAPS system used by the USGS aligns the multi-resolution bands based on the pixel corners/edges but reports file corner coordinates based on the pixel centers. This leads to the multi-resolution bands having different reported corner coordinates. This is supported by the FAST-L7A by providing separate header records for each of the multi-resolution band sets. The Level 1 metadata file also includes optional parameters for specifying the corners of the panchromatic and thermal bands separately from the VNIR/SWIR bands.

2.1   FAST-L7A

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

L7fppprrr_rrrYYYYMMDD_AAA.FST

where	L7	=	Landsat 7 Mission
	f	=	ETM+ format (1 or 2) (data not pertaining to a specific format defaults to 1)
	ppp	=	starting path of the product
	rrr_rrr	=	starting and ending rows of the product
	YYYYMMDD	=	acquisition date of the image
	AAA	=	file type:B10 = band 1; B20 = band 2; B30 = band 3; B40 = band 4; B50 = band 5; B61 = band 6L; B62 = band 6H; B70 = band 7; B80 = band 8; HPN= panchromatic band header file; HRF = VNIR/ SWIR bands header file; HTM = thermal bands header file; MTL = Level 1 metadata
	FST	=	FAST file extension

Table 2-2. File Naming Convention for FAST-L7A

2.1.1 Header File

The first file that should be read is a read-me-first file that contains header data in American Standard Code for Information Interchange (ASCII). Each band group [panchromatic, visible near infrared/short-wave 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.

2.1.2 Level 1 Metadata File

The Level 1 metadata file is created during product generation and contains information specific to the product ordered. This file includes applicable image description information from the metadata provided with the input raw or L0Rp data.

2.1.3 Image File

Each image file contains only one ETM+ band of image pixels. There are no header records within the image file, nor are there prefix or suffix data in the individual image records. Image data are unblocked. The image files are 8-bit unsigned integers. Scaling parameters to convert these 8-bit integer values to at-aperture spectral radiance in units of Watts / (square meter – micrometer – steradian) are included in the header files for the three band groups.

Section 3   Level 1 Output File Formats

3.1   FAST-L7A File Formats

3.1.1 Header File

There is one header file for each band group in the product. The three 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 band group.

Table 3-1 through Table 3-10 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 validation products.

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.

3.1.2 Level 1 Metadata File

The Level 1 metadata file is created during product generation and contains information specific to the product ordered. Table 3-1 to Table 3-10 list the full contents of the Level

1 metadata file. This file contains applicable image description information from the metadata provided with the input raw or L0Rp data.

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. Path/row/fraction/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.path/row/fraction/subscene. For WRS-2 full scene validation products this will be the same as field #4 above.
	21	212	230	A19	bACQUISITIONbDATEb=
	22	231	238	A8	N/A
	23	239	239	1X	Blank fill
	24	240	240	A1	Carriage return
4	25	241	251	A11	SATELLITEb=
	26	252	261	A10	N/A
	27	262	270	A9	bSENSORb=
	28	271	280	A10	N/A
	29	281	294	A14	bSENSORbMODEb=
	30	295	300	A6	N/A
	31	301	313	A13	bLOOKbANGLEb=
	32	314	319	F6.2	N/A
	33	320	320	A1	Carriage return

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

Line	Field	Start Byte	End Byte	Format	Description
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=
	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
	68	673	687	A15	bPRODUCTbSIZEb=
	69	688	697	A10	Product size:FULLbSCENE
	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

Table 3-2. Administrative Record for Panchromatic Band (2 of 4)

Line	Field	Start Byte	End Byte	Format	Description
	74	752	764	A13	bRESAMPLINGb=
	75	765	766	A2	Resampling algorithm used: NN Nearest Neighbor (radiometric validation product) CC Cubic Convolution (geometric validation product)
	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
	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=
	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	bACQUIREDbbBITSbPERbPIXELb=
	102	1012	1013	I2	Acquired bits per pixel: 8
	103	1014	1039	26X	Blank fill
	104	1040	1040	A1	Carriage return
14	105	1041	1055	A15	BANDSbPRESENTb=
	106	1056	1087	A32	Image bands present for the pan band group: 8
	107	1088	1119	32X	Blank fill
	108	1120	1120	A1	Carriage return
15	109	1121	1130	A10	FILENAMEb=
	110	1131	1159	A29	Filename for first band
	111	1160	1169	A10	FILENAMEb=
	112	1170	1198	A29	Filename for second band (N/A)
	113	1199	1199	1X	Blank fill
	114	1200	1200	A1	Carriage return

Table 3-3. Administrative Record for Panchromatic Band (3 of 4)

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

Table 3-4. Administrative Record for Panchromatic Band (4 of 4)

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	50	A50	BIASESbANDbGAINSbINbASCENDINGb BANDbNUMBERbORDERbbb
	2	51	79	29X	Blank fill
	3	80	80	A1	Carriage return
2	4	81	104	D24.15	Bias for first band. The bias and gain are defined such that the formula: Bias + Gain * (8-bit digital number) yields a spectral radiance value in units of Watts / (square meter – micrometer – steradian)
	5	105	105	1X	Blank fill
	6	106	129	D24.15	Gain for first band. The bias and gain are defined such that the formula: Bias + Gain * (8-bit digital number) yields a spectral radiance value in units of Watts / (square meter – micrometer – steradian)
	7	130	159	30X	Blank fill
	8	160	160	A1	Carriage return
3	9	161	184	D24.15	Bias for second band (not used, blank fill)
	10	185	185	1X	Blank fill
	11	186	209	D24.15	Gain for second band (not used, blank fill)
	12	210	239	30X	Blank fill
	13	240	240	A1	Carriage return
4	14	241	264	D24.15	Bias for third band (not used, blank fill)
	15	265	265	1X	Blank fill
	16	266	289	D24.15	Gain for third band (not used, blank fill)
	17	290	319	30X	Blank fill
	18	320	320	A1	Carriage return
5	19	321	344	D24.15	Bias for fourth band (not used, blank fill)
	20	345	345	1X	Blank fill
	21	346	369	D24.15	Gain for fourth band (not used, blank fill)
	22	370	399	30X	Blank fill
	23	400	400	A1	Carriage return
6	24	401	424	D24.15	Bias for fifth band (not used, blank fill)
	25	425	425	1X	Blank fill
	26	426	449	D24.15	Gain for fifth band (not used, blank fill)
	27	450	479	30X	Blank fill
	28	480	480	A1	Carriage return
7	29	481	504	D24.15	Bias for sixth band (not used, blank fill)
	30	505	505	1X	Blank fill
	31	506	529	D24.15	Gain for sixth band (not used, blank fill)
	32	530	559	30X	Blank fill
	33	560	560	A1	Carriage return
8	34	561	584	D24.15	Bias for seventh band (not used, blank fill)
	35	585	585	1X	Blank fill
	36	586	609	D24.15	Gain for seventh band (not used, blank fill)
	37	610	639	30X	Blank fill
	38	640	640	A1	Carriage return

Table 3-5. Radiometric Record for Panchromatic Band (1 of 2)

Line	Field	Start Byte	End Byte	Format	Description
9	39	641	664	D24.15	Bias for eighth band (not used, blank fill)
	40	665	665	1X	Blank fill
	41	666	689	D24.15	Gain for eighth band (not used, blank fill)
	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 3-6. Radiometric Record for Panchromatic Band (2 of 2)

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: UTMb
	4	36	47	A12	bELLIPSOIDb=
	5	48	65	A18	Earth ellipsoid used: WGS84bbbbbbbbbbbbb
	6	66	73	A8	bDATUMb=
	7	74	79	A6	Datum name: WGS84bbbbbbbbbbbbbb
	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: 0.0
	12	134	134	1X	Blank fill
	13	135	158	D24.15	USGS projection parameter #2: 0.0
	14	159	159	1X	Blank fill
	15	160	160	A1	Carriage return
3	16	161	184	D24.15	USGS projection parameter #3: 0.0
	17	185	185	1X	Blank fill
	18	186	209	D24.15	USGS projection parameter #4: 0.0
	19	210	210	1X	Blank fill
	20	211	234	D24.15	USGS projection parameter #5: 0.0
	21	235	239	5X	Blank fill
	22	240	240	A1	Carriage return
4	23	241	264	D24.15	USGS projection parameter #6: 0.0
	24	265	265	1X	Blank fill
	25	266	289	D24.15	USGS projection parameter #7: 0.0
	26	290	290	1X	Blank fill
	27	291	314	D24.15	USGS projection parameter #8: 0.0
	28	315	319	5X	Blank fill
	29	320	320	A1	Carriage return
5	30	321	344	D24.15	USGS projection parameter #9: 0.0
	31	345	345	1X	Blank fill
	32	346	369	D24.15	USGS projection parameter #10: 0.0
	33	370	370	1X	Blank fill
	34	371	394	D24.15	USGS projection parameter #11: 0.0
	35	395	399	5X	Blank fill
	36	400	400	A1	Carriage return
6	37	401	424	D24.15	USGS projection parameter #12: 0.0
	38	425	425	1X	Blank fill
	39	426	449	D24.15	USGS projection parameter #13: 0.0
	40	450	450	1X	Blank fill
	41	451	474	D24.15	USGS projection parameter #14: 0.0
	42	475	479	5X	Blank fill
	43	480	480	A1	Carriage return
7	44	481	504	D24.15	USGS projection parameter #15: 0.0
	45	505	505	A1	Blank fill
	46	506	520	A15	USGSbMAPbZONEb=
	47	521	526	I6	UTM Zone Number
	48	527	559	33X	Blank fill
	49	560	560	A1	Carriage return

Table 3-7. Geometric Record for Panchromatic Band (1 of 4)

Line	Field	Start Byte	End Byte	Format	Description
8	50	561	564	A4	Ulb=
	51	565	565	1X	Blank fill
	52	566	578	A13	Geodetic longitude of upper left corner of product. This is the longitude of the pixel in the first row and first column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (upper left) corner. 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. This is the latitude of the pixel in the first row and first column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (upper left) corner. Latitude is expressed as degrees, minutes, seconds. For example, 9 degrees, 4 minutes, 24.2334 seconds north of the equator is expressed as 090424.2334N
	55	592	592	1X	Blank fill
	56	593	605	F13.3	Easting of upper left corner of product in projection units (meters only)
	57	606	606	1X	Blank fill
	58	607	619	F13.3	Northing of upper left corner of product in projection units (meters only)
	59	620	639	20X	Blank fill
	60	640	640	A1	Carriage return
9	61	641	644	A4	Urb=
	62	645	645	1X	Blank fill
	63	646	658	A13	Geodetic longitude of upper right corner of product. This is the longitude of the pixel in the first row and last column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (upper right) corner.
	64	659	659	1X	Blank fill
	65	660	671	A12	Geodetic latitude of upper right corner of product. This is the latitude of the pixel in the first row and last column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (upper right) corner.
	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). For map north-up products this will be the same as the upper left corner northing.
	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. This is the longitude of the pixel in the last row and last column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (lower right) corner.
	75	739	739	1X	Blank fill
	76	740	751	A12	Geodetic latitude of lower right corner of product. This is the latitude of the pixel in the last row and last column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (lower right) corner.
	77	752	752	1X	Blank fill

Table 3-8. Geometric Record for Panchromatic Band (2 of 4)

Line	Field	Start Byte	End Byte	Format	Description
	78	753	765	F13.3	Easting of lower right corner of product in projection units (meters only). For map north-up products this will be the same as the upper right corner easting.
	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. This is the longitude of the pixel in the last row and first column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (lower left) corner.
	86	819	819	1X	Blank fill
	87	820	831	A12	Geodetic latitude of lower left corner of product. This is the latitude of the pixel in the last row and first column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (lower left) corner.
	88	832	832	1X	Blank fill
	89	833	845	F13.3	Easting of lower left corner of product in projection units (meters only). For map north-up products this will be the same as the upper left corner easting.
	90	846	846	1X	Blank fill
	91	847	859	F13.3	Northing of lower left corner of product in projection units (meters only). For map north-up products this will be the same as the lower right corner northing.
	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)
	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

Table 3-9. Geometric Record for Panchromatic Band (3 of 4)

Line	Field	Start Byte	End Byte	Format	Description
	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). The field is sometimes referred to as the horizontal display shift and provides a measure of the cross-track offset of the actual scene ground track from the nominal WRS ground track. If the actual ground track is to the left (east on a descending pass) of the WRS ground track then the offset value is positive. If the actual ground track is to the right (west on a descending pass) of the WRS ground track then the offset value is negative.
	111	975	994	20A	bORIENTATIONbANGLEb=
	112	995	1000	F6.2	North Up (map-oriented). North Up (map-oriented) orientation angle will always have a value of 0.00
	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 3-10. Geometric Record for Panchromatic Band (4 of 4)

Line	Field	Start Byte	End Byte	Format	Description
	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. Path/row/fraction/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 path/row/fraction/subscene. For WRS-2 full scene validation products this will be the same as field #4 above.
	21	212	230	A19	bACQUISITIONbDATEb=
	22	231	238	A8	N/A
	23	239	239	1X	Blank fill
	24	240	240	A1	Carriage return
4	25	241	251	A11	SATELLITEb=
	26	252	261	A10	N/A
	27	262	270	A9	bSENSORb=
	28	271	280	A10	N/A
	29	281	294	A14	bSENSORbMODEb=
	30	295	300	A6	N/A
	31	301	313	A13	bLOOKbANGLEb=
	32	314	319	F6.2	N/A
	33	320	320	A1	Carriage return

Table 3-11. Administrative Record for VNIR and SWIR Bands (1 of 4)

Line	Field	Start Byte	End Byte	Format	Description
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=
	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
	68	673	687	A15	bPRODUCTbSIZEb=
	69	688	697	A10	Product size:FULLbSCENE
	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

Table 3-12. Administrative Record for VNIR and SWIR Bands (2 of 4)

Line	Field	Start Byte	End Byte	Format	Description
	74	752	764	A13	bRESAMPLINGb=
	75	765	766	A2	Resampling algorithm used: NN Nearest Neighbor (radiometric validation product) CC Cubic Convolution (geometric validation product)
	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
	84	848	864	A17	bLINESbPERbBANDb=
	85	865	869	I5	Number of lines per VNIR and SWIR bands
	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=
	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
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
	107	1088	1119	32X	Blank fill
	108	1120	1120	A1	Carriage return

Table 3-13. Administrative Record for VNIR and SWIR Bands (3 of 4)

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

Table 3-14. Administrative Record for VNIR and SWIR Bands (4 of 4)

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	50	A50	BIASESbANDbGAINSbINbASCENDINGbBANDbNUMBER bORDERbbb
	2	51	79	29X	Blank fill
	3	80	80	A1	Carriage return
2	4	81	104	D24.15	Bias for first band. The bias and gain are defined such that the formula: Bias + Gain * (8-bit digital number) yields a spectral radiance value in units of Watts / (square meter – micrometer – steradian)
	5	105	105	1X	Blank fill
	6	106	129	D24.15	Gain for first band. The bias and gain are defined such that the formula: Bias + Gain * (8-bit digital number) yields a spectral radiance value in units of Watts / (square meter – micrometer – steradian)
	7	130	159	30X	Blank fill
	8	160	160	A1	Carriage return
3	9	161	184	D24.15	Bias for second band (defined as noted in field #4)
	10	185	185	1X	Blank fill
	11	186	209	D24.15	Gain for second band (defined as noted in field #6)
	12	210	239	30X	Blank fill
	13	240	240	A1	Carriage return
4	14	241	264	D24.15	Bias for third band (defined as noted in field #4)
	15	265	265	1X	Blank fill
	16	266	289	D24.15	Gain for third band (defined as noted in field #6)
	17	290	319	30X	Blank fill
	18	320	320	A1	Carriage return
5	19	321	344	D24.15	Bias for fourth band (defined as noted in field #4)
	20	345	345	1X	Blank fill
	21	346	369	D24.15	Gain for fourth band (defined as noted in field #6)
	22	370	399	30X	Blank fill
	23	400	400	A1	Carriage return
6	24	401	424	D24.15	Bias for fifth band (defined as noted in field #4)
	25	425	425	1X	Blank fill
	26	426	449	D24.15	Gain for fifth band (defined as noted in field #6)
	27	450	479	30X	Blank fill
	28	480	480	A1	Carriage return
7	29	481	504	D24.15	Bias for sixth band (defined as noted in field #4)
	30	505	505	1X	Blank fill
	31	506	529	D24.15	Gain for sixth band (defined as noted in field #6)
	32	530	559	30X	Blank fill
	33	560	560	A1	Carriage return
8	34	561	584	D24.15	Bias for seventh band (not used, blank fill)
	35	585	585	1X	Blank fill
	36	586	609	D24.15	Gain for seventh band (not used, blank fill)
	37	610	639	30X	Blank fill
	38	640	640	A1	Carriage return

Table 3-15. Radiometric Record for VNIR and SWIR Bands (1 of 2)

Line	Field	Start Byte	End Byte	Format	Description
9	39	641	664	D24.15	Bias for eighth band (not used, blank fill)
	40	665	665	1X	Blank fill
	41	666	689	D24.15	Gain for eighth band (not used, blank fill)
	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 3-16. Radiometric Record for VNIR and SWIR Bands (2 of 2)

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: UTMb
	4	36	47	A12	bELLIPSOIDb=
	5	48	65	A18	Earth ellipsoid used: WGS84bbbbbbbbbbbbb
	6	66	73	A8	bDATUMb=
	7	74	79	A6	Datum name: WGS84bbbbbbbbbbbbb
	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: 0.0
	12	134	134	1X	Blank fill
	13	135	158	D24.15	USGS projection parameter #2: 0.0
	14	159	159	1X	Blank fill
	15	160	160	A1	Carriage return
3	16	161	184	D24.15	USGS projection parameter #3: 0.0
	17	185	185	1X	Blank fill
	18	186	209	D24.15	USGS projection parameter #4: 0.0
	19	210	210	1X	Blank fill
	20	211	234	D24.15	USGS projection parameter #5: 0.0
	21	235	239	5X	Blank fill
	22	240	240	A1	Carriage return
4	23	241	264	D24.15	USGS projection parameter #6: 0.0
	24	265	265	1X	Blank fill
	25	266	289	D24.15	USGS projection parameter #7: 0.0
	26	290	290	1X	Blank fill
	27	291	314	D24.15	USGS projection parameter #8: 0.0
	28	315	319	5X	Blank fill
	29	320	320	A1	Carriage return
5	30	321	344	D24.15	USGS projection parameter #9: 0.0
	31	345	345	1X	Blank fill
	32	346	369	D24.15	USGS projection parameter #10: 0.0
	33	370	370	1X	Blank fill
	34	371	394	D24.15	USGS projection parameter #11: 0.0
	35	395	399	5X	Blank fill
	36	400	400	A1	Carriage return
6	37	401	424	D24.15	USGS projection parameter #12: 0.0
	38	425	425	1X	Blank fill
	39	426	449	D24.15	USGS projection parameter #13: 0.0
	40	450	450	1X	Blank fill
	41	451	474	D24.15	USGS projection parameter #14: 0.0
	42	475	479	5X	Blank fill
	43	480	480	A1	Carriage return
7	44	481	504	D24.15	USGS projection parameter #15: 0.0
	45	505	505	A1	Blank fill
	46	506	520	A15	USGSbMAPbZONEb=
	47	521	526	I6	UTM Zone Number
	48	527	559	33X	Blank fill

Table 3-17. Geometric Record for VNIR and SWIR Bands (1 of 4)

Line	Field	Start Byte	End Byte	Format	Description
	49	560	560	A1	Carriage return
8	50	561	564	A4	Ulb=
	51	565	565	1X	Blank fill
	52	566	578	A13	Geodetic longitude of upper left corner of product. This is the longitude of the pixel in the first row and first column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (upper left) corner. 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. This is the latitude of the pixel in the first row and first column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (upper left) corner. Latitude is expressed as degrees, minutes, seconds. For example, 9 degrees, 4 minutes, 24.2334 seconds north of the equator is expressed as 090424.2334N
	55	592	592	1X	Blank fill
	56	593	605	F13.3	Easting of upper left corner of product in projection units (meters only)
	57	606	606	1X	Blank fill
	58	607	619	F13.3	Northing of upper left corner of product in projection units (meters only)
	59	620	639	20X	Blank fill
	60	640	640	A1	Carriage return
9	61	641	644	A4	Urb=
	62	645	645	1X	Blank fill
	63	646	658	A13	Geodetic longitude of upper right corner of product. This is the longitude of the pixel in the first row and last column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (upper right) corner.
	64	659	659	1X	Blank fill
	65	660	671	A12	Geodetic latitude of upper right corner of product. This is the latitude of the pixel in the first row and last column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (upper right) corner.
	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). For map north-up products this will be the same as the upper left corner northing.
	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. This is the longitude of the pixel in the last row and last column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (lower right) corner.
	75	739	739	1X	Blank fill
	76	740	751	A12	Geodetic latitude of lower right corner of product. This is the latitude of the pixel in the last row and last column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (lower right) corner.
	77	752	752	1X	Blank fill

Table 3-18. Geometric Record for VNIR and SWIR Bands (2 of 4)

Line	Field	Start Byte	End Byte	Format	Description
	78	753	765	F13.3	Easting of lower right corner of product in projection units (meters only). For map north-up products this will be the same as the upper right corner easting.
	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. This is the longitude of the pixel in the last row and first column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (lower left) corner.
	86	819	819	1X	Blank fill
	87	820	831	A12	Geodetic latitude of lower left corner of product. This is the latitude of the pixel in the last row and first column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (lower left) corner.
	88	832	832	1X	Blank fill
	89	833	845	F13.3	Easting of lower left corner of product in projection units (meters only). For map north-up products this will be the same as the upper left corner easting.
	90	846	846	1X	Blank fill
	91	847	859	F13.3	Northing of lower left corner of product in projection units (meters only). For map north-up products this will be the same as the lower right corner northing.
	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)
	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

Table 3-19. Geometric Record for VNIR and SWIR Bands (3 of 4)

Line	Field	Start Byte	End Byte	Format	Description
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). The field is sometimes referred to as the horizontal display shift and provides a measure of the cross-track offset of the actual scene ground track from the nominal WRS ground track. If the actual ground track is to the left (east on a descending pass) of the WRS ground track then the offset value is positive. If the actual ground track is to the right (west on a descending pass) of the WRS ground track then the offset value is negative.
	111	975	994	20A	bORIENTATIONbANGLEb=
	112	995	1000	F6.2	North Up (map-oriented). North Up (map-oriented) orientation angle will always have a value of 0.00
	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 3-20. Geometric Record for VNIR and SWIR Bands (4 of 4)

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: path/row/fraction/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: 0.00
	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: path/row/fraction/subscene. For WRS-2 full scene validation products this will be the same as field #4 above.
	21	212	230	A19	bACQUISITIONbDATEb=
	22	231	238	A8	N/A
	23	239	239	1X	Blank fill
	24	240	240	A1	Carriage return
4	25	241	251	A11	SATELLITEb=
	26	252	261	A10	N/A
	27	262	270	A9	bSENSORb=
	28	271	280	A10	N/A
	29	281	294	A14	bSENSORbMODEb=
	30	295	300	A6	N/A
	31	301	313	A13	bLOOKbANGLEb=
	32	314	319	F6.2	N/A
	33	320	320	A1	Carriage return

Table 3-21. Administrative Record for Thermal Bands (1 of 4)

Line	Field	Start Byte	End Byte	Format	Description
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=
	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
	68	673	687	A15	bPRODUCTbSIZEb=
	69	688	697	A10	Product size:FULLbSCENE
	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

Table 3-22. Administrative Record for Thermal Bands (2 of 4)

Line	Field	Start Byte	End Byte	Format	Description
	74	752	764	A13	bRESAMPLINGb=
	75	765	766	A2	Resampling algorithm used: NN Nearest Neighbor (radiometric validation product) CC Cubic Convolution (geometric validation product)
	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=
	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
	107	1088	1119	32X	Blank fill
	108	1120	1120	A1	Carriage return

Table 3-23. Administrative Record for Thermal Bands (3 of 4)

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

Table 3-24. Administrative Record for Thermal Bands (4 of 4)

Line	Field	Start Byte	End Byte	Format	Description
1	1	1	50	A50	BIASESbBANDbGAINSbINbASCENDINGbBANDb NUMBERbORDERbbb
	2	51	79	29X	Blank fill
	3	80	80	A1	Carriage return
2	4	81	104	D24.15	Bias for first band. The bias and gain are defined such that the formula: Bias + Gain * (8-bit digital number) yields a spectral radiance value in units of Watts / (square meter – micrometer – steradian)
	5	105	105	1X	Blank fill
	6	106	129	D24.15	Gain for first band. The bias and gain are defined such that the formula: Bias + Gain * (8-bit digital number) yields a spectral radiance value in units of Watts / (square meter – micrometer – steradian)
	7	130	159	30X	Blank fill
	8	160	160	A1	Carriage return
3	9	161	184	D24.15	Bias for second band (defined as noted in field #4)
	10	185	185	1X	Blank fill
	11	186	209	D24.15	Gain for second band (defined as noted in field #6)
	12	210	239	30X	Blank fill
	13	240	240	A1	Carriage return
4	14	241	264	D24.15	Bias for third band (not used, blank fill)
	15	265	265	1X	Blank fill
	16	266	289	D24.15	Gain for third band (not used, blank fill)
	17	290	319	30X	Blank fill
	18	320	320	A1	Carriage return
5	19	321	344	D24.15	Bias for fourth band (not used, blank fill)
	20	345	345	1X	Blank fill
	21	346	369	D24.15	Gain for fourth band (not used, blank fill)
	22	370	399	30X	Blank fill
	23	400	400	A1	Carriage return
6	24	401	424	D24.15	Bias for fifth band (not used, blank fill)
	25	425	425	1X	Blank fill
	26	426	449	D24.15	Gain for fifth band (not used, blank fill)
	27	450	479	30X	Blank fill
	28	480	480	A1	Carriage return
7	29	481	504	D24.15	Bias for sixth band (not used, blank fill)
	30	505	505	1X	Blank fill
	31	506	529	D24.15	Gain for sixth band (not used, blank fill)
	32	530	559	30X	Blank fill
	33	560	560	A1	Carriage return
8	34	561	584	D24.15	Bias for seventh band (not used, blank fill)
	35	585	585	1X	Blank fill
	36	586	609	D24.15	Gain for seventh band (not used, blank fill)
	37	610	639	30X	Blank fill
	38	640	640	A1	Carriage return

Table 3-25. Radiometric Record for Thermal Bands (1 of 2)

Line	Field	Start Byte	End Byte	Format	Description
9	39	641	664	D24.15	Bias for eighth band (not used, blank fill)
	40	665	665	1X	Blank fill
	41	666	689	D24.15	Gain for eighth band (not used, blank fill)
	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 3-26. Radiometric Record for Thermal Bands (2 of 2)

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: UTMb
	4	36	47	A12	bELLIPSOIDb=
	5	48	65	A18	Earth ellipsoid used: WGS84bbbbbbbbbbbbb
	6	66	73	A8	bDATUMb=
	7	74	79	A6	Datum name: WGS84bbbbbbbbbbbbb
	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: 0.0
	12	134	134	1X	Blank fill
	13	135	158	D24.15	USGS projection parameter #2: 0.0
	14	159	159	1X	Blank fill
	15	160	160	A1	Carriage return
3	16	161	184	D24.15	USGS projection parameter #3: 0.0
	17	185	185	1X	Blank fill
	18	186	209	D24.15	USGS projection parameter #4: 0.0
	19	210	210	1X	Blank fill
	20	211	234	D24.15	USGS projection parameter #5: 0.0
	21	235	239	5X	Blank fill
	22	240	240	A1	Carriage return
4	23	241	264	D24.15	USGS projection parameter #6: 0.0
	24	265	265	1X	Blank fill
	25	266	289	D24.15	USGS projection parameter #7: 0.0
	26	290	290	1X	Blank fill
	27	291	314	D24.15	USGS projection parameter #8: 0.0
	28	315	319	5X	Blank fill
	29	320	320	A1	Carriage return
5	30	321	344	D24.15	USGS projection parameter #9: 0.0
	31	345	345	1X	Blank fill
	32	346	369	D24.15	USGS projection parameter #10: 0.0
	33	370	370	1X	Blank fill
	34	371	394	D24.15	USGS projection parameter #11: 0.0
	35	395	399	5X	Blank fill
	36	400	400	A1	Carriage return
6	37	401	424	D24.15	USGS projection parameter #12: 0.0
	38	425	425	1X	Blank fill
	39	426	449	D24.15	USGS projection parameter #13: 0.0
	40	450	450	1X	Blank fill
	41	451	474	D24.15	USGS projection parameter #14: 0.0
	42	475	479	5X	Blank fill
	43	480	480	A1	Carriage return
7	44	481	504	D24.15	USGS projection parameter #15: 0.0
	45	505	505	A1	Blank fill
	46	506	520	A15	USGSbMAPbZONEb=
	47	521	526	I6	UTM Zone Number
	48	527	559	33X	Blank fill

Table 3-27. Geometric Record for Thermal Bands (1 of 4)

Line	Field	Start Byte	End Byte	Format	Description
	49	560	560	A1	Carriage return
8	50	561	564	A4	Ulb=
	51	565	565	1X	Blank fill
	52	566	578	A13	Geodetic longitude of upper left corner of product. This is the longitude of the pixel in the first row and first column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (upper left) corner. 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. This is the latitude of the pixel in the first row and first column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (upper left) corner. Latitude is expressed as degrees, minutes, seconds. For example, 9 degrees, 4 minutes, 24.2334 seconds north of the equator is expressed as 090424.2334N
	55	592	592	1X	Blank fill
	56	593	605	F13.3	Easting of upper left corner of product in projection units (meters only)
	57	606	606	1X	Blank fill
	58	607	619	F13.3	Northing of upper left corner of product in projection units (meters only)
	59	620	639	20X	Blank fill
	60	640	640	A1	Carriage return
9	61	641	644	A4	Urb=
	62	645	645	1X	Blank fill
	63	646	658	A13	Geodetic longitude of upper right corner of product. This is the longitude of the pixel in the first row and last column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (upper right) corner.
	64	659	659	1X	Blank fill
	65	660	671	A12	Geodetic latitude of upper right corner of product. This is the latitude of the pixel in the first row and last column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (upper right) corner.
	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). For map north-up products this will be the same as the upper left corner northing.
	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. This is the longitude of the pixel in the last row and last column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (lower right) corner.
	75	739	739	1X	Blank fill
	76	740	751	A12	Geodetic latitude of lower right corner of product. This is the latitude of the pixel in the last row and last column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (lower right) corner.
	77	752	752	1X	Blank fill

Table 3-28. Geometric Record for Thermal Bands (2 of 4)

Line	Field	Start Byte	End Byte	Format	Description
	78	753	765	F13.3	Easting of lower right corner of product in projection units (meters only). For map north-up products this will be the same as the upper right corner easting.
	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. This is the longitude of the pixel in the last row and first column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (lower left) corner.
	86	819	819	1X	Blank fill
	87	820	831	A12	Geodetic latitude of lower left corner of product. This is the latitude of the pixel in the last row and first column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (lower left) corner.
	88	832	832	1X	Blank fill
	89	833	845	F13.3	Easting of lower left corner of product in projection units (meters only). For map north-up products this will be the same as the upper left corner easting.
	90	846	846	1X	Blank fill
	91	847	859	F13.3	Northing of lower left corner of product in projection units (meters only). For map north-up products this will be the same as the lower right corner northing.
	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)
	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

Table 3-29. Geometric Record for Thermal Bands (3 of 4)

Line	Field	Start Byte	End Byte	Format	Description
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). The field is sometimes referred to as the horizontal display shift and provides a measure of the cross-track offset of the actual scene ground track from the nominal WRS ground track. If the actual ground track is to the left (east on a descending pass) of the WRS ground track then the offset value is positive. If the actual ground track is to the right (west on a descending pass) of the WRS ground track then the offset value is negative.
	111	975	994	20A	bORIENTATIONbANGLEb=
	112	995	1000	F6.2	North Up (map-oriented). North Up (map-oriented) orientation angle will always have a value of 0.00
	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 3-30. Geometric Record for Thermal Bands (4 of 4)

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	Quote-delimited ASCII string indicating the unique product request number. USGS products use the format: "NNNYYMMDDSSSS_UUUUU" where NNNYYMMDDSSSS = 13-digit order number NNN = Node indicator YY = Year MM = Month DD = Day SSSS = Sequence number for the day UUUUU = 5-digit unit number	Unique product generation request ID generated by the production system.
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) 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	= "NNN"	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
GROUND_STATION	3	= "NNN"	Ground station that received data
LPS_PROCESSOR_NUMBER	1	= 1-9	Level 0 processor number
DATEHOUR_CONTACT_PERIOD	7	= "YYDOYHH"	Date and hour of contact period
SUBINTERVAL_NUMBER	2	= "00"-"99"	Subinterval number within contact period
END_GROUP	18	= METADATA_FILE_INFO	End of metadata information group

Table 3-31. Level 1 Metadata File (1 of 12)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
GROUP	16	= PRODUCT_METADATA	Beginning of product metadata group
PRODUCT_TYPE	3	= "L1G"	Identifier to inform user of product type
PROCESSING_SOFTWARE	15	= "SYSTEM_VERSION" where SYSTEM = processing system (e.g., IAS, LPGS, NLAPS) VERSION = version of software	L1 processing system and software version identifiers. Examples: • IAS_4.5 • LPGS_4.3
EPHEMERIS_TYPE	10	= "DEFINITIVE"	Identifier to inform user of orbital ephemeris type used.
SPACECRAFT_ID	8	= "Landsat7"	Name of satellite platform
SENSOR_ID	4	= "ETM+"	Name of imaging sensor
ACQUISITION_DATE	20	= YYYY-MM-DD	Date image was acquired
WRS_PATH	3	= NNN, where NNN = path number (001-233)	WRS path value for product
STARTING_ROW	3	= NNN, where NNN = row of first full or partial scene in product (001-248)	Starting WRS row
ENDING_ROW	3	= NNN, where NNN = row of last full or partial scene in product (001-248)	Ending WRS row. This will be the same as the starting row for Level 1 validation products.
BAND_COMBINATION	9	= "123456678"	L1-generated indicator of bands present. 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	Geodetic latitude of upper left corner of product. This is the longitude of the pixel in the first row and first column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (upper left) corner.
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	Geodetic longitude of upper left corner of product. This is the longitude of the pixel in the first row and first column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (upper left) corner.
PRODUCT_UR_CORNER_LAT	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	Geodetic latitude of upper right corner of product. This is the longitude of the pixel in the first row and last column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (upper right) corner.
PRODUCT_UR_CORNER_LON	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	Geodetic longitude of upper right corner of product. This is the longitude of the pixel in the first row and last column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (upper right) corner.
PRODUCT_LL_CORNER_LAT	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	Geodetic latitude of lower left corner of product. This is the longitude of the pixel in the last row and first column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (lower left) corner.

Table 3-32. Level 1 Metadata File (2 of 12)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
PRODUCT_LL_CORNER_LON	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	Geodetic longitude of lower left corner of product. This is the longitude of the pixel in the last row and first column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (lower left) corner.
PRODUCT_LR_CORNER_LAT	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	Geodetic latitude of lower right corner of product. This is the longitude of the pixel in the last row and last column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (lower right) corner.
PRODUCT_LR_CORNER_LON	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	Geodetic longitude of lower right corner of product. This is the longitude of the pixel in the last row and last column of the product image file. The pixel coordinate reference point may be either the pixel center or the pixel (lower right) corner.
PRODUCT_UL_CORNER_MAPX	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection X coordinate for upper left corner of product
PRODUCT_UL_CORNER_MAPY	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection Y coordinate for upper left corner of product
PRODUCT_UR_CORNER_MAPX	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection X coordinate for upper right corner of product
PRODUCT_UR_CORNER_MAPY	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection Y coordinate for upper right corner of product
PRODUCT_LL_CORNER_MAPX	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection X coordinate for lower left corner of product
PRODUCT_LL_CORNER_MAPY	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection Y coordinate for lower left corner of product
PRODUCT_LR_CORNER_MAPX	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection X coordinate for lower right corner of product
PRODUCT_LR_CORNER_MAPY	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection Y coordinate for lower right corner of product
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	Latitude value for upper left corner of product band 8, if different than VNIR/SWIR. Not used otherwise.
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	Longitude value for upper left corner of product band 8, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_UR_CORNER_LAT_PAN	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	Latitude value for upper right corner of product band 8, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_UR_CORNER_LON_PAN	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	Longitude value for upper right corner of product band 8, if different than VNIR/SWIR. Not used otherwise.

Table 3-33. Level 1 Metadata File (3 of 12)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
PRODUCT_LL_CORNER_LAT_PAN	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	Latitude value for lower left corner of product band 8, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_LL_CORNER_LON_PAN	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	Longitude value for lower left corner of product band 8, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_LR_CORNER_LAT_PAN	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	Latitude value for lower right corner of product band 8, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_LR_CORNER_LON_PAN	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	Longitude value for lower right corner of product band 8, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_UL_CORNER_MAPX_PAN	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection X coordinate for upper left corner of product band 8, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_UL_CORNER_MAPY_PAN	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection Y coordinate for upper left corner of product band 8, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_UR_CORNER_MAPX_PAN	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection X coordinate for upper right corner of product band 8, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_UR_CORNER_MAPY_PAN	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection Y coordinate for upper right corner of product band 8, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_LL_CORNER_MAPX_PAN	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection X coordinate for lower left corner of product band 8, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_LL_CORNER_MAPY_PAN	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection Y coordinate for lower left corner of product band 8, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_LR_CORNER_MAPX_PAN	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection X coordinate for lower right corner of product band 8, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_LR_CORNER_MAPY_PAN	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection Y coordinate for lower right corner of product band 8, if different than VNIR/SWIR. Not used otherwise.
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	Latitude value for upper left corner of product bands 61, 62, if different than VNIR/SWIR. Not used otherwise.
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	Longitude value for upper left corner of product bands 61, 62, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_UR_CORNER_LAT_THM	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	Latitude value for upper right corner of product bands 61, 62, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_UR_CORNER_LON_THM	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	Longitude value for upper right corner of product bands 61, 62, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_LL_CORNER_LAT_THM	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	Latitude value for lower left corner of product bands 61, 62, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_LL_CORNER_LON_THM	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	Longitude value for lower left corner of product bands 61, 62, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_LR_CORNER_LAT_THM	11	= -90.0000000 through +90.0000000 degrees (with 7-digit precision)	Latitude value for lower right corner of product bands 61, 62, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_LR_CORNER_LON_THM	12	= -180.0000000 through +180.0000000 degrees (with 7-digit precision)	Longitude value for lower right corner of product bands 61, 62, if different than VNIR/SWIR. Not used otherwise.

Table 3-34. Level 1 Metadata File (4 of 12)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
PRODUCT_UL_CORNER_MAPX_THM	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection X coordinate for upper left corner of product bands 61, 62, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_UL_CORNER_MAPY_THM	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection Y coordinate for upper left corner of product bands 61, 62, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_UR_CORNER_MAPX_THM	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection X coordinate for upper right corner of product bands 61, 62, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_UR_CORNER_MAPY_THM	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection Y coordinate for upper right corner of product bands 61, 62, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_LL_CORNER_MAPX_THM	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection X coordinate for lower left corner of product bands 61, 62, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_LL_CORNER_MAPY_THM	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection Y coordinate for lower left corner of product bands 61, 62, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_LR_CORNER_MAPX_THM	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection X coordinate for lower right corner of product bands 61, 62, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_LR_CORNER_MAPY_THM	14	= -132000000.000 through 132000000.000Units are feet or meters	Projection Y coordinate for lower right corner of product bands 61, 62, if different than VNIR/SWIR. Not used otherwise.
PRODUCT_SAMPLES_PAN	6		Product samples for the panchromatic band
PRODUCT_LINES_PAN	6		Product lines for the panchromatic band
PRODUCT_SAMPLES_REF	6		Product samples for the reflective bands
PRODUCT_LINES_REF	6		Product lines for the reflective bands
PRODUCT_SAMPLES_THM	6		Product samples for the thermal bands
PRODUCT_LINES_THM	6		Product lines for the thermal bands
BAND1_FILE_NAME	29	"L71ppprrr_rrrYYYYMMDD_B10.FST"	L1-generated external element file name for band 1
BAND2_FILE_NAME	29	"L71ppprrr_rrrYYYYMMDD_B20.FST"	L1-generated external element file name for band 2
BAND3_FILE_NAME	29	"L71ppprrr_rrrYYYYMMDD_B30.FST"	L1-generated external element file name for band 3
BAND4_FILE_NAME	29	"L71ppprrr_rrrYYYYMMDD_B40.FST"	L1-generated external element file name for band 4
BAND5_FILE_NAME	29	"L71ppprrr_rrrYYYYMMDD_B50.FST"	L1-generated external element file name for band 5
BAND61_FILE_NAME	29	"L71ppprrr_rrrYYYYMMDD_B61.FST"	L1-generated external element file name for band 6 format 1
BAND62_FILE_NAME	29	"L72ppprrr_rrrYYYYMMDD_B62.FST"	L1-generated external element file name for band 6 format 2
BAND7_FILE_NAME	29	"L72ppprrr_rrrYYYYMMDD_B70.FST"	L1-generated external element file name for band 7
BAND8_FILE_NAME	29	"L72ppprrr_rrrYYYYMMDD_B80.FST"	L1-generated external element file name for band 8

Table 3-35. Level 1 Metadata File (5 of 12)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
METADATA_L1_FILE_NAME	29	"L71ppprrr_rrrYYYYMMDD_MTL.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 used to create the Level 1 product.
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 (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 (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 (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 (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 (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 (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 (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 (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 (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 (w/(m^2 sr micron)). Also, the spectral radiance corresponding to QCALMIN_BAND5.

Table 3-36. Level 1 Metadata File (6 of 12)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
LMAX_ BAND61	7	= NNN.NNN	Maximum achievable spectral radiance value for band 6 format 1 (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 (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 (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 (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 (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 (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 (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 (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

Table 3-37. Level 1 Metadata File (7 of 12)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
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 (Digital Number (DN)).
QCALMIN_BAND1	5	= NNN.N	Minimum possible pixel value for band 1 (Digital Number (DN)).
QCALMAX_BAND2	5	= NNN.N	Maximum possible pixel value for band 2 (Digital Number (DN)).
QCALMIN_BAND2	5	= NNN.N	Minimum possible pixel value for band 2 (Digital Number (DN)).
QCALMAX_BAND3	5	= NNN.N	Maximum possible pixel value for band 3 (Digital Number (DN)).
QCALMIN_BAND3	5	= NNN.N	Minimum possible pixel value for band 3 (Digital Number (DN)).
QCALMAX_BAND4	5	= NNN.N	Maximum possible pixel value for band 4 (Digital Number (DN)).
QCALMIN_BAND4	5	= NNN.N	Minimum possible pixel value for band 4 (Digital Number (DN)).
QCALMAX_BAND5	5	= NNN.N	Maximum possible pixel value for band 5 (Digital Number (DN)).
QCALMIN_BAND5	5	= NNN.N	Minimum possible pixel value for band 5 (Digital Number (DN)).
QCALMAX_BAND61	5	= NNN.N	Maximum possible pixel value for band 6 format 1 (Digital Number (DN)).
QCALMIN_BAND61	5	= NNN.N	Minimum possible pixel value for band 6 format 1 (Digital Number (DN)).
QCALMAX_BAND62	5	= NNN.N	Maximum possible pixel value for band 6 format 2 (Digital Number (DN)).
QCALMIN_BAND62	5	= NNN.N	Minimum possible pixel value for band 6 format 2 (Digital Number (DN)).
QCALMAX_BAND7	5	= NNN.N	Maximum possible pixel value for band 7 (Digital Number (DN)).
QCALMIN_BAND7	5	= NNN.N	Minimum possible pixel value for band 7 (Digital Number (DN)).
QCALMAX_BAND8	5	= NNN.N	Maximum possible pixel value for band 8 (Digital Number (DN)).
QCALMIN_BAND8	5	= NNN.N	Minimum possible pixel value for band 8 (Digital Number (DN)).
END_GROUP	19	= MIN_MAX_PIXEL_VALUE	End of the min/max pixel value group

Table 3-38. Level 1 Metadata File (8 of 12)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
GROUP	18	= PRODUCT_PARAMETERS	Beginning of product parameters group (both 1R and 1G products)
CORRECTION_METHOD_GAIN_BAND1	3	= "CPF" (for CPF gains)	Correction method used by L1 in creating image for band 1
CORRECTION_METHOD_GAIN_BAND2	3	= "CPF" (for CPF gains)	Correction method used by L1 in creating image for band 2
CORRECTION_METHOD_GAIN_BAND3	3	= "CPF" (for CPF gains)	Correction method used by L1 in creating image for band 3
CORRECTION_METHOD_GAIN_BAND4	3	= "CPF" (for CPF gains)	Correction method used by L1 in creating image for band 4
CORRECTION_METHOD_GAIN_BAND5	3	= "CPF" (for CPF gains)	Correction method used by L1 in creating image for band 5
CORRECTION_METHOD_GAIN_BAND61	3	= "CPF" (for CPF gains)	Correction method used by L1 in creating image for band 6 format 1
CORRECTION_METHOD_GAIN_BAND62	3	= "CPF" (for CPF gains)	Correction method used by L1 in creating image for band 6 format 2
CORRECTION_METHOD_GAIN_BAND7	3	= "CPF" (for CPF gains)	Correction method used by L1 in creating image for band 7
CORRECTION_METHOD_GAIN_BAND8	3	= "CPF" (for CPF gains)	Correction method used by L1 in creating image for band 8
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
BAND2_GAIN	1	= "L" (for low gain) = "H" (for high gain)	Gain state for band 2's first data line
BAND3_GAIN	1	= "L" (for low gain) = "H" (for high gain)	Gain state for band 3's first data line
BAND4_GAIN	1	= "L" (for low gain) = "H" (for high gain)	Gain state for band 4's first data line
BAND5_GAIN	1	= "L" (for low gain) = "H" (for high gain)	Gain state for band 5's first data line
BAND6_GAIN1	1	= "L" (for low gain) = "H" (for high gain)	Gain state for band 6's first data line-format 1
BAND6_GAIN2	1	= "L" (for low gain) = "H" (for high gain)	Gain state for band 6's first data line-format 2
BAND7_GAIN	1	= "L" (for low gain) = "H" (for high gain)	Gain state for band 7's first data line
BAND8_GAIN	1	= "L" (for low gain) = "H" (for high gain)	Gain state for band 8's first data line
BAND1_GAIN_CHANGE	1	= "0" (for no gain change) = "+" (for low to high) = "-" (for high to low)	Presence and direction of gain change for band 1
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

Table 3-39. Level 1 Metadata File (9 of 12)

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

Table 3-40. Level 1 Metadata File (10 of 12)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
SUN_AZIMUTH	12	= -180.0000000 through 180.0000000 degrees (with 7-digit precision) A positive value indicates angles to the east or clockwise from north. A negative value (-) indicates angles to the west or counterclockwise from north. Leading zeros are not required.	Sun azimuth angle in degrees for image center location at image center acquisition time
SUN_ELEVATION	11	= -90.0000000 through 90.0000000 degrees (with 7-digit precision) A positive value indicates a daytime scene. A negative value (-) indicates a nighttime scene. Leading zeros are not required.	Sun elevation angle in degrees for image center location at image center acquisition time
OUTPUT_FORMAT	10	= "FORMAT_VERSION" where FORMAT = FASTL7A VERSION = output format version	Output format and output format version of image. Examples: • FASTL7A NOTE: no version included for 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: 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: 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: 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: 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: 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: 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: 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: BAND_AVERAGE = NASA REFERENCE_DETECTOR = CCRS
STRIPING_BAND8	20	= "NONE" = "BAND_AVERAGE" = "REFERENCE_DETECTOR"	Indicator of type of striping correction applied for band 8 image: BAND_AVERAGE = NASA REFERENCE_DETECTOR = CCRS

Table 3-41. Level 1 Metadata File (11 of 12)

Parameter Name	Size*	Value, Format, Range, and Units	Parameter Description/Remarks
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 15.00 meters, in increments of 0.01 meters	Grid cell size used in creating image for pan band
GRID_CELL_SIZE_THM	6	= 10.00 through 60.00 meters, in increments of 0.01 meters	Grid cell size used in creating image for thermal bands
GRID_CELL_SIZE_REF	6	= 10.00 through 30.00 meters, in increments of 0.01 meters	Grid cell size used in creating image for VNIR/SWIR bands
ORIENTATION	3	= "NUP" North Up	Orientation used in creating image
RESAMPLING_OPTION	3	= "NN" Nearest Neighbor (radiometric validation product) = "CC" Cubic Convolution (geometric validation product)	Resampling option used in creating image
MAP_PROJECTION	4	= "UTM" Universal Transverse Mercator	Map projection used in creating image
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 UTM**
GROUP	14	UTM_PARAMETERS	Beginning of UTM parameters group
ZONE_NUMBER	3	= 1 to 60 or –1 to –60	Value used to indicate zone number
END_GROUP	13	UTM_PARAMETERS	End of UTM parameters group
END_GROUP	148	L1_METADATA_FILE	End of Level 1 metadata file level group
END			Required standalone parameter signifying file end

Table 3-42. Level 1 Metadata File (12 of 12)

Section 4　Product Packaging

L1G distribution products are available from the USGS on CD-ROM and via electronic transfer. The following sections provide information on each of the distribution methods for the FAST-L7A product format. The preferred distribution medium for Level 1 validation products is CD-ROM.

4.1　CD-ROM

Each full scene validation product will be written to one CD-ROM. At least the following information will be labeled directly onto the CD-ROM: product type (i.e., FAST), 13-digit order number, 5-digit unit number, CD-ROM volume number, start path, start row, end row, and acquisition date. The path, row, and acquisition date information is supplied in the format of the naming convention of the base part of filenames as defined in Section 3.

4.2　Electronic Transfer

Products may also be made available via electronic transfer, although, as noted above, distribution on CD-ROM is preferred.

　　　　　　　　　　　　　　　L7-PD-15.2

Appendix A   Glossary

Level 1G (L1G) digital image- Radiometrically corrected Landsat 7 ETM+ image data resampled for geometric correction and registration to a geographic map projection

Level 1G (L1G) product- Complete L1 product; includes, for all bands, FAST-L7A format L1G image and associated header records and metadata required by the FAST-L7A format

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

Appendix B   Acronyms

ASCII	American Standard Code for Information Interchange
CCB	Configuration Control Board
CCR	Configuration Change Request
CCRS	Canada Centre for Remote Sensing
CD-ROM	Compact Disc Read-Only Memory
CPF	Calibration Parameter File
DFCB	Data Format Control Book
EDC	EROS Data Center
EROS	Earth Resources Observation System
ETM+	Enhanced Thematic Mapper Plus
FAST-L7A	FAST-Landsat 7 Format
ftp	file transfer protocol
GMT	Greenwich Mean Time
GSFC	Goddard Space Flight Center
IAS	Image Assessment System
IC	Internal Calibrator
IC	International Cooperator
ICD	Interface Control Document
JPL	Jet Propulsion Laboratory
L0Rp	Level 0 distribution product reformatted
L1	Level 1
L1G	Level 1 geometrically corrected

LCCR	Landsat 7 Configuration Control Board
LPGS	Level 1 Product Generation System
m	meter
mm	millimeter
N/A	not applicable
NASA	National Aeronautics and Space Administration
NLAPS	National Land Archive Processing System
ODL	Object Description language
SAIC	Science Applications International Coorporation
SWIR	Short-Wave Infrared
USGS	United States Geologic Survey
UTC	Universal Time Coordinated
UTM	Universal Transverse Mercator
VNIR	Visible and Near Infrared
WRS	Worldwide Reference System
0R	zero reformatted data
Zulu	Greenwich Mean time

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