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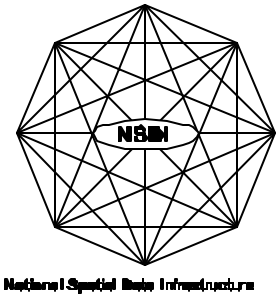

Content Standard for Digital Geospatial Metadata: Extensions for Remote Sensing Metadata

Standards Working Group
Federal Geographic Data Committee

Federal Geographic Data Committee
Department of Agriculture • Department of Commerce • Department of Defense • Department of Energy
Department of Housing and Urban Development • Department of the Interior • Department of State
Department of Transportation • Environmental Protection Agency
Federal Emergency Management Agency • Library of Congress
National Aeronautics and Space Administration • National Archives and Records Administration
Tennessee Valley Authority

Federal Geographic Data Committee

Established by Office of Management and Budget Circular A-16, the Federal Geographic Data Committee (FGDC) promotes the coordinated development, use, sharing, and dissemination of geographic data.

The FGDC is composed of representatives from the Departments of Agriculture, Commerce, Defense, Energy, Housing and Urban Development, the Interior, State, and Transportation; the Environmental Protection Agency; the Federal Emergency Management Agency; the Library of Congress; the National Aeronautics and Space Administration; the National Archives and Records Administration; and the Tennessee Valley Authority. Additional Federal agencies participate on FGDC subcommittees and working groups. The Department of the Interior chairs the committee.

FGDC subcommittees work on issues related to data categories coordinated under the circular. Subcommittees establish and implement standards for data content, quality, and transfer; encourage the exchange of information and the transfer of data; and organize the collection of geographic data to reduce duplication of effort. Working groups are established for issues that transcend data categories.

For more information about the committee, or to be added to the committee's newsletter mailing list, please contact:

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Introductory Material

1. Objective

The purpose of these *Extensions for Remote Sensing Metadata* (hereafter *Remote Sensing Extensions*) is to provide a common terminology and set of definitions for documenting geospatial data obtained by remote sensing, within the framework of the *FGDC (1998) Content Standard for Digital Geospatial Metadata* (hereafter *FGDC Metadata Content Standard* or simply base standard). Creating these *Remote Sensing Extensions* will provide a means to use standard FGDC content to describe geospatial data derived from remote sensing measurements.

2. Scope

This standard is intended to support the collection and processing of geospatial metadata for data derived from remote sensing. It is intended to be usable by all levels of government and the private sector. The standard is not intended to reflect an implementation design. An implementation design requires adapting the structure and form of the standard to meet application requirements.

The *FGDC Metadata Content Standard* was developed to define the information about a geospatial dataset required by prospective users: its availability, its fitness for an intended use, and the means of accessing and successfully transferring it. These *Remote Sensing Extensions* are to provide additional information particularly relevant to remote sensing: the geometry of the measurement process, the properties of the measuring instrument, the processing of raw readings into geospatial information, and the distinction between metadata applicable to an entire collection of data and those applicable only to component parts. For that purpose, these *Remote Sensing Extensions* establish the names, definitions, and permissible values for new data elements and the compound elements of which they are the components. These new elements are placed within the structure of the base standard, allowing the combination of the original standard and the new extensions to be treated as a single entity. These *Remote Sensing Extensions* do not specify either the means by which this information is organized in a computer system for data transfer or the means by which this information is transmitted, communicated, or presented to the user.

3. Applicability

This standard is for the documentation of geospatial data. Executive Order 12906, "Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure," was signed on April 11, 1994, by President William J. Clinton. Section 3, Development of a National Geospatial Data Clearinghouse, paragraph (b) states: "Standardized Documentation of Data. Beginning nine months from the date of this order, each agency shall document all new geospatial data it collects or produces, either directly or indirectly, using the standard under development by the FGDC, and make that standardized documentation electronically accessible to the Clearinghouse network. Within one year of the date of this order, agencies shall adopt a schedule, developed in consultation with the FGDC, for documenting, to the extent practicable, geospatial data previously collected or produced, either directly or indirectly, and making that data documentation electronically accessible to the Clearinghouse network." These *Remote Sensing Extensions* are a data documentation standard as described in the executive order, extending the applicability to geospatial data derived from remote sensing.

The FGDC also invites and encourages organizations and individuals from State, local, and tribal governments, the private sector, and non-profit organizations to use these *Remote Sensing Extensions* in documenting their geospatial data. Lack of information for prospective users on what data exist, the fitness of such data for planned applications, and the conditions for accessing or transferring data

to a user's system have been a major difficulty in the geospatial data community. These *Remote Sensing Extensions*, developed with broad public participation, will expand the information already provided by the base standard in a way particularly useful to recipients of remote sensing data and thus contribute to developing the National Spatial Data Infrastructure.

4. Related Standards

The *FGDC Metadata Content Standard* was developed to identify and define the metadata elements used to document digital geospatial datasets. These *Remote Sensing Extensions* follow the rules for extended elements specified in Appendix D of the *FGDC Metadata Content Standard*. The combination of the base standard and these *Remote Sensing Extensions* serves all the purposes of the base standard but expands it to support data from remote sensing.

Project Team 19115 of ISO/Technical Committee (TC) 211 has developed a Draft International Standard, Geographic information – Metadata (ISO, 2001). All areas where the content of this standard overlaps 19115 have been checked for consistency, and many names and definitions have been harmonized. Some of the elements originally defined for these *Extensions* were incorporated into the ISO metadata standard, ISO 19115, during earlier stages in its development. In addition, there are plans in ISO to produce a technical amendment to ISO 19115 that will incorporate metadata for remote sensing, and this document has been submitted one of the base documents on which that technical amendment will be constructed. ISO 19115 also has a recommended extension methodology, in its Appendix E. These *Remote Sensing Extensions* have been constructed to be compatible with that methodology, insofar as it is consistent with that of the FGDC standard. This standard is intended to apply for FGDC as long as FGDC is maintaining its own standard in the area of metadata; when, as is anticipated, an adaptation of ISO 19115 becomes the FGDC standard in line with the emphasis on voluntary standards, the availability of this standard as input to the ISO standard will mean that its content will to a great extent be supported by that standard.

The *Proposed EOSDIS Core System (ECS) Core Metadata Standard* (Hughes Applied Information Systems, 1994) defined metadata in several areas: algorithm and processing packages, data sources, references, data collections, spatial and temporal extent, and content. Much of the metadata specified in that standard had corresponding content in FGDC's standard. However, there are a number of areas in which the ECS standard described metadata not contained in the FGDC standard, in particular, algorithm and processing metadata, instrument metadata, and collection and granule metadata. In such areas, the ECS standard was used as a guide in the development of these *Remote Sensing Extensions*. The current ECS Data model is described by Raytheon Information Technology Systems (2000).

The *FGDC* (1999) *Content Standard for Remote Sensing Swath Data* specifies association of data with its date, time, and geolocation. While geolocation information that varies from measurement to measurement is included as part of the data, much of the descriptive information does not change, such as the parameters of a satellite orbit or the orientation of the instruments and optical systems on the platform. Such information is more appropriately stored as metadata than as data, and the metadata necessary to derive the geolocation information essential to the swath standard are included in these *Remote Sensing Extensions*.

5. Standards Development Process

This standard was developed by the Imagery Subgroup of the FGDC Standards Working Group (SWG), with the participation of members of the FGDC Metadata Ad Hoc Working Group, and with support from government, industry, and the academic community. Organizations represented include the National Aeronautics and Space Administration (NASA), the United States Geological Survey,

the National Imagery and Mapping Agency (NIMA), the International Society for Photogrammetry and Remote Sensing (ISPRS), the University of California at Santa Barbara, Raytheon ITSS, SGT, Inc., Global Science and Technology, Inc (GST), Computer Sciences Corporation, and Lockheed Martin. NASA and NASA-supporting members of the imagery subgroup wrote an initial skeleton draft, drawing heavily on the *Proposed ECS Core Metadata Standard* and on discussion of requirements for deriving geographical positions in the *Moderate-Resolution Imaging Radiometer (MODIS) Level 1A Earth Location: Algorithm Theoretical Basis Document* (MODIS Science Data Support Team, 1997). This skeleton draft was then distributed to a review team for comment, revision, and amplification, and members of the team met to discuss the review and suggest further revisions. This distribution was followed by a series of revisions, reviews, and meetings to discuss the reviews and revisions. Experts on instrument metadata were consulted. Scanning instrument metadata were added and expanded based on a description of the Sensor Modeling Language being developed at the University of Alabama at Huntsville. Frame camera metadata were contributed by photogrammetric experts from ISPRS and leading companies, including ZI/Imaging, LH Systems, and Carl Zeiss Jena. The revised draft was reviewed by the Imagery Subgroup and approved for submittal to the FGDC/SWG for public review in October 2000. Comments were collected over a 90-day review period and received from 13 individuals affiliated with seven different organizations. These comments were evaluated by an editing committee including members from NASA, George Mason University and GST, both supporting NASA, the National Oceanic and Atmospheric Administration (NOAA), the United States Geological Survey (USGS), NIMA, and the Fish and Wildlife Service, which met in January 2002.

6. Maintenance Authority

The NASA Earth Science Data and Information System (ESDIS) Program maintains this standard for the Federal Geographic Data Committee. Address questions concerning this standard to

NASA Goddard Space Flight Center
Code 423
Greenbelt, MD 20771.

Organization of This Document

These *Remote Sensing Extensions* are organized under the hierarchy of compound elements and data elements of the *FGDC Content Standard for Digital Geospatial Metadata*. Where appropriate, extended elements have been organized under existing compound elements in the base standard. The elements in these extensions are to be used as an addition to those of the standard; the extensions are not a complete definition of all metadata content in themselves. There are two completely new sections under Metadata. There is also a new section, Location Information, which is never used alone but is called by other sections of the metadata standard, like Citation Information in the base standard. The *Remote Sensing Extensions* begin with the production rules for Metadata expanded to include the two new sections. Following are the production rules and the Extension_Information definitions for the new elements for each component of Metadata in turn. The production rules list all elements of the base standard that have a new element as a component at any subordinate level, to clarify the relation of the new elements to the existing elements. If an element of the existing standard is listed, all components immediately under it are provided in the production rules expansion, but only those lower level components that have extended elements under them are expanded further. For example, the Metadata element and all immediately subordinate elements are listed. However, production rules are not provided for Distribution_Information and its subordinate elements because none has been extended. New elements are in **boldface.** Existing elements that have been extended either through the addition of subordinate elements or by extension of the domain are in ***boldface italic*** when listed as components of other elements but in ordinary type when being expanded into components. For example, Lineage is in bold italic when given as a component of Data_Quality_Information, to show that there is some extension under it. When Lineage is expanded into Source_Information and Process_Step, it is in ordinary type, but Process_Step is in bold italic to show that it is an element of the original standard that has been expanded.

Following the production rules for each Metadata section, the Extension_Information definitions for the new extended elements are provided. The two new sections under Metadata and the utility Location Information statement follow the expanded sections from the base standard: first the full production rules, and then the Extension_Information definitions for each. The new sections and elements have not been numbered, in contrast with the procedure followed in the base standard but consistent with the procedure in the FGDC (1999) Biological Data Profile.

In some cases, elements that are optional or mandatory-if-applicable may have component elements that are mandatory or mandatory-if-applicable. Such component elements become mandatory or mandatory-if-applicable only if the parent element is used. The listing of such an element as mandatory under its parent does not mean that it is unconditionally mandatory for the dataset as a whole. For example, Mission_History, which is optional, has a mandatory element Mission_Start_Date. If there is no Mission_History metadata, the Mission_Start_Date element is not required. Similarly, Grid_First_Element and its components, Grid_First_Element_Map_X_Coordinate and Grid_First_Element_Map_Y_Coordinate, are mandatory. Grid_First_Element is, however, a component of Georectified_Raster, one of two alternatives under Georeferencing_System/ Horizontal_Coordinate_System_Definition. If the other alternative is used, Grid_First_Element and its components are not required.

Appendix D contains an index of definitions of extended elements.

The Citation_Information in the *FGDC Metadata Standard* is defined as the recommended reference to be used for the dataset. In these extensions, the term *dataset* in that context is interpreted to mean not only the particular dataset that the metadata describe, but also technical papers, data dictionaries,

users guides, and other documents that provide information about the data. It also is used to describe metadata that are not usually considered citations but effectively contain the same information. For example, in the description of an algorithm, the Originator corresponds to the developer of the algorithm, Publication_Date is the date it was frozen in final form, Title is the name of the algorithm, Edition is the version number; and Online_Linkage could be the on-line location of the implementing software.

Data Aggregation Terminology

The *FGDC Metadata Content Standard* provides "a hierarchy of data elements and compound elements that define the information content for metadata to document a set of digital geospatial data," as defined in its section *Organization of the Standard*. Many elements in the document refer to such a dataset. However, the term *dataset* is not defined. Data may be organized in a hierarchical structure, with a body of data being aggregated from smaller bodies. Different sets of terminology are in use to describe the different levels of aggregation. For example, a *granule* is defined as the smallest data unit in an archive that a user can order without requiring special processing to generate it. An aggregation of multiple data granules from a single source is called a *single type collection*. In a single type collection, metadata fields will be the same and at least one metadata field will have the same value for all granules. For example, the NOAA/NASA Pathfinder program compiles monthly average land and sea surface temperatures. The collection of all monthly average land surface temperatures is a single type collection. Another single type collection would be all the January average surface temperatures. An aggregation from many different sources is called a *multitype* collection. These sources may have different schemas, and the data from the different sources may thus be described using different metadata fields. For example, a dataset designed for studies of the effects of El Niño and La Niña events on vegetation could contain TOPEX/Poseidon total monthly average sea surface heights and values for the Pathfinder Normalized Difference Vegetation Index. These terms are defined in the Raytheon Information Technology Systems (2000) description of the implementation Earth science data model for the ECS project. Figure 1 shows possible relations between different levels and kinds of data aggregations and their components.

Other terms may be used to describe levels of aggregation. An alternative set of definitions uses *dataset* for the basic unit, *dataset series* for an aggregation from a single source, and *dataset initiative* or simply *initiative* for an aggregation of many sources. Figure 2 shows possible aggregation relations using this terminology. The different levels of aggregation are also defined by calling the basic unit a *product*, an aggregation of multiple products that have many or all attributes in common, including a common range of some kind in time and space, an *archive collection*, and an aggregation with a common semantic theme that is not necessarily homogeneous and may have few or no attributes in common a *theme collection* (Committee on Earth Observation Satellites 1999). .

In a collection, the metadata descriptions will have varied scope. Some will have values that apply to the collection as a whole and are inherited by the individual granules; others will have different values from one granule to the next. In these extensions, the term *dataset* is interpreted to refer to an aggregation of data at any level, as appropriate to the context. Metadata definitions have been added describing the component parts of an aggregation or describing the larger aggregation of which a data unit or aggregation is a member, to allow the user to determine the level of aggregation to which a metadata element applies.

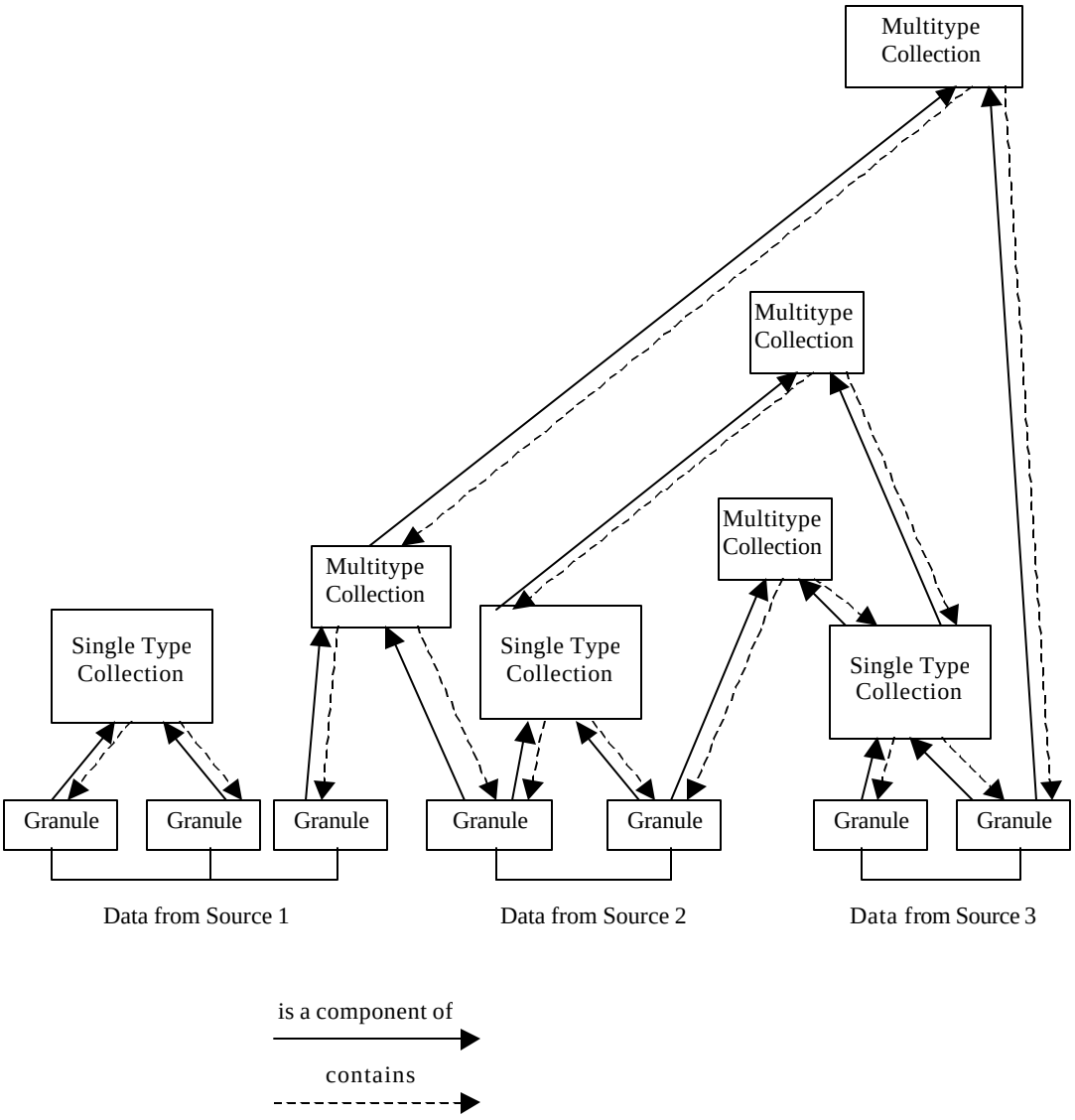

Figure 1. Data Aggregation — Granules and Collections

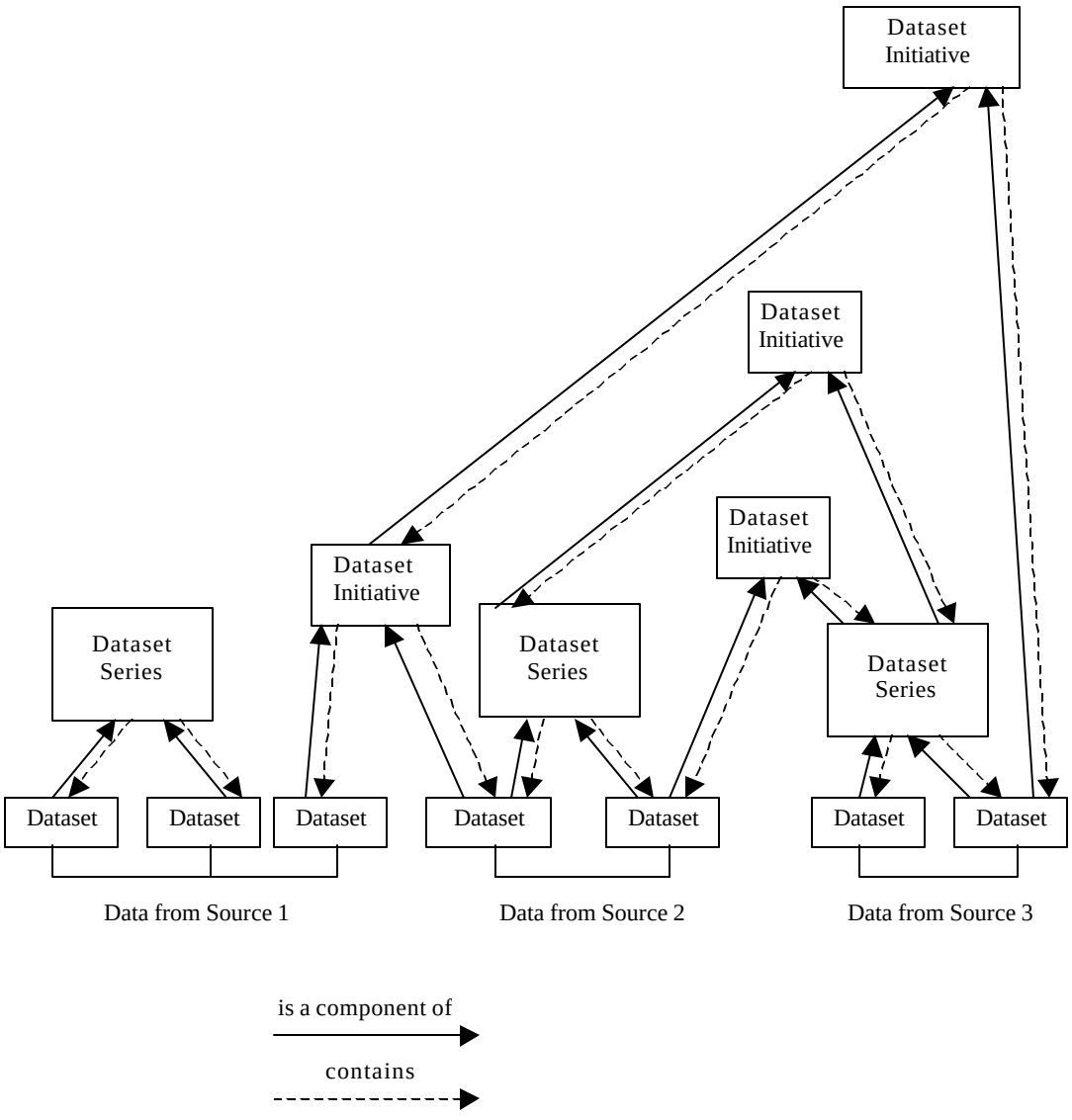

Figure 2. Data Aggregation — Datasets, Series, and Initiatives

Metadata

0 Metadata -- data about the content, quality, condition, and other characteristics of data.
Type: compound
Short Name: metadata

Metadata =

Identification_Information +
0{***Data_Quality_Information***}1 +
0{***Spatial_Data_Organization_Information***}1 +
0{***Spatial_Reference_Information***}1 +
0{***Entity_and_Attribute_Information***}1 +
0{Distribution_Information}n +
Metadata_Reference_Information +
0{Platform_and_Mission_Information}1
0{Instrument_Information}n

Identification Information

1 Identification Information -- basic information about the dataset.
Type: compound
Short Name: idinfo

Identification_Information =
Dataset_Identifier +
Citation +
Description +
Time_Period_of_Content +
Status +
Spatial_Domain +
0{Processing_Level}n +
Keywords +
0{Platform_and_Instrument_Identification}n +
[Band_Identification|
Thematic_Layer_Identification] +
Access_Constraints +
Use_Constraints +
(Point_of_Contact) +
(1{Browse_Graphic}n) +
(Data_Set_Credit) +
(Security_Information) +
(Native_Data_Set_Environment) +
(1{Cross_Reference}n) +
0{Aggregation Information}n

Description =
Abstract +
Purpose +
(1{Documentation}n) +
(Supplemental_Information)

Documentation =
(1{Data_Dictionary_Reference}n) +
(1{User's_Guide}n) +
(1{Science_Paper}n)

Data_Dictionary_Reference =
Citation_Information *(see section 8 of base standard for production rules)*

User's_Guide =
Citation_Information *(see section 8 of base standard for production rules)*

Science_Paper =
Citation_Information *(see section 8 of base standard for production rules)*

Spatial_Domain =
Bounding_Coordinates +
(1{Data_Set_G-Polygon}n) +
(1{Frame_Area}n) +
(1{Multiple_Image_Alignment}n) +
(Worldwide_Reference_System)

Frame_Area =
Frame_Area_Value +
Frame_Area_Units

Multiple_Image_Alignment =
ID_Overlapping_Dataset +
Type_of_Overlap +
Percentage_of_Overlap

ID_Overlapping_Dataset =
Dataset_Identifier

Wordwide_Reference_System =
Path +
Row

Processing_Level =
Processing_Level_Identifier +
Processing_Level_Authority

Processing_Level_Authority =
Citation_Information *(see section 8 of base standard for production rules)*

Platform_and_Instrument_Identification =
(Mission_Name) +
Platform_Full_Name +
(Platform_Short_Name) +
(Platform_Serial_Identifier) +
Instrument_Full_Name +
0{Instrument_Short_Name}1

Band_Identification =
Number_of_Bands +
0{Individual_Band_Identification}n

Individual_Band_Identification =
Band_ID +
Band_Measurement_Mode_ID

Thematic_Layer_Identification =
Number_of_Thematic_Layers +
1{Layer_Name}n

Layer_Name =
Theme *(see section 1 of base standard for production rules)*

Aggregation_Information =
(1{Container_Packet_ID}n) +
0{Component_Information}1

Container_Packet_ID =
Dataset_Identifier

Component_Information =
1{Aggregation_Member_ID}n +
1{Aggregation_Criteria}n

Aggregation_Member_ID =
Dataset_Identifier

Extension_Information
Name: Dataset_Identifier
Short Name: datsetid
Type: text
Domain: free text
Parent: Identification_Information
Optionality: Mandatory
Repeatability: =1
Definition: Unique string to identify a dataset.
Rationale: Provides a unique identifier for a dataset whenever it is referenced.
Source: ISO (2001) TC 211 Draft International Standard - Geographic Information – Metadata; Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – ID of data object

Extension_Information
Name: Documentation
Short Name: documnts
Type: compound
Child: Data_Dictionary_Reference
Child: User's_Guide
Child: Science_Paper

Parent: Description
Optionality: Optional
Repeatability: >=1
Definition: Information about or relevant to the dataset.
Rationale: Not all useful information about the dataset accompanies the data.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information
Name: Data_Dictionary_Reference
Short Name: datdicrf
Type: compound
Child: Citation_Information
Parent: Documentation
Optionality: Optional
Repeatability: >=1
Definition: Reference to a list of terms and their definitions, used in describing the dataset.
Rationale: Users may need to know where to find definitions of dataset terminology.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information
Name: User's_Guide
Short Name: userguid
Type: compound
Child: Citation_Information
Parent: Documentation
Optionality: Optional
Repeatability: >=1
Definition: Reference information for User's Guides.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS Guide Document elements

Extension_Information
Name: Science_Paper
Short Name: scipap
Type: compound
Child: Citation_Information
Parent: Documentation
Optionality: Optional
Repeatability: >=1
Definition: Reference information for scientific papers relevant to the dataset.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information
Name: Frame_Area

Short Name: frarea
Type: compound
Child: Frame_Area_Value
Child: Frame_Area_Units
Parent: Spatial_Domain
Optionality: Optional
Repeatability: >=1
Definition: Geographical area covered by individual frame.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Frame_Area_Value
Short Name: frareavl
Type: real
Domain: Frame_Area_Value > 0.0
Parent: Frame_Area
Optionality: Mandatory
Repeatability: =1
Definition: Area covered by frame, in units given by Frame_Area_Units.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Frame_Area_Units
Short Name: frareaun
Type: text
Domain: "square meters" "square miles" free text
Parent: Frame_Area
Optionality: Mandatory
Repeatability: =1
Definition: Units in which value given by Frame_Area_Value is expressed.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Multiple_Image_Alignment
Short Name: multimal
Type: compound
Child: ID_Overlapping_Dataset
Child: Type_of_Overlap
Child: Percentage_of_Overlap
Parent: Spatial_Domain
Optionality: Optional
Repeatability: >=1
Definition: Positioning of other frame imaging some areas in common.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: ID_Overlapping_Dataset
Short Name: ovlpdtid

Type: compound
Child: Dataset_Identifier
Parent: Multiple_Image_Alignment
Optionality: Mandatory
Repeatability: =1
Definition: Identifier for external frame imaging some areas in common.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Type_of_Overlap
Short Name: ovlptype
Type: text
Domain: "overlap" "sidelap" free text
Parent: Multiple_Image_Alignment
Optionality: Mandatory
Repeatability: =1
Definition: Information as to whether external frame is along same (overlap) or parallel (sidelap) flight line.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Percentage_of_Overlap
Short Name: ovlppct
Type: real
Domain: 0.0 <= Percentage_of_Overlap <= 100.0
Parent: Multiple_Image_Alignment
Optionality: Mandatory
Repeatability: =1
Definition: Area common to two successive photos along the same flight strip, expressed as a percentage of photo area.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Worldwide_Reference_System
Short Name: wwrefsys
Type: compound
Child: Path
Child: Row
Parent: Spatial_Domain
Optionality: Optional
Repeatability: =1
Definition: Global notation system for Landsat data.
Source: USGS Earth Resources Observation System (EROS) Data Center

Extension_Information
Name: Path
Short Name: wwrefpat
Type: Integer

Domain: 0 < Path <= 251
Parent: Worldwide_Reference_System
Optionality: Mandatory
Repeatability: =1
Definition: Sequential number, increasing east to west, assigned to satellite orbital track.
Source: USGS EROS Data Center

Extension_Information
Name: Row
Short Name: wwrefrow
Type: Integer
Domain: 0 < Row <= 248
Parent: Worldwide_Reference_System
Optionality: Mandatory
Repeatability: =1
Definition: Sequential number assigned to frame latitudinal center line along a path.
Source: USGS EROS Data Center

Extension_Information
Name: Processing_Level
Short Name: proclevl
Type: compound
Child: Processing_Level_Identifier
Child: Processing_Level_Authority
Parent: Identification_Information
Optionality: Mandatory-if-applicable
Repeatability: >=1
Definition: Degree of data processing applied to the measurements, as exemplified in Appendixes A–C.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS Processing Level ID (ECS F&PRS, CODMAC and ESADS definitions; EOS Data Panel Report); Kresse (2000)

Extension_Information
Name: Processing_Level_Identifier
Short Name: prolevid
Type: text
Domain: free text
Parent: Processing_Level
Optionality: Mandatory
Repeatability: =1
Definition: Data distributor's code that identifies the level of data processing applied to the measurements, as defined in Processing_Level_Authority. Appendixes A-C show examples.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS Processing Level ID (ECS F&PRS, CODMAC and ESADS definitions; EOS Data Panel Report); Kresse (2000)

Extension_Information
Name: Processing_Level_Authority
Short Name: prolevau
Type: compound
Child: Citation_Information
Parent: Processing_Level
Optionality: Mandatory
Repeatability: =1
Definition: Reference for the definition of the product level designations used.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard –DSS Processing Level ID (ECS F&PRS, CODMAC and ESADS definitions; EOS Data Panel Report), Kresse (2000)

Extension_Information
Name: Platform_and_Instrument_Identification
Short Name: plainsid
Type: compound
Child: Mission_Name
Child: Platform_Full_Name
Child: Platform_Short_Name
Child: Platform_Serial_Identifier
Child: Instrument_Full_Name
Child: Instrument_Short_Name
Parent: Identification_Information
Optionality: Mandatory-if-applicable
Repeatability: >=1
Definition: Designations for the measuring instruments and their bands, the platform carrying them, and the mission to which the data contribute.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Mission_Name
Short Name: missname
Type: text
Domain: free text
Parent: Platform_and_Instrument_Identification
Optionality: Optional
Repeatability: =1
Definition: The character string by which the mission is known.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Platform_Full_Name
Short Name: platflnm
Type: text
Domain: free text

Parent: Platform_and_Instrument_Identification
Optionality: Mandatory
Repeatability: =1
Definition: The complete name of the platform.
Rationale: The complete name is needed for clear identification of the platform.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS Satellite Long Name

Extension_Information
Name: Platform_Short_Name
Short Name: platfsnm
Type: text
Domain: free text
Parent: Platform_and_Instrument_Identification
Optionality: Optional
Repeatability: =1
Definition: An acronym or shorter form of the platform name, used to identify the platform.
Rationale: The platform is often better known by its short name than by its full name.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS Satellite Short Name

Extension_Information
Name: Platform_Serial_Identifier
Short Name: platfser
Type: text
Domain: free text
Parent: Platform_and_Instrument_Identification
Optionality: Optional
Repeatability: =1
Definition: The serial letters and/or numbers applied to the platform.
Rationale: The platform identifier specifies the member of the series from which the data come.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard –DSS Satellite Number

Extension_Information
Name: Instrument_Full_Name
Short Name: instflnm
Type: text
Domain: free text
Parent: Platform_and_Instrument_Identification
Optionality: Mandatory
Repeatability: =1
Definition: The complete name of the instrument.
Rationale: The complete name is needed for clear identification of the instrument.
Source: Raytheon Information Technology Systems (2000) Implementation Earth Science Model for the ECS Project

Extension_Information
Name: Instrument_Short_Name
Short Name: instshnm
Type: text
Domain: free text
Parent: Platform_and_Instrument_Identification
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: The short name, acronym, or other identifier by which the instrument is known.
Rationale: The instrument is often better known by its short name than by its full name.
Source: Raytheon Information Technology Systems (2000) Implementation Earth Science Model for the ECS Project

Extension_Information
Name: Band_Identification
Short Name: bandidnt
Type: compound
Child: Number_of_Bands
Child: Individual_Band_Identification
Parent: Identification_Information
Optionality: Conditional - present and mandatory if and only if Thematic_Layer_Identification is absent
Repeatability: =1
Definition: Complete information to identify instrument wavelengths or other channels.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Number_of_Bands
Short Name: numbands
Type: integer
Domain: Number_of_Bands > 0
Parent: Band_Identification
Optionality: Mandatory
Repeatability: =1
Definition: The number of instrument bands.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Individual_Band_Identification
Short Name: inbident
Type: compound
Child: Band_ID
Child: Band_Measurement_Mode_ID
Parent: Band_Identification
Optionality: Mandatory-if-applicable

Repeatability: =Number_of_Bands
Definition: Complete information to identify a single instrument band.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Band_ID
Short Name: bandid
Type: text
Domain: free text
Parent: Individual_Band_Identification
Optionality: Mandatory
Repeatability: =1
Definition: Designation for individual measurement band.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Band_Measurement_Mode_ID
Short Name: bmmodid
Type: text
Domain: free text
Parent: Individual_Band_Identification
Optionality: Mandatory
Repeatability: =1
Definition: Identifier designating channel, wavelength, and/or field of view of measurement.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Thematic_Layer_Identification
Short Name: thelayid
Type: compound
Child: Number_of_Thematic_Layers
Child: Layer Name
Parent: Identification_Information
Optionality: Conditional - present and mandatory if and only if Band_Identification is absent
Repeatability: =1
Definition: Listing of the kinds of geospatial information represented by the dataset.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Number_of_Thematic_Layers
Short Name: numthlay
Type: integer

Domain: Number_of_Thematic_Layers > 0
Parent: Thematic_Layer_Identification
Optionality: Mandatory
Repeatability: =1
Definition: Number of kinds of geospatial information represented by the dataset.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Layer_Name
Short Name: layrname
Type: compound
Child: Theme
Parent: Thematic_Layer_Identification
Optionality: Mandatory
Repeatability: =Number_of_Thematic_Layers
Definition: Description of one kind of geospatial information represented by the dataset.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Aggregation_Information
Short Name: agginfo
Type: compound
Child: Container_Packet_ID
Child: Component_Information
Parent: Identification_Information
Optionality: Optional
Repeatability: >=1
Definition: Information relating a dataset to collections of which it is a component or relating a collection dataset to its components, as described in the section on Data Aggregation Technology.
Rationale: As noted in the introductory material, a dataset may be one component of a larger aggregation or may itself be an aggregation of smaller components. This information places the dataset in relation to its container or components.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS ECS Data Collection Class

Extension_Information
Name: Container_Packet_ID
Short Name: conpckid
Type: compound
Child: Dataset_Identifier
Parent: Aggregation_Information
Optionality: Optional
Repeatability: >=1
Definition: Identifier of an aggregation of which the dataset is a member.

Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – Aggregation Relationship

Extension_Information
Name: Component_Information
Short Name: compinfo
Type: compound
Child: Aggregation_Member_ID
Child: Aggregation_Criteria
Parent: Aggregation_Information
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Information about components aggregated into the dataset.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information
Name: Aggregation_Member_ID
Short Name: aggmemid
Type: compound
Child: Dataset_Identifier
Parent: Component_Information
Optionality: Mandatory
Repeatability: >=1
Definition: Identifier of component of a dataset.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information
Name: Aggregation_Criteria
Short Name: aggcrit
Type: text
Domain: free text
Parent: Component_Information
Optionality: Mandatory
Repeatability: >=1
Definition: Criteria by which components of a dataset are chosen for inclusion.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – Aggregation Attribute

Data Quality Information

2 Data Quality Information -- a general assessment of the quality of the dataset. (Recommendations on information to be reported and tests to be performed are found in "Spatial Data Quality," which is chapter 3 of part 1 in Department of Commerce, 1992, Spatial Data Transfer Standard (SDTS) (Federal Information Processing Standard 173): Washington, Department of Commerce, National Institute of Standards and Technology.)

Type: compound
Short Name: dataqual

Data_Quality_Information =
0{Attribute_Accuracy}1 +
Logical_Consistency_Report +
Completeness_Report +
0{Positional_Accuracy}1 +
Lineage +
(Image_Quality) +
(Acquisition_Information) +
(Cloud_Cover)

Lineage **=**
0{Source_Information}n +
1{***Process_Step***}n

Process_Step =
Process_Description +
0{Source_Used_Citation_Abbreviation}n +
Process_Date +
(Process_Time) +
0{Source_Produced_Citation_Abbreviation}n +
(Process_Contact) +
(Algorithm_Information) +
(Processing_Information)

Algorithm_Information =
Algorithm_Identifiers +
Algorithm_Description +
1{Algorithm_Change_History}n+
(1{Algorithm_Peer_Review_Information}n)

Algorithm_Identifiers =
Citation_Information *(see section 8 of base standard for production rules)*

Algorithm_Description =
[Algorithm_Text_Description|
Algorithm_Reference]

Algorithm_Reference =
Citation_Information *(see section 8 of base standard for production rules)*

Algorithm_Change_History =
[Algorithm_Change_Description|
Algorithm_Change_Reference]

Algorithm_Change_Description =
1{Process_Step}n *(see section 2 of base standard for production rules)*

Algorithm_Change_Reference =
Citation_Information *(see section 8 of base standard for production rules)*

Algorithm_Peer_Review_Information =
[Algorithm_Peer_Review_Description|
Algorithm_Peer_Review_Reference]

Algorithm_Peer_Review_Description =
[1{Process_Step}n *(see section 2 of base standard for production rules)*

Algorithm_Peer_Review_Reference =
Citation_Information *(see section 8 of base standard for production rules)*

Processing_Information =
Processing_Identifiers +
1{Processing_Input_Dataset}n +
(1{Ancillary_Dataset}n) +
Processing_Software +
Processing_Procedure +
0{Processing_Change_History}1 +
(1{Processing_Documentation}n)

Processing_Identifiers =
Citation_Information *(see section 8 of base standard for production rules)*

Processing_Input_Dataset =
Input_Dataset_Identifier +
[Input_Description|
Input_Reference] +
0{Input_Level}1

Input_Dataset_Identifier =
Dataset_Identifier *(see section 1 for production rules)*

Input_Reference =
Citation_Information *(see section 8 of base standard for production rules)*

Input_Level =
Processing_Level *(see section 1 for production rules)*

Ancillary_Dataset =
0{Ancillary_Dataset_Identifier}1 +
[Ancillary_Description|
Ancillary_Reference]

Ancillary_Dataset_Identifier =
Dataset_Identifier *(see section 1 for production rules)*

Ancillary_Description =
Ancillary_Dataset_Description +
0{Command_Line_Processing_Parameter}n

Ancillary_Reference =
Citation_Information *(see section 8 of base standard for production rules)*

Processing_Software =
[Processing_Software_Description|
Processing_Software_Reference]

Processing_Software_Reference =
Citation_Information *(see section 8 of base standard for production rules)*

Processing_Procedure =
Processing_Run_History +
Processing_Environment +
(Processing_Procedure_Description)

Processing_Run_History =
1{Process_Step}n *(see section 2 of base standard for production rules)*

Processing_Environment =
Native_Data_Set_Environment *(see section 1 of base standard for production rules)*

Processing_Change_History =
1{Process_Step}n *(see section 2 of base standard for production rules)*

Processing_Documentation =
Citation_Information *(see section 8 of base standard for production rules*

Acquisition_Information =
Satellite/Local_Zenith_Angle +
Satellite/Local_Azimuth_Angle +
Solar_Zenith_Angle +
Solar_Azimuth_Angle +
0{Relative_Azimuth}1 +
Clock_Time/Drift +
Ascending/Descending_Indicator +
(Nadir)

Nadir =
Nadir_Latitude +
Nadir_Longitude

Domain Extension
Element: Process_Date
Domain: "Unknown" "Not Complete" free date
Extended Domain: "Unknown" "Not Complete" "Not Applicable" free date
Rationale: Additional text choice "Not Applicable" provides a value for this element that is appropriate when value of Process_Description called by Algorithm_Change_Description is "none".

Extension_Information
Name: Algorithm_Information
Short Name: algoinfo
Type: compound
Child: Algorithm_Identifiers
Child: Algorithm_Description
Child: Algorithm_Change_History
Child: Algorithm_Peer_Review_Information
Parent: Process_Step
Optionality: Optional
Repeatability: =1
Definition: Details of the methodology by which geographic information was derived from the instrument readings.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information
Name: Algorithm_Identifiers
Short Name: algoid
Type: compound
Child: Citation_Information
Parent: Algorithm_Information
Optionality: Mandatory
Repeatability: =1
Definition: Information identifying the algorithm and version or date.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information
Name: Algorithm_Description
Short Name: algodesc
Type: compound
Child: Algorithm_Text_Description
Child: Algorithm_Reference
Parent: Algorithm_Information
Optionality: Mandatory
Repeatability: =1
Definition: Kinds of material providing a description of the algorithm used to generate the data.
Rationale: To assist users in understanding what features in their data may arise as a result of the properties of the processing algorithm.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information
Name: Algorithm_Text_Description
Short Name: algotexd
Type: text
Domain: free text
Parent: Algorithm_Description
Optionality: Conditional - present and mandatory if and only if Algorithm_Reference is absent
Repeatability: =1
Definition: Text description of algorithm used to generate the data.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information
Name: Algorithm_Reference
Short Name: algoref
Type: compound
Child: Citation_Information
Parent: Algorithm_Description

Optionality: Conditional - present and mandatory if and only if Algorithm_Text_Description is absent
Repeatability: =1
Definition: Reference to document containing description of algorithm.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS Guide Document Information

Extension_Information
Name: Algorithm_Change_History
Short Name: algochhi
Type: compound
Child: Algorithm_Change_Description
Child: Algorithm_Change_Reference
Parent: Algorithm_Information
Optionality: Mandatory
Repeatability: >=1
Definition: Description of the modifications of the algorithm in its development from version to version.
Rationale: Allows users to understand where differences in their data from previous versions may arise as a result of changes in the algorithm.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Algorithm_Change_Description
Short Name: algochde
Type: compound
Child: Process_Step
Parent: Algorithm_Change_History
Optionality: Conditional - present and mandatory if and only if Algorithm_Change_Reference is absent
Repeatability: =1
Definition: Information included with dataset describing modifications of the algorithm in its development from version to version.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information
Name: Algorithm_Change_Reference
Short Name: algochrf
Type: compound
Child: Citation_Information
Parent: Algorithm_Change_History
Optionality: Conditional - present and mandatory if and only if Algorithm_Change_Description is absent
Repeatability: =1
Definition: Reference to document describing modifications of the algorithm in its development from version to version.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Algorithm_Peer_Review_Information
Short Name: algprevi
Type: compound
Child: Algorithm_Peer_Review_Description
Child: Algorithm_Peer_Review_Reference
Parent: Algorithm_Information
Optionality: Optional
Repeatability: >=1
Definition: Description, including dates, of peer review of the algorithm for purposes of ensuring its quality.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Algorithm_Peer_Review_Description
Short Name: algprevd
Type: compound
Child: Process_Step
Parent: Algorithm_Peer_Review_Information
Optionality: Conditional - present and mandatory if and only if Algorithm_Peer_Review_Reference is absent
Repeatability: =1
Definition: Description accompanying dataset, including dates, of peer review of the algorithm for purposes of ensuring its quality.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS Review content

Extension_Information
Name: Algorithm_Peer_Review_Reference
Short Name: algprevr
Type: compound
Child: Citation_Information
Parent: Algorithm_Peer_Review_Information
Optionality: Conditional - present and mandatory if and only if Algorithm_Peer_Review_Description is absent
Repeatability: =1
Definition: Reference to document describing peer review of the algorithm for purposes of ensuring its quality, including dates.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Processing_Information
Short Name: procinfo
Type: compound
Child: Processing_Identifiers
Child: Processing_Input_Dataset
Child: Ancillary Dataset
Child: Processing_Software

Child: Processing_Procedure
Child: Processing_Change_History
Child: Processing_Documentation
Parent: Process_Step
Optionality: Optional
Repeatability: =1
Definition: Comprehensive information about the procedure by which the algorithm was applied to derive geographic data from the raw instrument measurements, such as datasets, software used, and the processing environment.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information
Name: Processing_Identifiers
Short Name: procidfs
Type: compound
Child: Citation_Information
Parent: Processing_Information
Optionality: Mandatory
Repeatability: =1
Definition: Information to identify processing package that produced the data.
Rationale: Allows users to distinguish data from different eras of processing.
Source: Raytheon Information Technology Systems (2000) Implementation Earth Science Model for the ECS Project – PGE Identifier

Extension_Information
Name: Processing_Input_Dataset
Short Name: procinp
Type: compound
Child: Input_Dataset_Identifier
Child: Input_Description
Child: Input_Reference
Child: Input_Level
Parent: Processing_Information
Optionality: Mandatory
Repeatability: >=1
Definition: The data used as input to single or multistage processing used to derive product.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Input_Dataset_Identifier
Short Name: inpdatid
Type: compound
Child: Dataset_Identifier
Parent: Processing_Input_Dataset
Optionality: Mandatory

Repeatability: =1
Definition: Unique identifier for input dataset.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Input_Description
Short Name: prindesc
Type: text
Domain: free text
Parent: Processing_Input_Dataset
Optionality: Conditional - present and mandatory if and only if Input_Reference is absent
Repeatability: =1
Definition: Description of input datasets for processing.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Input_Reference
Short Name: prinref
Type: compound
Child: Citation_Information
Parent: Processing_Input_Dataset
Optionality: Conditional - present and mandatory if and only if Input_Description is absent
Repeatability: =1
Definition: Reference to document describing input to processing.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS Guide Dataset Information

Extension_Information
Name: Input Level
Short Name: prinlevl
Type: compound
Child: Processing_Level
Parent: Processing_Input_Dataset
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Data distributor's code that identifies the degree of radiometric and geometric processing applied to the data defined in Processing_Input_Dataset.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information
Name: Ancillary_Dataset
Short Name: ancdata
Type: compound

Child: Ancillary_Dataset_Identifier
Child: Ancillary_Description
Child: Ancillary_Reference
Parent: Processing_Information
Optionality: Mandatory
Repeatability: >=1
Definition: Data other than input required to process the input data.
Source: NASA, 1999b, GSFC Earth Sciences Distributed Active Archive Center Parameter Data Product Glossary

Extension_Information
Name: Ancillary_Dataset_Identifier
Short Name: ancdatid
Type: compound
Child: Dataset_Identifier
Parent: Ancillary_Dataset
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Unique identifier for ancillary dataset.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Ancillary_Description
Short Name: ancdesc
Type: compound
Child: Ancillary_Dataset_Description
Child: Command_Line_Processing_Parameter
Parent: Ancillary_Dataset
Optionality: Conditional - present and mandatory if and only if Ancillary_Reference is absent
Repeatability: =1
Definition: Description of ancillary data and descriptive parameters used in processing step.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Ancillary_Dataset_Description
Short Name: ancdsdes
Type: text
Domain: free text
Parent: Ancillary_Description
Optionality: Mandatory
Repeatability: =1
Definition: Description of ancillary datasets for processing.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Command_Line_Processing_Parameter

Short Name: procpmcl
Type: text
Domain: free text
Parent: Ancillary_Description
Optionality: Mandatory-if-applicable
Repeatability: >=1
Definition: Parameters to control processing operations, entered at run time.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Ancillary_Reference
Short Name: ancref
Type: compound
Child: Citation_Information
Parent: Ancillary_Dataset
Optionality: Conditional - present and mandatory if and only if Ancillary_Description is absent
Repeatability: =1
Definition: Reference to document describing ancillary data.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Processing_Software
Short Name: procsoft
Type: compound
Child: Processing Software Description
Child: Processing Software Reference
Parent: Processing_Information
Optionality: Mandatory
Repeatability: =1
Definition: The computer programs used to process data from one level to another.
Source: Raytheon Information Technology Systems (2000) Implementation Earth Science Model for the ECS Project

Extension_Information
Name: Processing_Software_Description
Short Name: prsodesc
Type: text
Domain: free text
Parent: Processing_Software
Optionality: Conditional - present and mandatory if and only if Processing_Software_Reference is absent
Repeatability: =1
Definition: Text description of processing software.
Source: Raytheon Information Technology Systems (2000) Implementation Earth Science Model for the ECS Project – PGEDescription

Extension_Information
Name: Processing_Software_Reference
Short Name: prsoref
Type: compound
Child: Citation_Information
Parent: Processing_Software
Optionality: Conditional - present and mandatory if and only if Processing_Software_Description is absent
Repeatability: =1
Definition: Reference to document describing processing software.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS Guide Algorithm Information

Extension_Information
Name: Processing_Procedure
Short Name: procprcd
Type: compound
Child: Processing_Run_History
Child: Processing_Environment
Child: Processing_Procedure_Description
Parent: Processing_Information
Optionality: Mandatory
Repeatability: =1
Definition: Description of decision parameters in and circumstances and methods of processing.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Processing_Run_History
Short Name: prunhist
Type: compound
Child: Process_Step
Parent: Processing_Procedure
Optionality: Mandatory
Repeatability: =1
Definition: History of processing runs that create data set described by metadata.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Processing_Environment
Short Name: procenv
Type: compound
Child: Native_Data_Set_Environment
Parent: Processing_Procedure
Optionality: Mandatory
Repeatability: =1

Definition: The environment in which the processing was carried out, including, but not limited to, the platform, the operating system name and version, and other configuration control information.
Source: ISO (2001) TC 211 Draft International Standard - Geographic Information – Metadata; Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – Intended Operating System;

Extension_Information
Name: Processing_Procedure_Description
Short Name: procpdes
Type: text
Domain: free text
Parent: Processing_Procedure
Optionality: Optional
Repeatability: =1
Definition: Additional details about the processing procedure.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Processing_Change_History
Short Name: procchhi
Type: compound
Child: Process_Step
Parent: Processing_Information
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Description of the changes in processing procedure from version to version.
Rationale: Allows users to understand any differences that may arise from differences between the way the current version was processed and the way previous versions they used were processed.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Processing_Documentation
Short Name: procdoc
Type: compound
Child: Citation_Information
Parent: Processing_Information
Optionality: Optional
Repeatability: >=1
Definition: Reference to documentation describing the processing.
Rationale: A full description of all aspects of the processing may be too detailed for inclusion in accompanying metadata.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Image_Quality
Short Name: imagqual
Type: text
Domain free text
Parent: Data_Quality_Information
Optionality: Optional
Repeatability: =1
Definition: Qualitative description of image quality.
Source: ISO (2001) TC 211 Draft International Standard - Geographic Information – Metadata

Extension_Information
Name: Acquisition_Information
Short Name: acqinfo
Type: compound
Child: Satellite/Local_Zenith_Angle
Child: Satellite/Local_Azimuth_Angle
Child: Solar_Zenith_Angle
Child: Solar_Azimuth_Angle
Child: Relative_Azimuth
Child: Clock_Time/Drift
Child: Ascending/Descending_Indicator
Child: Nadir
Parent: Data_Quality_Information
Optionality: Optional
Repeatability: =1
Definition: Information describing configuration under which data were acquired, including satellite and solar position and time correction.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Satellite/Local_Zenith_Angle
Short Name: satlocza
Type: real
Domain: -180.0 <= Satellite/Local_Zenith_Angle <= 180.0
Parent: Acquisition_Information
Optionality: Mandatory
Repeatability: =1
Definition: The angle at the viewed point between the zenith at the viewed point and the satellite, in degrees.
Source: NOAA National Environmental Satellite Data and Information Service

Extension_Information
Name: Satellite/Local_Azimuth_Angle
Short Name: satlocaa
Type: real
Domain: -180.0 <= Satellite/Local_Azimuth_Angle <= 180.0

Parent: Acquisition_Information
Optionality: Mandatory
Repeatability: =1
Definition: The angle at the viewed point, measured in the horizontal plane at the viewed point, between the north direction and the direction to the satellite, measured in degrees eastward from north.
Source: NOAA National Environmental Satellite Data and Information Service

Extension_Information
Name: Solar_Zenith_Angle
Short Name: solarzea
Type: real
Domain: -180.0 <= Solar_Zenith_Angle <= 180.0
Parent: Acquisition_Information
Optionality: Mandatory
Repeatability: =1
Definition: The angle at the viewed point between the zenith at the viewed point and the Sun, in degrees.
Source: NOAA National Environmental Satellite Data and Information Service

Extension_Information
Name: Solar_Azimuth_Angle
Short Name: solaraza
Type: real
Domain: -180.0 <= Solar_Azimuth_Angle <= 180.0
Parent: Acquisition_Information
Optionality: Mandatory
Repeatability: =1
Definition: The angle at the viewed point, measured in the horizontal plane at the viewed point, between the north direction and the direction to the Sun, measured in degrees eastward from north.
Source: NOAA National Environmental Satellite Data and Information Service

Extension_Information
Name: Relative_Azimuth
Short Name: relazi
Type: real
Domain: -180.0 <= Relative_Azimuth <= 180.0
Parent: Acquisition_Information
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: The angle at the viewed point, measured in the horizontal plane at the viewed point, clockwise in degrees from the azimuth of the Sun to the azimuth of the satellite.
Source: NOAA National Environmental Satellite Data and Information Service

Extension_Information
Name: Clock_Time/Drift

Short Name: clocdrft
Type: real
Domain: -75.0 <= Clock_Time/Drift <= 75.0
Parent: Acquisition_Information
Optionality: Mandatory
Repeatability: =1
Definition: Error from GMT, needed to correct the time tag for scan data, in milliseconds.
Source: NOAA National Environmental Satellite Data and Information Service

Extension_Information
Name: Ascending/Descending_Indicator
Short Name: ascdscin
Type: text
Domain: "0" "1"
Parent: Acquisition_Information
Optionality: Mandatory
Repeatability: =1
Definition: Flag indicating whether satellite is moving northward or southward. *(Note: 0 represents ascending or northward; 1 represents descending or southward.)*
Source: NOAA National Environmental Satellite Data and Information Service

Extension_Information
Name: Nadir
Short Name: nadir
Type: compound
Child: Nadir_Latitude
Child: Nadir_Longitude
Parent: Acquisition_Information
Optionality: Optional
Repeatability: =1
Definition: Location of point directly underneath platform.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Nadir_Latitude
Short Name: nadirlat
Type: real
Domain: -90.0 <= Nadir_Latitude <= 90.0
Parent: Nadir
Optionality: Mandatory
Repeatability: =1
Definition: Latitude of nadir.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Nadir_Longitude
Short Name: nadirlon

Type: real
Domain: -180.0 <= Nadir_Longitude < 180.0
Parent: Nadir
Optionality: Mandatory
Repeatability: =1
Definition: Longitude of nadir.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Spatial Data Organization Information

3 Spatial Data Organization Information -- the mechanism used to represent spatial information in the dataset.
Type: compound
Short Name: spdoinfo

Spatial_Data_Organization_Information =
0{Indirect_Spatial_Reference}1 +
0{Direct_Spatial_Reference_Method +
([Point_and_Vector_Object_Information |
Raster_Object_Information])}1

Raster_Object_Information =
Cell_Value_Type +
[***Raster_Object_Type*** +
(Row_Count +
Column_Count +
0{Vertical_Count}1) |
Dimension_Description]

Dimension_Description =
Number_of_Data_Dimensions +
1{Dimension_Properties}n

Dimension_Properties =
Name_of_Dimension +
Dimension_Count

Domain Extension
Element: Raster_Object_Type
Domain: "Point" "Pixel" "Grid Cell" "Voxel"
Extended Domain: "Point" "Pixel" "Grid Cell" "Voxel" "Swath"
Rationale: "Swath" is another kind of raster.

Extension_Information
Name: Cell_Value_Type
Short Name: cvaltype
Type: text
Domain: "unsigned eight-bit integer" "signed eight-bit integer" "big endian unsigned sixteen-bit integer" "big endian signed sixteen-bit integer" "little endian unsigned sixteen-bit integer" "little endian signed sixteen-bit integer" "big endian unsigned thirty-two bit integer" "big endian signed thirty-two bit integer" "little-endian unsigned thirty-two bit integer" "little endian signed thirty-two bit integer" "big endian single precision IEEE floating point" "big endian double precision IEEE floating point" "little endian single precision

IEEE floating point" "little endian double precision IEEE floating point" free text
Parent: Raster_Object_Information
Optionality: Mandatory
Repeatability: =1
Definition: Bit representation of data value in raster cell.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Dimension_Description
Short Name: dimdesc
Type: compound
Child: Number_of_Data_Dimensions
Child: Dimension_Properties
Parent: Raster_Object_Information
Optionality: Conditional - present and mandatory if and only if Raster_Object_Type +Row_Count + Column_Count +0{Vertical Count}1 combination is absent
Repeatability: =1
Definition: Specification for the independent axes in the coordinate system in which spatial data are located.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Number_of_Data_Dimensions
Short Name: nodatdim
Type: integer
Domain: Number_of_Data_Dimensions > 0
Parent: Dimension_Description
Optionality: Mandatory
Repeatability: =1
Definition: Number of axes used in spatial data matrix.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Dimension_Properties
Short Name: dimprops
Type: compound
Child: Name_of_Dimension
Child: Dimension_Count
Parent: Dimension_Description
Optionality: Mandatory
Repeatability: =Number_of_Data_Dimensions
Definition: Description of individual axis in spatial data matrix.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Name_of_Dimension
Short Name: namedim
Type: text
Domain: "row" "column" "vertical" "band" free text
Parent: Dimension_Properties
Optionality: Mandatory
Repeatability: =1
Definition: Designation assigned to an axis.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Dimension_Count
Short Name: dimcount
Type: integer
Domain: Dimension_Count >= 1
Parent: Dimension_Properties
Optionality: Mandatory
Repeatability: =1
Definition: The maximum number of data points along the corresponding axis.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Spatial Reference Information

4 Spatial Reference Information -- the description of the reference frame for, and the means to encode, coordinates in the dataset.
Type: compound
Short Name: spref

Spatial_Reference_Information =
0{Horizontal_Coordinate_System_Definition}1 +
0{***Vertical_Coordinate_System_Definition***}1 +
0{Georeferencing_Information}1

Vertical_Coordinate_System_Definition =
0{***Altitude_System_Definition***}1 +
0{Depth_System_Definition}1

Altitude_System_Definition =
Altitude_Datum_Name +
1{Altitude_Resolution}n +
[*Altitude_Distance_Units* |
Altitude_Distance_Layer] +
Altitude_Encoding_Method

Georeferencing_Information =
[Georectified_Raster |
Georeferenceable_Raster]

Georectified_Raster =
Pixel_Resolution +
Grid_First_Element +
Grid_Orientation +
Point_Position_In_Pixel +
Storage_Order

Pixel_Resolution =
Coordinate_Representation *(see section 4 of base standard for production rules)* +
Planar_Distance_Units *(see section 4 of base standard for production rules)*

Grid_First_Element =
Grid_First_Element_Map_X_Coordinate +
Grid_First_Element_Map_Y_Coordinate

Grid_Orientation =
Row_Delta_X +
Row_Delta_Y +
Column_Delta_X +
Column_Delta_Y

Georeferenceable_Raster =
1{Georeferencing_Description}n +
(1{Aerotriangulation_Reference}n) +
0{Swath_Track_Information}1

Georeferencing_Description =
[Ground_Control_Point_Information |
Instrument_Specific_Georeferencing |
Referencing_Polynomial |
Other_Georeferencing_Description]

Ground_Control_Point_Information =
Ground_Control_Point_Organization +
[Ground_Control_Point_Description +
1{Ground_Control_Point_Position}n |
1{Ground_Control_Point_Description +
Ground_Control_Point_Position}n]

Ground_Control_Point_Description =
Control_Point_Type +
(Control_Point_Origin) +
(Control_Point_Use_Flag) +
(Control_Point_Horizontal_X_Accuracy) +
(Control_Point_Horizontal_Y_Accuracy) +
(Control_Point_Vertical_Accuracy)

Ground_Control_Point_Position =
Control_Point_Raster_Position +
[Control_Point_Earth_Location |
Control_Point_Identification]

Control_Point_Raster_Position =
Control_Point_Row +
Control_Point_Column

Control_Point_Earth_Location =
Control_Point_x_Value +
Control_Point_y_Value +
(Control_Point_z_Value)

Control_Point_Identification =
Control_Point_ID +
Control_Point_Authority

Control_Point_Authority =
Contact_Information *(see section 10 of base standard for production rules)*

Instrument_Specific_Georeferencing =
1{Positional_Information}n +

(Exterior_Orientation_Accuracy) +
Rotation_Sequence +
Axis_Rotation_Convention

Positional_Information =
Projection_Center_X_Position +
Projection_Center_Y_Position +
Projection_Center_Z_Position +
Roll +
Pitch +
Yaw +
Attitude_Angular_Units

Exterior_Orientation_Accuracy =
X_Position_Accuracy +
Y_Position_Accuracy +
Z_Position_Accuracy +
Roll_Accuracy +
Pitch_Accuracy +
Yaw_Accuracy

Referencing_Polynomial =
Polynomial_Function *(see section 5 for production rules)*

Aerotriangulation_Reference =
Citation_Information *(see section 8 of base standard for production rules)*

Swath_Track_Information =
Ground_Shape +
Cross_Track_Motion

Conditionality Change
Element: Altitude_Distance_Units
Conditionality: Mandatory
Revised Conditionality: Conditional - present and mandatory if and only if Altitude_Distance_Layer is absent
Rationale: Allows additional methods of specifying altitude with which datasets conforming to the base standard will be compliant.

Extension_Information
Name: Altitude_Distance_Layer
Short Name: altlayer
Type: text
Domain: "millibars" "theta value" "cloud layer" "atmosphere layer" free text
Parent: Altitude_System_Definition
Optionality: Conditional - present and mandatory if and only if Altitude_Distance_Units is absent

Repeatability: =1
Definition: System of atmospheric levels in which altitudes are recorded.
Rationale: The added layers are standard for describing atmospheric datasets and should be specifically identified among those preferred.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Georeferencing_Information
Short Name: georefin
Type: compound
Child: Georectified_Raster
Child: Georeferenceable_Raster
Parent: Spatial_Reference_Information
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Information that will allow determination of geographical location of raster points.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Georectified_Raster
Short Name: georecra
Type: compound
Child: Pixel_Resolution
Child: Grid_First_Element
Child: Grid_Orientation
Child: Point_Position_In_Pixel
Child: Storage_Order
Parent: Georeferencing_Information
Optionality: Conditional - present and mandatory if and only if Georeferenceable_Raster is absent
Repeatability: =1
Definition: Raster whose cells are regularly spaced in a geographic or map coordinate system defined in some Spatial_Referencing_System, such that any cell can be geolocated given its raster coordinate and the raster origin, cell spacing, and orientation, possibly including a terrain model. *(Note: Let a_{mn} be the pixel grid point in the m^{th} row and the n^{th} column, with (x,y) the position of that grid point in map coordinates. Let the map position corresponding to the first element of the grid a_{11} be (x_0,y_0). Then $x= x_0 + (m-1)Dx_m + (n-1)Dy_m$ and $y= y_0 + (m-1)Dx_n + (n-1)Dy_n$, where the D terms are defined in the elements below. The overlay is shown in Figure 3, with definitions of the individual pixels.)*
Rationale: Provides user geographic locations of all points in the case of a regular georectified grid.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Pixel_Resolution
Short Name: pixlreso

Type: compound
Child: Coordinate_Representation
Child: Planar_Distance_Units
Parent: Georectified_Raster
Optionality: Mandatory
Repeatability: =1
Definition: Geographic dimensions corresponding to one raster pixel of processed data.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

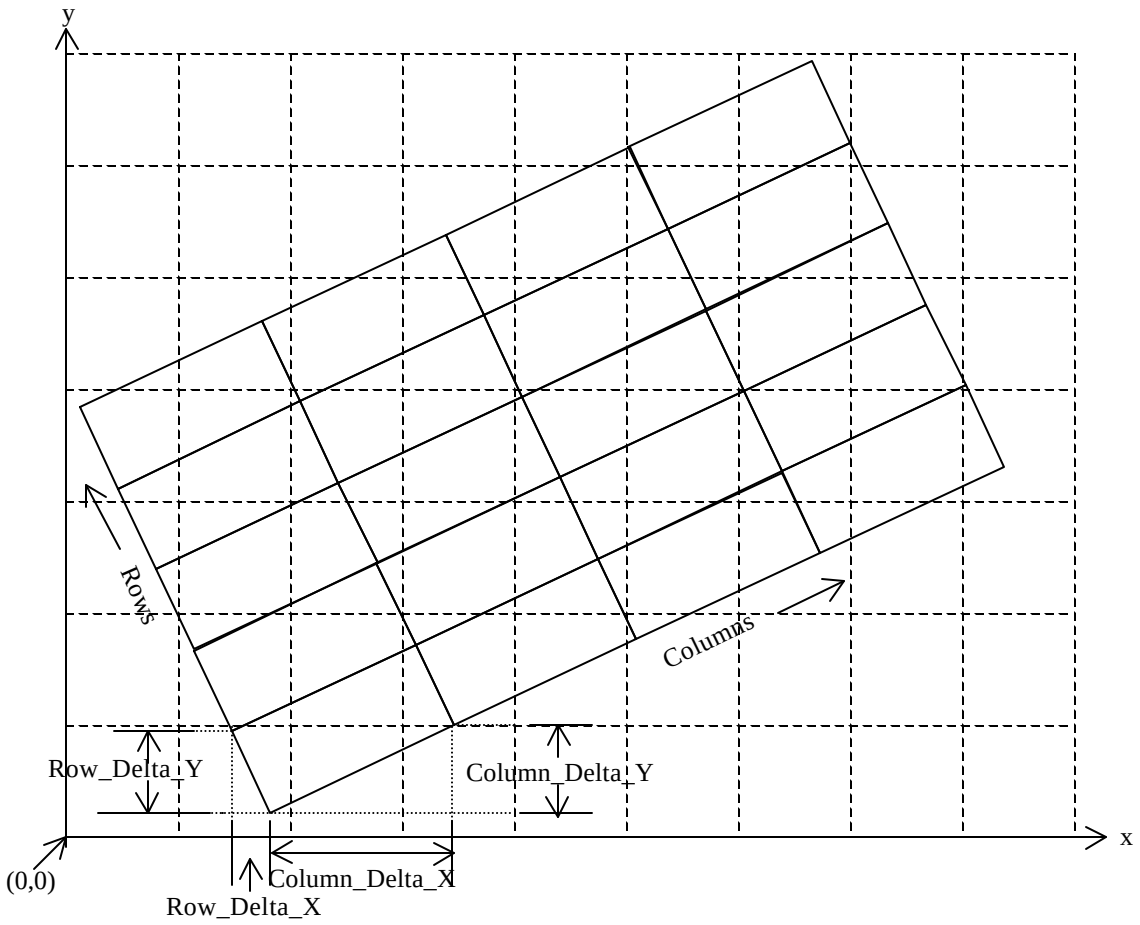

Figure 3. Row-column pixel grid (solid lines) superimposed on map x-y grid (broken lines)

Extension_Information
Name: Grid_First_Element
Short Name: gridinit
Type: compound
Child: Grid_First_Element_Map_X_Coordinate

Child: Grid_First_Element_Map_Y_Coordinate
Parent: Georectified_Raster
Optionality: Mandatory
Repeatability: =1
Definition: Point on map (x_0,y_0) corresponding to first element of the pixel array.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Grid_First_Element_Map_X_Coordinate
Short Name: grinitx
Type: real
Domain: free real
Parent: Grid_First_Element
Optionality: Mandatory
Repeatability: =1
Definition: Value x_0 of x-coordinate on map at point corresponding to first element of pixel system.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Grid_First_Element_Map_Y_Coordinate
Short Name: grinity
Type: real
Domain: free real
Parent: Grid_First_Element
Optionality: Mandatory
Repeatability: =1
Definition: Value y_0 of y-coordinate on map at point corresponding to first element of pixel system.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Grid_Orientation
Short Name: gridori
Type: compound
Child: Row_Delta_X
Child: Row_Delta_Y
Child: Column_Delta_X
Child: Column_Delta_Y
Parent: Georectified_Raster
Optionality: Mandatory
Repeatability: =1
Definition: Orientation of image pixel grid relative to map on which it is overlaid.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Row_Delta_X
Short Name: rowdeltx
Type: real
Domain: free real
Parent: Grid_Orientation
Optionality: Mandatory
Repeatability: =1
Definition: Increment Dx_m in map x-coordinates corresponding to increment of one grid row; a negative value means that map x-coordinate decreases with increasing row number.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Row_Delta_Y
Short Name: rowdelty
Type: real
Domain: free real
Parent: Grid_Orientation
Optionality: Mandatory
Repeatability: =1
Definition: Increment Dy_m in map y-coordinates corresponding to increment of one grid row; a negative value means that map y-coordinate decreases with increasing row number.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Column_Delta_X
Short Name: coldeltx
Type: real
Domain: free real
Parent: Grid_Orientation
Optionality: Mandatory
Repeatability: =1
Definition: Increment Dx_n in map x-coordinates corresponding to increment of one grid column; a negative value means that map x-coordinate decreases with increasing column number.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Column_Delta_Y
Short Name: coldelty
Type: real
Domain: free real
Parent: Grid_Orientation
Optionality: Mandatory
Repeatability: =1

Definition: Increment Dy_n in map y-coordinates corresponding to increment of one grid column; a negative value means that map y-coordinate decreases with increasing column number.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Point_Position_In_Pixel
Short Name: ptpos
Type: text
Domain: "center" "lower left corner" "lower right corner" "upper left corner" "upper right corner" free text
Parent: Georectified_Raster
Optionality: Mandatory
Repeatability: =1
Definition: The point in the pixel corresponding to the earth location of the pixel.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Storage_Order
Short Name: storord
Type: text
Domain: "row major" "column major" free text
Parent: Georectified_Raster
Optionality: Mandatory
Repeatability: =1
Definition: Description of which index varies most rapidly in the sequential storage of raster elements — row index (row major) or column index (column major).
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Georeferenceable_Raster
Short Name: georbler
Type: compound
Child: Georeferencing_Description
Child: Aerotriangulation_Reference
Child: Swath_Track_Information
Parent: Georeferencing_Information
Optionality: Conditional - present and mandatory if and only if Georectified_Raster is absent
Repeatability: =1
Definition: Raster whose cells may be irregularly spaced in any geographic or map projection coordinate system, whose cells can be geolocated using geolocation information supplied with the data but not from the raster properties alone.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Georeferencing_Description
Short Name: georefde
Type: compound
Child: Ground_Control_Point_Information
Child: Instrument_Specific_Georeferencing
Child: Referencing_Polynomial
Child: Other_Georeferencing_Description
Parent: Georeferenceable_Raster
Optionality: Mandatory
Repeatability: >=1
Definition: Description of information provided in metadata that allows the geographic or map location of raster points to be located.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Ground_Control_Point_Information
Short Name: gcptinfo
Type: compound
Child: Ground_Control_Point_Organization
Child: Ground_Control_Point_Description
Child: Ground_Control_Point_Position
Parent: Georeferencing_Description
Optionality: Conditional – mandatory if neither Instrument_Specific_Georeferencing, Referencing_Polynomial, nor Other_Georeferencing_Description is present; otherwise optional
Repeatability: =1
Definition: Information describing data points for which both raster and geographic locations are available that can be used to relate raster and geographic coordinates at other points.
Rationale: If ground control points are used to geolocate data, information on them must be supplied to help the user understand how the process was carried out.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Ground_Control_Point_Organization
Short Name: gcporg
Type: text
Domain: "location" "library"
Parent: Ground_Control_Point_Information
Optionality: Mandatory
Repeatability: =1
Definition: Specification as to whether geographic locations of control points are supplied together with raster points or are in separate library.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Ground_Control_Point_Description
Short Name: gcptdesc
Type: compound
Child: Control_Point_Type
Child: Control_Point_Origin
Child: Control_Point_Use_Flag
Child: Control_Point_Horizontal_X_Accuracy
Child: Control_Point_Horizontal_Y_Accuracy
Child: Control_Point_Vertical_Accuracy
Parent: Ground_Control_Point_Information
Optionality: Mandatory
Repeatability: >=1
Definition: Lineage and applicability of ground control points.
Source: ISPRS WG II/4

Extension_Information
Name: Control_Point_Type
Short Name: gcptype
Type: text
Domain: “full” “horizontal” “vertical”
Parent: Ground_Control_Point_Description
Optionality: Mandatory
Repeatability: =1
Definition: Direction or directions for which control point provides georeference information.
Source: ISPRS WG II/4

Extension_Information
Name: Control_Point_Origin
Short Name: gcpori
Type: text
Domain: "terrestrial" "global positioning system" "aerotriangulation" "tie point" free text
Parent: Ground_Control_Point_Description
Optionality: Optional
Repeatability: =1
Definition: The source of the ground control point measurement.
Source: ISPRS WG II/4

Extension_Information
Name: Control_Point_Use_Flag
Short Name: gcpusefl
Type: text
Domain: "new" "used" "verified" "not verified" "used and verified" free text
Parent: Ground_Control_Point_Description
Optionality: Optional
Repeatability: =1
Definition: Whether the ground control point has previously been used and verified.
Source: ISPRS WG II/4

Extension_Information
Name: Control_Point_Horizontal_X_Accuracy
Short Name: gcpxaccu
Type: real
Domain: Control_Point_Horizontal_X_Accuracy >= 0.0
Parent: Ground_Control_Point_Description
Optionality: Optional
Repeatability: =1
Definition: *A priori* standard deviation of the horizontal coordinates of the ground control point, in coordinate units specified under Horizontal_Coordinate_System_Definition.
Source: ISPRS WG II/4

Extension_Information
Name: Control_Point_Horizontal_Y_Accuracy
Short Name: gcpyaccu
Type: real
Domain: Control_Point_Horizontal_Y_Accuracy >= 0.0
Parent: Ground_Control_Point_Description
Optionality: Optional
Repeatability: =1
Definition: *A priori* standard deviation of the horizontal coordinates of the ground control point, in coordinate units specified under Horizontal_Coordinate_System_Definition.
Source: ISPRS WG II/4

Extension_Information
Name: Control_Point_Vertical_Accuracy
Short Name: gcpzaccu
Type: real
Domain: Control_Point_Vertical_Accuracy >= 0.0
Parent: Ground_Control_Point_Description
Optionality: Optional
Repeatability: =1
Definition: *A priori* standard deviation of the vertical coordinate of the ground control point, in units specified by Altitude_Distance_Units.
Source: ISPRS WG II/4

Extension_Information
Name: Ground_Control_Point_Position
Short Name: gcptpos
Type: compound
Child: Control_Point_Raster_Position
Child: Control_Point_Earth_Location
Child: Control_Point_Identification
Parent: Ground_Control_Point_Information
Optionality: Mandatory
Repeatability: >=1
Definition: Location of individual control points, defined separately for every point, in both raster and geographic or map coordinate systems.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Control_Point_Raster_Position
Short Name: conptrpo
Type: compound
Child: Control_Point_Row
Child: Control_Point_Column
Parent: Ground_Control_Point_Position
Optionality: Mandatory
Repeatability: =1
Definition: Position in raster array of individual ground control point used in geolocating data.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Control_Point_Row
Short Name: gcprow
Type: real
Domain: Control_Point_Row >= 0.0
Parent: Control_Point_Raster_Position
Optionality: Mandatory
Repeatability: =1
Definition: Value of row coordinate at ground control point position in raster grid.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Control_Point_Column
Short Name: gcpcolum
Type: real
Domain: Control_Point_Column >= 0.0
Parent: Control_Point_Raster_Position
Optionality: Mandatory
Repeatability: =1
Definition: Value of column coordinate at ground control point position in raster grid.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Control_Point_Earth_Location
Short Name: gcpearlc
Type: compound
Child: Control_Point_x_Value
Child: Control_Point_y_Value
Child: Control_Point_z_Value
Parent: Ground_Control_Point_Position

Optionality: Conditional - present and mandatory if and only if value of Ground_Control_Point_Organization is "location"
Repeatability: =1
Definition: Geographic or map location of ground control point.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Control_Point_x_Value
Short Name: gcpxval
Type: real
Domain: free real
Parent: Control_Point_Earth_Location
Optionality: Mandatory
Repeatability: =1
Definition: Value of map x-coordinate at control point location.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Control_Point_y_Value
Short Name: gcpyval
Type: real
Domain: free real
Parent: Control_Point_Earth_Location
Optionality: Mandatory
Repeatability: =1
Definition: Value of map y-coordinate at control point location.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Control_Point_z_Value
Short Name: gcpzval
Type: real
Domain: free real
Parent: Control_Point_Earth_Location
Optionality: Optional
Repeatability: =1
Definition: Value of vertical coordinate at control point location.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Control_Point_Identification
Short Name: gcpidnt
Type: compound
Child: Control_Point_ID
Child: Control_Point_Authority
Parent: Ground_Control_Point_Position

Optionality: Conditional - present and mandatory if and only if value of Ground_Control_Point_Organization is "library"
Repeatability: =1
Definition: Information allowing the user to find the location of a control point from a catalogue.
Source: U. S. National Imagery and Mapping Agency

Extension_Information
Name: Control_Point_ID
Short Name: gcpid
Type: text
Domain: free text
Parent: Control_Point_Identification
Optionality: Mandatory
Repeatability: =1
Definition: Identifier assigned to control point in library.
Source: U. S. National Imagery and Mapping Agency

Extension_Information
Name: Control_Point_Authority
Short Name: gcpauth
Type: compound
Child: Contact_Information
Parent: Control_Point_Identification
Optionality: Mandatory
Repeatability: =1
Definition: Contact who can supply ground control point coordinates given identifier.
Source: U. S. National Imagery and Mapping Agency

Extension_Information
Name: Instrument_Specific_Georeferencing
Short Name: insspgeo
Type: compound
Child: Positional_Information
Child: Exterior_Orientation_Accuracy
Child: Rotation_Sequence
Child: Axis_Rotation_Convention
Parent: Georeferencing_Description
Optionality: Conditional - mandatory if neither Ground_Control_Point_Information, Referencing_Polynomial, nor Other_Georeferencing_Description is present; otherwise optional
Repeatability: =1
Definition: Information relating coordinate system of a particular instrument to ground coordinate system.
Source: ISPRS WG II/4.0

Extension_Information
Name: Positional_Information
Short Name: posiinfo
Type: compound

Child: Projection_Center_X_Position
Child: Projection_Center_Y_Position
Child: Projection_Center_Z_Position
Child: Roll
Child: Pitch
Child: Yaw
Child: Attitude_Angular_Units
Parent: Instrument_Specific_Georeferencing
Optionality: Mandatory
Repeatability: >=1
Definition: Orientation of instrument and detector projection.
Source: ISPRS WG II/4

Extension_Information
Name: Projection_Center_X_Position
Short Name: prjcxpos
Type: real
Domain: free real
Parent: Positional_Information
Optionality: Mandatory
Repeatability: =1
Definition: X-component of the position of the projection center in the ground coordinate system defined under Horizontal_Coordinate_System_Definition.
Source: ISPRS WG II/4

Extension_Information
Name: Projection_Center_Y_Position
Short Name: prjcypos
Type: real
Domain: free real
Parent: Positional_Information
Optionality: Mandatory
Repeatability: =1
Definition: Y-component of the position of the projection center in the ground coordinate system defined under Horizontal_Coordinate_System_Definition.
Source: ISPRS WG II/4

Extension_Information
Name: Projection_Center_Z_Position
Short Name: prjczpos
Type: real
Domain: free real
Parent: Positional_Information
Optionality: Mandatory
Repeatability: =1
Definition: Z-component of the position of the projection center in the ground coordinate system defined under Vertical_Coordinate_System_Definition.
Source: ISPRS WG II/4

Extension_Information
Name: Roll
Short Name: omegarll
Type: real
Domain: free real
Parent: Positional_Information
Optionality: Mandatory
Repeatability: =1
Definition: Roll angle omega of image coordinate system relative to ground coordinate system, in units defined by Attitude_Angular_Units, measured clockwise around the positive x-axis (the direction of motion).
Source: ISPRS WG II/4

Extension_Information
Name: Pitch
Short Name: phipitch
Type: real
Domain: free real
Parent: Positional_Information
Optionality: Mandatory
Repeatability: =1
Definition: Pitch angle phi of image coordinate system relative to ground coordinate system, in units defined by Attitude_Angular_Units, measured clockwise around the positive y-axis ($z \times x$).
Source: ISPRS WG II/4

Extension_Information
Name: Yaw
Short Name: kappayaw
Type: real
Domain: free real
Parent: Positional_Information
Optionality: Mandatory
Repeatability: =1
Definition: Yaw angle kappa of image coordinate system relative to ground coordinate system, in units defined by Attitude_Angular_Units, measured clockwise around the positive z-axis (vertical).
Source: ISPRS WG II/4

Extension_Information
Name: Attitude_Angular_Units
Short Name: attanglu
Type: text
Domain: "degrees" "radians" free text
Parent: Positional_Information
Optionality: Mandatory
Repeatability: =1
Definition: Units of angular measure in which Roll, Pitch, and Yaw are expressed.
Source: ISPRS WG II/4

Extension_Information
Name: Exterior_Orientation_Accuracy
Short Name: accexori
Type: compound
Child: X_Position_Accuracy
Child: Y_Position_Accuracy
Child: Z_Position_Accuracy
Child: Roll_Accuracy
Child: Pitch_Accuracy
Child: Yaw_Accuracy
Parent: Instrument_Specific_Georeferencing
Optionality: Optional
Repeatability: =1
Definition: Uncertainties in the parameters of exterior orientation.
Source: ISPRS WG II/4

Extension_Information
Name: X_Position_Accuracy
Short Name: accxpos
Type: real
Domain: X_Position_Accuracy >= 0.0
Parent: Exterior_Orientation_Accuracy
Optionality: Mandatory
Repeatability: =1
Definition: Standard deviation of x coordinate of projection center.
Source: ISPRS WG II/4

Extension_Information
Name: Y_Position_Accuracy
Short Name: accypos
Type: real
Domain: Y_Position_Accuracy >= 0.0
Parent: Exterior_Orientation_Accuracy
Optionality: Mandatory
Repeatability: =1
Definition: Standard deviation of y coordinate of projection center.
Source: ISPRS WG II/4

Extension_Information
Name: Z_Position_Accuracy
Short Name: acczpos
Type: real
Domain: Z_Position_Accuracy >= 0.0
Parent: Exterior_Orientation_Accuracy
Optionality: Mandatory
Repeatability: =1
Definition: Standard deviation of z coordinate of projection center.
Source: ISPRS WG II/4

Extension_Information
Name: Roll_Accuracy
Short Name: accomega
Type: real
Domain: Roll_Accuracy >= 0.0
Parent: Exterior_Orientation_Accuracy
Optionality: Mandatory
Repeatability: =1
Definition: Standard deviation of roll angle, omega, in same units as angle.
Source: ISPRS WG II/4

Extension_Information
Name: Pitch_Accuracy
Short Name: accphi
Type: real
Domain: Pitch_Accuracy >= 0.0
Parent: Exterior_Orientation_Accuracy
Optionality: Mandatory
Repeatability: =1
Definition: Standard deviation of pitch angle, phi, in same units as angle.
Source: ISPRS WG II/4

Extension_Information
Name: Yaw_Accuracy
Short Name: acckappa
Type: real
Domain: Yaw_Accuracy >= 0.0
Parent: Exterior_Orientation_Accuracy
Optionality: Mandatory
Repeatability: =1
Definition: Standard deviation of yaw angle, kappa, in same units as angle.
Source: ISPRS WG II/4

Extension_Information
Name: Rotation_Sequence
Short Name: pcrotseq
Type: text
Domain: “123” “132” “213” “231” “312” “321”
Parent: Instrument_Specific_Georeferencing
Optionality: Mandatory
Repeatability: =1
Definition: Sequence of rotations in roll, pitch and yaw: 1 represents roll, 2 represents pitch, and 3 represents yaw, such that "132" would represent a rotation in the sequence roll, yaw, pitch.
Source: ISPRS WG II/4

Extension_Information
Name: Axis_Rotation_Convention
Short Name: axrotcon
Type: text

Domain: “rotated” “fixed”
Parent: Instrument_Specific_Georeferencing
Optionality: Mandatory
Repeatability: =1
Definition: Description of whether the coordinate system axes are rotated or remain fixed with each step of application of the rotation matrix.
Source: ISPRS WG II/4

Extension_Information
Name: Referencing_Polynomial
Short Name: refrpoly
Type: compound
Child: Polynomial_Function
Parent: Georeferencing_Description
Optionality: Conditional - mandatory if neither Ground_Control_Point_Information, Instrument_Specific_Georeferencing, nor Other_Georeferencing_Description is present; otherwise optional
Repeatability: =1
Definition: Polynomial function used to relate image and ground positions.
Source: ISPRS WG II/4

Extension_Information
Name: Other_Georeferencing_Description
Short Name: othrefde
Type: text
Child: free text
Parent: Georeferencing_Description
Optionality: Conditional - mandatory if neither Ground_Control_Point_Information, Instrument_Specific_Georeferencing, nor Referencing_Polynomial is present; otherwise optional
Repeatability: =1
Definition: Text description of other method for georeferencing.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Aerotriangulation_Reference
Short Name: aerotref
Type: compound
Child: Citation_Information
Parent: Georeferenceable_Raster
Optionality: Optional
Repeatability: >=1
Definition: Reference containing information describing photogrammetric triangulation using aerial images.
Source: Moffit, F., Mikhail, E. (1980): Photogrammetry, Harper & Row, Publishers, New York

Extension_Information
Name: Swath_Track_Information

Short Name: swtrkinf
Type: compound
Child: Ground_Shape
Child: Cross_Track_Motion
Parent: Georeferenceable_Raster
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Properties of the swath track on the ground.
Rationale: Aids the user in deriving coordinates of all image points.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Ground_Shape
Short Name: grndshpe
Type: text
Domain: free text
Parent: Swath_Track_Information
Optionality: Mandatory
Repeatability: =1
Definition: Shape of pixel on ground.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Cross_Track_Motion
Short Name: xtrckmot
Type: text
Domain: free text
Parent: Swath_Track_Information
Optionality: Mandatory
Repeatability: =1
Definition: Direction and pattern of measurements relative to track.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Entity and Attribute Information

5 Entity and Attribute Information -- details about the information content of the dataset, including the entity types, their attributes, and the domains from which attribute values may be assigned.

Type: compound
Short Name: eainfo

Entity_and_Attribute_Information =
[1{***Detailed_Description***}n |
1{Overview_Description}n |
1{***Detailed_Description***}n +
1{Overview_Description}n]

Detailed_Description =
Entity_Type +
0{***Attribute***}n

Attribute =
Attribute_Label +
Attribute_Definition +
Attribute_Definition_Source +
1{***Attribute_Domain_Values***}n +
0{Beginning_Date_of_Attribute_Values +
0{Ending_Date_of_Attribute_Values}1}n +
(Attribute_Value_Accuracy_Information) +
(Attribute_Measurement_Frequency)

Attribute_Domain_Values =
[Enumerated_Domain |
Range_Domain |
Codeset_Domain |
Unrepresentable_Domain] +
0{**Data_Scaling_Information**}1

Data_Scaling_Information =
[Polynomial_Function|
Non_Polynomial_Scaling]

Polynomial Function =
Polynomial_Numerator +
0{Polynomial_Denominator}1

Polynomial_Numerator =
Number_of_Numerator_Terms +
1{Polynomial_Coefficient}n

Polynomial_Denominator =
Number_of_Denominator_Terms +
1{Polynomial_Coefficient}n

Extension_Information
Name: Data_Scaling_Information
Short Name: datascal
Type: compound
Child: Polynomial_Function
Child: Non_Polynomial_Scaling
Parent: Attribute_Domain_Values
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Function converting set of values on one scale to another.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Polynomial_Function
Short Name: polyfunc
Type: compound
Child: Polynomial_Numerator
Child: Polynomial_Denominator
Parent: Data_Scaling_Information
Optionality: Conditional - present and mandatory if and only if Non_Polynomial_Scaling is absent
Repeatability: =1
Definition: A function in successive powers of the independent variable, or the ratio of such functions, used in a transformation, one example of which is scaling, derivation of a set of values on one scale or coordinate system from the value in another, in the sense derived value = polynomial (initial value).
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Polynomial_Numerator
Short Name: polynume
Type: compound
Child: Number_of_Numerator_Terms
Child: Polynomial_Coefficient
Parent: Polynomial_Function
Optionality: Mandatory
Repeatability: =1
Definition: The polynomial function when not a ratio, and the dividend of the ratio when it is.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Number_of_Numerator_Terms
Short Name: nnumterm
Type: integer
Domain: Number_of_Numerator_Terms >=1
Parent: Polynomial_Numerator

Optionality: Mandatory
Repeatability: =1
Definition: The number of nonzero terms in the numerator of the polynomial.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Polynomial_Denominator
Short Name: polydeno
Type: compound
Child: Number_of_Denominator_Terms
Child: Polynomial_Coefficient
Parent: Polynomial_Function
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: The divisor of a polynomial function that is a ratio. *(Note: If absent, assumed equal to 1.)*
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Number_of_Denominator_Terms
Short Name: ndenterm
Type: integer
Domain: Number_of_Denominator_Terms >=1
Parent: Polynomial_Denominator
Optionality: Mandatory
Repeatability: =1
Definition: The number of nonzero terms in the denominator of the polynomial.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Polynomial_Coefficient
Short Name: polycoef
Type: real
Domain: free real
Parent: Polynomial_Numerator or Polynomial_Denominator
Optionality: Mandatory
Repeatability: =Number_of_Numerator_Terms, if Polynomial_Numerator is parent, or =Number_of_Denominator_Terms, if Polynomial_Denominator is parent
Definition: The coefficient of one term in the numerator or denominator of a polynomial function. *(Note: For a polynomial numerator or denominator of order m, there will be m+1 coefficients. Any of these coefficients, except that of the m power term, may be zero. When the function is linear, the coefficient of the zero-power term is the offset and the coefficient of the first power term is the scale factor.)*
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Non_Polynomial_Scaling
Short Name: npolscal

Type: text
Domain: free text
Parent: Data_Scaling_Information
Optionality: Conditional - present and mandatory if and only if Polynomial_Function is absent
Repeatability: =1
Definition: Text description of the function used to derive a set of values on one scale from their value in another, using a function that is not a polynomial.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Platform and Mission Information

Extension Information

Name: Platform_and_Mission_Information
Short Name: plmiinfo
Type: compound
Child: Mission_Information
Child: Platform_Information
Parent: Metadata
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Descriptive information about the platform from which the measurements that produced the data and about the program of which the data collection was a part.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Platform_and_Mission_Information =
(Mission_Information) +
(1{Platform_Information}n)

Mission_ Information =
(Mission_Description) +
(**Mission_History**)

Mission_History =
Mission_Start_Date +
(1{Mission_Significant_Event}n) +
0{Mission_Completion}1

Mission_Start_Date =
Single Date/Time *(see section 9 of base standard for production rules)*

Mission_Significant_Event =
Process_Step *(see section 2 of base standard for production rules)*

Mission_Completion =
Single Date/Time *(see section 9 of base standard for production rules)*

Platform_Information =
Platform_Start_Date +
(1{Platform_Sponsor}n) +
(Platform_Description)
(Platform_Orbit) +
(Flight Protocol)

Platform_Start_Date =
Single Date/Time *(see section 9 of base standard for production rules)*

Platform_Orbit =
Ephemeris +
[Keplerian_Orbit|
Nominal_Geostationary_Position]

Ephemeris =
Single Date/Time *(see section 9 of base standard for production rules)*

Keplerian_Orbit =
[Semimajor_Axis |
Orbit_Period |
Semimajor_Axis +
Orbit_Period] +
Eccentricity +
Orbit_Angle_Units +
Inclination +
Right_Ascension_of_Ascending_Node +
Argument_of_Perigee +
Perigee_Passage_Time

Orbit_Period =
Orbit_Period_Units +
Orbit_Period_Value

Perigee_Passage_Time =
Single Date/Time *(see section 9 of base standard for production rules)*

Nominal_Geostationary_Position =
Platform_Nominal_Longitude +
Platform_Nominal_Altitude

Platform_Nominal_Altitude =
Platform_Nominal_Altitude_Units +
Platform_Nominal_Altitude_Value

Platform_Nominal_Altitude_Units =
Altitude_Distance_Units *(see section 4 of base standard for complete production rules)*

Flight_Protocol =
Flying_Height +
(GPS_Information_System_Availability) +
(INS_Reading_Availability)

Extension_Information
Name: Mission_Information
Short Name: missinfo
Type: compound
Child: Mission_Description
Child: Mission_History
Parent: Platform_and_Mission_Information
Optionality: Optional
Repeatability: =1
Definition: General information about the overall data gathering program to which the data contribute.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Mission_Description
Short Name: missdesc
Type: text
Domain: free text
Parent: Mission_Information
Optionality: Optional
Repeatability: =1
Definition: Description of the mission of which the platform observations are part and the objectives of that mission.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Mission_History
Short Name: misshist
Type: compound
Child: Mission_Start_Date
Child: Mission_Significant_Event
Child: Mission_Completion
Parent: Mission_Information
Optionality: Optional
Repeatability: =1
Definition: Significant events and dates over the history of the mission.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Mission_Start_Date
Short Name: missstdt
Type: compound
Child: Single_Date/Time
Parent: Mission_History
Optionality: Mandatory
Repeatability: =1

Definition: Date that mission during which data were taken began.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Mission_Significant_Event
Short Name: misssige
Type: compound
Child: Process_Step
Parent: Mission_History
Optionality: Optional
Repeatability: >=1
Definition: Date and description of a major occurrence during mission.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Mission_Completion
Short Name: misscomp
Type: compound
Child: Single_Date/Time
Parent: Mission_History
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Scheduled or actual end date of mission during which data were taken.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Platform_Information
Short Name: platinfo
Type: compound
Child: Platform_Start_Date
Child: Platform_Sponsor
Child: Platform_Description
Child: Platform_Orbit
Child: Flight_Protocol
Parent: Platform_and_Mission_Information
Optionality: Optional
Repeatability: >=1
Definition: General information about the platform from which the data were taken.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Platform_Start_Date
Short Name: platstdt
Type: compound
Child: Single Date/Time
Parent: Platform_Information

Optionality: Mandatory
Repeatability: =1
Definition: Start date of platform operation.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Platform_Sponsor
Short Name: platspon
Type: text
Domain: free text
Parent: Platform_Information
Optionality: Optional
Repeatability: >=1
Definition: An organization responsible for building, launch, or operation of the platform, and its role.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Platform_Description
Short Name: platdesc
Type: text
Domain: free text
Parent: Platform_Information
Optionality: Optional
Repeatability: =1
Definition: Narrative description of the platform from which the data were taken.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Platform_Orbit
Short Name: platforb
Type: compound
Child: Ephemeris
Child: Keplerian_Orbit
Child: Nominal_Geostationary_Position
Parent: Platform_Information
Optionality: Optional
Repeatability: =1
Definition: Orbital parameters of instrument platform.
Rationale: Informs the user about potential spatial and temporal coverage of the data.
Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 98 revision

Extension_Information
Name: Ephemeris
Short Name: ephem
Type: compound
Child: Single_Date/Time
Parent: Platform_Orbit

Optionality: Mandatory
Repeatability: =1
Definition: Time at which nominal platform orbit or geostationary position is valid.
Rationale: Orbits precess and geostationary positions may vary over the life of a platform, and therefore the time of validity must be given.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Keplerian_Orbit
Short Name: kepleror
Type: compound
Child: Semimajor_Axis
Child: Orbit_Period
Child: Eccentricity
Child: Orbit_Angle_Units
Child: Inclination
Child: Right_Ascension_of_Ascending_Node
Child: Argument_of_Perigee
Child: Perigee_Passage_Time
Parent: Platform_Orbit
Optionality: Conditional - present and mandatory only if Nominal_Geostationary_Position is absent
Repeatability: =1
Definition: Nominal Keplerian elements of platform orbit.
Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 98 revision

Extension_Information
Name: Semimajor_Axis
Short Name: semimaax
Type: real
Domain: $6378.2 < \text{Semimajor axis} < 2.61 \times 10^5$
Parent: Keplerian_Orbit
Optionality: Conditional - mandatory if Orbit_Period is absent; otherwise optional
Repeatability: =1
Definition: Semimajor axis of platform orbit, in kilometers.
Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 98 revision

Extension_Information
Name: Orbit_Period
Short Name: orbitpd
Type: compound
Child: Orbit_Period_Units
Child: Orbit_Period_Value
Parent: Keplerian_Orbit
Optionality: Conditional - mandatory if Semimajor_Axis is absent; otherwise optional
Repeatability: =1
Definition: Time from one perigee to the next. *(Note: The orbit period is related to the semimajor axis of the orbit by $P^2=4p^2a^3/[G(M+m)]$, where P is the orbit period, a is the semimajor axis, G the universal gravitational constant, M the mass of the Earth, and m the mass of the satellite. In practice, because the product GM is*

easier to obtain than G or M, and because m<<M, the form $P^2=4p^2a^3/GM$ is often used.)

Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 98 revision

Extension_Information
Name: Orbit_Period_Units
Short Name: orpdunit
Type: text
Domain: "seconds" "minutes" "hours" "days" free text
Parent: Orbit_Period
Optionality: Mandatory
Repeatability: =1
Definition: Unit of measure used to express orbit period.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Orbit_Period_Value
Short Name: orpdval
Type: real
Domain: Orbit_Period_Value > 0.0
Parent: Orbit_Period
Optionality: Mandatory
Repeatability: =1
Definition: Time required for one platform orbit, in units given by Orbit_Period_Units.
Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 98 revision

Extension_Information
Name: Eccentricity
Short Name: eccentry
Type: real
Domain: 0.0 <= Eccentricity < 1.0
Parent: Keplerian_Orbit
Optionality: Mandatory
Repeatability: =1
Definition: Eccentricity of orbit, equal to $(1-b/a)^{1/2}$, where a is the length of the major axis and b is the length of the minor axis of the orbit.
Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 98 revision

Extension_Information
Name: Orbit_Angle_Units
Short Name: orbangun
Type: text
Domain: "degrees" "radians" free text
Parent: Keplerian_Orbit
Optionality: Mandatory
Repeatability: =1
Definition: Unit of measure used to express orbital angles.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Inclination
Short Name: inclinat
Type: real
Domain: 0.0 <= Inclination <= 180.0
Parent: Keplerian_Orbit
Optionality: Mandatory
Repeatability: =1
Definition: Angle between orbit and equator, in units given by Orbit_Angle_Units.
Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 98 revision

Extension_Information
Name: Right_Ascension_of_Ascending_Node
Short Name: raascnod
Type: real
Domain: 0.0 <= Right_Ascension_of_Ascending_Node < 360.0
Parent: Keplerian_Orbit
Optionality: Mandatory
Repeatability: =1
Definition: The right ascension (angle eastward from the vernal equinox) where the satellite orbit crosses the equator, moving northward, in units given by Orbit_Angle_Units.
Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 98 revision

Extension_Information
Name: Argument_of_Perigee
Short Name: argupgee
Type: real
Domain: 0.0 <= Argument_of_Perigee < 360.0
Parent: Keplerian_Orbit
Optionality: Mandatory
Repeatability: =1
Definition: The angle between the ascending node and perigee, measured from the ascending node in the direction of the platform's motion along the plane of the orbit, in units given by Orbit_Angle_Units.
Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 98 revision

Extension_Information
Name: Perigee_Passage_Time
Short Name: peripass
Type: compound
Child: Single Date/Time
Parent: Keplerian_Orbit
Optionality: Mandatory
Repeatability: =1
Definition: One date and time where platform was at closest point to earth in its orbit.
Source: EOS Handbook: NOAA Polar Orbiter Data Users Guide, Dec. 98 revision

Extension_Information
Name: Nominal_Geostationary_Position
Short Name: ngeopos

Type: compound
Child: Platform_Nominal_Longitude
Child: Platform_Nominal_Altitude
Parent: Platform_Orbit
Optionality: Conditional - present and mandatory only if Keplerian_Orbit is absent
Repeatability: =1
Definition: Nominal location of platform designed to remain stationary over one point on earth.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Platform_Nominal_Longitude
Short Name: pnomlong
Type: real
Domain: -180.0 < Platform_Nominal_Longitude <= 180.0
Parent: Nominal_Geostationary_Position
Optionality: Mandatory
Repeatability: =1
Definition: Nominal value for longitude of subsatellite point for geostationary satellite.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Platform_Nominal_Altitude
Short Name: gpnalti
Type: compound
Child: Platform_Nominal_Altitude_Units
Child: Platform_Nominal_Altitude_Value
Parent: Nominal_Geostationary_Position
Optionality: Mandatory
Repeatability: =1
Definition: Nominal altitude of geostationary satellite above the surface given by Altitude_Datum_Name defined in base standard.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Platform_Nominal_Altitude_Units
Short Name: gpnaltun
Type: compound
Child: Altitude_Distance_Units
Parent: Platform_Nominal_Altitude
Optionality: Mandatory
Repeatability: =1
Definition: Units of measure in which nominal altitude for platform is expressed.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Platform_Nominal_Altitude_Value
Short Name: gpnaltva
Type real
Domain: free real
Parent: Platform_Nominal_Altitude
Optionality: Mandatory
Repeatability: =1
Definition: Value for nominal altitude of platform, in units given by Platform_Nominal_Altitude_Units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Flight_Protocol
Short Name: fltprot
Type: compound
Child: Flying Height
Child: GPS_Information_System_Availability
Child: INS_Reading_Availability
Parent: Platform_Information
Optionality: Optional
Repeatability: =1
Definition: Description of circumstances and properties of the flight track relevant to use of the images and data.
Source: ISPRS WG II/4

Extension_Information
Name: Flying_Height
Short Name: flyhite
Type: real
Domain: Flying_Height > 0.0
Parent: Flight_Protocol
Optionality: Mandatory
Repeatability: =1
Definition: Height of platform above ground in meters, with an uncertainty of 10-100 meters.
Rationale: This value is used for planning purposes or photo interpretation.
Source: ISPRS/WG-II/4

Extension_Information
Name: GPS_Information_System_Availability
Short Name: gpsavail
Type: text
Domain: "available" "not available"
Parent: Flight Protocol
Optionality: Optional
Repeatability: =1
Definition: Availability of three-dimensional Global Positioning System (GPS) positions.
Source: ISPRS/WG-II/4

Extension_Information

Name: INS_Reading_Availability
Short Name: insavail
Type: text
Domain: "available" "not available"
Parent: Flight_Protocol
Optionality: Optional
Repeatability: =1
Definition: Availability of Inertial Navigation System (INS) readings along the flight line.
Source: ISPRS/WG-II/4

Instrument Information

Extension_Information
Name: Instrument_Information
Short Name: instinfo
Type: compound
Child: Instrument_Description
Child: Instrument_Reference
Parent: Metadata
Optionality: Mandatory-if-applicable
Repeatability: >=1
Definition: Instrument properties and behavior.
Rationale: The properties of the instrument must be known in order to interpret the readings as geographic information.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Instrument_Information =
[1{Instrument_Description}n |
1{Instrument_Reference}n |
1{Instrument_Description}n +
1{Instrument_Reference}n]

Instrument_Description =
Instrument_Type +
0{Operational_Mode}1 +
Collection_Type +
(Sensor_Orientation) +
[Frame_Camera|
Scan|Other_Collector_Description] +
(Instrument_Properties_Description)

Sensor_Orientation =
Axes +
(Rotation_Description) +
(Translation_Description)

Axes =
X_Axis_Definition +
Y_Axis_Definition +
Z_Axis_Definition

Frame_Camera =
(Frame_Hardware) +
Frame_Optics +
Frame_Geometric_Properties +
(Frame_Operation) +
(Frame_Radiometric_Properties) +
(Frame_Spectral_Properties)

Frame_Hardware =
(Camera_Type) +
(Camera_Identifier) +
(Lens) +
(Magazine_Identifier) +
(Film_Type) +
(Aerial_Film_Speed) +
(Effective_Aerial_Film_Speed) +
(Developing_Institution)

Lens =
Lens_Type +
Lens_Identifier

Developing_Institution =
Contact_Information *(see section 10 of base standard for production rules)*

Frame_Optics =
(Photographic_Resolving_Power) +
(Relative_Aperture) +
(Exposure_Time) +
Calibrated_Focal_Length +
(Quality_of_Focal_Length) +
(Last_Calibration)

Photographic_Resolving_Power =
Number_of_Resolution_Values +
1{Resolution_Value_Set}n +
(Area_Weighted_Average_Resolution)

Resolution_Value_Set =
Resolving_Angle +
Resolving_Value_Radial +
Resolving_Value_Tangential

Last_Calibration =
Date_of_Last_Calibration +
(Method_of_Last_Calibration) +
(Institution_of_Last_Calibration)

Frame_Geometric_Properties =
(Image_Size) +
[Fiducial |
Reseau |
Sensor_System] +
0{Principal_Point_of_Autocollimation}1 +
(Quality_of_Principal_Point_of_Autocollimation) +
(Principal_Point_of_Symmetry) +
(Quality_of_Principal_Point_of_Symmetry) +

(Fiducial_Center) +
(Sensor_Element_Location) +
0{Distortion}1

Image_Size =
Image_Size_x_Value +
Image_Size_y_Value

Fiducial =
Location_Information *(see separate section for production rules)*

Reseau =
Location_Information *(see separate section for production rules)*

Sensor_System =
Sensor_Grid +
Calibrated_Detector_Positions

Sensor_Grid =
Raster_Object_Type *(see section 3 for production rules)*

Calibrated_Detector_Positions =
Location_Information *(see separate section for production rules)*

Principal_Point_of_Autocollimation =
Location_Information *(see separate section for production rules)*

Quality_of_Principal_Point_of_Autocollimation =
Quality_of_Autocollimation_Principal_Point_x_Value +
Quality_of_Autocollimation_Principal_Point_y_Value

Principal_Point_of_Symmetry =
Location_Information *(see separate section for production rules)*

Quality_of_Principal_Point_of_Symmetry =
Quality_of_Symmetry_Principal_Point_x_Value +
Quality_of_Symmetry_Principal_Point_y_Value

Fiducial_Center =
Location_Information *(see separate section for production rules)*

Sensor_Element_Location =
Availability_of_Element_Locations +
(Source_of_Element_Locations)

Source_of_Element_Locations =
Citation_Information *(see section 8 of base standard for production rules)*

Distortion =
0{Distortion_Type_Radial_Symmetrical}1 +
(Distortion_Type_Radial_Asymmetrical) +
(Distortion_Type_Affine)

Distortion_Type_Radial_Symmetrical =
[Distance_Dependent_Distortion |
Angle_Dependent_Distortion |
Radial_Symmetrical_Distortion_Polynomial]

Distance_Dependent_Distortion =
Radial_Symmetrical_Distance_Interval +
Number_of_ Distance_Distortion_Values +
1{Distance_Distortion_Value}n

Angle_Dependent_Distortion =
Radial_Symmetrical_Angle_Interval +
Number_of_Angle_Distortion_Values +
1{Angle_Distortion_Value}n

Radial_Symmetrical_Distortion_Polynomial =
Polynomial_Function *(see section 5 for production rules)*

Distortion_Type_Radial_Asymmetrical =
Radial_Asymmetrical_Coefficient_B1 +
Radial_Asymmetrical_Coefficient_B2

Distortion_Type_Affine =
Affine_Distortion_X_Prime_Coefficient +
Affine_Distortion_Y_Prime_Coefficient

Frame_Operation =
(Stabilized_Mount) +
(Forward_Motion_Compensation)

Frame_Radiometric_Properties =
0{Frame_Radiometric_Calibration}1 +
(Light_Drop)

Frame_Radiometric_Calibration =
Data_Scaling_Information *(see Entity and Attribute Information for production rules)*

Frame_Spectral_Properties =
(Frame_Spectral_Information) +

(Filter_on_Camera) +
(Spectral_Limit)

Frame_Spectral_Information =
Spectral_Information *(see elsewhere in this section for production rules)*

Filter_on_Camera =
Filter_on_Camera_Indicator +
0{Filter_Type}1 +

Scan =
1{Scan_Geometric_Properties}n +
Sample_Properties +
Scan_Radiometric_Properties +
0{Scan_Spectral_Properties}1

Scan_Geometric_Properties =
Scan_Angle_Units +
Scan_Time_Units +
Scan_Distance_Units +
0{Scan_Cross_Track_Properties}1 +
0{Scan_Elevation_Properties}1 +
0{Profile_Properties}1 +
(Scan_Timing) +
Instantaneous_Field_of_View

Scan_Cross_Track_Properties =
Cross_Track_Zero +
[Cross_Track_Sweep |
Cross_Track_Fixed_Angle] +
(Cross_Track_Description)

Cross_Track_Zero =
Cross_Track_Axis +
Cross_Track_Direction

Cross_Track_Sweep =
Number_of_Cross_Track_Samples +
Cross_Track_Start_Angle +
[Cross_Track_Extent_Angle |
Cross_Track_Step_Angle]

Scan_Elevation_Properties =
Elevation_Zero +
[Elevation_Sweep |
Elevation_Fixed_Angle] +
(Elevation_Description)

Elevation_Zero =
Elevation_Axis +
Elevation_Direction

Elevation_Sweep =
Number_of_Elevation_Samples +
Elevation_Start_Angle +
[Elevation_Extent_Angle |
Elevation_Step_Angle]

Profile_Properties =
[Profile_Sounding |
Profile_Fixed] +
(Profile_Description)

Profile_Sounding =
Number_of_Profile_Samples +
Profiling_Direction +
Profile_Start +
[Profile_Extent |
Profile_Step]

Scan_Timing =
Scan_Start_Time +
[Scan_Duration |
Scan_Step_Time] +
Scan_Repeat_Time

Scan_Start_Time =
Single Date/Time *(see section 9 of base standard for production rules)*

Instantaneous_Field_of_View =
IFOV_Units +
IFOV_x_Definition +
IFOV_x_Value +
IFOV_y_Definition +
IFOV_y_Value

Sample_Properties =
Sample_Description_Units +
1{Pixel_Description}n

Sample_Description_Units =
0{Sample_Angle_Units}1 +
0{Sample_Profile_Units}1

Sample_Profile_Units =
Altitude_Distance_Units *(see Spatial_Reference_Information for production rules)*

Pixel_Description =
0{Pixel_Cross_Track_Size}1 +
0{Pixel_Elevation_Size}1 +
0{Pixel_Profile_Size}1 +
(Pixel_Height_Above_Ellipsoid) +
(Pixel_Point_Spread_Function)

Scan_Radiometric_Properties =
Data_Scaling_Information *(see Entity and Attribute Information for production rules)*

Scan_Spectral_Properties =
Spectral_Information

Spectral_Information =
Number_of_Wavelength_Bands +
1{Wavelength_Band_Properties}n

Number_of_Wavelength_Bands =
Number_of_Bands *(see section 1 for production rules)*

Wavelength_Band_Properties =
Wavelength_Units +
(Band_Boundary_Definition) +
Minimum_Wavelength +
Maximum_Wavelength +
(Peak_Wavelength) +
(Wavelength_Region) +
(Nominal_Spatial_Resolution) +
(Band_Quality) +
0{Polarization_Characteristics}n +
(Band_Description)

Nominal_Spatial_Resolution =
Spatial_Resolution_Units +
Spatial_Resolution_Value

Polarization_Characteristics =
Receiver_Polarization +
0{Sender_Polarization}1

Instrument_Reference =
Citation_Information *(see section 8 of base standard for production rules)*

Extension_Information
Name: Instrument_Description
Short Name: instdesc

Type: compound
Child: Instrument_Type
Child: Operational_Mode
Child: Collection_Type
Child: Sensor_Orientation
Child: Frame_Camera
Child: Scan
Child: Other_Collector_Description
Child: Instrument_Properties_Description
Parent: Instrument_Information
Optionality: Conditional - mandatory if no instances of Instrument_Reference present, otherwise optional
Repeatability: >=1
Definition: Characteristics and behavior of instrument.
Rationale: Descriptive information about the instrument may be in metadata accompanying the data.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Instrument_Type
Short Name: insttyp
Type: text
Domain: "imager" "sounder" free text
Parent: Instrument_Description
Optionality: Mandatory
Repeatability: =1
Definition: Class of data measuring instrument.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – Instrument Data Collection Type

Extension_Information
Name: Operational_Mode
Short Name: opmode
Type: text
Domain: "launch" "survival" "initialization" "safe" "diagnostic" "standby" "crosstrack" "biaxial" "solar calibration" free text
Parent: Instrument_Description
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: The way in which the instrument is functioning.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard

Extension_Information
Name: Collection_Type
Short Name: colltype
Type: text
Domain: "frame" "pushbroom" "whiskbroom" "panoramic" "radar" "laser" free text
Parent: Instrument_Description

Optionality: Mandatory
Repeatability: =1
Definition: The way in which the instrument gathers data from the scene observed.
Source: ISPRS/WG-II/4

Extension_Information
Name: Sensor_Orientation
Short Name: orininfo
Type: compound
Child: Axes
Child: Rotation_Description
Child: Translation_Description
Parent: Instrument_Description
Optionality: Optional
Repeatability: =1
Definition: Positioning and direction of instrument components on platform.
Rationale: This information is required in order to derive the direction of observation.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Axes
Short Name: axes
Type: compound
Child: X_Axis_Definition
Child: Y_Axis_Definition
Child: Z_Axis_Definition
Parent: Sensor_Orientation
Optionality: Mandatory
Repeatability: =1
Definition: Orientation of instrument axes.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: X_Axis_Definition
Short Name: xaxisdef
Type: text
Domain: "up" "down" "forward" "backward" "left" "right" "north" "south" "east" "west" free text
Parent: Axes
Optionality: Mandatory
Repeatability: =1
Definition: Direction of instrument x-axis.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Y_Axis_Definition
Short Name: yaxisdef

Type: text
Domain: "up" "down" "forward" "backward" "left" "right" "north" "south" "east" "west"
free text
Parent: Axes
Optionality: Mandatory
Repeatability: =1
Definition: Direction of instrument y-axis.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Z_Axis_Definition
Short Name: zaxisdef
Type: text
Domain: "up" "down" "forward" "backward" "left" "right" "north" "south" "east" "west"
free text
Parent: Axes
Optionality: Mandatory
Repeatability: =1
Definition: Direction of instrument z-axis.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Rotation_Description
Short Name: rotdesc
Type: text
Domain: free text
Parent: Sensor_Orientation
Optionality: Optional
Repeatability: =1
Definition: Description of direction of instrument components relative to platform axes.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Translation_Description
Short Name: trandesc
Type: text
Domain: free text
Parent: Sensor_Orientation
Optionality: Optional
Repeatability: =1
Definition: Description of position of instrument components relative to platform axes.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Frame_Camera
Short Name: frame

Type: compound
Child: Frame_Hardware
Child: Frame_Optics
Child: Frame_Geometric_Properties
Child: Frame_Operation
Child: Frame_Radiometric_Properties
Child: Frame_Spectral_Properties
Parent: Instrument_Description
Optionality: Conditional - present and mandatory if and only if Scan and Other_Collector_Description are absent
Repeatability: =1
Definition: Description of photographic system using a central perspective projection, with the detector, normally film, pressed against a calibrated frame during the exposure.
Source: ISPRS/WG-II/4

Extension_Information
Name: Frame_Hardware
Short Name: fcamhwar
Type: compound
Child: Camera_Type
Child: Camera_Identifier
Child: Lens
Child: Magazine_Identifier
Child: Film_Type
Child: Aerial_Film_Speed
Child: Effective_Aerial_Film_Speed
Child: Developing_Institution
Parent: Frame_Camera
Optionality: Optional
Repeatability: =1
Definition: Physical description of camera and film.
Source: ISPRS/WG-II/4

Extension_Information
Name: Camera_Type
Short Name: camtype
Type: text
Domain: "RMK 60/25" "RMK 30/23" "RMK 15/23“ "RMK 11.5/18" "RMK 15/23" "RMK 8.5/23" "RMK TOP 15" "RMK TOP 30" "MRB 30/2323" "MRB 21" "MRB 15/2323" "MRB 9/2323" "LMK" "LMK1000" "LMK1009" "LMK1015" "LMK1021" "LMK1030" "LMK2000" "LMK2009" "LMK2015" "LMK2021" "LMK2030" "RC 8" "RC 9" "RC 10" "RC 10A" "RC 20" "RC 30" free text *(RMK camera types are manufactured by Zeiss Oberkochen, MRB and LMK Camera types by Zeiss Jena, RC8-RC10A by Wild, RC20 by Leica, and RC30 by Leica/LH systems)*
Parent: Frame_Hardware
Optionality: Optional
Repeatability: =1
Definition: Model of camera as defined by manufacturer.
Source: ISPRS/WG-II/4

Extension_Information
Name: Camera_Identifier
Short Name: camident
Type: text
Domain: free text
Parent: Frame_Hardware
Optionality: Optional
Repeatability: =1
Definition: Manufacturer's unique alphanumeric code specifying the camera body.
Source: ISPRS/WG-II/4

Extension_Information
Name: Lens
Short Name: lens
Type: compound
Child: Lens_Type
Child: Lens_Identifier
Parent: Frame_Hardware
Optionality: Optional
Repeatability: =1
Definition: Optical component that uses refraction to focus light on the image plane.
Source: ISPRS/WG-II/4

Extension_Information
Name: Lens_Type
Short Name: lenstype
Type: text
Domain: "Topogon" "Telikon" "Topar" "Pleogon" "S-Pleogon" "Aviogon" "Wide Angle 15AG" "Orbigon" "Normal Aviogon" "Semi-wide-angle 21 NAG" "Semi-wide-angle 21 NAG II" "Semi-wide-angle 21-4 NAGA" "Semi-wide-angle NAGA-F" "Super Aviogon" "Super-wide-angle 8.8 SAG" "Super-wide-angle 8.8 SAG II" "Super-wide-angle 8.8/4 SAG-A" "Super-wide-angle 8.8/4 SAGA-F" "Aviotar 30At" "Aviotar 30AtI" "Aviotar 30/4 NAT" "Aviotar 30/4 NAT-A" "Aviotar 30/4 NATA-F" "Aviotar 30/4 NAT-S" "Universal Aviogon 15 UAG" "Universal Aviogon 15 UAGI" "Universal Aviogon 15 UAGII" "Universal Aviogon 15/4 UAG" "Universal Aviogon 15/4 UAG-A" "Universal Aviogon 15/4 UAGA-F" "Universal Aviogon 15/4 UAG-S" "Lamegor PI 5.6/300(A).B" "Lamegoron PI 5.6/210A "Lamegon PI 4/150(A,B,C),D" "Superlamegon PI 5.6/90 (A,B),C" "Metrogon" "Geocon" free text *(List items Topogon through S-Pleogon are manufactured by Zeiss, Aviogon through Orbigon by Wild, Normal Aviogon, all the Semi-wide-angle models, Super Aviogon, and all the Super-wide angle models by Wild/Leica, the Aviotar and Universal Aviogon models by Wild/Leica/LH Systems, and the Lamegor through SuperLamegon by Zeiss, the Metrogon by Bausch and Lomb, and the Geocon by Baker.)*
Parent: Lens
Optionality: Mandatory
Repeatability: =1
Definition: Manufacturer's name specifying design of lens.
Source: ISPRS/WG-II/4

Extension_Information
Name: Lens_Identifier
Short Name: lensidnt
Type: text
Domain: free text
Parent: Lens
Optionality: Mandatory
Repeatability: =1
Definition: Unique alphanumeric identifier assigned by camera manufacturer to individual lens.
Source: ISPRS/WG-II/4

Extension_Information
Name: Magazine_Identifier
Short Name: magident
Type: text
Domain: free text
Parent: Frame_Hardware
Optionality: Optional
Repeatability: =1
Definition: Unique alphanumeric identifier of individual magazine as assigned by manufacturer.
Source: ISPRS/WG-II/4

Extension_Information
Name: Film_Type
Short Name: filmtype
Type: text
Domain: free text
Parent: Frame_Hardware
Optionality: Optional
Repeatability: =1
Definition: Manufacturer's name and specification of film
Source: ISPRS/WG-II/4

Extension_Information
Name: Aerial_Film_Speed
Short Name: afspeed
Type: real
Domain: Aerial_Film_Speed > 0.0
Parent: Frame_Hardware
Optionality: Optional
Repeatability: =1
Definition: Two-thirds of the exposure in lux seconds at the point on the characteristic curve where the density is 0.3 above fog density, under processing conditions defined in ANSI PH2.34-1969.
Source: Albertz, J. and Kreiling, W. (1989): Photogrammetric Guide, Wichmann, Karlsruhe, ISPRS/WG-II/4.

Extension_Information
Name: Effective_Aerial_Film_Speed
Short Name: eafspeed
Type: real
Domain: Effective_Aerial_Film_Speed > 0.0
Parent: Frame_Hardware
Optionality: Optional
Repeatability: =1
Definition: Two-thirds of the exposure in lux seconds at the point on the characteristic curve where the density is 0.3 above fog density, under processing conditions other than those defined in ANSI PH2.34-1969 or determined empirically for color and infrared-sensitive films not covered by ANSI Standard PH 2.34-1969.
Source: Albertz, J. and Kreiling, W. (1989): Photogrammetric Guide, Wichmann, Karlsruhe, ISPRS/WG-II/4.

Extension_Information
Name: Developing_Institution
Short Name: develop
Type: compound
Child: Contact_Information
Parent: Frame_Hardware
Optionality: Optional
Repeatability: =1
Definition: Institution where the film was developed.
Source: ISPRS/WG-II/4

Extension_Information
Name: Frame_Optics
Short Name: fcamoptc
Type: compound
Child: Photographic_Resolving_Power
Child: Relative_Aperture
Child: Exposure_Time
Child: Calibrated_Focal_Length
Child: Quality_of_Focal_Length
Child: Last_Calibration
Parent: Frame_Camera
Optionality: Mandatory
Repeatability: =1
Definition: Physical description of the photographic system.
Source: ISPRS/WG-II/4

Extension_Information
Name: Photographic_Resolving_Power
Short Name: phorespo
Type: compound
Child: Number_of_Resolution_Values
Child: Resolution_Value_Set
Child: Area_Weighted_Average_Resolution
Parent: Frame_Optics

Optionality: Optional
Repeatability: =1
Definition: Resolving power of the camera at different field angles.
Source: ISPRS/WG-II/4

Extension_Information
Name: Number_of_Resolution_Values
Short Name: nresval
Type: integer
Domain: Number_of_Resolution_Values >= 1
Parent: Photographic_Resolving_Power
Optionality: Mandatory
Repeatability: =1
Definition: Number of angles at which values of resolving power are available.
Source: ISPRS/WG-II/4

Extension_Information
Name: Resolution_Value_Set
Short Name: phoreset
Type: compound
Child: Resolving_Angle
Child: Resolving_Value_Radial
Child: Resolving_Value_Tangential
Parent: Photographic_Resolving_Power
Optionality: Mandatory
Repeatability: >=1
Definition: Resolving power of the camera at different field angles.
Source: ISPRS/WG-II/4

Extension_Information
Name: Resolving_Angle
Short Name: resangle
Type: real
Domain: Resolving_Angle >= 0.0
Parent: Resolution_Value_Set
Optionality: Mandatory
Repeatability: =1
Definition: A field angle at which values of the resolving power are available.
Source: ISPRS/WG-II/4

Extension_Information
Name: Resolving_Value_Radial
Short Name: resrad
Type: real
Domain: Resolving_Value_Radial > 0.0
Parent: Resolution_Value_Set
Optionality: Mandatory
Repeatability: =1
Definition: Resolving power in radial direction, given in line pairs per millimeter.
Source: ISPRS/WG-II/4

Extension_Information
Name: Resolving_Value_Tangential
Short Name: restang
Type: real
Domain: Resolving_Value_Tangential > 0.0
Parent: Resolution_Value_Set
Optionality: Mandatory
Repeatability: =1
Definition: Resolving power in tangential direction, given in line pairs per millimeter.
Source: ISPRS/WG-II/4

Extension_Information
Name: Area_Weighted_Average_Resolution
Short Name: awar
Type: real
Domain: Area_Weighted_Average_Resolution > 0.0
Parent: Photographic_Resolving_Power
Optionality: Optional
Repeatability: =1
Definition: Area weighted average resolution, given in line pairs per millimeter.
Source: ISPRS/WG-II/4

Extension_Information
Name: Relative_Aperture
Short Name: relaper
Type: real
Domain: Relative_Aperture > 0.0
Parent: Frame_Optics
Optionality: Optional
Repeatability: =1
Definition: Ratio of focal length of camera to diameter of opening through which camera gathers light.
Source: ISPRS/WG-II/4

Extension_Information
Name: Exposure_Time
Short Name: expotime
Type: real
Domain: Exposure_Time > 0.0
Parent: Frame_Optics
Optionality: Optional
Repeatability: =1
Definition: Length of exposure, in seconds.
Source: ISPRS/WG-II/4

Extension_Information
Name: Calibrated_Focal_Length
Short Name: calfocl
Type: real
Domain: Calibrated_Focal_Length > 0.0

Parent: Frame_Optics
Optionality: Mandatory
Repeatability: =1
Definition: Approximate distance between the projection center and the image plane in millimeters, measured in the laboratory before launch.
Source: ISPRS/WG-II/4

Extension_Information
Name: Quality_of_Focal_Length
Short Name: quafocl
Type: real
Domain: Quality_of_Focal_Length > 0.0
Parent: Frame_Optics
Optionality: Optional
Repeatability: =1
Definition: The standard deviation in millimeters of the calibrated focal length.
Source: ISPRS/WG-II/4

Extension_Information
Name: Last_Calibration
Short Name: lastcali
Type: compound
Child: Date_of_Last_Calibration
Child: Method_of_Last_Calibration
Child: Institution_of_Last_Calibration
Parent: Frame_Optics
Optionality: Optional
Repeatability: =1
Definition: Description of most recent camera calibration.
Source: ISPRS/WG-II/4

Extension_Information
Name: Date_of_Last_Calibration
Short Name: datlcali
Type: date
Domain: free date
Parent: Last_Calibration
Optionality: Mandatory
Repeatability: =1
Definition: Date of most recent camera calibration.
Source: ISPRS/WG-II/4

Extension_Information
Name: Method_of_Last_Calibration
Short Name: metlcali
Type: text
Domain: "optical" "photographic"
Parent: Last_Calibration
Optionality: Optional
Repeatability: =1

Definition: Method of most recent camera calibration.
Source: ISPRS/WG-II/4

Extension_Information
Name: Institution_of_Last_Calibration
Short Name: inslcali
Type: text
Domain: free text
Parent: Last_Calibration
Optionality: Optional
Repeatability: =1
Definition: Institution that performed the camera calibration that occurred at Date_of_Last_Calibration.
Source: ISPRS/WG-II/4

Extension_Information
Name: Frame_Geometric_Properties
Short Name: framegeo
Type: compound
Child: Image_Size
Child: Fiducial
Child: Reseau
Child: Sensor_System
Child: Principal_Point_of_Autocollimation
Child: Quality_of_Principal_Point_of_Autocollimation
Child: Principal_Point_of_Symmetry
Child: Quality_of_Principal_Point_of_Symmetry
Child: Fiducial_Center
Child: Sensor_Element_Location
Child: Distortion
Parent: Frame_Camera
Optionality: Mandatory
Repeatability: =1
Definition: Geometric characteristics of instrument used to derive single frame images.
Source: ISPRS/WG-II/4

Extension_Information
Name: Image_Size
Short Name: imsize
Type: compound
Child: Image_Size_x_Value
Child: Image_Size_y_Value
Parent: Frame_Geometric_Properties
Optionality: Optional
Repeatability: =1
Definition: Metric length and width of the image.
Source: ISPRS/WG-II/4

Extension_Information
Name: Image_Size_x_Value

Short Name: imsizex
Type: real
Domain: Image_Size_x_Value > 0.0
Parent: Image_Size
Optionality: Mandatory
Repeatability: =1
Definition: Image size, in millimeters, in the direction of the x-axis.
Source: ISPRS/WG-II/4

Extension_Information
Name: Image_Size_y_Value
Short Name: imsizey
Type: real
Domain: Image_Size_y_Value > 0.0
Parent: Image_Size
Optionality: Mandatory
Repeatability: =1
Definition: Image size, in millimeters, in the direction of the y-axis.
Source: ISPRS/WG-II/4

Extension_Information
Name: Fiducial
Short Name: fcfid
Type: compound
Child: Location_Information
Parent: Frame_Geometric_Properties
Optionality: Conditional - present and mandatory if and only if Reseau and Sensor_System are absent
Repeatability: =1
Definition: Calibrated coordinates for four or more marks attached to the frame of the camera, in millimeters in the image coordinate system.
Source: ISPRS/WG-II/4

Extension_Information
Name: Reseau
Short Name: fcres
Type: compound
Child: Location_Information
Parent: Frame_Geometric_Properties
Optionality: Conditional - present and mandatory if and only if Fiducial and Sensor_System are absent
Repeatability: =1
Definition: Calibrated positions of engraved réseau-crosses that are pressed against the film during exposure, given in millimeters in the image coordinate system.
Source: ISPRS/WG-II/4

Extension_Information
Name: Sensor_System
Short Name: fcss
Type: compound

Child: Sensor_Grid
Child: Calibrated_Detector_Positions
Parent: Frame_Geometric_Properties
Optionality: Conditional - present and mandatory if and only if Fiducial and Reseau are absent
Repeatability: =1
Definition: Image coordinate system defined by the pixels of the scanner.
Source: ISPRS/WG-II/4

Extension_Information
Name: Sensor_Grid
Short Name: fcssgrid
Type: compound
Child: Raster_Object_Type
Parent: Sensor_System
Optionality: Mandatory
Repeatability: =1
Definition: Number of cells along axes of sensor grid.
Source: ISPRS/WG-II/4

Extension_Information
Name: Calibrated_Detector_Positions
Short Name: fcsscapo
Type: compound
Child: Location_Information
Parent: Sensor_System
Optionality: Mandatory
Repeatability: =1
Definition: Position of detectors in sensor grid coordinate system.
Source: ISPRS/WG-II/4

Extension_Information
Name: Principal_Point_of_Autocollimation
Short Name: pripoaut
Type: compound
Child: Location_Information
Parent: Frame_Geometric_Properties
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: The point (x_0', y_0') where the plumb line coming from the projection center crosses the image plane, given in millimeters in the image coordinate system, determined by projecting an illuminated object to infinity, reflecting its image from a flat mirror surface, and adjusting the instrument until both the object and image are in focus at the same plane.
Source: ISPRS/WG-II/4

Extension_Information
Name: Quality_of_Principal_Point_of_Autocollimation
Short Name: quappa
Type: compound

Child: Quality_of_Autocollimation_Principal_Point_x_Value
Child: Quality_of_Autocollimation_Principal_ Point_y_Value
Parent: Frame_Geometric_Properties
Optionality: Optional
Repeatability: =1
Definition: Uncertainty in the location of the principal point of autocollimation.
Source: ISPRS/WG-II/4

Extension_Information
Name: Quality_of_Autocollimation_Principal_Point_x_Value
Short Name: quappax
Type: real
Domain: Quality_of_Autocollimation_Principal_Point_x_Value >= 0.0
Parent: Quality_of_Principal_Point_of_Autocollimation
Optionality: Mandatory
Repeatability: =1
Definition: Standard deviation, in millimeters, of the x-position of the principal point of autocollimation.
Source: ISPRS/WG-II/4

Extension_Information
Name: Quality_of_Autocollimation_Principal_Point_y_Value
Short Name: quappay
Type: real
Domain: Quality_of_Autocollimation_Principal_Point_y_Value >= 0.0
Parent: Quality_of_Principal_Point_of_Autocollimation
Optionality: Mandatory
Repeatability: =1
Definition: Standard deviation, in millimeters, of the y-position of the principal point of autocollimation.
Source: ISPRS/WG-II/4

Extension_Information
Name: Principal_Point_of_Symmetry
Short Name: priposym
Type: compound
Child: Location_Information
Parent: Frame_Geometric_Properties
Optionality: Optional
Repeatability: =1
Definition: The coordinate of the center of the circles of equal distortion of the lens (x_s',y_s') in millimeters in the image coordinate system.
Source: ISPRS/WG-II/4

Extension_Information
Name: Quality_of_Principal_Point_of_Symmetry
Short Name: quapps
Type: compound
Child: Quality_of_Symmetry_Principal_Point_x_Value
Child: Quality_of_Symmetry_Principal_Point_y_Value

Parent: Frame_Geometric_Properties
Optionality: Optional
Repeatability: =1
Definition: Uncertainty in the location of the principal point of symmetry.
Source: ISPRS/WG-II/4

Extension_Information
Name: Quality_of_Symmetry_Principal_Point_x_Value
Short Name: quappsx
Type: real
Domain: Quality_of_Symmetry_Principal_Point_x_Value >= 0.0
Parent: Quality_of_Principal_Point_of_Symmetry
Optionality: Mandatory
Repeatability: =1
Definition: Standard deviation, in millimeters, of the x-position of the principal point of symmetry.
Source: ISPRS/WG-II/4

Extension_Information
Name: Quality_of_Symmetry_Principal_Point_y_Value
Short Name: quappsy
Type: real
Domain: Quality_of_Symmetry_Principal_Point_y_Value > 0.0
Parent: Quality_of_Principal_Point_of_Symmetry
Optionality: Mandatory
Repeatability: =1
Definition: Standard deviation, in millimeters, of the y-position of the principal point of symmetry.
Source: ISPRS/WG-II/4

Extension_Information
Name: Fiducial_Center
Short Name: fidcent
Type: compound
Child: Location_Information
Parent: Frame_Geometric_Properties
Optionality: Optional
Repeatability: =1
Definition: Coordinates in millimeters, in the image coordinate system, of center point where lines between the four or more fiducial marks meet.
Source: ISPRS/WG-II/4

Extension_Information
Name: Sensor_Element_Location
Short Name: sensello
Type: compound
Child: Availability_of_Element_Locations
Child: Source_of_Element_Locations
Parent: Frame_Geometric_Properties
Optionality: Optional

Repeatability: =1
Definition: Physical position of individual scanner pixels, in the image coordinate system.
Source: ISPRS/WG-II/4

Extension_Information
Name: Availability_of_Element_Locations
Short Name: senselav
Type: text
Domain: "available" "not available"
Parent: Sensor_Element_Location
Optionality: Mandatory
Repeatability: =1
Definition: Whether or not a reference providing sensor element location exists.
Source: ISPRS/WG-II/4

Extension_Information
Name: Source_of_Element_Locations
Short Name: senselso
Type: compound
Child: Citation_Information
Parent: Sensor_Element_Location
Optionality: Optional
Repeatability: =1
Definition: Citation for reference providing sensor element location information.
Source: ISPRS/WG-II/4

Extension_Information
Name: Distortion
Short Name: distort
Type: compound
Child: Distortion_Type_Radial_Symmetrical
Child: Distortion_Type_Radial_Asymmetrical
Child: Distortion_Type_Affine
Parent: Frame_Geometric_Properties
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Departure of positions in image from those in scene imaged.
Source: ISPRS/WG-II/4

Extension_Information
Name: Distortion_Type_Radial_Symmetrical
Short Name: dsttrs
Type: compound
Child: Distance_Dependent_Distortion
Child: Angle_Dependent_Distortion
Child: Radial_Symmetrical_Distortion_Polynomial
Parent: Distortion
Optionality: Mandatory-if-applicable
Repeatability: =1

Definition: The shift of an image point towards the center (negative values) or border (positive values) of the image.
Source: ISPRS/WG-II/4

Extension_Information
Name: Distance_Dependent_Distortion
Short Name: rsdisdis
Type: compound
Child: Radial_Symmetrical_Distance_Interval
Child: Number_of_Distance_Distortion_Values
Child: Distance_Distortion_Value
Parent: Distortion_Type_Radial_Symmetrical
Optionality: Conditional - present and mandatory if and only if Angle_Dependent_Distortion and Radial_Symmetrical_Distortion_Polynomial are absent
Repeatability: =1
Definition: Lens distortion values provided as a function of linear distance to the principal point of best symmetry.
Source: ISPRS/WG-II/4

Extension_Information
Name: Radial_Symmetrical_Distance_Interval
Short Name: rsdmdist
Type: real
Domain: Radial_Symmetrical_Distance_Interval > 0.0
Parent: Distance_Dependent_Distortion
Optionality: Mandatory
Repeatability: =1
Definition: Radial intervals at which distortion values are available, given in millimeters.
Source: ISPRS/WG-II/4

Extension_Information
Name: Number_of_Distance_Distortion_Values
Short Name: rsdnumv
Type: integer
Domain: Number_of_Distance_Distortion_Values > 0
Parent: Distance_Dependent_Distortion
Optionality: Mandatory
Repeatability: =1
Definition: Number of radial points at which distance-dependent distortion values are provided.
Source: ISPRS/WG-II/4

Extension_Information
Name: Distance_Distortion_Value
Short Name: rsddval
Type: real
Domain: free real
Parent: Distance_Dependent_Distortion
Optionality: Mandatory

Repeatability: =Number_of_Distance_Distortion_Values
Definition: Value of distortion at one of the radial distances specified by Radial_Distance_Interval, in micrometers.
Source: ISPRS/WG-II/4

Extension_Information
Name: Angle_Dependent_Distortion
Short Name: rsaddist
Type: compound
Child: Radial_Symmetrical_Angle_Interval
Child: Number_of_Angle_Distortion_Values
Child: Angle_Distortion_Value
Parent: Distortion_Type_Radial_Symmetrical
Optionality: Conditional - present and mandatory if and only if Distance_Dependent_Distortion and Radial_Symmetrical_Distortion_Polynomial are absent
Repeatability: =1
Definition: Lens distortion values provided as a function of the angle from the optical axis.
Source: ISPRS/WG-II/4

Extension_Information
Name: Radial_Symmetrical_Angle_Interval
Short Name: rsangint
Type: real
Domain: Radial_Symmetrical_Angle_Interval > 0.0
Parent: Angle_Dependent_Distortion
Optionality: Mandatory
Repeatability: =1
Definition: Interval in angle at which distortion values are available, given in degrees.
Source: ISPRS/WG-II/4

Extension_Information
Name: Number_of_Angle_Distortion_Values
Short Name: rsanumv
Type: integer
Domain: Number_of_Angle_Distortion_Values > 0
Parent: Angle_Dependent_Distortion
Optionality: Mandatory
Repeatability: =1
Definition: Number of distortion values supplied as a function of angle.
Source: ISPRS/WG-II/4

Extension_Information
Name: Angle_Distortion_Value
Short Name: rsadval
Type: real
Domain: free real
Parent: Angle_Dependent_Distortion
Optionality: Mandatory
Repeatability: =Number_of_Angle_Distortion_Values

Definition: Value of distortion at one of the angular distances specified by Radial_Symmetrical_Measurement_Angle, given in micrometers.
Source: ISPRS/WG-II/4

Extension_Information
Name: Radial_Symmetrical_Distortion_Polynomial
Short Name: rsdispol
Type: compound
Child: Polynomial_Function
Parent: Distortion_Type_Radial_Symmetrical
Optionality: Conditional - present and mandatory if and only if Distance_Dependent_Distortion and Angle_Dependent_Distortion are absent
Repeatability: =1
Definition: Lens distortion in micrometers that is a function of the distance to the principal point of best symmetry, presented in the form of an odd-power polynomial:
$\Delta r' = K_0 * r' + K_1 * r'^3 + K_2 * r'^5 + K_3 * r'^7 \ldots$
Source: Moffit, F., Mikhail, E. (1980): Photogrammetry, Harper & Row, Publishers, New York
Luhmann, T. (2000): Nahbereichsphotogrammetrie, Wichmann-Verlag, Heidelberg

Extension_Information
Name: Distortion_Type_Radial_Asymmetrical
Short Name: dsttrasy
Type: compound
Child: Radial_Asymmetrical_Coefficient_B1
Child: Radial_Asymmetrical_Coefficient_B2
Parent: Distortion
Optionality: Optional
Repeatability: =1
Definition: Distortion that can be expressed in the form
$\Delta x' = B_1 (r'^2 + 2x'^2) + 2B_2 * x' * y'$
$\Delta y' = B_2 (r'^2 + 2x'^2) + 2B_1 * x' * y'$
Source: Brown, D.C. (1971): Close-range camera calibration. Photogrammetric Engineering, 37(8), pp. 855-866
Luhmann, T. (2000): Nahbereichsphotogrammetrie, Wichmann-Verlag, Heidelberg

Extension_Information
Name: Radial_Asymmetrical_Coefficient_B1
Short Name: rab1
Type: real
Domain: free real
Parent: Distortion_Type_Radial_Asymmetrical
Optionality: Mandatory
Repeatability: =1
Definition: Value for B_1 to be used in the formula given in the definition of Distortion_Type_Radial_Asymmetrical.
Source: Brown, D.C. (1971): Close-range camera calibration. Photogrammetric Engineering, 37(8), pp. 855-866
Luhmann, T. (2000): Nahbereichsphotogrammetrie, Wichmann-Verlag, Heidelberg

Extension_Information
Name: Radial_Asymmetrical_Coefficient_B2
Short Name: rab2
Type: real
Domain: free real
Parent: Distortion_Type_Radial_Asymmetrical
Optionality: Mandatory
Repeatability: =1
Definition: Value to be used for B_2 in the formula given in the definition of Distortion_Type_Radial_Asymmetrical.
Source: Brown, D.C. (1971): Close-range camera calibration. Photogrammetric Engineering, 37(8), pp. 855-866
Luhmann, T. (2000): Nahbereichsphotogrammetrie, Wichmann-Verlag, Heidelberg

Extension_Information
Name: Distortion_Type_Affine
Short Name: dsttaf
Type: compound
Child: Affine_Distortion_X_Prime_Coefficient
Child: Affine_Distortion_Y_Prime_Coefficient
Parent: Distortion
Optionality: Optional
Repeatability: =1
Definition: Errors of the image coordinate system that can be described with an affine transformation of the following form:
$\Delta x' = C_1 * x' + C_2 * y'$
$\Delta y' = 0$
Source: Luhmann, T. (2000): Nahbereichsphotogrammetrie, Wichmann-Verlag, Heidelberg

Extension_Information
Name: Affine_Distortion_X_Prime_Coefficient
Short Name: affc1
Type: real
Domain: free real
Parent: Distortion_Type_Affine
Optionality: Mandatory
Repeatability: =1
Definition: Coefficient of x' term in the formula given in the definition of Distortion_Type_Affine.
Source: Luhmann, T. (2000): Nahbereichsphotogrammetrie, Wichmann-Verlag, Heidelberg

Extension_Information
Name: Affine_Distortion_Y_Prime_Coefficient
Short Name: affc2
Type: real
Domain: free real
Parent: Distortion_Type_Affine
Optionality: Mandatory
Repeatability: =1

Definition: Coefficient of y' term in the formula given in the definition of Distortion_Type_Affine.
Source: Luhmann, T. (2000): Nahbereichsphotogrammetrie, Wichmann-Verlag, Heidelberg

Extension_Information
Name: Frame_Operation
Short Name: fcoper
Type: compound
Child: Stabilized_Mount
Child: Forward_Motion_Compensation
Parent: Frame_Camera
Optionality: Optional
Repeatability: =1
Definition: Information describing the configuration or motion of the camera mounting.
Source: ISPRS/WG-II/4

Extension_Information
Name: Stabilized_Mount
Short Name: stabmnt
Type: text
Domain: "T_AS" "CCNS4" free text
Parent: Frame_Operation
Optionality: Optional
Repeatability: =1
Definition: Type of stabilized mount used during the photo flight.
Source: ISPRS/WG-II/4.

Extension_Information
Name: Forward_Motion_Compensation
Short Name: fmc
Type: text
Domain: "yes" "no"
Parent: Frame_Operation
Optionality: Optional
Repeatability: =1
Definition: Whether or not image is moved in flying direction during exposure in order to compensate image motion for ground speed.
Source: ISPRS/WG-II/4.

Extension_Information
Name: Frame_Radiometric_Properties
Short Name: fradprop
Type: compound
Child: Frame_Radiometric_Calibration
Child: Light_Drop
Parent: Frame_Camera
Optionality: Optional
Repeatability: =1
Definition: Information on the relation between radiation received and measured by a detector system.

Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Frame_Radiometric_Calibration
Short Name: fcradcal
Type: compound
Child: Data_Scaling_Information
Parent: Frame_Radiometric_Properties
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Transformation from units in which electronic detector measures to physical units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Light_Drop
Short Name: lightdrp
Type: real
Domain: 0.0 <= Light_Drop <= 100.0
Parent: Frame_Radiometric_Properties
Optionality: Optional
Repeatability: =1
Definition: The ratio of the light at the border of the image to that at the center, given as a percentage.
Source: ISPRS/WG-II/4

Extension_Information
Name: Frame_Spectral_Properties
Short Name: fcspecpr
Type: compound
Child: Frame_Spectral_Information
Child: Filter_on_Camera
Child: Spectral_Limit
Parent: Frame_Camera
Optionality: Optional
Repeatability: =1
Definition: Wavelength-dependent characteristics of system.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Frame_Spectral_Information
Short Name: fcspecin
Type: compound
Child: Spectral_Information
Parent: Frame_Spectral_Properties
Optionality: Optional
Repeatability: =1

Definition: Information about wavelength sensitivity of detector.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Filter_on_Camera
Short Name: filtonca
Type: compound
Child: Filter_on_Camera_Indicator
Child: Filter_Type
Parent: Frame_Spectral_Properties
Optionality: Optional
Repeatability: =1
Definition: Device placed in front of camera lens limiting the range of wavelengths that can pass through.
Source: ISPRS/WG-II/4

...Extension_Information
Name: Filter_on_Camera_Indicator
Short Name: filtcain
Type: text
Domain: "yes" "no"
Parent: Filter_on_Camera
Optionality: Mandatory
Repeatability: =1
Definition: Indicator as to whether or not there is a filter in front of the camera.
Source: ISPRS/WG-II/4

Extension_Information
Name: Filter_Type
Short Name: ftrtyp
Type: text
Domain: "CTO 1" "L453" "L477" "L510" "L599" "L731" "HF-3 (2B)" "No. 3(Aero 1)" "No. 8 (K2)" "No. 12 (Minus Blue)" "No. 15 (G)" "No. 25 (A)" "No. 89 B (IR)" "Sandwich Color" "Haze Filter" "Sandwich False Color" "Dark Yellow" "Light Red" "Infrared" "A2" "B" "D" "F" "H" "I" "K" free text
Parent: Filter_on_Camera
Optionality: Mandatory-if-applicable
Repeatability: =1
Manufacturers name for and/or description of filter used. *(Note: CTO-1 and L filters are all manufactured by AGFA Gevaert, HF-3 to 89 by Kodak Wratten, Sandwich Color to Infrared by Wild, and A2 to K by Carl Zeiss.)*
Source: Albertz, J., Kreiling, W. (1989): Photogrammetric Guide, Wichmann, Karlsruhe.

Extension_Information
Name: Spectral_Limit
Short Name: spectlim
Type: real
Domain: Spectral_Limit > 0.0
Parent: Frame_Spectral_Properties

Optionality: Optional
Repeatability: =1
Definition: Maximum wavelength, in nanometers, at which focus of lens is judged accurate, errors due to chromatic aberration being too large at longer wavelengths.
Source: ISPRS/WG-II/4

Extension_Information
Name: Scan
Short Name: scan
Type: compound
Child: Scan_Geometric_Properties
Child: Sample_Properties
Child: Scan_Radiometric_Properties
Child: Scan_Spectral_Properties
Parent: Instrument_Description
Optionality: Conditional - present and mandatory if and only if Frame_Camera and Other_Collector_Description are absent
Repeatability: =1
Definition: Properties of sensor whose detector view moves over the ground in a direction roughly perpendicular to the track of a moving point.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Scan_Geometric_Properties
Short Name: scangeom
Type: compound
Child: Scan_Angle_Units
Child: Scan_Time_Units
Child: Scan_Distance_Units
Child: Scan_Cross_Track_Properties
Child: Scan_Elevation_Properties
Child: Profile_Properties
Child: Scan_Timing
Child: Instantaneous_Field_of_View
Parent: Scan
Optionality: Mandatory
Repeatability: >=1
Definition: Spatial and temporal description of scan.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Scan_Angle_Units
Short Name: scanangu
Type: text
Domain: "degrees" "radians" "arcminutes" "arcseconds" free text
Parent: Scan_Geometric_Properties
Optionality: Mandatory
Repeatability: =1

Definition: Units in which angles are measured in scan description.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Scan_Time_Units
Short Name: scantimu
Type: text
Domain: "seconds" "minutes" " microseconds" free text
Parent: Scan_Geometric_Properties
Optionality: Mandatory
Repeatability: =1
Definition: Units in which time is measured in scan description.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Scan_Distance_Units
Short Name: scandisu
Type: text
Domain: "meters" "kilometers" free text
Parent: Scan_Geometric_Properties
Optionality: Mandatory
Repeatability: =1
Definition: Units in which distance is measured in scan description.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Scan_Cross_Track_Properties
Short Name: xtrkprop
Type: compound
Child: Cross_Track_Zero
Child: Cross_Track_Sweep
Child: Cross_Track_Fixed_Angle
Child: Cross_Track_Description
Parent: Scan_Geometric_Properties
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Description of data sampling in direction approximately perpendicular to track in horizontal direction.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Cross_Track_Zero
Short Name: xtkzero
Type: compound
Child: Cross_Track_Axis
Child: Cross_Track_Direction

Parent: Scan_Cross_Track_Properties
Optionality: Mandatory
Repeatability: =1
Definition: Direction relative to which cross-track angles are measured.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Cross_Track_Axis
Short Name: xtkaxis
Type: text
Domain: "x" "y" "z" free text
Parent: Cross_Track_Zero
Optionality: Mandatory
Repeatability: =1
Definition: Axis about which cross-track angles are measured.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Cross_Track_Direction
Short Name: xtkdir
Type: text
Domain: "positive" "negative"
Parent: Cross_Track_Zero
Optionality: Mandatory
Repeatability: =1
Definition: Direction on Cross_Track_Axis relative to which cross-track angles are measured.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Cross_Track_Sweep
Short Name: xtkswp
Type: compound
Child: Number_of_Cross_Track_Samples
Child: Cross_Track_Start_Angle
Child: Cross_Track_Extent_Angle
Child: Cross_Track_Step_Angle
Parent: Scan_Cross_Track_Properties
Optionality: Conditional - present and mandatory if and only if Cross_Track_Fixed_Angle is absent
Repeatability: =1
Definition: Description of angular properties of cross-track sweep.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Number_of_Cross_Track_Samples

Short Name: xtksamp
Type: integer
Domain: Number_of_Cross_Track_Samples > 0
Parent: Cross_Track_Sweep
Optionality: Mandatory
Repeatability: =1
Definition: Number of measurements in direction across the track in each scan.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Cross_Track_Start_Angle
Short Name: xtkstang
Type: real
Domain: free real
Parent: Cross_Track_Sweep
Optionality: Mandatory
Repeatability: =1
Definition: Angle of start of cross-track measurement from Cross_Track_Axis, in Scan_Angle_Units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Cross_Track_Extent_Angle
Short Name: xtkexang
Type: real
Domain: Cross_Track_Extent_Angle > 0.0
Parent: Cross_Track_Sweep
Optionality: Conditional - present and mandatory if and only if Cross_Track_Step_Angle is absent
Repeatability: =1
Definition: Angle between end and start of cross-track range.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Cross_Track_Step_Angle
Short Name: xtstpang
Type: real
Domain: Cross_Track_Step_Angle > 0.0
Parent: Cross_Track_Sweep
Optionality: Conditional - present and mandatory if and only if Cross_Track_Extent_Angle is absent
Repeatability: =1
Definition: Angle between cross-track steps, in Scan_Angle_Units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Cross_Track_Fixed_Angle
Short Name: xtfixang
Type: real
Domain: free real
Parent: Scan_Cross_Track_Properties
Optionality: Conditional - present and mandatory if and only if Cross_Track_Sweep is absent
Repeatability: =1
Definition: Constant angle relative to cross-track axis at which scanner is held while it scans in another direction.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Cross_Track_Description
Short Name: xtrkdesc
Type: text
Domain: free text
Parent: Scan_Cross_Track_Properties
Optionality: Optional
Repeatability: =1
Definition: Additional information about cross-track measurements, in text form.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Scan_Elevation_Properties
Short Name: elevprop
Type: compound
Child: Elevation_Zero
Child: Elevation_Sweep
Child: Elevation_Fixed_Angle
Child: Elevation_Description
Parent: Scan_Geometric_Properties
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Description of data sampling in direction approximately perpendicular to track and cross-track sweep direction.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Elevation_Zero
Short Name: elevzero
Type: compound
Child: Elevation_Axis
Child: Elevation_Direction
Parent: Scan_Elevation_Properties
Optionality: Mandatory

Repeatability: =1
Definition: Direction relative to which elevation angles are measured.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Elevation_Axis
Short Name: elevaxis
Type: text
Domain: "x" "y" "z" free text
Parent: Elevation_Zero
Optionality: Mandatory
Repeatability: =1
Definition: Axis about which elevation angles are measured.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Elevation_Direction
Short Name: elevdir
Type: text
Domain: "positive" "negative"
Parent: Elevation_Zero
Optionality: Mandatory
Repeatability: =1
Definition: Direction on Elevation_Axis relative to which elevation angles are measured.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Elevation_Sweep
Short Name: elevswp
Type: compound
Child: Number_of_Elevation_Samples
Child: Elevation_Start_Angle
Child: Elevation_Extent_Angle
Child: Elevation_Step_Angle
Parent: Scan_Elevation_Properties
Optionality: Conditional - present and mandatory if and only if Elevation_Fixed_Angle is absent
Repeatability: =1
Definition: Description of angular properties of elevation sweep.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Number_of_Elevation_Samples
Short Name: elevsamp
Type: integer
Domain: Number_of_Elevation_Samples > 0

Parent: Elevation_Sweep
Optionality: Mandatory
Repeatability: =1
Definition: Number of measurements in direction across the track in each scan.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Elevation_Start_Angle
Short Name: elestang
Type: real
Domain: free real
Parent: Elevation_Sweep
Optionality: Mandatory
Repeatability: =1
Definition: Angle of start of elevation measurement from Elevation_Axis, in Scan_Angle_Units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Elevation_Extent_Angle
Short Name: eleexang
Type: real
Domain: Elevation_Extent_Angle > 0.0
Parent: Elevation_Sweep
Optionality: Conditional - present and mandatory if and only if Elevation_Step_Angle is absent
Repeatability: =1
Definition: Angle between end and start of elevation range.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Elevation_Step_Angle
Short Name: elstpang
Type: real
Domain: Elevation_Step_Angle > 0.0
Parent: Elevation_Sweep
Optionality: Conditional - present and mandatory if and only if Elevation_Extent_Angle is absent
Repeatability: =1
Definition: Angle between elevation steps, in Scan_Angle_Units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Elevation_Fixed_Angle
Short Name: elfixang
Type: real

Domain: free real
Parent: Scan_Elevation_Properties
Optionality: Conditional - present and mandatory if and only if Elevation_Sweep is absent
Repeatability: =1
Definition: Constant angle relative to elevation axis at which scanner is held while it scans in another direction.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Elevation_Description
Short Name: elevdesc
Type: text
Domain: free text
Parent: Scan_Elevation_Properties
Optionality: Optional
Repeatability: =1
Definition: Additional information about elevation measurements, in text form.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Profile_Properties
Short Name: profprop
Type: compound
Child: Profile_Sounding
Child: Profile_Fixed
Child: Profile_Description
Parent: Scan_Geometric_Properties
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Description of data sampling in vertical direction.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Profile_Sounding
Short Name: profsond
Type: compound
Child: Number_of_Profile_Samples
Child: Profiling_Direction
Child: Profile_Start
Child: Profile_Extent
Child: Profile_Step
Parent: Profile_Properties
Optionality: Conditional - present and mandatory if and only if Profile_Fixed is absent
Repeatability: =1
Definition: Description of process of profile sampling.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Number_of_Profile_Samples
Short Name: profsamp
Type: integer
Domain: Number_of_Profile_Samples > 0
Parent: Profile_Sounding
Optionality: Mandatory
Repeatability: =1
Definition: Number of heights at which measurements are made.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Profiling_Direction
Short Name: profdir
Type: text
Domain: "upward" "downward"
Parent: Profile_Sounding
Optionality: Mandatory
Repeatability: =1
Definition: Direction of sequence of heights at which profile measurements are made.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Profile_Start
Short Name: profst
Type: real
Domain: Profile_Start > 0.0
Parent: Profile_Sounding
Optionality: Mandatory
Repeatability: =1
Definition: Height of start of profile measurements.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Profile_Extent
Short Name: profext
Type: real
Domain: Profile_Extent > 0.0
Parent: Profile_Sounding
Optionality: Conditional - present and mandatory if and only if Profile_Step is absent
Repeatability: =1
Definition: Distance between end and start of profile range, in Scan_Distance_Units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Profile_Step

Short Name: profstep
Type: real
Domain: Profile_Step > 0.0
Parent: Profile_Sounding
Optionality: Conditional - present and mandatory if and only if Profile_Extent is absent
Repeatability: =1
Definition: Distance between profile steps, in Scan_Distance_Units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Profile_Fixed
Short Name: proffix
Type: real
Domain: Profile_Fixed > 0.0
Parent: Profile_Properties
Optionality: Conditional - present and mandatory if and only if Profile_Sounding is absent
Repeatability: =1
Definition: Fixed profile level at which scanning is taking place.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Profile_Description
Short Name: profdesc
Type: text
Domain: free text
Parent: Profile_Properties
Optionality: Optional
Repeatability: =1
Definition: Additional information about profile measurements, in text form.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Scan_Timing
Short Name: scantime
Type: compound
Child: Scan_Start_Time
Child: Scan_Duration
Child: Scan_Step_Time
Child: Scan_Repeat_Time
Parent: Scan_Geometric_Properties
Optionality: Optional
Repeatability: =1
Definition: Schedule for scans.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Scan_Start_Time
Short Name: scanstart
Type: compound
Child: Single Date/Time
Parent: Scan_Timing
Optionality: Mandatory
Repeatability: =1
Definition: Time at start of scan.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Scan_Duration
Short Name: scandur
Type: real
Domain: Scan_Duration > 0.0
Parent: Scan_Timing
Optionality: Conditional - present and mandatory if and only if Scan_Step_Time is absent
Repeatability: =1
Definition: Duration of a single scan, in Scan_Time_Units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Scan_Step_Time
Short Name: scanstept
Type: real
Domain: Scan_Step_Time > 0.0
Parent: Scan_Timing
Optionality: Conditional - present and mandatory if and only if Scan_Duration is absent
Repeatability: =1
Definition: Time for one step in scan, in Scan_Time_Units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Scan_Repeat_Time
Short Name: scanrptt
Type: real
Domain: Scan_Repeat_Time > 0.0
Parent: Scan_Timing
Optionality: Mandatory
Repeatability: =1
Definition: Time between the start of one scan and the next, in Scan_Time_Units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Instantaneous_Field_of_View

Short Name: ifov
Type: compound
Child: IFOV_Units
Child: IFOV_x_Definition
Child: IFOV_x_Value
Child: IFOV_y_Definition
Child: IFOV_y_Value
Parent: Scan_Geometric_Properties
Optionality: Mandatory
Repeatability: =1
Definition: Ground or target area viewed by a sensor at a given time.
Source: NASA's Goddard Space Flight Center Earth Sciences Distributed Active Archive Center Ozone Glossary

Extension_Information
Name: IFOV_Units
Short Name: ifovunit
Type: text
Domain: "meters" "degrees" "milliradians" free text
Parent: Instantaneous_Field_of_View
Optionality: Mandatory
Repeatability: =1
Definition: Units in which value of instantaneous field of view is expressed.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Editor

Extension_Information
Name: IFOV_x_Definition
Short Name: ifovxdef
Type: text
Domain: "cross track" "along scan" "frame" free text
Parent: Instantaneous_Field_of_View
Optionality: Mandatory
Repeatability: =1
Definition: Definition of x direction in instantaneous field of view.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Editor

Extension_Information
Name: IFOV_x_Value
Short Name: ifovxval
Type: real
Domain: IFOV_x_Value > 0.0
Parent: Instantaneous_Field_of_View
Optionality: Mandatory
Repeatability: =1
Definition: Size of instantaneous field of view, in direction defined by IFOV_x_Definition, in units given by IFOV_Units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Editor

Extension_Information
Name: IFOV_y_Definition

Short Name: ifovydef
Type: text
Domain: "along track" "cross scan" free text
Parent: Instantaneous_Field_of_View
Optionality: Mandatory
Repeatability: =1
Definition: Definition of y direction in instantaneous field of view.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Editor

Extension_Information
Name: IFOV_y_Value
Short Name: ifovyval
Type: real
Domain: IFOV_y_Value > 0.0
Parent: Instantaneous_Field_of_View
Optionality: Mandatory
Repeatability: =1
Definition: Size of instantaneous field of view, in direction defined by IFOV_y_Definition, in units given by IFOV_Units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Editor

Extension_Information
Name: Sample_Properties
Short Name: sampprop
Type: compound
Child: Sample_Description_Units
Child: Pixel_Description
Parent: Scan
Optionality: Mandatory
Repeatability: =1
Definition: Description of sensor pixel properties.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Sample_Description_Units
Short Name: sampdesu
Type: compound
Child: Sample_Angle_Units
Child: Sample_Profile_Units
Parent: Sample_Properties
Optionality: Mandatory
Repeatability: =1
Definition: Units in which pixel properties are provided.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Sample_Angle_Units
Short Name: sampangu

Type: text
Domain: "degrees" "radians" "arcminutes" "arcseconds" free text
Parent: Sample_Description_Units
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Units in which angles are measured in pixel description.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Sample_Profile_Units
Short Name: samprofu
Type: compound
Child: Altitude_Distance_Units
Parent: Sample_Description_Units
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Units used to measure profile heights and distances.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Pixel_Description
Short Name: pixldesc
Type: compound
Child: Pixel_Cross_Track_Size
Child: Pixel_Elevation_Size
Child: Pixel_Profile_Size
Child: Pixel_Height_Above_Ellipsoid
Child: Pixel_Point_Spread_Function
Parent: Sample_Properties
Optionality: Mandatory
Repeatability: >=1
Definition: Description of angular dimensions and location of scanner picture cell.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Pixel_Cross_Track_Size
Short Name: pixxtksz
Type: real
Domain: Pixel_Cross_Track_Size > 0.0
Parent: Pixel_Description
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Angular extent of pixel in cross-track direction, in units specified in Sample_Angle_Units.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – Detector FOV Resolution

Extension_Information
Name: Pixel_Elevation_Size
Short Name pixelvsz
Type: real
Domain: Pixel_Elevation_Size > 0.0
Parent: Pixel_Description
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Size of pixel in elevation direction, in units specified in Sample_Angle_Units.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard –Detector FOV Resolution

Extension_Information
Name: Pixel_Profile_Size
Short Name: pixprfsz
Type: real
Domain: Pixel_Profile_Size > 0.0
Parent: Pixel_Description
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Size of pixel in profile direction, in units specified in Sample_Profile_Units.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – Detector FOV Resolution

Extension_Information
Name: Pixel_Height_Above_Ellipsoid
Short Name: pixelhgt
Type: real
Domain: Pixel_Height_Above_Ellipsoid > 0.0
Parent: Pixel_Description
Optionality: Optional
Repeatability: =1
Definition: Height of pixel above ellipsoid defined as part of spatial representation information, in units specified in Sample_Profile_Units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Pixel_Point_Spread_Function
Short Name: pixelpsf
Type: text
Domain: free text
Parent: Pixel_Description
Optionality: Optional
Repeatability: =1
Definition: Pixel image distribution that would be produced by a single point.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Scan_Radiometric_Properties
Short Name: sradprop
Type: compound
Child: Data_Scaling_Information
Parent: Scan
Optionality: Mandatory
Repeatability: =1
Definition: Function used to convert quantity in detector units to physical units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Scan_Spectral_Properties
Short Name: scspprop
Type: compound
Child: Spectral_Information
Parent: Scan
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Design specifications for wavelength-dependent scanner properties.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Spectral_Information
Short Name: specinfo
Type: compound
Child: Number_of_Wavelength_Bands
Child: Wavelength_Band_Properties
Parent: Scan_Spectral_Properties
Optionality: Mandatory
Repeatability: =1
Definition: Wavelength-dependent properties of optical systems.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Number_of_Wavelength_Bands
Short Name: nowvband
Type: compound
Child: Number_of_Bands
Parent: Spectral_Information
Optionality: Mandatory
Repeatability: =1
Definition: Number of separate wavelength ranges at which system measures.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Wavelength_Band_Properties
Short Name: wvbandpr
Type: compound
Child: Wavelength_Units
Child: Band_Boundary_Definition
Child: Minimum_Wavelength
Child: Maximum_Wavelength
Child: Peak_Wavelength
Child: Wavelength_Region
Child: Nominal_Spatial_Resolution
Child: Band_Quality
Child: Polarization_Characteristics
Child: Band_Description
Parent: Spectral_Information
Optionality: Mandatory
Repeatability: >=1
Definition: Design specifications for properties of an individual wavelength range.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Wavelength_Units
Short Name: waveunit
Type: text
Domain: "m" "cm" "mm" "µm" "nm" free text
Parent: Wavelength_Band_Properties
Optionality: Mandatory
Repeatability: =1
Definition: Units in which band wavelengths are expressed.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Band_Boundary_Definition
Short Name: bbnddef
Type: text
Domain: "3db" "half maximum" "50 %" "1/e" "equivalent width" free text
Parent: Wavelength_Band_Properties
Optionality: Optional
Repeatability: =1
Definition: Designation of criterion for defining maximum and minimum wavelengths for a spectral band.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Minimum_Wavelength
Short Name: lambdmin
Type: real

Domain: Minimum_Wavelength > 0.0
Parent: Wavelength_Band_Properties
Optionality: Mandatory
Repeatability: =1
Definition: Minimum wavelength boundary of the spectral range of the band using the criterion in Band_Boundary_Definition, in units specified by Wavelength_Units.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS Channel Spectrum Start

Extension_Information
Name: Maximum_Wavelength
Short Name: lambdmax
Type: real
Domain: Maximum_Wavelength >= Minimum_Wavelength
Parent: Wavelength_Band_Properties
Optionality: Mandatory
Repeatability: =1
Definition: Maximum wavelength boundary of the spectral range of the band using the criterion in Band_Boundary_Definition, in units specified by Wavelength_Units.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS Channel Spectrum End

Extension_Information
Name: Peak_Wavelength
Short Name: pkwavlen
Type: real
Domain: Minimum_Wavelength <= Peak_Wavelength <= Maximum_Wavelength
Parent: Wavelength_Band_Properties
Optionality: Optional
Repeatability: =1
Definition: Wavelength of maximum sensitivity within the band, in units specified by Wavelength_Units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Wavelength_Region
Short Name: wavlreg
Type: text
Domain: "ultraviolet" "visible" "infrared" "microwave" "radio" free text
Parent: Wavelength_Band_Properties
Optionality: Optional
Repeatability: =1
Definition: Wavelength of maximum sensitivity within the band, in units specified by Wavelength_Units.
Source: FGDC/SWG Remote Sensing Metadata Extensions Editing Committee

Extension_Information
Name: Nominal_Spatial_Resolution
Short Name: nomspres

Type: compound
Child: Spatial_Resolution_Units
Child: Spatial_Resolution_Value
Parent: Wavelength_Band_Properties
Optionality: Optional
Repeatability: =1
Definition: Smallest distance between which separate points can be distinguished, as specified in instrument design.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Spatial_Resolution_Units
Short Name: spatresu
Type: text
Domain: "meters" "kilometers" "degrees" free text
Parent: Nominal_Spatial_Resolution
Optionality: Mandatory
Repeatability: =1
Definition: Units in which spatial resolution is expressed.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Spatial_Resolution_Value
Short Name: spatresv
Type: real
Domain: Spatial_Resolution_Value > 0.0
Parent: Nominal_Spatial_Resolution
Optionality: Mandatory
Repeatability: =1
Definition: Quantitative measure of designed instrument spatial resolution, in units given by Spatial_Resolution_Units.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Band_Quality
Short Name: bandqual
Type: text
Domain: free text
Parent: Wavelength_Band_Properties
Optionality: Optional
Repeatability: =1
Definition: Description of state of band, including degree of degradation and impact on resolution and measurement accuracy.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS Channel Quality

Extension_Information
Name: Polarization_Characteristics
Short Name: polrzcha
Type: compound
Child: Receiver_Polarization
Child: Sender_Polarization
Parent: Wavelength_Band_Properties
Optionality: Mandatory-if-applicable
Repeatability: >=1
Definition: Degree of polarization of band.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Receiver_Polarization
Short Name: revrpolr
Type: text
Domain: "horizontal" "vertical" "left circular" "right circular" free text
Parent: Polarization_ Characteristics
Optionality: Mandatory
Repeatability: =1
Definition: Polarization direction that a receiver is designed to accept.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Sender_Polarization
Short Name: sendpolr
Type: text
Domain: "horizontal" "vertical" "left circular" "right circular" free text
Parent: Polarization_Characteristics
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Polarization of radiation emitted as part of a measurement system.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Band_Description
Short Name: banddesc
Type: text
Domain: free text
Parent: Wavelength_Band_Properties
Optionality: Optional
Repeatability: =1
Definition: Additional descriptive material about band properties.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Other_Collector_Description
Short Name: othcolde
Type: text
Domain: free text
Parent: Instrument_Description
Optionality: Conditional - present and mandatory if and only if Frame_Camera and Scan are absent
Repeatability: =1
Definition: Description of properties of data collection system other than frame camera or whiskbroom scanner.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Instrument_Properties_Description
Short Name: instpdes
Type: text
Domain: free text
Parent: Instrument_Description
Optionality: Optional
Repeatability: =1
Definition: Textual information on instrument properties, in areas not otherwise specified in this standard.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Instrument_Reference
Short Name: instref
Type: compound
Child: Citation_Information
Parent: Instrument_Information
Optionality: Conditional - mandatory if no instances of Instrument_ Description present, otherwise optional
Repeatability: >=1
Definition: Reference providing description of instrument properties and behavior.
Rationale: Descriptive information about the instrument may be in a document separate from the data.
Source: Hughes Applied Information Systems (1994) Proposed ECS Core Metadata Standard – DSS Guide Instrument Information

Location Information

Extension_Information
Name: Location_Information
Short Name: locainfo
Type: compound
Child: Number_of_Points
Child: Coordinate_System
Child: Coordinate_XY_Units
Child: Coordinate_Z_Units
Child: Coordinate_Point
Parent: *Called by many elements throughout the document.*
Optionality: *Specified by referencing element.*
Repeatability: *Specified by referencing element.*
Definition: Information about the location of a set of one or more points. (*Note: this section provides a means of describing position in a coordinate system relevant to the calling element and is used by other sections of the metadata extensions. This section is never used alone. It differs from the Spatial Reference Information in that it provides positions in a coordinate system relevant to metadata elements, whereas the Spatial Reference Information refers only to positions at which the data are located.*)
Rationale: There are numerous metadata elements that consist of one or more coordinate points. Since the concept appears so frequently, creating one standard compound element is preferable to repeating the same structure at many points throughout the standard.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Location_Information =
Number_of_Points +
0{Coordinate_System}1 +
0{Coordinate_XY_Units}1 +
(Coordinate_Z_Units) +
1{Coordinate_Point}n

Coordinate_System =
[Unreferenced_Coordinate_System|
Referenced_Coordinate_System]

Referenced_Coordinate_System =
Spatial_Reference_Information *(see section 4 of base standard for production rules)*

Coordinate_Point =
Coordinate_x_Value +
Coordinate_y_Value +
0{Coordinate_z_Value}1

Extension_Information
Name: Number_of_Points
Short Name: numpoint
Type: integer
Domain: Number_of_Points > 0
Parent: Location_Information
Optionality: Mandatory
Repeatability: =1
Definition: Number of coordinate positions.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Coordinate_System
Short Name: coordsys
Type: compound
Child: Unreferenced_Coordinate_System
Child: Referenced_Coordinate_System
Parent: Location_Information
Optionality: Conditional - present and mandatory if and only if not defined in referencing element
Repeatability: =1
Definition: Definition of axes of coordinate system in which location of positions is provided.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Unreferenced_Coordinate_System
Short Name: unrefsys
Type: text
Domain: free text
Parent: Coordinate_System
Optionality: conditional - present and mandatory if and only if Referenced_Coordinate_System is not present
Repeatability: =1
Definition: Coordinate system which is not georeferenced and for which georeferencing information is unavailable or irrelevant.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Referenced_Coordinate_System
Short Name: refsys
Type: compound
Child: Spatial_Reference_Information
Parent: Coordinate_System
Optionality: conditional - present and mandatory if and only if Unreferenced_Coordinate_System is not present
Repeatability: =1

Definition: Coordinate system that can be georeferenced..
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Coordinate_XY_Units
Short Name: coordxyu
Type: text
Domain: "micrometers" "millimeters" "meters" "kilometers" free text
Parent: Location_Information
Optionality: Conditional - present and mandatory if and only if the coordinates correspond to physical dimensions and are not specified elsewhere.
Repeatability: =1
Definition: Physical dimension corresponding to value of unity in x and y coordinate directions as defined in Coordinate_System or referencing element, where the coordinates correspond to physical dimensions.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Coordinate_Z_Units
Short Name: coordzu
Type: text
Domain: "meters" "feet" "millibars" free text
Parent: Location_Information
Optionality: Optional
Repeatability: =1
Definition: Physical dimension corresponding to value of unity in z coordinate directions Coordinate_System or referencing element, where the coordinates correspond to physical dimensions.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Coordinate_Point
Short Name: coordpt
Type: compound
Child: Coordinate_x_Value
Child: Coordinate_y_Value
Child: Coordinate_z_Value
Parent: Location_Information
Optionality: Mandatory
Repeatability: =Number_of_Points
Definition: Location of a coordinate point described by the referencing element.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Coordinate_x_Value
Short Name: coorxval

Type: real
Domain: free real
Parent: Coordinate_Point
Optionality: Mandatory
Repeatability: =1
Definition: Location of point along x-axis.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Coordinate_y_Value
Short Name: cooryval
Type: real
Domain: free real
Parent: Coordinate_Point
Optionality: Mandatory
Repeatability: =1
Definition: Location of point along y-axis.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

Extension_Information
Name: Coordinate_z_Value
Short Name: coorzval
Type: real
Domain: free real
Parent: Coordinate_Point
Optionality: Mandatory-if-applicable
Repeatability: =1
Definition: Location of point along z-axis.
Source: FGDC/SWG Imagery Subgroup Remote Sensing Metadata Extensions Development Team

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Appendix A - NASA Data Product Levels (informative)

This set of Data Product Levels, defined by NASA (1999) ranges from Level 0 to Level 4. Level 0 data products are raw instrument data at full instrument resolution. At higher levels, raw instrument data are converted into more usable parameters and formats that are of interest to the users. At Level 4, parameters are further refined through the use of models. The levels of data are shown below.

Level 0
Level 0 data products are reconstructed, unprocessed instrument/payload data at full resolution; any and all communications artifacts, e.g. synchronization frames, communications headers, duplicate data removed.

Level 1A
Level 1A data products are reconstructed, unprocessed instrument data at full resolution, time-referenced and annotated with ancillary information, including radiometric and geometric calibration coefficients and georeferencing parameters, e.g., platform ephemeris. Ancillary information is computed and appended but not applied to the Level 0 data.

Level 1B
Level 1B data products are Level 1A data that have been processed to sensor units. Not all instruments will have data equivalent to Level 1B.

Level 2
Level 2 data products are derived geophysical variables at the same resolution and locations as the Level 1 source data.

Level 3
Level 3 data products are variables mapped on uniform space-time grid scales, usually with some completeness and consistency.

Level 4
Level 4 data products are model output or results from analyses of lower level data, e.g. variables derived from multiple measurements.

Appendix B - NOAA Data Product Levels (informative)

This set of Data Product Levels, defined by NOAA, ranges from Level 0 to Level 1b. Level 0 data products are unprocessed telemetry data. At the higher levels, the raw instrument data are time sequenced, and time-referenced ancillary data are added.

Level 0
Level 0 data products are unprocessed telemetry data as received from the observing platform excluding communications artifacts introduced by the ground system.

Level 1a
Level 1a data products are telemetry data that have been extracted but not decommutated from Level 0 and formatted into time-sequenced datasets for easier processing. The Level 1a formats are NOAA's internal formats and are only used for NOAA processing. They only exist briefly for the purpose of creating the Level 1b datasets. Levels 2-4 are the same as NASA levels 2-4.

Level 1b
Level 1b data products are discrete, instrument-specific datasets derived from Level 1a containing unprocessed data at full resolution, time-referenced, and annotated with ancillary information including data quality indicators, calibration coefficients and georeferencing parameters.

Level 2
Level 2 data products are derived geophysical variables at the same resolution and locations as the Level 1 source data.

Level 3
Level 3 data products are variables mapped on uniform space-time grid scales, usually with some completeness and consistency.

Level 4
Level 4 data products are model output or results from analyses of lower level data, e.g. variables derived from multiple measurements.
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Appendix C - ISPRS Data Product Levels (informative)

This set of Data Product Levels, defined by ISPRS, ranges from Level 0 to Level 4. As with the NASA data levels, Level 0 data products are raw instrument data at full instrument resolution, and data products at higher levels contain more usable parameters and formats that are of interest to the users. The highest ISPRS product level corresponds to a geographically located orthophoto.

Level 0
Level 0 describes the original or raw data coming from the sensor without any georeferencing or sensor information.

Level 1
Level 1 contains information that allows determination of the location of the image on the raster grid system. It does not contain any geolocation information

Level 2
Ancillary information is computed and appended but not applied to the Level 0 data.

Level 3
Level 3 describes image data which were originally acquired by a line sensor and which have been processed to a common plane. This generates a readily visible image similar to an image taken by a frame camera

Level 4
Level 4 describes processed image data that are directly related to the object coordinate system (orthophoto)

Alternative Level Structure

The alternative levels are only based on geometric properties. Geophysical variables and results from analyses using the same geometry create a sublevel only
(level 2c = level 3 in "Level-Structure").

Alternative Level	Above explained Level
Level 0	Level 0
Level 1	Level 1
Level 2a	Level 2a
Level 2b	Level 2b
Level 2c	Level 3
Level 3	Level 4

Appendix D - Index of Definitions of Extended Elements (informative)