METRIC

MIL-PRF-32466A
SUPERSEDING
MIL-PRF-32466
26 June 2013

PERFORMANCE SPECIFICATION

SYSTEM SPECIFICATION FOR ENHANCED CONTROLLED IMAGE BASE (ECIB)

This specification is approved for use by all Departments and Agencies of the Department of Defense.

Comments, suggestions, or questions on this document should be addressed to the National Geospatial-Intelligence Agency (NGA), ATTN: Departmental Standardization Officer, 3838 Vogel Road, Arnold, MO 63010-6238, Mail Stop L18, or by e-mail to DepSO@nga.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil.

AMSC N/A AREA GINT

1. SCOPE

1.1 Scope. This specification provides requirements for the preparation and use of the National Geospatial-Intelligence Agency's (NGA) Enhanced Controlled Image Base (ECIB). ECIB files are physically formatted within a National Imagery Transmission Format 2.1 (NITF 2.1) file (MIL-STD-2500C).

1.2 Purpose. The purpose of this document is to specify the data format and characteristics of ECIB for producers and users.

1.3 Resolution. The Enhanced Controlled Image Base product can be produced at multiple resolutions. The most common resolutions are 0.5, 1, and 5 meter. ECIB will also allow for the option of non-standard or native resolution (e.g. airborne sources).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are referenced in sections 3, 4, 5, or 6 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, 5 or 6 of this specification whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

INTERNATIONAL STANDARDIZATION AGREEMENTS

STANAG 2211 — Geodetic Datums, Projections, Grids and Grid References.

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-A-89007 — ARC Digitized Raster Graphics (ADRG)

MIL-PRF-32283 – Enhanced Compressed Raster Graphic (ECRG)

MIL-PRF-89041A - Controlled Image Base (CIB)

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-2411 – Interface Standard Raster Product Format

MIL-STD-2411-1 – Interface Standard Registered Data Values for Raster Product Format

MIL-STD-2414 – Bar Coding for Geospatial Products

MIL-STD-2500C – National Imagery Transmission Format Version 2.1

MIL-STD-600001 Mapping, Charting, and Geodesy Accuracy

(Copies of these documents are available online at http://quicksearch.dla.mil/)[1]

The Digital Geographic Information Exchange Standard (DIGEST), Edition 2.1 September 2000.

(Copies of this publication are available at: https://www.dgiwg.org/digest/index.htm)[1]

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

STDI-0002-1_4.0 – The Compendium of Controlled Extensions for The National Imagery Format (NITF) volume 1, Tagged Record Extensions (TRE)

[1] Links in this document are only valid as of the document's publication date.

NGA.STND.0036_1.0.0_WGS84 - World Geodetic System 84

NGA.STND.0037_2.0_GRIDS - Datums, Ellipsoids, Grids, and Grid Reference Systems

(Copies of these publications are available online from the National System for Geospatial Intelligence (NSG) Standards Registry at https://nsgreg.nga.mil/)

N-0205/98 NITFS Standards Compliance and Interoperability Test & Evaluation Program Plan

(Copies of this publication are available online from the National Geospatial-Intelligence Agency, NITF Technical Board (NTB) at http://www.gwg.nga.mil/ntb/baseline/docs/n010598/)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents are those cited in the solicitation or contract.

ANSI/IEEE Std. 754-2008 — IEEE Standard for Binary Floating Point Arithmetic

ANSI/IEEE 1003.1 — Portable Operating System Interface for Computer Environments (POSIX)

(Copies of these publications are available from the American National Standards Institute (ANSI) at http://webstore.ansi.org/ansidocstore)

ISO 9660:1988 — Information Processing, Volume and File Structure of Optical Data Discs (CD-ROM) for Information Interchange.

ISO/IEC 10149:1995 — Information Technology — Data Interchange on Read-Only 120 mm CD-ROM

ISO/IEC 16448:2002 — Information Technology — 120 mm DVD – Read-only disk

ISO/IEC 13346 Parts 1-5 — Volume and File Structure of Write-Once and Rewriteable Media Using Nonsequential Recording (NSR) for Information Interchange

ISO/IEC 15444-1:2004 — Information Technology - JPEG 2000 image coding system: core coding system

(Copies of these publications are available from the International Organization for Standardization (ISO) at http://www.iso.org/iso/en/prods-services/ISOstore/store.html)

BPJ2K01.10 — ISO/IEC BIIF Profile for JPEG2000, Version 01.10

(Copies of this publication are available online from the National Geospatial-Intelligence Agency, NITF Technical Board NTB) at www.gwg.nga.mil/ntb/baseline/documents.html

ESRI Shapefile Technical Description – An ESRI White Paper – July 1998

(Copies of this publication are available from Adobe at http://www.esri.com/library/whitepapers/pdfs/shapefile.pdf)

Extensible Markup Language (XML) 1.0 (Third Edition)

(Copies of this publication are available at http://www.w3.org/TR/2004/REC-xml-20040204/)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. In order to minimize potential conflicts within this document and associated references the document was validated using the 5-step Standards Validation testing approach as set forth in section 2.0 of NITFS Standards Compliance and Interoperability Test and Evaluation Program Plan, N-0105/98. Following the procedures set forth in N-0105/98 will provide a high degree of confidence that the document is technically correct, consistent, complete, testable and implementable, prior to fielding by developers.

3. REQUIREMENTS

3.1 First article. The sample shall be inspected and approved under appropriate provisions of the production contract. The contracting officer shall specify the appropriate type of first article and the number of units to be furnished.

The contracting officer shall also include arrangements for selection, inspection, and approval of the first article.

3.2 Horizontal Accuracy.

a. The horizontal accuracy of ECIB data depends on the accuracy of the imagery support data of the sensor capturing the image source from which the ECIB was derived and the accuracy of the digital elevation model (DEM) used to orthorectify the image. The horizontal accuracy attribute within the ECIB frame file defines the accuracy for each areal extent. Each Areal extent is defined as a singular image and DEM extent.

b. The absolute horizontal accuracy is listed in the AAH field of the ACCHZB extension for the particular image source utilized in production. The relative horizontal accuracy is listed in the APH field of the ACCHZB extension. Accuracies shall be determined relative to a 90% Circular Map Accuracy. The accuracy error attributable to compressing the ECIB data contributes insignificantly to the total accuracy of the product.

3.3 Vertical Accuracy. Vertical Accuracy is not applicable to this product specification.

3.4 Resolution. The spatial resolution of the ECIB data depends on the spatial resolution of the image source from which the product is derived and any processing steps which affect the resolution or GSD. Note that in this specification, the terms "GSD" and "resolution" are used interchangeably. The spatial resolution of the ECIB product shall be produced based on source data and customer requirements.

3.5 Horizontal Datum. The horizontal datum for ECIB shall be WGS-84, as defined by the NSG Standard.

3.6 Product Description. The ECIB products shall conform to this specification. The processing of ECIB includes Joint Photographic Experts Group (JPEG) 2000 compression. ECIB images may be Red-Green-Blue (RGB) or panchromatic. Images will be processed into an ECIB product with a specified resolution which will be reflected in the NGA Reference Number (NRN) for the product. Individual ECIB products are uniquely referenced by the exchange media that was associated with the original data delivery from the producer. An individual ECIB product may consist of a single 1 degree by 1 degree cell, multiple 1 degree by 1 degree cells, or a quarter cell (1 quadrant of a 1 degree

cell). The product will be sized in accordance with the allowable space on the exchange media or as defined in the *Product Specific Guidance*. An ECIB Volume is defined to be the content that resides on one physical exchange media. The terms product and volume may be used interchangeably. Therefore multiple products may not reside on an exchange media, and a product may not span multiple volumes.

3.7 ECIB Exchange media and recording formats. The primary exchange media shall be Digital Versatile Disc (DVD) or Blu-Ray discs. In addition, the products may be distributed on the NGA Joint Worldwide Intelligence Communication System (JWICS), Secret Internet Protocol Router Network (SIPRNet), and Non-classified Internet Protocol Router Network (NIPRNet), among other current and future media. Many of the current media standards, listed in Table I, and recording format standards for these media are as specified in this document.

TABLE I. ECIB media standards

Interchange Media	Recording Standard	Volume/File Structure
DVD		UDF v1.5
Blu-Ray		UDF v1.5
NIPRNet		FTP/HTTP
SIPRNet		FTP/HTTP
JWICS		FTP/HTTP

3.7.1 Source Imagery.

a. ECIB will be produced directly from source images and reformatted into an ECIB frame file structure. ECIB files will be physically formatted within the NITF product.

b. Each ECIB exchange volume contains compressed, transformed images from multiple source images. The source data for ECIB production are digital satellite images processed to a standard spatial resolution.

c. Applicable ancillary information (e.g., image source, accuracy) included with the source image at the time of ECIB production are included in the NITF metadata of the [frame file]

and shapefile attributes. Source imagery data that are more recent than the current version of a frame file or contain data that are of higher quality (e.g., less cloud cover, <=30° off nadir) are candidates for ECIB update data.

3.7.2 Projection system. The Equal Arc-Second Raster Chart (ARC) system, as described in MIL-A-89007, divides the surface of the earth ellipsoid into 18 latitudinal bands called zones. Zones 1-9 cover the Northern hemisphere and zones 10-18 (labeled A through J, exclusive of I) cover the Southern hemisphere. One zone in each hemisphere covers the polar areas. Each non-polar zone covers a part of the ellipsoid between two latitude limits and completely encircles the Earth. The nominal zone limits for ECIB are listed below in Table II. The extents of the ECIB zone overlaps are defined in Tables A-VI, A-VII, and A-VIII of Appendix A.

TABLE II. ECIB zone limits

Zone Number	Equatorward Latitude	Midpoint Latitude	Poleward Latitude
1,A	0°	22.94791772°	32°
2,B	32°	41.12682127°	48°
3,C	48°	52.28859923°	56°
4,D	56°	60.32378942°	64°
5,E	64°	66.09421768°	68°
6,F	68°	70.10896259°	72°
7,G	72°	74.13230145°	76°
8,H	76°	78.17283750°	80°
9,J	80°	———	90°

3.7.3 Distribution frames. The ECIB database is composed of rectangular grids of frames of pixels for each zone and can be distributed with contiguous or non-contiguous coverage. Each frame is represented by a discrete file.

3.7.4 Imagery seams. ECIB is designed to be seamless. Seamless is generally interpreted to allow a "shear" of one pixel or less of horizontal displacement. One pixel of shear is desirable, but often not attainable without significant manual effort. Therefore this is not to be interpreted as an absolute requirement. Actual allowable shear in an ECIB will be determined by separate production guidance. Source images are indistinguishable except where shear and/or shifts in pixel values occur as a result of inconsistencies in source imagery collection parameters (e.g., gain values set differently, images

collected on different dates.) Processing of the source imagery into ECIB will include a brightness and/or contrast adjustment in order to minimize such differences; however, it typically will not be possible to eliminate all visual differences between mosaicked images. ECIB image data from adjacent frames abut exactly to provide unbroken coverage. However, gaps in coverage may occur as a result of incomplete source image data. In the case where source imagery is extremely dark or light (e.g., contains features that are unrecognizable), data will be enhanced such that contrast will be heightened over large areas and features are recognizable without further enhancement by the user. No artificial seams (i.e., along geocell or frame boundaries) will be introduced to data during processing from source to final ECIB product except in the case along the degree boundary where an adequate DEM is not available for the adjacent cell. In addition ECIB volumes should be radiometrically balances with adjacent volumes such that contrast is minimized without degrading the product frames. At a minimum, ECIB producers should present their approach to both radiometric balancing and contrast enhancement for review before production begins.

3.7.5 Data file organization. ECIB data files are arranged in a hierarchical directory/subdirectory structure (see Figures 1 and 2). The ECIB directories and data files, enumerated below, are fully described in paragraphs 3.7.5.a through 3.7.5.f. Any computer system that can access distribution media conforming to the standards listed in Table I should be able to access ECIB data.

a. Root Directory: Enhanced Product Format (EPF) directory is the root. EPF directory contains [table of contents file], one or more directories of [frame file]s. The root directory shall be named “EPF”.

```
(Level 0) EPF [EPF root directory] (unordered)
(Level 1) TOC.xml [table of contents file]
(Level 1) SHAPEFILE [shapefiles directory]
(Level 2) [shapefiles] (1, ... many)
(Level 1) [frame directory] (1, ... many)
(Level 2) [frame file] (1, ... many)
```

FIGURE 1. ECIB directory and file structure

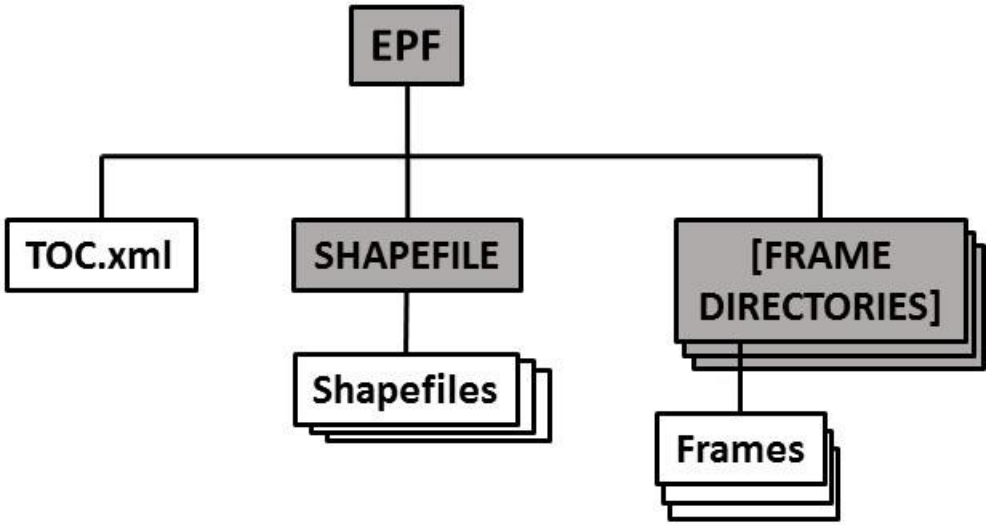

FIGURE 2. Pictorial representation of ECIB directory and file structure

b. [table of contents file]: The [table of contents file] provides an overview of the data contents of the distribution media. The Table of Contents (TOC) will be in an XML format and will contain a header specification, frame list, and media metadata. The details of the TOC are provided in section C.2.3.1.

c. [SHAPEFILE directory]: Contains the shapefiles pertaining to the ECIB products on the media.

d. [Shapefile files]: The Environmental Systems Research Institute (ESRI) shapefile is a required component of the ECIB product. ECIB shapefile polygons convey the extents of all included frames, source imagery used in the orthorectification process. The shapefile attributes will list all source images used in the production of the frames: the production date, image dates, absolute and relative horizontal accuracy of the frame, the GSD, and the name of the collecting sensor. Shapefile format is defined in section C.2.3.2.

e. [frame file directory]s: ECIB will contain from 1 to n [frame file directory]s for a given product. If the product contains frame files for a single 1 degree by 1 degree cell, there will be one frame file directory containing all frame files, and the directory name will be the integer southwest corner coordinate of the 1 degree cell in accordance with the first seven characters of the ID in Section 3.19.b. If there are multiple 1 degree cells within the product, there will be

one frame file directory for each 1 degree cell, each containing the frame files that are within the 1 degree cell boundary. No product will cross arc zones. Each of the frame file directory names shall be based upon the integer southwest corner coordinate of the particular 1 degree cell in accordance with the first seven characters of the Product Item ID in Section 3.19.b. If the product consists of a single cell, there will be one frame file directory containing all frame files, and the directory name will be the integer southwest corner coordinate of the 1 degree cell in accordance with the first seven characters of the Product Item ID in Section 3.19.b, and appended with the extent code [A,B,C,D] associated with the quadrant as stated in Section 3.19.b.

f. [frame file]s: The [frame file]s contain the image and support data for the geographic frames on an ECIB product. Particular details of some of the contents of the frame file are described in section C.2.1 (ECIB NITF 2.1 File Structure). The frame file naming convention shall be in accordance with this specification, and is described in section A.2.6.1 (Frame naming convention).

3.8 Frame structure.

3.8.1 Pixel spacing for ECIB. In the nonpolar zones, pixel spacing is the nominal ground sample distance (GSD) of the orthorectified source images in both the east-west and north-south directions on the WGS-84 ellipsoid. In the polar zones, pixel spacing is the minimal GSD of the orthorectified source images in both X and Y axes of the polar stereographic projection.

a. Within a non polar zone, pixel spacing is fixed in units of arc-seconds of latitude per pixel and arc-seconds of longitude per pixel.

b. The numbers of ECIB pixels in both latitudinal and longitudinal directions shall be adjusted so that there are integral numbers of frames per zone. In the polar zone, the number of ECIB pixels is adjusted so that there is an even number of frames across the zone in each dimension.

3.8.2 Frame Description.

a. Each frame shall comprise a rectangular array of 2304 by 2304 pixels (5,308,416 pixels). For other resolutions, the frame size will need to be calculated with the equations provided in Appendix A. ECIB frames will not be tiled into subframes, but a virtual grid of 6 by 6 virtual subframes is used only for mathematical purposes in this specification (36 virtual subframes). Each virtual subframe shall comprise a rectangular array of 384 by 384 output pixels (147,456 pixels). For other resolutions, K (virtual subframe size) will need to be calculated with the equations provided in Appendix A.

b. All frames within a zone shall abut in a mutually exclusive manner without any pixel overlap or pixel redundancy, except as noted in section 3.7.4 (Imagery seams). The distance between a pixel that falls on a frame border and its neighbor in the adjacent frame shall equal the GSD for the product. The northern and southern boundaries of a zone generally will not fall exactly on the northern and southern boundaries of a frame. There shall be frame overlap between the zones, as defined in Appendix A.

c. For 5.0 meter, 1.0 meter and 0.5 meter ECIB products (2304 x 2304 pixels), Appendix A lists the number of frame rows and columns in each zone for the latitudinal and longitudinal directions, East-West pixel spacing constants (i.e., the number of pixels for 360° longitude), North-South pixel spacing constants (i.e., number of pixels in 90° from equator to pole. These are examples, values for other ECIB resolutions may be generated by following the same computations.

d. The midpoint latitude for each zone shall be the same as for the ADRG ARC-zone schematic (see 3.7.2, Table II, ECIB zone limits).

3.8.3 Numbering and origin conventions.

a. All index numbers shall start from 0. The origin for the pixel numbering within frames shall be from the upper left corner. Pixels shall be counted in row-major order from the origin. Appendix A provides a set of coordinate conversions between row/column coordinate of a pixel within a frame, and the latitude and longitude of the corresponding point, based on the coordinate information provided within each frame.

b. In addition, ECIB frames may be considered to form conceptual “rows” and “columns” within zones. Section A.2.6 (Frame conventions) uses this concept to define the naming convention of frames for various resolutions by using the resolution and zone specific "frame number”. The rows and columns are numbered from 0. The origin for counting non-polar frame rows and columns in both the northern and southern hemispheres is the southernmost latitude of the zone, and 180° west longitude, with columns counted in an easterly direction from that origin. The origin for counting polar frames is the lower-left corner of the polar zone, with rows and columns numbered from that origin. Section A.2 (Coordinate Transformations) provides the coordinate conversions for points within a frame file.

3.8.4 Non-polar frame overlap.

a. The longitudinal and latitudinal extents of the zones in the southern hemisphere are identical to those in the northern hemisphere.

b. Rows of frames from different zones do not have the same longitudinal extent since the longitudinal pixel intervals differ.

c. For each non-polar zone N, the top-most frame row of that zone corresponds (in latitude) with the bottom-most frame row of zone N+1 (as depicted in

d. FIGURE **3,** ECIB zone boundary overlap structure). Thus the frames at the top and bottom rows of each zone shall overlap frames of those zones above and below. In each ARC zone, the lower-left pixel in lower-left frame is edge-aligned with the ARC system origin.

3.8.5 Frame structure for polar regions. The ECIB frame structure is unique in the polar regions. ECIB shall use a polar stereographic projection, in which meridians (constant longitude) are plotted as radii emanating from the poles, and parallels (constant latitude) are plotted as concentric circles that are centered at the poles.

a. The north and south polar zones, 9 and J, are depicted in FIGURE 4 and 5, respectively. These zones are circular with the pole at the center and the radius being the distance from the pole to approximately 80° (north or south) latitude. The polar frame structure is square. The center frame is positioned with the pole in the exact center of that frame and the sides of

the frame making right angles with the 0°, 90°E, 180°W, and 90°W meridians. The origin for polar zone frame rows and columns is the lower-left corner of the zone. Polar ECIB frames are not all oriented along the north-south and east-west directions. Further detail on the frame structure and orientation is provided in section A.3.

b. The pixel coordinate system for polar zones is centered at the pole. Polar zone pixels are transformed from (<X>, <Y>) pixel row and column coordinates to latitude and longitude (ϕ, λ) coordinates, as described in section A.2.4 (Polar latitude and longitude of an ECIB frame pixel). Pixel resolutions and sizes are not constant in a left-right or up-down direction. The number of pixels in the polar zone is adjusted so that there are an even number of virtual subframes centered about the poles. There are an odd number of frames with symmetry about the pole. Section A.3 provides calculations to compute average frame pixel resolutions.

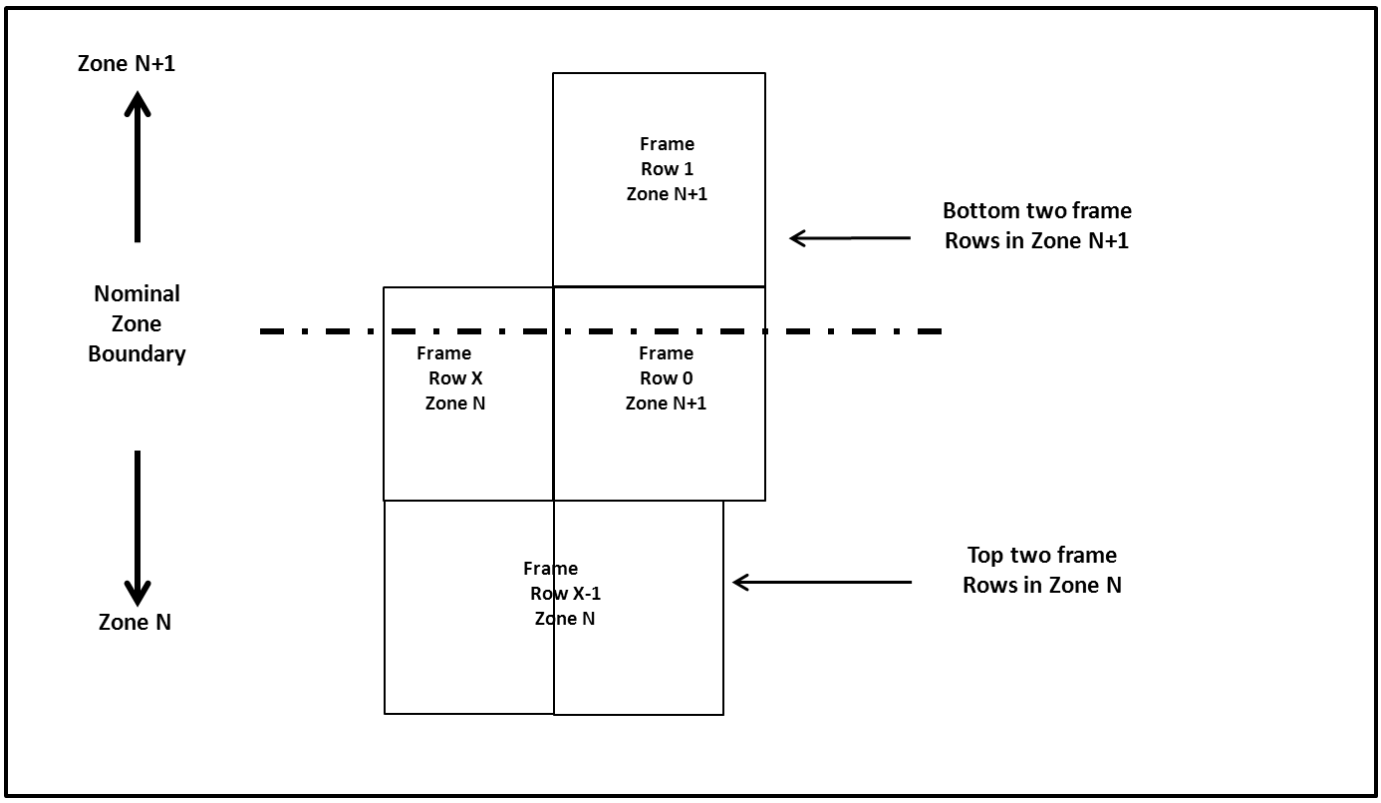

FIGURE 3. ECIB zone boundary overlap structure

3.8.6 Polar Zone Overlap. Zones 8 and H extend nominally to 80°. The overlap provided into the polar zones shall consist

of the one row of frames that "straddle" the 80° parallel. Polar data will extend to and include the row of frames that straddle the 80° parallel.

3.9 Coordinate reference systems.

3.9.1 Non-polar coordinates. Coordinates for row and column pixels in the non-polar zones are proportional to WGS-84 latitude and longitude of features under the Equirectangular projection (as defined in *Map Projections—A Working Manual*, page 90). The coordinate conversions for the non-polar case are in sections A.2.2 and A.2.3.

3.9.2 Polar coordinates. Pixel coordinates in the polar zones are proportional to rectangular coordinates of the Azimuthal Equidistant projection, polar aspect, spherical form (as defined in *Map Projections—A Working Manual*, page 191). The coordinate conversions for the polar case are provided in sections A.2.4 and A.2.5.

3.9.3 WGS-84 coordinates. The WGS-84 coordinates for longitude and latitude in ECIB are signed values in the range -180° <= longitude <= +180° and -90° <= latitude <= +90°.

3.10 Project Distortion. A nominal GSD is given for the various ECIB products. In order to view the earth ellipsoid as a flat surface, it must be projected to a flat plane. This can be accomplished using a projection which uses localized values in which frames could not be seamlessly joined. In ECIB, the ARC projection was chosen for use for several reasons including (1) it provides a way to project the earth such that it is seamless within zones, (2) the ARC system is used by CADRG, ECRG, and CIB® data, which allows applications to more easily utilize the data types, and (3) the ARC projection system retains a high accuracy and causes minimal visual distortion.

3.10.1 Non-polar distortion. For the nonpolar zones, some minor visual distortion is present due to a stretch (at the poleward latitude) and shrink (at equatorward latitude) in the east-west direction. There is no distortion (i.e., the nominal pixel interval is true) along the parallel at the mid-latitude of each zone.

3.10.2 Polar distortion. Some distortion occurs in the polar zones as a result of the projection of the image pixels

into the polar stereographic projection. The amount of the distortion and the resulting change in accuracy is minimal.

3.11 Image formats. Each ECIB product contains compressed, transformed images from multiple source images. A compressed JPEG2000 image segment exists for each ECIB frame. In cases where source imagery does not exist, blank areas of frames shall be padded with zeroes in order to fully populate the frame extent. The source polygons stored in the SNSPSB Tagged Record Extensions (TRE) must be used to determine exact areas without source. Consult the *Product Specific Guidance* for the number of bands since many exploitation systems may not handle more than the nominal three bands.

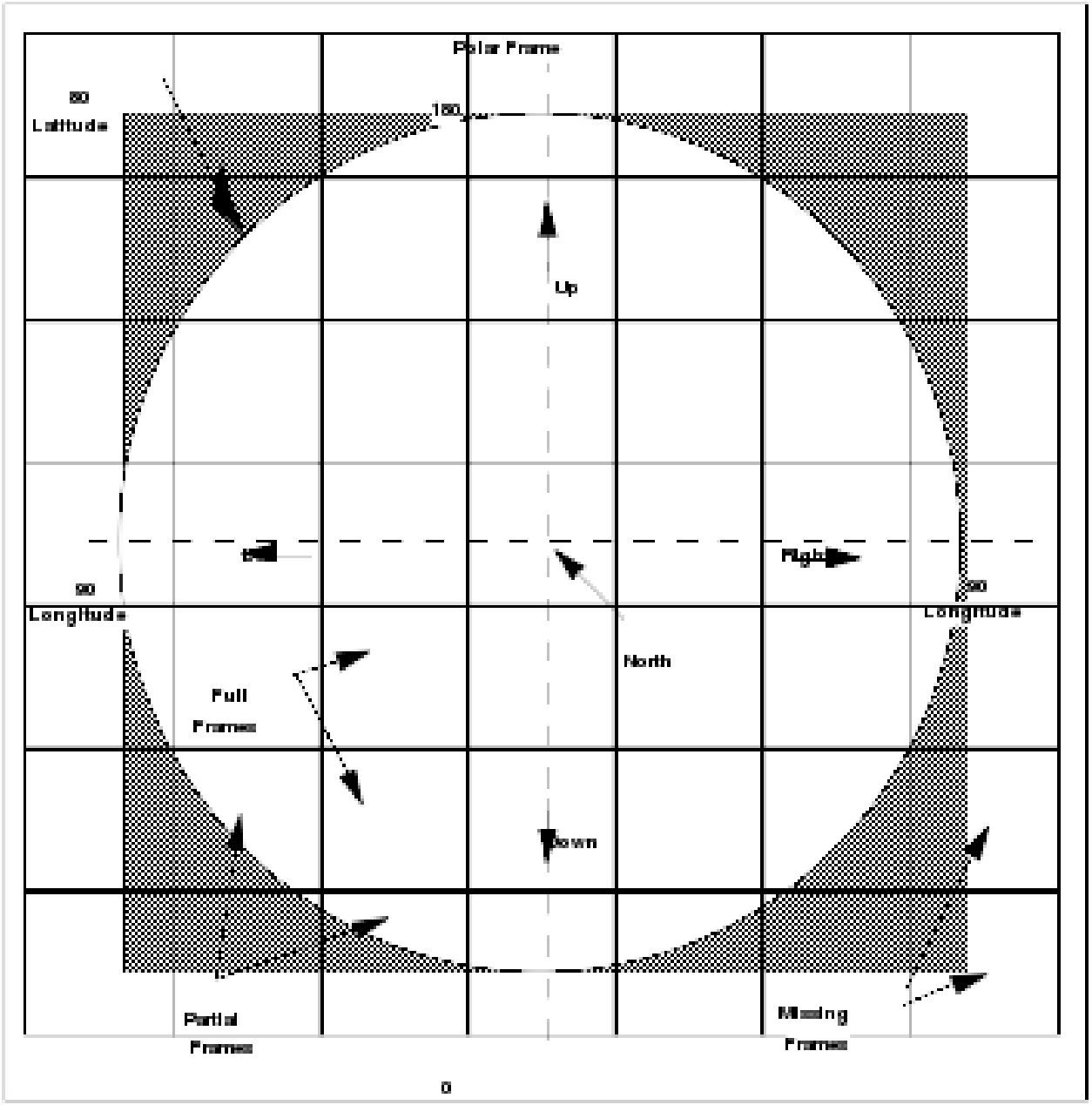

FIGURE 4. Frame orientation for the north polar zone

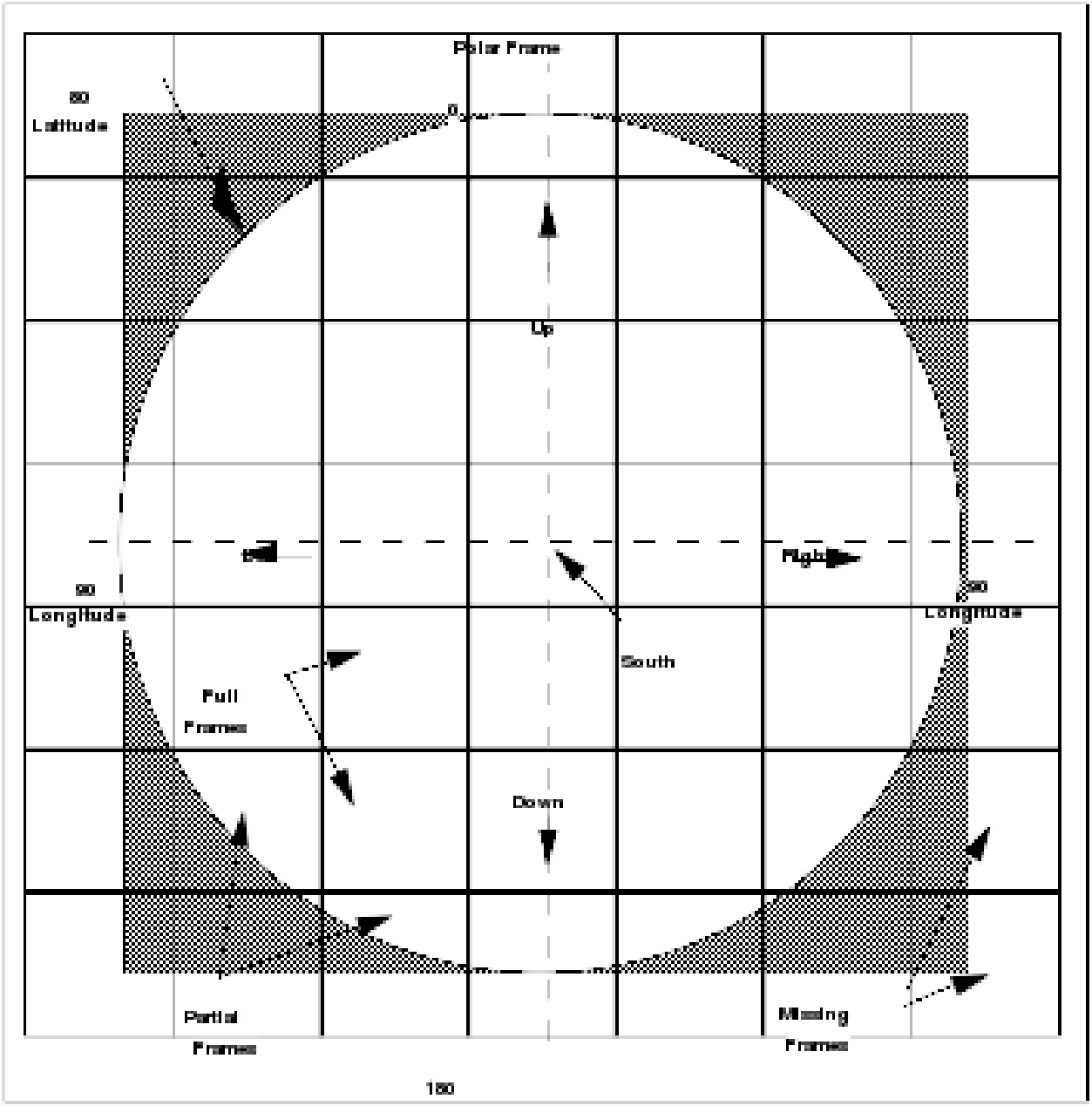

FIGURE 5. Frame orientation for the south polar zone

3.12 Source Support Data. Each ECIB interchange volume contains the following source support data:

a. Header data within the [table of contents file] and [frame file]s that contain the critical configuration control information needed by software application.

b. The [table of contents file] that describes the geographic boundaries and locations of actual data, and pathnames to the [frame file]s and their locations. Refer to Section 3.13.1.

c. Attribute data gives important information about the source image(s) such as accuracy and date of collection.

3.12.1 Orthorectification. Portions of one or more source images are mosaicked together to form each frame file. Source images are orthorectified to an elevation surface referenced to DOD current standard ellipsoid which provides for the removal of terrain relief and other distortions present within the original source imagery.

3.12.2 Color reduction. An ECIB frame will use 8 bits per pixel per band to the extent source imagery will be resampled if applicable.

3.12.3 Compression algorithm. Spatial compression shall be performed using JPEG 2000 with a standard compression ratio of 15:1. The 9-7I Wavelet Transform with Irreversible Component Transform (ICT) shall be used to compress the source image. No internal tiling will occur, so the tile size shall be equal to the frame size. Five (5) Decomposition layers will be used to allow for six (6) viewing resolutions.

3.13 ECIB volume support data. Each ECIB volume shall contain support information for the frame files contained therein. This information shall consist of:

- TOC.xml file
- Shapefiles containing source and frame extents on the volume

These files describe the contents of the ECIB media, not individual frames. Details about the above volume support data are provided in section C.2.3.

3.13.1 The table of contents (TOC) file. The structure and data types for the table of contents file are defined in section C.2.3.1.

3.13.2 The frame file. The data for each ECIB frame is provided in separate frame files. ECIB frames shall be formatted within a NITF 2.1 file. ECIB frames contain the JPEG2000 compressed image and a variety of metadata about the frame. Details are provided in section C.2.

3.14 Storage requirements. Including overhead, the ECIB image data is approximately 15:1 compressed with respect to the source image data. The storage requirements are discussed in Appendix B. ECIB products on DVD and Blue-ray shall be sized such that they will not span multiple volumes. Storage on distribution media other than DVD and Blue-ray shall be appropriate to the data capacity of that media.

3.15 ECIB decompression. All information required for decompression of an ECIB frame file is contained within the file itself. Most importantly, software should be written to support variable resolution (PPI).

3.16 ECIB frame updates. Changes to ECIB frame files (NITF image segment) shall require updates to the affected field values in the NITF headers and TREs.

3.17 ECIB frame description. The optional Frame Description text segment is intended to be a placeholder for storing additional metadata about ECIB frames.

3.18 Media labeling. ECIB Media will be labeled in accordance with ECIB *Product Specific Guidance* (PSG).

3.19 Catalog indexing. Each Media in the ECIB library shall be indexed to facilitate configuration management, including updates, additions, and replacements. The format for NGA Reference number shall be specified per DLA product identification guidance:

a. Five characters represent the Product Series: "ECIBU", "ECIBS", or “ECIBZ” where "U" indicates an unclassified production set, "S" indicates a classified production set, “Z” indicates an expurgated or a holiday production set.

b. Ten characters represent the Product Item ID: “DD(“N”or”S”)DDD(“E”or”W”)SSI”. The first three characters

"DDx" is the southernmost extent of the product in integer degrees latitude and ends with the letter "N" or "S" for northern or southern hemisphere. The next four characters "DDDx" is the westernmost extent of the product in integer degrees longitude and ends with the letter "W" or "E" for western or eastern hemisphere. The next two characters "SS" represent the Data Series (GSD and the spectral mode) of the data (i.e. panchromatic or RGB), shown in Table III and within MIL-STD-2411-1. The last character "I" indicates the Data Extent of the data contained within the volume as shown in Table IV.

TABLE III. Data Series Codes for ECIB

Code	GSD	Data Type
IA	10m	Panchromatic imagery
IB	5m	Panchromatic imagery
IC	2m	Panchromatic imagery
ID	1m	Panchromatic imagery
IE	.5m	Panchromatic imagery
IF	Non-standard	Panchromatic imagery
IG	10m	RGB Multi-band imagery
IH	5m	RGB Multi-band imagery
II	2m	RGB Multi-band imagery
IJ	1m	RGB Multi-band imagery
IK	.5m	RGB Multi-band imagery
IL	Non-standard	RGB Multi-band imagery

TABLE IV. Data Extent Codes for ECIB

Code	Extent of Volume
X	1 degree x 1 degree cell
M	Multiple 1 degree x 1 degree cells
A	Northwest quadrant of the 1 degree x 1 degree cell identified by the SW corner coord.
B	Northeast quadrant of the 1 degree x 1 degree cell identified by the SW corner coord.
C	Southwest quadrant of the 1 degree x 1 degree cell identified by the SW corner coord.
D	Southeast quadrant of the 1 degree x 1 degree cell identified by the SW corner coord.

c. Three characters represent the edition number: example: “001”.

d. The Volume ID shall be 18 characters in length, and is created by the concatenation of the Product Series (characters 1-5), Product Item ID (characters 6-15), and Edition Number (characters 16-18) in that order, as specified in Sections 3.19.a, 3.19.b, and 3.19.c.

e. Data Extent. For multi-cell volumes such as 5m the ECIB volume will contain the “M” designator. Use the “X” of a standard 1 degree cell. When the ECIB volume is divided into quarter cells use the A,B,C,D designators to identify the specific quarter cell. For oceanic volumes use the “M” designator to identify the volume contains multiple cells.

3.20 Standard distribution. ECIB packaging will normally be based on GSD of the data.

3.21 Nonstandard distribution. In support of crisis, special, and/or reoccurring broad-based user requirements, ECIB may be geopackaged vertically (all spatial resolutions) and with other products covering discrete geographic regions. For example, data sets can be identified for test ranges, major training centers, crisis areas, or by other common thematic content where integrated datasets with mixed data types and levels of detail are needed by large numbers of users.

4. PACKAGING

4.1 Source Packaging. When actual packaging of material is to be performed by DoD or in-house contract personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Service or Defense Agency, or within the military service’s system Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, media products, or by contacting the responsible packaging activity.

5. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

5.1 Intended use. This specification is intended to provide guidelines for the preparation and use of ECIB data to support various military weapons, C3I theater battle management, mission planning, and digital moving map systems. ECIB data is not a commercial product and is releasable only to DoD and its' associated contractors.

a. ECIB image data is of appropriate size and quality for use in military command and control systems, ground-based force to unit-level mission planning systems, and aircraft cockpit displays. ECIB is intended to satisfy the needs of a broad range of users in its compression ratio and display resolution.

b. The image compression of ECIB compared to source images offers distinct operational, logistical, and supportability benefits to many users of controlled imagery. It permits the same datasets to be used for both ground-based and aircraft cockpit displays, offers significant savings in media storage/transportation and peripheral costs, results in faster data loading times and requires less frequent reloading of hard disks from media. It also allows multiple product types to be placed on interchange media for geographic areas of interest.

5.2 Subject term (key word) listing.

a. Key Words

CIB®
Controlled Image Base
ECIB
Enhanced Controlled Image Base
Frame
Imagery
JPEG2000
NITF
Orthomosaic

b. Acronyms

ADRG	ARC Digitized Raster Graphics
ANSI	American National Standards Institute
ARC	Equal Arc-Second Raster Chart
CIB®	Controlled Image Base
DEM	Digital Elevation Model
DVD	Digital Versatile Disc (or Digital Video Disc)
ECIB	Enhanced Controlled Image Base
ECRG	Enhanced Compressed Raster Graphics

EPF	Enhanced Product Format
EPJE	Exploitation Preferred Joint Photographic Experts Group Encoding
GSD	Ground Sample Distance
ICT	Irreversible Component Transform
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
IIF	Image Interchange Format
ISO	International Standards Organization
JPEG	Joint Photographic Experts Group
JWICS	Joint Worldwide Intelligence Communication System
MIL-PRF	Military Performance Specification
MIL-STD	Military Standard
NCGIS	National Center for Geospatial-Intelligence Standards
NGA	National Geospatial-Intelligence Agency
NITF	National Imagery Transmission Format
NIPRNet	Non-classified Internet Protocol Router Network
NPJE	NSIF Preferred JPEG 2000 Encoding
NRN	NGA Reference Number
NSIF	NATO Secondary Imagery Format
NSR	Nonsequential Recording
POSIX	Portable Operating System Interface for Computer Environments
PPI	Pixels Per Inch
PSG	Product Specific Guidance
RPCL	Resolution Precinct Component Layer
RPF	Raster Product Format
SIPRNet	Secret Internet Protocol Router Network
STANAG	Standardization Agreement
TOC	Table of Contents
TRE	Tagged Record Extension
WGS-84	World Geodetic System – 1984
XML	eXtensible Markup Language

International standardization agreements. Certain provisions of this specification may be subject to STANAG 2211, “Geodetic Datums, Projections, Grids, and Grid References.” When amendment, revision, or cancellation of this specification is proposed that will modify the international agreement concerned, the preparing activity will take appropriate action through international standardization channels, including departmental standardization offices, to change the agreement or make other appropriate accommodations.

5.3 NGA operational help desk. For questions concerning this or other NGA products, services, or specifications, please telephone the NGA CIB/ECIB Hotline at (314)676-9160.

5.4 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.”

COORDINATE TRANSFORMATION RELATIONSHIPS

A.1. SCOPE

A.1.1 Scope. The information contained herein is intended for compliance. Section A.2 provides the coordinate transformation relationship between the latitude and longitude of points and the rows and columns of virtual subframes and pixels within a [frame file]. It also defines a conceptual grid of [frame file]s that can be used by producers and receivers to manage datasets, and it provides a naming convention to be used for ECIB frame files. Section A.3 describes the method of determining the possible number of frames and virtual subframes per zone at each resolution, and provides tables of these values for two resolutions. This appendix is a mandatory part of the specification.

A.2. COORDINATE TRANSFORMATIONS

A.2.1 References for the ARC system projection. Nonpolar zone equations are based on the Equirectangular projection. Polar zone equations are based on the Azimuthal Equidistant projection, polar aspect, and spherical form. Coordinate values are in the range -180° = longitude (l) = +180° and -90° = latitude (f) = +90°. West longitudes are negative; East longitudes are positive; South latitudes are negative; North latitudes are positive. Tables A-I and A-II list the parameters used, respectively, for the nonpolar and polar coordinate computations.

a. For the polar case, the relationship between the pixel locations and geodetic latitude and longitude shall adhere to the convention defined in Appendix sections 30.3.3 and 30.3.4 of MIL-A-89007 (also listed below). Specifically, from the following equations, pixels in the polar region are mapped into a pixel coordinate system that is centered at the pole itself, to facilitate the transformations from pixel coordinates to latitude and longitude.

MIL-A-89007: APPENDIX Section 30.3.3. North polar case

a. ARC system coordinates (x_0 , y_0) at (ϕ_0 , λ_0)

x_0 = (B_s / 360) (90° - ϕ_0) sin (λ_0)

y_0 = -(B_s / 360) (90° - ϕ_0) cos (λ_0)

b. ARC system coordinates (x, y) at (ϕ_{84} , λ_{84})

x = (B_s / 360) (90° - ϕ_{84}) sin (λ_{84})

y = - (B_s / 360) (90° - ϕ_{84}) cos (λ_{84})

c. ZDR pixel coordinates (r, c) at (x, y)

r = round (y_0 – y)

c = round (x - x_0)

MIL-A-89007: APPENDIX Section 30.3.4. South polar case

a. ARC system coordinates (x_0 , y_0) at (ϕ_0 , λ_0)

x_0 = (B_s / 360) (90° + ϕ_0) sin (λ_0)

y_0 = (B_s / 360) (90° + ϕ_0) cos (λ_0)

b. ARC system coordinates (x, y) at (ϕ_{84} , λ_{84})

x = (B_s / 360) (90° + ϕ_{84}) sin (λ_{84})

y = (B_s / 360) (90° + ϕ_{84}) cos (λ_{84})

c. ZDR pixel coordinates (r, c) at (x, y)

r = round (y_0 – y)

c = round (x - x_0)

TABLE A-I. Non-polar coordinate conversion parameters

Parameter	Description
(r_{Fz}, c_{Fz})	Row and column number of a ECIB frame in zone z for scale r.
(R, C)	Maximum number of rows and columns within contiguous grid for zone z and resolution r.
n_{rz}	Cumulative frame number within zone z at resolution r.
(r_{PF}, c_{PF})	Row and column number of a pixel within a frame.
(ϕ, λ)	Latitude, longitude of point in WGS-84 coordinates.
(ϕ_F, λ_F)	Latitude, longitude of frame origin for non-polar.
(ϕ_{rz}, λ_z)	Latitude, longitude of ARC non-polar origin of zone z and resolution r (λ_z = -180°).
A_{rz}	East-West Pixel Constant for resolution r and zone z. Equals the number of pixels of resolution r around the midpoint latitude of zone z representing a full circle.
B_r	North-South Pixel Constant for scale resolution r in all zones. Equals the number of pixels of resolution r representing an arc of 90°.
P_F	Number of pixels in each dimension of a frame ::>=2304.

TABLE A-II. Polar coordinate conversion parameters

Parameter	Description
(r_F, c_{FZ})	Row and column number of an ECIB frame in a polar zone.
(r_{PF}, c_{PF})	Row and column number of a pixel within a frame.
(ϕ, λ)	Latitude and longitude of a point in WGS-84 coordinates.
(<X>, <Y>)	Projection coordinates of a pixel with respect to pole.
C_r	Polar Pixel Constant for resolution r divided by 90°.
P_F	Number of pixels in each dimension of a frame ::>=2304.
R	Number of pixels from a pole to side of frame structure.

b. For all broad area ECIB image products, a theoretical grid of contiguous frames shall be defined by the producers for each resolution and zone. Some frames within these grids will never be produced (i.e., if no source image is collected that includes the predefined area of the entire frame), and some frames will be only partially filled (i.e., if the source image exists for only a portion of the predefined area of the frame). The grids are defined to facilitate configuration management of the [frame file]s and to provide a framework for the frame naming convention (see section A.2.6). Within each zone grid, an absolute frame numbering scheme is defined within each zone at each resolution. The frame numbers start from 0 at the southwest (bottom-left) corner of each zone, increase in row-major order left to right for each row, and end at the northeast upper-right) corner of the zone.

c. The numbers of frame and virtual subframe rows and columns, the pixel constants, and the exact latitudinal zone extents for three example ECIB resolutions are provided in section A.3.3. (See Tables A-V, A-VI, and A-VII.)

A.2.2 Non-polar latitude and longitude of an ECIB frame pixel. The following equations may be used to obtain the latitude (ϕ) and longitude (λ) of a pixel. The latitude of a pixel is a function of the frame row number and pixel row number within the frame. The longitude of a pixel is a function of the frame column number for its zone and pixel column number within the frame (see Figure A-1). The latitude and longitude of a pixel can be determined relative to the origin (ϕF, λF) of a frame (i.e., northwest or upper-left corner latitude and longitude) as provided in the frame metadata. The latitudes and longitudes used in the conversion equations are signed real numbers with a negative number signifying southern or western hemisphere, respectively.

A.2.2.1 Pixel row coordinate to latitude coordinate equation.

$$\phi = \phi_F - \frac{90}{B_r} * (r_{PF} + 0.5) \quad (1)$$

A.2.2.2 Pixel column coordinate to longitude coordinate equation.

$$\lambda = \lambda_F + \frac{360}{A_{rz}} * (c_{PF} + 0.5) \quad (2)$$

where:

90°/B*r* ::= <latitude/vertical interval> for pixels
360°/A*rz* ::= <longitude/horizontal interval> for pixels

and

ϕF ::= <northwest/upper left latitude> of frame
λF ::= <northwest/upper left longitude> of frame

A.2.3 Non-polar frame pixel coordinates of a geographic point. The following equations can be used to obtain the frame and pixel row and column numbers (rFz, CFz, rFP and cFP) of a point, given the latitude and longitude of the point (see Figure A-1). The zone of the point is determined by zone extents with overlap (see section A.3). Tables A-V, A-VI, and A-VII give examples for 5m, 1m, and 0.5m ECIB resolutions.

A.2.3.1 Latitude equations. The following equation can be used to calculate the frame row within the zone:

$$r_{FZ} = \mathrm{INT}\left[\frac{\phi - \phi_{OZ}}{90} * \frac{B_r}{P_F}\right] \quad (3)$$

The latitude of the frame origin (ϕF, the latitude of the northwest corner of the frame) is calculated as follows:

$$\phi_F = \frac{90}{B_r} * P_F * (r_{FZ} + 1) + \phi_{OZ} \quad (4)$$

The pixel row (with respect to the frame origin) is calculated using the following equation:

$$r_{PF} = \mathrm{INT}\left[\frac{\phi_F - \phi}{90} * B_r\right] \quad (5)$$

A.2.3.2 Longitude equations. The following equation can be used to calculate the frame column within the zone:

$$c_{FZ} = \mathrm{INT}\left[\frac{\lambda - \lambda_{OZ}}{360} * \frac{A_O}{P_F}\right] \quad (6)$$

The longitude of the frame origin (λF, the longitude of the northwest corner of the frame), can be calculated as follows:

$$\lambda_F = \frac{360}{A_O} * P_F * (c_{FZ}) + \lambda_{OZ} \quad (7)$$

The pixel column with respect to the frame origin can be calculated using the following equation:

$$c_{PF} = \mathrm{INT}\left[\frac{\lambda - \lambda_F}{360} * A_O\right] \quad (8)$$

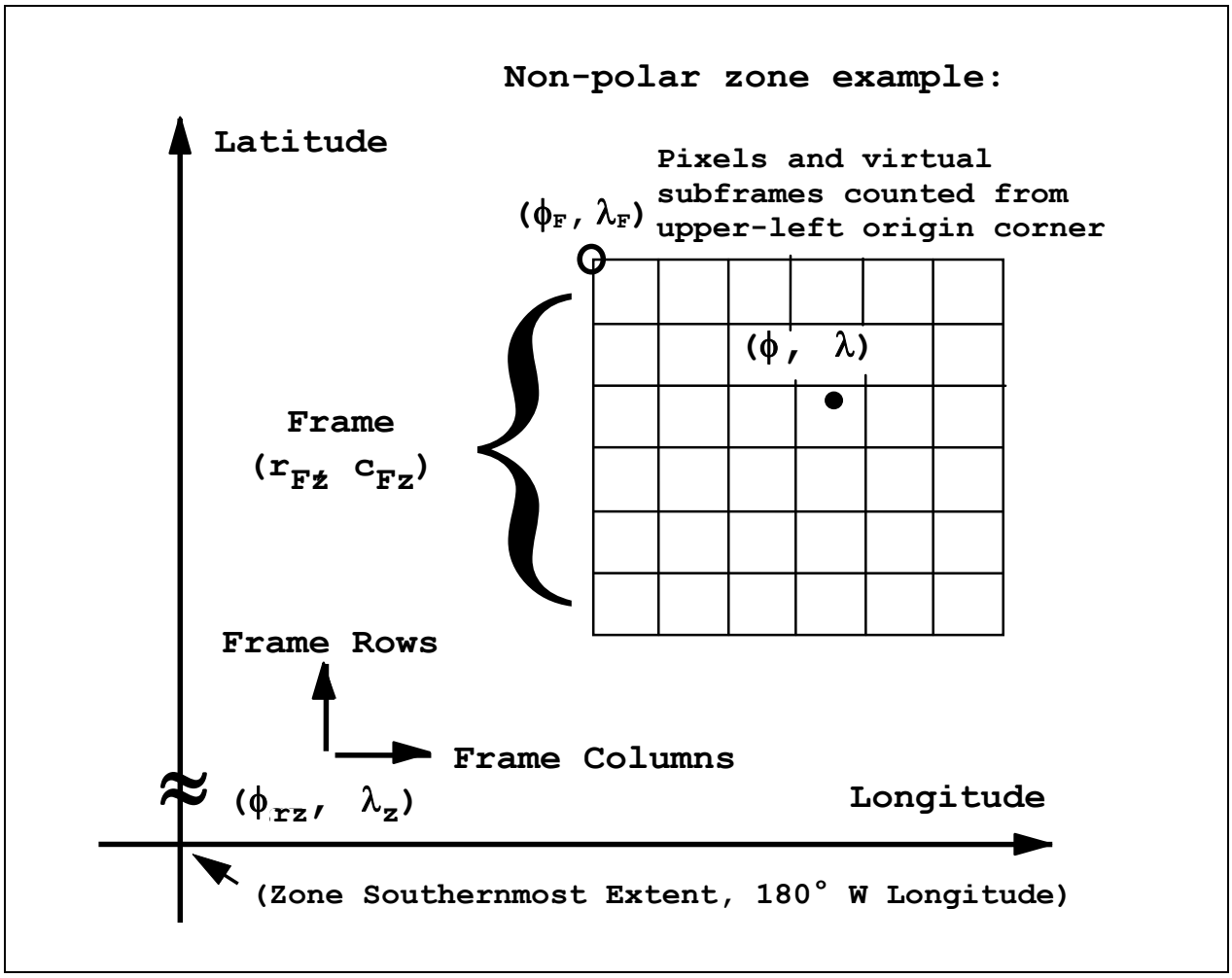

FIGURE A-1. Coordinate transformation in non-polar zones.

A.2.4 Polar latitude and longitude of an ECIB frame pixel.

A.2.4.1 North polar region. Given the projection coordinates of a point (<X>, <Y>) with respect to the north pole, its latitude and longitude in degrees shall be computed as follows (see Figure A-2):

$$\phi = 90 - \frac{\sqrt{(X)^2 + (Y)^2}}{C_r} \quad (9)$$

$$\lambda = \text{ACOS} \frac{-(Y)}{\sqrt{(X)^2 + (Y)^2}} \quad \text{for } X > 0 \quad (10)$$

$$\lambda = -\text{ACOS} \frac{-(Y)}{\sqrt{(X)^2 + (Y)^2}} \quad \text{for } X < 0 \quad (11)$$

where: $\lambda = 180^\circ$ for [<X> = 0 and <Y> > 0]

and $\lambda = 0^\circ$ for [<X> = 0 and <Y> = 0]

and $0^\circ = \text{ACOS}\left[\frac{-\langle Y\rangle}{\sqrt{\langle X\rangle^2 + \langle Y\rangle^2}}\right] = 180^\circ$

A.2.4.2 South polar region. Given the projection coordinates of a point (<X>, <Y>) with respect to the south pole, its latitude and longitude in degrees shall be computed as follows (see Figure A-3):

$$\phi = -90 + \frac{\sqrt{\langle X\rangle^2 + \langle Y\rangle^2}}{C_r} \quad (12)$$

$$\lambda = \text{ACOS}\ \frac{<Y>}{\sqrt{<X>^2 + <Y>^2}} \qquad \text{for } <X> > 0 \qquad \textbf{(13)}$$

$$\lambda = -\text{ACOS}\ \frac{<Y>}{\sqrt{<X>^2 + <Y>^2}} \qquad \text{for } <X> < 0 \qquad \textbf{(14)}$$

where: $\lambda = 0^\circ$ for [<X> = 0 and <Y> = 0]

and $\lambda = 180^\circ$ for [<X> = 0 and <Y> < 0]

and $0^\circ = \text{ACOS}\left[\frac{<Y>}{\sqrt{<X>^2 + <Y>^2}}\right] = 180^\circ$

A.2.5 Polar frame pixel coordinates of a geographic point.

A.2.5.1 North polar region. Given the latitude and longitude of point (ϕ, λ), its projection coordinates (<X>, <Y>) shall be computed as follows (see Figure A-2):

$$<X> = C_r * (90 - \phi) * \text{SIN}(\lambda) \qquad \textbf{(15)}$$

$$<Y> = -C_r * (90 - \phi) * \text{COS}(\lambda) \qquad \textbf{(16)}$$

The coordinates <X> and <Y> are given with respect to the north pole as an origin of a rectangular coordinate system. It is useful to translate the coordinates of the point to the ECIB frame structure. The frame structure has its origin in its lower left corner. The expressions for the frame row and column, the subframe row and column, and the pixel position with respect to the lower left corner of the frame structure are computed as follows:

$$r_F = \text{INT}\ \frac{<Y> + R}{P_F} \qquad \textbf{(17)}$$

$$c_F = \mathrm{INT}\left[\frac{<X>+R}{P_F}\right] \quad (18)$$

$$r_{PF} = [P_F] - \mathrm{INT}\left[\frac{<Y>+R}{P_F} - r_F\right] * P_F \quad (19)$$

$$c_{PF} = \mathrm{INT}\left[\frac{<X>+R}{P_F} - c_F\right] * P_F \quad (20)$$

The constant *R* is calculated by finding the number of frames on a side of the frame structure (see Figure A-4), dividing by two and multiplying by the number of pixels (2304) per frame side.

$$R = \frac{FS}{2} * 2304 \quad (21)$$

A.2.5.2 South polar region. Given the latitude and longitude of point (ϕ, λ), its projection coordinates (<X>, <Y>) shall be computed as follows (see Figure A-3):

$$<X> = C_r * (90 + \phi) * \mathrm{SIN}(\lambda) \quad (22)$$

$$<Y> = C_r * (90 + \phi) * \mathrm{COS}(\lambda) \quad (23)$$

The coordinates <X> and <Y> are given with respect to the south pole as an origin of a rectangular coordinate system. Since the frame coordinate system has its origin in the lower left corner in an identical scheme as the north polar region, all frame, subframe and pixel calculations are identical to the north polar calculations.

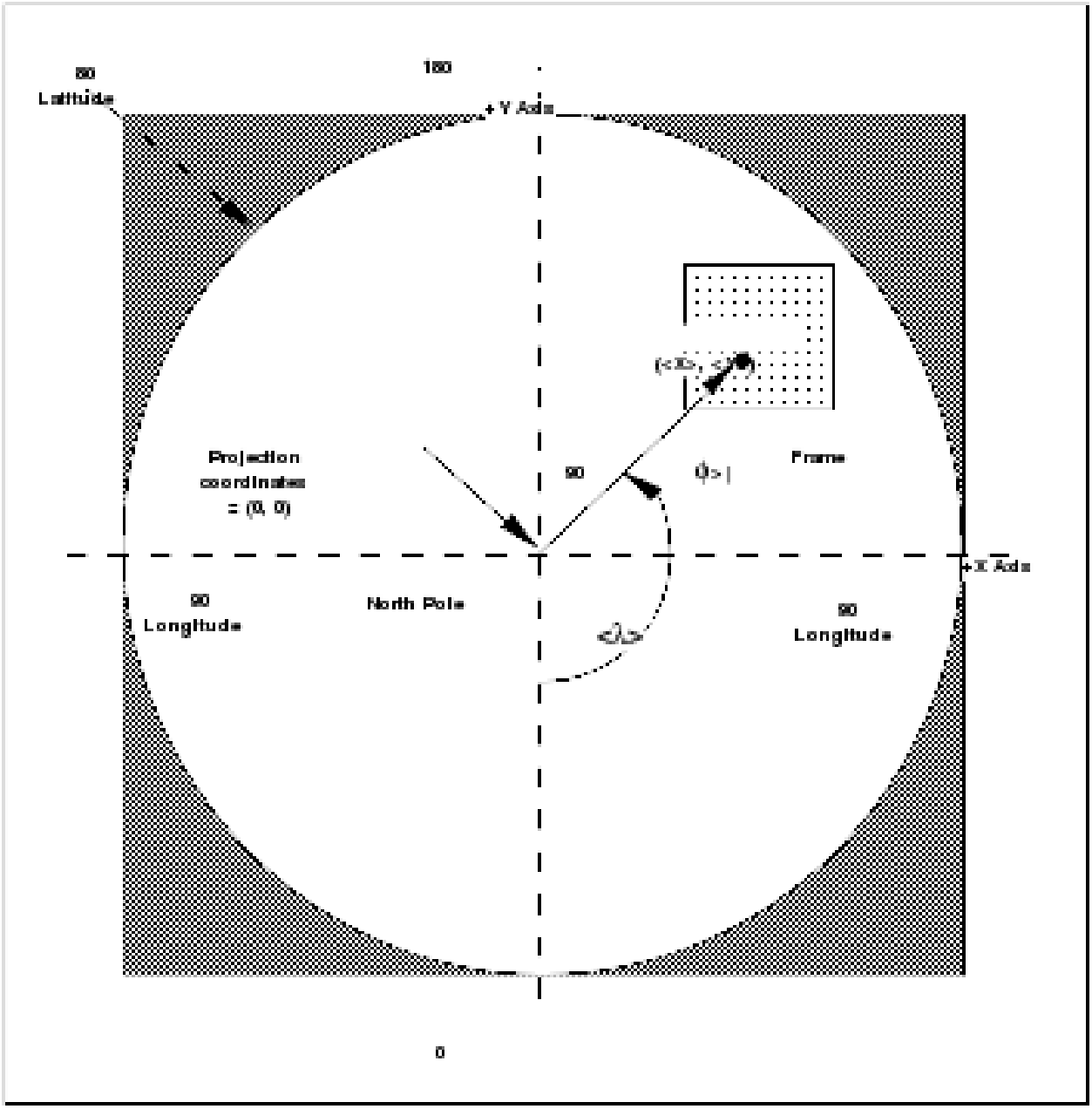

FIGURE A-2. Coordinate transformation in north polar region

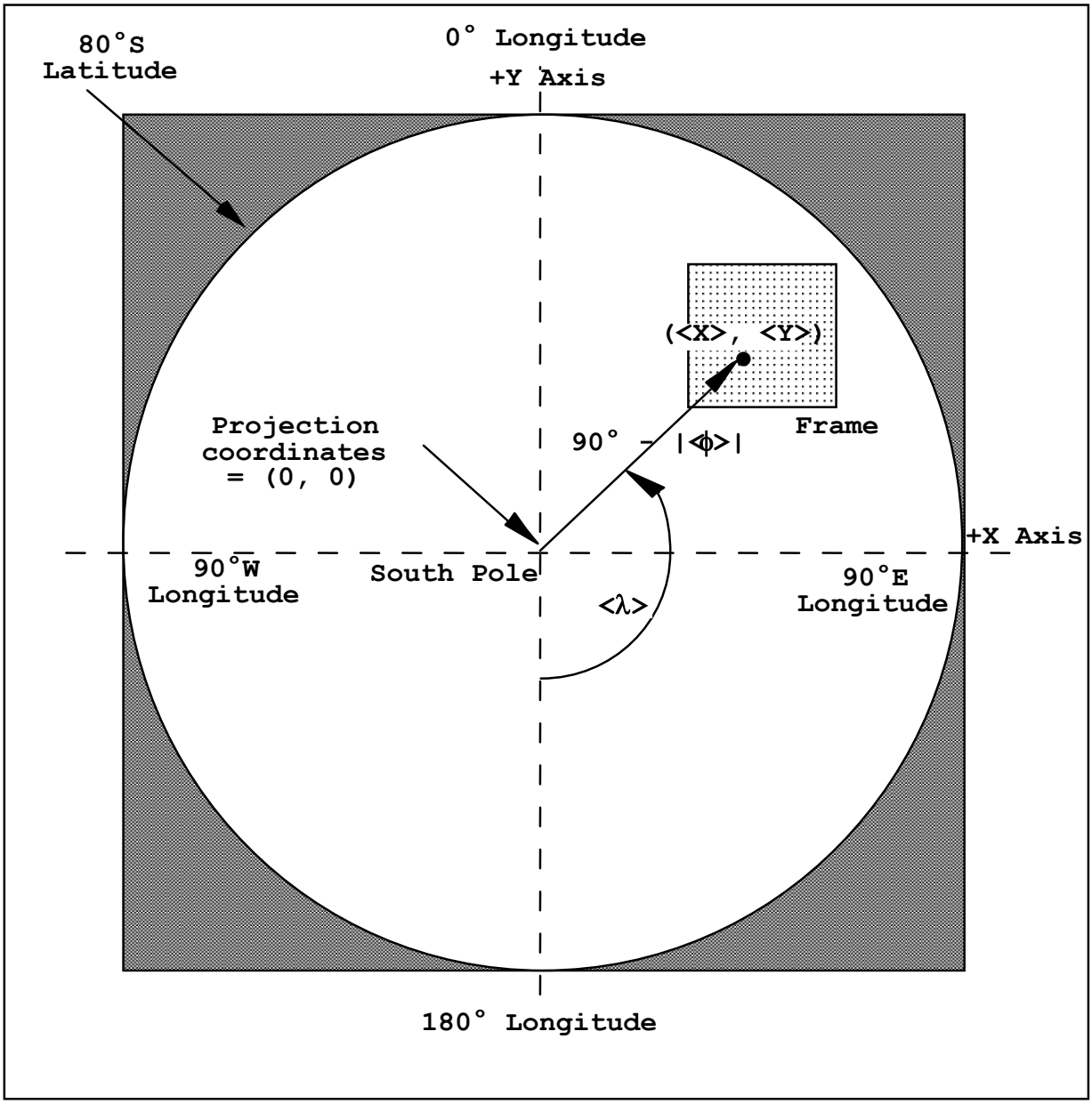

FIGURE A-3. Coordinate transformation in south polar region

A.2.6 Frame conventions.

A.2.6.1 Frame naming convention. ECIB frame file names shall conform to the form "fffffffffvvvp.ccz". (The contiguous frame grid concept is depicted in figure A-4.) ECIB producers are responsible for ensuring that [frame files] for all spatial resolutions, zones, and revisions, have unique names.

a. The "fffffffff" portion of the name shall be a ten-digit radix 34 value that encodes the unique cumulative frame number within a zone in base 34, n*rz* (see equations below), with the right-most digit being the least significant position. The radix 34 value incorporates the numbers 0 through 9 and letters A through Z exclusive of the letters "I" and "O" as they are easily confused with the numbers "1" and "0". For example, the "fffffffff" portion of the names would start with "0000000000," and proceed through "0000000009". The next value would be "000000000A" and the values would proceed through "000000000Z", "0000000010", and so forth until "ZZZZZZZZZZ". This allows 2,064,377,754,059,776 unique [frame file] names.

b. The "vvv" portion of the name shall be a successive version number.

c. The "p" portion of the name shall be a radix 34 value that designates the producer code ID registered in MIL-STD-2411-1.

d. The "cc" and "z" portions of the name extension shall encode the data series code and the arc zone. Refer to Table II for a complete list of zone limits and Table III for data series codes.

A.2.6.2 Frame numbering convention. The number of rows and columns for 5-meter, 1-meter and 0.5-meter GSD are provided in Tables A-VI, A-VII, and A-VIII. The relationships between frame row and column numbers, and the cumulative count of frames within a zone are expressed in the equations below:

$$n_{cz} = C_{Fz} + (r_{Fz} * C_z) \quad \textbf{(24)}$$

$$n_{cz}\ (\text{maximum}) = (R_z * C_z) - 1 \quad \textbf{(25)}$$

$$r_{Fz} = INT \left[\frac{n_{rz}}{C_z} \right] \quad (26)$$

$$c_{Fz} = n_{rz} - (r_{Fz} * C_z) \quad (27)$$

where C_Z is the number of columns in the zone and R_Z is the number of rows in the zone. The frame number of the frame denoted by the frame row r_{FZ} and frame column c_{FZ} is n_{rz}.

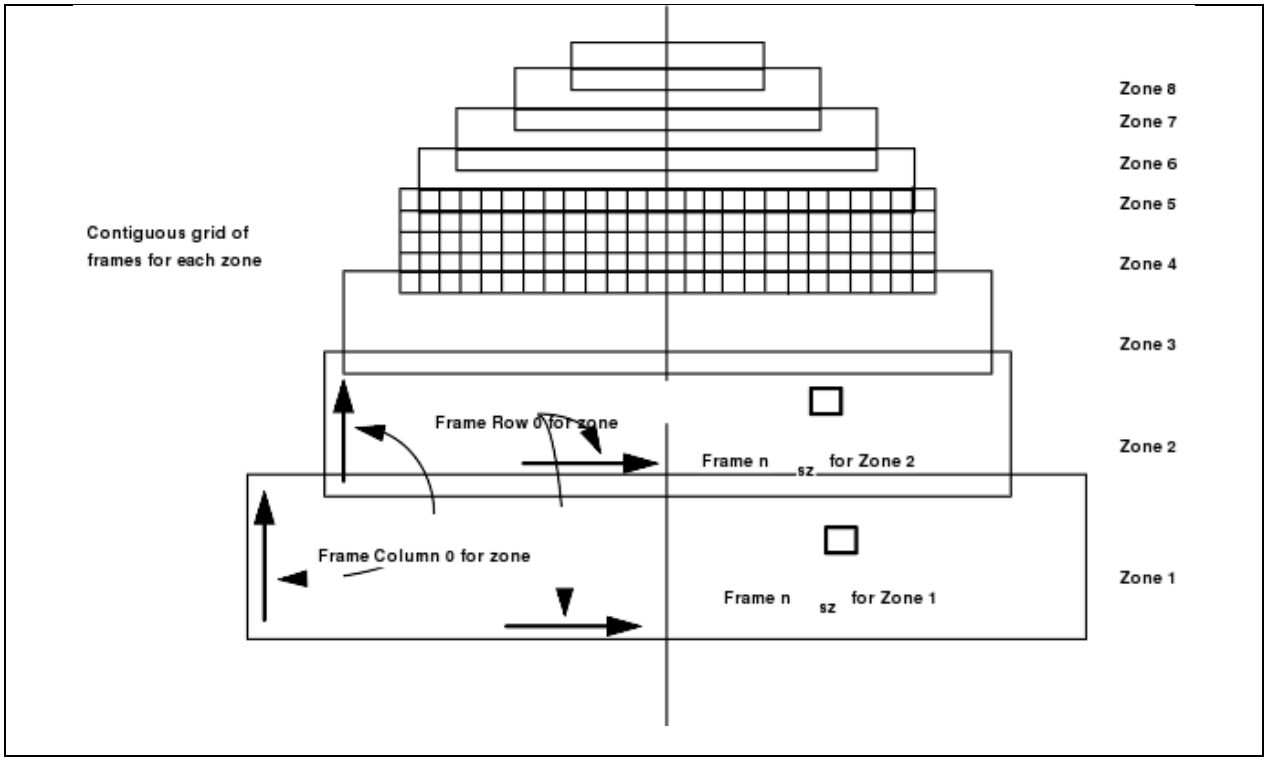

FIGURE A-4. Contiguous frame numbering convention for zones

A.3. FRAME AND VIRTUAL SUBFRAME STRUCTURE

A.3.1 Method of computation for nonpolar zones. This section describes the method of computation of the nonpolar latitudinal and longitudinal pixel constants and pixel sizes, the number of frames and virtual subframes in each zone for the latitudinal and longitudinal directions, the rules of zone overlaps, and the zonal extents. Nonpolar ECIB frames shall be north-up. The pixel size and interval data may be used to define

[frame file]s containing image data for non-contiguous areas at various resolutions.

A.3.1.1 Calculating Pixel constant.

a. The north-south or latitudinal pixel constant is the number of pixels latitudinally from the equator to a pole (90°). The east-west pixel constant is the number of pixels longitudinally from the 180° west longitude meridian going 360° in an easterly direction along the zone midpoint. The latitudinal and longitudinal pixel constants for various resolutions of ECIB are derived by using the pixel spacing constants given for the 1:1,000,000 scale charts in MIL-A-89007 and adjusting for a particular image resolution. To determine the north-south pixel constant, the "B" parameter in Table ~~A-~~III (copied here for reference from section 70 of MIL-A-89007) is multiplied by a scale factor (1,000,000*S), where "S" is the scale corresponding to the resolution of the image. "S" is equal to (100 x 10^{-6} / GSD). This value is rounded up to the next highest multiple of 512 pixels (the pixel constant for a corresponding scale of ADRG data). The ECIB pixel constant is calculated by dividing this value by 4 to represent 90° instead of 360° and rounding to the nearest multiple of 384 pixels (the size of a virtual subframe). The east-west pixel constant is calculated in a similar way, using the "A" constant which represents the number of pixels required to circle the earth at the midpoint latitudes of each zone. The calculation for the east-west pixel constant does not include division by 4 because the longitudinal or east-west pixel constant encircles the earth (360°) at each midpoint latitude.

b. ARC system data for scale 1:1,000,000. (shown here for reference) Pixel spacing constants and spacing intervals for all zones at the scale 1:1,000,000 are shown in Table A-III below.

TABLE A-III. ARC system parameter values at scale 1:1,000,000

Zone Limits			Nominal Pixel Spacing			
Zone	Equator-ward	Pole-ward	A	B	Lon (microns)	Lat (microns)
1,A	0	32	369664	400384	99.9	99.9
2,B	32	48	302592	400384	99.9	99.9
3,C	48	56	245760	400384	100.0	99.9
4,D	56	64	199168	400384	99.9	99.9
5,E	64	68	163328	400384	99.7	99.9
6,F	68	72	137216	400384	99.7	99.9
7,G	72	86	110080	400384	99.8	99.9
8,H	86	80	82432	400384	100.0	99.9
9,J	80	90	400384	400384	99.9	99.9

c. The following generalized equations can be used to calculate the Pixel Constants for ECIB by using the appropriate subframe size (SF). Table A-IV lists the N-S and E-W pixel constants for 3 image resolutions for the nonpolar zones as calculated from the equations below. The N-S pixel constant is the same for all nonpolar zones for a given resolution.

$$PixConst1_{N\text{-}S} = Round\left(\frac{RoundUp\left(\frac{B * 1000000 * (0.0001/GSD)}{512}\right) * 512}{4 * SF} * SF\right) \quad (28)$$

$$PixConst1_{E\text{-}W} = Round\left(\frac{RoundUp\left(\frac{A * 1000000 * (0.0001/GSD)}{512}\right) * 512}{SF} * SF\right) \quad (29)$$

TABLE A-IV. Calculated E-W & N-S Pixel Constants

Zone	ECIB .5M Pixel Constants	ECIB 1M Pixel Constants	ECIB 5M Pixel Constants
1,A	73932672	36966528	7393152
2,B	60518400	30259200	6051840
3,C	49152000	24576000	4915200
4,D	39833472	19916928	3983232
5,E	32665728	16332672	3266688
6,F	27443328	13721472	2744448
7,G	22015872	11008128	2201472
8,H	16486272	8243328	1648512
N-S	20019072	10009728	2001792

A.3.1.2 Calculating Equatorward and Poleward Zone Extents.

a. The poleward and equatorward extents of a zone are not exactly equal to the nominal zone extents as defined in Table ~~A-~~ III, because frames overlapping the nominal zone boundaries are filled with data. For the northern hemisphere, the exact poleward zone extent is defined as latitude of the top of the frame overlapping the poleward nominal zone extent. The exact equatorward zone extent is defined as the latitude of the bottom of the frame overlapping the equatorward nominal zone extent. In the case of the southern hemisphere, the top of the overlapping frame defines the equatorward extent, and the bottom defines the poleward extent.

b. To calculate the exact poleward zone extent for a given resolution, first calculate the number of pixels in a degree of latitude for the resolution. This number is the N-S pixel constant divided by 90° (this number is the inverse of the <latitude/vertical interval> described in A.3.1.1). The number of frames needed to reach the nominal zone boundary is the number of pixels per degree of latitude multiplied by the nominal zone boundary (in degrees), divided by 2304, the number of pixels rows in a frame, and rounded up to the nearest integer. The exact zone extent is calculated by multiplying the number of frames by 2304 and dividing by the number of pixels in a degree of latitude.

c. To calculate the exact equatorward zone extent for a given resolution, again calculate the number of frames needed to reach the nominal zone boundary (the equatorward boundary in this case) by using the same method described in the previous paragraph. For the equatorward case, round the number of frames down to the nearest integer. Again, the exact zone extent is calculated by multiplying the number of frames by 2304 and dividing by the number of pixels in a degree of latitude.

d. The maximum stretch or shrink of frame pixels within a zone may be computed as the difference between the cosine of the resulting zonal extents latitude and the cosine of the midpoint latitude, and then dividing by the cosine of the midpoint latitude.

A.3.1.3 Calculating Latitudinal Frames and Subframes. The number of latitudinal frames and subframes in a zone for a given resolution can be computed by using the exact poleward and equatorward zone extents and the number of pixels per degree of latitude (as calculated in A.3.1.2). The number of latitudinal frames is the difference (in degrees) between the exact poleward zone extent and exact equatorward zone extent, multiplied by number of pixels per degree, divided by 2304, the number of pixel rows per frame, then rounded to the nearest whole number. Multiplying the number of framerows by 6 will yield the number of subframes for that resolution and zone.

A.3.1.4 Calculating Longitudinal frames and subframes. The number of longitudinal frames and subframes is computed by determining the number of subframes to reach around the earth along a parallel at the zone midpoint. The east-west pixel constant is divided by 384 pixels to determine the number of subframes. The results are divided by 6 and rounded up to obtain the number of frame columns.

A.3.2 Additional computations for the polar zones. The computations for the polar zones are described in the following sections.

A.3.2.1 Polar pixel constant. For ECIB, the polar pixel constant is derived from the N-S pixel constant for a particular resolution product. The ECIB value for the polar pixel constant is calculated by multiplying the N-S pixel constant for the resolution by the ratio 20/90 (degrees), rounding to the nearest multiple of 768 (to insure that the number of virtual subframes

about the pole can be equal in each direction), then multiplying by the ratio 90/20 (degrees).

A.3.2.2 Polar frames and virtual subframes. The number of the polar virtual subframes in each dimension (symmetric) is computed by multiplying the polar pixel constant by the ratio 20°/90°, dividing by 384 pixels per virtual subframe, and then adding four subframes to the result. The four subframes are added to allow for overlap all around the earth. The number of frames is determined by dividing this value by 6 virtual subframes per frame, but rounding up to the next odd number of frames. (This ensures that a symmetric number of frames can be centered at the pole.) All polar frames are fully populated provided that data exists in the areas.

A.3.2.3 Polar zone extents. The poleward extent of the polar zones is exactly 90°. The equatorward extent of the polar regions is less than 80° (i.e., it overlaps the data from zones 8 and H) but the exact extent varies. This is because the frames are not aligned with the latitudinal bands around the earth (see Figures A-2 and A-3).

A.3.3 Tabular data for frame and virtual subframe structure. Results of computations defined above for the latitudinal and longitudinal data are enumerated in Tables A-V, A-VI, and A-VII for three resolutions of ECIB source data. The same values can be computed for any arbitrary resolution image, using the methodology outlined above in A.3.1 and A.3.2. This would allow developing ECIB [frame files] for various resolution, non-contiguous images.

TABLE A-V. Frame/subframe sizes for IMAGE GSD OF 5.0 METER (2304 x 2304 pixels)

			N-S pixel Constant	N-S Pixel Size (m)
			2001792	5
Zone Number	Subframes in Zone (Rows) Latitudinal	Frame Rows in Zone Latitudinal	Equatorward Zone Extent with Overlap	Poleward Zone Extent with Overlap
1, A	1854	309	0	32.0084404
2, B	936	156	31.9048533	48.0644542
3, C	468	708	47.9608671	56.0406676
4, D	468	78	55.9370804	64.0168809
5, E	240	40	63.9132937	68.0567811
6, F	240	40	67.9531939	72.0966814
7, G	234	39	71.9930942	76.0329944
8, H	240	40	75.9294073	80.0728947
9, J	----	----	79.9693075	90
Zone Number	Subframes (Columns) Longitudinal	Frame (Columns) Longitudinal	E-W Pixel Constant	E-W Pixel Size (m)
1, A	19254	3209	7393152	5
2, B	15762	2627	6051840	5
3, C	12804	2134	4915200	5
4, D	10374	1729	3983232	5
5, E	8508	1418	3266688	5
6, F	7152	1192	2744448	5
7, G	5736	956	2201472	5
8, H	4296	716	1648512	5
Zone Number	Polar (X-Y) Subframes	Polar (X-Y) Frames	POL Pixel Constant	POL Pixel Size (m)
9, J	1162	195	2001024	5

TABLE A-VI. Frame/subframe sizes for IMAGE GSD OF 1.0 METER (2304 x 2304 pixels)

			N-S pixel Constant	N-S Pixel Size (m)
			10009728	1
Zone Number	Subframes in Zone (Rows) Latitudinal	Frame Rows in Zone Latitudinal	Equatorward Zone Extent with Overlap	Poleward Zone Extent with Overlap
1, A	9270	1545	0	32.0059846
2, B	4644	774	31.9852687	48.0193348
3, C	2322	387	47.9986189	56.0156520
4, D	2322	387	55.9949361	64.0119692
5, E	1164	194	63.9912533	68.0101277
6, F	1164	194	67.9894119	72.0082863
7, G	1164	194	71.9875705	76.0064449
8, H	1164	194	75.9857291	80.0046035
9, J	----	----	79.9838877	90
Zone Number	Subframes (Columns) Longitudinal	Frame (Columns) Longitudinal	E-W Pixel Constant	E-W Pixel Size (m)
1, A	96270	16045	36966528	1
2, B	78804	13134	30259200	1
3, C	64002	10667	24576000	1
4, D	51870	8645	19916928	1
5, E	42534	7089	16332672	1
6, F	35736	5956	13721472	1
7, G	28668	4778	11008128	1
8, H	21468	3578	8243328	1
Zone Number	Polar (X-Y) Subframes	Polar (X-Y) Frames	POL Pixel Constant	POL Pixel Size (m)
9, J	5796	967	10008576	1

TABLE A-VII. Frame/subframe sizes for IMAGE GSD OF 0.5 METER (2304 x 2304 pixels)

			N-S pixel Constant	N-S Pixel Size (m)
			20019072	0.5
Zone Number	Subframes in Zone (Rows) Latitudinal	Frame Rows in Zone Latitudinal	Equatorward Zone Extent with Overlap	Poleward Zone Extent with Overlap
1, A	18540	3090	0	32.0065985
2, B	9276	1546	31.9962404	48.0098978
3, C	4638	773	47.9995396	56.0063683
4, D	4638	773	55.9960102	64.0028389
5, E	2322	387	63.9924808	68.0010742
6, F	2328	388	67.9907161	72.0096676
7, G	2322	387	71.9993095	76.0079029
8, H	2322	387	75.9975447	80.0061381
9, J	----	----	79.9957800	90
Zone Number	Subframes (Columns) Longitudinal	Frame (Columns) Longitudinal	E-W Pixel Constant	E-W Pixel Size (m)
1, A	192534	32089	73932672	0.5
2, B	157602	26267	60518400	0.5
3, C	128004	21334	49152000	0.5
4, D	103734	17289	39833472	0.5
5, E	85068	14178	32665728	0.5
6, F	71472	11912	27443328	0.5
7, G	57336	9556	22015872	0.5
8, H	42936	7156	16486272	0.5
Zone Number	Polar (X-Y) Subframes	Polar (X-Y) Frames	POL Pixel Constant	POL Pixel Size (m)
9, J	11590	1933	20020608	0.5

STORAGE REQUIREMENTS

B.1. SCOPE

B.1.1 Scope. The information contained herein is intended for compliance. This appendix provides information about the sizes of the sections of a frame file and provides a typical example with binary and decimal or logical values for that example. This appendix is a mandatory part of the specification.

B.2. FRAME FILE SIZE COMPUTATIONS

B.2.1 Computation of frame file size. Table B-I provides the size computations for ECIB. These assumptions are the estimated file sizes based on the individual file structures.

TABLE B-I. ECIB [frame file] size computations

Section Name	Full 254 PPI Frame Example Bytes
NITF Header	*For no text segment 407, for one text segment 416 and two text segments 425 (fixed fields) + GEOPS (454) +* Length of Text Segment(s)
Image Segment Sub-Header	Length of image sub-header + GEOLOB (59) + J2KLRA (variable length) + ACCHZB (variable length) + (BNDPLB (variable length) and/or SNSPSB (variable length))
Image Segment	Length of Compressed Image Segment
Commercial License Text Segment Sub-Header (if frame includes commercial imagery)	282
Commercial License Text Segment (if frame includes commercial imagery)	Length of Commercial License Text Segment
Frame Description Text Segment Sub-Header (optional)	282
Frame Description Text Segment (optional)	Length of Frame Description Text Segment

ECIB DATA CONTENT SPECIFICS

C.1. SCOPE

C.1.1 Scope. This appendix lists ECIB file content specifics, attributes, and data types. This appendix is a mandatory part of the specification, and compliance testing will include tests for the presence of required information content specified herein.

C.2. ECIB DATA CONTENT

C.2.1 ECIB NITF 2.1 File Structure.

An ECIB frame file is a NITF 2.1 file that must contain the following elements, with the source specification for each element in parentheses:

- NITF 2.1 File Header
  - File Header (MIL-STD-2500C)
  - GEOPSB (Georeferencing Information, STDI-0002-1)
- One Image Segment
  - Image Sub-header (MIL-STD-2500C)
  - GEOLOB (Geographic Coordinate Information, STDI-0002-1)
  - J2KLRA (JPEG 2000 Layers Information, BPJ2K01.10)
  - ACCHZB (Horizontal Accuracy, STDI-0002-1)
  - BNDPLB and/or SNSPSB (see note below)

Note:
One of the following two NITF records is required:

If the NITF TRE Controlled Extension sensor data is not required (or available), then only populate the BNDPLB TRE tag extension. If the sensor data is required, then populate the SNSPSB tag extension. Consult the *Product Specific Guidance* as to which of

these NITIF Controlled Extension tags is required. Refer to tables D1-9 and D1-13 for usage.

- BNDPLB (Bounding Polygon information, STDI-0002-1) or SNSPSB (Sensor Parameters Data Extension, STDI-0002-1)
- Image Data Field (Joint Photographic Experts Group (JPEG) 2000 compressed) [see C.2.2 for JPEG2000 Specifics]

- One Text Segment(s)
  - Text Segment 1 - Commercial License statements for each source image included in the frame (required when commercial imagery is included in the frame).
  - [Optional] Text Segment 2 (optional) – Frame description text, for additional metadata deemed necessary by the producer.

C.2.1.1 ECIB NITF Headers and Extensions.

TABLE C-I. ECIB NITF 2.1 File Header contents (from MIL-STD-2500C)

FIELD	NAME	SIZE	ECIB VALUE	NOTES
FHDR	File Profile Name	4	BCS-A “NITF”	Required
FVER	File Version	5	BCS-A “02.10”	Required
CLEVEL	Complexity Level	2	BCS-N positive integer “05”	Required
STYPE	Standard Type	4	BCS-A “BF01”	Required
OSTAID	Originating Station ID	10	BCS-A Producer ID Information	Required
FDT	File Date and Time	14	BCS-N integer CCYYMMDDhhmmss	Required Frame creation date (image dates in SNSPSB table)
FTITLE	File Title	80	ECS-A Frame File Name	Required
FSCLAS	File Security Classification	1	ECS-A S or U	Required
FSCLSY	File Security Classification System	2	ECS-A “US”	Required
FSCODE	File Codewords	11	BCS-A (Default is BCS spaces 0x20))	Required
FSCTLH	File Control and Handling	2	ECS-A (Default is ECS spaces (0x20))	Required
FSREL	File Releasing Instructions	20	ECS-A (Default is ECS spaces (0x20))	Required
FSDCTP	File Declassification Type	2	ECS-A DD, DE, GD, GE, O, X (Default is ECS spaces (0x20))	Required
FSDCDT	File Declassification Date	8	ECS-A CCYYMMDD (Default is ECS spaces (0x20))	Required
FSDCXM	File Declassification Exemption	4	ECS-A X1 to X8, X251 to X259, (Default is ECS spaces (0x20))	Required

FIELD	NAME	SIZE	ECIB VALUE	NOTES
FSDG	File Downgrade	1	ECS-A S,C,R (Default is ECS spaces (0x20))	Required
FSDGDT	File Downgrade Date	8	ECS-A CCYYMMDD (Default is ECS spaces (0x20))	Required
FSCLTX	File Classification Text	43	ECS-A (Default is ECS spaces (0x20))	Required
FSCATP	File Classification Authority Type	1	ECS-A (Default is ECS spaces (0x20))	Required
FSCAUT	File Classification Authority	40	ECS-A (Default is ECS spaces (0x20))	Required
FSCRSN	File Classification Reason	1	ECS-A A to G (Default is ECS spaces (ox20))	Required
FSSRDT	File Security Source Date	8	ECS-A CCYYMMDD (Default is ECS spaces (0x20))	Required
FSCTLN	File Security Control Number	15	ECS-A (Default is ECS spaces (0x20))	Required
FSCOP	File Copy Number	5	BCS-N positive integer “00000”	Required
FSCPYS	File Number of Copies	5	BCS-N positive integer “00000”	Required
ENCRYP	Encryption	1	BCS-N positive integer “0”	Required
FBKGC	File Background Color	3	Unsigned binary integer 0x000000 – for Black	Required
ONAME	Originator’s Name	24	*ECS-A* *(Default is ECS spaces (0x20))* *Producer Code*	Required
OPHONE	Originator’s Phone Number	18	ECS-A (Default is ECS spaces (0x20))	Required
FL	File Length	12	BCS-N positive integer	Required
HL	NITF File Header Length	6	BCS-N positive integer 000388 to 999999	Required
NUMI	Number of Image Segments	3	BCS-N positive integer “001”	Required
. . . . . Start for each IS LISHn, LIn.				
NOTE: Only a single pair as Profile requires one image segment.				

FIELD	NAME	SIZE	ECIB VALUE	NOTES
LISH001	Length of nth Image Sub-header	6	BCS-N positive integer 001076 to 999998	Required, Per Appendix B, there will be a single image in the file.
LI001	Length of nth Image Segment	10	BCS-N positive integer See Notes to less than 0000524228799	Required, Per Appendix B, there will be a single image in the file. Note: Based on Appendix B this value will likely be less than 1,000,000 bytes.
. . . . End for each IS LISHn, LIn; the number of loop repetitions is the value specified in the NUMI field.				
NUMS	Number of Graphic Segments	3	BCS-N positive integer “000”	Required
NUMX	Reserved for Future Use	3	BCS-N positive integer “000”	Required
NUMT	Number of Text Segments	3	BCS-N positive integer “001” to “002” or “000” if no license required	Required
. . . . . Start for each TS LTSHn, LTn.				
NOTE: Profile includes conditional commercial license text segment and optional frame description text segment				
LTSHn	Length of nth text sub-header	4	BCS-N positive integer “0282”	Conditional - If CI in frame, must include.
LTn	Length of nth text segment	5	BCS-N positive integer 00001 to 99998	Conditional - If CI in frame, must include.
. . . . End for each TS LTSHn, LTn; the number of loop repetitions is the value specified in the NUMT field.				
NUMDES	Number of Data Extension Segments	3	BCS-N positive integer “000”	Required
NUMRES	Number of Reserved Extension Segments	3	BCS-N positive integer “000”	Required
UDHDL	User Defined Header Data Length	5	BCS-N positive integer “00000”	Required
XHDL	Extended Header Data Length	5	BCS-N positive integer “00457”	Required; there will be a single TRE in the header of the file.
XHDLOFL	Extended Header Data Overflow	3	BCS-N positive integer “000”	Required; there will be no use of TRE Overflow.
XHD	Extended Header Data	454	TRE	Required; the total length is based on the CETAG length 6, the CEL length 5 and the GEOPSB length 443 bytes.

C.2.1.2 GEOPS (Georeferencing Information). GEOPS information is stored in NITF Header (XHD).

TABLE C-II. GEOPS – Geopositioning Information Extension (from STDI-0002-1 App. P)

FIELD	NAME	SIZE	ECIB VALUE	NOTES
CETAG	Unique Extension Identifier	6	BCS-A "GEOPSB"	Required
CEL	Length of Data to Follow	5	BCS-N positive integer "00443"	Required
TYP	Coordinate System Type	3	BCS-A "GEO"	Required
UNI	Coordinate Units	3	BCS-A "DEG"	Required
DAG	Geodetic Datum Name	80	BCS-A "World Geodetic System 1984" followed by 54 BCS spaces "0x20"	Required
DCD	Geodetic Datum Code	4	BCS-A "WGE"	Required
ELL	Ellipsoid Name	80	BCS-A "World Geodetic System 1984" followed by 54 BCS spaces "0x20"	Required
ELC	Ellipsoid Code	3	BCS-A "WE"	Required
DVR	Vertical Datum Reference	80	BCS-A BCS spaces "0x20"	Required
VDCDVR	Code (Category) of Vertical Reference	4	BCS-A BCS spaces "0x20"	Required
SDA	Sounding Datum Name	80	BCS-A BCS spaces "0x20"	Required
VDCSDA	Code for Sounding Datum	4	BCS-A BCS spaces "0x20"	Required
ZOR	Z values False Origin	15	BCS-N positive integer "000000000000000"	Required
GRD	Grid Code	3	BCS-A (Default is BCS spaces (0x20))	Required
GRN	Grid Description	80	BCS-A (Default is BCS spaces (0x20))	Required
ZNA	Grid Zone Number	4	BCS-N integer "0000"	Required

C.2.1.3 ECIB Image Segment Sub-Header.

TABLE C-III. ECIB image segment sub-header (from MIL-STD-2500C)

FIELD	NAME	SIZE	ECIB VALUE	NOTES
IM	File Part Type	2	BCS-A IM	Required
IID1	Image Identifier 1	10	BCS-A “ECIB”	Required
IDATIM	Image Date and Time	14	BCS-N CCYYMMDDhhmmss	Required; Oldest Source Significant Date
TGTID	Target Identifier	17	BCS-A (Default is BCS spaces (0x20))	Required
IID2	Image Identifier 2	80	ECS-A (Default is ECS spaces (0x20)) Frame File Name	Required
ISCLAS	Image Security Classification	1	ECS-A U, C, S, T, R	Required
ISCLSY	Image Security Classification System	2	ECS-A “US”	Required
ISCODE	Image Codewords	11	ECS-A (Default is ECS spaces (0x20))	Required
ISCTLH	Image Control and Handling	2	ECS-A (Default is ECS spaces (0x20))	Required
ISREL	Image Releasing Instructions	20	ECS-A (Default is ECS spaces (0x20))	Required
ISDCTP	Image Declassification Type	2	ECS-A (Default is ECS spaces (0x20)) DD, DE, GD, GE, O, X	Required
ISDCDT	Image Declassification Date	8	ECS-A (Default is ECS spaces (0x20)) CCYYMMDD	Required
ISDCXM	Image Declassification Exemption	4	ECS-A (Default is ECS space (0x20)) X1 to X8, X251 to X259	Required
ISDG	Image Downgrade	1	ECS-A (Default is ECS spaces (0x20)) S, C, R	Required

ISDGDT	Image Downgrade Date	8	ECS-A (Default is ECS spaces (0x20)) CCYYMMDD	Required
ISCLTX	Image Classification Text	43	ECS-A (Default is ECS spaces (0x20))	Required
ISCATP	Image Classification Authority Type	1	ECS-A (Default is ECS spaces (0x20)) O, D, M	Required
ISCAUT	Image Classification Authority	40	ECS-A (Default is ECS spaces (0x20))	Required
ISCRSN	Image Classification Reason	1	ECS-A (Default is ECS space (0x20)) A to G	Required
ISSRDT	Image Security Source Date	8	ECS-A (Default is ECS spaces (0x20)) CCYYMMDD	Required
ISCTLN	Image Security Control Number	15	ECS-A (Default is ECS spaces (0x20))	Required
ENCRYP	Encryption	1	BCS-N positive integer “0”	Required
ISORCE	Image Source	42	ECS-A (Default is ECS spaces (0x20))	Required; Source Type: QUICKBIRD, GEOEYE1, QB, GE1, WV1, WV2, etc
NROWS	Number of Significant Rows in Image	8	“00002304” for 1m and 5m ECIB	Required
NCOLS	Number of Significant Columns in Image	8	“00002304” for 1m and 5m ECIB	Required
PVTYPE	Pixel Value Type	3	BCS-A INT	Required
IREP	Image Representation	8	BCS-A “RGB” or “MONO” with BCS spaces (0x20)	Required, The YcbCr601 transform will be done internal to the J2K compressed data stream; expected output from decoders is RGB. MONO refers to panchromatic imagery.
ICAT	Image Category	8	BCS-A ”VIS” followed by 5 BCS spaces (0x20)	Required

ICAT	Image Category	8	BCS-A ”VIS” followed by 5 BCS spaces (0x20)	Required
ABPP	Actual Bits-Per-Pixel Per Band	2	BCS-N “08”	Required
PJUST	Pixel Justification	1	BCS-A “R”	Required
ICORDS	Image Coordinate Representation	1	BCS-A (Default is BCS spaces (0x20)) “D” for decimal degrees	Required
IGEOLO	Image Geographic Location	60	BCS-A ±dd.ddd±ddd.ddd (four times)	Conditional, for cataloging, not for geo-referencing; field is omitted if ICORDS field is BCS space
NICOM	Number of Image Comments	1	BCS-N positive integer “1”	Required
$ICOM_1$	Image Comment 1	80	Production Date CCYYMMDD	Required
IC	Image Compression	2	BCS-A “C8”	Required
COMRAT	Compression Rate Code	4	BCS-A “0053” or similar value	Required, 15:1 compression, 8/15 = 0.5 (per band) so COMRAT = (approximately) 0053
NBANDS	Number of Bands	1	BCS-N “0”-“9”	Required. “0” if more than 9 bands. For ECIB, value = “1” or “3” for standard products.
XBANDS	Number of additional Bands	5	BCS-N “00010”-“99999”	Conditional – if more than 9 bands. Not populated for standard ECIB products.
. . . . . Start for each IREPBANDn to LUTDnm fields.				
NOTE: The fields IREPBANDn to LUTDnm fields repeat the number of times indicated in the NBANDS field				
$IREPBAND_n$	Nth Band Representation	2	BCS-A “R ”, “G ”, “B ” or “M “(for mono), Use two spaces for other bands	Required. Mono references the panchromatic mode.
$ISUBCAT_n$	Nth Band Subcategory	6	BCS-A (BCS spaces (0x20))	Required
IFC_n	Nth Band Image Filter Condition	1	BCS-A “N”	Required

IMFLTn	Nth Band Standard Image Filter Code	3	BCS-A (BCS spaces (0x20))	Required
$NLUTS_n$	Number of LUTS for the nth Image Band	1	BCS-N “0”	Required
ISYNC	Image Sync code	1	BCS-N “0”	Required
IMODE	Image Mode	1	BCS-A “B”	Required
NBPR	Number of Blocks Per Row	4	BCS-N “0001”	Required, No Tiling
NBPC	Number of Blocks Per Column	4	BCS-N “0001”	Required, No Tiling
NPPBH	Number of Pixels Per Block Horizontal	4	BCS-N “2304” or = NCOLS	Required
NPPBV	Number of Pixels Per Block Vertical	4	BCS-N “2304” or = NROWS	Required
NBPP	Number of Bits Per Pixel per Band	2	BCS-N “08” (or “16” for future use)	Required
IDLVL	Image Display Level	3	BCS-N “001”	Required
IALVL	Attachment Level	3	BCS-N “000”	Required
ILOC	Image Location	10	BCS-N “0000000000”	Required
IMAG	Image Magnification	4	BCS-A 1.0 followed by a BCS space (0x20)	Required
UDIDL	User Defined Image Data Length	5	BCS-N “00000”	Required
IXSHDL	Image Extended Sub-header Data Length	5	BCS-N 59 (GEOLOB) + Length of RA + Length of ACCHZB + [Length of BNDPLB or Length of SNSPSB] + 4 for IXSOFL	Required; there will be four TREs in the image sub-header of the file. Required: GEOLOB, J2KLRA, ACCHZB. If no sensor data, then BNDPLB is required. If sensor data is present, SNSPSB is required.
IXSOFL	Image Extended Sub-header Overflow	3	BCS-N “000”	Required.
IXSHD	Image Extended Sub-header Data	IXSHDL -3	TREs (see tables below)	Required

C.2.1.4 GEOLOB (Geographic Coordinate Information). GEOLOB information is stored in Image Segment Sub-header (IXSHD).

TABLE C-IV. GEOLOB – Geographic Coordinate System (from STDI-0002-1 App.)

FIELD	NAME	SIZE	ECIB VALUE	NOTES
CETAG	Unique Extension Identifier	6	BCS-A GEOLOB	Required
CEL	Length of Data to Follow	5	BCS-N positive integer 00048	Required
ARV	Longitude Density	9	BCS-N positive integer 000000002 to 999999999	Required
BRV	Latitude Density	9	BCS-N positive integer 000000002 to 999999999	Required
LSO	Longitude of Reference Origin	15	BCS-N In the form of +ddd.ddddddddd	Required Origin Longitude of the frame (NW corner)
PSO	Latitude of Reference Origin	15	BCS-N In the form of +ddd.ddddddddd	Required Origin Latitude of the frame (NW corner)

C.2.1.5 J2KLRA (JPEG 2000 Layer Information). J2KLRA information is stored in Image Segment Sub-header (IXSHD).

TABLE C-V. J2KLRA – JPEG 2000 Layers(from ISO/IEC BPJ2K01.10)

FIELD	NAME	SIZE	ECIB VALUE	NOTES
CETAG	Unique Extension Identifier	6	BCS-A J2KLRA	Required
CEL	Length of Data to Follow	5	BCS-N positive integer	Required
ORIG	Original compressed data.	1	“8”	Required
Original compressed image information (the first JPEG2000 Compression)				
NLEVELS_O	Number of wavelet levels in original image	2	“05”	Required
NBANDS_O	Number of bands in original image	5	BCS-N 00001-16384	Required
NLAYERS_O	Number of layers in original image	3	BCS-N “005”	Required
$LAYER\_ID_0$	Layer ID Number	3	“000”	Required
$BITRATE_0$	Target bitrate	9	“00.031250”	Required 256:1 compression
$LAYER\_ID_0$	Layer ID Number	3	“001”	Required
$BITRATE_0$	Target bitrate	9	“00.062500”	Required 128:1 compression
$LAYER\_ID_0$	Layer ID Number	3	“002”	Required
$BITRATE_0$	Target bitrate	9	“00.125000”	Required 64:1 compression
$LAYER\_ID_0$	Layer ID Number	3	“003”	Required
$BITRATE_0$	Target bitrate	9	“00.250000”	Required 32:1 compression
$LAYER\_ID_0$	Layer ID Number	3	“004”	Required
$BITRATE_0$	Target bitrate	9	“00.533333”	Required 15:1 compression
conditional fields if the data has been parsed				
NLEVELS_I	Number of wavelet levels in this image	2	BCS-N 00-32	Conditional
NBANDS_I	Number of bands in this image	5	BCS-N 00001-00009	Conditional
NLAYERS_I	Number of layers in this image	3	BCS-N 001-999	Conditional

C.2.1.6 ACCHZB (Horizontal Accuracy Information). ACCHZB information is stored in Image Segment Sub-header (IXSHD).

TABLE C-VI. Horizontal Accuracy (from STDI-0002-1 App. P)

FIELD	NAME	SIZE	ECIB VALUE	NOTES
CETAG	Unique Extension Identifier	6	BCS-A "ACCHZB"	Required
CEL	Length of Data to Follow	5	BCS-N 00011 to 99985	Required
NUM_ACHZ	Number of Horizontal Accuracy Regions	2	BCS-N 01 to 99	Required
Start for each region of horizontal accuracy				
$UNIAAH_n$	Unit of measure for AAH_n	3	BCS-A "DM" (=decimeters) or "M" (= meters)	Required
AAH_n	Absolute Horizontal Accuracy	5	BCS-N 00000 to 99999	Required
$UNIAPH_n$	Unit of Measure for APH_n	3	BCS-A (Default is BCS spaces (0x20)) "DM" (decimeters) or "M" (= meters) (if relative accuracy is known)	Required
APH_n	Point-to-point Horizontal Accuracy	5	BCS-N 00000 to 99999	Conditional If $UNIAPH_n$ = M
NUM_PTS_n	Number of Points in Bounding Polygon	3	BCS-N 004-999 (or 000 when NUM_ACHZ = 1) First and last points shall be the same	Required
Start for each bounding polygon point (coordinate pair)				
LON_{nm}	Longitude/Easting of the m^{th} point	15	BCS-N Decimal degrees ±ddd.ddd…	Conditional
LAT_{nm}	Latitude/Northing of the m^{th} point	15	BCS-N Decimal degrees ±dd.ddd…	Conditional
End for each bounding polygon point (coordinate pair)				
End for each region of horizontal accuracy				

C.2.1.7 BNDPL (Bounding Polygon). This optional extension is dedicated to provide an accurate location of the significant data contained in the Image Segment. The coordinates of this bounding polygon refer to the absolute coordinate system defined in the GEOPS (and possibly in the PRJPS) extension. The extension is called BNDPL and Table C-VIII details the user-defined fields.

TABLE C-VII. BNDPL – Bounding Polygon Extension (from DIGEST Table D1-9)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Identifier. The last character identifies the version of the TRE	6	BCS-A BNDPLB	<R>
CEL	Length of Data to follow The CEL Field value shall be equal to: 4 + NUM_PTS * 30	5	BCS-N positive integer 00124 to 99964	<R>
The following fields define BNDPL...				
NUM_PTS	Number of points in bounding polygon This field shall contain the number of points (coordinate pairs) constituting the bounding polygon. The first and last points shall be the same. Coordinate values shall refer to the coordinate system and units defined in GEOPS (and possibly in PRJPS).	4	BCS-N positive integer 0004 to 3332	R
. . . .	Start for each bounding polygon point			
LONn	Longitude/Easting This field shall contain the easting (when the value of GEOPS.UNI is M) or longitude (otherwise) of the n^{th} bounding	15	BCS-N	R
LATn	Latitude/Northing This field shall contain the northing (when the value of GEOPS.UNI is M) or latitude (otherwise) of the n^{th} bounding polygon	15	BCS-N	R
. . . .	End for each bounding polygon point			

C.2.1.8 SNSPS (Sensor Parameters Data Extension). The user-defined fields of the SNSPS data extension are detailed in Table D1-13, together with their descriptions. The attitude data are given relative to the orbital reference of the sensor. The additional auxiliary parameters can be either character strings, integer, or floating point numeric values. The auxiliary parameter value format discriminates between the 3 possible cases. The precision (and units) of the numeric values defines the accuracy required by the location model.

TABLE C-VIII. SNSPS – Sensor Parameters Data Extension (from DIGEST Table D1-13)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Identifier. The last character identifies the version of the TRE	6	BCS-A **SNSPSB**	R
CEL	Length of Data to Follow Note that the value range for NUM_SNS, NUMBPn, NUM_PTSnp, NUM_BNDn and NUM_AUXn fields may be limited to less than their maximum value due to the limited length of a TRE (i.e. CEL limited to 99985).	5	BCS-N positive integer **00161** to **99985**	R
The following fields define SNSPS				
NUM_SNS	Number of sets of sensor parameters The image contained in the current Image Segment may be derived from one or many original scenes (source images) from different sensors. Each original scene is described using a set of sensor parameters. This field shall contain the number of sensor parameter sets to follow, that is, the number of original scenes used to produce the image.	2	BCS-N positive integer **01** to **99**	R
.... Start for each set of sensor parameters				
1. Bounding Polygons				
NUM_BPn	Number of Bounding Polygons This field shall contain the number of bounding polygons defining the part of the image concerned by the n^{th} original scene. If the set of sensor parameters applies to the entire Image Segment (necessary when the GEOPS extension is not present), then this field contains **00**.	2	BCS-N positive integer **01** to **99** or **00**	R
.... Start for each bounding polygon of the n^{th} original scene				

NUM_PTSnp	Number of Points in the p^{th} Bounding Polygon This field is required when the value of NUM_BPn is greater than 00, and shall be omitted otherwise. When present, this field shall contain the number of points (coordinate pairs) that are used to define the p^{th} bounding polygon of the n^{th} original scene. Coordinate values shall refer to the coordinate system and units defined in GEOPS (and possibly in PRJPS). First and last points shall be the same.	3	BCS-N positive integer **004** to **999**	C (R)

FIELD	**NAME**	**SIZE**	**VALUE RANGE**	**TYPE**
	. . . . Start for each point (coordinate pair) of the p^{th} bounding polygon			
LONnpm	Longitude/Easting This field is required when the value of NUM_BPn is greater than 00, and shall be omitted otherwise. When present, this field shall contain the easting (when the value of GEOPS.UNI is M) or the longitude (otherwise) of the m^{th} point of the p^{th} bounding polygon.	15	BCS-N	C (R)
LATnpm	Latitude/Northing This field is required when the value of NUM_BPn is greater than 00, and shall be omitted otherwise. When present, this field shall contain the northing (when the value of GEOPS.UNI is M) or the latitude (otherwise) of the m^{th} point of the p^{th} bounding polygon.	15	BCS-N	C (R)
	. . . . End for each point (coordinate pair) of the p^{th} bounding polygon			
	. . . . End for each bounding polygon of the n^{th} original scene			
	2. Identification of the bands of the n^{th} original scene at capture stage			
NUM_BNDn	Number of Bands This field shall contain the number of bands of the n^{th} original scene. NOTE: The band description of the original scene may differ from the band description of the transmitted image especially in case of radiometric treatment (e.g., infra-red band changed into red band, RGB image changed into color-coded image, ...). When there is a one-to-one correspondence between the original scene and the image, the band description order in the SNSPS extension shall be consistent with the band description order in the Image Subheader.	2	BCS-N positive integer **01** to **99**	R
	. . . . Start for each band of the n^{th} original scene			
BIDnp	Original Scene Band Identification This field shall contain an identification of the p^{th} band of the n^{th} original scene.	5	BCS-A	R

WS1np	Signal Lower Limit This field shall contain the lower limit (wavelength, amplitude or phase) of the signal for the p^{th} band of the n^{th} original scene. This value can be determined by half maximum value. The unit of measure is nanometres for wavelength.	5	BCS-N positive integer	<R>
WS2np	Signal Upper Limit This field shall contain the upper limit (wavelength, amplitude or phase) of the signal for the p^{th} band of the n^{th} original scene. This value can be determined by half maximum value. The unit of measure is nanometers for wavelength.	5	BCS-N positive integer	<R>

FIELD	**NAME**	**SIZE**	**VALUE RANGE**	**TYPE**
. . . .	End for each band of the n^{th} original scene			
3. Image resolution at capture stage of the n^{th} original scene				
UNIRESn	Resolutions and ground sample distances units This field shall contain the unit of measure of the REXn, REYn, GSXn and GSYn Fields.	3	BCS-A See Part 3-7	R
REXn	Resolution in columns This field shall contain the resolution in columns of the n^{th} original scene at capture stage.	6	BCS-N	R
REYn	Resolution in rows This field shall contain the resolution in rows of the n^{th} original scene at capture stage.	6	BCS-N	R
GSXn	Ground Sample Distance in columns This field shall contain the ground pixel spacing in columns of the n^{th} original scene at capture stage measured at pixel GSL. The REX and GSX Fields may have different values (e.g., for ERS1 SAR PRI images, REX = 27 m, GSX = 12.5 m), but the default value of the GSX Field is the value of the REX Field (e.g., for SPOT images in PAN mode, REX = GSX = 10 m).	6	BCS-N	R
GSYn	Ground Sample Distance in rows This field shall contain the ground pixel spacing in rows of the n^{th} original scene at capture stage measured at pixel GSL. The REY and GSY Fields may have different values, but the default value of the GSY Field is the value of the REY Field.	6	BCS-N	R

GSLn	Location of pixel for GSXn and GSYn This field can contain an approximate location (e.g., UPPER LEFT, LOWER RIGHT, CENTER, ...) of the n^{th} original scene pixel where the ground sample distances and resolutions have been measured. The default value is **BCS Spaces**.	12	BCS-A	<R>
4. Basic parameters				
PLTFMn	Vector or Mission Name This field shall contain the name of the vector or mission used to produce the n^{th} original scene (e.g., **SPOT3**).	8	BCS-A	R
INSn	Sensor or Instrument Name This field shall contain the name of the sensor or instrument used to produce the n^{th} original scene (e.g., **HRV1**).	8	BCS-A	R
MODn	Spectral Mode This field shall contain the identification of the sensor processing mode used to capture the n^{th} original scene (e.g., **PAN**).	4	BCS-A	R

FIELD	**NAME**	**SIZE**	**VALUE RANGE**	**TYPE**
PRLn	Processing Level This field shall contain the identification of the processing level applied to the n^{th} original scene in order to produce the transmitted image (e.g., **1A**).	5	BCS-A	R
SIDn	Source Image ID This field can contain an identification of the n^{th} original scene. The default value is **BCS Spaces**.	10	BCS-A	<R>
ACTn	Acquisition Date & Time This field shall contain the acquisition date and time of the n^{th} original scene. This information is generally computed at scene centre.	18	BCS-A YYYYMMDDhhmmss.fff	R
UNINOAn	Unit of the Scene Orientation Angle This field shall contain the unit of measure of the NOAn Field, or **BCS Spaces** if this information is unknown or not applicable. The default units are decimal degrees (**DEC**). The default value is **BCS Spaces**.	3	BCS-A See Part 3-7	<R>
NOAn	Scene Orientation Angle This field is omitted when UNINOAn contains **BCS Spaces**. Otherwise, this field shall contain the complement of the angle between the lines of the n^{th} original scene and the meridian of the absolute coordinate system. This angle is usually measured at scene centre.	7	BCS-N	C

UNIANGn	Unit of Incidence Angle This field shall contain the unit of measure of the incidence angle of the n^{th} original scene, or **BCS Spaces** if this angle is unknown or not applicable. The default units are decimal degrees (**DEC**). The default value is **BCS Spaces**.	3	BCS-A See Part 3-7	<R>
ANGn	Incidence Angle at Original Scene Centre This field is omitted when UNIANGn contains **BCS Spaces**. Otherwise, this field shall contain the incidence angle of the n^{th} original scene. This information is generally computed at scene centre.	7	BCS-N	C
UNIALTn	Unit of Altitude This field shall contain the unit of altitude of sensor when capturing the n^{th} original scene, or **BCS Spaces** if this altitude is unknown or not applicable. The default units are metres (**M**). The default value is **BCS Spaces**.	3	BCS-A See Part 3-7	<R>
ALTn	Altitude of Sensor This field is omitted when UNIALTn contains **BCS Spaces**. Otherwise, this field shall contain the altitude of sensor when capturing the n^{th} original scene.	9	BCS-N	C

FIELD	**NAME**	**SIZE**	**VALUE RANGE**	**TYPE**
LONSCCn	WGS84 Longitude of Original Scene Centre This field shall contain the longitude of the n^{th} original scene centre. The coordinate system is geographic and refers to the WGS84 datum. The units for longitude are seconds of arc (**SEC**).	10	BCS-N ±SSSSSS.SS	R
LATSCCn	WGS84 Latitude of Original Scene Centre This field shall contain the latitude of the n^{th} original scene centre. The coordinate system is geographic and refers to the WGS84 datum. The units for latitude are seconds of arc (**SEC**).	10	BCS-N ±SSSSSS.SS	R
UNISAEn	Unit of Solar Angles This field shall contain the unit of solar angles of the n^{th} original scene, or **BCS Spaces** if these angles are unknown or not applicable. The default units are decimal degrees (**DEC**). The default value is **BCS Spaces**.	3	BCS-A See Part 3-7	<R>
SAZn	Solar Azimuth This field is omitted when UNISAEn contains **BCS Spaces**. Otherwise, this field shall contain the solar azimuth of the n^{th} original scene. This information is generally computed at scene centre.	7	BCS-N	C

SELn	Solar Elevation This field is omitted when UNISAEn contains **BCS Spaces**. Otherwise, this field shall contain the solar elevation of the n^{th} original scene. This information is generally computed at scene centre.	7	BCS-N	C
UNIRPYn	Unit of Attitude Angles This field shall contain the unit of attitude angles of the n^{th} original scene, or **BCS Spaces** if these angles are unknown or not applicable. The default units are decimal degrees (**DEC**). The default value is **BCS Spaces**.	3	BCS-A See Part 3-7	<R>
ROLn	Roll of the Sensor This field is omitted when UNIRPYn contains **BCS Spaces**. Otherwise, this field shall contain the roll of the sensor while capturing the n^{th} original scene. This information is generally computed at scene centre.	7	BCS-N	C
PITn	Pitch of the Sensor This field is omitted when UNIRPYn contains **BCS Spaces**. Otherwise, this field shall contain the pitch of the sensor while capturing the n^{th} original scene. This information is generally computed at scene centre.	7	BCS-N	C

FIELD	**NAME**	**SIZE**	**VALUE RANGE**	**TYPE**
YAWn	Yaw of the Sensor This field is omitted when UNIRPYn contains **BCS Spaces**. Otherwise, this field shall contain the yaw of the sensor while capturing the n^{th} original scene. This information is generally computed at scene centre.	7	BCS-N	C
UNIPXTn	Unit of Pixel Time This field shall contain the unit of the PXTn Field, or **BCS Spaces** if the pixel time is unknown or not applicable. The default units are seconds (**S**). The default value is **BCS Spaces**.	3	BCS-A See Part 3-7	<R>
PXTn	Pixel Time This field is omitted when UNIPXTn contains **BCS Spaces**. Otherwise, this field shall contain the start time of acquisition of the n^{th} original scene.	14	BCS-N	C

UNISPEn	Unit of Attitude Speed This field shall contain the unit of attitude speeds of the nth original scene, or **BCS Spaces** if these speeds are unknown or not applicable. The default units are seconds of arc per second (**SEC/S**). Angle units and time units are separated by a BCS Solidus (0x2F). The default value is **BCS Spaces**.	7	BCS-A See Part 3-7	<R>
ROSn	Roll Speed This field is omitted when UNISPEn contains **BCS Spaces**. Otherwise, this field shall contain the rotation speed around the roll axis of the sensor while capturing the nth original scene. This information is generally computed at scene centre.	22	BCS-N	C
PISn	Pitch Speed This field is omitted when UNISPEn contains **BCS Spaces**. Otherwise, this field shall contain the rotation speed around the pitch axis of the sensor while capturing the nth original scene. This information is generally computed at scene centre.	22	BCS-N	C
YASn	Yaw Speed This field is omitted when UNISPEn contains **BCS Spaces**. Otherwise, this field shall contain the rotation speed around the yaw axis of the sensor while capturing the nth original scene. This information is generally computed at scene centre.	22	BCS-N	C

FIELD	**NAME**	**SIZE**	**VALUE RANGE**	**TYPE**
5. Auxiliary parameters				
NUM_AUXn	Number of Auxiliary Parameters This field shall contain the number of auxiliary (additional) parameters of the nth original scene. The definition of an additional parameter is necessarily given by the APIn, APFn, UNIAPXn Fields and by one of the APNn, APRn and APAn Fields, depending of the format specified by the parameter value of the APFn Field. The default value is **000**.	3	BCS-N positive integer **000** to **999**	R
. . . .	Start for each additional auxiliary parameter of the nth original scene			

APInp	Auxiliary Parameter ID This field is required when the value of NUM_AUXn is greater than 00, and shall be omitted otherwise. This field shall contain an identification of the p^{th} auxiliary parameter of the n^{th} original scene. The first character of this field can't be a BCS Space as a significant ID is expected.	20	BCS-A	C (R)
APFnp	Auxiliary Parameter Value Format This field is required when the value of NUM_AUXn is greater than 00, and shall be omitted otherwise. This field shall specify the format of the auxiliary parameter value. The APNnp, APRnp and APAnp Fields are required when the APFnp value is respectively **I**, **R** and **A**.	1	BCS-A **I**, **R** or **A**	C (R)
UNIAPXnp	Unit of Auxiliary Parameter This field is required when the value of NUM_AUXn is greater than 00, and shall be omitted otherwise. This field shall specify the unit of the p^{th} auxiliary parameter, or **BCS Spaces** if not applicable (e.g., the auxiliary parameter is not numerical). When a compound unit is formed by multiplication or division of two units, they are separated by a full stop (0x2E) or respectively a solidus (0x2F). The default value is **BCS Spaces**.	7	BCS-A See Part 3-7	C (<R>)
APNnp	Auxiliary Parameter Integer Value This field appears if and only if NUM_AUXn value is greater than 00 and the APF value is I. In this case, this field contains an integer value corresponding to the p^{th} auxiliary parameter.	10	BCS-N	C
APRnp	Auxiliary Parameter Real Value This field appears if and only if NUM_AUXn value is greater than 00 and the APF value is R. In this case, this field contains a real value corresponding to the p^{th} auxiliary parameter.	20	BCS-N	C

FIELD	**NAME**	**SIZE**	**VALUE RANGE**	**TYPE**
APAnp	Auxiliary Parameter Characters String Value This field appears if and only if NUM_AUXn value is greater than 00 and the APF value is A. In this case, this field contains a string value corresponding to the p^{th} auxiliary parameter.	20	ECS-A	C
. . . . End for each additional auxiliary parameter of the n^{th} original scene				
. . . . End for each set of sensor parameters				

C.2.1.9 ECIB Text Segment Sub-Headers; Commercial License and (optional) Frame Description.

TABLE C-IX. ECIB Text Segments (from MIL-STD-2500C)

FIELD	NAME	SIZE	ECIB VALUE	NOTES
TE	File Part Type	2	"TE"	Required
TEXTID	Text Identifier	7	"FRMDESC" or "LICENSE"	FRMDESC is optional. LICENSE is Conditional-required if CI used in the frame.
TXTALVL	Text Attachment Level	3	"000"	Required
TXTDT	Text Date and Time	14	CCYYMMDDhhmmss	Required - Date of oldest image in frame (date image is shot).
TXTITL	Text Title	80	"Frame Description" or commercial license segment, valid values are in CDP NITF 2.1 specification document	Required
TSCLAS	Text Security Classification	1	S or U	Required
TSCLSY	Text Security Classification System	2	ECS-A "US"	Required
TSCODE	Text Codewords	11	BCS-A (Default is BCS spaces (0x20))	Required
TSCTLH	Text Control and Handling	2	ECS-A (Default is ECS spaces (0x20))	Required
TSREL	Text Releasing Instructions	20	ECS-A (Default is ECS spaces (0x20))	Required
TSDCTP	Text Declassification Type	2	ECS-A DD, DE, GD, GE, O, X (Default is ECS spaces (0x20))	Required
TSDCDT	Text Declassification Date	8	ECS-A CCYYMMDD (Default is ECS spaces (0x20))	Required
TSDCXM	Text Declassification Exemption	4	ECS-A X1 to X8, X251 to X259, (Default is ECS spaces (0x20))	Required

TSDG	Text Downgrade	1	ECS-A S,C, R (Default is ECS spaces (0x20))	Required
TSDGDT	Text Downgrade Date	8	ECS-A CCYYMMDD (Default is ECS spaces (0x20))	Required
TSCLTX	Text Classification Text	43	ECS-A (Default is ECS spaces (0x20))	Required
TSCATP	Text Classification Authority Type	1	ECS-A (Default is ECS spaces (0x20))	Required
TSCAUT	Text Classification Authority	40	ECS-A (Default is ECS spaces (0x20))	Required
TSCRSN	Text Classification Reason	1	ECS-A A to G (Default is ECS spaces (0x20))	Required
TSSRDT	Text Security Source Date	8	ECS-A CCYYMMDD (Default is ECS spaces (0x20))	Required
TSCTLN	Text Security Control Number	15	ECS-A (Default is ECS spaces (0x20))	Required
ENCRYP	Encryption	1	“0”	Required
TXTFMT	Text Format	3	“STA”	Required
TXSHDL	Text Extended Sub-header Data Length	5	“00000”	Required

C.2.2 JPEG 2000 Details.

C.2.2.1 JPEG 2000 References

- ISO/IEC 15444-1
- BPJ2K01.10 (BPJ2K01.10 sections 7, 8, and D.4.7)

C.2.2.2 JPEG 2000 File Format within NITF/NSIF.

- JPC Compressed Data Stream Only
  - Minimal JPEG2000 file that gives only the information required to decode the data.
  - This is the recommended approach for use of JPEG 2000 within NITF/NSIF from BPJ2K01.10
  - The JPC Compressed Data Stream is entirely contained within the NITF 2.1 Image Segment described by the Image Segment Sub-header in section C.2.1.3.
- JPEG 2000 ECIB Details
  - JPEG 2000 Part 1 Profile 1 Compliant
  - ECIB 15:1 Compression
  - RPCL (Resolution Precinct Component Layer)
    - Precinct Size of 256x256.
  - 9-7I Irreversible wavelet Transformation
    - Implements ICT (Irreversible Component Transform)
  - Code-Block Size of 64x64
  - No Tiling
    - Tile Size will equal Frame Size, i.e. No tiles within an image
  - 5 (five) Decomposition Layers will allow for 6 (six) viewing resolutions
  - PLT Marker for the single tile-part
  - 5 (five) Quality Layers (0.03125, 0.0625, 0.125, 0.25, 0.533333 bpppb)

C.2.2.3 Specifics in addition to BPJ2K01.10 Section 7.

- XT_{SIZ} = X_{SIZ} = YT_{SIZ} = Y_{SIZ} [Single Tile for entire image]
- Progression Order = 0000 0010 [RPCL]
- Scod = 0000 0111 [Entropy Coder, with precincts defined in Precinct Size, EPH Marker shall be used, SOP marker segments may be used]
- SPcod/SPcoc Precinct Size Field = 1000 1000 [256 x 256 Precincts]
- Lqcd in QCD and/or QCC = 35 [9-7i wavelet]
- Sqcd in QCD and/or QCC = 0100 0010 [9-7 Irreversible Filter, 2 Guard Bits, and Scalar Expounded Quantization]
- XO_{SIZ} and YO_{SIZ} = 0 [No offset from origin of reference grid]
- XTO_{SIZ} and YO_{SIZ} = 0 [No offset from origin to edge of first tile]
- Multiple Component Transform = 0000 0001 [Component Transform Used]
- SPcod/SPcoc N_{LEVELS} = 5
- SPcod/SPcoc Transformation = 0000 0000 [9-7 Irreversible Wavelet Filter]

C.2.3 Volume metadata files.

C.2.3.1 Table of Contents (TOC). The Extensible Markup Language (XML) schema below defines the XSD for the ECIB Table of Contents (TOC) file. Immediately below the schema is Table C-VIII, a human-readable equivalent of the XML schema document, with field definitions and examples.

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">
	<xs:simpleType name="T_classification">
		<xs:restriction base="xs:string">
			<xs:enumeration value="U"/>
			<xs:enumeration value="S"/>
			<xs:enumeration value="T"/>
			<xs:enumeration value="C"/>
			<xs:enumeration value="R"/>
		</xs:restriction>
	</xs:simpleType>
	<xs:complexType name="T_source_list">
		<xs:sequence " minOccurs=”0” maxOccurs="unbounded">
			<xs:element ref="source"/>
		</xs:sequence>
		<xs:attribute ref="number_of_sources" use="required"/>
	</xs:complexType>
	<xs:complexType name="T_shapefile_list">
		<xs:sequence>
			<xs:element ref="shapefile" maxOccurs="unbounded"/>
		</xs:sequence>
		<xs:attribute ref="number_of_shapefiles" use="required"/>
	</xs:complexType>
	<xs:complexType name="T_shapefile">
		<xs:sequence>
			<xs:element ref="file_name"/>
			<xs:element ref="bounding_rectangle"/>
		</xs:sequence>
	</xs:complexType>
	<xs:complexType name="T_security">
		<xs:sequence>
			<xs:element ref="classification"/>
			<xs:element ref="classifier_country_code"/>
			<xs:element ref="release_marking"/>
			<xs:element ref="control_handling"/>
			<xs:element ref="downgrade_instructions"/>
```

```
        </xs:sequence>
</xs:complexType>
<xs:complexType name="T_gsd">
        <xs:sequence>
                <xs:element ref="frame" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:attribute ref="gsd" use="required"/>
</xs:complexType>
<xs:complexType name="T_product">
        <xs:sequence>
                <xs:element ref="disc"/>
        </xs:sequence>
        <xs:attribute ref="product_title" use="required"/>
</xs:complexType>
<xs:complexType name="T_media_producer">
        <xs:sequence>
                <xs:element ref="producer_name"/>
                <xs:element ref="producer_address" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
</xs:complexType>
<xs:complexType name="T_product_series">
        <xs:sequence>
                <xs:element ref="volume_id"/>
                <xs:element ref="product_item_id"/>
                <xs:element ref="product_edition"/>
                <xs:element ref="copyright_year"/>
                <xs:element ref="government_producer"/>
                <xs:element ref="stock_number" minOccurs="0"/>
                <xs:element ref="media_production_date"/>
                <xs:element ref="bounding_rectangle"/>
                <xs:element ref="security"/>
                <xs:element ref="governing_standard"/>
                <xs:element ref="number_of_frames"/>
                <xs:element ref="media_producer"/>
                <xs:element ref="media_description" minOccurs="0"/>
        </xs:sequence>
        <xs:attribute ref="product_series" use="required"/>
</xs:complexType>
<xs:complexType name="T_government_producer">
        <xs:sequence>
                <xs:element ref="producer_name"/>
                <xs:element ref="producer_address" minOccurs="0"/>
                <xs:element ref="producer_information" minOccurs="0" maxOccurs="unbounded"/>
```

```
        </xs:sequence>
</xs:complexType>
<xs:complexType name="T_governing_standard">
        <xs:sequence>
                <xs:element ref="standard_name"/>
                <xs:element ref="standard_number"/>
                <xs:element ref="standard_date"/>
        </xs:sequence>
</xs:complexType>
<xs:complexType name="T_frame_list">
        <xs:sequence>
                <xs:element ref="gsd"/>
        </xs:sequence>
        <xs:attribute ref="number_of_frames" use="required"/>
</xs:complexType>
<xs:complexType name="T_frame">
        <xs:sequence>
                <xs:element ref="frame_path"/>
                <xs:element ref="security"/>
                <xs:element ref="source_list"/>
        </xs:sequence>
        <xs:attribute ref="frame_name" use="required"/>
</xs:complexType>
<xs:complexType name="T_file_header">
        <xs:sequence>
                <xs:element ref="file_name"/>
                <xs:element ref="product_series"/>
        </xs:sequence>
        <xs:attribute ref="file_status" use="required"/>
</xs:complexType>
<xs:complexType name="T_disc">
        <xs:sequence>
                <xs:element ref="frame_list"/>
        </xs:sequence>
        <xs:attribute ref="id" use="required"/>
</xs:complexType>
<xs:complexType name="T_bounding_rectangle">
        <xs:sequence>
                <xs:element ref="lat_lon" maxOccurs="unbounded"/>
        </xs:sequence>
</xs:complexType>
<xs:complexType name="T_Table_of_Contents">
        <xs:sequence>
                <xs:element ref="file_header"/>
```

```
                <xs:element ref="product"/>
                <xs:element ref="shapefile_list" minOccurs="0"/>
        </xs:sequence>
</xs:complexType>
<xs:attribute name="gsd" type="xs:string"/>
<xs:attribute name="product_title" type="xs:string"/>
<xs:attribute name="number_of_sources" type="xs:integer"/>
<xs:attribute name="number_of_shapefiles" type="xs:integer"/>
<xs:attribute name="number_of_frames" type="xs:integer"/>
<xs:attribute name="frame_name" type="xs:string"/>
<xs:attribute name="id" type="xs:string"/>
<xs:attribute name="file_status">
        <xs:simpleType>
                <xs:restriction base="xs:string">
                        <xs:enumeration value="new"/>
                        <xs:enumeration value="replacement"/>
                        <xs:enumeration value="update"/>
                </xs:restriction>
        </xs:simpleType>
</xs:attribute>
<xs:attribute name="product_series" type="xs:string "/>
<xs:element name="stock_number" type="xs:string"/>
<xs:element name="standard_number" type="xs:string"/>
<xs:element name="standard_name" type="xs:string"/>
<xs:element name="standard_date" type="xs:date"/>
<xs:element name="source_list" type="T_source_list"/>
<xs:element name="source" type="xs:string"/>
<xs:element name="shapefile_list" type="T_shapefile_list"/>
<xs:element name="shapefile" type="T_shapefile"/>
<xs:element name="security" type="T_security"/>
<xs:element name="gsd" type="T_gsd"/>
<xs:element name="release_marking" type="xs:string"/>
<xs:element name="product" type="T_product"/>
<xs:element name="producer_name" type="xs:string"/>
<xs:element name="producer_information" type="xs:string"/>
<xs:element name="producer_address" type="xs:string"/>
<xs:element name="volume_id" type="xs:string"/>
<xs:element name="number_of_frames" type="xs:integer"/>
<xs:element name="product_item_id" type="xs:string"/>
<xs:element name="media_production_date" type="xs:date"/>
<xs:element name="media_producer" type="T_media_producer"/>
<xs:element name="product_series" type="T_product_series"/>
<xs:element name="product_edition">
        <xs:simpleType>
```

```
                    <xs:restriction base="xs:integer">
                        <xs:pattern value="[0-9][0-9][0-9]"/>
                    </xs:restriction>
                </xs:simpleType>
            </xs:element>
            <xs:element name="media_description" type="xs:string"/>
            <xs:element name="lat_lon" type="xs:string"/>
            <xs:element name="government_producer" type="T_government_producer"/>
            <xs:element name="governing_standard" type="T_governing_standard"/>
            <xs:element name="frame_path" type="xs:string"/>
            <xs:element name="frame_list" type="T_frame_list"/>
            <xs:element name="frame" type="T_frame"/>
            <xs:element name="file_name" type="xs:string"/>
            <xs:element name="file_header" type="T_file_header"/>
            <xs:element name="disc" type="T_disc"/>
            <xs:element name="classifier_country_code" type="xs:string"/>
            <xs:element name="control_handling" type="xs:string"/>
            <xs:element name="downgrage_instructions " type="xs:string"/>
            <xs:element name="copyright_year" type="xs:string" minOccurs="0"/>
            <xs:element name="copyright_year">
                <xs:simpleType>
                    <xs:restriction base="xs:integer">
                        <xs:pattern value="[0-9][0-9][0-9]"/>
                    </xs:restriction>
                </xs:simpleType>
            </xs:element>
            <xs:element name="classification " type="T_classification"/>
            <xs:element name="bounding_rectangle " type="T_bounding_rectangle"/>
            <xs:element name="Table_of_Contents " type="T_Table_of_Contents"/>
</xs:schema>
```

TABLE C-X. The XML table of contents (TOC) layout

Heading	Subheader	Subheader Contents	Subheader Content Details	Value	Frequency	Description
				(default value is ***bold***)		
Table of Contents						
File Header				Attribute: file_status - ***new*** or *update* or *replacement*	Required	This header describes the actual TOC file, including production dates and associated metadata.
	File Name			***TOC.xml***	Required	The TOC file name
	Product Series			Attribute: Product Series = ***ECIBx***	Required	ECIBx as defined in 3.19.a
		Product Item ID		(text)	Required	As defined in 3.19.b
		Government Producer		--	*Optional*	The designation of the official producer of this media data set (NGA).
			Producer Name	***National Geospatial-Intelligence Agency (NGA)***	Required	Producer of the product.
			Producer Address	***3200 S. Second St., St. Louis, Missouri U.S.A. 63118***	*Optional*	The address of the producer.
			Producer Information	***Property of the US Government***	*Optional* - possibly 0, 1, or many occurrences	An optional list of pertinent information concerning the government sponsor.
		Volume ID		*(text)*	Required	The unique Volume ID for the media, as defined in Section 3.19.d
		Stock Number		(text)	*Optional*	The National Stock Number under which this media is officially categorized.
		Product Edition		***001***-xx	*Optional*	The official edition number of the product release (assuming similar if not same set of frames).
		Copyright		**Copyright** YYYY	*Optional*	Identifies that the product is copyrighted, and the year the product was produced
		Media Production Date		In YYYY-MM-DD format	Required	The date the data was generated.

Heading	Subheader	Subheader Contents	Subheader Content Details	Value	Frequency	Description
		Bounding Rectangle	Latitude/ Longitude	(comma separated numeric pairs)	Required (recommend a list of 5 pair)	A list of latitude/longitude points that describe the outer-most bounding rectangle specified as NW(Lat/Lon), NE(Lat/Lon), SE, SW corner coordinates, and then repeat the NW coordinate for a total of 5 pairs or coordinates. Each Latitude/Longitude entry will be expressed in signed decimal degrees with 6 significant digits after the decimal point (latitude will be +/-dd.dddddd and longitude will be +/-ddd.dddddd)..
		Security		--	Required	The highest level of security associated with the entire volume of media.
			Classification	*U, C, S, T, R*	Required	The highest classification of each of the frames on the media.
			Classifier Country Code		Required	The country code of the country specifying the classification.
			Control Handling	**(text)**	Required	Control Handling information provided by the producing country
			Release Marking	***From MIL-STD-2500C Table A-4***	Required	Any release caveats or other markings associated with the classification.
			Downgrade Instructions	***(text)***	Optional	Any downgrading instructions associated with the volume.
		Governing Standard		--	Required	The official standard on which the ECIB product is based, MIL-STD-2500C.
			Standard Name	***Performance Specification for ECIB***	Required	The official title of the specification
			Standard Number	***MIL-PRF-32466***	Required	The official specification number assigned, MIL-PRF-32466
			Standard Date	*YYYY-MM-DD*	Required	The official date the specification was approved.
		Number Of Frames		1 - n	*Required*	The number of frames associated with this media set.
		Media Producer		--	Optional	The critical information regarding the actual producer of the set of frames.
			Producer Name	(text)	Required	The name of the actual producer of this media set.
			Producer Address	(free-form text)	*Optional* - possibly 0, 1, or many occurrences.	An optional list of pertinent information concerning the media producer.
		Media Description		(free-form text)	*Optional* - may or may not be present.	The free-form text description of the contents of the media. May contain location-based information or other information, as deemed necessary.

Heading	Subheader	Subheader Contents	Subheader Content Details	Value	Frequency	Description
Product				Contains Attribute: “product_title”	Required	This section lists each of the products on this media (typically only one).
	Disc			Contains Attribute: “id” – the Disc Number	Required	This subsection lists all of the discs (media) that span the media set.
	(Frame List)			Contains Attribute: “number_of_frames” in this frame list	Required	The subsection lists each frame on this media as part of this media set.
		GSD		Contains Attribute: “gsd”	Required	This subsection segregates each listed frame by GSD. The gsd Attribute is the numeric value of the GSD in meters.
			Frame	Attribute: Frame Name (use naming convention specified in section A.2.6)	Required	This section describes the included frame
			(Frame Path)	(text)	*Required*	This section identifies the relative path location from the root directory
			(Security)	uses same *Classification/Country Code/Release Marking* description as above.	Required	The highest classification of each of the source images in the frame.
			(Source List)	Attribute: Number of Sources in this list	*Required*	The list of source images that contributed to this frame
			(Source)	Name of the Source	*Required*	The name of the source
Shapefile List				Contains Attribute: “number_of_shapefiles” in this list	*Optional* - may or may not be present.	The list of included Shapefiles that can be used to show primarily bounding rectangles of the individual frame groups.
	Shapefile				Required	This section describe each Shapefile.
		File Name			Required	The Shapefile file name. The name is given in a relative path to the shapefile directory
		Bounding Rectangle		--	Required	The overall bounding rectangle of the specified Shapefile,
			Latitude/ Longitude	(comma separated numeric pairs)	Required	the list of latitudes and longitudes that comprise the bounding rectangle. Note: list must be closed polygons.

C.2.3.2 Shapefiles.

- Frame Extent Shapefile (for all frames on a media)
  - Each frame included shall be represented by a polygon representing the geographic extent of the frame.
  - Frame shapefiles shall be named with respect to the EPF directory in the following manner: ./SHAPEFILE/<frame file directory name>_frames.shp. The <frame file directory name> corresponds to the frame file directory name defined in Section 3.7.5.e. If the product contains one 1 degree cell, or one quarter cell, there will be one suite of shapefiles named in accordance with Section 3.7.5.e. If the product contains more than one 1 degree cell then there will be a separate suite of shapefiles for every 1 degree cell, each named in accordance with the frame file directory name defined in Section 3.7.5.e. A suite of shape files includes the following files: *.shp, *.dbf, *.prj, *.shx.

  - Each frame polygon is required to have the following Column Names and associated attributes:
    - FID (supplied by ESRI)
    - Shape
    - Frame_Name
    - Prod_Date (YYYYMMDD date frame is produced)

- Source Image Extent Shapefile (for all frames on a media)
  - Each source used to create the frames on the media shall be represented by a polygon representing the geographic extent of the source image.

- Source Image shapefiles shall be named with respect to the EPF directory in the following manner:./SHAPEFILE/<frame file directory name><C>_source.shp The <frame file directory name> corresponds to the frame file directory name defined in Section 3.7.5.e. If the product contains one 1 degree cell, or one quarter cell, there will be one suite of shapefiles named in accordance with Section 3.7.5.e. If the product contains more than one 1 degree cell then there will be a separate suite of shapefiles for every 1 degree cell, each named in accordance with the frame file directory name defined in Section 3.7.5.e. A suite of shape files includes the following files: *.shp, *.dbf, *.prj, *.shx. The <C> represents the classification of the source image shapefile, where "U" indicates an Unclassified source shapefile, and "S" indicates a Secret source shapefile.

  Note: When the ECIB is an expurgated "Z" the "U" or "S" should be used to identify the shapefile classification.

  Note: Consult the ECIB Product Specific Guidance for specific instructions relating to "source" [image] shapefile metadata accuracy reporting when the product data is derived from All Sources.

- Each source image polygon will have the following Column Names with associated attributes:
  - FID (supplied by ESRI)
  - Classif (classification of this shapefile, either "U" or "S")
  - Release (Releasability or blank)
  - Shape
  - Sensor_Typ (source sensor name, free text, e.g. "WV02")

- Img_Date (YYYYMMDD date of source image)
- GSD – in meters (4 characters)
- Abs_HorAcc (meters, 5 characters. Post process value)
- Rel_HorAcc (meters, 5 characters. Post process value)

- There is a 10 character limitation on the DBF file column header names. Reference: http://support.esri.com/usa/knowledgebase/techarticles/detail/31008

- The projection of the Shapefile for a given zone will be the same as the projection of the frames within that zone.

INDEX

Custodians:
Army - MI
Navy - NO
Air Force - 09

Preparing Activity:
NGA - MP
(Project GINT-2016-004)

Review Activities:
Army - AV
Navy - AS, CG, MC
Air Force - 11, 33, 99
DIA - DI
DISA - DC1
NSA - NS
OSD – DMS

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above by using the ASSIST Online database at https://assist.dla.mil/.