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Department of the Interior
U.S. Geological Survey

Landsat 8-9
Operational Land Imager (OLI) - Thermal Infrared Sensor (TIRS) Collection 2 Level 2 (L2) Data Format Control Book (DFCB)

Version 6.0

September 2020

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Executive Summary

This Data Format Control Book (DFCB) presents detailed data formats of the Landsat 8 (L8) and Landsat 9 (L9) Collection 2 (C2) Level 2 (L2) products that the Landsat Product Generation System (LPGS) generates. This processing system produces L2 output files from Level 1 (L1) input files. Images are produced in Cloud Optimized Geographic Tagged Image File Format (GeoTIFF) (COG).

The Landsat Data Processing and Archive System (DPAS) Configuration Control Board (CCB) maintains and controls this DFCB. Staff may update or revise this document only upon Landsat DPAS CCB approval. Please direct comments and questions regarding this DFCB to the following:

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Section 1 Introduction

The Landsat mission is a joint mission formulated, implemented, and operated by the National Aeronautics and Space Administration (NASA) and the Department of the Interior (DOI) U.S. Geological Survey (USGS). Landsat is a remote-sensing satellite mission providing coverage of the Earth's land surfaces. The Landsat series of satellites continue the 40+ years of global data collection and distribution.

1.1 Background

The goal of Landsat is to continue the collection, archival, and distribution of multispectral imagery affording global, synoptic, and repetitive coverage of the Earth's land surfaces at a scale where natural and human-induced changes can be detected, differentiated, characterized, and monitored over time. The Landsat programmatic goals are stated in the United States Code, Title 15 Chapter 82 "Land Remote Sensing Policy" (derived from the Land Remote Sensing Policy Act of 1992). This policy requires that the Landsat Project provide data into the future that are sufficiently consistent with previous Landsat data to allow the detection and quantitative characterization of changes in or on the surface of the Earth. The highly successful Landsat series of missions have provided satellite coverage of the Earth's continental surfaces since 1972. The data from these missions constitute the longest continuous record of Earth's surface as seen from space.

1.2 Purpose and Scope

This Data Format Control Book (DFCB) provides a high-level description of the Landsat 8 and Landsat 9 C2 L2 product distribution.

This DFCB describes the formats and data contents of the C2 L2 output files. The output format generated by the LPGS for distribution is COG.

The file formats contained in this DFCB are applicable to the C2 L2 products that LPGS generates at the USGS Earth Resources Observation and Science (EROS) Center.

1.3 Document Organization

This document contains the following sections:

- Section 1 provides an introduction
- Section 2 provides an overview of C2 L2 product files
- Section 3 provides data format definitions of the C2 L2 product files
- Appendix A provides a list of acronyms
- The References section provides a list of reference documents

1.4 Terminology

Level 2 Science Product (L2SP) — The L2SP includes Surface Reflectance (SR), Surface Temperature (ST), ST intermediate bands, an angle coefficients file, and Quality Assessment (QA) Bands. It is created by correcting a Level 1 Systematic

Terrain (Corrected) (L1GT) or Level 1 Precision Terrain (Corrected) (L1TP) product for atmospheric effects.

Level 2 Surface Reflectance (L2SR) — The L2SR includes Surface Reflectance (SR), an angle coefficients file, and Quality Assessment (QA) Bands. It is created by correcting a Level 1 Systematic Terrain (Corrected) (L1GT) or Level 1 Precision Terrain (Corrected) (L1TP) product for atmospheric effects.

Section 2 Overview of L2 Product Files

This section provides an overview of the L2 product files.

2.1 Level 2 Output Files Overview

The standard L2SP is a Digital Number (DN) product stored in a 16-bit unsigned integer format. Refer to LSDS-1747 Landsat 8-9 Calibration and Validation (Cal/Val) Algorithm Description Document (ADD) for a description of the atmospheric auxiliary data preprocessing, the SR algorithm, and the Single Channel algorithm for ST.

SR bands approximate what a field spectroradiometer sensor held just above the Earth's surface would measure. Coarse Resolution Water Vapor and Ozone datasets from the Moderate Resolution Imaging Spectrometer (MODIS) instrument on NASA's Terra and/or Aqua satellites are used in the SR algorithm. SR bands require Top of Atmosphere (TOA) reflectance bands corrected for per-pixel sun angles. SR bands are generated only for scenes with the Solar Zenith Angle (SZA) less than 76°. The SZA is 90° minus the sun elevation angle. Most L2 products are from scenes between 65 degrees north and 65 degrees south latitude. Table 2-2 lists specifications for the SR bands. The values output from Landsat Surface Reflectance Code (LaSRC) are scaled to fit in unsigned integers for the files named in the values for FILE_NAME_BAND_X; where X = [1,7]. The range of values output by LaSRC in conjunction with the values for REFLECTANCE_MULT_BAND_X and REFLECTANCE_ADD_BAND_X limit the value in the named files to 65455. SR might have noticeable errors for scenes captured greater than 10 degrees off-nadir.

The ST band provides the temperature of the Earth's surface in Kelvin (K). The emissivity auxiliary data, used by the ST algorithm for TIRS, is obtained from the Advanced Spaceborne Thermal Emission and Reflection Radiometer Global Emissivity Dataset (ASTER GED) by Land Processes Distributed Active Archive Center (LP DAAC). Goddard Earth Observing System Model, Version 5 (GEOS-5) Forward Process for Instrument Teams (FP-IT) data are used in the Single Channel algorithm for atmospheric correction. Table 2-3 lists specifications for the ST band. The Single Channel algorithm that generates the ST band requires L1's TIRS Band 10 as an input. The ST band is scaled to Kelvin by multiplying the DN times the value for TEMPERATURE_MULT_BAND_ST_B10 and adding the value for TEMPERATURE_ADD_BAND_ST_B10. All values can be found in Table 3-4.

The L2SP image data are atmospherically corrected and available as COG files. Table 2-1 shows the band identification, while Table 2-6 lists the L2SP components. If ST cannot be produced, an SR-only product is attempted. Atmospheric auxiliary data used in processing a L1 product into the L2 product are described in LSDS-1329 Landsat Atmospheric Auxiliary Data Data Format Control Book (DFCB).

Seven ST intermediate bands are included in the L2SP when the Single Channel algorithm is used to generate ST. These ST intermediate bands consist of a thermal band converted to radiance, upwelled radiance, downwelled radiance, atmospheric

transmittance, emissivity estimated from ASTER GED, emissivity standard deviation, and pixel distance to cloud. Table 2-4 provides specifications for these bands.

Four QA Bands are included in the L2 product. These QA Bands consist of the L1 pixel, L1 radiometric saturation, SR aerosol, and ST uncertainty. Table 2-5 lists specifications for these bands.

Band Number	Band Description	Band Range (nm)
1	Coastal Aerosol (Operational Land Imager (OLI))	435-451
2	Blue (OLI)	452-512
3	Green (OLI)	533-590
4	Red (OLI)	636-673
5	Near-Infrared (NIR) (OLI)	851-879
6	Short Wavelength Infrared (SWIR) 1 (OLI)	1566-1651
7	SWIR 2 (OLI)	2107-2294
10	Thermal Infrared Sensor (TIRS) 1	10600-11190

Table 2-1. Band Reference Table

Band Number	Identifier FT	Units	Valid Range	Fill Value
1	SR_B1	Unitless	1 through 65455	0 (No Data)
2	SR_B2	Unitless	1 through 65455	0 (No Data)
3	SR_B3	Unitless	1 through 65455	0 (No Data)
4	SR_B4	Unitless	1 through 65455	0 (No Data)
5	SR_B5	Unitless	1 through 65455	0 (No Data)
6	SR_B6	Unitless	1 through 65455	0 (No Data)
7	SR_B7	Unitless	1 through 65455	0 (No Data)

Table 2-2. OLI SR Band Specifications

Identifier FT	Units	Range	Fill Value
ST_B10	Scaled Kelvin	1 through 65535	0 (No Data)

Table 2-3. TIRS ST Band Specifications

Band Name	Identifier FT	Data Type	Units	Valid Range	Fill Value	Scale Factor
Thermal band converted to radiance	ST_TRAD	INT16	W/(m^2 sr µm)/DN	0 through 22000	-9999 (No Data)	0.001
Upwelled Radiance	ST_URAD	INT16	W/(m^2 sr µm)/DN	0 through 28000	-9999 (No Data)	0.001
Downwelled Radiance	ST_DRAD	INT16	W/(m^2 sr µm)/DN	0 through 28000	-9999 (No Data)	0.001
Atmospheric Transmittance	ST_ATRAN	INT16	Unitless	0 through 10000	-9999 (No Data)	0.0001
Emissivity of Band 10 estimated from ASTER GED	ST_EMIS	INT16	Emissivity coefficient	0 through 10000	-9999 (No Data)	0.0001
Emissivity standard deviation	ST_EMSD	INT16	Emissivity coefficient	1 through 10000	-9999 (No Data)	0.0001
Pixel distance to cloud	ST_CDIST	INT16	Kilometers	0 through 24000	-9999 (No Data)	0.01

Table 2-4. Single Channel ST Intermediate Band Specifications

Band Name	Identifier FT	Data Type	Units	Range	Fill Value	Scale Factor
Level-1 QA Band	QA_PIXEL	UINT16	Bit Index	0 through 65535	1 (bit 0)	NA
Level-1 Radiometric Saturation QA	QA_RADSAT	UINT16	Bit Index	0 through 65535	NA	NA
SR Aerosol QA	SR_QA_AEROSOL	UINT8	Bit Index	0 through 255	1	NA
Surface Temperature QA	ST_QA	INT16	Kelvin	0 through 32767	-9999 (No Data)	0.01

Table 2-5. OLI / TIRS Quality Assessment Band Specifications

L2 Product Components
L2SP/L2SR image files
ST Intermediate Band files
QA_PIXEL file
QA_RADSAT file
SR_QA_AEROSOL file
ST_QA file
Angle Coefficient file
L2SP/L2SR metadata files

Table 2-6. L2 Product Components

2.1.1 Product Files

The product consists of individual files listed in Table 2-6. The files are unbundled and can be downloaded individually.

2.1.2 Naming Convention

Table 2-7 describes the Landsat Product Identifier: LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX. Table 2-7 and Table 2-8 contain the file types and extensions for file names associated with the L2 products.

Identifier	Description
L	Landsat
X	Sensor of: C = Combined TIRS and OLI Indicates which sensor collected data for this product
SS	Landsat satellite (08 for Landsat 8, 09 for Landsat 9)
LLLL	Processing level (L2SP, L2SR)
PPP	Satellite orbit location in reference to the Worldwide Reference System-2 (WRS-2) path of the product
RRR	Satellite orbit location in reference to the WRS-2 row of the product
YYYY	Acquisition year of the image
MM	Acquisition month of the image
DD	Acquisition day of the image
yyyy	Processing year of the image
mm	Processing month of the image
dd	Processing day of the image
CC	Collection number (e.g., 02)
TX	Collection category: "T1" for Tier 1 (highest quality), "T2" for Tier 2

Table 2-7. Landsat 8-9 Product ID

The Landsat Product ID described in Table 2-7 is the first part of the file name, the file type and extension components of the file name are described in Table 2-8. The Landsat Product ID, file type, and extension make the file name: LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_FT.ext

Identifier	Description
FT	File type, where FT equals one of the following: MTL (metadata file), MD5 (checksum file), (SR_B1-7) (Surface Reflectance Bands), (ST_B10) (Surface Temperature Band), SR_QA_AEROSOL (Aerosol retrieval per pixel), QA_PIXEL (Level-1 QA Band), QA_RADSAT (Radiometric saturation per pixel), ST_QA (Surface Temperature QA), ST_TRAD (Thermal band converted to radiance), ST_URAD (Upwelled Radiance), ST_DRAD (Downwelled Radiance), ST_ATRAN (Atmospheric Transmittance), ST_EMIS (Emissivity estimated from ASTER GED Band 10), ST_EMSD (Emissivity standard deviation), ST_CDIST (Pixel distance to cloud), ANG (angle coefficient file)
.ext	File extension, where .TIF equals COG file extension, .xml equals XML extension (metadata), and .txt equals text extension

Table 2-8. File Naming Convention

2.1.3 Example File Names

2.1.3.1 SR Image Files

LC08_L2SP_222005_20140922_20140923_02_T1_SR_B1.TIF
LC08_L2SP_222005_20140922_20140923_02_T1_SR_B2.TIF
LC08_L2SP_222005_20140922_20140923_02_T1_SR_B3.TIF
LC08_L2SP_222005_20140922_20140923_02_T1_SR_B4.TIF
LC08_L2SP_222005_20140922_20140923_02_T1_SR_B5.TIF
LC08_L2SP_222005_20140922_20140923_02_T1_SR_B6.TIF
LC08_L2SP_222005_20140922_20140923_02_T1_SR_B7.TIF

2.1.3.2 ST Image File

LC08_L2SP_222005_20140922_20140923_02_T1_ST_B10.TIF

2.1.3.3 QA Band

LC08_L2SP_222005_20140922_20140923_02_T1_QA_PIXEL.TIF

2.1.3.4 Radiometric Saturation and Terrain Occlusion QA Band

LC08_L2SP_222005_20140922_20140923_02_T1_QA_RADSAT.TIF

2.1.3.5 SR Aerosol QA

LC08_L2SP_222005_20140922_20140923_02_T1_SR_QA_AEROSOL.TIF

2.1.3.6 ST QA

LC08_L2SP_222005_20140922_20140923_02_T1_ST_QA.TIF

2.1.3.7 Metadata

LC08_L2SP_222005_20140922_20140923_02_T1_MTL.txt
LC08_L2SP_222005_20140922_20140923_02_T1_MTL.xml

2.1.3.8 Angle Coefficient File

LC08_L2SP_222005_20140922_20140923_02_T1_ANG.txt

2.1.3.9 ST Intermediate Band Files

LC08_L2SP_222005_20140922_20140923_02_T1_ST_TRAD.TIF
LC08_L2SP_222005_20140922_20140923_02_T1_ST_URAD.TIF
LC08_L2SP_222005_20140922_20140923_02_T1_ST_DRAD.TIF
LC08_L2SP_222005_20140922_20140923_02_T1_ST_ATRAN.TIF
LC08_L2SP_222005_20140922_20140923_02_T1_ST_EMIS.TIF
LC08_L2SP_222005_20140922_20140923_02_T1_ST_EMSD.TIF
LC08_L2SP_222005_20140922_20140923_02_T1_ST_CDIST.TIF

2.1.3.10 Checksum

LC08_L2SP_222005_20140922_20140923_02_T1_MD5.txt

Section 3 Data Format Definition

This section describes the storage format for the data. Refer to LSDS-1822 Landsat 8-9 Operational Land Imager (OLI) – Thermal Infrared Sensor (TIRS) Collection 2 Level 1 (L1) Data Format Control Book (DFCB) for a more detailed description of the Geographic Tagged Image File Format (GeoTIFF). Refer to LSDS-1822 for a more detailed description of TIFF. Refer to LSDS-1388 Landsat Cloud Optimized GeoTIFF (COG) Data Format Control Book (DFCB) for a more detailed description of COG. The Geospatial Data Abstraction Library (GDAL) NODATA tag is used to indicate, in conjunction with the value for the pixel, which pixel(s) have no data for applicable bands. If GDAL's NODATA tag is included for the band, it is mentioned in this section.

3.1 L2 Image Files

Each image band in the L2SP is in a separate file. Each band is a grayscale COG file, which contains unsigned 16-bit integers. The image files contain the tags and keys defined by the GeoTIFF specification, which allows GeoTIFF readers to read the images. The GDAL_NODATA tag defines the value of 0 to be the no data value for these bands.

3.2 QA Band File

The output from the CFMask algorithm is used as an input for the Quality Assessment Application, which calculates values for all fields in the QA Band file. The QA Band file contains quality statistics gathered from the cloud mask and statistics information for the scene. The QA Band file is an unsigned 16-bit COG image with the same dimensions as the L1 scene. For some artifacts bits that are distinguishable at the L1G stage of processing are allocated. Bit 0 is the least significant. As several pixel quality classification types exist, a range of confidence levels is provided for each classification type. Table 3-1 shows the bits being set to pixel condition. A value of 1 for fill indicates that the associated L1 image bands have fill data for the corresponding pixel.

A 3x3 pixel window is used for setting cloud dilation.

Bit	Flag Description	Values
0	Fill	0 for image data 1 for fill data
1	Dilated Cloud	0 for cloud is not dilated or no cloud 1 for cloud dilation
2	Cirrus	0 for Cirrus Confidence: no confidence level set or Low Confidence 1 for high confidence cirrus
3	Cloud	0 for cloud confidence is not high 1 for high confidence cloud
4	Cloud Shadow	0 for Cloud Shadow Confidence is not high 1 for high confidence cloud shadow
5	Snow	0 for Snow/Ice Confidence is not high 1 for high confidence snow cover
6	Clear	0 if Cloud or Dilated Cloud bits are set 1 if Cloud and Dilated Cloud bits are not set

Bit	Flag Description	Values
7	Water	0 for land or cloud 1 for water
8-9	Cloud Confidence	00 for no confidence level set 01 Low confidence 10 Medium confidence 11 High confidence
10-11	Cloud Shadow Confidence	00 for no confidence level set 01 Low confidence 10 Reserved 11 High confidence
12-13	Snow/Ice Confidence	00 for no confidence level set 01 Low confidence 10 Reserved 11 High confidence
14-15	Cirrus Confidence	00 for no confidence level set 01 Low confidence 10 Reserved 11 High confidence

Table 3-1. QA Band Bit Description

3.3 Radiometric Saturation and Terrain Occlusion QA Band File

The radiometric saturation QA Band indicates which sensor band(s) are saturated. Table 3-2 shows which bits are for band data saturation and which bit is for terrain occlusion. Radiometric saturation is not common for OLI; it typically happens because of clouds and bright targets. Radiometric saturation can occur under two situations:

1. When the processed L1 product's saturated pixels have the maximum unsigned 16-bit value of 65535.
2. When a sensor is saturated during data capture.

The TIRS sensor is not affected by radiometric saturation.

The terrain occlusion bit is set when the desired terrain is not visible from the sensor due to intervening terrain.

Bit	Flag Description	Values
0	Band 1 Data Saturation	0 no saturation 1 saturated data
1	Band 2 Data Saturation	0 no saturation 1 saturated data
2	Band 3 Data Saturation	0 no saturation 1 saturated data
3	Band 4 Data Saturation	0 no saturation 1 saturated data
4	Band 5 Data Saturation	0 no saturation 1 saturated data
5	Band 6 Data Saturation	0 no saturation 1 saturated data
6	Band 7 Data Saturation	0 no saturation 1 saturated data
7	Unused	0 not checked
8	Band 9 Data Saturation	0 no saturation 1 saturated data
9	Unused	0
10	Unused	0
11	Terrain occlusion	0 no terrain occlusion 1 terrain occlusion
12	Unused	0
13	Unused	0
14	Unused	0
15	Unused	0

Table 3-2. Radiometric Saturation and Terrain Occlusion QA Band Bit Description

3.4 SR Aerosol QA File

The SR Aerosol QA file provides low-level details about factors that may have influenced the final product. The default value for bits 6 and 7, “Aerosol Level’, is Climatology (00). A value of Climatology means no aerosol correction was applied. The absolute difference of the climatology SR and the Lambertian SR after aerosol corrections determines whether the value for “Aerosol Level” is low, medium, or high. A land test and potentially a water test are performed during aerosol retrieval. If the pixel passes the clear land test then “Valid aerosol retrieval” is set to 1, else the pixel is run through the water test. If the pixel passes the water test then both “Water’ and “Valid aerosol retrieval” are set to 1, else both “Water” and “Valid aerosol retrieval” are set to 0. Aerosol retrieval is attempted for a representative pixel within each 3x3 window. The remaining pixels in each 3x3 window are interpolated from the surrounding representative pixels and their “Interpolated Aerosol” is set to 1. If a pixel’s aerosol is interpolated using a representative pixel with a value of 1 for "Water", it too will have “Water” set to 1. Pixels with an “Aerosol Level” classified as high are not recommended for use. A value of 1 for fill indicates that the associated L1 image bands have fill data for the corresponding pixel.

Bit	Flag Description	Values
0	Fill	0 Pixel is not fill 1 Pixel is fill
1	Valid aerosol retrieval	0 Pixel retrieval is not valid 1 Pixel retrieval is valid
2	Water	0 Pixel is not water 1 Pixel is water
3	Unused	0
4	Unused	0
5	Interpolated Aerosol	0 Pixel is not aerosol interpolated 1 Pixel is aerosol interpolated
6	Aerosol Level	00 Climatology 01 Low 10 Medium 11 High
7		
0 is Least Significant Bit, 7 is Most Significant Bit		

Table 3-3. SR Aerosol QA File

3.5 Surface Temperature QA File

The ST QA file indicates uncertainty of the temperatures given in the ST band file. The ST QA file is generated using uncertainty values and distance to cloud values. Higher numbers indicate greater uncertainty. This file is not included in the product when an SR-only product is generated. The GDAL_NODATA tag defines the value of -9999 to be the no data value for this band.

3.6 ST Intermediate Bands

The ST intermediate bands are related to generating Surface Temperature. These bands are not included in the product when an SR-only product is generated. The GDAL_NODATA tag defines the value of -9999 to be the no data value for these bands.

3.6.1 Atmospheric Transmittance layer (ATRAN)

This indicates the ratio of the transmitted radiation to the total radiation incident upon the medium (atmosphere).

3.6.2 Distance to Cloud (CDIST)

This indicates the distance, in kilometers, that a pixel is from the nearest cloud pixel. Infrequently, the pixel distance to cloud will be greater than the maximum allowed value. This layer is used with emissivity standard deviation to create surface temperature QA.

3.6.3 Downwelled Radiance layer (DRAD)

This indicates the thermal energy emitted by the atmosphere that reaches the Earth's surface and is then reflected toward the sensor.

3.6.4 Emissivity layer (EMIS)

This indicates the ratio of the energy radiated from a material’s surface to the energy radiated from a blackbody. Landsat emissivity values that are greater than the water

emissivity constant are adjusted to be the water constant (0.988). Negative values for emissivity are replaced with the fill value instead.

3.6.5 Emissivity Standard Deviation (EMSD)

This indicates the extent of variation for the emissivity product. This layer is used with CDIST to create ST_QA.

3.6.6 Thermal Radiance layer (TRAD)

This displays the values produced when L1's TIRS Band 10 is converted to radiance. The maximum value for thermal radiance, 22000 $Wm^{-2}sr^{-1}\mu m^{-1}$, may be exceeded (e.g., over volcanoes and fires). TRAD is generated so all the radiance layers share the same units.

3.6.7 Upwelled Radiance layer (URAD)

This indicates the amount of energy emitted from the atmosphere and scattered toward the sensor.

3.7 L2 Metadata Files

The L2 metadata files are created during product generation and contain information regarding the product ordered. The L1 metadata is encapsulated in the L2 metadata. Some files listed in the L1 metadata are not contained in the L2 product; these files are highlighted in red in Table 3-4. Some of the fields listed in the L1 metadata do not apply to the files in the L2 product. These fields are for provenance and are highlighted in red in Table 3-4. Files and fields included for provenance also have an asterism symbol: ⁂ at the end of each row.

Table 3-4 lists the L2 metadata using Object Description Language (ODL). Table 3-5 shows the structure of the Extensible Markup Language (XML) metadata file. The XML file contains only parent elements and children elements. Table 3-5 does not show every possible value associated with each parameter name like Table 3-4 does.

The PRODUCT_CONTENTS group contains information about files in the product (e.g., it includes file names and the data type for the GeoTIFF files). Most of the parameters and parameter values in PRODUCT_CONTENTS are duplicates of the same parameter and parameter values in LEVEL2_PROCESSING_RECORD.

Important fields from the L1 metadata apply to the L2 product. The number of lines in the file referenced by the FILE_NAME_QUALITY_L1_PIXEL are the same as the number of lines given by REFLECTIVE_LINES, found in the L1 metadata, in the metadata file.

For the SR-only product, the TIRS_SSM_POSITION_STATUS and TIRS_SSM_MODEL parameters are left in the IMAGE_ATTRIBUTES group even though the TIRS bands are not in the product. This is because only combined products can be processed to L2, i.e., OLI-only products are not processed to L2. These parameters are present only for L8. For the SR-only product, the

IMAGE_QUALITY_TIRS parameter is left in the IMAGE_ATTRIBUTES group. This parameter is present for both L8 and L9. The SENSOR_ID parameter has a value of “OLI_TIRS” because both OLI and TIRS were used to capture the scene.

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
GROUP	= LANDSAT_METADATA_FILE	The beginning of the first-level ODL group. It indicates the start of the Landsat metadata file group.
GROUP	= PRODUCT_CONTENTS	The beginning of the product contents group.
ORIGIN	= “Image courtesy of the U.S. Geological Survey”	Origin of the product.
DIGITAL_OBJECT_IDENTIFIER	= “https://doi.org/10.5066/P9OGBGM6”	Digital Object Identifier for Level 2 OLI-TIRS. For more information on Digital Object Identifiers, visit https://www.doi.org.
LANDSAT_PRODUCT_ID	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX”	Landsat uses the “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX” format, where: L = Landsat X = Sensor SS = Satellite (08 or 09) LLLL = Processing correction Level PPP = WRS path RRR = WRS row YYYYMMDD = Acquisition year (YYYY) Month (MM) Day (DD) yyyymmdd = Processing year (yyyy) month (mm) day (dd) CC = Collection number TX = Collection category
PROCESSING_LEVEL	= “L2SP” = “L2SR”	Level 2 Science Product Level 2 Surface Reflectance
COLLECTION_NUMBER	= NN	The product collection number.
COLLECTION_CATEGORY	= “T1” = “T2”	The scene collection category, “T1” for Tier 1 quality collection and “T2” for Tier 2 quality collection.

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
OUTPUT_FORMAT	= “GEOTIFF”	Output file format for image files.
FILE_NAME_BAND_1	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SR_B1.TIF”	The file name for Surface Reflectance from Band 1.
FILE_NAME_BAND_2	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SR_B2.TIF”	The file name for Surface Reflectance from Band 2.
FILE_NAME_BAND_3	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SR_B3.TIF”	The file name for Surface Reflectance from Band 3.
FILE_NAME_BAND_4	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SR_B4.TIF”	The file name for Surface Reflectance from Band 4.
FILE_NAME_BAND_5	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SR_B5.TIF”	The file name for Surface Reflectance from Band 5.
FILE_NAME_BAND_6	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SR_B6.TIF”	The file name for Surface Reflectance from Band 6.
FILE_NAME_BAND_7	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SR_B7.TIF”	The file name for Surface Reflectance from Band 7.
FILE_NAME_BAND_ST_B10	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_B10.TIF”	The file name for Surface Temperature from Band 10. This field is not present if the PROCESSING_LEVEL is L2SR.
FILE_NAME_THERMAL_RADIANCE	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_TRAD.TIF”	The file name for the thermal band converted to radiance for Band 10. This field is not present if the PROCESSING_LEVEL is L2SR.

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
FILE_NAME_UPWELL_RADIANCE	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_URAD.TIF”	The file name for the upwelled radiance. This field is not present if the PROCESSING_LEVEL is L2SR.
FILE_NAME_DOWNWELL_RADIANCE	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_DRAD.TIF”	The file name for the downwelled radiance. This field is not present if the PROCESSING_LEVEL is L2SR.
FILE_NAME_ATMOSPHERIC_TRANSMITTANCE	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_ATRAN.TIF”	The file name for the atmospheric transmittance. This field is not present if the PROCESSING_LEVEL is L2SR.
FILE_NAME_EMISSIVITY	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_EMIS.TIF”	The file name for the emissivity estimated from ASTER GED for Band 10. This field is not present if the PROCESSING_LEVEL is L2SR.
FILE_NAME_EMISSIVITY_STDEV	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_EMSD.TIF”	The file name for standard deviation of the emissivity estimated from ASTER GED. This field is not present if the PROCESSING_LEVEL is L2SR.
FILE_NAME_CLOUD_DISTANCE	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_CDIST.TIF”	The file name for Surface Temperature cloud distance band which gives the pixel distance to the cloud in Kilometers. This field is not present if the PROCESSING_LEVEL is L2SR.
FILE_NAME_QUALITY_L2_AEROSOL	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SR_QA_AEROSOL.TIF”	The file name for the Surface Reflectance Aerosol QA Band.
FILE_NAME_QUALITY_L2_SURFACE_TEMPERATURE	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_QA.TIF”	The file name for the Surface Temperature QA Band. This field is not present if the PROCESSING_LEVEL is L2SR.

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
FILE_NAME_QUALITY_L1_PIXEL	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_QA_PIXEL.TIF”	The file name for the L1 Quality Assessment (QA) Band.
FILE_NAME_QUALITY_L1_RADIOMETRIC_SATURATION	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_QA_RADSAT.TIF”	The file name for the Radiometric Saturation Quality Assessment (QA) Band.
FILE_NAME_ANGLE_COEFFICIENT	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ANG.txt”	The file name for the angle coefficient file.
FILE_NAME_METADATA_ODL	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_MTL.txt”	The file name for L2 ODL metadata.
FILE_NAME_METADATA_XML	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_MTL.xml”	The file name for L2 XML metadata.
DATA_TYPE_BAND_1	= “UINT16”	The GeoTIFF file for band 1 uses unsigned 16-bit integers.
DATA_TYPE_BAND_2	= “UINT16”	The GeoTIFF file for band 2 uses unsigned 16-bit integers.
DATA_TYPE_BAND_3	= “UINT16”	The GeoTIFF file for band 3 uses unsigned 16-bit integers.
DATA_TYPE_BAND_4	= “UINT16”	The GeoTIFF file for band 4 uses unsigned 16-bit integers.
DATA_TYPE_BAND_5	= “UINT16”	The GeoTIFF file for band 5 uses unsigned 16-bit integers.
DATA_TYPE_BAND_6	= “UINT16”	The GeoTIFF file for band 6 uses unsigned 16-bit integers.
DATA_TYPE_BAND_7	= “UINT16”	The GeoTIFF file for band 7 uses unsigned 16-bit integers.
DATA_TYPE_BAND_ST_B10	= “UINT16”	The GeoTIFF file band 10 uses unsigned 16-bit integers. This field is

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
		not present if the PROCESSING_LEVEL is L2SR.
DATA_TYPE_THERMAL_RADIANCE	= “INT16”	The thermal band converted to radiance uses signed 16-bit integers. This field is not present if the PROCESSING_LEVEL is L2SR.
DATA_TYPE_UPWELL_RADIANCE	= “INT16”	The upwelled radiance band uses signed 16-bit integers. This field is not present if the PROCESSING_LEVEL is L2SR.
DATA_TYPE_DOWNWELL_RADIANCE	= “INT16”	The downwelled radiance band uses signed 16-bit integers. This field is not present if the PROCESSING_LEVEL is L2SR.
DATA_TYPE_ATMOSPHERIC_TRANSMITTANCE	= “INT16”	The atmospheric transmittance band uses signed 16-bit integers. This field is not present if the PROCESSING_LEVEL is L2SR.
DATA_TYPE_EMISSIVITY	= “INT16”	The emissivity estimated from ASTER GED uses signed 16-bit integers. This field is not present if the PROCESSING_LEVEL is L2SR.
DATA_TYPE_EMISSIVITY_STDEV	= “INT16”	The emissivity standard deviation uses signed 16-bit integers. This field is not present if the PROCESSING_LEVEL is L2SR.
DATA_TYPE_CLOUD_DISTANCE	= “INT16”	The Surface Temperature cloud distance band uses signed 16-bit integers. This field is not present if the PROCESSING_LEVEL is L2SR.

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
DATA_TYPE_QUALITY_L2_AEROSOL	= “UINT8”	The Surface Reflectance aerosol QA file uses unsigned 8-bit integers.
DATA_TYPE_QUALITY_L2_SURFACE_TEMPERATURE	= “INT16”	The Surface Temperature QA file uses signed 16-bit integers. This field is not present if the PROCESSING_LEVEL is L2SR.
DATA_TYPE_QUALITY_L1_PIXEL	= “UINT16”	The L1 Quality Assessment Band, which is included in the L2 product, uses unsigned 16-bit integers.
DATA_TYPE_QUALITY_L1_RADIOMETRIC_SATURATION	= “UINT16”	The L1 radiometric saturation band, which is included in the L2 product, uses unsigned 16-bit integers.
END_GROUP	= PRODUCT_CONTENTS	
GROUP	= IMAGE_ATTRIBUTES	
SPACECRAFT_ID	= “LANDSAT_8” = “LANDSAT_9”	Spacecraft from which the data were captured.
SENSOR_ID	= “OLI_TIRS”	Sensor used to capture this scene.
WRS_TYPE	= 2	World Reference System (WRS) type used for the collection of this scene.
WRS_PATH	= 1-233	Orbital WRS-2 defined nominal Landsat satellite track (path).
WRS_ROW	= 1-248	Orbital WRS-2 defined nominal Landsat row number for this scene.
NADIR_OFFNADIR	= “NADIR” = “OFFNADIR”	Nadir or Off-Nadir condition of the scene.
TARGET_WRS_PATH	= 1-233	Nearest WRS-2 path to the Line-of-Sight (LOS) scene center of the image.
TARGET_WRS_ROW	= 1-248, 880-889, 990-999	Nearest WRS-2 row to the LOS scene center of the image. Rows 880–889

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
		are reserved for the north pole and 990–999 are reserved for the south pole, where WRS-2 is not defined.
DATE_ACQUIRED	= YYYY-MM-DD	The date the image was acquired.
SCENE_CENTER_TIME	= “HH:MI:SS.SSSSSSSZ”	Scene center time and date for when the image was acquired. HH = Hour (00-23), MI = Minute, SS.SSSSSSS = Fractional seconds, Z = constant (indicates “Zulu” time (same as GMT)).
STATION_ID	= “XXX”	The Ground Station that received the data. See LSDS-547 Landsat Ground Station (GS) Identifiers for all possible station IDs (e.g., “LGN” = Landsat Ground Network).
CLOUD_COVER	= 0.00–100.00, -1	The overall cloud coverage (percent) of the WRS-2 scene. -1 indicates that the score was not calculated.
CLOUD_COVER_LAND	= 0.00–100.00, -1	The overall cloud coverage over land (percent) in the WRS-2 scene. -1 indicates that the score was not calculated.
IMAGE_QUALITY_OLI	= 0–9	The composite image quality for the OLI bands. Values: 9 = Best. 1 = Worst. 0 = Image quality not calculated. For Landsat 8, this parameter is adjusted downward for scenes collected using the lower 12 bits from the OLI sensor (TRUNCATION_OLI = “LOWER”).
IMAGE_QUALITY_TIRS	= 0–9	The composite image quality for the TIRS bands. Values: 9 = Best. 1 =

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
		Worst. 0 = Image quality not calculated. It is also adjusted downward for scenes processed with “SWITCHED” for the TIRS_SSM_POSITION_STATUS value.
SATURATION_BAND_1	= “Y” = “N”	Indicates Band 1 includes saturated pixels identified by the Radiometric Saturation Quality Assessment (QA) Band.
SATURATION_BAND_2	= “Y” = “N”	Indicates Band 2 includes saturated pixels identified by the Radiometric Saturation QA Band.
SATURATION_BAND_3	= “Y” = “N”	Indicates Band 3 includes saturated pixels identified by the Radiometric Saturation QA Band.
SATURATION_BAND_4	= “Y” = “N”	Indicates Band 4 includes saturated pixels identified by the Radiometric Saturation QA Band.
SATURATION_BAND_5	= “Y” = “N”	Indicates Band 5 includes saturated pixels identified by the Radiometric Saturation QA Band.
SATURATION_BAND_6	= “Y” = “N”	Indicates Band 6 includes saturated pixels identified by the Radiometric Saturation QA Band.
SATURATION_BAND_7	= “Y” = “N”	Indicates Band 7 includes saturated pixels identified by the Radiometric Saturation QA Band.
SATURATION_BAND_8	= “N”	Band 8 is not checked for saturation.
SATURATION_BAND_9	= “Y” = “N”	Indicates Band 9 includes saturated pixels identified by the Radiometric Saturation QA Band.

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
ROLL_ANGLE	= -15.00 through +15.00	The amount of spacecraft roll angle at the scene center. The roll value is given in the Yaw Steering Frame (YSF) reference, whose x-axis is aligned with the instantaneous ground track velocity vector. Rolls about this x-axis go by the right-hand rule: a positive roll results in the instruments pointing to the left of the ground track, while a negative roll results in the instrument pointing to the right.
SUN_AZIMUTH	= -180.00000000 through 180.00000000	The Sun azimuth angle in degrees for the image center location at the image center acquisition time. A positive value indicates angles to the east or clockwise from the north. A negative value (-) indicates angles to the west or counterclockwise from the north.
SUN_ELEVATION	= -90.00000000 through 90.00000000	The Sun elevation angle in degrees for the image center location at the image center acquisition time. A positive value indicates a daytime scene. A negative value (-) indicates a nighttime scene. Note: For reflectance calculation, the sun zenith angle is needed, which is 90 - sun elevation angle.
EARTH_SUN_DISTANCE	= N.NNNNNNN	Measurement of the earth to sun distance at the particular day and time of imagery acquisition. Astronomical Unit (AU) of measurement.

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
TRUNCATION_OLI	= “UPPER”	The OLI truncation mode. “LOWER” indicates that the lower 12 bits were used and “UPPER” indicates the upper 12 bits were used. The normal truncation mode is “UPPER”. This field is not included for Landsat 9.
TIRS_SSM_MODEL	= “FINAL” = “ACTUAL”	Indicates how the Landsat 8 TIRS Scene Select Mirror (SSM) position was determined. The “FINAL” status indicates final estimated encoder values generated after the switch event. The “ACTUAL” status indicates actual encoder values. This field is not included for Landsat 9.
TIRS_SSM_POSITION_STATUS	= “NOMINAL” = “ESTIMATED” = “SWITCHED”	The Landsat 8 TIRS SSM position status. The “NOMINAL” status indicates the SSM was functioning normally for this scene. The “SWITCHED” status indicates the SSM switched operating modes in the scene and may have TIRS image quality issues, which directly impact the IMAGE_QUALITY_TIRS value. The “ESTIMATED” status indicates the SSM position was estimated, which may not be as accurate as the “NOMINAL” status. This field is not included for Landsat 9.
END_GROUP	= IMAGE_ATTRIBUTES	
GROUP	= PROJECTION_ATTRIBUTES	
MAP_PROJECTION	= “UTM” = “PS”	The map projection used in creating the image. Universal Transverse

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
		Mercator (UTM) or Polar Stereographic (PS).
DATUM	= “WGS84”	The datum used in creating the image.
ELLIPSOID	= “WGS84”	The ellipsoid used in creating the image.
UTM_ZONE	= 1 through 60	The value used to indicate the zone number. This parameter is only included for the UTM projection.
VERTICAL_LON_FROM_POLE	= 0	Vertical longitude (decimal degrees) from the pole. Only present when MAP_PROJECTION is PS.
TRUE_SCALE_LAT	= -71.00000 = 71.00000	Latitude of true scale in a map projection. Only present when MAP_PROJECTION is PS.
FALSE_EASTING	= 0	Value added to all "x" values in the rectangular coordinates for a map projection. Frequently assigned to eliminate negative numbers. Expressed in the unit of measure identified in the ProjLinearUnitsGeoKey. Only present when MAP_PROJECTION is PS.
FALSE_NORTHING	= 0	Value added to all "y" values in the rectangular coordinates for a map projection. Frequently assigned to eliminate negative numbers. Expressed in the unit of measure identified in the ProjLinearUnitsGeoKey. Only present when MAP_PROJECTION is PS.
GRID_CELL_SIZE_REFLECTIVE	= 30.00	The grid cell size in meters used in creating the image for Visible and

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
		Near Infrared (VNIR) / Short-Wave Infrared (SWIR) bands.
GRID_CELL_SIZE_THERMAL	= 30.00	The grid cell size in meters used in creating the image for the thermal bands. This field is not present if the PROCESSING_LEVEL is L2SR.
REFLECTIVE_LINES	= 0–99999	The number of product lines for the reflective bands (Bands 1–7 and Band 9).
REFLECTIVE_SAMPLES	= 0–99999	The number of product samples for the reflective bands (Bands 1–7 and Band 9).
THERMAL_LINES	= 0–99999	The number of product lines for the thermal bands (Bands 10–11). This field is not present if the PROCESSING_LEVEL is L2SR.
THERMAL_SAMPLES	= 0–99999	The number of product samples for the thermal bands (Bands 10–11). This field is not present if the PROCESSING_LEVEL is L2SR.
ORIENTATION	= “NORTH_UP”	The orientation used in creating the image.
CORNER_UL_LAT_PRODUCT	= -90.00000 through +90.00000	The latitude value for the upper-left corner of the product, measured at the center of the pixel. A positive (+) value indicates north latitude; a negative (-) value indicates south latitude. Units are in degrees.
CORNER_UL_LON_PRODUCT	= -180.00000 through +180.00000	The longitude value for the upper-left corner of the product, measured at the center of the pixel. Positive (+) value indicates east longitude; negative (-)

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
		value indicates west longitude. Units are in degrees.
CORNER_UR_LAT_PRODUCT	= -90.00000 through +90.00000	The latitude value for the upper-right corner of the product, measured at the center of the pixel. Units are in degrees.
CORNER_UR_LON_PRODUCT	= -180.00000 through +180.00000	The longitude value for the upper-right corner of the product, measured at the center of the pixel. Units are in degrees.
CORNER_LL_LAT_PRODUCT	= -90.00000 through +90.00000	The latitude value for the lower-left corner of the product, measured at the center of the pixel. Units are in degrees.
CORNER_LL_LON_PRODUCT	= -180.00000 through +180.00000	The longitude value for the lower-left corner of the product, measured at the center of the pixel. Units are in degrees.
CORNER_LR_LAT_PRODUCT	= -90.00000 through +90.00000	The latitude value for the lower-right corner of the product, measured at the center of the pixel. Units are in degrees.
CORNER_LR_LON_PRODUCT	= -180.00000 through +180.00000	The longitude value for the lower-right corner of the product, measured at the center of the pixel. Units are in degrees.
CORNER_UL_PROJECTION_X_PRODUCT	= -132000000.000 through 132000000.000	The upper-left corner map projection X coordinate, measured at the center of the pixel. Units are in meters.
CORNER_UL_PROJECTION_Y_PRODUCT	= -132000000.000 through 132000000.000	The upper-left corner map projection Y coordinate, measured at the center of the pixel. Units are in meters.

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
CORNER_UR_PROJECTION_X_PRODUCT	= -132000000.000 through 132000000.000	The upper-right corner map projection X coordinate, measured at the center of the pixel. Units are in meters.
CORNER_UR_PROJECTION_Y_PRODUCT	= -132000000.000 through 132000000.000	The upper-right corner map projection Y coordinate, measured at the center of the pixel. Units are in meters.
CORNER_LL_PROJECTION_X_PRODUCT	= -132000000.000 through 132000000.000	The lower-left corner map projection X coordinate, measured at the center of the pixel. Units are in meters.
CORNER_LL_PROJECTION_Y_PRODUCT	= -132000000.000 through 132000000.000	The lower-left corner map projection Y coordinate, measured at the center of the pixel. Units are in meters.
CORNER_LR_PROJECTION_X_PRODUCT	= -132000000.000 through 132000000.000	The lower-right corner map projection X coordinate, measured at the center of the pixel. Units are in meters.
CORNER_LR_PROJECTION_Y_PRODUCT	= -132000000.000 through 132000000.000	The lower-right corner map projection Y coordinate, measured at the center of the pixel. Units are in meters.
END_GROUP	= PROJECTION_ATTRIBUTES	
GROUP	= LEVEL2_PROCESSING_RECORD	
ORIGIN	= “Image courtesy of the U.S. Geological Survey”	Origin of the product.
DIGITAL_OBJECT_IDENTIFIER	= “https://doi.org/10.5066/P9OGBGM6”	Digital Object Identifier for Level 2 OLI-TIRS. For more information on Digital Object Identifiers, visit https://www.doi.org.
REQUEST_ID	= “NNNNNNNNNNNN_UUUUU”	USGS products use the “NNNYYMMDDSSSS_UUUUU” format, where: NNNYYMMDDSSSS = 13-digit Tracking, Recording, and Metrics (TRAM) order number

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
		NNN = Node indicator YY = Year MM = Month DD = Day SSSS = Sequence number for the day UUUUU = Five-digit TRAM unit number
LANDSAT_PRODUCT_ID	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX”	Landsat uses the “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX” format, where: L = Landsat X = Sensor SS = Satellite (08 or 09) LLLL = Processing correction Level PPP = WRS path RRR = WRS row YYYYMMDD = Acquisition year (YYYY) Month (MM) Day (DD) yyyymmdd = Processing year (yyyy) month (mm) day (dd) CC = Collection number TX = Collection category
PROCESSING_LEVEL	= “L2SP” = “L2SR”	Level 2 Science Product Level 2 Surface Reflectance
OUTPUT_FORMAT	= “GEOTIFF”	Output file format for image files.
DATE_PRODUCT_GENERATED	= YYYY-MM-DDTHH:MI:SSZ	The date when the metadata file for the product was created: YYYY-MM-DDTHH:MI:SSZ Where: YYYY = Four-digit Julian year MM = Month of the Julian year (01-12)

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
		DD = Day of the Julian month (01-31) T = Start of time information in ODL American Standard Code for Information Interchange (ASCII) time code format HH = Hours (00-23) MI = Minutes (00-59) SS = Seconds (00-59) Z = Zulu time (same as Greenwich Mean Time (GMT))
PROCESSING_SOFTWARE_VERSION	= “LPGS_X.Y.Z”	The processing software version that created the product. The version consists of a system name followed by an underscore and then the software version, where X is the major release number, Y is the minor release number, and Z is the patch (or engineering) release number. X, Y, and Z are all numeric values.
ALGORITHM_SOURCE_SURFACE_REFLECTANCE	= “LaSRC_X.Y.Z”	The version of the Landsat Surface Reflectance Code (LaSRC) used to process Surface Reflectance bands.
DATA_SOURCE_OZONE	= “MODIS”	Data source for the Surface Reflectance algorithm.
DATA_SOURCE_PRESSURE	= “Calculated”	Data source for the Surface Reflectance algorithm. The pressure is calculated based on elevation.
DATA_SOURCE_WATER_VAPOR	= “MODIS”	Data source for the Surface Reflectance algorithm.
DATA_SOURCE_AIR_TEMPERATURE	= “MODIS”	Data source for the Surface Reflectance algorithm.

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
ALGORITHM_SOURCE_SURFACE_TEMPERATURE	= “st_X.Y.Z”	The version of the Landsat Surface Temperature code used to process Surface Temperature band. This field is not present if the PROCESSING_LEVEL is L2SR.
DATA_SOURCE_REANALYSIS	= “GEOS-5 FP-IT”	Data source for the Surface Temperature algorithm. This field is not present if the PROCESSING_LEVEL is L2SR.
END_GROUP	= LEVEL2_PROCESSING_RECORD	
GROUP	= LEVEL2_SURFACE_REFLECTANCE_PARAMETERS	
REFLECTANCE_MAXIMUM_BAND_1	= N.NNNNNN	Maximum achievable reflectance value for Band 1.
REFLECTANCE_MINIMUM_BAND_1	= N.NNNNNN	Minimum achievable reflectance value for Band 1.
REFLECTANCE_MAXIMUM_BAND_2	= N.NNNNNN	Maximum achievable reflectance value for Band 2.
REFLECTANCE_MINIMUM_BAND_2	= N.NNNNNN	Minimum achievable reflectance value for Band 2.
REFLECTANCE_MAXIMUM_BAND_3	= N.NNNNNN	Maximum achievable reflectance value for Band 3.
REFLECTANCE_MINIMUM_BAND_3	= N.NNNNNN	Minimum achievable reflectance value for Band 3.
REFLECTANCE_MAXIMUM_BAND_4	= N.NNNNNN	Maximum achievable reflectance value for Band 4.
REFLECTANCE_MINIMUM_BAND_4	= N.NNNNNN	Minimum achievable reflectance value for Band 4.
REFLECTANCE_MAXIMUM_BAND_5	= N.NNNNNN	Maximum achievable reflectance value for Band 5.

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
REFLECTANCE_MINIMUM_BAND_5	= N.NNNNNN	Minimum achievable reflectance value for Band 5.
REFLECTANCE_MAXIMUM_BAND_6	= N.NNNNNN	Maximum achievable reflectance value for Band 6.
REFLECTANCE_MINIMUM_BAND_6	= N.NNNNNN	Minimum achievable reflectance value for Band 6.
REFLECTANCE_MAXIMUM_BAND_7	= N.NNNNNN	Maximum achievable reflectance value for Band 7.
REFLECTANCE_MINIMUM_BAND_7	= N.NNNNNN	Minimum achievable reflectance value for Band 7.
QUANTIZE_CAL_MAX_BAND_1	= 1-65535	Maximum possible pixel value for Band 1. Note OLI never has a value above 65455.
QUANTIZE_CAL_MIN_BAND_1	= 1	Minimum possible pixel value for Band 1.
QUANTIZE_CAL_MAX_BAND_2	= 1-65535	Maximum possible pixel value for Band 2. Note OLI never has a value above 65455.
QUANTIZE_CAL_MIN_BAND_2	= 1	Minimum possible pixel value for Band 2.
QUANTIZE_CAL_MAX_BAND_3	= 1-65535	Maximum possible pixel value for Band 3. Note OLI never has a value above 65455.
QUANTIZE_CAL_MIN_BAND_3	= 1	Minimum possible pixel value for Band 3.
QUANTIZE_CAL_MAX_BAND_4	= 1-65535	Maximum possible pixel value for Band 4. Note OLI never has a value above 65455.
QUANTIZE_CAL_MIN_BAND_4	= 1	Minimum possible pixel value for Band 4.

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
QUANTIZE_CAL_MAX_BAND_5	= 1-65535	Maximum possible pixel value for Band 5. Note OLI never has a value above 65455.
QUANTIZE_CAL_MIN_BAND_5	= 1	Minimum possible pixel value for Band 5.
QUANTIZE_CAL_MAX_BAND_6	= 1-65535	Maximum possible pixel value for Band 6. Note OLI never has a value above 65455.
QUANTIZE_CAL_MIN_BAND_6	= 1	Minimum possible pixel value for Band 6.
QUANTIZE_CAL_MAX_BAND_7	= 1-65535	Maximum possible pixel value for Band 7. Note OLI never has a value above 65455.
QUANTIZE_CAL_MIN_BAND_7	= 1	Minimum possible pixel value for Band 7.
REFLECTANCE_MULT_BAND_1	= 2.75e-05	Multiplicative radiometric rescaling factor applied to the L2 band.
REFLECTANCE_MULT_BAND_2	= 2.75e-05	Multiplicative radiometric rescaling factor applied to the L2 band.
REFLECTANCE_MULT_BAND_3	= 2.75e-05	Multiplicative radiometric rescaling factor applied to the L2 band.
REFLECTANCE_MULT_BAND_4	= 2.75e-05	Multiplicative radiometric rescaling factor applied to the L2 band.
REFLECTANCE_MULT_BAND_5	= 2.75e-05	Multiplicative radiometric rescaling factor applied to the L2 band.
REFLECTANCE_MULT_BAND_6	= 2.75e-05	Multiplicative radiometric rescaling factor applied to the L2 band.
REFLECTANCE_MULT_BAND_7	= 2.75e-05	Multiplicative radiometric rescaling factor applied to the L2 band.
REFLECTANCE_ADD_BAND_1	= -0.2	Additive rescaling factor applied to the L2 band.

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
REFLECTANCE_ADD_BAND_2	= -0.2	Additive rescaling factor applied to the L2 band.
REFLECTANCE_ADD_BAND_3	= -0.2	Additive rescaling factor applied to the L2 band.
REFLECTANCE_ADD_BAND_4	= -0.2	Additive rescaling factor applied to the L2 band.
REFLECTANCE_ADD_BAND_5	= -0.2	Additive rescaling factor applied to the L2 band.
REFLECTANCE_ADD_BAND_6	= -0.2	Additive rescaling factor applied to the L2 band.
REFLECTANCE_ADD_BAND_7	= -0.2	Additive rescaling factor applied to the L2 band.
END_GROUP	= LEVEL2_SURFACE_REFLECTANCE_PARAMETERS	
GROUP	= LEVEL2_SURFACE_TEMPERATURE_PARAMETERS	This group is not present if the PROCESSING_LEVEL is L2SR.
TEMPERATURE_MAXIMUM_BAND_ST_B10	= NNN.NNNNNN	Maximum achievable temperature value for Band 10.
TEMPERATURE_MINIMUM_BAND_ST_B10	= NNN.NNNNNN	Minimum achievable temperature value for Band 10.
QUANTIZE_CAL_MAXIMUM_BAND_ST_B10	= 1-65535	Maximum possible pixel value for the Band 10.
QUANTIZE_CAL_MINIMUM_BAND_ST_B10	= 1	Minimum possible pixel value for the Band 10.
TEMPERATURE_MULT_BAND_ST_B10	= 0.00341802	Multiplicative temperature rescaling factor to convert DN to temperature.
TEMPERATURE_ADD_BAND_ST_B10	= 149.0	Additive temperature rescaling factor to convert DN to temperature.

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
END_GROUP	= LEVEL2_SURFACE_TEMPERATURE_PARAMETERS	
GROUP	= LEVEL1_PROCESSING_RECORD	
ORIGIN	= “Image courtesy of the U.S. Geological Survey”	Origin of the product.⁂
DIGITAL_OBJECT_IDENTIFIER	= “https://doi.org/10.5066/P975CC9B”	Digital Object Identifier for Level 1 OLI-TIRS. For more information on Digital Object Identifiers, visit https://www.doi.org.⁂
REQUEST_ID	= “NNNNNNNNNNNNN_UUUUU”	USGS products use the “NNNYYMMDDSSSS_UUUUU” format, where: NNNYYMMDDSSSS = 13-digit Tracking, Recording, and Metrics (TRAM) order number NNN = Node indicator YY = Year MM = Month DD = Day SSSS = Sequence number for the day UUUUU = Five-digit TRAM unit number.⁂
LANDSAT_SCENE_ID	= “LsSppprrrYYYYDDDGGGVV”	The unique Landsat scene identifier.⁂
LANDSAT_PRODUCT_ID	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX”	Landsat uses the “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX” format, where: L = Landsat X = Sensor SS = Satellite (08 or 09) LLLL = Processing correction Level

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
		PPP = WRS path RRR = WRS row YYYYMMDD = Acquisition year (YYYY) Month (MM) Day (DD) yyyymmdd = Processing year (yyyy) month (mm) day (dd) CC = Collection number TX = Collection category⁂
PROCESSING_LEVEL	= “L1GT” = “L1TP”	The identifier to inform the user of the processing level of the product.⁂
COLLECTION_CATEGORY	= “T1” = “T2”	The scene collection category, “T1” for Tier 1 quality collection and “T2” for Tier 2 quality collection.⁂
OUTPUT_FORMAT	= “GEOTIFF”	Output file format for image files.⁂
DATE_PRODUCT_GENERATED	= YYYY-MM-DDTHH:MI:SSZ	The date when the metadata file for the product was created: YYYY-MM-DDTHH:MI:SSZ Where: YYYY = Four-digit Julian year MM = Month of the Julian year (01-12) DD = Day of the Julian month (01-31) T = Start of time information in ODL American Standard Code for Information Interchange (ASCII) time code format HH = Hours (00-23) MI = Minutes (00-59) SS = Seconds (00-59) Z = Zulu time (same as Greenwich Mean Time (GMT))⁂
PROCESSING_SOFTWARE_VERSION	= “LPGS_X.Y.Z”	The processing software version that created the product. The version

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
		consists of a system name followed by an underscore and then the software version, where X is the major release number, Y is the minor release number, and Z is the patch (or engineering) release number. X, Y, and Z are all numeric values.⁂
FILE_NAME_BAND_1	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_B1.TIF”	The file name for L1 Band 1.⁂
FILE_NAME_BAND_2	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_B2.TIF”	The file name for L1 Band 2.⁂
FILE_NAME_BAND_3	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_B3.TIF”	The file name for L1 Band 3.⁂
FILE_NAME_BAND_4	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_B4.TIF”	The file name for L1 Band 4.⁂
FILE_NAME_BAND_5	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_B5.TIF”	The file name for L1 Band 5.⁂
FILE_NAME_BAND_6	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_B6.TIF”	The file name for L1 Band 6.⁂
FILE_NAME_BAND_7	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_B7.TIF”	The file name for L1 Band 7.⁂
FILE_NAME_BAND_8	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_B8.TIF”	The file name for L1 Band 8.⁂

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
FILE_NAME_BAND_9	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_B9.TIF”	The file name for L1 Band 9.⁂
FILE_NAME_BAND_10	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_B10.TIF”	The file name for L1 Band 10.⁂
FILE_NAME_BAND_11	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_B11.TIF”	The file name for L1 Band 11.⁂
FILE_NAME_QUALITY_L1_PIXEL	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_QA_PIXEL.TIF”	The file name for the L1 Quality Assessment (QA) Band.
FILE_NAME_QUALITY_L1_RADIOMETRIC_SATURATION	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_QA_RADSAT.TIF”	The file name for the Radiometric Saturation Quality Assessment (QA) Band.
FILE_NAME_ANGLE_COEFFICIENT	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ANG.txt”	The file name for the angle coefficient file.
FILE_NAME_ANGLE_SENSOR_AZIMUTH_BAND_4	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_VAA.TIF”	The file name for the Band 4 View (sensor) Azimuth Angle.⁂
FILE_NAME_ANGLE_SENSOR_ZENITH_BAND_4	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_VZA.TIF”	The file name for the Band 4 View (sensor) Zenith Angle.⁂
FILE_NAME_ANGLE_SOLAR_AZIMUTH_BAND_4	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SAA.TIF”	The file name for the Band 4 Solar Azimuth Angle.⁂
FILE_NAME_ANGLE_SOLAR_ZENITH_BAND_4	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SZA.TIF”	The file name for the Band 4 Solar Zenith Angle.⁂

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
FILE_NAME_METADATA_ODL	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_MTL.txt”	The file name for L1 ODL metadata.⁂
FILE_NAME_METADATA_XML	= “LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_MTL.xml”	The file name for L1 XML metadata.⁂
FILE_NAME_CPF	= “LXSSCPF_YYYYMMDD_yyyymmdd_CC.NN”	The file name for the CPF used to generate the product.⁂
FILE_NAME_BPF_OLI	= “LOSBPFYYYYMMDDhhmmss_YYYYMMDDhhmmss.nn”	The file name for the Bias Parameter File (BPF) used to generate the product, if applicable.⁂
FILE_NAME_BPF_TIRS	= “LTSBPFYYYYMMDDhhmmss_YYYYMMDDhhmmss.nn”	The file name for the BPF used to generate the product, if applicable.⁂
FILE_NAME_RLUT	= “LXSSRLUT_YYYYMMDD_yyyymmdd_CC_NN.h5”	The file name for the Response Linearization Lookup Table (RLUT) used to generate the product, if applicable.⁂
DATA_SOURCE_TIRS_STRAY_LIGHT_CORRECTION	= “TIRS”	The correction source used in creating the Landsat 8 TIRS stray light correction image. This field is not included for Landsat 9.⁂
DATA_SOURCE_ELEVATION	= “GLS2000” = “RAMP” = “GTOPO30”	Indicates the source of the DEM used in the correction process.⁂
GROUND_CONTROL_POINTS_VERSION	= 0-999	GCP dataset version used in the precision correction process. This parameter is only present if the PROCESSING_LEVEL is L1TP.⁂
GROUND_CONTROL_POINTS_MODEL	= 0-9999	Number of GCPs used in the precision correction process. This parameter is

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
		only present if the PROCESSING_LEVEL is L1TP.⁂
GEOMETRIC_RMSE_MODEL	= N.NNN	Combined Root Mean Square Error (RMSE) of the geometric residuals (meters) in both across-track and along-track directions measured on the GCPs used in geometric precision correction. This parameter is only present if the PROCESSING_LEVEL is L1TP.⁂
GEOMETRIC_RMSE_MODEL_Y	= N.NNN	The post-fit RMSE for the along-track direction. Units are in meters equal to or greater than zero, with no upper limit, and three decimal places. This parameter is only present if the PROCESSING_LEVEL is L1TP.⁂
GEOMETRIC_RMSE_MODEL_X	= N.NNN	The post-fit RMSE for the along-track direction. Units are in meters equal to or greater than zero, with no upper limit, and three decimal places. This parameter is only present if the PROCESSING_LEVEL is L1TP.⁂
GROUND_CONTROL_POINTS_VERIFY	= 1-9999	Number of GCPs used in the verification of the terrain corrected product.⁂
GEOMETRIC_RMSE_VERIFY	= 0.000-9999.999	RMSE of the geometric residuals (meters) measured on the terrain-corrected product independently using GLS2000.⁂
END_GROUP	= LEVEL1_PROCESSING_RECORD	
GROUP	= LEVEL1_MIN_MAX_RADIANCE	⁂

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
RADIANCE_MAXIMUM_BAND_1	= NNN.NNNNN	Maximum achievable spectral radiance value for Band 1.⁂
RADIANCE_MINIMUM_BAND_1	= NNN.NNNNN	Minimum achievable spectral radiance value for Band 1.⁂
RADIANCE_MAXIMUM_BAND_2	= NNN.NNNNN	Maximum achievable spectral radiance value for Band 2.⁂
RADIANCE_MINIMUM_BAND_2	= NNN.NNNNN	Minimum achievable spectral radiance value for Band 2.⁂
RADIANCE_MAXIMUM_BAND_3	= NNN.NNNNN	Maximum achievable spectral radiance value for Band 3.⁂
RADIANCE_MINIMUM_BAND_3	= NNN.NNNNN	Minimum achievable spectral radiance value for Band 3.⁂
RADIANCE_MAXIMUM_BAND_4	= NNN.NNNNN	Maximum achievable spectral radiance value for Band 4.⁂
RADIANCE_MINIMUM_BAND_4	= NNN.NNNNN	Minimum achievable spectral radiance value for Band 4.⁂
RADIANCE_MAXIMUM_BAND_5	= NNN.NNNNN	Maximum achievable spectral radiance value for Band 5.⁂
RADIANCE_MINIMUM_BAND_5	= NNN.NNNNN	Minimum achievable spectral radiance value for Band 5.⁂
RADIANCE_MAXIMUM_BAND_6	= NNN.NNNNN	Maximum achievable spectral radiance value for Band 6.⁂
RADIANCE_MINIMUM_BAND_6	= NNN.NNNNN	Minimum achievable spectral radiance value for Band 6.⁂
RADIANCE_MAXIMUM_BAND_7	= NNN.NNNNN	Maximum achievable spectral radiance value for Band 7.⁂
RADIANCE_MINIMUM_BAND_7	= NNN.NNNNN	Minimum achievable spectral radiance value for Band 7.⁂
RADIANCE_MAXIMUM_BAND_8	= NNN.NNNNN	Maximum achievable spectral radiance value for Band 8.⁂

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
RADIANCE_MINIMUM_BAND_8	= NNN.NNNNN	Minimum achievable spectral radiance value for Band 8.⁂
RADIANCE_MAXIMUM_BAND_9	= NNN.NNNNN	Maximum achievable spectral radiance value for Band 9.⁂
RADIANCE_MINIMUM_BAND_9	= NNN.NNNNN	Minimum achievable spectral radiance value for Band 9.⁂
RADIANCE_MAXIMUM_BAND_10	= NNN.NNNNN	Maximum achievable spectral radiance value for Band 10.⁂
RADIANCE_MINIMUM_BAND_10	= NNN.NNNNN	Minimum achievable spectral radiance value for Band 10.⁂
RADIANCE_MAXIMUM_BAND_11	= NNN.NNNNN	Maximum achievable spectral radiance value for Band 11.⁂
RADIANCE_MINIMUM_BAND_11	= NNN.NNNNN	Minimum achievable spectral radiance value for Band 11.⁂
END_GROUP	= LEVEL1_MIN_MAX_RADIANCE	⁂
GROUP	= LEVEL1_MIN_MAX_REFLECTANCE	⁂
REFLECTANCE_MAXIMUM_BAND_1	= N.NNNNNN	Maximum achievable reflectance value for Band 1.⁂
REFLECTANCE_MINIMUM_BAND_1	= N.NNNNNN	Minimum achievable reflectance value for Band 1.⁂
REFLECTANCE_MAXIMUM_BAND_2	= N.NNNNNN	Maximum achievable reflectance value for Band 2.⁂
REFLECTANCE_MINIMUM_BAND_2	= N.NNNNNN	Minimum achievable reflectance value for Band 2.⁂
REFLECTANCE_MAXIMUM_BAND_3	= N.NNNNNN	Maximum achievable reflectance value for Band 3.⁂
REFLECTANCE_MINIMUM_BAND_3	= N.NNNNNN	Minimum achievable reflectance value for Band 3.⁂
REFLECTANCE_MAXIMUM_BAND_4	= N.NNNNNN	Maximum achievable reflectance value for Band 4.⁂

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
REFLECTANCE_MINIMUM_BAND_4	= N.NNNNNN	Minimum achievable reflectance value for Band 4.⁂
REFLECTANCE_MAXIMUM_BAND_5	= N.NNNNNN	Maximum achievable reflectance value for Band 5.⁂
REFLECTANCE_MINIMUM_BAND_5	= N.NNNNNN	Minimum achievable reflectance value for Band 5.⁂
REFLECTANCE_MAXIMUM_BAND_6	= N.NNNNNN	Maximum achievable reflectance value for Band 6.⁂
REFLECTANCE_MINIMUM_BAND_6	= N.NNNNNN	Minimum achievable reflectance value for Band 6.⁂
REFLECTANCE_MAXIMUM_BAND_7	= N.NNNNNN	Maximum achievable reflectance value for Band 7.⁂
REFLECTANCE_MINIMUM_BAND_7	= N.NNNNNN	Minimum achievable reflectance value for Band 7.⁂
REFLECTANCE_MAXIMUM_BAND_8	= N.NNNNNN	Maximum achievable reflectance value for Band 8.⁂
REFLECTANCE_MINIMUM_BAND_8	= N.NNNNNN	Minimum achievable reflectance value for Band 8.⁂
REFLECTANCE_MAXIMUM_BAND_9	= N.NNNNNN	Maximum achievable reflectance value for Band 9.⁂
REFLECTANCE_MINIMUM_BAND_9	= N.NNNNNN	Minimum achievable reflectance value for Band 9.⁂
END_GROUP	= LEVEL1_MIN_MAX_REFLECTANCE	⁂
GROUP	= LEVEL1_MIN_MAX_PIXEL_VALUE	⁂
QUANTIZE_CAL_MAX_BAND_1	= 1-65535	Maximum possible pixel value for Band 1.⁂
QUANTIZE_CAL_MIN_BAND_1	= 0-1	Minimum possible pixel value for Band 1.⁂
QUANTIZE_CAL_MAX_BAND_2	= 1-65535	Maximum possible pixel value for Band 2.⁂

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
QUANTIZE_CAL_MIN_BAND_2	= 0-1	Minimum possible pixel value for Band 2.⁂
QUANTIZE_CAL_MAX_BAND_3	= 1-65535	Maximum possible pixel value for Band 3.⁂
QUANTIZE_CAL_MIN_BAND_3	= 0-1	Minimum possible pixel value for Band 3.⁂
QUANTIZE_CAL_MAX_BAND_4	= 1-65535	Maximum possible pixel value for Band 4.⁂
QUANTIZE_CAL_MIN_BAND_4	= 0-1	Minimum possible pixel value for Band 4.⁂
QUANTIZE_CAL_MAX_BAND_5	= 1-65535	Maximum possible pixel value for Band 5.⁂
QUANTIZE_CAL_MIN_BAND_5	= 0-1	Minimum possible pixel value for Band 5.⁂
QUANTIZE_CAL_MAX_BAND_6	= 1-65535	Maximum possible pixel value for Band 6.⁂
QUANTIZE_CAL_MIN_BAND_6	= 0-1	Minimum possible pixel value for Band 6.⁂
QUANTIZE_CAL_MAX_BAND_7	= 1-65535	Maximum possible pixel value for Band 7.⁂
QUANTIZE_CAL_MIN_BAND_7	= 0-1	Minimum possible pixel value for Band 7.⁂
QUANTIZE_CAL_MAX_BAND_8	= 1-65535	Maximum possible pixel value for Band 8.⁂
QUANTIZE_CAL_MIN_BAND_8	= 0-1	Minimum possible pixel value for Band 8.⁂
QUANTIZE_CAL_MAX_BAND_9	= 1-65535	Maximum possible pixel value for Band 9.⁂
QUANTIZE_CAL_MIN_BAND_9	= 0-1	Minimum possible pixel value for Band 9.⁂

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
QUANTIZE_CAL_MAX_BAND_10	= 1-65535	Maximum possible pixel value for Band 10.⁂
QUANTIZE_CAL_MIN_BAND_10	= 0-1	Minimum possible pixel value for Band 10.⁂
QUANTIZE_CAL_MAX_BAND_11	= 1-65535	Maximum possible pixel value for Band 11.⁂
QUANTIZE_CAL_MIN_BAND_11	= 0-1	Minimum possible pixel value for Band 11.⁂
END_GROUP	= LEVEL1_MIN_MAX_PIXEL_VALUE	⁂
GROUP	= LEVEL1_RADIOMETRIC_RESCALING	⁂
RADIANCE_MULT_BAND_1	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Radiance units for Band 1 (W/(m^2 sr um)/DN).⁂
RADIANCE_MULT_BAND_2	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Radiance units for Band 2 (W/(m^2 sr um)/DN).⁂
RADIANCE_MULT_BAND_3	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Radiance units for Band 3 (W/(m^2 sr um)/DN).⁂
RADIANCE_MULT_BAND_4	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Radiance units for Band 4 (W/(m^2 sr um)/DN).⁂
RADIANCE_MULT_BAND_5	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
		Radiance units for Band 5 (W/(m^2 sr um)/DN).⁂
RADIANCE_MULT_BAND_6	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Radiance units for Band 6 (W/(m^2 sr um)/DN).⁂
RADIANCE_MULT_BAND_7	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Radiance units for Band 7 (W/(m^2 sr um)/DN).⁂
RADIANCE_MULT_BAND_8	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Radiance units for Band 8 (W/(m^2 sr um)/DN).⁂
RADIANCE_MULT_BAND_9	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Radiance units for Band 9 (W/(m^2 sr um)/DN).⁂
RADIANCE_MULT_BAND_10	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Radiance units for Band 10 (W/(m^2 sr um)/DN).⁂
RADIANCE_MULT_BAND_11	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Radiance units for Band 11 (W/(m^2 sr um)/DN).⁂
RADIANCE_ADD_BAND_1	= NN.NNNNN	The additive rescaling factor used to convert calibrated DN to Radiance units for Band 1 (W/(m^2 sr um)).⁂
RADIANCE_ADD_BAND_2	= NN.NNNNN	The additive rescaling factor used to convert calibrated DN to Radiance units for Band 2 (W/(m^2 sr um).⁂

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
RADIANCE_ADD_BAND_3	= NN.NNNNN	The additive rescaling factor used to convert calibrated DN to Radiance units for Band 3 (W/(m^2 sr um).⁂
RADIANCE_ADD_BAND_4	= NN.NNNNN	The additive rescaling factor used to convert calibrated DN to Radiance units for Band 4 (W/(m^2 sr um).⁂
RADIANCE_ADD_BAND_5	= NN.NNNNN	The additive rescaling factor used to convert calibrated DN to Radiance units for Band 5 (W/(m^2 sr um).⁂
RADIANCE_ADD_BAND_6	= NN.NNNNN	The additive rescaling factor used to convert calibrated DN to Radiance units for Band 6 (W/(m^2 sr um).⁂
RADIANCE_ADD_BAND_7	= NN.NNNNN	The additive rescaling factor used to convert calibrated DN to Radiance units for Band 7 (W/(m^2 sr um).⁂
RADIANCE_ADD_BAND_8	= NN.NNNNN	The additive rescaling factor used to convert calibrated DN to Radiance units for Band 8 (W/(m^2 sr um).⁂
RADIANCE_ADD_BAND_9	= NN.NNNNN	The additive rescaling factor used to convert calibrated DN to Radiance units for Band 9 (W/(m^2 sr um).⁂
RADIANCE_ADD_BAND_10	= NN.NNNNN	The additive rescaling factor used to convert calibrated DN to Radiance units for Band 10 (W/(m^2 sr um).⁂
RADIANCE_ADD_BAND_11	= NN.NNNNN	The additive rescaling factor used to convert calibrated DN to Radiance units for Band 11 (W/(m^2 sr um).⁂
REFLECTANCE_MULT_BAND_1	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Reflectance for Band 1 (DN^-1).⁂

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
REFLECTANCE_MULT_BAND_2	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Reflectance for Band 2 (DN^-1).⁂
REFLECTANCE_MULT_BAND_3	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Reflectance for Band 3 (DN^-1).⁂
REFLECTANCE_MULT_BAND_4	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Reflectance for Band 4 (DN^-1).⁂
REFLECTANCE_MULT_BAND_5	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Reflectance for Band 5 (DN^-1).⁂
REFLECTANCE_MULT_BAND_6	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Reflectance for Band 6 (DN^-1).⁂
REFLECTANCE_MULT_BAND_7	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Reflectance for Band 7 (DN^-1).⁂
REFLECTANCE_MULT_BAND_8	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Reflectance for Band 8 (DN^-1).⁂
REFLECTANCE_MULT_BAND_9	= N.NNNNE-NN	The multiplicative rescaling factor used to convert calibrated DN to Reflectance for Band 9 (DN^-1).⁂
REFLECTANCE_ADD_BAND_1	= N.NNNNNN	The additive rescaling factor used to convert calibrated DN to Reflectance for Band 1.⁂
REFLECTANCE_ADD_BAND_2	= N.NNNNNN	The additive rescaling factor used to convert calibrated DN to Reflectance for Band 2.⁂

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
REFLECTANCE_ADD_BAND_3	= N.NNNNNN	The additive rescaling factor used to convert calibrated DN to Reflectance for Band 3.**
REFLECTANCE_ADD_BAND_4	= N.NNNNNN	The additive rescaling factor used to convert calibrated DN to Reflectance for Band 4.**
REFLECTANCE_ADD_BAND_5	= N.NNNNNN	The additive rescaling factor used to convert calibrated DN to Reflectance for Band 5.**
REFLECTANCE_ADD_BAND_6	= N.NNNNNN	The additive rescaling factor used to convert calibrated DN to Reflectance for Band 6.**
REFLECTANCE_ADD_BAND_7	= N.NNNNNN	The additive rescaling factor used to convert calibrated DN to Reflectance for Band 7.**
REFLECTANCE_ADD_BAND_8	= N.NNNNNN	The additive rescaling factor used to convert calibrated DN to Reflectance for Band 8.**
REFLECTANCE_ADD_BAND_9	= N.NNNNNN	The additive rescaling factor used to convert calibrated DN to Reflectance for Band 9.**
END_GROUP	= LEVEL1_RADIOMETRIC_RESCALING	**
GROUP	= LEVEL1_THERMAL_CONSTANTS	**
K1_CONSTANT_BAND_10	= NNN.NNNN	K1 coefficient for Band 10 radiance to temperature conversion.**
K2_CONSTANT_BAND_10	= NNNN.NNNN	K2 coefficient for Band 10 radiance to temperature conversion.**
K1_CONSTANT_BAND_11	= NNN.NNNN	K1 coefficient for Band 11 radiance to temperature conversion.**

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
K2_CONSTANT_BAND_11	= NNNN.NNNN	K2 coefficient for Band 11 radiance to temperature conversion.⁂
END_GROUP	= LEVEL1_THERMAL_CONSTANTS	⁂
GROUP	= LEVEL1_PROJECTION_PARAMETERS	
MAP_PROJECTION	= “UTM” = “PS”	The map projection used in creating the image. Universal Transverse Mercator (UTM) or Polar Stereographic (PS).
DATUM	= “WGS84”	The datum used in creating the image.
ELLIPSOID	= “WGS84”	The ellipsoid used in creating the image.
UTM_ZONE	= 1 through 60	The value used to indicate the zone number. This parameter is only included for the UTM projection.
VERTICAL_LON_FROM_POLE	= 0	Vertical longitude (decimal degrees) from the pole. Only present when MAP_PROJECTION is PS.
TRUE_SCALE_LAT	= -71.00000 = 71.00000	Latitude of true scale in a map projection. Only present when MAP_PROJECTION is PS.
FALSE_EASTING	= 0	Value added to all "x" values in the rectangular coordinates for a map projection. Frequently assigned to eliminate negative numbers. Expressed in the unit of measure identified in the ProjLinearUnitsGeoKey. Only present when MAP_PROJECTION is PS.
FALSE_NORTHING	= 0	Value added to all "y" values in the rectangular coordinates for a map

Parameter Name	Value, Format, and Range	Parameter Description / Remarks
		projection. Frequently assigned to eliminate negative numbers. Expressed in the unit of measure identified in the ProjLinearUnitsGeoKey. Only present when MAP_PROJECTION is PS.
GRID_CELL_SIZE_PANCHROMATIC	= 15.00	The grid cell size in meters used in creating the image for the panchromatic band.
GRID_CELL_SIZE_REFLECTIVE	= 30.00	The grid cell size in meters used in creating the image for Visible and Near Infrared (VNIR) / Short-Wave Infrared (SWIR) bands.
GRID_CELL_SIZE_THERMAL	= 30.00	The grid cell size in meters used in creating the image for the thermal bands.
ORIENTATION	= “NORTH_UP”	The orientation used in creating the image.
RESAMPLING_OPTION	= “CUBIC_CONVOLUTION”	The resampling option used in creating the image. Cubic Convolution (CC).
END_GROUP	= LEVEL1_PROJECTION_PARAMETERS	
END_GROUP	= LANDSAT_METADATA_FILE	
END		

Table 3-4. L2 Metadata ODL File

The XML metadata file and ODL metadata file have comparable fields. The LANDSAT_METADATA_FILE group for ODL is synonymous to the root element LANDSAT_METADATA_FILE for XML. The LANDSAT_METADATA_FILE group for ODL contains nested groups, synonymously, the LANDSAT_METADATA_FILE root element for XML has children elements. In the XML metadata file, the ODL parameter name is used in the start-tag and end-tag for elements. All parameters listed in the metadata file using ODL format are also in a separate metadata file using the XML format.

The XML metadata file and ODL metadata file have some contrasts. The ODL file distinguishes between strings and numerical values through the presence or absence of quotes around a value. The XML file does not make that distinction. The ODL file has an END statement signifying the end of the file. The XML file does not have a comparable entity.

XML Elements
<?xml version="1.0" encoding="UTF-8"?>
<LANDSAT_METADATA_FILE>
<PRODUCT_CONTENTS>
<ORIGIN>Image courtesy of the U.S. Geological Survey</ORIGIN>
<DIGITAL_OBJECT_IDENTIFIER>https://doi.org/10.5066/P9OGBGM6</DIGITAL_OBJECT_IDENTIFIER>
<LANDSAT_PRODUCT_ID>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX</LANDSAT_PRODUCT_ID>
<PROCESSING_LEVEL>L2SP</PROCESSING_LEVEL>
<COLLECTION_NUMBER>NN</COLLECTION_NUMBER>
<COLLECTION_CATEGORY>T1</COLLECTION_CATEGORY>
<OUTPUT_FORMAT>GEOTIFF</OUTPUT_FORMAT>
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<FILE_NAME_BAND_2>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SR_B2.TIF</FILE_NAME_BAND_2>
<FILE_NAME_BAND_3>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SR_B3.TIF</FILE_NAME_BAND_3>
<FILE_NAME_BAND_4>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SR_B4.TIF</FILE_NAME_BAND_4>
<FILE_NAME_BAND_5>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SR_B5.TIF</FILE_NAME_BAND_5>
<FILE_NAME_BAND_6>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SR_B6.TIF</FILE_NAME_BAND_6>
<FILE_NAME_BAND_7>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SR_B7.TIF</FILE_NAME_BAND_7>

XML Elements
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<FILE_NAME_THERMAL_RADIANCE>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_TRAD.TIF</FILE_NAME_THERMAL_RADIANCE>
<FILE_NAME_UPWELL_RADIANCE>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_URAD.TIF</FILE_NAME_UPWELL_RADIANCE>
<FILE_NAME_DOWNWELL_RADIANCE>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_DRAD.TIF</FILE_NAME_DOWNWELL_RADIANCE>
<FILE_NAME_ATMOSPHERIC_TRANSMITTANCE>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_ATRAN.TIF</FILE_NAME_ATMOSPHERIC_TRANSMITTANCE>
<FILE_NAME_EMISSIVITY>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_EMIS.TIF</FILE_NAME_EMISSIVITY>
<FILE_NAME_EMISSIVITY_STDEV>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_EMSD.TIF</FILE_NAME_EMISSIVITY_STDEV>
<FILE_NAME_CLOUD_DISTANCE>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_CDIST.TIF</FILE_NAME_CLOUD_DISTANCE>
<FILE_NAME_QUALITY_L2_AEROSOL>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_SR_QA_AEROSOL.TIF</FILE_NAME_QUALITY_L2_AEROSOL>
<FILE_NAME_QUALITY_L2_SURFACE_TEMPERATURE>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ST_QA.TIF</FILE_NAME_QUALITY_L2_SURFACE_TEMPERATURE>

XML Elements
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<FILE_NAME_ANGLE_COEFFICIENT>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_ANG.txt</FILE_NAME_ANGLE_COEFFICIENT>
<FILE_NAME_METADATA_ODL>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_MTL.txt</FILE_NAME_METADATA_ODL>
<FILE_NAME_METADATA_XML>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_MTL.xml</FILE_NAME_METADATA_XML>
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<DATA_TYPE_BAND_2>UINT16</DATA_TYPE_BAND_2>
<DATA_TYPE_BAND_3>UINT16</DATA_TYPE_BAND_3>
<DATA_TYPE_BAND_4>UINT16</DATA_TYPE_BAND_4>
<DATA_TYPE_BAND_5>UINT16</DATA_TYPE_BAND_5>
<DATA_TYPE_BAND_6>UINT16</DATA_TYPE_BAND_6>
<DATA_TYPE_BAND_7>UINT16</DATA_TYPE_BAND_7>
<DATA_TYPE_BAND_ST_B10>UINT16</DATA_TYPE_BAND_ST_B10>
<DATA_TYPE_THERMAL_RADIANCE>INT16</DATA_TYPE_THERMAL_RADIANCE>
<DATA_TYPE_UPWELL_RADIANCE>INT16</DATA_TYPE_UPWELL_RADIANCE>
<DATA_TYPE_DOWNWELL_RADIANCE>INT16</DATA_TYPE_DOWNWELL_RADIANCE>
<DATA_TYPE_ATMOSPHERIC_TRANSMITTANCE>INT16</DATA_TYPE_ATMOSPHERIC_TRANSMITTANCE>
<DATA_TYPE_EMISSIVITY>INT16</DATA_TYPE_EMISSIVITY>
<DATA_TYPE_EMISSIVITY_STDEV>INT16</DATA_TYPE_EMISSIVITY_STDEV>
<DATA_TYPE_CLOUD_DISTANCE>INT16</DATA_TYPE_CLOUD_DISTANCE>

XML Elements
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<DATA_TYPE_QUALITY_L2_SURFACE_TEMPERATURE>INT16</DATA_TYPE_QUALITY_L2_SURFACE_TEMPERATURE>
<DATA_TYPE_QUALITY_L1_PIXEL>UINT16</DATA_TYPE_QUALITY_L1_PIXEL>
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<IMAGE_ATTRIBUTES>
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<WRS_ROW>1-248</WRS_ROW>
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<TARGET_WRS_PATH>1-233</TARGET_WRS_PATH>
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<CLOUD_COVER_LAND>0.00–100.00, -1</CLOUD_COVER_LAND>
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<IMAGE_QUALITY_TIRS>0–9</IMAGE_QUALITY_TIRS>
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<SATURATION_BAND_2>Y</SATURATION_BAND_2>
<SATURATION_BAND_3>Y</SATURATION_BAND_3>
<SATURATION_BAND_4>Y</SATURATION_BAND_4>

XML Elements
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<SATURATION_BAND_7>Y</SATURATION_BAND_7>
<SATURATION_BAND_8>N</SATURATION_BAND_8>
<SATURATION_BAND_9>Y</SATURATION_BAND_9>
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<SUN_AZIMUTH>-180.00000000 through 180.00000000</SUN_AZIMUTH>
<SUN_ELEVATION>-90.00000000 through 90.00000000</SUN_ELEVATION>
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<FALSE_EASTING>0</FALSE_EASTING>
<FALSE_NORTHING>0</FALSE_NORTHING>
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<GRID_CELL_SIZE_THERMAL>30.00</GRID_CELL_SIZE_THERMAL>
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<CORNER_UL_LON_PRODUCT>-180.00000 through +180.00000</CORNER_UL_LON_PRODUCT>
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</PROJECTION_ATTRIBUTES>
<LEVEL2_PROCESSING_RECORD>
<ORIGIN>Image courtesy of the U.S. Geological Survey</ORIGIN>
<DIGITAL_OBJECT_IDENTIFIER>https://doi.org/10.5066/P9OGBGM6</DIGITAL_OBJECT_IDENTIFIER>
<REQUEST_ID>NNNNNNNNNNNNN_UUUUU</REQUEST_ID>
<LANDSAT_PRODUCT_ID>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX</LANDSAT_PRODUCT_ID>

XML Elements
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<DATA_SOURCE_OZONE>MODIS</DATA_SOURCE_OZONE>
<DATA_SOURCE_PRESSURE>Calculated</DATA_SOURCE_PRESSURE>
<DATA_SOURCE_WATER_VAPOR>MODIS</DATA_SOURCE_WATER_VAPOR>
<DATA_SOURCE_AIR_TEMPERATURE>MODIS</DATA_SOURCE_AIR_TEMPERATURE>
<ALGORITHM_SOURCE_SURFACE_TEMPERATURE>st_X.Y.Z</ALGORITHM_SOURCE_SURFACE_TEMPERATURE>
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XML Elements
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<ORIGIN>Image courtesy of the U.S. Geological Survey</ORIGIN>⁂
<DIGITAL_OBJECT_IDENTIFIER>https://doi.org/10.5066/P975CC9B</DIGITAL_OBJECT_IDENTIFIER>⁂
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<LANDSAT_SCENE_ID>LsSppprrrYYYYDDDGGGVV</LANDSAT_SCENE_ID>⁂
<LANDSAT_PRODUCT_ID>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX</LANDSAT_PRODUCT_ID>⁂
<PROCESSING_LEVEL>L1GT</PROCESSING_LEVEL>⁂
<COLLECTION_CATEGORY>T1</COLLECTION_CATEGORY>⁂
<OUTPUT_FORMAT>GEOTIFF</OUTPUT_FORMAT>⁂
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<PROCESSING_SOFTWARE_VERSION>LPGS_X.Y.Z</PROCESSING_SOFTWARE_VERSION>⁂
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<FILE_NAME_BAND_2>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_B2.TIF</FILE_NAME_BAND_2>⁂
<FILE_NAME_BAND_3>LXSS_LLLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX_B3.TIF</FILE_NAME_BAND_3>⁂

XML Elements
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<FILE_NAME_BPF_TIRS>LTSBPFYYYYMMDDhhmmss_YYYYMMDDhhmmss.nn</FILE_NAME_BPF_TIRS>⁂
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Table 3-5. L2 Metadata XML File

3.8 Angle Coefficients File

The angle coefficients file contains coefficients used for calculating solar and satellite viewing angles. The contents of the angle coefficients file are copied verbatim from the L1 angle coefficients file. Only the file name is changed to indicate it is part of the Level 2 product. Refer to LSDS-1822 for a description of the L1 angle coefficient file.

3.9 Checksum File

A single checksum file is created for all the files in the product. The checksum file contains a Message-Digest Algorithm 5 (MD5) checksum for every file. The file is in plain text format and contains the output from md5sum for each file. The checksum file is not distributed with the final product.

Appendix A Acronyms

ADD	Algorithm Description Document
ANG	Angle Coefficient File
ASCII	American Standard Code for Information Interchange
ASTER GED	Advanced Spaceborne Thermal Emission and Reflection Radiometer Global Emissivity Dataset
ATRAN	Atmospheric Transmittance Layer
AU	Astronomical Unit
BPF	Bias Parameter File
C2	Collection 2
Cal/Val	Calibration/Validation
CC	Cubic Convolution
CCB	Configuration Control Board
CDIST	Distance to Cloud
CFMask	C version of FMask
COG	Cloud Optimized GeoTIFF
CPF	Calibration Parameter File
CR	Change Request
DEM	Digital Elevation Model
DFCB	Data Format Control Book
DN	Digital Number
DOI	Department of the Interior
DPAS	Data Processing and Archive System
DRAD	Downwelled Radiance Layer
EMIS	Emissivity Layer
EMSD	Emissivity Standard Deviation
EPSG	European Petroleum Survey Group
EROS	Earth Resources Observation and Science
FT	File Type
GCP	Ground Control Point
GDAL	Geospatial Data Abstraction Library
GeoTIFF	Geographic Tagged Image File Format
GMT	Greenwich Mean Time
K	Kelvin
L0R	Level 0 Reformatted
L1	Level 1 Data Product
L1GT	Level 1 Systematic Terrain (Corrected)
L1TP	Level 1 Precision Terrain (Corrected)
L2	Level 2 Data Product
L2SP	Level 2 Science Product
L2SR	Level 2 Surface Reflectance
L8	Landsat 8

L9	Landsat 9
LaSRC	Landsat Surface Reflectance Code
LGN	Landsat Ground Network
LOS	Line-of-Sight
LP DAAC	Land Processes Distributed Active Archive Center
LPGS	Landsat Product Generation System
LSDS	Land Satellites Data System
MD5	Message-Digest Algorithm 5
MTL	Metadata file
NASA	National Aeronautics and Space Administration
NIR	Near-Infrared
nm	Nanometer
ODL	Object Description Language
OLI	Operational Land Imager
PS	Polar Stereographic
QA	Quality Assessment
RADSAT	Radiometric Saturation
RLUT	Response Linearization Lookup Table
RMSE	Root Mean Square Error
SAA	Solar Azimuth Angle
SR	Surface Reflectance
SSM	Scene Select Mirror
ST	Surface Temperature
STDEV	Standard Deviation
SWIR	Short Wavelength Infrared
SZA	Solar Zenith Angle
T1	Tier 1
T2	Tier 2
TIFF	Tagged Image File Format
TIRS	Thermal Infrared Sensor
TOA	Top of Atmosphere
TRAD	Thermal Radiance Layer
TRAM	Tracking, Routing, and Metrics
URAD	Upwelled Radiance Layer
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
VAA	View Azimuth Angle
VNIR	Visible and Near Infrared
VZA	View Zenith Angle
WGS84	World Geodetic System 1984
WRS	Worldwide Reference System
WRS-2	Worldwide Reference System 2
XML	Extensible Markup Language

YSF	Yaw Steering Frame

References

Please see https://www.usgs.gov/land-resources/nli/landsat/glossary-and-acronyms for a complete list of acronyms.

USGS/EROS. LSDS-293. Landsat Data Management Policy.

USGS/EROS. LSDS-547. Landsat Ground Station (GS) Identifiers.

USGS/EROS. LSDS-1329. Landsat Atmospheric Auxiliary Data Data Format Control Book (DFCB).

USGS/EROS. LSDS-1388. Landsat Cloud Optimized GeoTIFF (COG) Data Format Control Book (DFCB).

USGS/EROS. LSDS-1747. Landsat 8-9 Calibration and Validation (Cal/Val) Algorithm Description Document (ADD).

USGS/EROS. LSDS-1822. Landsat 8-9 Operational Land Imager (OLI) – Thermal Infrared Sensor (TIRS) Collection 2 Level 1 (L1) Data Format Control Book (DFCB).

EPSG Geodetic Parameter Registry
http://www.epsg-registry.org

GeoTIFF Specification
http://web.archive.org/web/20160403164508/http:/www.remotesensing.org/geotiff/spec/geotiffhome.html

Landsat 8 Surface Reflectance Code LaSRC Product