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N-0105/98

National Imagery and Mapping Agency

NATIONAL IMAGERY TRANSMISSION FORMAT STANDARD (NITFS)

STANDARDS COMPLIANCE AND INTEROPERABILITY TEST AND EVALUATION PROGRAM PLAN

Version 1.0
25 August 1998

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TBD/TBR Listing

Page Number	TBD/TBR	Description
1, 100	TBD001	Para 1.2, 6.0 and 6.1 Place holder for future interoperability testing criteria. Work on this section to commence once the compliance sections are completed.
47	TBD002	Para 5.5.13 Reduced Resolution Data Sets (RRDS). Determine specific test criteria for RRDS if/when a standardized approach for producing and handling RRDS is defined.
47, 93	TBD003	Para 5.4.26.4 Year 2000 (Y2K). Establish Y2K rules for data other than NITF header/subheader; i.e. product specific data fields which have only two digit year entries.
36, D-8	TBD004	Tables 5-1 and D-3. Multi-Component Compression. Test criteria to be developed once a multi-component compression standard is selected or developed.
iii	TBD005	Effectivity Table. Insert effectivity date for PIAE Ver 3 once established in the USIGS Interoperability Profile.
71	TBD006	Para 5.15.2 Digital Signature RES criteria. Waiting for definition of Digital Signature RES specification from which test criteria will be extracted
75	TBD007	Para 5.18.3 SARSDE. Determine the test criteria for this set of tagged record extensions. Working with airborne programs to validate candidate test criteria.
75	TBD008	Para 5.18.4 VIMAS. Determine the test criteria for this set of tagged record extensions. Working with airborne programs to validate candidate test criteria.
75	TBD009	Para 5.18.5 GeoSDE. Determine the test criteria for this set of tagged record extensions. SAF/NSIF custodian recently funded these activities. Work in progress.
73	TBD011	Para 5.18.1 National SDE. Determine the test criteria for these SDE. Presently working to validate test criteria for for at least point positioning.
85	TBD012	Para 5.18.6 RPF Extensions. Determine the test criteria for this set of tagged record extensions.
85	TBD013	Para 5.18.15 DPPDB Extensions. Determine the test criteria for this set of tagged record extensions. Presently working to validate test criteria for point positioning.
86	TBD014	Para 5.18.17 HISTOA Extension. Determine the test criteria for this tagged record extension.
4	TBR001	Update reference to MIL-STD 2500A once Notice 3 is fully progressed.
4	TBR001a	Update reference to MIL-STD 2500B once Notice 1 is fully progressed.
5	TBR001b	Update reference to MIL-STD 2301A once final publication process is complete.
5	TBR001c	Update reference to Geospatial and Imagery Access Services Specification Version 3.2. Awaiting approval at the next scheduled NCCB meeting, 28Jul98.
5	TBR001d	Update reference to USIGS System Architecture Volume II, USIGS Interoperability Profile (UIP). Awaiting approval at the next scheduled NCCB meeting , 28Jul98.
6	TBR001e	Update reference to STANAG 4545, NATO Secondary Imagery Format (Version 1.0), Study Draft 2, once it is fully progressed.

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Change Log

Date	Pages Affected	Mechanism
19 June 1998	All	Version 1.0, Initial Release

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Effectivity Log

Number	Effective	Description
E001	TBD005	PIAE version 3.0 becomes effective for implementation and test.

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Foreword

The National Imagery Transmission Format Standard (NITFS) is the standard for the formatting and exchange of digital imagery and imagery-related products between members of the Intelligence Community. The Intelligence Community is made up of the Department of Defense (DOD) and other departments or agencies of the United States Government as defined by Executive Order 12333.

This Standards Compliance and Interoperability Test and Evaluation Program Plan has been developed by the Defense Information Systems Agency's (DISA's) Joint Interoperability Test Command (JITC) in coordination with the Geospatial and Imagery Standards Management Committee (G/ISMC) based upon current policies, procedures, and guidelines received from the DOD and the National Imagery and Mapping Agency (NIMA/ST/SES). The JITC is the responsible organization for execution of the NITFS Testing Program.

The DOD and members of the Intelligence Community are committed to interoperability of systems used for formatting, transmitting, receiving, exchanging, and processing imagery and imagery related information. This Test and Evaluation Program Plan describes the processes and procedures for obtaining testing of imagery implementations for compliance with the NITFS and for interoperability among systems within the United States Imagery and Geospatial System (USIGS). It also prescribes NITFS Test and Evaluation Program policies, defines roles and responsibilities of participating organizations, and provides test funding guidance.

The suite of standards which comprise the NITFS has evolved over time to meet the requirements of user systems. This test program plan addresses the implementation test criteria for the NITFS associated with NITF version 1.1, NITF version 2.0, and NITF version 2.1.

Beneficial comments (recommendations, additions, deletions) and other pertinent data which may be of use in improving this document should be addressed to: Joint Interoperability Test Command, NITFS Test and Evaluation Facility, ATTN: JTDB, Fort Huachuca, AZ 85613-7020.

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EXECUTIVE SUMMARY

This document establishes the National Imagery Transmission Format Standard (NITFS) Test and Evaluation Program for achieving and sustaining NITFS compliance and interoperability by all fielded and developmental digital imagery systems. It describes the processes and procedures for obtaining testing of imagery implementations for compliance with the NITFS and for interoperability within the United States Imagery and Geospatial System (USIGS). It also prescribes NITFS Test and Evaluation Program policies, defines roles and responsibilities of participating organizations, and provides test funding guidance.

The National Imagery and Mapping Agency (NIMA/ST/SES) oversees the process whereby digital imagery systems achieve and sustain NITFS compliance and interoperability through the Test and Evaluation Program. Initial testing of an imagery implementation is achieved at the NITFS Test and Evaluation Facility located at the Joint Interoperability Test Command (JITC). Compliance and interoperability are sustained through retesting, as necessitated by validated changes to the NITFS, changes to (or problems with) registered NITFS configuration items, or when directed by NIMA/ST/SES, as long as the imagery system is operational.

As changes or additions are nominated for inclusion in the NITF Standard, they are validated through testing prior to being forwarded to the Geospatial and Imagery Standards Management Committee (G/ISMC) for approval for implementation and addition to the compliance requirements of the NITFS Test and Evaluation Program.

NITFS implementation requirements for compliance are detailed in this plan. The plan covers implementation test criteria for NITF1.1, NITF2.0, NITF2.1 and the related NITFS standards and specifications for imagery compression, graphic annotation, data extensions, and tactical communications protocols.

Implementation sponsors request and sustain NITFS compliance using the procedures described herein. A register of completed NITFS tests is maintained by the JITC NITFS Test and Evaluation Facility at Fort Huachuca, Arizona.

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1.0 INTRODUCTION

1.1 Purpose

This document establishes the National Imagery Transmission Format Standard (NITFS) Standards Compliance and Interoperability Test and Evaluation Program for achieving and sustaining NITFS based interoperability by all fielded and developmental digital imagery implementations. It describes the processes and procedures for obtaining testing of an imagery implementation for compliance with the NITFS and interoperability within the United States Imagery and Geospatial System (USIGS). It also prescribes NITFS Test and Evaluation Program policies, defines roles and responsibilities of participating organizations, and provides test funding guidance.

1.2 Scope

This document contains technical and administrative information regarding NITFS test planning, execution, and reporting. It provides details on:

- Testing Process
- Retesting Process
- Compliance Testing Criteria
- Compliance Test Planning
- Compliance Test Reporting
- Registration of Successful Test Results
- Interoperability Certification Testing (TBD001)
- Reporting Functional Problems With NITFS Compliant Implementations
- Reporting Changes to NITFS Configuration Items
- Validating Proposed Enhancements to NITFS

1.3 Background

1.3.1 NITF Version 1.1

The development of the National Imagery Transmission Format (NITF) was initiated in 1985 under the auspices of the Imagery Acquisition Management Plan (IAMP) Working Group of the Office of the Assistant Secretary of Defense, Command, Control, Communications, and Intelligence (OASD/C^{3}I). Version 1.0 of the NITF was published, but not released, in 1988. This version served as the prototype for demonstrating that the format could be implemented. In 1988 and 1989, the NITF was successfully implemented and tested on six different systems using operational communications media with cryptographic and forward error correction devices. The specification for NITF Version 1.1 was approved and released by OASD/C3I on 1 March 1989 as the NITF baseline version. At the time, the Defense Intelligence Agency (DIA) was the executive agent for the test, evaluation, and validation of all NITF related hardware, software, and their respective modifications. The DIA

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entered into a Memorandum of Agreement (MOA) with the Joint Interoperability Test Command (JITC) to provide technical oversight for all NITF certification testing and to operate a test facility designed exclusively for supporting the NITF program. NITF 1.1 testing was conducted from January 1990 through December 1993.

1.3.2 NITF Version 2.0

NITF version 2.0 was published along with a suite of military standards designated as the National Imagery Transmission Format Standard (NITFS) in June 1993. The major additions to NITF version 1.1 included the Tactical Communications Protocol 2 (TACO2) to enable transmission over tactical circuits; improved image compression using the Joint Photographic Experts Group (JPEG) compression algorithm; support for large images and color images; and symbolic annotations using Computer Graphics Metafile (CGM). The Central Imagery Office (CIO) had since been organized and became the NITFS Program Manager. The JITC continued to serve as the Executive Agent for execution of the NITFS testing program.

1.3.3 NITF Version 2.1

A number of factors have driven the changes made to NITF 2.0 during recent years. Among these are: the creation of the National Imagery and Mapping Agency (NIMA); the Department of Defense (DOD) mandate for the selection and implementation of commercial/international standards over government/military standards where possible; user requirements for improved fusion of information, whether imagery, geospatial, or other data types; and the ever increasing need to share data within and external to systems of the DOD/Intelligence Community. NITF 2.1 is based on extensive coordination among NITFS users within the USIGS community, North Atlantic Treaty Organization (NATO) and Allied Nations, national and international standards bodies, and with commercial vendors and groups dealing with related standards and technologies. Military Standard 2500B has been developed with the intention of it being the technical baseline for establishing an International Standardized Profile (ISP) of ISO/IEC 12087-5, Basic Image Interchange Format (BIIF). A summary of changes made to the existing NITF 2.0 baseline in support of the NITF 2.1 is included in Appendix C.

NITF Version 2.1 compliance testing will be available beginning 1 October 1998. It will be done in parallel with NITF 2.0 testing until 1 October 1999 when the general need for testing of NITF 2.0 pack capabilities is anticipated to cease. The capability to test NITF 2.0 will be maintained until all contractual requirements for NITF 2.0 in place on 1 October 1999 have been satisfied. The target for fielded systems to no longer produce NITF 2.0 formatted files is 1 October 2002. The need to unpack and interpret NITF 2.0 files will continue indefinitely.

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1.4 References

(Note: Those documents with version numbers designated as 0.9x are draft specifications that have not undergone validation testing as described in section 2.0. The implementation and test details of these specifications are subject to change based on the lessons learned by the first attempts to implement and test the features of these specifications. Implementers of these specifications are encouraged to coordinate their implementation efforts with the NITFS Test and Evaluation Facility personnel.)

1.4.1 Policy and Planning Documents

CJCSI 6212.01A	Compatibility, Interoperability, and Integration of Command, Control, Communications, Computers, and Intelligence Systems, 30 June 1995.
DOD/JTA V1.0	Department of Defense Joint Technical Architecture Version 1.0, 22 August 1996.
JIEO Circular 9002	Requirements Assessment and Interoperability Certification of C4I and AIS Equipment and Systems, 23 January 1995.
JIEO Circular 9008	NITFS Certification Test and Evaluation Program Plan, 30 June 1993, with Errata Sheet dated 20 June 1997.
JIEO Plan 9000	Department of Defense and Intelligence Community Imagery Information Technology Standards Management Plan, 01 November 1995.
NITF 1.1 Vol I	Department of Defense, National Imagery Transmission Format, Certification Plan Volume I, Policy, 02 January 1990.
NITF 1.1 Vol II	Department of Defense, National Imagery Transmission Format, Certification Plan Volume II, Processes and Procedures 02 January 1990.

(Requests for copies of the above policy and planning documents may be addressed to the Joint Interoperability Test Command, NITFS Test and Evaluation Facility, Building 57305, Fort Huachuca, AZ 85613-7020.)

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1.4.2 Federal Information Processing Standards (FIPS)

FIPS PUB 10-4	Countries, Dependencies, Areas of Special Sovereignty, and Their Principal Administrative Divisions., April 1995
FIPS PUB 147	Group 3 Apparatus for Document Transmission (DOD adopted, 19 August 1981.

1.4.2 Military Standards (MIL-STDs) and Handbooks

MIL-HDBK-1300A	Military Handbook for the National Imagery Transmission Format Standard (NITFS), 12 October 1994.
MIL-STD-2500A	National Imagery Transmission Format (Version 2.0) for the National Imagery Transmission Format Standard, 12 October 1994 with Notice 2, 26 September 1997. (TBR001 - Notice 3 is currently being progressed; this reference needs to be updated once the Notice is completed.)
MIL-STD-2500B	National Imagery Transmission Format (Version 2.1) for the National Imagery Transmission Format Standard, 22 August 1997. (TBR001a - With Change Notice 1 once it is fully progressed.)
MIL-STD-188-161	Interoperability and Performance Standards for Digital Facsimile Equipment, 30 October 1991.
MIL-STD-188-196	Bi-Level Image Compression for the National Imagery Transmission Format Standard, 18 June 1993 with Notice 1, 27 June 1996.
MIL-STD 188-197A	Adaptive Recursive Interpolated Differential Pulse Code Modulation (ARIDPCM) Compression Algorithm for the National Imagery Transmission Format Standard, 12 October 1994.
MIL-STD-188-198A	Joint Photographic Experts Group (JPEG) Image Compression for the National Imagery Transmission Format Standard, 15 December 1993 with Notice 1, 12 October 1994 and Notice 2, 14 March 1997.
MIL-STD-188-199	Vector Quantization Decompression for the National Imagery Transmission Format Standard, 27 June 1994 with Notice 1, 27 June 1996.

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MIL-STD-2301	Computer Graphics Metafile (CGM) Implementation Standard for the National Imagery Transmission Format Standard, 18 June 1993 with Notice 1, 12 October 1994.
MIL-STD-2301A	Computer Graphics Metafile (CGM) Implementation Standard for the National Imagery Transmission Format Standard, (DRAFT), (TBR001b - Currently being progressed for final publication; publication date is forthcoming.).
MIL-STD-2045-44500	-Tactical Communications Protocol 2 (TACO2) for the National Imagery Transmission Format Standard, 18 June 1993 with Notice 1, 29 July 1994 and Notice 2, 27 June 1996.
MIL-STD-6040	United States Message Text Format (MTF) Note: The baseline for this standard is updated frequently, but this has no impact within the context of its current use within the NITFS. Currency of the USMTF has potential impact when MTF data within NITF files is passed to external processes.

(Copies of the above military standards and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

1.4.3 NIMA Specifications and Publications

DIGEST	Digital Geographic Information Exchange Standard (DIGEST), Edition 2.0, June 1997.
N0101-B	Geospatial and Imagery Access Services Specification (GIAS), Version 3.1, 05 February 1998. (TBR001c v3.2)
N0102-B	USIGS System Architecture, Volume II, USIGS Interoperability Profile (UIP), RFC NO1-0068, 5 June 1998. (TBR001d)
N-0106-97	National Imagery Transmission Format Standard (NITFS) Bandwidth Compression Standards and Guidelines, 25 August 1997.
NSPIA	NIMA Standards Profile for Imagery Archive (NSPIA), 23 April 1997.
NTER	NITFS Tagged Extensions Registry (NTER), latest

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	update as posted at: http://jitc.fhu.disa.mil/nitf/tag_reg/mast.htm.
NSDE	NIMA Support Data Extensions (SDE) (Version 1.2) for the National Imagery Transmission Format Standard (NITFS), 13 March 1997.
NUTA	NIMA USIGS Technical Architecture (NUTA), 28 October 1997.
PIAE v2	National Imagery Transmission Format Standard Profile for Imagery Archive Extension (PIAE), Version 2.0, 25 April 1996.
PIAE v3	National Imagery Transmission Format Standard Profile for Imagery Archive Extensions (PIAE), Version 3.0, 25 September 1997. (E001)
RASG-9606-001	Airborne Synthetic Aperture Radar (SAR) Support Data Extensions (SDE) for the National Imagery Transmission Format (Version 2.0) of the National Imagery Transmission Format Standard, Version 0.9, 20 May 1996.
VIMAS	Visible, Infrared, and Multispectral Airborne Sensor Support Data Extensions for the National Imagery Transmission Format of the National Imagery Transmission Format Standard Version 0.9, 25 September 1997.

(Requests for copies of the above NIMA Specifications and Publications may be made to the National Imagery and Mapping Agency, Attn.: NIMA/ST/SES, MS-P-24, 12310 Sunrise Valley Drive, Reston, VA 20191-3449.)

1.4.4 Standardized NATO Agreements

STANAG 4545	NATO Secondary Imagery Format (Version 1.0); Study Draft 2, currently being progressed (TBR001e).

(Requests for copies of the above STANAG may be made to SAF/AQIJ, 1060 AF Pentagon (5D156), Washington, DC 20330-1060.)

1.4.5 International Standards

ANSI X3.4	American National Standards Institute (ANSI), X3.4 - 1986, American National Standard Code for Information Interchange (ASCII), 1986.

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CCITT	Recommendation T.4, Standardization of Group 3 Facsimile Apparatus or Document Transmission, 1998
ISO/IEC Directives	Procedures for the technical work of ISO/IEC JTC1 on Information Technology, Third Edition 1995.
ISO/IEC TR10000-1	Information technology - Framework and Taxonomy of International Standardized Profiles - Part 1: General principles and documentation framework, third edition, 1995.
ISO/IEC TR10000-2	Information technology - Framework and taxonomy of International Standardized Profiles - Part 2 : Principles and Taxonomy for OSI Profiles, third edition, 1995.
ISO/IEC 8632-1:1994	Information Technology - Computer graphics metafile for the storage and transfer of picture description information - Part 1: Functional Specification, AMD 2, 01 July 1995.
ISO/IEC 8632-3:1994	Information Technology - Computer graphics metafile for the storage and transfer of picture description information - Part 3: Binary Encoding, AMD 2, 01 August 1995.
ISO/IEC 8632:1992	Information Technology - Computer graphics metafile for the storage and transfer of picture description information, AMD.1:1994 - Parts 1-4: Rules for Profiles.
ISO/IEC 9973:1994	1st Edition, Procedures for Registration of Graphical Items, 15 December 1994.
ISO/IEC 10646-1:1993	Information technology - Universal Multiple-Octet Coded Character Set (UCS) - Part 1: Architecture and Basic Multiple Plane, AMD 6, 15 Nov. 1996.
ISO/IEC 10918-1:1994	Information technology - Digital compression and coding of continuous-tone still images : Requirements and guidelines, 15 December 1994.
ISO/IEC 10918-2:1995	Information technology - Digital compression and coding of continuous-tone still images : Compliance testing, 15 August 1995.
ISO/IEC 10918-3:DIS	Information Technology; Digital Compression and Coding of Continuous-Tone Still Images; Part 1: Extensions, 01 May 1997.

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ISO/IEC 10918-4:DIS	Information Technology; Digital Compression and Coding of Continuous-Tone Still Images: Part 4; Registration Procedures for JPEG Profile, APPn Marker, and SPIFF Profile ID Marker, 26 Dec. 96.
ISO/IEC 11072:1993	Information technology - Computer graphics - Computer Graphics Reference Model, 01 Oct. 92.
ISO/IEC 12087-1:1995	Information technology - Computer graphics and image processing - Image processing and Interchange—Functional specification Part 1: Common architecture for imaging, 15 April 1995.
ISO/IEC 12087-2:1994	Information technology - Computer graphics and image processing - Image processing and Interchange—Functional specification Part 2: Programmer's imaging kernel system application program interface.
ISO/IEC 12087-3:1995	Information technology - Computer graphics and image processing - Image processing and Interchange—Functional specification Part 3: Image Interchange Facility (IIF), AMD 1, 15 December 1997.
ISO/IEC 12087-5: 1998	Information technology; Computer graphics and image processing; Image Processing and Interchange; Functional Specification - Part 5: Basic Image Interchange Format .
ITU T.4 (1993:03)	Terminal Equipment and Protocols for Telematic Services - Standardization of Group 3 Facsimile Apparatus for Document Transmission, AMD2 08/95.

(Application for copies may be addressed to the American National Standards Institute, 13th Floor, 11 West 42nd Street, New York, NY 10036.)

1.5 Applicability

The NITFS is the designated standard for the formatting and exchange of digital imagery and imagery-related products between members of the Intelligence Community as defined by Executive Order 12333, the Department of Defense (DOD) and other Departments or Agencies of the United States Government as governed by Memoranda of Agreement (MOAs) with those Agencies and the Intelligence Community/DOD. Adherence to U.S. Federal and DOD standards is

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required before a particular system can be employed in joint or combined operations. The DOD Directive 4630.5 states that for purposes of compatibility, interoperability, and integration all command, control, communications, and intelligence (C^3I) systems developed for use by U.S. forces are considered to be for joint use.

1.6 Authority

The Defense Information Systems Agency (DISA) is the DOD authority for NITFS validation testing. The Director, Central Intelligence (DCI) is the Intelligence Community authority for mandatory NITFS compliance. The Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (ASD/C^3I) is the DOD authority requiring Secondary Imagery Dissemination System (SIDS) compliance with the NITFS. The NIMA/ST/SES is the Test Program Authority and provides management oversight for the NITFS Test and Evaluation Program. The JITC, an element of the DISA, is the Executive Agent to NIMA/ST/SES for execution of the NITFS Test and Evaluation Program. Figure 1-1 depicts these organizational relationships.

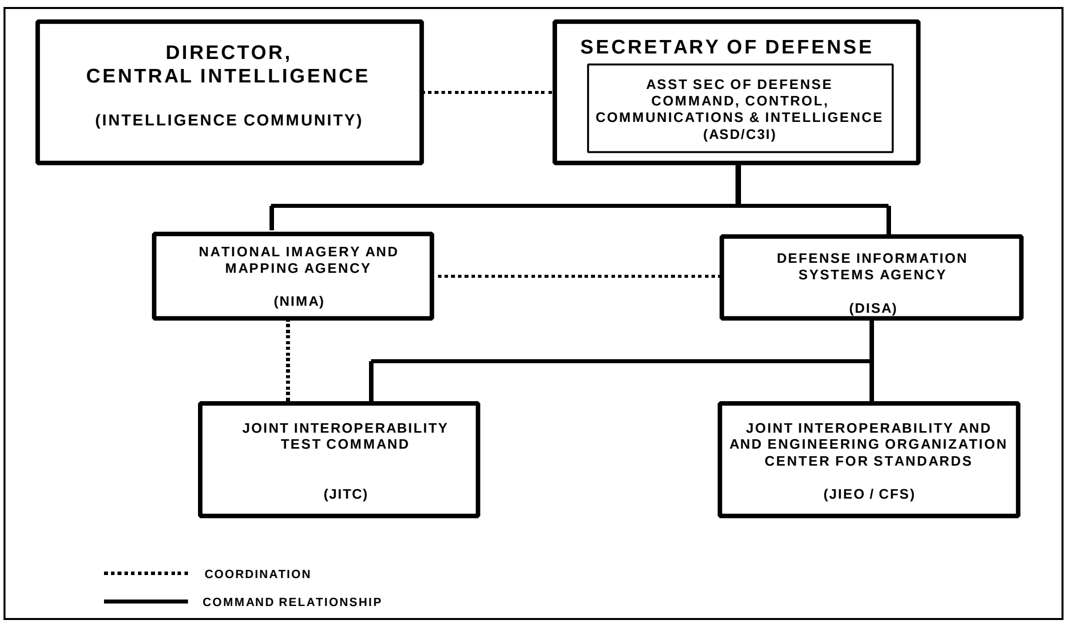

Figure 1-1 NITFS Test and Evaluation Program Organizational Relationships

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1.7 Definitions

For the purpose of this plan, the following terms are defined as stated:

1.7.1 Certification (Interoperability)

Confirmation by DISA that a Command, Control, Communications, Computer, and Intelligence (C4I)/Automated Information System (AIS) system has undergone appropriate testing; that the applicable standards and requirements for compatibility, interoperability, and integration have been met; and a system is ready for joint and/or combined use. See JCSI 6212A.

(Note: For the NITF 2.0 test program, the term ‘System Certification’ was used to designate those systems (hardware and software) which implemented both NITF 2.0 and TACO2 and successfully completed NITFS compliance testing.)

1.7.2 Compliance Registration (Standards Compliance)

A statement attesting to the fact that an implementation, product or component has been tested as meeting NITFS applicable compliance criteria. The degree of compliance is recorded in a registry.

1.7.3 NITFS Test and Evaluation Facility

The personnel, equipment, data, and facilities for conducting NITFS compliance testing and maintaining the NITF program for NIMA along with policies, procedures, planning, etc.

1.7.4 Common Coordinate System

The virtual row and column coordinate space against which all NITF file components are ultimately referenced. The location of NITF components with attachment level of zero are referenced to the origin of the Common Coordinate System. The extent of the common coordinate system is defined by the complexity level designation.

1.7.5 Compatibility, Interoperability, and Integration (CII)

A policy set by DOD and the Joint Staff defining the requirements certification process and identifying assessment criteria. See JCSI 6212A and JIEO Circular 9002.

1.7.6 Configuration Item

A specific component of hardware and/or software that has an impact on NITFS compliance.

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1.7.7 Configuration Management

A discipline applying technical and administrative direction and monitoring to:

- Identify and document the functional and physical characteristics of a configuration item.
- Control changes to those characteristics.
- Record and report change processing and implementation status.

1.7.8 Developmental System

A system that has not been approved for use and/or production.

1.7.9 Digital Imagery System

The equipment and procedures used in the collection, storage, display, manipulation, analysis, annotation, exchange and/or transmission of imagery and imagery products.

1.7.10 Dissemination System

A system with functional requirements to distribute digital imagery via electronic communications facilities. Imagery processing is primarily focused on preparing the data for the eccentricities (e.g. constrained bandwidth, noise environment, etc.) of the communications channels across which it will be disseminated. Representative systems include the Dissemination Element (DE), Global Broadcast System (GBS), etc.

1.7.11 Exploitation System

A system with functional requirements to analyze, exploit, and extract information from digital imagery to produce an exploited imagery product. Representative systems include Image Data Exploitation System (IDEX), NIMA Softcopy Exploitation Systems as defined by the NIMA Imagery Information Exploitation Environment (NIIEE), Common Exploitation Workstation (CEW), etc.

1.7.12 Fielded System

A system that has been approved for use and/or production.

1.7.13 Implementation Under Test (IUT)

A candidate implementation of any portion of the NITFS suite of standards for which compliance testing is being performed. An implementation does not necessarily comprise a full imagery system.

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1.7.14 Library System

A system with functional requirements to catalogue, store and retrieve digital imagery. Representative systems include Image Product Archive (IPA), Image Product Library (IPL), NIMA Libraries, etc.

1.7.15 NITFS Compliance

The ability of an implementation to create and output NITFS compliant files and/or to accept NITFS files and recognize the component parts as prescribed in the NITFS Test and Evaluation Program Plan.

1.7.16 NITFS Component Compliance

A statement to the fact that an item (as opposed to a full implementation) has been tested for compliance to a specific subset of the NITFS compliance criteria.

1.7.17 Native Mode

The intrinsic attributes and operational mode of an imagery system. When an imagery system's architecture, design, and/or internal representation for images, graphics, labels, text, and/or other data is not in accordance with the NITFS, its native mode is considered to be other than NITFS.

1.7.18 NITF

The National Imagery Transmission Format. The term NITF is often used to describe a file that is formatted according to the NITFS. The term usually inherits the context of the latest version of NITF when the version is not specifically identified.

1.7.19 NITFS

The National Imagery Transmission Format Standard (NITFS) is comprised of the suite of standards applicable to the formatting and exchange of digital imagery. The term is used when addressing the overall national imagery standardization effort.

1.7.20 NITF Version 1.1

The initial version of NITF implemented for which a formal testing program was established. Requirements for compliance with NITF Version 1.1 are fully described in the NITF Version 1.1, Volume I, NITF Certification Plan Policy and Volume II, Certification Plan Processes and Procedures.

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1.7.21 NITF Version 2.0

The second version of NITF implemented for which a formal testing program was established. Requirements for compliance with NITF Version 2.0 are fully described in Joint Interoperability and Engineering Organization (JIEO) Circular 9008, NITFS Certification Test and Evaluation Program Plan.

1.7.22 NITF Version 2.1

The third version of NITF for which this program plan establishes the formal compliance test program.

1.7.23 Pack

To create or construct an NITF file within the set of conditions and constraints defined for compliance with the NITFS.

1.7.24 Primary Imagery System

The equipment and procedures used in the electronic collection, storage, and exchange of original quality, non-exploited imagery and imagery products.

1.7.25 Production System

A system with functional requirements to generate digital imagery from sensor sources. Representative systems include Common Imagery Processor (CIP), Digital Production System (DPS), Point Positioning Production System (PPPS), etc.

1.7.26 Secondary Imagery Dissemination System (SIDS)

The equipment and procedures supporting the process of post-collection electronic dissemination of Command, Control, Communications, and Intelligence (C^3I) data, over a time interval ranging from near-real-time to a period of days, at a quality level determined by receiver requirements.

1.7.27 System Under Test (SUT)

A candidate imagery system for which NITFS compliance testing is being performed.

1.7.28 Tactical System

A system with requirements to operate when deployed into the battlefield; often characterized by the need to obtain data communications from military tactical communication channels vice fixed plant communications typical of commercial civilian organizations.

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1.7.29 Unpack

To interpret and make appropriate use of the imagery, data, and associated information contained in an NITF compliant file. In most instances, this includes the capability to accurately display and/or print the contents of an NITF file.

1.7.30 USIGS Architecture Framework

The interrelated set of USIGS Architecture components which includes the Operational Architecture, the Technical Architecture, the Systems Architecture, and the Data Architecture. The Operational Architecture identifies the operational element, activities, and information flows. The Technical Architecture identifies applicable standards and conventions that govern systems implementation and operation. The Systems Architecture overlays system capabilities onto requirements and identified standards to provide a map of current and future capabilities. The Data Architecture provides the common data modeling and terminology baseline needed to articulate and integrate the other component architecture views.

1.7.31 USIGS Interoperability Profile

The USIGS Interoperability Profile (UIP) defines the profile for software interface standards to be used to achieve interoperability between multiple clients and servers within the United States Imagery and Geospatial System architecture.

1.8 Test Program Concept

The NITFS Test and Evaluation Program is composed of the NITFS Test and Evaluation Facility, policies, procedures, and administrative and planning actions required to achieve and sustain an imagery implementation's compliance with the NITFS and interoperability within the USIGS through testing. The test program supports both the DOD and the Intelligence Community objectives for ensuring an interoperable format for the exchange of digital imagery products among heterogeneous systems.

1.8.1 National Imagery and Mapping Agency

The NIMA/ST/SES oversees the process whereby imagery systems achieve and sustain NITFS compliance and interoperability through the NITFS Test and Evaluation Program. Initial compliance testing of an imagery system is achieved at the designated test facility, the JITC, or at alternate locations as approved by the JITC. Compliance to standards and interoperability within USIGS is sustained through retesting, as necessitated by changes to the NITFS, changes to (or problems with) tested NITFS configuration items, or when directed by NIMA/ST/SES, as long as the imagery system is operational.

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1.8.2 Joint Interoperability Test Command

The JITC serves as NIMA/ST/SES's executive agent for execution of NITFS test related activities. The JITC has established a NITFS testing facility that supports compliance testing of NITFS capable implementations, validation testing of proposed additions to NITFS, and other NITFS related test activities.

1.9 Test Program Policies

The following policies apply to the NITFS Test and Evaluation Program:

1.9.1 General

Those systems, subsystems, and components within the United States Imagery and Geospatial System which exchange digital imagery must achieve compliance with the NITFS as specified by the USIGS Architecture Framework, the USIGS Interoperability Profile (UIP), and the Joint Technical Architecture (JTA).

1.9.1.1 NITF Version 1.1. All NITFS imagery systems were to be NITF 2.0 compliant within two years of the January 1994 start date for the NITFS Test and Evaluation Program for NITF 2.0 as described in JIEO Circular 9008. To support interoperability during the transition, all NITF 2.0 compliant systems were required to allow for the proper interpretation and use of NITF Version 1.1 formatted files and the creation of NITF Version 1.1 compliant files. The requirement for NITF 2.0 systems to create NITF 1.1 files is now optional, no NITF 1.1 only systems should be used in the field following October 1998. However, due to the extensive existence of legacy NITF 1.1 files, NITF 2.0 and NITF 2.1 systems must continue to properly interpret NITF 1.1 files.

1.9.1.2 NITF Version 2.0. All currently fielded imagery systems must be at least NITF 2.0 compliant by October 1998. Compliance testing for NITF 2.0 only systems will cease in October 1999.

1.9.1.3 NITF Version 2.1. The goal is for all currently fielded imagery systems to be NITF 2.1 compliant or replaced by NITF 2.1 compliant systems within at least two years of the start date of this NITFS Test and Evaluation Program Plan (1 October 1998). Since NITF 2.1 uses a four digit year field, implementation of NITF 2.1 prior to the end of 1999 will ease year 2000 compliance requirements and is highly encouraged. To support interoperability during the transition period, all NITF 2.1 compliant systems must have a mode of operation that allows for proper interpretation and use of NITF Version 2.0 formatted files and that limits the creation of an NITF file content to the constraints of NITF version 2.0. Developmental systems must be tested for and achieve NITF 2.1 compliance prior to fielding. NITF 2.1 capable systems must continue to properly interpret NITF Version 1.1 files.

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1.9.1.4 Distributed Applications. Some developers may choose to implement systems that distribute NITFS functions across several processing platforms which are networked together. In such cases, the systems will be evaluated as a whole in determining which NITFS attributes and associated compliance criteria apply to each component of the system. In any case, provision must be made for the system to fully satisfy the Complexity Level (CLEVEL) criteria for which registration is desired before the system will be registered as NITFS compliant.

1.9.1.5 NITFS Components. Developers may choose to submit components and/or products that implement only a portion of the NITFS compliance requirements for testing and registration. The component will be tested for compliance to the applicable standards. Component registration does not mean that any implementation which uses the registered component is deemed to be fully compliant with NITFS. Use of the registered component may, however, expedite test and evaluation of the implementation for compliance registration.

1.9.1.6 TACO2. All imagery systems deemed to be tactical within the USIGS Architecture, and those which are required to directly communicate with tactical systems, must support the TACO2 Protocol via either a synchronous or asynchronous communications port.

1.9.2 Test Sponsorship

1.9.2.1 Government. Imagery systems can be sponsored for standards compliance and CII certification testing by any governmental department, service, or agency.

1.9.2.2 Non-government. Commercial developers or vendors may request NITFS compliance testing without government sponsorship on a fee-for-service basis with the JITC. Although commercial developers may not request Compatibility, Interoperability and Integration (CII) certification testing, they may request, on a fee-for-service basis, technical interoperability tests. The successful results of such tests may expedite an eventual government request for CII certification testing.

1.9.4 Test Location

Compliance testing will normally be conducted in the NITFS Test and Evaluation Facility. Testing at alternate locations may be granted on a case-by-case basis.

1.9.5 Retesting

Retesting of implementations may be directed by the NIMA/ST/SES; or may be requested by sponsors and/or developers, depending on conditions such as:

1.9.5.1 Changes to the NITFS compliance requirements.

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1.9.5.2 Latent functional problems discovered with previously tested implementations.

1.9.5.3 Any changes to a configuration controlled item of a NITFS compliance tested implementation.

1.9.5.4 The expiration period for registration has elapsed.

1.10 Test Program Responsibilities

The following paragraphs describe the roles and responsibilities of principal organizations that assist in implementing the NITFS Test and Evaluation Program.

1.10.1 NIMA

NIMA/ST/SES has the responsibility to:

- Serve as the Test Program Sponsor and oversee the execution of the NITFS Test and Evaluation Program.
- Provide funding and budget oversight for the establishment and general operation of the NITFS Test and Evaluation Program. (Individual test sponsors program and budget for compliance testing of their implementations.)
- Assist in the development, promulgation, and utilization of the NITFS.

Coordinate the resolution of functional and interoperability problems with NITFS compliant implementations.

1.10.2 JITC

The JITC has responsibility to:

- Establish, manage, and operate the NITFS Test and Evaluation Facility.
- Process test and retest requests.
- Arbitrate test scheduling conflicts. The JITC will attempt to coordinate schedule adjustments for urgent test requests.
- Plan, schedule, and execute compliance tests.
- Publish test results and forward certificates of registration.
- Maintain and publish a register of NITFS compliant systems, implementations and components.
- Maintain the NITFS Test and Evaluation Program Plan.
- Serve as an advisor to the Chairperson of the Geospatial and Imagery Standards Management Committee (G/ISMC) and the DISA Center for Standards (CFS).

1.10.3 Test Sponsors

Those sponsoring implementations for NITFS testing have the following Test and Evaluation Program Responsibilities.

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- Request NITFS testing and/or retesting for compliance with the NITFS.
- Promptly report functional problems experienced with NITFS tested configuration items to the NITFS Test and Evaluation Facility.
- Provide primary and alternate points of contact for testing matters.
- Program and budget for the direct costs of NITFS testing (test fee), plus the associated equipment shipping, travel, and per-diem costs.

1.10.4 Geospatial and Imagery Standards Management Committee (G/ISMC)

The G/ISMC, chaired by the NIMA/ST/SES, is the configuration management forum for the development and maintenance of the NITFS. The G/ISMC develops new imagery standards as appropriate. It is the Commanders In Chief (CINCs), Services and Agencies (C/S/A) forum that reviews, analyzes, and evaluates NITFS requirements and proposed changes, and approves or disapproves their incorporation into appropriate standards. Supported by the DISA CFS, it maintains configuration control of the NITFS by deciding standardization issues arising during development, validation, testing, implementation, and operations impacting imagery system interoperability. Details regarding the G/ISMC are contained in JIEO Plan 9000, Supplement 1.

1.11 Test Program Funding

1.11.1 Test Funding Concept

1.11.1.1 DOD/Intelligence Community. Within the DOD/Intelligence Community, NITFS Test and Evaluation Program funding is shared by the NIMA/ST/SES and imagery system sponsors. The NIMA/ST/SES budgets and funds for all operational and maintenance expenses of the NITFS Test and Evaluation Facility (test equipment, software, test tool development, license fees, etc.). DOD/Intelligence Community and other system sponsors support NITFS testing by providing funding in the form of a fee for each test and/or retest.

1.11.1.2 Vendors. The JITC has been designated as a Major Range and Test Facility Base (MRTFB). As a result, commercial developers and vendors may obtain NITFS testing services on a reimbursable cost basis from the JITC.

1.11.2 Principal Funding Activities

1.11.2.1 Test sponsors must transfer a NITFS test fee to the NITFS Test and Evaluation Facility prior to testing.

1.11.2.2 Sponsors will fund their own shipping costs, travel, per-diem, and consumable supplies associated with testing at the NITFS Test and Evaluation Facility.

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1.11.2.3 Sponsors will fund the shipping, travel, per-diem, and consumable supplies incurred by the test team when tests are conducted at locations other than the NITFS Test and Evaluation Facility.

1.11.2.4 Commercial sponsors must enter into a “Terms and Conditions For Testing at the JITC Agreement” through the Fort Huachuca Directorate of Contracting prior to receiving test services.

1.11.3 Test Budgeting

Government sponsors must budget for NITFS testing of developmental imagery systems through the Planning, Programming, and Budgeting System (PPBS). Sponsors must ensure that a Military Service (or equivalent) Program Element Monitor (PEM) oversees their imagery system throughout its life-cycle to include NITFS testing through the programming and budgeting phases of the PPBS.

1.12 Points of Contact

1.12.1 NITFS Test and Evaluation Program Management

National Imagery and Mapping Agency
ATTN: Standards & Interoperability Div.
NIMA/ST/SES (Mail Stop P-24)
12310 Sunrise Valley Drive
Reston, VA 20191-3449
Phone: (703) 262-4400
Fax: (703) 262-4401
URL: http://www.nima.mil

1.12.2 NITFS Test Information, Scheduling, Documents and Testing Request Forms

Joint Interoperability Test Command
NITFS Test and Evaluation Facility
ATTN: JTDB
Building 57305 Brainard Road
Fort Huachuca, AZ 85613-7020
Phone: (520) 538-5458 or 5494
Fax: (520) 538-5257
STU: (520) 538-5458
URL: http://jitc.fhu.disa.mil/nitfs

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1.12.3 Imagery Standardization and G/ISMC Information

DISA/JIEO/Center for Standards
10701 Parkridge Boulevard
Reston, VA 22091-4357
Phone: (703) 735-3535
Fax: (703) 735-3256
URL: http://www.itsi.disa.mil

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2.0 STANDARDS VALIDATION TESTING

2.1 General

2.1.1 Purpose

As changes or additions are nominated to the NITF Standard, they must be validated through testing prior to G/ISMC approval for implementation and addition to the compliance requirements of the NITFS Test and Evaluation Program. Validation testing ensures that the changes or additions to be included in the NITF Standard are technically correct, consistent, complete, and testable.

2.1.2 Validation Methodology

The process for validating a proposed standard or proposed change or addition to an existing standard is as follows:

2.1.2.1 Step 1. The service, functional, and/or performance requirements are fully identified and an appropriate authority ratifies that the requirements are valid. The test objectives and criteria are developed that will be used to ascertain whether the proposed solution satisfies the validated requirements.

2.1.2.2 Step 2. As the proposed standard is being written, compliance test objectives, criteria, and test cases are also written.

2.1.2.3 Step 3. A physical realization of the proposed standard must be implemented. The test procedures and tools needed to conduct compliance testing must also be developed independently of the developer, but in synchronization with the development of the sample implementation.

2.1.2.4 Step 4. The compliance test procedures and tools are used to verify that the sample implementation conforms to the proposed written standard. Based on compliance test results, the sample implementation is modified and re-tested until it adequately conforms with the proposed standard.

2.1.2.5 Step 5. Once the sample implementation has been verified as compliant to the proposed standard, the implementation is evaluated against the objectives and criteria defined in Step 1 to measure how well the proposed standard meets the original service, functional, and/or performance requirements. Upon successful completion of this step, the standard is considered to be validated. A natural outcome of the validation process is the creation of the Means of Testing (MOT), e.g. test procedures and tools, for testing products for compliance with the standard.

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2.2 Requirements Definition

The technical, functional, and operational performance requirements, as applicable for any nominated changes or additions to the NITF Standard, must be clearly defined and approved for validation testing by the G/ISMC. The requirements must be stated in sufficient detail to derive validation test objectives and evaluation criteria.

2.3 Test Funding/Planning

2.3.1 Funding

Based on the validation test objectives and evaluation criteria, the NITFS Test and Evaluation Facility will prepare a cost estimate to plan and conduct the validation test(s) and report the results of the validation. The NIMA/ST/SES is responsible for obtaining any additional funding above that already budgeted/programmed for the NITFS Test and Evaluation Program.

2.3.2 Planning

The NITFS Test and Evaluation Facility will prepare the validation test plan for approval by the NITFS G/ISMC. The G/ISMC is responsible for establishing the performance requirements for the proposed capability and the criteria for measuring the adequacy of performance. A time-line within the validation test plan will provide milestones that outline the testing period to include the time that the test report should be published.

2.4 Test Execution

Standards validation testing will be conducted at the JITC NITFS Test and Evaluation Facility unless an alternate test site is approved by the NIMA/ST/SES. The NITFS G/ISMC is responsible for providing a sample implementation which demonstrates the proposed change to the standard. The JITC will develop the test procedures and MOT required to test compliance to the proposed change or additions. Once the sample implementation has been tested as compliant to the new proposal, it will be tested and evaluated for adequacy of performance in accordance with the performance requirements established by the NITFS G/ISMC.

2.5 Test Reports

Upon completion of the validation testing, all accumulated test results will be integrated into a final validation test report. The final report will indicate the degree to which the proposed changes or additions met the requirement and performance criteria for validation. The test report will be forwarded to the G/ISMC with recommendation for addition to the NITF Standard or recommendation for disapproval.

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3.0 COMPLIANCE TEST AND EVALUATION

3.1 General

Imagery system sponsors request and sustain NITFS compliance using the procedures described in this section. Request and report formats are provided in Appendix B. Procedures are prescribed for the following activities:

- Initial Compliance Testing
- Compliance Retesting
- Derived Registrations
- Test Planning
- Test Execution
- Test Reporting
- Reporting Any Modifications To NITFS Configuration Items
- Reporting Latent Functional Problems with NITFS Tested Implementations

3.2 Initial Compliance Testing Administrative Procedures

3.2.1 Test Sponsor

The Test Sponsor will:

3.2.1.1 Prepare and submit the following items to the JITC:

- A letter, using the organization's letterhead, requesting the desired test
- NITFS Form CTR-1, Compliance Test Request (CTR)
- NITFS Form CTR-2, NITFS System Registration Data
- NITFS Form CTR-3, NITFS Software Registration Data
- NITFS Form CTR-4, Alternate Test Site Request (if applicable)
- NITFS Form CTR-5, Y2K System Awareness Checklist
- One copy of the implementation's technical manual(s) and operator manual(s)
- NITFS test fee

3.2.1.2 Submit the test request package to:

Joint Interoperability Test Command
NITFS Test and Evaluation Facility
ATTN: JTDB
Building 57305 Brainard Road
Fort Huachuca, AZ 85613-7020

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3.2.1.3 Transfer the NITFS Test fee to:

Joint Interoperability Test Command
NITFS Test and Evaluation Facility
ATTN: Financial Management Office (JTAF)
Building 57305 Brainard Road
Fort Huachuca, AZ 85613-7020

3.2.1.4 Enter into a "Terms and Conditions For Tests" agreement with the Fort Huachuca Contracting Office (commercial vendor sponsored tests only). Vendors may obtain a copy of the standardized "Terms and Conditions For Tests" agreement from the JITC. An official with the power to bind the company should sign in the space provided for Purchaser. A certification by a corporate officer that the agreement signature has the power to bind the firm to the agreement must also be provided. The signed "Terms and Conditions For Tests" should be returned to:

Directorate of Contracting
ATTN: ATZS-DKO-J
P.O. Box 12748
Fort Huachuca, AZ 85613-0748

3.2.2 JITC

The JITC NITFS Test and Evaluation Facility will:

- Review submitted documentation
- Provide a point of contact for coordination
- Schedule compliance testing
- Prepare test plan(s)
- Conduct compliance testing
- Prepare a test report and provide registration recommendations to the NIMA/ST/SES
- Review and disseminate the test report to the test sponsor and/or implementation developer
- Prepare and disseminate a letter of registration to the test sponsor and/or implementation developer

3.3 Retesting Administrative Procedures

3.3.1 Test Sponsors

Test sponsors prepare and submit the following items to the JITC:

- A letter requesting retesting that includes the test sponsor's assessment of the impact on NITFS compliance of the changes made since the last test
- NITFS Form CTR-1, Compliance Test Request

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- NITFS Form CTR-2, NITFS System Test Registration, noting changes since the last test
- NITFS Form CTR-3, NITFS Software Registration Data, noting changes since the last test
- NITFS Form CTR-4, Alternate Test Site Request (if applicable).
- One copy of each updated implementation technical manual(s) and operator manual(s)
- The test fee if it is determined that a retest is required

3.3.2 NITFS Test and Evaluation Facility

The NITFS Test and Evaluation Facility will:

- Review the retest request
- Provide a point of contact for coordination
- Determine if retesting is required
- Schedule, plan, and conduct testing, if required
- Prepare test report and compliance certificate, then forward the recommendations to the NIMA/ST/SES
- Approve re-registration recommendations
- Prepare and disseminate a decision letter of re-registration

3.4 Derived Registration Administrative Procedures

System sponsors may request that registration be granted to a particular system in a derived manner based upon previous compliance tests of similar configurations. The derived certification may require a limited file exchange.

3.4.1 System Sponsors

In addition to the procedures outlined above for requesting system retesting, system sponsors desiring a derived system registration must also submit the following to the NITFS Test and Evaluation Facility:

- Written rationale for requesting derived registration including sponsor's assessment of impact on NITFS functionality of the proposed configuration.
- Brief report of any internal demonstration testing that has been done to substantiate that the proposed configuration is NITFS compliant.

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3.4.2 NITFS Test and Evaluation Facility

The NITFS Test and Evaluation Facility will review the request for a derived registration and determine the level of testing required to register the system configuration. The level of testing required will generally be one of the following:

- If the new configuration is determined to be essentially identical to a previously tested implementation, a recommendation will be made to add the system to the NITFS Test Register.
- If the new configuration is slightly different from the previously tested implementation, an abbreviated test will be performed (over dial-up line when possible). If anomalies are identified during the abbreviated test, a full compliance test will be required. Otherwise, a recommendation will be made to add the system to the NITFS Compliance Register.
- If the new configuration is judged to pose a risk to NITFS compliance, a full compliance test will be required.

3.5 Test Planning

The JITC is responsible for developing a comprehensive test plan and associated procedures for fully testing compliance with the implementation requirements for the NITFS. The JITC will tailor the overall test plan for the specific test criteria, test procedures, and resources needed to conduct the testing for the implementation under test.

3.6 Test Execution

3.6.1 Location

Compliance testing will be conducted at the JITC NITFS Test and Evaluation Facility unless an alternate test site has been approved by NIMA/ST/SES.

3.6.2 Unpacking

All NITFS files received by the candidate implementation during the test will be displayed and visually examined for completeness and the correct placement of NITFS components. Large image viewing will be done through a random sampling of the full image focusing on areas of the image that have been annotated.

3.6.3 Packing

All NITFS test files created by the candidate implementation during the test will be examined visually and compared to control test files that have been processed by the NITFS Test and Evaluation Facility. Image, symbol, text and associated data will be checked for conformance with the standards. Field values will be checked for the appropriate values within the ranges allowed for compliant NITFS files.

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3.7 Test Reports

Upon completion of testing, all accumulated results will be integrated into an individual NITFS compliance test report. The test report will indicate whether or not the implementation met the criteria for NITFS compliance. Items documented in the report include, but are not limited to: scope, methodology, test limitations, duration of each test, NITFS functional capabilities demonstrated, corrective actions taken during the tests, discrepancies observed, and overall conclusions and recommendations.

3.8 Reporting Modifications of NITFS Configuration Items

3.8.1 System Sponsors

System sponsors must report hardware and software modifications made to tested systems to the NITFS Test and Evaluation Facility by submitting the following items:

- One copy each of the system updated technical manual(s) and operator manual(s)
- NITFS Form CTR-2, NITFS System Registration Data, noting changes since the last submission
- NITFS Form CTR-3, NITFS Software Registration Data, noting changes since the last submission
- A letter describing modifications and assessing the impact on NITFS compliance

3.8.2 NITFS Test and Evaluation Facility

The NITFS Test and Evaluation Facility staff will:

- Provide a point of contact for coordination
- Review the modification description
- Determine if re-testing is required
- Make recommendation to the NIMA/ST/SES
- Schedule and conduct testing, if required
- Prepare the test report and forward the re-registration recommendation to the NIMA/ST/SES
- Prepare and disseminate a letter of reregistration as warranted by the results of testing

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3.9 Reporting Latent Functional Problems

3.9.1 System Sponsors

When functional or other problems are encountered with the NITFS or a specific implementation or component of the NITFS, system sponsors shall report the problem(s) to the NIMA/ST/SES using the following procedures:

- Prepare a letter identifying NITFS problems
- Submit two copies of the letter and any other supporting data for review

3.9.2 NIMA/ST/SES

The NIMA/ST/SES will coordinate the resolution of NITFS related problems

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4.0 NITFS REGISTRATION

4.1 General

A registry of implementations successfully completing NITFS compliance tests is maintained by the NITFS Test and Evaluation Facility. The registry consists of a system register, a product register, a component register, and a register of available sample software. A register is also available listing those systems receiving CII Certifications.

4.1.1 NITFS System Compliance Register

The NITFS System Compliance Register identifies those systems that have successfully completed NITFS testing or have received a derived registration. It also contains the NITFS configuration items (identified by an '*') associated with the tested system. Any change to a system's NITFS configuration item(s) following registration must be reported to the NITFS Test and Evaluation Facility for assessment of impact on continued NITFS compliance and registration. The contents of the register reflect the information shown in Appendix B, NITFS Form CTR-2.

4.1.2 NITFS Product Compliance Register

The NITFS Product Register will be maintained to expedite derived system registration requests based on product implementations that have previously been demonstrated to properly implement the attributes of the NITFS during a compliance test. The register will identify the software version and minimum hardware configuration items required to support the product. The fact that a software package or other product appears on the NITFS Product Register does not mean that any system which uses the product is NITFS compliant. Each time a software package or other product is ported to or loaded on a hardware configuration not listed in the System Compliance Register, the system developer/sponsor must submit a request for system registration. The contents of the register reflect the information shown in Appendix B, NITFS Form CTR-3.

4.1.3 NITFS Component Compliance Register

The NITFS Component Register provides a means to register components and/or products that implement a portion of the NITFS system compliance requirements, but do not of themselves constitute a complete NITFS capable implementation. For example, a JPEG compression card, a CGM implementation, a TACO2 implementation, or a specialized Work Station may be tested for compliance with applicable portions of the NITFS and, if compliant, be added to the component register. The fact that a component appears on the NITFS component register does not mean that any system which uses the component is NITFS registered. System

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developers/sponsors must submit a request for NITFS compliance registration. The contents of the register will be determined by the specifics of those components nominated for registration. Data elements of the component register will be appropriate extractions from the system compliance register.

4.1.4 NITFS Sample Software Register

The sample software register contains a list of software that has been made available to assist in implementing the NITFS. The sample software has been tested to determine the degree to which it is compliant with the NITFS. In some instances the purpose of developing the sample software was satisfied without resolving deficiencies identified during testing. A list of known deviations from the applicable portions of the NITFS suite of standards is available from the NITFS Test and Evaluation Facility.

4.1.5 NITFS CII Certification Register

The NITFS CII compliance register identifies those NITFS compliant systems which have been granted CII certification in accordance with CJCSI 6212.01A, Compatibility, Interoperability and Integration of Command, Control, Communications, Computers, and Intelligence Systems, 30 June 1995. The CII Certification Test Program is described in JIEO Circular 9002, Requirements Assessment and Interoperability Certification of C4I and AIS Equipment and Systems, 23 January 1995.

4.2 Register Access

Copies of the registers are available by contacting the NITFS Test and Evaluation Facility. The registers are also available on the World Wide Web via the G/ISMC NITFS Technical Board (NTB) Home Page at URL http://www-ismc.itsi.disa.mil/ntb/ntb.html.

4.3 Expiration of Registration

Entries in the system, product, and component registers expire two years from the date of entry. Sponsors must update their registration by submitting a request for reregistration. The NITFS Test and Evaluation Facility will review the requests and determine the degree of testing needed to update the register entry(s). The re-registration fee will be commensurate with the level of effort required to review the request, perform tests as necessary, and update the register entry.

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5.0 NITFS COMPLIANCE CRITERIA

5.1 General

5.1.1 Compliance Criteria

The NITFS compliance criteria are derived from the suite of NITFS documents. NITF file components, attributes, allowable field values, formats, and field lengths are fully described in the NITFS documents. Since the NITFS is very flexible, it has many options, the use of which must be constrained for implementation if file exchange interoperability is to be achieved. The criteria identify the features, capabilities, formats, field values, ranges, and associated boundary conditions of the NITFS against which an implementation is tested for compliance.

5.1.2 Pack/Unpack

For the purposes of this program plan, the term "pack" means to create or construct an NITF file within the set of conditions and constraints defined for compliance with the NITFS. The term "unpack" means to interpret and properly display imagery data (images and symbols) and accurately process associated information contained in a NITF file. In most instances, this includes the capability to accurately display and/or print the contents of an NITF file. Under some circumstances, unpacking a file results in a non-displayed product such as re-packing another file resulting from a translation or conversion process. For example, translation or conversion services may be supported by an imagery library or gateway server, often with no human involvement or intervention. In these cases, the resulting files will be evaluated using the applicable test criteria which pertain to the documented requirements of the specific interface involved. An implementation may be registered as having a pack-only capability, an unpack-only capability, or both a pack and unpack capability depending on the fielding intent and desire of the sponsor.

5.1.3 Compliance Principles

The NITFS compliance criteria contained herein are intended to strike a balance between fully implementing all the requirements in the standards and the planned operational requirements of the actual system(s) implementing the standard. The history of imagery systems is replete with examples of systems being deployed for use in environments for which they were not originally intended to operate. This fact drives the need to establish baseline requirements from the standards which are applicable to all implementations regardless of perceived operational requirements. Where clear USIGS Architectural guidance exists, the applicable test criteria for the required services and features will be selected from among the criteria established in this plan. The cardinal principles are:

5.1.3.1 The packing implementation shall ensure all produced NITF files are NITFS compliant within the bounds of the established complexity levels. When the

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implementation also supports unpacking, it must be capable of properly unpacking (and portraying when applicable) any file that it is able to pack.

5.1.3.2 The unpacking implementation shall ensure the information from NITF files is presented as the originator intended, at least for the fundamental segments of the file (images, symbols and text).

5.1.3.3 When unpacking NITF files with unrecognized content (e.g. content that cannot be properly interpreted or presented by the implementation, for example extension data), the implementation shall have a means to alert the system operator or administrator that the file(s) has unrecognized content in addition to what is being presented or interpreted.

5.1.4 Native Mode Rule

The Native Mode rule refers to the requirement that those implementations offering features or attributes in their native mode of operation that directly correlate with elements defined in NITF 2.1, such as supporting the creation of symbol annotation, will be required to support those features and attributes in accordance with NITFS.

5.2 NITFS Complexity Levels

Implementations of the NITFS are tested according to their ability to pack and/or unpack various CLEVELs of NITFS formatted files. This concept allows NITFS to be implemented on a wide range of hardware platforms with various levels of internal resources while maintaining a baseline level of interoperability between all compliance tested systems. For NITF 2.1, four CLEVELs have been defined, CL03, CL05, CL06, and CL07. A summary of the attributes of each CLEVEL is listed in Table 5-1. Files shall be marked at the lowest CLEVEL for which they qualify.

5.3 Elements of NITFS Compliance

Table 5-1 contains an overview summary of the NITF 2.1 compliance criteria for general reference; the specific attributes and compliance test requirements are described in the remainder of this chapter with additional details in the appendices. The specific field values, ranges, and boundary conditions of the NITF file format required for compliance testing are identified in Appendix D. The specific test conditions for ARIDPCM Compression, Bi-Level Compression, JPEG Compression, Vector Quantization Decompression, CGM, TACO2, and NITF version 1.1 and 2.0 backward compatibility are identified in Appendices E, F, G, H, I, J and K respectively. Tactical systems, and those systems with requirements to interface with tactical systems, must provide a means for exchanging (both transmit and receive) files using the TACO2 protocol, even if they have pack only or unpack-only capabilities.

Unpack applications shall be able to fully interpret any compliant file within the supported complexity level. Pack applications shall ensure no files are produced

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which extend beyond the allowed features and ranges of the applicable complexity level of the file being packed. Proper interpretation of the table is further defined by the text of this chapter.

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Table 5-1. NITFS 2.1 Compliance Criteria Summary*

Feature	Complexity Level			
	3	**5**	**6**	**7**
Common Coordinate System (CCS) Extent **(origin) To max (row, column)**	00000000, 00000000 To 00002047, 00002047	00000000, 00000000 To 00008191, 00008191	00000000, 00000000 To 00065535, 00065535	00000000,00000000 To 99999999,99999999
Maximum File Size	50 Mb - 1 (52,428,799)	1Gb -1 (1,073,741,823)	2Gb -1 byte (2,147,483,647)	10 GB-1 byte (10,737,418,239)
Image Size **Image(s) placed within CCS extent**	0002-2048 Rows X 0002-2048 Cols (R & C <= 2048)	0002-8192 Rows X 0002-8192 Cols (R or C > 2048)	0002-65536 Rows X 0002-65536 Cols (R or C > 8192)	0002-99999999 X 0002-99999999 (R or C > 65536)
Image Blocking (Rectangular blocks allowed)	Single and Multiple Blocks 0002-2048 Rows X 0002-2048 Cols	Single and Multiple Blocks 0002-8192 Rows X 0002-8192 Cols	Multiple blocking is mandatory for images that exceed 8192 pixels per row or column. 0002-8192 Rows X 0002-8192 Cols	
Monochrome (MONO) **No Compression**	Single Band 1, 8, 12, 16, 32, 64 Bits per pixel (NBPP) With and without LUT IC=NC, NM Image Mode (IMODE) = B			
Color 1 or 8-Bit (RGB/LUT) **No Compression**	Single Band 1, 8 Bits per pixel (NBPP) With LUT IC=NC, NM IMODE = B			
Color 24-Bit (RGB) **No Compression**	Three Bands 8 Bits per pixel per band (NBPP) No LUT IC=NC, NM IMODE = B,P,R,S			
Multispectral **(MULTI)** **No Compression**	2-9 bands 8, 16, 32, 64-bits per pixel per band With and without LUT in each band IMODE =B, P, R, S	2-256 bands 8, 16, 32, 64-bits per pixel per band With and without LUT in each band IMODE =B, P, R, S		2- 999 bands 8, 16, 32, 64-bits per pixel per band With and without LUT in each band IMODE =B,P,R,S
JPEG DCT Compression **Monochrome** **(MONO)**	Single Band 8 & 12 Bit sample (NBPP) No LUT IC=C3, M3 IMODE B			

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Table 5-1 NITFS 2.1 Compliance Criteria Summary* (cont'd.)

Feature	Complexity Level 3	5	6	7
JPEG DCT Compression Color 24-Bit (RGB)	Three Bands 8-Bit Sample per band (NBPP) No LUT IC=C3, M3 IMODE = P			
JPEG Compression Color 24-Bit (YCbCr601)	Three Bands 8 Bit Sample per band (NBPP) No LUT IC=C3, M3 IMODE = P			
Downsampled JPEG DCT Monochrome (MONO)	Single Band Single Block Only 8-Bit sample (NBPP) No LUT IC=I1 IMODE = B (Image size may not exceed 2048 pixels per Row or Column)			
JPEG Lossless Compression Monochrome (MONO)	Single Band 8, 12 and 16-Bit Sample (NBPP) No LUT IC = C5, M5 IMODE = B (This feature is optional for implementation.)			
JPEG Lossless Compression 24-Bit Color (RGB)	Three Bands 8-Bit Sample per band (NBPP) No LUT IC = C5, M5 (This feature is optional for implementation.)			
Bi-LEVEL Compression (MONO)	Single Band / Block 1-Bit per pixel (NBPP) With and without LUT IC = C1, M1 COMRAT = 1D, 2DS, 2DH IMODE = B (Image size may not exceed 2560 pixels per row by 8192 pixels per column)			
Bi-LEVEL Compression RGB/LUT	Single Band / Block 1-Bit per pixel (NBPP) With and without LUT IC = C1, M1 COMRAT = 1D, 2DS, 2DH IMODE = B (Image size may not exceed 2560 pixels per row by 8192 pixels per column)			
VQ Compression	Single Band 8 Bits per pixel (NBPP) 4x4 Kernel 4 tables IC = C4, M4 IMODE = B			

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Table 5-1 NITFS 2.1 Compliance Criteria Summary* (cont'd.)

Feature	Complexity Level			
	3	5	6	7
VQ Monochrome (MONO)	With and without LUT IMODE = B			
VQ 8-bit color (RGB/LUT)	With LUT IMODE = B			
Multispectral (MULTI) Individual Band JPEG Compression	2 to 9 bands 8, 12-bits per pixel per band No LUT IMODE =B, S IC = C3, M3	2 to 256 bands 8, 12-bits per pixel per band No LUT IMODE =B, S IC = C3, M3		2 to 999 bands 8, 12-bits per pixel per band No LUT IMODE =B, S IC = C3, M3
Multispectral (MULTI) Multi-Component Compression (TBD004)	2 to 9 bands 8, 12-bits per pixel per band No LUT IMODE =B, P, S IC = C6, M6 (This feature is optional for implementation.)	2 to 256 bands 8, 12-bits per pixel per band No LUT IMODE =B, P, S IC = C6, M6 (This feature is optional for implementation.)		2 to 999 bands 8, 12-bits per pixel per band No LUT IMODE =B, P, S IC = C6, M6 (This feature is optional for implementation.)
Elevation Data (NODISPLY)	Single Band 16-Bits per pixel (NBPP) No LUT IC = NC IMODE = B ICAT = DTEM, ISUBCATn = code from DIGEST Part 3 Annex B (or BCS-A spaces (0x20)) Applicable TREs:Standard Geospatial Support Data Extensions (GEOSDE), DIGEST Part 2 Annex D (This feature is optional for implementation.)			
Location Grid (NODISPLY)	Two Bands 16, 32-Bits per pixel (NBPP) No LUT IC = NC IMODE = B ICAT = LOCG, ISUBCATn = CGX, CGY or GGX, GGY Applicable TREs:Standard Geospatial Support Data Extensions (GEOSDE), DIGEST Part 2 Annex D (This feature is optional for implementation.)			
Matrix Data (NODISPLY)	2 to 9 Bands 8, 16, 32, and 64-bits per Pixel per Band, No LUT in any Band IMODE=B,P,R,S (This feature is optional for implementation.)	2 to 256 Bands 8, 16, 32, and 64-bits per Pixel per Band, No LUT in any Band IMODE=B,P,R,S (This feature is optional for implementation.)		2 to 999 Bands 8, 16, 32, and 64-bits per Pixel per Band, No LUT in any Band IMODE=B,P,R,S (This feature is optional for implementation.)

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Table 5-1 NITFS 2.1 Compliance Criteria Summary* (cont'd.)

Feature	Complexity Level			
	3	5	6	7
Number of Image Segments Per File	0 to 20 Segments	0 to 100 Segments		
Number of CGM Graphic Segments Per File	0 to 100 Segments			
Aggregate Size of Graphic Segments Per File	1 Mbyte maximum	2 Mb maximum		
CGM Graphic Profile	MIL-STD-2301A			
Number of Text Segments Per File	0 to 32 Segments			
Text Format Codes Supported	STA, UT1, MTF			
Text Data Per Segment	00001 to 99999 Characters			
Tagged Record Extensions (TRE)	Tagged Record Extensions may appear in the UDHD, XHD, UDID, IXSHD, SXSHD, TXSHD fields and in the "TRE_OVERFLOW" DES regardless of CLEVEL. Only approved Tagged Record Extensions listed in the Data Extension Register are allowed.			
Number of Data Extension Segments (DESs) Per File	0 to 10 Only approved DES(s) listed in the Data Extension Register are allowed.			
Currently Approved DESs	TRE_OVERFLOW STREAMING_FILE_HEADER			
Number of Reserved Extension Segments (RESs) Per File	None			
Currently Approved RESs	None			

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Table 5-1 NITFS 2.1 Compliance Criteria Summary* (cont'd.)

Feature	Complexity Level			
	3	5	6	7
NITF 2.0	All unpack capable implementations must properly interpret any compliant NITF 2.0 file of all comparable CLEVEL(s) as implemented for NITF 2.1. Implementations capable of packing NITF2.0 files must be able to create NITF 2.0 formatted files within the NITF2.0 constraints for the comparable CLEVEL(s) as implemented for NITF 2.1. NITF 2.1 CLEVEL — NITF 2.0 CLEVEL 7 — N/A 6 — 6 5 — 5, 4 3 — 3, 2, 1			
NITF 1.1	All unpack capable implementations must properly interpret any compliant NITF 1.1 file.			
TACO2	Tactical systems, and those systems with requirements to interface with tactical systems.			

*Note: This table only provides an overview summary of compliance criteria. Proper interpretation of the table is specified in the text of this chapter and associated appendices.

5.4 NITFS Compliance Test Functional Requirements

5.4.1 NITF Pack

5.4.1.1 An implementation must be able to pack NITF compliant files within the constraints of the CLEVEL file types for which compliance is desired. An implementation must at least support packing the NITFS CLEVEL attributes corresponding with those available in its native mode of operation. For example, if the native mode supports annotation using graphics, the implementation must support graphics annotation according to the NITFS.

5.4.1.2 If a system has an image capture or input device, the implementation must support the CLEVELs of the image size(s) that can be captured. Additionally, it must support the boundary conditions for the supported CLEVEL.

5.4.1.3 An implementation is not required to implement all NITF attributes available at any particular CLEVEL. The set of pack features implemented is somewhat at the discretion of the system sponsor. It is the responsibility of those acquiring or intending to use a particular implementation to ensure that the needed packing features are present. Whatever set of features are implemented, they must be done within the constraints of the appropriate CLEVEL and will be thoroughly tested.

5.4.1.4 An implementation that packs an NITF file must have a means to ensure that the file meets the specific complexity level intended and does not exceed the boundary conditions for that CLEVEL file type.

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5.4.2 NITF Unpack

5.4.2.1 An implementation must be able to unpack any NITF compliant file at the CLEVEL for which compliance is being tested. The capability for unpack must be equal to or greater than the CLEVEL capability for packing. It must also unpack any NITF file packed at a lesser CLEVEL. Hence, there is a stringent requirement for an unpacker to be robust enough to handle all NITF file features (even if it can't pack the feature) that may be invoked by any packing implementation of equal CLEVEL or below.

5.4.2.2 An implementation attempting to unpack a file packed at a higher CLEVEL may do its best to properly interpret and use the file. Upon detecting the unsupported CLEVEL of the file, the implementation must at least alert the system operator of the event and provide the option to abort continuation of the unpack process. This must be done without adversely disrupting the system operation (such as requiring a re-boot or re-initialization of the system). If the application allows the operator the option to proceed with the unpack operation, the operator must be alerted of the potential for disruption of operation and potential incompleteness of any resulting presentation.

5.4.2.3 As long as the segment offset lengths in the file header are accurate, the implementation must be able to skip past errored segments and any segments containing non-supported optional features or attributes. The implementation must otherwise properly interpret remaining file segments. The operator must be notified about segments which cannot be properly interpreted.

5.4.3 Nested CLEVELs

All NITF implementations must be capable of performing the basic NITFS file processing functions associated with each lower CLEVEL below that to which it is being tested/registered. All unpack implementations must be able to unpack any lower level compliant NITF file. All pack implementations must mark NITF files at the lowest CLEVEL that supports unpacking of the file, regardless of the maximum CLEVEL capability of the packing implementation. Generally, pack implementations should be able to pack NITF files of each CLEVEL below which it is capable in order to interchange files with other implementations of lower CLEVELs. When so required by the system sponsor, the system must be able to pack NITF files at each lower CLEVEL with contents that do not exceed the boundary conditions for each respective CLEVEL.

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5.4.4 Common Coordinate System (CCS)

One of the differences between CLEVELs in Table 5-1 is the CCS size constraint. These constraints define the boundary rectangle of the combined displayable elements (image and graphic segments) contained within an NITF file for each respective CLEVEL. All pack capable implementations must constrain the size and location of displayable elements within the boundary of the respective CLEVEL of the file being packed. All unpack capable implementations must support the full extent of the Common Coordinate System size of the CLEVELs for which compliance is sought and apply the background color as specified by the originator of the file.

5.4.5 JPEG Discrete Cosine Transform (DCT) Compression

All unpack capable implementations must support JPEG decompression using the DCT, Huffman Entropy Encoding, and 8-bit and 12-bit precision mode of operation. All pack capable implementations with requirements to support JPEG compression must implement JPEG DCT using the specifications and guidance contained within MIL-STD-188-198A and do so within the bounds of the criteria established for unpacking. Implementations must support the use of restart markers in the compressed data.

5.4.6 Downsampled JPEG

All unpack capable implementations must support all features of Downsampled JPEG decompression. Pack capable implementations with requirements to support Downsampled JPEG compression must only pack these type of image segments within the bounds of the compliance criteria established for unpacking. All Downsampled JPEG image segments will be single band and single block; no larger than 2048 pixels per row and per column. (Note: These are constraints imposed by the Downsampled JPEG specification).

5.4.7 Lossless JPEG

Unpack capable systems may optionally support Lossless JPEG decompression. Pack capable implementations, with requirements to support Lossless JPEG compression, must only pack these type of image segments within the bounds of the compliance criteria established for unpacking.

5.4.8 Bi-Level Compression

All unpack capable implementations must support Bi-Level decompression using the Huffman Entropy Encoding. They must support unpacking in all three modes: One-Dimensional coding, Two-Dimensional coding with standard vertical resolution, and

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Two-Dimensional coding with high vertical resolution. Pack capable implementations with requirements to support Bi-Level compression must do so within the bounds of the criteria established for unpacking. All Bi-Level image segments will be single band and single blocked.

5.4.9 Vector Quantization (VQ) Compression

All unpack capable implementations must support VQ decompression and must comply with the specifications and guidance contained within Mil-Std-188-199 and the criteria established for unpacking. Pack capable implementations with requirements to support VQ compression must only pack VQ compressed image segments within the bounds of the criteria established for unpacking. Producers of VQ compressed image segments are solely responsible for the means of generating code tables resulting in appropriate quality of the decompressed imagery.

5.4.10 ARIDPCM Compression

The use of ARIDPCM compression is limited to NITF 1.1 formatted files. All unpack capable implementations must support decompression of ARIDPCM compressed image segments contained in NITF 1.1 formatted files. Pack capable implementations with requirements to support NITF 1.1 with ARIDPCM compression must do so within the bounds of the criteria established for unpacking.

5.4.11 CGM Graphics

All implementations must support unpacking NITF files that contain CGM graphic segments. Those implementations that support annotation using graphics in their native mode must support packing of CGM graphic segments. The applicable profile of CGM for NITF2.1 is that described by MIL-STD-2301A. The applicable profile of CGM for NITF2.0 is that described by MIL-STD-2301.

5.4.12 Bit-Mapped Symbols

The use of bit-mapped symbols is limited to legacy NITF 1.1 and 2.0 formatted files. All unpack capable implementations must support the unpacking and display of NITF version 1.1 and 2.0 files that contain bit-mapped symbols (graphic segments). NITF 2.1 pack capable implementations supporting graphics must only use CGM formatted graphics unless they are re-packing (into NITF 2.0) legacy NITF 2.0 files with existing bit-mapped symbols.

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5.4.13 Monochrome

All unpack implementations must support unpacking monochrome image segments with the following NBPP pixel depths: 1, 8, 12, 16, 32, and 64 bits per pixel with ABPP pixel depths of 1, 8, 12, 11-16, 32, and 64 bits per pixel. All pack capable implementations with the requirement to pack monochrome image data must do so within the bounds of the criteria established for unpacking.

5.4.14 Color

All unpack capable implementations must support the unpacking and display of color image segments. (The display device does not necessarily need to be a color display.) Both single band (NBPP=1 or 8) with look-up-table (LUT), and three band (NBPP=8 for each band, total of 24 bits) must be supported. All pack capable implementations with the requirement to pack color image data must do so within the bounds of the criteria established for unpacking.

5.4.15 Multispectral

All unpack capable implementations must support the unpacking and display of multispectral image segments containing up to nine bands for CLEVEL 3 implementations, 256 bands for CLEVEL 5 and 6, and 999 bands for CLEVEL 7 implementations. All pack capable implementations, with requirements to pack multispectral image data, must do so within the bounds of the criteria established for unpacking.

5.4.16 Nodisplay Image Representation

Unpack capable implementations may optionally support image segments with matrix data having an Image Representation (IREP) of NODISPLY. When supported, the implementation must pass the data field content to the appropriate matrix data application according to the ICAT value for further processing. Implementations without a requirement to support nodisplay matrix data must not be adversely affected when image segments containing such data are encountered. At the very least the operator must be notified about segments that can not be properly interpreted. Pack capable implementations with requirements to support the nodisplay representation of matrix data must do so within the bounds of the criteria established for unpacking.

5.4.16.1 Elevation Data

Unpack capable implementations may optionally support exploitation of elevation matrix data contained within an image segment. Those systems that choose to implement this feature must do so in accordance with the criteria detailed in section 5.18.13, GeoSDE. In general, when a file contains an image segment with pixel data, a corresponding image segment with elevation matrix data and the

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appropriate Geospatial Support Data Extensions (GeoSDE), the implementation must be able to indicate the elevation for all pixels within the image pixel array that have elevation data associated with them. The implementation must also present the associated accuracy information given in the GeoSDE. All pack capable implementations with the requirement to pack elevation matrix data must do so within the bounds of the criteria established for unpacking.

5.4.16.2 Location Grid Data

Unpack capable implementations may optionally support exploitation of location grid data contained within an image segment. Those systems that choose to implement this feature must do so in accordance with the criteria detailed in section 5.18.13, GeoSDE. In general, if a file contains an image segment with pixel data, a corresponding image segment with location grid data and the appropriate GeoSDE, the implementation must be able to indicate the location coordinates for all pixels within the image pixel array that have location data associated with them. The implementation must also present the associated accuracy information given in the GeoSDE. All pack capable implementations with the requirement to pack location grid data must do so within the bounds of the criteria established for unpacking.

5.4.17 Masked Tables

All unpack capable implementations must properly interpret and use block and pixel mask tables. Unpack capable implementations must interpret and properly use the pad pixel value when defined in masked tables. A pad pixel value of zero must be treated as transparent. Pack capable implementations that insert block and/or pixel mask tables must populate them with accurate offset and related values.

5.4.18 Tagged Record Extensions (TREs)

TREs may appear in the following fields: UDHD, XHD, UDID, IXSHD, SXSHD, TXSHD, and the “TRE_OVERFLOW” DES regardless of CLEVEL. Only G/ISMC approved Tagged Record Extensions are allowed as shown in the TRE portion of the NITFS Tagged Extension Registry. As a minimum, unpack capable implementations must at least ignore TREs and properly unpack the segment in which the TRE exists. If the implementation supports the interpretation of TREs, it must also do so when the TREs happen to be located in a TRE_OVERFLOW DES.

5.4.19 Data Extension Segments (DESs)

Only G/ISMC approved DESs are allowed as shown in the DES portion of the NITFS Tagged Extension Registry. All unpack capable implementations must be able to interpret NITF files containing the STREAMING_FILE_HEADER DES. If the implementation supports the interpretation of TREs, it must also support the TRE_OVERFLOW DES. As a minimum, unpack capable implementations must at least ignore other DESs and properly unpack other supported file segments.

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5.4.20 Reserved Extension Segments (RESs)

Only G/ISMC approved RESs are allowed as shown in the RES portion of the NITFS Tagged Extension Registry. As a minimum, unpack capable implementations must at least ignore RESs and properly unpack other supported file segments.

5.4.21 TACO2

All tactical systems, and those systems with requirements to interface with tactical systems, must provide a means for exchanging files using the TACO2 protocol as well as demonstrate the capability to configure TACO2 parameter settings. All such systems must at least support and demonstrate point-to-point and Secure Telephone Unit-3rd Generation (STU-III) capability.

5.4.22 Communications Channels

All systems, and/or components within a system, must support the exchange of NITF files across whatever standard (ANSI, ISO, FIPS, Commercial, etc.) communication channel/protocol that is provided with the system/component. The file exchange capability must be supported between components within the system as well as between systems.

5.4.23 Physical Exchange Media

Systems with exchangeable media capability intended for distribution or exchange of imagery products, (e.g. magnetic disk, tape, optical disk, etc.) must be able to exchange NITF files via the media. All systems must provide some means to exchange NITF files for compliance test purposes. Most systems have some type of media peripheral(s) to at least support system operation and maintenance that can be used for this purpose. Alternative arrangements to complete compliance testing must be coordinated with the JITC Test and Evaluation Facility personnel when this is not the case.

5.4.24 NITF 1.1 Files

All NITF 2.1 unpack capable implementations must be able to unpack any NITF version 1.1 minimum compliant file (no waivers). All NITF 2.1 implementations are discouraged from packing NITF 1.1 files in order to limit the quantity of legacy 1.1 files that may have to be dealt with into the future.

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5.4.25 NITF 2.0 Files

All NITF 2.1 unpack capable implementations must be able to unpack any NITF version 2.0 compliant file as defined in the JIEO Circular 9008. All pack capable implementations may optionally support the capability to pack NITF files within the constraints of NITF version 2.0 as defined in JIEO Circular 9008. See Appendix K, Constraints for NITF 2.0 compliance.

5.4.26 Year 2000 (Y2K) Implementors must provide a statement summarizing their approach for resolving Y2K associated issues. The summary must cover the NITF application, the operating system and the platform upon which the product resides.

5.4.26.1 The following is some primary examples of date usage:

- Calculate the duration between two dates
- Calculate date based on starting date and plus or minus duration
- Calculate day of week, day of month, week of year, and monthy of year
- Evaluate Leap Year correctly
- Compare two dates
- convert between various date representations
- Reference sam date data addressed with different variables
- Store, retrieve, and display date data
- Move date data into memory
- Move date data across all interfaces

5.4.26.2 NITFS Form CTR-5, Y2K System Awareness Checklist, in Appendix B provides the developer with questions that will assist in assembling the summary statement.

5.5 NITF 2.1 File Format Criteria - General

5.5.1 All fields designated for BCS-A alphanumeric character string information contained in the NITF header and subheader fields must be given in the printable BCS-A character set [space (0x20) through tilde (0x7E)] with eight bits (one byte) per character, the most significant bit always set to zero

5.5.2 Those header and subheader fields designated to allow UT1 character strings must contain characters within the Basic Multilingual Plane (BMP) blocks Basic Latin and Latin-1 Supplement [0x20 through 0x7F and 0xA0 through 0xFF] with eight bits (one byte) per character.

5.5.3 All length sizes or character counts given in header and subheader fields must specify the number of eight-bit bytes.

5.5.4 All characters in fields designated as alphanumeric (BCS-A or UT1) must be left justified and padded with spaces as necessary to fill the field.

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5.5.5 All characters in numeric fields (BCS-N) must be right justified and padded with leading zeroes as necessary to fill the field. The following characters are allowed in numeric fields only when designated in the field range definition: Numbers 0 to 9 (0x1 to 0x9), Slant bar (0x 2F), plus (0x 2B), minus (0x 2D), and decimal point (0x 2E).

5.5.6 The background color field must contain unsigned binary integers expressing the common coordinate system background color in red, green, blue order.

5.5.7 All required fields must be present and must contain valid data within the specified ranges.

5.5.8 Conditional fields are present only if indicated by the value of one or more preceding fields. When a conditional field is present, it must contain valid data.

5.5.9 Coordinates for image and graphic segments must be given as an ordered pair (r,c), where the first number (r) indicates the row and the second number (c) indicates the column within the common coordinate system. The positive row axis is oriented 90 degrees clockwise relative to the positive column axis. Each data segment's location coordinates (r,c) identify the location of its origin (0,0) point relative to the location coordinates of the data segment to which it is attached. The location coordinates are relative to the origin of the common coordinate system when the segment is attached to attachment level 0 (unattached).

5.5.10 Data segments must be placed following the file header fields in the following order: image segment(s), graphic segment(s), text segment(s), data extension segment(s), reserved extension segment(s). If one or more segments of a given data segment type is included, each segment must include the applicable segment subheader preceding the content data. If a data segment type is omitted, the subheader for that data segment type will also be omitted.

5.5.11 The following are the maximum file size constraints for each complexity level (CLEVEL).

5.5.11.1 For CLEVEL 3, unpack capable implementations must be able to unpack files with file sizes up to and including 50 Megabytes minus one byte. Implementations capable of packing CLEVEL 3 files shall not pack files of size greater than 50 Megabytes minus one byte. (50 Megabytes - 1 = 52,428,799 bytes)

5.5.11.2 For CLEVEL 5, unpack capable implementations must be able to unpack files with file sizes up to and including one Gigabyte minus one byte. Implementations capable of packing CLEVEL 5 files shall not pack files of size greater than one Gigabyte minus one byte. (1Gb - 1 = 1,073,741,823 bytes)

5.5.11.3 For CLEVEL 6, unpack capable implementations must be able to unpack files with file sizes up to and including 2 Gigabytes minus 1 byte. Implementations

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capable of packing CLEVEL 6 files shall not pack files of size greater than 2 Gbytes minus one byte. (2Gb - 1 = 2,147,483,647 bytes)

5.5.11.4 For CLEVEL 7, unpack capable implementations must be able to unpack files with file sizes up to and including 10 Gigabytes minus 1 byte. Implementations capable of packing CLEVEL 7 files shall not pack files of size greater than 10 Gbytes minus one byte. (10Gb - 1 = 10,737,418,239 bytes)

5.5.12 Y2K

5.5.12.1 All presentation to users of dates will use 4-digit year, regardless of internal or NITF file representation of the data.

5.5.12.2 All date sensitive manipulation or calculations will be done with due consideration for the appropriate century.

5.5.12.3 For NITF 2.0 and NITF 1.1 formatted files, the implementation must associate century according to the window date rules established by NIMA.

1. For NITF header and subheader date fields, the window date rule is:
   - 00 to 59 indicates the century 2000
   - 60 to 99 indicates the century 1900
2. The window date rule is product specific for dates within tagged record extensions. (TBD003 NIMA needs to define rules for dates other than those in NITF headers and subheaders.)
3. Lacking a specific window date rule, the rule for NITF headers and subheaders will be applied.

5.5.13 (TBD002) Reduced resolution data sets.

5.6 Image Segment Criteria

For all implementations:

5.6.1 Unpack

The implementation must be able to unpack NITF files containing single block image segment(s) and NITF files containing multiple-block image segment(s) comprised of the applicable pixel ranges for each respective CLEVEL. The implementation must support block sizes from 2x2 pixels up to the maximum single block size designated for the CLEVEL. The block pixel ranges for each CLEVEL are:

- 0002-2048 pixels by 0002-2048 pixels for CLEVEL 3
- 0002-8192 pixels by 0002-8192 pixels for CLEVELs 5, 6, and 7

Image segments are formatted as follows:

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5.6.1.1 Single band monochrome (shades of gray), single and multiple blocks, 1, 8, 12, 16, 32 and 64 bits per pixel with and without a LUT, compressed and uncompressed, with and without masking tables. For 16 bits-per-pixel (NBPP=16):

- 11 significant bits, right justified and left bits filled with zeros
- 12 significant bits, right justified and left bits filled with zeros
- 13 significant bits, right justified and left bits filled with zeros
- 14 significant bits, right justified and left bits filled with zeros
- 15 significant bits, right justified and left bit filled with a zero
- 16 significant bits

5.6.1.2 Single band RGB color (RGB/LUT), single and multiple blocks, one and eight bits-per-pixel, with three LUTs (8 bits-per-pixel for each of R, G and B), uncompressed, with and without masking tables.

Note: Multiple blocks are not supported for one bit per pixel (Bi-Level) image segments.

5.6.1.3 Color (24-bit), three bands (RGB), Image representation (IREP) RGB, eight bits-per-pixel in each band, single and multiple blocks, without LUTs, JPEG compressed and uncompressed, with and without mask tables, image data ordered as follows:

- Band Interleaved by Block (IMODE B)
- Band Interleaved by Pixel (IMODE P)
- Band Sequential (Only valid for image segments with multiple blocks and multiple bands) (IMODE S)
- Band Interleaved by Row (IMODE R)

5.6.1.4 Color (24-bit), three bands (YCbCr), eight bits-per-pixel in each band, single and multiple blocks, without LUTs, with and without masking tables, JPEG compressed image data ordered as Band Interleaved by Pixel, IMODE P.

5.6.1.5 Bi-level compressed, single band, one bit-per-pixel, single block, with and without LUTs, with and without masking tables.

5.6.1.6 VQ compressed, single band, 8 bits-per-pixel, single and multiple blocks, with and without LUTs, with and without masking tables.

5.6.1.7 Multispectral, up to 999 bands (depending upon applicable CLEVEL, 8, 16, 32, or 64 bits-per-pixel for each band, single and multiple blocks with and without LUTs, uncompressed, with and without mask tables, image data ordered as follows:

- Band interleaved by block (IMODE B)
- Band interleaved by pixel (IMODE P)
- Band Interleaved by Row (IMODE R)
- Band Sequential (Only valid for image segments with multiple blocks and multiple bands) (IMODE S)

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5.6.1.7.1 For the two band case, the implementation must be able to at least present either band of a two band multispectral image segment according to the value of the IREPBAND field. First priority must be given the band marked LU and the LUT must be applied for the presentation. If LU is not present, the implementation must present the band marked M. If neither LU nor M is present, the implementation must present the first band as if it were marked M.

5.6.1.7.2 For the three band or greater case, the implementation must be able to present any three bands and any single band of a multispectral image as indicated by the values appearing in the IREPBANDn fields. First priority must be given to those bands marked R, G, and B. If no ba`nds are marked R, G, and B, the next priority goes to the first band marked LU. Lacking any bands marked LU, the implementation must present the first band marked M. When no bands are marked, the implementation must present the first three bands as if they were marked R, G, and B.

5.6.1.7.3 Once the multispectral image is initially presented, the implementation may offer additional presentation options to the operator. For example, the operator may be allowed to select any of the bands, or combinations of the bands for display, print, or further processing.

5.6.1.7.4 Unpack capable implementations must support decompressing of JPEG DCT compressed multispectral image segments.

5.6.1.7.5 Unpack capable implementations may optionally support decompressing of multi-component compressed multispectral image segments.

5.6.1.8 Downsampled JPEG, single band monochrome (shades of gray), single block, eight bits-per-pixel, without a LUT, JPEG compressed, without masking tables.

5.6.1.9 Elevation data

5.6.1.9.1 Support of image segments containing elevation data is optional. When supported, the implementation must be able to unpack and interpret the data in the single-band elevation data image segment as follows:

1. The implementation will recognize that the image segment(s) contains elevation data when the ICAT field contains the value DTEM.
2. The ISUBCAT field value will be interpreted as the unit of elevation measure according to the codes identified in DIGEST Table 7-1 Units of Measure Codes.
3. The implementation must Interpret up to 20 elevation grid segments that are associated with a single image segment.

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4. The implementation must interpret the ratio of image pixels to grid elements so that the appropriate grid element is identified with the appropriate pixel of the associated image segment.
5. Calculation of elevation must not presume greater vertical and horizontal accuracy than the data within the support data of the image segment.
6. When elevation points are less frequent than pixel values of an image segment, the system must interpolate between grid points.
7. In the instance that two elevation grid segments overlap. that segment with the highest display level will have precedence when displaying elevation.

5.6.1.10 Location grid data. Support of image segments containing location grid data is optional. When supported, the implementation must be able to unpack and interpret the data in the two-band location grid data image segment as follows:

1. The implementation will recognize that the image segment(s) contains location data when the ICAT field contains the value DTEM.
2. The ISUBCAT field value will be interpreted as either CGY and CGX for cartographic or GGY and GGX for geographic location values.
3. The implementation must Interpret up to 20 location grid segments that are associated with a single image segment.
4. The implementation must interpret the ratio of image pixels to grid elements so that the appropriate grid element is identified with the appropriate pixel of the associated image segment.
5. Calculation of location must not presume greater accuracy than the data within the support data of the image segment.
6. For each location grid the implementation must interpret both geographic and Cartesian location values.
7. When location points are less frequent than pixel values of an image segment, the system must interpolate between grid points as defined in DIGEST, part 2 Section 10.
8. In the instance that two elevation grid segments overlap. that segment with the highest display level will have precedence when displaying elevation.

5.6.1.11 Matrix data. The support of Matrix data is optional. Since there is no means to identify the meaning or significance of the matrix data, packers of such data must externally inform unpackers of the data as to the meaning of the data. Once community utility of specific types of matrix data has been established and documented, an explicit ICAT code for the data will be established

5.6.1.11.2 Unpack. Upon receipt of files with image segments of ICAT = MATR, unpackers must at least be able to skip past this segment and unpack other segments within the file. The operator must be alerted that the file contained this type of image segment.

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5.6.1.12 Pixel Value Type

An implementation must be able to unpack files with the following pixel value types:

1. Pixel value type B (Bi-Level); NBPP = 1; ABPP = 1.
2. Pixel value type INT (unsigned Integer); NBPP = 2 to 8, 12, 16, 32, and 64; ABPP = 2 to 16, 32, and 64.
3. Pixel value type SI (Signed Integer); NBPP = 2 to 8, 12, 16, 32, and 64; ABPP = 2 to 16, 32, and 64.
4. Pixel value type R (Real); 32 bit and 64 bit floating point representation; NBPP = 32 and 64; ABPP = 32 and 64.
5. Pixel value type C (Complex); the values represented with real and imaginary parts; each in 32-bit floating point representation and appearing in adjacent blocks, first real, then imaginary. NBPP = 64; ABPP = 64.

5.6.1.13 ICORDS/IGEOLO

5.6.1.13.1 Implementations that support geographic location information contained in the image segment subheader must be able to interpret one or more of the coordinate representation types specified in the Image Coordinate Representation (ICORDS) field. The following are valid values found in the ICORDS field:

1. D indicates Geographic coordinates of Latitude and Longitude expressed in decimal degrees.
2. G indicates Geographic coordinates, Latitude and Longitude expressed in degrees, minutes, seconds.
3. U indicates UTM expressed in Military Grid Reference System (MGRS) form.
4. N indicates UTM coordinates, Northern hemisphere.
   S indicates UTM coordinates, Southern hemisphere.

NOTE: The above values are different from those used in NITF2.0.

5.6.1.13.2 Implementations that support geographic location information must be able to interpret the four corner location data points in the following order, from the upper left corner of the image clockwise ending at the bottom left corner of the image.

5.6.1.13.3 Implementations must not infer, imply or display pixel precision greater than that represented in the image segment IGEOLO field. Since no projection or accuracy is associated with the corner coordinates in the image subheader (the geodetic reference system is defined to be WGS84), the implementation must not use the data for other than determining approximate location. Systems must not use these coordinates for precise positioning or measurements.

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5.6.1.13.4 Implementations must resolve instances in UTM where any of the four corner coordinates are not in the same hemisphere (Northern or Southern).

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5.6.1.14 ICAT/ISUBCAT

Generally, code values in the ICAT and ISUBCAT have no defined significance when unpacking an image segment. They are simply informational (often used for cataloging purposes). In some cases, the code values in the ICAT and ISUBCAT fields have impact on the interpretation of data values during the unpack processes.

5.6.1.14.1 The following ICAT and associated ISUBCAT code values are generally provided for informational or cataloging purposes only. No specific handling or presentation requirements are specified when unpacking.

1. ICAT = VIS, SL, TI, FL, RD, EO, OP, HR, CP, BP, SAR, FP, VD, MAP, PAT, LEG; where ISUBCAT = Spaces.
2. ICAT = IR, MS or HS; where ISUBCAT = the wave length of the associated data in the band.
3. ICAT = MATR; where ISUBCAT is undefined.

5.6.1.14.2 The following ICAT and associated ISUBCAT code values require special handling during the unpack process.

1. ICAT = LOCG, where ISUBCATn = CGX, CGY, GGX, GGY.
2. ICAT = BARO, DEPTH, or DTEM where ISUBCAT = unit of measure code from DIGEST part 3 annex B.
3. ICAT = SARIQ; where ISUBCATn = I, Q or M, P
4. ICAT = WIND or CURRENT, where ISUBCATn = SPEED and DIRECTION.

5.6.2 Pack

5.6.2.1 The implementation must be able to pack NITF files with either a monochrome image segment(s) or a color image segment(s) (if color capable in native mode, must be color capable in NITF mode) that does not exceed the maximum pixel size and blocking constraints of identified in the Unpack paragraph 5.6.1. The implementation must ensure that the operator cannot create files that exceed the maximum unpack boundary conditions for the respective CLEVEL. Optional pack implementations shall follow the same test criteria as specified for unpack.

5.6.2.2 The implementation may optionally pack Single band RGB color (RGB/LUT),imagery.

5.6.2.3 The implementation may optionally pack Color (24-bit), three bands (RGB), Image representation (IREP) RGB, eight bits-per-pixel in each band.

5.6.2.4 When packing a 3-band 24-bit color image segment using JPEG compression, only IMODE P is allowed.

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5.6.2.5 The implementation may optionally pack one bit-per-pixel image segments, with and without a LUT.

5.6.2.6 The implementation may optionally pack VQ compressed image segments. Re-compression of decompressed VQ image segments is prohibited; however, a decompressed VQ image segment may be packed in its uncompressed state (NC or NM) or in its original compressed form (C4 or M4). Extracted portion(s) of a VQ compressed image may be repacked using the original code book and codes from the original coded pixel data.

5.6.2.7 The implementation may optionally pack multispectral image segments. A multispectral image segment must have at least two bands and no more than 999 bands. The IREPBANDn fields must be populated within the criteria established for unpacking multispectral images. The implementation may optionally compress multipectral image segments using JPEG DCT or the multi-component compression algorithm.

5.6.2.8 The implementation may optionally pack Downsampled JPEG compressed image segments.

5.6.2.9 Elevation grid data. The implementation may optionally pack image segments containing elevation data.

5.6.2.9.1 The generation of image segments containing elevation data is optional. When supported, the implementation must be able to pack elevation data in the single-band elevation data image segment as follows:

1. The implementation will enter the value DTEM to the ICAT field of the image subheader.
2. The implementation will enter the unit of elevation value (codes identified in DIGEST Table 7-1 Units of Measure Codes) to the .ISUBCAT field of the image subheader.
3. The implementation must not exceed 20 elevation grid segments per single image segment.

5.6.2.10 Location grid data. The implementation may optionally pack image segments containing location grid data.

5.6.2.10.1 The generation of image segments containing location grid data is optional. When supported, the implementation must be able to pack location grid data image segment as follows:

1. The implementation will enter the value LOCG to the ICAT field of the image subheader.
2. The implementation will apply either CGY and CGX for cartographic or GGY and GGX for geographic location values in the ISUBCAT field of the image subheader.

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3. The implementation must not exceed 20 elevation grid segments per single image segment.

5.6.2.11 Matrix data. The implementation may optionally pack image segments containing matrix data. Since there is no means to identify the meaning or significance of the matrix data, packers of such data must externally inform unpackers of the data as to the meaning of the data. Once community utility of specific types of matrix data has been established and documented, an explicit ICAT code for the data will be established.

5.6.2.11.1 Packers of image segments with ICAT = MATR data must do so in accordance with all criteria established for packing of imagery segments.

5.6.2.12 Pixel Value Type An implementation may pack files with any of the following pixel value type:

1. Pixel value type B (Bi-Level); NBPP = 1; ABPP = 1.
2. Pixel value type INT (unsigned Integer); NBPP = 2 to 8, 12, 16, 32, and 64; ABPP = 2 to 16, 32, and 64.
3. Pixel value type SI (Signed Integer); NBPP = 2 to 8, 12, 16, 32, and 64; ABPP = 2 to 16, 32, and 64.
4. Pixel value type R (Real); 32-bit and 64-bit floating point representation; NBPP = 32 and 64, ABPP = 32 and 64.
5. Pixel value type C (Complex); the values represented with real and imaginary parts; each in 32-bit floating point representation and appearing in adjacent blocks, first real, then imaginary. NBPP = 64;ABPP = 64.

5.6.2.13 ICORDS/IGEOLO

5.6.2.13.1 Implementations that support geographic location information may populate the IGEOLO field with the approximate geographic location corner points using any of the coordinate representations specified for the Image Coordinate Representation (ICORDS) field. The following are valid values for the ICORDS field:

1. D indicates Geographic coordinates of Latitude and Longitude expressed in decimal degrees.
2. G indicates Geographic coordinates, Latitude and Longitude expressed in degrees, minutes, seconds.
3. U indicates UTM expressed in Military Grid Reference System (MGRS) form.
4. N indicates UTM coordinates, Northern hemisphere.
   S indicates UTM coordinates, Southern hemisphere.

NOTE: The above values are different from those used in NITF2.0.

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5.6.2.13.2 When populating the IGEOLO field, implementations must apply the four corner location points in the following order: from the upper left corner of the image (Row 0, Column 0) clockwise ending at the bottom left corner of the image (Max Row, Column 0).

5.6.2.13.3 Implementations must not populate the IGEOLO fields with more precision than warranted, given the source of the information.

5.6.2.14 ICAT/ISUBCAT

5.6.2.14.1 An implementation may pack files using any of the following ICAT/ISUBCAT codes:

1. ICAT = VIS, SL, TI, FL, RD, EO, OP, HR, CP, BP, SAR, FP, VD, MAP, PAT, LEG; where ISUBCAT = Spaces.
2. ICAT = IR, MS or HS; where ISUBCAT = the wave length of the associated data in the band.
3. ICAT = LOCG, where ISUBCATn = CGX, CGY, GGX, GGY.
4. ICAT = SARIQ; where ISUBCATn = I, Q or M, P.
5. ICAT = BARO, DEPTH, or DTEM where ISUBCAT = unit of measure code from DIGEST.
6. ICAT = WIND or CURRENT, where ISUBCAT = SPEED and DIRECTION.

5.6.2.15 When a file is created from a pre-existing uncompressed image segment that is going to be transmitted as it is being compressed (near real time compression), and all information in the file is known with the exception of the total file size and first image segment size (based on contents of the initial file, the lengths of all other data elements are known), only a completed file header will be contained in the "STREAMING_FILE_HEADER File Header, DES" and the file itself may contain other data elements. If the file results from a near real time collection process, it must contain only a single image, and the "STREAMING_FILE_HEADER, DES" will contain a completed file header, first image subheader and associated tag data included in the extension area if required. In either case, the Steaming File Header DES must be the last segment in the file.

5.7 Multiple Image Segment Criteria

5.7.1 For CLEVELS 3 and 5, the IUT interprets files with up to 20 image segments.

5.7.2 For CLEVELS 6 and 7, the IUT interprets files with up to 100 image segments.

5.7.3 For CLEVELS 3 and 5, the IUT does not generate files which have more than 20 image segments.

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5.7.4 For CLEVELS 6 and 7, the IUT does not generate files which have more than 100 image segments. These implementations must be able to create compliant files that are downward compatible (no more than 20 total image segments per file) with lower CLEVELs.

5.7.5 Image segments are properly positioned within the common coordinate system according to the coordinates identified in the image subheaders.

5.7.6 All image segments in a file must conform to the compliance criteria established for image segments in paragraph 5.6.

5.8 Image Compression Criteria, JPEG

All unpack capable implementations must support JPEG decompression using the DCT, Huffman Entropy decoding, with both 8-bit and 12-bit precision modes of operation. Implementations must support the use of restart markers in the compressed data. Similarly, all pack capable implementations with the requirement to support JPEG compression must implement JPEG DCT compression in accordance with the specifications and guidance contained within MIL-STD-188-198A and do so within the bounds of the criteria established for unpacking.

5.8.1 JPEG, Sequential DCT Lossy

5.8.1.1 The IUT supports the Sequential DCT based modes of compression using Huffman Entropy encoding. The image compression field of the image subheader is set to C3 and/or M3 when the image has been compressed using JPEG DCT. The COMRAT field of the image subheader is set to 00.0.

5.8.1.2 The IUT supports eight bit and 12 bit source sample precision for all CLEVELs. When the source sample precision is two through seven bits, the data must be converted to eight bits. If the source sample precision is 9 through 11 or more than 12 bits, the data must be converted to 12 bits-per-pixel for compression. A recommended but not mandatory conversion process is described in paragraph 6.2 of MIL-STD-188-198A.

5.8.1.3 The encoder must generate the full interchange format. Full interchange JPEG format is a data stream containing all the tables, markers and segments necessary to decode and render the compressed image. The use of default or pre-positioned tables to decompress an image is prohibited. Note: This restriction also applies to packing of NITF 2.0 files.

5.8.1.4 For monochrome imagery and color (RGB) imagery compressed as RGB, the quantized DCT coefficient accuracy from the DCT based encoder is within +/- 1 for each coefficient, when compared to reference test data created from a double precision reference encoder. (ISO/IEC 10918-2 Digital Compression and Coding of Continuous-tone Still Images, Part II: Compliance Testing).

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5.8.1.5 Once the criteria in paragraph 5.8.1.4 has been met, RGB color test images transformed into YCbCr color space and JPEG encoded by the IUT must have the same general appearance when decoded and displayed as the test images which were encoded, decoded, and displayed in RGB color space by the IUT.

5.8.1.6 The decoder interprets the full interchange format..

5.8.1.7 The decoder interprets the abbreviated interchange format (legacy NITF 2.0 only).

5.8.1.8 For monochrome and color (RGB) imagery compressed as RGB, the output of the DCT based decoder, when passed through a reference Forward DCT (FDCT) and Quantizer, is accurate to within +/- 1 for each coefficient, when compared to reference test data created from a double precision reference decoder. (ISO Draft CD 10918-2 Digital Compression and Coding of Continuous-tone Still Images, Part II: Compliance Testing).

5.8.1.9 Once the criterion in paragraph 5.8.1.8 has been met, JPEG encoded YCbCr test images decoded and displayed by the IUT must have the same general appearance as the RGB equivalent compressed images when decompressed and displayed in RGB color space by the IUT.

5.8.1.10 The encoder must include the applicable Quantization Tables (Q-Tables) as well as Huffman Tables (H-Tables) in the compressed data stream.

5.8.1.11 The decoder makes use of Q-Tables when included in the JPEG header.

5.8.1.12 The IUT supports recommended Q-Tables, Q1 through Q5, for data type 0 and for future image data types, as tables are approved by the NITFS G/ISMC.

5.8.1.13 The IUT makes use of the Binary Digits (BITS) and Huffman Values (HUFFVALS) tables included in the JPEG header.

5.8.1.14 If the IUT is capable of generating custom BITS and HUFFVALS tables, they are generated in accordance with Appendix C of the JPEG MIL-STD-188-198A.

5.8.1.15 If the Define Q-Table (DQT) marker is present in the compressed data, the table specified by the DQT marker takes precedence over any table specified by the Compression Rate Code (COMRAT) field in the NITF image subheader. Note: This restriction also applies to packing of NITF 2.0 files.

5.8.1.16 If an IUT can generate a custom quantization table, that Q-Table must be structured in accordance with MIL-STD-188-198A.

5.8.1.17 The encoder includes restart marker code(s) in the entropy encoded data stream. The encoder must be able to place at least one restart marker code per

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pixel row. The encoder must place no more restart marker code(s) than one per neighborhood.

5.8.1.18 The entropy decoder must re-synchronize the decompression at the next restart marker when data is corrupted in the entropy encoded stream.

5.8.1.19 JPEG entropy decoders shall be able to decode and display a JPEG compressed image in which no more than 10% of the restart intervals in the compressed data stream contain errors. JPEG entropy decoders shall recognize the following as errors:

1. Restart Marker appearing too early in the data stream.
2. Restart Marker appearing too late in the data stream.
3. Restart Marker missing from the data stream.
4. Unknown Huffman code in the data stream.

5.8.1.20 When the entropy decoder detects any of these errors in the compressed JPEG data stream, the imagery implementation must identify the corrupted data in the decoded image. This can be accomplished by reporting or replacing the corrupted restart interval with a suitable pattern so that when the decoded image is displayed, it is apparent that the compressed data stream had an error. This pattern shall be limited to the Re-Start Marker (RST) Interval(s) in which the error occurred. All RST intervals without errors must be decoded and displayed.

5.8.1.21 The IUT uses default HUFFVALS & BITS tables when not found in the JPEG stream.

5.8.2 JPEG, Sequential DCT Lossy with Post Processing Extensions

5.8.2.1 An unpack implementation may optionally support post-processing of JPEG decompressed pixel data when the IOMAPA tagged record extension is indicated with the image segment. If the implementation supports this option, the criteria of paragraph 5.18.8 IOMAPA apply.

5.8.2.2 A pack implementation may optionally pre-process image pixel data prior to JPEG compression. When doing so, only the processes allowed in the IOMAPA tagged record extension are allowed. The IOMAPA extension must be associated with the image segment and its fields must be populated with the constraints established for the packing of the IOMAPA extension as detailed in para. 5.18.8.

5.8.3 JPEG, Downsampled JPEG

5.8.3.1 Compression. To verify that the IUT properly implements the downsampled phase of the downsample JPEG algorithm, the IUT must implement the JPEG DCT 8-bit per pixel compression in a manner to accept externally, provided Huffman and Quantization tables. JITC will provide these tables during compliance testing.

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Alternately, the IUT must make available a file containing the actual downsampled pixel values before JPEG compression.

5.8.3.1.1 The IUT encoder must limit the use of Downsampled JPEG to monochrome image segments that are single blocked and are no larger than 2048 by 2048 pixels.

5.8.3.1.2 The IUT supports the sync based mode for downsampling.

5.8.3.1.3 The Image Compression (IC) field of the image subheader is set to I1 when the image has been compressed using the Downsampled JPEG compression algorithm.

5.8.3.1.4 The IUT supports 8-bit source sample precision for all CLEVELs and should specifically follow the CLEVEL range specification set by JPEG.

5.8.3.1.5 Downsampling supports anti-aliasing sampling.

5.8.3.1.6 Downsampling only uses sampling ratios that are greater than one.

5.8.3.1.7 Downsampling is performed twice, once for each respective dimension; rows and columns.

5.8.3.1.8 Downsampling clamps to an integer multiple of 8 pixels for both the horizontal and vertical dimensions.

5.8.3.1.9 Downsampling mirrors the edge of the original image before downsampling.

5.8.3.2 De-Compression. To verify that the IUT properly implements the upsample phase of the downsample JPEG algorithm, the IUT must implement the JPEG DCT 8-bit per pixel decompression in the following manner. The IUT must be able to save to an NITF file the output of the JPEG DCT decompressor module, and the output of the upsample algorithm before further processing to either takes place. i.e. remapping by the video driver for display.

5.8.3.2.1 The IUT supports the sync based mode for upsampling.

5.8.3.2.2 The bit depth (bits per pixel) remains the same throughout the process (downsampling->JPEG Compression->JPEG Decompression->upsampling).

5.8.3.2.3 When error(s) in the decompression process occurs in the data stream, the IUT must replace the encoded/decoded image file corrupted data with a pattern so that when the image is displayed it is apparent that the compressed image data had an error. This pattern shall be limited to the upsampled pixels corresponding to the JPEG RST interval(s) in which the error occurred. All RST intervals without errors must be decoded and displayed.

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5.8.3.2.4 Upsampling only uses sampling ratios that are less than one.

5.8.3.2.5 Upsampling is performed twice, once for each respective dimension; rows and column.

5.8.3.2.6 Frequency of the original signal matches the frequency of the upsampled signal.

5.8.3.3 File Compliance.

5.8.3.3.1 Files with Downsampled JPEG compressed image segments and overlay segments must adhere to location, display level and attachment level criteria.

5.8.3.3.2 Pixel locations will be the same before downsampling and after upsampling. (Visually it may appear that there has been some movement due to the JPEG compression/de-compression algorithm's use of neighborhoods).

5.8.3.3.3 IUT supports 8-bit monochrome images without LUT.

5.8.3.3.4 IUT supports downsampling/upsampling of both even and uneven image sizes.

5.8.3.3.5 IUT supports single blocked image segments.

5.8.3.3.6 The COMRAT field of the image subheader is set to 00.0.

5.8.4 JPEG, Lossless

5.8.4.1 The IUT supports the lossless sequential mode of compression and decompression using Huffman Entropy encoding and decoding for 8, 12, 16 and 24-bpp source imagery. The compression field of the image subheader must be set to C5 or M5 when compressing the image using Lossless JPEG DPCM. The COMRAT field of the image subheader must be set to 00.0.

5.8.4.2 The encoder must generate the full interchange JPEG format. The full interchange JPEG format is a data stream containing all the tables, markers and segments necessary to decode and render the compressed image. The use of prepositioned tables needed to decompress an image (abbreviated interchange JPEG format) is prohibited.

5.8.4.3 The decoder interprets the full interchange format.

5.8.4.4 The encoder must include the Huffman Tables (H-Tables) used to compress the image in the JPEG data stream.

5.8.4.5 The decoder must make use of the H-Tables found in the JPEG stream to decompress the entropy data. This includes split and short H- Tables.

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5.8.4.6 Compression Accuracy. Implementations must accurately compress image data into an image segment so that the segment, when decompressed by a trusted lossless JPEG implementation, yields an image array identical to the original uncompressed image data.

5.8.4.7 Decompression Accuracy. Implementations must accurately decompress a lossless encoded JPEG image segment that was produced by a trusted encoder so that the resulting decompressed image array is identical to the original uncompressed image data.

5.8.4.8 If the IUT is capable of generating custom Huffman Tables, they must be generated in accordance with Appendix C of the JPEG MIL-STD-188-198A.

5.8.4.9 The encoder must be able to include restart marker codes in the entropy encoded data stream, at least one marker for every eight rows of image data per frame.

5.8.4.10 The entropy decoder must re-synchronize the decompression at the next restart marker when encountering corrupted data in the entropy encoded stream.

5.8.4.11 JPEG entropy decoders must be able to decode and display a JPEG compressed image in which no more than 10% of the restart intervals in the compressed data stream contain errors. JPEG entropy decoders must be able to recognize the following as errors:

1. Restart Marker appearing too early in the data stream
2. Restart Marker appearing too late in the data stream
3. Restart Marker missing from the data stream
4. Unknown Huffman code in the data steam

When the entropy decoder detects any of the errors in the compressed JPEG data steam, the imagery implementation must identify the corrupted data in the decoded image. The implementation must replace the corrupted restart interval with a suitable pattern so that when displaying the decoded image, the compressed data stream error is apparent. (A 2 by 2, 2 color checker board pattern per JPEG neighborhood is recommended for this replacement pattern.) This pattern must be limited to the Re-Start Marker (RST) interval(s) in which the error(s) occurred. All RST intervals without errors must also be decoded.

5.9 Image Compression Criteria, Bi-Level

5.9.1 The IUT supports Bi-level image compression with IC field value set to C1 or M1 with modes of operation as follows:

1. 1D for One Dimensional Coding (Encode is optional; decode is mandatory).

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2. 2DS for Two Dimensional Coding, Standard Vertical Resolution, K=2 (Encode is optional; decode is mandatory).
3. 2DH for Two Dimensional Coding, High Vertical Resolution, K=4 (Encode is optional; decode is mandatory).

5.9.2 The IUT encoder supports compression of Bi-level images with horizontal scan lines containing up to and including 2560 pixels and containing up to and including 8192 scan lines as constrained by CLEVEL limits.

5.9.3 The IUT decoder supports decompression of Bi-level images with horizontal scan lines containing up to and including 2560 pixels and containing up to and including 8192 scan lines as constrained by CLEVEL limits.

5.9.4 Images compressed by the IUT encoder must compare bit-by-bit with the same images compressed by the test facility's trusted reference encoder.

5.9.5 Images decompressed by the IUT decoder must compare bit-by-bit with the same images decompressed by the test facility's trusted reference decoder.

5.9.6 The IUT must support the use of synchronization and Huffman codes.

5.9.7 Bi-Level compressed images are always a single block; multiple blocks are not allowed with Bi-level compression.

5.9.8 Unpack capable implementations must be able to identify and properly present pad pixels when the pad output pixel code value is identified in mask table records.

5.10 Image Compression Criteria, ARIDPCM

5.10.1 The use of ARIDPCM image compression is limited to NITF 1.1 formatted files. The implementation must preclude the use of ARIDPCM when creating NITF 2.0 and NITF 2.1 formatted files.

5.10.2 The implementation must interpret and render minimum compliant NITF 1.1 files containing imagery that have been compressed using the ARIDPCM algorithm at all allowed rates (4.50, 2.30, 1.40, and 0.75).

5.10.3 The creation of NITF1.1 files is highly discouraged since it will prolong the requirement for systems to continue to read NITF1.1 files in addition to the newer versions. However, those implementations with a valid requirement may optionally pack compliant NITF1.1 files containing imagery compressed at any of the allowed rates of the ARIDPCM algorithm (4.5, 2.3, 1.4, and 0.75). The implementation will be tested for compliance to the ARIDPCM algorithm for all compression rates that the implementation claims to use.

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5.11 Image Compression Criteria, VQ

5.11.1 When the image compression field is set to M4 or C4, the image data of the VQ compressed image segment shall contain a VQ header followed by the compressed image data as specified in MIL-STD-188-199.

5.11.2 The IUT shall support both v x h kernel-by-kernel decompression and individual rows for all v x h kernels stored together such that the image can be decompressed line-by-line.

5.11.3 The first image code in the VQ image segment (following VQ header) shall be used to spatially decompress the v x h indices in the upper left corner of the image. The decompression shall continue from left to right across the columns of the first row of image codes, then down each of the rows of image codes sequentially.

5.11.4 For color images that are compressed, each value in the spatially decompressed image represents an index into the color table output.

5.11.5 VQ implementations within NITFS are limited to 8-bit RGB with LUT, or monochrome without LUT.

5.11.6 The COMRAT field must be present in all NITFS VQ files and must contain a value given in the form n.nn representing the average number of bits-per-pixel for the image after compression. This entry is for informational purposes only and is not necessary for the decompression process.

5.11.7 The IC field shall contain the value C4 if the image is not masked or M4 if the image is masked.

5.11.8 The NITFS VQ image data section shall provide up to 4096 compression codes entries, organized in a 4x4 kernel configuration.

5.11.9 The current implementation of VQ within NITFS uses a single band with an associated LUT, and has an IMODE of B, band interleaved by block.

5.11.9.1. For current VQ NITFS applications, the number of spectral groups is 1.

5.11.9.2. The number of blocks per row and number of blocks per column fields within the NITFS image subheader define the number of image block tables in the spatial data subsection.

5.11.9.3. If the image contains one or more spectral band table(s), the pixels within the image will correspond to a single-value quantity such as a gray scale value or a single entry within a color table.

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5.11.9.4. The image row level of organization in the NITFS image subheader shall correspond to the image row level in the VQ header.

5.11.9.5. The number of bands in the NITFS image subheader shall correspond to the number of bands in the VQ header.

5.11.10 Fields containing identification and origination information, file security information, and the number and size of the data items contained in the NITFS file shall be located in the NITFS file header. Within the image data section, multi-byte fields are written in the "big endian" format.

5.11.11 The VQ header must have the structure identified in MIL-STD-188-199.

5.11.12 The implementation may optionally compress images using VQ, but may only do so within the bounds and constraints established for VQ decompression. Recompression of decompressed VQ images is prohibited; however, a decompressed VQ image may be packed in its uncompressed state (NC or NM) or in its original compressed form (C4 or M4). An extracted portion(s) of a VQ compressed image may be repacked using the original code book and codes from the original coded pixel data.

5.12 Graphic Criteria, CGM Graphics

5.12.1 An implementation must be able to interpret and use an NITF file containing 0-100 CGM graphic segments. For CLEVEL 03, the maximum aggregate size of the graphic segments is one Mbyte (1,048,576 bytes). For CLEVELs 5,6, and 7, the maximum aggregate size of the graphic segments is two Mbytes (2,097,152 bytes). (For NITF2.0, the maximum aggregate size of the graphic segment is one Mbyte.)

5.12.2 If an implementation in its native mode of operation has the capability to generate any type of graphic annotations, it must support the inclusion of CGM graphic segments within NITF files that it creates.

5.12.3 The implementation must preclude the generation of an NITF file containing CGM graphic segments that exceed the maximum interpretation ranges for specific CLEVELs as stated above.

5.12.4 For all CLEVELs, the implementation must be able to interpret and use any CGM graphic segment compliant with MIL-STD-2301A. (MIL-STD-2301 applies for NITF2.0.)

5.12.5 For all CLEVELs, the implementation must not create any CGM graphic segment that is not compliant with MIL-STD-2301A. (MIL-STD-2301 applies for NITF2.0.)

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5.13 Text Criteria

5.13.1 STA. The implementation must unpack and display text data in all text segments marked with the text format code for standard ASCII (STA).

For text segments formatted as STA:

1. Contents are composed of none other than the following BCS characters: Line Feed (0x0A), Form Feed (0x0C), Carriage Return (0x0D), and space (0x20) through tilde (0x7E).
2. All lines are separated by carriage return/line feed (CR/LF) pairs, where the first character of the next line (if present) immediately follows the line feed character.
3. Text data is presented as a contiguous file, with each permitted BCS character immediately following the other.
4. Text data begins with the first, or left-most character of the text, followed by subsequent characters, as read from left to right.
5. No field delimiters or special characters are used to designate the end of the text data.

If more than one text segment is included in the NITF file, the last character of the first segment is followed by the first character of the next segment's subheader.

5.13.2 The implementation must unpack and display text data in all text segments marked with the text format code for Universal Multiple Character Set (UCS) Transformation Format 1 (UT1) (single octet).

For text segments formatted as UT1:

1. Contents are composed of none other than the following characters: Line Feed (0x0A), Form Feed (0x0C), Carriage Return (0x0D), and space (0x20) through tilde (0x7E) and No break space (0xA0) through small "y" with diaeresis (0xFF).
2. All lines are separated by carriage return/line feed (CR/LF) pairs, where the first character of the next line (if present) immediately follows the line feed character.
3. Text data is presented as a contiguous file, with each permitted character immediately following the other.
4. Text data begins with the first, or left-most character of the text, followed by subsequent characters, as read from left to right.
5. No field delimiters or special characters are used to designate the end of the text data.
6. If more than one text segment is included in the NITF file, the last character of the first segment is followed by the first character of the next segment's subheader.

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5.13.3 MTF. For text segments identified by the text format code for Message Text Format (MTF), the implementation must be able to unpack and display the text data. The implementation may optionally pass the text data to an MTF capable application for further processing in accordance with Mil-Std-6040.

For proper display of text files formatted as MTF:

1. Contents are composed of none other than the following characters: Line Feed (0x0A), Form Feed (0x0C) and space (0x20) through tilde (0x7E).
2. Line endings are identified by either a sixty nine character count or the use of double solious (0x2F), (// (end of set marker) may identifying CR/LF) , where the first character of the next line (if present) immediately follows the line feed character.
3. Text data is presented as a contiguous file, with each permitted character immediately following the other.
4. Text data begins with the first, or left-most character of the text, followed by subsequent characters, as read from left to right.
5. No field delimiters or special characters are used to designate the end of the text data, however, the // end of set marker is always present at the end of the text data.
6. If more than one text segment is included in the NITF file, the last character of the first segment is followed by the first character of the next segment's subheader

5.13.4 Other. For text files associated with any text format code other than STA, UT1, or MTF (e.g. UC2), the NITF implementation must not be adversely affected when attempting to display the text data field.**5.13.5** An implementation must be able to interpret a file containing 0-32 text segments. The maximum size of the text portion in any text segment must not exceed 99,999 characters.

5.13.6 Pack. Implementations that support the packing of text segments must do so within the criteria established for unpacking.

5.14 Data Extension Segment Criteria

5.14.1 DES Pack

Files packed by NITF compliant implementations that do not use DESs must fill the Number of Data Extension Segments (NUMDES) field with "000". Implementations that require the insertion of DESs shall fill the NUMDES field, Length of Nth DES Subheader (LDSHnnn) field, and the Length of Nth DES Reserved field (LDnnn) with the associated values determined by the length of the DES. Implementations that are required to pack NITF files with DESs shall be tested for the proper generation of the associated data defined by the DES. Only G/ISMC approved DESs are allowed as shown in the DES portion of the NITFS Tagged Extension Registry.

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5.14.2 DES Unpack

5.14.2.1 All unpack capable implementations must be able to interpret NITF files containing the STREAMING_FILE_HEADER DES.

5.14.2.2 Upon unpack of a file where the NUMDES field contains a count other than "000", and the DES is unknown, the implementation must at least properly interpret the other legal components of the file. Implementations that require the use of DES shall be tested for the interpretation of the associated data defined by the DES. The structure and identifier for all allowed DESs is controlled by the G/ISMC.

5.14.3 Tagged Record Extension Overflow (TRE_OVERFLOW)

5.14.3.1 Pack. When tagged record extensions overflow the file header or any segment subheader user defined or extension area, the NITF compliant implementation must make use of the TRE_OVERFLOW DES. Implementations that require the use of TRE_OVERFLOW DESs shall fill the NUMDES field, Length of Nth DES Subheader (LDSHnnn) field, and Length of Nth DES Data field (LDnnn) with the associated values determined by the length of the respective DESs. Implementations that require the use of DESs shall be tested for the generation of the associated data defined by the DES. All overflow tags within the DES shall be registered with the NITFS G/ISMC.

5.14.3.2 Unpack. Upon receipt of a file with TRE_OVERFLOW DESs, the implementation must at least otherwise properly interpret the other legal components of the file. Implementations that require the use of tagged record extensions shall be tested for the interpretation of the associated data when placed in the DES.

5.14.4 STREAMING_FILE_HEADER DES

5.14.4.1 Pack NITF 2.1. When using the STREAMING_FILE_HEADER DES, the NUMDES will be “001,” the DESTAG Unique DES Type Identifier will be STREAMING_FILE_HEADER, and DESVER Version of the data field definition will be 01. The values populated in the length fields in the file header and first image subheader have no meaning, but must be within the allowable ranges specified by the standard. For consistency among applications, it is required that the length fields of the file header be populated with the maximum allowed value (for example, the File Length field would be populated with 999999999999) when valid data is not available as the file is being packed. Files using this DES must contain at least one image segment. The field values in the STREAMING_FILE_HEADER DES are subject to the same compliance constraints as if located in the main file header/first image subheader and shall not extend beyond what is to be replaced in the main file header or by both the file header and first image subheader. The structure of the STREAMING_FILE_HEADER and main file header/first image header must be

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aligned, field by field, byte by byte, with the exception of tag data that may not be known until the image is either collected or compressed. The CLEVEL fielded in the file header of STREAMING_FILE_HEADER will be marked with the CLEVEL in accordance with CLEVEL 3-7 constraints. The reserved segment data for the STREAMING_FILE_HEADER will be as follows:

Table 5-2. STREAMING_FILE_HEADER Data Extension Segment Data

CFHD1-L	Length of Corrected File Header Data (CFHD) 1	7	0000404-9999998	R
CFHD-DELIM1	CFHD Unique Delimiter 1	4	0x0A6E1D97	R
CFHD-RD	CFHD Replacement Data	**		R
CFHD-DELIM2	CFHD Unique Delimiter 2	4	0x0ECA14BF	R
CFHD2-L	Length of CFHD 2	7	0000404-9999999	R

**unknown size (variable)

5.14.4.2 Unpack NITF 2.1. Unpack implementations must be able to interpret the file to the same degree as if the file header was properly populated with the information contained in the "DES" DES. The designated field values in the DES take priority over the same fields as in the main file header and the first image subheader if included. An implementation may repack the file to replace the headers with the contents of the "STREAMING_FILE_HEADER" DES. Implementations must verify file compliance ensuring the file is marked at the lowest CLEVEL needed to properly interpret the file when repacking. The "STREAMING_FILE_HEADER" DES will be removed if the file is repacked. When modifying the file for any reason, the implementation may not re-pack the file using the "STREAMING_FILE_HEADER" DES.

5.14.4.3 Pack NITF 2.0. Pack implementations that supports the generation of the STREAMING_FILE_HEADER must meet the same test criteria as specified for NITF 2.1 packers, but must always set the Compliance Level (CLEVEL) value to 07.

5.14.4.4 Unpack NITF 2.0

5.14.4.4.1 Upon receipt of a CLEVEL file, implementations that do not support the STREAMING_FILE_HEADER alert the operator that the file being received is not supported.

5.14.4.4.2 Implementations that support the STREAMING_FILE_HEADER will meet the same test criteria as specified for NITF 2.1.

5.15 Reserved Extension Segment (RES) Criteria

5.15.1 Registered RESs

5.15.1.1 Only G/ISMC approved RESs are allowed as shown in the RES portion of the NITFS Tagged Extension Registry.

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5.15.1.2 Upon receipt of a file where the NUMRES field contains a count other than "000," and the RES is unknown, the implementation must otherwise properly interpret the other legal components of the file.

5.15.2 DIGITAL SIGNATURE RES (TBD006)

5.16 Overlay and Display Level Criteria

5.16.1 The IUT must support non-destructive overlays. Overlays must not be merged with other displayable segments in a way that precludes them from being separated from it.

5.16.2 The IUT must render overlays in the order indicated by their display level, not by their relative position within the NITF structure.

5.16.3 The non-transparent pixel value of a higher numbered display level replaces the values of lower numbered display levels when rendered.

5.16.4 Overlays must be positioned at the correct row and column in the common coordinate system relative to the origin of the segment to which they are attached.

5.16.5 All display level values within a file are unique.

5.17 Attachment Level Criteria

5.17.1 The image or graphic segment in the file having the lowest numerical display level must have attachment level zero.

5.17.2 IUTs capable of packing overlay segments within a file must at least support packing the segments using attachment level 000. Segments may have attachment levels of 000 or greater. Unpack capable IUTs must support attachment levels over the range of 000 - 998.

5.17.3 The attachment level of a segment must be equal to the display level of the segment to which it is attached, or it must be set to 000 (unattached).

5.17.4 The display level of a segment must always be numerically greater than its attachment level.

5.17.5 The IUT must properly display and position all segments based on the specified row and column offset from the segment's origin point to which it is attached.

5.17.6 As an option, the IUT may use the parent-child relationship among its attached segments so that the elements may be treated together as a group for certain operations such as, moving, rotating, and displaying. The IUT will be tested for each operation it supports that makes use of the attachment levels.

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5.18 Tagged Record Extensions Criteria

The following criteria pertain to all implementations of the NITFS.

1. Upon receipt of a file which contains information in tagged record extensions, the implementation must at least properly interpret the other legal components of the file
2. Only those tagged record extensions registered with the G/ISMC may be used
3. Each tagged record extension consists of three required fields: TRETAG, (6 byte unique extension identifier), TREL (length of extension in bytes), and TREDATA (data according to the specification of the extension)
4. A sequence of tagged record extensions can appear in the User Defined Header Data (UDHD) and/or Extended Header field of the NITF file header or any segment subheader User Defined Data field and/or Extended Subheader data field. For NITF, 2.0 additional restrictions for placement of TREs applies. Controlled extension may appear in the Extended Header Data field of the NITF file header or in the Extended Sub-header Date field for any standard data type data item in the file.
5. A sequence of tagged record extensions can also appear in a TRE_OVERFLOW DES. This condition will be identified by the three byte numeric overflow field of the UDHD, XHD, UDID, IXSHD, SXSHD, or TXSHD field containing the sequence number of the DES into which the tags are placed. For NITF 2.0, Controlled extensions may appear in Controlled Extension DES. Registered extensions may appear in a Registered Extension DES.
6. When the tagged record extension carries data that is associated with the file as a whole, it must appear in the file header. If the extension carries data associated with a segment in the file, it must appear in the subheader of that segment or an associated TRE_OVERFLOW DES.
7. A tagged record extension must be included in its entirety within the specific header or subheader field selected to contain it, or it must be placed in its entirety in an overflow DES.
8. All information, including numbers, contained in TREs must be given in the printable ASCII character set [space (32) through tilde (126)] with eight bits (one byte per character).
9. All data in fields designated as alphanumeric (BCS-A) must be left justified and padded with spaces as necessary to fill the field.
10. All data in numeric (BCS-N) fields must be right justified and padded with leading zeroes as necessary to fill the field.
11. All required fields must be present and must contain valid data as defined in the NITFS TRE documents.

5.18.1 National Support Data Extensions (NATSDE) (TBD011)

5.18.2 Profile for Imagery Archive Extensions (PIAE)

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The following criteria pertain to those implementations which support the creation and use of PIAEs. Refer to the NITFS PIAE, Version 2, for additional information. Production sources that produce NITFS files with PIAEs must create these files in compliance with the NITFS, NITFS PIAEs, and the SPIA. (E001, PIAE version 3 effectivity).

5.18.2.1 When used, PIAE tags shall appear in the following extended data fields or the TRE_OVERFLOW DES if overflowed:

1. PIAPR tag: XHD of file header; one per file
2. PIAIM tag: IXSHD of image subheader; one per each image in the file
3. PIATG tag: IXSHD of image subheader, SXSHD of graphic subheader, TXSHD of text subheader; up to 250 per file
4. PIAPE tag: IXSHD of image subheader, SXSHD of graphic subheader, TXSHD of text subheader; up to 250 per file
5. PIAEV tag: IXSHD of image subheader, SXSHD of graphic subheader, TXSHD of text subheader; up to 250 per file
6. PIAEQ tag: IXSHD of image subheader, SXSHD of graphic subheader, LXSHD of label subheader, TXSHD of text subheader; up to 250 per file
7. Any implementation modifying an NITF file will ensure that the FDT field has been updated
8. As a minimum, systems submitting NITF files to an archive must include a PIAPR tag and a PIAIM tag for each image in the file they create for submission

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5.18.2.2 Receiving Archives:

Must review NITF files to ensure they are in compliance with NITFS and PIAE documentation. This will include:

1. Checking NITF header and subheader data
2. Checking PIAE tag data
3. Identifying missing tags
4. When problems with incoming NITF files are identified, the file will be queued for operator review and action
5. Must archive submitted files that have no format problems without operator interface
6. Must apply a unique ACCESSID to newly submitted files containing an existing PIAPR tag when the file is new to the archive
7. Must insert a PIAPR tag if the submitted file is new to the archive and contains no PIAE tags. All required fields will be filled out and an ACCESSID will be assigned

5.18.2.3 Disseminating Archives:

1. Must ensure that non-NITF formatted files converted to NITF format are in compliance with all applicable NITFS and PIAE requirements
2. Must ensure NITFS compliance is maintained on output files resulting from data manipulation actions such as pixel subsampling, chipping, decompressing, compressing, etc.
3. Must ensure that files, originally archived as NITF files, have preserved the original data integrity of its segments and support data

NOTE: A determination to implement GeoSDEs within NITF 2.1 has not yet been made. The candidate test criteria that follow in this paragraph are still under development and have not been validated. The candidate test criteria are subject to significant change and are provided for informational purposes only. Beneficial review and comment on these proposed criteria are welcome. Direct all comments the JITC.

5.18.3 Airborne Synthetic Aperture Radar (SAR) SDEs (TBD007)

The following criteria pertain to those implementations which support the creation and use of Airborne Synthetic Aperture Radar (SAR) SDEs. Refer to the NITFS Airborne SAR SDE, RASG-9606-001 document, for additional information. Production sources that produce NITFS files with Airborne SAR SDEs must create these files in compliance with the NITFS, NITFS Airborne SAR and the SDE document.

5.18.3.1 When used, Airborne SAR tags shall appear in the following user defined or extended data fields or the TRE_OVERFLOW DES if overflowed:

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1. AIMIDA tag: UDID or IXSHD of the image header; one per each image in the file
2. EXPLTA tag: UDID or IXSHD of the image header; one per each image in the file.
3. BLOCKA tag: UDID or IXSHD of image subheader; one per each image in the file
4. SECTGA tag: UDID or IXSHD of the image subheader; up to 10 per NITF file
5. MPDSRA tag: UDID or IXSHD of image subheader, one per each image in the file
6. MENSRA tag: UDID or IXSHD of image subheader, one per each image in the file
7. ACFTA tag: UDID or IXSHD of image subheader, one per each image in the file
8. PATCHA tag: UDID or IXSHD of an image subheader, each patch of the scene may; be treated as an independent image and placed into a separate file, of the multiple patches (up to 999) of a scene may all be placed into a single file. There will always be 1 patch per file in spot mode
9. MTIRPA tag: UDID or IXSHD of the image subheader, 11 per NITF file.

5.18.4 Visible, Infrared, Multi-Spectral Airborne SDE (VIMAS) (TBD008)

5.18.5 Geospatial Support Data Extensions (GeoSDE) (TBD009)

The following criteria apply to those implementations which support files containing Geospatial Support Data Extensions.

5.18.5.1 Pack criteria for GeoSDE Implementations

5.18.5.1.1 Implementations that produce files with GeoSDEs must pack these files in compliance with the NITFS and DIGEST 2.0. Table 5-3 identifies the criteria for determining the specific GeoSDE controlled extensions applicable to an image segment of a given category and representation. All criteria identified under the Criteria Sets must be met in order to identify the applicable set of controlled extensions to be used.

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Table 5-3. Criteria that determine the GeoSDE's that accompany a file

<table>
<tr><th colspan="3">Criteria, Categories and Representations Applicable for Raster Map, Elevation, Image, and Matrix Data</th><th colspan="3">Required Controlled Extensions to be included in the NITF Image Subheader</th></tr>
<tr><th>CRITERIA SET A1
(Raster Maps & Elevation Data)</th><th>ICAT</th><th>IREP</th><th>ACCURACY</th><th>LOCATION</th><th>SOURCE</th></tr>
<tr><td rowspan="2">1. Horizontal and Vertical Accuracy are consistent across a region
2. The raster is rectified consistently with geographic (lat/long) coordinated systems</td><td>MAP</td><td>MONO
RGB
RGB/LUT</td><td>ACCPO</td><td>GEOPS
GEOLO</td><td>SOURC</td></tr>
<tr><td>DTEM</td><td>NODISPLY</td><td>ACCPO</td><td>GEOPS
GEOLO</td><td>SOURC</td></tr>
<tr><th>CRITERIA SET A2
(Raster Maps & Elevation Data)</th><th>ICAT</th><th>IREP</th><th>ACCURACY</th><th>LOCATION</th><th>SOURCE</th></tr>
<tr><td rowspan="2">1. Horizontal and Vertical Accuracy are consistent across a region
2. The raster is rectified consistently with cartographic (E,N) coordinate systems</td><td>MAP</td><td>MONO
RGB
RGB/LUT</td><td>ACCPO</td><td>GEOPS
MAPLO</td><td>SOURC</td></tr>
<tr><td>DTEM</td><td>NODISPLY</td><td>ACCPO</td><td>GEOPS
MAPLO</td><td>SOURC</td></tr>
<tr><th>CRITERIA SET A3
(Raster Maps & Elevation Data)</th><th>ICAT</th><th>IREP</th><th>ACCURACY</th><th>LOCATION</th><th>SOURCE</th></tr>
<tr><td rowspan="2">1. Horizontal and Vertical Accuracy are consistent across a region
2. The raster is non-rectified and positioned using a location grid
3. Registration points are provided in either geographic or cartographic systems</td><td>MAP</td><td>MONO
RGB
RGB/LUT</td><td>ACCPO</td><td>GEOPS
GRDPS
REGPT</td><td>SOURC</td></tr>
<tr><td>DTEM</td><td>NODISPLY</td><td>ACCPO</td><td>GEOPS
GRDPS
REGPT</td><td>SOURC</td></tr>
<tr><th>CRITERIA SET A4
(Raster Maps & Elevation Data)</th><th>ICAT</th><th>IREP</th><th>ACCURACY</th><th>LOCATION</th><th>SOURCE</th></tr>
<tr><td rowspan="2">1. Horizontal accuracy for when vertical accuracy varies across the region for which horizontal accuracy is constant
2. Vertical accuracy when the horizontal accuracy varies across the region for which vertical is constant
3. The raster is rectified consistently with cartographic (E,N) coordinate systems</td><td>MAP</td><td>MONO
RGB
RGB/LUT</td><td>ACCHZ
and
ACCVT</td><td>GEOPS
MAPLO</td><td>SOURC</td></tr>
<tr><td>DTEM</td><td>NODISPLY</td><td>ACCHZ
and
ACCVT</td><td>GEOPS
MAPLO</td><td>SOURC</td></tr>
</table>

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Table 5-3. Criteria that determine the GeoSDE's that accompany a file (continued)

Criteria, Categories and Representations Applicable for Raster Map, Elevation, Image, and Matrix Data			Required Controlled Extensions to be included in the NITF Image Subheader		
CRITERIA SET A5 (Raster Maps & Elevation Data)	**ICAT**	**IREP**	**ACCURACY**	**LOCATION**	**SOURCE**
1. Horizontal accuracy for when vertical accuracy varies across the region for which horizontal accuracy is constant 2. Vertical accuracy when the horizontal accuracy varies across the region for which vertical is constant 3. The raster is non-rectified and positioned using a location grid 4. Registration points are provided in either geographic or cartographic systems	MAP	MONO RGB RGB/LUT	ACCHZ and ACCVT	GEOPS GRDPS REGPT	SOURC
	DTEM	NODISPLY	ACCHZ and ACCVT	GEOPS GRDPS REGPT	SOURC
CRITERIA SET B1 (Image Data)	**ICAT**	**IREP**	**ACCURACY**	**LOCATION**	**SOURCE**
1. Horizontal accuracy for when vertical accuracy varies across the region for which horizontal accuracy is constant 2. The image is rectified consistently with geographic (lat/long) coordinate systems	VIS, SL, FL, RD, HR, HS, CP, SAR, IR, MS	MONO RGB RGB/LUT MULTI	ACCHZ	GEOPS GEOLO	SNSPS
CRITERIA SET B2 (Image Data)	**ICAT**	**IREP**	**ACCURACY**	**LOCATION**	**SOURCE**
1. Horizontal accuracy for when vertical accuracy varies across the region for which horizontal accuracy is constant 2. The image is rectified consistently with cartographic (E,N) coordinate systems	VIS, SL, FL, RD, HR, HS, CP,,SA R, IR, MS	MONO RGB RGB/LUT MULTI	ACCHZ	GEOPS MAPLO	SNSPS

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Table 5-3. Criteria that determine the GeoSDE's that accompany a file (continued)

Criteria, Categories and Representations Applicable for Raster Map, Elevation, Image, and Matrix Data			**Required Controlled Extensions to be included in the NITF Image Subheader**		
CRITERIA SET B3 (Image Data)	**ICAT**	**IREP**	**ACCURACY**	**LOCATION**	**SOURCE**
1. Horizontal accuracy for when vertical accuracy varies across the region for which horizontal accuracy is constant 2. The image is non-rectified and positioned using a location grid 3. Registration points are provided in either geographic or cartographic systems	VIS, SL, FL, RD, HR, HS, CP,,SA R, IR, MS	MONO RGB RGB/LUT MULTI	ACCHZ	GEOPS GRDPS REGPT	SNSPS
CRITERIA SET C (Matrix Data)	**ICAT**	**IREP**	**ACCURACY**	**LOCATION**	**SOURCE**
The criteria for A1 thru A5 apply to other matrix data. At this point, definition of types of matrix data and applicable subcategories for matrix data is lacking. Test criteria for this category will be developed as the sub-category information is defined.	MATR	NODISPLY	TBD009	TBD009	TBD009

5.18.6.1.2 Table 5-3a identifies auxiliary data and the related GeoSDE. An image segment containing raster map, elevation, image, or matrix data may be associated with one or more image segments in the file containing auxiliary data. Auxiliary data may consist of the legend (LEG), the colour-patch of a map (PAT), or a location grid (LOCG). The associated image segments contain no GeoSDEs themselves, but rather refer to the information in the associated image segment's GeoSDEs (for example, the coordinates of a location grid are expressed in the absolute reference system defined by the GEOPS SDE of the image segment to which it is associated).

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Table 5-3a Auxiliary Data

Auxiliary Data	ICAT	IREP	Related Extension	Comment
Legend	LEG	MONO RGB RGB/LUT	SOURC	TBD009
Colour-Patch	PAT	MONO RGB RGB/LUT	SOURC	TBD009
Location Grid (Cartographic)	LOCG	NODISPLY	GRDPS	ISUBCAT! = CGX ISUBCAT2 = CGY
Location Grid (Geodedic)	LOCG	NODISPLY	GRDPS	ISUBCAT1 = GGX ISUBCAT2 = GGY

5.18.5.2 Unpack criteria for GeoSDE Implementations

The following are the unpack criteria for the GeoSDE extensions when they appear in the file.

5.18.5.2.1 ACCPO Extension Criteria. The implementation must process all required fields in the ACCPO extension that contain valid data as defined in DIGEST 2.0.

5.18.5.2.1.1 The implementation must interpret the number of positional accuracy sets within a given file and allow the user to access and exploit the information contained in each accuracy set.

5.18.5.2.1.2 The implementation must correctly interpret and exploit the following information to the precision defined in the extension:

- Absolute Horizontal Accuracy
- Absolute Vertical Accuracy
- Relative Horizontal Accuracy
- Relative Vertical Accuracy

5.18.5.2.1.3 The implementation must not display or mensurate using precision values greater than those provided in the ACCPO extension.

5.18.5.2.1.4 The implementation must correctly display the units of measure for the different accuracy values as defined by the ACCPO extension.

5.18.5.2.1.5 The implementation must recognize and correctly associate accuracy information, both horizontal and vertical, as defined by the NOO-COO and LON and LAT coordinate pairs for up to 20 accuracy sets.

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5.18.5.2.1.6 The implementation must allow the user to display and/or exploit the positional accuracy data if , and only if, that information is contained in the extension.

5.18.5.2.2 GEOPS Extension Criteria. The implementation must process all required fields in the GEOPS extension that contain valid data as defined in DIGEST 2.0.

5.18.5.2.2.1 The implementation must process the information contained in the required name fields and present the user, upon request, with the:

- Coordinate System Type
- Ellipsoid Name
- Vertical Datum Name
- Geodetic Datum Name
- Cartographic Grid Code
- Grid Description
- Grid Zone Number
- Projection Name

5.18.5.2.2.2 The implementation must exploit the coded values, if the name field is null, for the:

- Ellipsoid
- Vertical Datum
- Geodetic Datum
- Projection

This information must be presented to the user upon request.

5.18.5.2.2.3 For each projection parameter, the implementation will define what the parameter is, using DIGEST 2.0, Part 3, and the false Easting and Northing of that parameter.

5.18.5.2.2.4 The implementation must display the units of measure for the coordinates in the data set.

5.18.5.2.3 GEOLO Extension Criteria. The implementation must process all required fields in the GEOLO extension that contain valid data as defined in DIGEST 2.0, Annex D.

5.18.5.2.3.1 The implementation must exploit the GEOLO extension for all image, raster or matrix data rectified consistently with geographic coordinate systems.

5.18.5.2.3.2 TBD009

5.18.5.2.3.3 The implementation must allow the user to access and exploit the Reference Origin information contained in the GEOLO Extension.

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5.18.5.2.3.4 The implementation must return a coordinate pair for any pixel in the image. The precision with which the coordinate pair is returned must not exceed that of the extension itself.

5.18.5.2.4 MAPLO Extension Criteria. The implementation must process all required fields in the MAPLO extension that contain valid data as defined in DIGEST 2.0.

5.18.5.2.4.1 The implementation must exploit the MAPLO extension for all image, raster or matrix data rectified consistently with cartographic coordinate systems.

5.18.5.2.4.2 The implementation must allow the user to access and exploit the Data Density for the E-W and N-S direction.

5.18.5.2.4.3 The implementation must denote the units of measurement for the Data Density.

5.18.5.2.4.4 The implementation must allow the user to access and exploit the Easting and Northing of the Reference Origin.

5.18.5.2.4.5 The implementation must return a coordinate pair for any pixel in the image. The precision with which the coordinate pair is returned must not exceed that of the extension itself.

5.18.5.2.5 SOURC Extension Criteria. The implementation must process all required fields in the SOURC extension that contain valid data as defined in DIGEST 2.0.

5.18.5.2.5.1 The implementation must identify and allow the user access to the Number of Source Descriptions.

5.18.5.2.5.2 The implementation must, for each source:

- Identify and allow the user access to the Image ID
- Identify and allow the user access to the number of Legend Images
- Identify and allow the user access to the number of insets
- Identify and allow the user access to the Series Designator
- Identify and allow the user access to the Source Edition Number
- Identify and allow the user access to the full name of the Source Document

5.18.5.2.5.3 Additional TBD009

5.18.5.2.6 GRDPS Extension Criteria. The implementation must process all required fields in the GRDPS extension that contain valid data as defined in DIGEST 2.0.

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5.18.5.2.6.1 The implementation must allow the user to process the information contained in the NUMGRDS field and make the information available to the user for processing.

5.18.5.2.6.2 For each location grid the implementation will:

- Define the elevation of the location grid in meters
- Identify the correct Grid Image file and allow the user to read in the image file and have it available for processing
- Identify the ratio of image pixels to grid elements for each column
- Identify the ratio of image pixels to grid elements for each row
- Identify the column and row number of the origin of the location grid
- Identify the number of rows and columns in the location grid
- Allow the user to exploit all of the information contained in the extension.

5.18.5.2.6.3 The implementation must allow the user to exploit all of the information in the extension (what is mandatory and what is optional as far as functionality required?).

5.18.5.2.6.4 The implementation must allow the user to derive the geographic location of each pixel in the Grid Image.

5.18.5.2.6.5 The implementation must notify the user of the density of the Grid Image File.

5.18.5.2.6.6 The implementation must allow the user to "thin" the density of the Grid Image File.

5.18.5.2.7 REGPT Extension Criteria. The implementation must process all required fields in the REGPT extension that contain valid data as defined in DIGEST 2.0.

5.18.5.2.7.1 The implementation must inform the user of the number of registration points available.

5.18.5.2.7.2 For each registration point present, the implementation must:

- Provide a point identification number
- Provide the Lat/Long or Easting/Northing of the Registration Point
- Provide the elevation of the Registration Point
- Provide the row and column number of the Registration Point
- Provide the Local Z coordinate of the Registration Point

5.18.5.2.7.3 The implementation must allow the user to exploit the Registration Points in order to adjust the overall image and improve accuracy of the data.

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5.18.5.2.8 ACCHZ Extension Criteria. The implementation must process all required fields in the ACCHZ extension that contain valid data as defined in DIGEST 2.0.

5.18.5.2.8.1 The implementation must interpret the number of horizontal accuracy sets within a given “frame file” and allow the user to access and exploit the information contained in each accuracy set.

5.18.5.2.8.2 The implementation must correctly interpret and exploit:

- Absolute Horizontal Accuracy
- Relative Horizontal Accuracy

5.18.5.2.8.3 The implementation must correctly display the units of measure for the different accuracy values as defined by the ACCHZ extension.

5.18.5.2.8.4 The implementation must recognize and correctly associate accuracy information as defined by the NOO-COO and LON and LAT coordinate pairs for up to 20 accuracy sets.

5.18.5.2.8.5 The implementation must allow the user to display and/or exploit the horizontal accuracy data if , and only if, that information is contained in the extension.

5.18.5.2.8.6 The implementation must display the horizontal accuracy values only to the precision to which it is defined by the extension.

5.18.5.2.9 ACCVT Extension Criteria. The implementation must process all required fields in the ACCVT extension that contain valid data as defined in DIGEST 2.0.

5.18.5.2.9.1 The implementation must interpret the number of vertical accuracy sets within a given “frame file” and allow the user to access and exploit the information contained in each accuracy set.

5.18.5.2.9.2 The implementation must correctly interpret and exploit:

- Absolute Vertical Accuracy
- Relative Vertical Accuracy

5.18.5.2.9.3 The implementation must correctly display the units of measure for the different accuracy values as defined by the ACCVT extension.

5.18.5.2.9.4 The implementation must recognize and correctly associate accuracy information as defined by the NOO-COO and LON and LAT coordinate pairs for up to 20 accuracy sets.

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5.18.5.2.9.5 The implementation must allow the user to display and/or exploit the vertical accuracy data if , and only if, that information is contained in the extension.

5.18.5.2.9.6 The implementation must display the vertical accuracy values only to the precision to which it is defined by the extension.

5.18.5.2.10 SNSPS Extension Criteria. The implementation must process all required fields in the SNSPS extension that contain valid data as defined in DIGEST 2.0.

5.18.5.2.10.1 TBD009

5.18.6 Raster Product Format (RPF) Extensions (TBD012)

5.18.7 Digital Point Positioning Data Base (DPPDB) Extensions (TBD013)

5.18.8 IOMAPA

5.18.8.1 To verify that the implementation properly interprets and implements the IOMAPA post processing tag data the implementation must be able to save, to an NITF file, the output of the extended sequential JPEG DCT module, and the output of the post processing module before further processing takes place. i.e. Remapping by the video driver for display. Test personnel will pass the output of the DCT module through a trusted post processing routine and compare its output to that of the IUT's post processing module. The two outputs shall be identical for IOMAPA method 0 and 1, and within + for each pixel value for IOMAPA 2 and 3.

The following criteria apply to those implementations with requirements to pack or interpret the IOMAPA tag data extension.

5.18.8.2 Pack criteria for IOMAPA

- Implementations creating NITF files, with the IOMAPA extension, must only do so in conjunction with 12 bit/pixel extended sequential JPEG DCT compression
- Implementation creating an NITF image segment, with an IOMAPA extension, must include the NITF APP6/0001 Block Minimum Value application data segment in the JPEG stream of that image segment
- Implementations may optionally pack any of the four types of IOMAPA extensions

5.18.8.3 Unpack criteria for IOMAPA

- Implementations must be able to correctly use the included IOMAPA extension values to post process a decompressed extended sequential JPEG stream, when the IOMAPA extension is associated with that extended sequential JPEG stream. (i.e. same image segment)

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- Implementations must be able to interpret and use all four variations of the IOMAPA extension

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5.18.9 HISTOA (TBD014)

5.19 NITF 2.0 Criteria

5.19.1 CLEVELS 1 through 6 JIEO Circular 9008 dated 30 June 93 (with errata sheet dated 20 June 97) defines the NITF 2.0 criteria for digital imagery products. The following table provides a summary of NITF 2.0 compliance test criteria. Appendix K contains the file format constraints for NITF 2.0 compliance.

Table 5-4. NITFS 2.0 Compliance Criteria Summary

Compliance Level	* 1	2	3	4	5	6
Common Coordinate System Size (Pixels)	0064-1024 V X 0064-1024 H	0064-1024 V X 0064-1024 H	0064-2048 V X 0064-2048 H	0064-4096 V X 0064-4096 H	0064-8192 V X 0064-8192 H	0064-65536 V X 0064-65536 H
Image Blocking	Single	Single	Single and Multiple 32^2, 64^2, 128^2, 256^2, 512^2, 1024^2	Single and Multiple 32^2, 64^2, 128^2, 256^2, 512^2, 1024^2	Single and Multiple 32^2, 64^2, 128^2, 256^2, 512^2, 1024^2	Multiple 32^2, 64^2, 128^2, 256^2, 512^2,1024^2
Monochrome (uncomp)	8 Bits\Pixel With & w/o LUT IMODE = B	8 Bits\Pixel With & w/o LUT IMODE = B	8 Bits\Pixel With & w/o LUT IMODE = B	8 & 16 Bits\Pixel With & w/o LUT IMODE = B	8 & 16 Bits\Pixel With & w/o LUT IMODE = B	8 & 16 Bits\Pixel With & w/o LUT IMODE = B
JPEG (mono)	8 Bit sample IMODE B	8 Bit sample IMODE B	8 Bit sample IMODE B	8 & 12 Bit sample IMODE B	8 & 12 Bit sample IMODE B	8 & 12 Bit sample IMODE B
Color 8 Bit (RGB/LUT) No Compression	No	Single Band W/LUT IMODE=B	Single Band W/LUT IMODE=B	Single Band W/LUT IMODE=B	Single Band W/LUT IMODE=B	Single Band W/LUT IMODE=B
Color 24 Bit (RGB) uncomp	No	Three Bands No LUT IMODE=B,P	Three Bands No LUT IMODE=B,P,S	Three Bands No LUT IMODE=B,P,S	Three Bands No LUT IMODE=B,P,S	Three Bands No LUT IMODE=B,P,S
JPEG (color RGB)	No	8 Bit Sample IMODE=P	8 Bit Sample IMODE=P	8 Bit Sample IMODE=P	8 Bit Sample IMODE=P	8 Bit Sample IMODE=P
JPEG (YCbCr)	No	8 Bit Sample IMODE=P	8 Bit Sample IMODE=P	8 Bit Sample IMODE=P	8 Bit Sample IMODE=P	8 Bit Sample IMODE=P

* 01 File < 1,213,000 bytes so that it fits on a 3.5" or 5.25" floppy disk.

Note: This table only provides an overview summary of certification criteria. Proper interpretation of the table is specified in the text of this chapter. CLEVEL "99" is used to designate an NITF 2.0 file not within the 1 to 6 CLEVEL definition.

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Table 5-4 NITFS 2.0 Certification Criteria Summary (cont'd.)

Compliance Level	*** 1**	**2**	**3**	**4**	**5**	**6**
Bi-Level Image	1bpp image w/wo LUT	1bpp image w/wo LUT	1bpp image w/wo LUT	1bpp image w/wo LUT	1bpp image w/wo LUT	1bpp image w/wo LUT
Bi-LEVEL Compression	COMRAT= 1D,2DS,2DH IMODE = B	COMRAT= 1D,2DS,2DH IMODE = B	COMRAT= 1D,2DS,2DH IMODE = B	COMRAT= 1D,2DS,2DH IMODE = B	COMRAT= 1D,2DS,2DH IMODE = B	COMRAT= 1D,2DS,2DH IMODE = B
Inset Image Overlays	0-4	0-4	0-19	0-19	0-19	0-19
Symbols	0-100	0-100	0-100	0-100	0-100	0-100
Aggregate Size	128 Kbyte max	128 Kbyte max	0.5 Mbyte max	1 Mbyte max	1 Mbyte max	1 Mbyte max
Bit Map Symbol Colors (1 BPP)	N,K,W	N,K,W, R,O,B,Y	N,K,W, R,O,B,Y	N,K,W, R,O,B,Y	N,K,W, R,O,B,Y	N,K,W, R,O,B,Y
Object Symbols	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed
CGM SYMBOLS	PREFERRD	PREFERRED	PREFERRED	PREFERRED	PREFERRED	PREFERRED
Labels 1-320 characters each; color options same as for Bit-map Symbols	0-100 2,048 char max	0-100 2,048 char max	0-100 2,048 char max	0-100 2,048 char max	0-100 2,048 char max	0-100 2,048 char max
Text	0-5 Files 100,000 chars max. aggregate	0-5 Files 100,000 chars max. aggregate	0-32 Files 100,000 chars max. aggregate	0-32 Files 100,000 chars max. aggregate	0-32 Files 100,000 chars max. aggregate	0-32 Files 100,000 chars max. aggregate
Controlled Tags	Controlled tags may appear in the following fields: XHD, IXSHD, SXSHD, LXSHD, TXSHD, and 'Controlled Extensions' DES regardless of CLEVEL.					
Registered Tags	Registered tags may appear in the following fields: UDHD, UDID, and 'Registered Extensions' DES regardless of CLEVEL.					
Data Extension Segment	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.

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Table 5-4. NITFS 2.0 Certification Criteria Summary (cont'd.)

Compliance Level	* 1	2	3	4	5	6
Reserved Segment	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.
VQ Compression	4x4 Kernel 4 table w/wo masking	4x4 Kernel 4 table w/wo masking	4x4 Kernel 4 table w/wo masking	4x4 Kernel 4 table w/wo masking	4x4 Kernel 4 table w/wo masking	4x4 Kernel 4 table w/wo masking
VQ Monochrome	w/wo LUT IMODE = B	w/wo LUT IMODE = B	w/wo LUT IMODE = B	w/wo LUT IMODE = B	w/wo LUT IMODE = B	w/wo LUT IMODE = B
VQ 8-bit color	No	with LUT IMODE = B	with LUT IMODE = B	with LUT IMODE = B	with LUT IMODE = B	with LUT IMODE = B
TACO2	ALL SYSTEMS MUST SUPPORT NITF FILE EXCHANGE USING TACO2 PROTOCOL					

* 01 File < 1,213,000 bytes so that it fits on a 3.5" or 5.25" floppy disk.

Note: This table only provides an overview summary of certification criteria. Proper interpretation of the table is specified in the text of this chapter. CLEVEL "99" is used to designate an NITF 2.0 file not within the 1 to 6 CLEVEL definition.

5.19.2 CLEVEL 7 Notice 2 to MIL-STD 2500A added CLEVEL 07 to mark NITF 2.0 files that use STREAMING_FILE_HEADER DES. In some operational circumstances (e.g. those with critical time or storage constraints) all the information (incomplete length fields) needed to populate the header fields may not be available at the start of file creation and transfer. STREAMING_FILE_HEADER, Data Extension Segment shall be used to provide the data needed to complete the file header. Incomplete length fields shall be populated with the character "9" (0x39) as a place holder Spstems receiving a file with an incomplete header shall locate the DES ans interpret the data in the DES as though it is actually located at the beginning of the file. The system may restore the file header fragment from the DES to populate the header. Any modification of this file shall result in the file being stored with a fully compliant and complete header.

5.19.3 NITF 2.1 and 2.0 STREAMING_FILE_HEADER Differences CLEVEL 07, has been added to mark NITF 2.0 files that use the STREAMING_FILE_HEADER DES. The STREAMING_FILE_HEADER DES for NITF 2.1 files is non-CLEVEL specific. Each of the four NITF 2.1 CLEVELs (03, 05, 06 and 07) are required to interpret the DES.

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5.20 NITF 1.1 Criteria

5.20.1 Minimum Compliant NITF Field Values and Ranges. The following subset of NITF capabilities has been prescribed to ensure a common level of functionality with systems using NITF version 1.1. Related message parameters are described below.

1. Image/Sub-image Parameters. Imagery will be gray scale and may be from 8 x 8 to 512 x 512 pixels, 8 bits-per-pixel. Images may be either uncompressed or compressed using ARIDPCM. Since sub-images may be overlaid on a base image, there may be from 0 to 5 images per message. The size of the largest image in the message may be up to 512 columns by 512 rows. The aggregate size of all remaining images within a message must not exceed 50 percent of the base image.
   Symbol Parameters. Symbols will be bit-mapped and may be 1 to 512 lines of 1 to 512 pixels per line, 1 bit-per-pixel, in white foreground on black background (N), black foreground on transparent background (K), or white foreground on transparent background (W). There may be 0 to 100 symbols per message. The maximum aggregate size of all symbols within a message must not exceed 262,144 bits.
3. Label Parameters. Labels will be in STA between 0 and 320 characters long. They may be white foreground (text) on transparent background, white on black, black on transparent or black on white. There may be 0 to 100 labels per message. The aggregate size of all labels within a message must not exceed 2,000 STA characters.
4. Text Parameters. Text files will be composed of STA characters. There may be 0 to 5 text files per message. The aggregate size of all text files within a message must not exceed 10,000 STA characters.

5.20.2 Minimum Compliance Capabilities:

5.20.2.1 Receive (Unpack) Capabilities. An NITF compliant Receive (unpack) capable system must be able to receive and unpack any minimum compliant NITF file.

5.20.2.2 Transmit (Pack) Capabilities. An NITF compliant Transmit (Pack) system must be able to pack and transmit a minimum compliant NITF file which will include selected combinations of:

- 0 images per message
- At least 1 image per message
- Compressing imagery with ARIDPCM using at least 1 rate (optional)
- 0 symbols per message
- At least 1 symbol per message, if there is no symbol waiver
- 0 labels per message
- At least 1 label per message, if there is no label waiver

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- 0 text files per message
- At least 1 text file per message, if there is no text waiver

5.21 Year 2000 Compliance Criteria:

5.21.1 All presentation to users of dates will use four digit year regardless of internal or NITF file representation of the date.

5.21.2 All date sensitive manipulation or calculations will be done with due consideration for the appropriate century.

5.21.3 For NITF 2.0 and NITF1.1 formatted files, the implementation must associate century according to the Window Date Rule established by NIMA.

1. For NITF header and subheader date fields,
2. For product specific data fields (TBD003)

5.22 Usability Criteria

The NITFS documents do not currently identify requirements for the usability of systems which implement NITFS. A system can be in technical compliance with the standards, yet not be well suited for use in its targeted user environment. The following usability criteria are based upon observations made during past NITF compliance tests. These criteria will be evaluated by the NITFS Test and Evaluation Facility and will be discussed in the test report, but they will not be considered compliance criteria for successful test completion. The purpose is to raise the sponsor's awareness of human factors considerations. Sponsors are encouraged to provide the NITFS Test and Evaluation Facility additional usability test criteria that they would like to have evaluated during compliance testing of their system.

5.22.1 Target Audience Description

The developer has prepared a target audience description for the system and used it in the design and development of the system. An appropriate Human Factors Engineering (HFE) and Safety evaluation has been conducted.

5.22.2 Operator’s Manual

An up-to-date operator's manual for the system was available at the time of compliance testing.

5.22.3 Consistent User Interface

The system has a consistent user interface with the appearance of a single integrated application. There is no perception of needing to exit and enter multiple routines to handle NITF operations. There is no need to enter commands at the operating system prompt once the application is started.

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5.22.4 Header/Subheader Defaults

The system does not require an operator entry for each and every NITF file header or subheader field value. It provides some mechanism for establishing default values and automatic calculation of values where appropriate.

5.22.5 Header/Subheader Edit

The system does not use hard coded header/subheader defaults that cannot be changed without re-coding and recompiling the program. The system provides edit capabilities for header/subheader values in a controlled manner depending on the access privilege of different levels of users.

5.22.6 Screen and Imagery Board Correspondence

A method is provided to handle the circumstance when the screen or other rendering device does not have the same pixel display capacity as the imagery processing board. There are clear procedures for setting up the appropriate parameters for proper image display. There is some means to alert the operator that the rendered image may be cropped because the display device doesn't handle the full image size as received (when no roaming or panning capability is provided).

5.22.7 Automatic Rendering

NITF message components are automatically displayed according to the NITF file header values without operator intervention; i.e. the operator is not required to read NITF header values and manually place components of the file for display.

5.22.8 Direct Text Entry

The system allows for the entry of text without the operator needing to be aware of special procedures for insuring only the NITFS STA, UT1 and MTF set of characters (without special word processing control codes, but with proper CR/LF line terminators) are entered into the NITF file.

5.22.9 User Alerts

There is some method to alert the operator that text or image comment fields are included within the NITF file being viewed and there is a convenient means to view the contents. The operator is alerted to other aspects regarding the file being viewed that are not readily apparent from the image display (such things as: user defined or extended data is included in the file; the image has color components but has been modified for display on a monochrome system; the file is in NITF 1.1, 2.0 or 2.1 format; security code words are included in the file headers; particular components could not be properly parsed or interpreted, etc.).

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5.22.10 Automatic Assist

The implementation assists the operator in preparing NITF files that do not exceed the established boundary conditions for a specific CLEVEL. There is no excessive dependence on operator knowledge or procedures to insure only compliant files are packed.

5.23 TACO2 Criteria

5.23.1 Point-To-Point Operation

The TACO2 IUT operates over a point-to-point channel.

5.23.2 Timing

The IUT operates over either synchronous or asynchronous circuits, or both.

5.23.3 Modes of Operation

The IUT supports full duplex (FDX), half duplex (HDX), and simplex (SDX) modes of operation. The IUT must not transmit or key a transmitter while in simplex receive mode.

5.23.4 Channel Data Rates

The IUT at least supports the following communications channel data rates:

- For synchronous links, rates of 1,200, 2,400, 4,800, 9,600, 16,000, 19,200, and 32,000 bps must be supported (using an external clock source).
- For asynchronous links, rates of 1,200, 2,400, 4,800, 9,600, and 19,200 bps must be supported.

5.23.5 NETBLT Data Packet Sizes

The IUT supports setting Network Block Transfer (NETBLT) Data Packet sizes ranging from 64 bytes to 512 bytes. (Note: Any size packet less than or equal to the setting may appear.)

5.23.6 NETBLT Buffer Sizes

The IUT supports NETBLT Buffer sizes from 64 bytes through 4096 bytes.

5.23.7 NETBLT Burst Sizes

The IUT supports NETBLT Burst sizes 1 through 32.

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5.23.8 ICMP Echo Response

The IUT interprets Internet Control Message Protocol (ICMP) Echo messages and responds with the appropriate ICMP Echo Reply message in full and half duplex operation.

5.23.9 Configurable Parameters

The IUT allows the operator to modify TACO2 configuration parameters.

5.23.10 Operation With STU-III Encrypted Channel

The IUT interfaces with a STU-III and performs full duplex TACO2 transfers with a distant system.

5.23.11 Checksums

The IUT checksums all DATA and LDATA packets. Upon receipt of bad checksums, full and half duplex receivers must request retransmission; simplex receivers may retain the data or replace it with nulls and provide an alert that the file was received with errors.

5.23.12 RS-232 (or compatible) Interface

The IUT must support data transfer using an RS-232 (or compatible) interface. The IUT must support the following operation, delays and waits for RS-232C (or equivalent) control signals as specified. (For the purposes of the test criteria in the following sub-paragraphs, a “transmission burst” is defined as a sequence of one or more packets transmitted contiguously. It does not necessarily correspond to a NETBLT burst, although it may.)

5.23.12.1 RTS (Request-To-Send). RTS must be held high while data is being transmitted. The IUT must have a means to wait a configurable amount of time after raising RTS and before transmitting data (RTS turn-on-delay). The IUT must also have a means to wait a configurable amount of time before lowering RTS after transmitting data (RTS turn-off delay). All delays (i.e., RTS turn-on delay, RTS turn-off delay, and half duplex turn-around delay) must be configurable from zero (0) to at least ten (10) seconds in intervals no larger than 200 milliseconds. The physical control lead response must have an accuracy of plus or minus 200 milliseconds of the delay setting.

5.23.12.1.1 Full Duplex. In full duplex mode, RTS may either be kept high throughout the transfer or lowered between transmission bursts.

5.23.12.1.2 Half Duplex. In half duplex mode, RTS must be kept low between transmission bursts to allow for incoming packets to be received. In half duplex

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mode, the IUT must wait a configurable amount of time before checking for DCD to be dropped low (if the DCD check is enabled) and raising RTS.

5.23.12.1.3 Simplex. In simplex transmit mode, RTS may either be kept high throughout the transfer or lowered between transmission bursts. In simplex receive mode, RTS must remain low.

5.23.12.2 CTS (Clear-To-Send). The IUT may have an option, which can be disabled, to check and wait for CTS to be high before transmitting each packet or transmission burst. When enabled, the check for CTS must occur after RTS is raised and before initiating the RTS turn-on delay.

5.23.12.3 DCD (Data-Carrier-Detect). The IUT may have an option, which can be disabled, to check and wait for DCD to be either high or low before transmitting.

5.23.12.3.1 Full Duplex. When enabled, in full duplex mode, the IUT must check and wait for DCD to be high. In full duplex mode, the check for DCD must occur after raising RTS and before checking for CTS to be high (if the CTS check is enabled) and before initiating the RTS turn-on delay.

5.23.12.3.2 Half Duplex. When enabled, in half duplex mode, the IUT must check and wait for DCD to be low before waiting the half duplex turn-around delay and before raising RTS.

5.23.12.3.3 Simplex. When enabled, in simplex mode, the IUT may check and wait for DCD to be either high or low. If the IUT is set to check and wait for DCD to be low, the check must occur before raising RTS. If the IUT is set to check and wait for DCD to be high, the check must occur after raising RTS and before checking for CTS to be high (if the CTS check is enabled) and before initiating the RTS turn-on delay.

5.23.12.4 DTR (Data-Terminal-Ready). The IUT must have the option to hold DTR high while in receive mode and while transmitting a file. The IUT must also have the option to pulse DTR (i.e., drop DTR for at least 20 milliseconds and then raise it) between transmission bursts. (This latter option allows DTR to be used as an encryption device resynchronization line. The pulse duration must be sufficient to cause the encryption equipment to resync. Note that when the DTR output signal is used in this manner, the DTR input on the communications equipment may need to be tied high.)

5.23.13 Transfer File Size

At a minimum, IUT must support the transmission and reception of the largest CLEVEL 03 file allowed in Table 5-1. This is currently 50 Mbytes. The test file must be handled under a single file transfer, not split among multiple transfer sessions.

5.23.14 Transfer Status

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The IUT must have an option to display status information indicating the progress of data transfers.

5.23.15 Abbreviated Headers

The IUT must support abbreviated headers in addition to the standard IP and NETBLT headers.

5.23.16 BERT

The IUT may, as an option, support the TACO2 Bit Error Ration Test (BERT) feature.

5.23.17 FEC-1

The IUT may, as an option, support the TACO2 Forward Error Correction 1 (FEC-1) features. Reception of FEC-I encoded packets must not cause a non-FEC capable system to crash.

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6.0 INTEROPERABILITY

6.1 General

This chapter is TBD001. This is a place holder for establishing a chapter to deal with interoperability testing of systems based on their intended use within the USIGS Architecture as detailed by the USIGS Architecture Framework (UAF) and the USIGS Interoperability Profile (UIP).

For those systems managed by/under the DODIIS management board refer to the following publications for additional guidance on interoperability testing.

- DODIIS Migration System Instructions, to DODISS Executive Agent, Program Managers, and Developers, February 1997
- DISA/JITC Interoperability Certification Test Program Plan, For the Department of Defense Intelligence Information Systems, DODIIS Migration Systems (DRAFT) Version 2.0, May 1998
- United States Imagery and Geospatial Information System Architecture Volume II, USIGS Interoperability profile, June 1998

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Appendix A -- List of Acronyms

ACCESSID	Access ID
AIS	Automated Information System
ANSI	American National Standards Institute
ARIDPCM	Adaptive Recursive Interpolated Differential Pulse Code Modulation
ASCII	American Standard Code for Information Interchange
ASD/C^3I	Assistant Secretary of Defense for Command, Control, Communications, and Intelligence
BCS	Basic Character Set
BCS-A	Basic Character Set - Alphanumeric
BCS-N	Basic Character Set - Numeric
BERT	Bit Error Rate Test
BIIF	Basic Image Interchange Format
BIT	Binary Digit
BPP	Bits-per-pixel
BPS	Bits Per Second
BWC	Bandwidth Compression
C^3I	Command, Control, Communications, and Intelligence
C^4I	Command, Control, Communications, Computers, and Intelligence
CADRG	Compressed ARC Digitized Raster Graphic
CCE	Continuous Comprehensive Evaluation
CCITT	Consultative Committee for International Telegraph and Telephone
CCS	Common Coordinate System
CEDATA	Controlled Extension Data
CEL	Controlled Extension Length
CETAG	Controlled Extension Tag
CEW	Common Exploitation Workstation
CFHD	Corrected File Header
CFS	Center For Standards
CGM	Computer Graphics Metafile
CIB	Controlled Image Base
CII	Compatibility, Interoperability, and Integration
CINC	Commander In Chief
CINCS	Commanders In Chief
CIO	Central Imagery Office
CIP	Common Imagery Processor
CJCSI	Chairman, Joint Chiefs of Staff Instruction
CLEVEL	Compliance Level (for NITF 2.0) Complexity Level (for NITF 2.1)
CMY	Cyan, Magenta, Yellow
COMSEC	Communications Security
COMRAT	Compression Rate Code

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Appendix A: List of Acronyms (cont'd.)

C/S/A	CINCs/Services/Agencies
CR	Carriage Return
CR/LF	Carriage Return/Line Feed
CTE	Compliance Test and Evaluation
CTS	Clear to Send
CY	Calendar Year
DATA	Data Buffer Sequence
DBMS	Database Management System
DCD	Data Carrier Detect
DCI	Director, Central Intelligence
DCT	Discrete Cosine Transform
DDN	Defense Data Network
DE	Dissemination Element
DES	Data Extension Segment
DIA	Defense Intelligence Agency
DIRINT	Director of Intelligence
DIS	Draft International Standard
DISA	Defense Information Systems Agency
DMA	Defense Mapping Agency
DOD	Department of Defense
DPPDB	Digital Point Positioning Data Base
DPS	Digital Production System
DQT	Define Q-Table
DSPO	Defense Support Project Office
DTR	Data Terminal Ready
EHD	Extended Header Data
EIA	Electronic Industries Association
FDCT	Forward Discrete Cosine Transform
FDX	Full Duplex
FEC	Forward Error Correction
FBKGC	File Background Color
FIPS	Federal Information Processing Standard
FPU	Floating Point Unit
FTP	File Transfer Protocol
GBS	Global Broadcast System
GeoSDE	Geospatial Support Data Extension
GIAS	Geospatial and Imagery Access Specification
G/ISMC	GSMC and ISMC
GOSIP	Government OSI Profile

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Appendix A: List of Acronyms (cont'd.)

GSMC	Geospatial Standards Management Committee
GUI	Graphical User Interface
H-TABLE	Huffman Table
HDLC	High-Level Data Link Control
HDX	Half Duplex
HFE	Human Factors Engineering
HUFFVALS	Huffman Values
IAMP	Imagery Acquisition Management Plan
IAS	Imagery Access Specification
IC	Image Compression
ICAT	Image Category
ICMP	Internet Control Message Protocol
ICS	Intelligence Community Standard
IDEX	Image Data Exploitation System
IEC	International Electrotechnical Commission
I/O	Input/Output
IFDCT	Inverse Forward Discrete Cosine Transform
IITSMP	Imagery Information Technology Standards Management Plan
IMODE	Image Mode
IP	Internet Protocol
IPA	Image Product Archive
IPL	Image Product Library
IR	Infra red
IREP	Image Representation
ISMC	Imagery Standards Management Committee
ISO	International Organization for Standards
ISP	International Standardized Profile
IUT	Implementation Under Test
JIEO	Joint Interoperability and Engineering Organization
JINTACCS	Joint Interoperability Tactical Command and Control System
JITC	Joint Interoperability Test Command
JPEG	Joint Photographic Experts Group
JTA	Joint Technical Architecture
LAN	Local Area Network
LBC	Label Background Color
LDATA	Last Data (packet of every buffer)
LF	Line Feed
LTC	Label Text Color
LUT	Look-up Table

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Appendix A: List of Acronyms (cont'd.)

MBZ	Must Be Zero
MIL-HDBK	Military Handbook
MIL-STD	Military Standard
MMU	Memory Management Unit
MOA	Memoranda of Agreement
MOT	Means of Testing
MRTFB	Major Range and Test Facility Base
MTF	Message Text Format
NATO	North Atlantic Treaty Organization
NBPP	Number of Bits Per Pixel
NCCB	NITF Configuration Control Board
NETBLT	Network Block Transfer
NIIEE	NIMA Imagery Information Exploitation Environment
NIMA	National Imagery and Mapping Agency
NITF	National Imagery Transmission Format
NITFS	National Imagery Transmission Format Standard
NSA	National Security Agency
NSIF	NATO Secondary Imagery Format
NTB	NITFS Technical Board
NUMDES	Number of Data Extension Segments
NUMRES	Number of Reserved Extension Segments
OASD/C^{3}I	Office of the Assistant Secretary of Defense for C^{3}I
ODASD/I	Office of the Deputy Assistant Secretary of Defense for Intelligence
ODCSINT	Office of the Deputy Chief of Staff for Intelligence
ODNI	Office of the Director of Naval Intelligence
OJCS	Organization of the Joint Chiefs of Staff
OSI	Open Systems Interconnection
PIAE	Profile for Imagery Archive Extensions
POC	Point of Contact
PPBS	Planning, Programming, and Budgeting System
PEM	Program Element Monitor
POSIX	Portable Operating System Interface for Computer Environments
PPPS	Point Positioning Production System
Q-Table	Quantization Table
RAM	Random Access Memory
REDATA	Registered Extension Data
REL	Registered Extension Length
RES	Reserved Extension Segment

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Appendix A: List of Acronyms (cont'd.)

RETAG	Registered Extension Tag
RFC	Request for Change
RGB	Red Green Blue
RST	Re-Start Marker
RTS	Request To Send
SAMI	Symbology and Annotation for Mapping and Imagery
SAR	Synthetic Aperture Radar
SDE	Support Data Extensions
SIDS	Secondary Imagery Dissemination System
SLIP	Serial Line Internet Protocol
SPIA	Standards Profile for Imagery Archives
STA	Standard ASCII
STANAG	Standardized NATO Agreement
STU-III	Secure Telephone Unit-3rd Generation
SUT	System Under Test
TACO2	Tactical Communications Protocol 2
TBD	To Be Determined
TBR	To Be Researched
TBP	To Be Published
TCP	Transmission Control Protocol
TD	Transmit Data
TIS	Technical Interface Specification
TMDE	Test, Measurement and Diagnostic Equipment
TRE	Tagged Record Extension
UAF	USIGS Architecture Framework
UCS	Universal Multiple Octet Coded Character Set
UDHD	User Defined Header Data
UDID	User Defined Image Data
UIP	USIGS Interoperability Profile
USA	United States Army
USAF	United States Air Force
USIGS	United States Imagery and Geospatial System
USMC	United States Marine Corps
USN	United States Navy
UTC	Coordinated Universal Time (i.e. ZULU)
VIMAS	Visible, Infrared, and Multispectral Airborne Sensor
VQ	Vector Quantization

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Appendix A: List of Acronyms (cont'd.)

WAN Wide Area Network

Y2K Year 2000
YCbCr Y=Brightness of signal. Cb=Chrominance (blue). Cr=Chrominance (red).
YCM Yellow, Cyan, Magenta
YIQ Intensity, Inphase, Quadrature

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Appendix B -- NITFS Forms

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COMPLIANCE TEST REQUEST

FROM: Sponsoring Organization	Date: ________
Mailing Address	
Primary Point of Contact Phone FAX Email	
Alternate Point of Contact Phone FAX Email	
TO: **Joint Interoperability Test Command** **NITFS Test and Evaluation Facility** **BLDG 57305** **Fort Huachuca, Az 85613-7020**	
Imagery System	
Security Classification	_ Unclassified _ Confidential _ Secret _ Top Secret
Type of Testing Requested	_ Initial Test _ Re-Test _ Derived Registration
Desired Location of Testing	_ NITFS Test and Evaluation Facility _ Other Location (Include NITFS Form CTE-4.)
Desired Test Dates	

Enclosures:

______	NITFS Form CTR-2 NITFS System Registration Data	(Mandatory)
______	NITFS Form CTR-3 NITFS Software Registration Data	(Mandatory)
______	NITFS Form CTR-4 Alternate Test Site Request	
______	NITFS Form CTR-5 NITF Applicaiton Y2K Summary	(Mandatory)
______	Technical Manual(s)	
______	Operator Manual(s)	
______	Other (e.g., additional testing desired)	

NAME & TITLE	SIGNATURE (Sponsor)

NITFS FORM CTR-1 (June 1998)

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NITFS SYSTEM REGISTRATION DATA

System Name		Date
NITFS Imagery Software		
TACO2 Software		
Test Sponsor		
Mailing Address		
Point of Contact		
Phone		FAX
Email		
Test Item Developer		
Mailing Address		
Point of Contact		
Phone		FAX
Email		
Complexity Level Supported	_ 3 _ 5 _ 6 _ 7 _ Other	
Hardware Platform		
Processor(s)		
RAM		
Local File Storage		
Network Interface(s)		
Display Adapter(s)		
Sync Comms Port(s)		
Async Comms Port(s)		
Other Required Hardware		
Operating System		
Other Required Software/Drivers		
Miscellaneous		

NITFS FORM CTR-2 (June 1998)

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NITFS SOFTWARE REGISTRATION DATA

System Name		Date
NITFS Imagery Software		
TACO2 Software		
Complexity Level Supported	_ 3 _ 5 _ 6 _ 7 _ Other	
Software Developer		
Mailing Address		
Point of Contact		
Phone		FAX
Email		
Implementation Language(s)		
Compiler(s)/Assembler(s) used for NITFS Software		
Hardware Requirements Processor(s) RAM File Storage Display Adaptor(s) Network Interface(s) TACO2 Interface(s) Other		
Software Requirements Operating System Network Software Drivers Other		
NITFS Functions not Supported		
Optional Functions and/or Data Types Supported		
Miscellaneous		

NITFS FORM CTR-3 (June 1998)

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ALTERNATE TEST SITE REQUEST

System Name		Date	
Proposed Test Site			
Address			
Point of Contact			
Phone		FAX	
Email			
Personnel Clearances Required			
Security POC		SCIF	_ Yes _ No
Address			
Phone		FAX	
Servicing SSO			
Diagram of Test Space(s)			
Available Work Space			
Network connectivity Available			
Interface Cables Available			
Power Available (Include number and type of sockets, and distance from work space.)			
Miscellaneous			

NITFS FORM CTR-4 (June 1998)

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NITF Y2K Compliance Summary

Hardware Enter the Hardware Platform the NITF application is presently running.	
Operating System Enter the Operating System and version the NITF application is running on.	
NITF Application Enter the NITF applicaiton and version.	
Comment: Provide a summary of your your approach for resolving Y2K associated issues. (CRT Forms 5a through 5c provide an informative guide and checklist for Y2K areas of consideration).	

NITFS FORM CTR-5 (June 1998)

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Y2K SYSTEM AWARENESS CHECKLIST

ITEM	YES	NO	N/A
System Hardware Platform Tests			
Does BIOS rollover to 2000 and display correctly?			
Does Real Time Clock rollover to 2000 on power up?			
Set date to 2000 turn the power off, does, Real Time Clock maintain the correct date when power up is applied?			
Operating System Tests			
Does 1999 rollover to 2000 using OS date setting commands?			
Does 2000-01-09 rollover to 2000-01-10 using 7 digit date?			
Does 2000-02-28 rollover to 2000-02-29 for year 2000 leap year day?			
Does 2000-10-09 rollover to 2000-10-10 using 8 digit date?			
Does the OS identify the date 2000-12-31?			
Is the Julian date conversion for 2000-02-29 00060 (if supported)?			
Is the Julian date conversion for 2000-12-31 00366 (if supported)?			
Software Development System Tests			
Does the software allow for setting the date to 2000-01-01?			
Does the software allow for setting the first 7 digits 2000-01-10?			
Does the software allow for setting the first 8 digits 2000-10-10?			
Does the software allow for setting the date to 2000-02-29?			
Does the software allow for setting the date to 2000-12-31?			
Does the software convert 2000-02-29 to the Julian date 00066?			
Does the software convert 2000-12-31 to the Julian date 00366?			
With the system clock set to 1999, does the software do calculations that span 1999 and 2000?			
Does the software calculate days between 1999 and 2000?			
Does the software calculate dates from 1999+n days into 2000?			
With the system clock set to 2000, does the software do calculations that span 2000?			
Does the software calculate days between two 2000 dates?			
Does the software calculate dates between two 2000 and 2000 +n dates?			
With the system clock set to 2000, does the software do calculations that span 2000 back to 1999?			

NITFS FORM CTR-5a (June 1998)

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Y2K SYSTEM AWARENESS CHECKLIST(cont)

ITEM	YES	NO	N/A
Does the software calculate dates between 2000 and 1999+n?			
With the system clock set to 2000, does the software do calculations that span within 1999?			
Does the software calculate days between 1999 and 2000?			
Does the software calculate dates between 1999+n and 2000?			
NIMA Window Date Rule			
Does software identify an NITF 2.0 FDT with YY of 60 as 1960?			
Does software identify an NITF 2.0 FDT with YY of 99 as 1999?			
Does software identify an NITF 2.0 FDT with YY of 00 as 2000?			
Does software identify an NITF 2.0 FDT with YY of 59 as 2059?			
Does software identify an NITF 2.0 IDATIM with YY of 60 as 1960?			
Does software identify an NITF 2.0 IDATIM with YY of 99 as 1999?			
Does software identify an NITF 2.0 IDATIM with YY of 00 as 2000?			
Does software identify an NITF 2.0 IDATIM with YY of 59 as 2059?			
General Information			
Are dates embedded as parts of other fields?			
If dates are used as part of a sort key, are they in the proper sequence?			
If the program uses any sort/merge utilities, does it correctly order file contents on date fields or correctly use indexed file structures keyed on date fields?			
Does the date arithmetic correctly calculate the duration (difference) between dates?			
Does the date arithmetic correctly calculate date based on starting date and duration?			
Does the date arithmetic correctly calculate day of week, day within a year, week within a year?			
For date key variables, does the program correctly search, sort, merge, and index on internal tables, linked lists or other data structures based on date variable?			
For key indexes including a date field, does the program produce the correct sequence across dates in 19nn and 20nn?			
Does the program truncate any century portion of date values during any assignment?			

NITFS FORM CTR-5b (June 1998)

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Y2K SYSTEM AWARENESS CHECKLIST(cont)

ITEM	YES	NO	N/A
Does the program correctly convert date values from one representation to another (e.g., YMD to Julian (YYDDD) to base-and-offset internal)?			
Does the program correctly convert between date representations according to the Gregorian calendar?			
Does the program correctly compare dates in any of its branching logic or calculation of Boolean values?			
Does the program store and retrieve dates accurately?			
Have all event horizon failure dates been identified?			
Is there any processing dependent upon embedded system (firmware/microprocessor) provided date/time input?			
Are date related random number generators used in processing?			
Are all date variables in the program initialized to the same convention for null values?			
If the program supports a user interface (input or inquiry), is the century date field four characters and unambiguous to a user for all possible date values in each field?			
If the program generates output, or a report, does the output correctly and consistently display a four-character century date field?			
Has usage of values in date fields for special purposes that are not dates (e.g., using 99999 or 99 to mean, "never expire") been eliminated?			

NITFS FORM CTR-5c (June 1998)

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Appendix C -- Changes in National Imagery Transmission Format (NITF)

C.1 Changes in NITF 2.0

The following is a summary of changes made to NITF 2.0 since its original publication.

C.1.1 Down Sampled JPEG

A new compression option, code I1, is added to indicate when an image has been down sampled prior to JPEG compression. This capability complements the current Lossy JPEG compression algorithm by providing for the down sampling of a NITF image prior to JPEG compression. The down sampling reduces the size of the image such that compression rates above 20:1 (up to 128:1) can be realized while still maintaining utility. Users who do not require high quality "exploitable" imagery, but do require recognizable imagery for transmission over reduced bandwidth communications links will appreciate of this capability.

C.1.2 12-Bit JPEG Post-Processing Extension

The Tagged Record Extension (TRE), IOMAPA, is added to specify the output mapping function to be applied to the image data following 12-bit JPEG decompression.

C.1.3 Vector Quantization (VQ)

A pair of compression codes, C4 and M4 are added to indicate that an image has been compressed using Vector Quantization (VQ) according to MIL-STD-188-199.

C.1.4 Lossless JPEG

A pair of compression codes, C5 and M5, are added to indicate that an image has been compressed using the lossless JPEG mode.

C.1.5 Message Text Format (MTF)

In the text subheader, a new Text Format -(TXTFMT) field value , MTF, is added to indicate that the ASCII text has been formatted according to MIL-STD-6040, United States Message Text Format (USMTF).

C.1.6 File Background Color

In the file header, a field, FBKGC, is added to define the background color to be used behind displayable segments. Without this feature an originator could inadvertently select a presentation color that is the same as a receiver's selected background color. The FBKGC field eliminates this potential visual information loss.

C.1.7 STREAMING_FILE_HEADER

A Data Extension Segment (DES), STREAMING_FILE_HEADER, is added to allow initiation of NITF file transmission before the file header is completely populated. The Streaming File Header DES is used during time critical or storage constrained operations.

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C.1.8 Compliance Level (CLEVEL) 07.

A Compliance Level, CLEVEL 07, has been is added to mark NITF 2.0 files that use the Streaming File Header DES.

C.1.9 Year 2000 Guidance

NITF 2.0 date fields express the year with two digits. The format is updated to prescribe the date windowing approach to determine the century.

C.2 Changes in NITF 2.1 from NITF 2.0

C.2.1 Deleted Features, Capabilities, and Constraints of NITF 2.0

The following paragraphs identify the features, capabilities, and implementation constraints of NITF 2.0 implementations that resulted in the development of NITF 2.1 .

C.2.1.1 <u>NITF1.1 compatibility.</u> There is no longer a mandatory requirement for full NITF1.1 backward compatibility. NITFS implementations are no longer required to demonstrate the capability to pack NITF 1.1 files. However, NITF 2.1 implementers must continue support for the interpretation of legacy NITF 1.1 files that may be archived.

C.2.1.2 <u>Adaptive Recursive Interpolated Differential Pulse Code Modulation (ARIDPCM) Compression support (MIL-STD-188-197(A)).</u> The ARIDPCM compression algorithm is no longer used except as it may appear in archived NITF 1.1 files.

C.2.1.3 <u>Display Level Constraint.</u> In NITF 2.1 files,the segment (image or graphic) with the lowest Display Level (DLVL) does not need to be positioned at the origin of the Common Coordinate System (CCS).

C.2.1.4 <u>Pre-Positioned Default Joint Photographic Experts Group (JPEG) Tables Implementation.</u> The Compression Rate Code (COMRAT) field is not used to designate pre-positioned default Quantization and Huffman tables in NITF 2.1. JPEG tables are included as part of the JPEG compressed image. Implementations that cannot generate tables customized for specific images, use a set of 'default tables' for different image types (VIS, SAR, IR, Color) that are defined in the standard. When custom tables are not available, the appropriate default tables are included in the JPEG stream.

C.2.1.5 <u>Graphic Segments use.</u> GRAPHIC segment (previously known as Symbol segment) use is constrained to Computer Graphics Metafile (CGM) encoded graphic. Bit-mapped symbol segments areeliminated. The use of OBJECT SYMBOLS.is no longer anticipated so its reference is removed. Since Bit-mapped symbol segments are no longer supported, the equivalent functional capability can be accomplished by using the Bi-level (single bit-per-pixel) raster image capability

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of the "IMAGE" segment construct. This also allows for Bi-Level compression of a bit-mapped raster not previously supported for bit-mapped symbols.

C.21.1.7 Label Segments use. The "LABEL" segment construct has been eliminated in NITF 2.1. A place holder in the file header is retained to preserve header structure compatibility with NITF 2.0, but its use is now reserved for future purposes.

C.2.2 Modified Features, Capabilities, and Constraints of NITF 2.1

The following paragraphs identify the NITF 2.0 features, capabilities, and implementation constraints that have been modified for NITF 2.1.

C.2.2.1 Header Field Types. The NITF header and subheader fields are designated Required or Conditional rather than Required, Optional and Conditional'Since more definitive field value ranges are designated, the need for optional fields is obviated.

C.2.2.2 File Profile Name and Version. A modified convention is added to mark files with the applicable NITF version. This aligns nitf 2.1BIIF and NSIF. The first four characters (bytes) of a BIIF, NITF 2.1and NSIF 1.0 file (FHDR field) portrays the profile name and the next five characters (bytes) (FVER field) protrays the version. The previously unused System Type (STYPE) field is populated with BF01 to indicate that the file is formated using ISO/IEC IS 12087-5 (BIIF). NITF 2.1 implementations process the following:

- "NITF01.10" Legacy NITF Version 1.1 files.
- "NITF02.00" Legacy NITF Version 2.0 files.
- "NITF02.10" NITF Version 2.1 files.
- "NSIF01.00" NSIF Version 1.0 files.

Note: The intent is for "NITF02.10" and "NSIF01.00" to be treated as aliases.

C.2.2.3 Compliance/Complexity Level. The field previously called 'Compliance Level' is now called 'Complexity Level'. Whereas NITF 2.0 was implemented with seven compliance level codes (01, 02, 03, 04, 05, 06, 07, and 99); NITF 2.1 (and NSIF 1.0) will initially use four complexity level codes (03, 05, 06, and 07).

C.2.2.5 Date and Time. The file header and segment subheaders date and time fields include century information to cope with the year 2000 transition. To keep the field length the same as that used in NITF 2.0, the month is designated as a numeric (01-12) vice an alphabetic (Jan - Dec) representation. The 'Z' indicator for UTC (ZULU) time is no longer included in the field, but all timeis expressed using the UTC time zone.

C.2.2.6 Modified Security Fields. The security fields of the file header and segment subheaders comply with the recent Executive Order for security markings.

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C.2.2.7 Block Shape and Size. In the past, NITF implementations were limited to using square blocks in multi-blocked images. Additionally, allowable block sizes were constrained to discrete sizes (32x32, 64x64, ... 1024x1024). With NITF 2.1 block shapes can be rectangular and of variable size across the ranges designated for each complexity level.

C.2.2.8 Image Coordinate Representation. The image coordinate representation fields (ICORDS and IGEOLO) in the image segment subheader are modified to improve clarity of use.

C.2.2.9 Transparent Pixels. To better reflect the intended concept, 'transparent pixel' is renamed 'pad pixel'. A new concept of designating a specific pixel value as being 'transparent' is added.

C.2.2.10 JPEG Compression. JPEG Application Markers structure is aligned with international profile registration constraints. The various JPEG Application Markers associated with NITF will be defined under Application Marker 6.

C.2.2.11 JPEG Compression (12-bit). All NITFS read capable implementations support 12-bit JPEG decompression of single band images.

C.2.2.12 VQ Decompression. All NITFS read capable implementations support decompression of Vector Quantization (VQ) compressed image segments. Implementations may optionally pack VQ.

C.2.2.13 Tagged Record Extensions (TREs). In the file header and image subheader,a physical separation for "registered tags" and "controlled tags" between "user defined" and "extended" fieldsnot required. Either type of TRE may appear in either area, thus doubling the space available to contain TREs. Removal of this NITF 2.0 restriction allows registered tags to appear in graphic and text subheaders that do not have user defined fields. As in NITF 2.0, TREs must be placed in the subheader of the segment for which the extension pertains or in the file header if the extension pertains to multiple segments or to the entirefile.

C.2.2.14 Overflow Data Extension Segment (DES). A new DES isadded to replace NITF 2.0 “Registered Extensions” and Controlled Extensions” DES that held overflow registered and controlled tags. “TRE_OVERFLOW” is the designated DES for containing overflow TREs, regardless if they are registered or controlled extensions. As with NITF 2.0, there must be a separate DES for the file header and for each subheader that need overflow space for TREs.

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C.2.2.15 Additional CGM Features. Additional features areadded to the CGM profile (MIL-STD-2301A), for use with NITF 2.1 These additional features include:

- The capability for edge visibility to be set either on or off rather than the current default of always on
- An increased range of allowed line widths from 2, 4 and 6 pixels to the range of 1 to at least 100 pixels
- The specification for the control of degeneracy that were not addressed in NITF 2.0
- Allowing for the explicit declaration of defaults currently only done implicitly
- Allowing for the presence of the null character in non-graphical character strings
- An updated metafile description structure
- Added capability for Auxiliary Color and Transparency control commands
- Added definition for consistent rendering of lines and edges
- Increased allowed range of font sizes
- Additional line and fill types
- A new graphic primitive for polygon sets

C.2.3 New Features and Capabilities for NITF 2.1

The following is a summary of features considered to be new to NITF 2.1.

C.2.3.1 Universal Multiple Octet Coded Character Set (UCS). NITF 2.1 allows the selection and use of UCS character set(s) within the text segment's text data field. As in NITF 2.0, the character codes in thefile header and subheader fields are constrained to eight bit codes. However, the constraint to only use 7-bit ASCII characters in the file header and subheader fields is removed from many fields.

C.2.3.2 Number of Bands. A conditional field (5 bytes) is established to allow for multi-spectral images that containmore than 9 bands.

C.2.3.3 Multiple 'Base' Images in a Single File. The NITF 2.0 paradigm of only allowing a single base image per NITF file is expanded. Through the appropriate placement of images within the common coordinate system and the proper association of attachment and display levels, the single base image per file paradigm has been expanded to allow multiple base images, each with its own set of associated overlays.

C.2.3.4 Multiple File Products. NITFS products consisting of multiple cross correlated NITF files are now being produced (e.g. Compressed ARC Digitized Raster Graphic (CADRG), Controlled Image Base (CIB), Digital Point Positioning Data Base (DPPDB), files split at 2GB boundaries, Rsets, and etc.) in NITF 2.0 format. As a minimum, NITF 2.0 interpreters are expected to read single files from these products. NITF 2.1 implementations should look toward full interpretation and

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user presentation of multiple file products. Further multiple file product paradigm expansion is anticipated.

C.2.3.5 Graphic Bounding Rectangles. Unused fields in the graphic subheader fields are redefined to allow for definition of a virtual bounding rectangle within which all visible components of a CGM graphic are contained.

C.2.3.6 Graphic Color. The graphic color field is redefined to express whether the CGM graphic is entirely monochrome or if it has color components.

C.2.3.7 STREAMING_FILE_HEADER Extension Concept. An ability to allow initiation of NITF file transmission prior to having all the information needed to complete the file header is added. This is done using the DES with identifier “STREAMING_FILE_HEADER” and is applicable to all Complexity Levels (CLEVELS). STREAMING_FILE_HEADER DES in a NITF 2.0 file is identified with the CLEVEL 07.

C.2.3.8 Geospacial Extensions. A set of Geospatial Support Data Extensions (GeoSDE) is added. These elements are defined based on agreement among a number of activities within and external to the National Imagery and Mapping Agency (NIMA), including NATO, the FGDC, and commercial entities.

C.2.3.9 Addition of New JPEG Huffman and Quantization Tables. Red Green Blue (RGB) Color and optimized 8-bit and 12-bit JPEG Quantization and Huffman tables for the three image types: Infra Red (IR), Synthetic Aperture Radar (SAR), and visible (VIS), are provided. As per the new NITF 2.1 requirement to always embed tables into the NITF/JPEG stream, these tables are defined as “recommended” tables, vice “default” tables as in NITF 2.0. The specific are aton the web athttp://164.214.2.51/ntb/jpg_tbls.html.

C.3 Changes in TACO2

C.3.1 The requirement for all NITF 2.0 system certification to undergo TACO2 Protocol testing has been relaxed. TACO2 testing for a system certification is optional for both NITF 2.1 as well as 2.0 imagery systems, however, all imagery systems deemed to be tactical within the USIGS Architecture, and those which are required to directly communicate with tactical systems, must support the TACO2 Protocol via either a synchronous or asynchronous communications port.

C.3.2 The minimum transmission file size tested was 1.2 Mb. The minimum file size for both NITF 2.1 and 2.0 has been increased to 50 Mb.

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C.3.3 Required data rate support has changed from a sweeping range of 300 bps to 32 Kbps for synchronous and 300 bps to 19.2 Kpbs for asynchronous to a selected rate evaluation. Those rates are

1. 1.2, 2.4, 4.8, 9.6, 16.0, 19.2 and 32.0 Kbps for synchronous
2. 1.2, 2.4, 4.8, 9.6 and 19.2 Kbps for synchronous

C.3.4 Additional features that were not defined in NITF 2.0 TACO2 testing that are optional for NITF 2.1 and 2.0 TACO2 testing are:

3. Bit Error Rate Test (BERT)
4. Forward Error Correction (FEC) - transmission and reception of TACO2 FEC-I
5. Abbreviated Headers - transmission and reception of abbreviated NETBLT/IP headers

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Appendix D -- National Imagery Transmission Format (NITF) 2.1 File Format Requirements

D.1 NITF 2.1 Compliance Tables

The following tables contain the file format constraints for NITF Version 2.1 compliance and must be used with the NITF Version 2.1 military standard (Mil-Std-2500B).

- The term "NA" under Format Values indicates that this field is not applicable to a minimum compliant NITF 2.1 file.
- The letters R and C in the Type column correspond to "Required" or "Conditional," respectively.

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Table D-1 File Header (NITF 2.1)

R = Required; C = Conditional

Field	Description	Size	Format Values	Type
FHDR	File Type & Version	9	NITF02.10 or NSIF01.00	R
CLEVEL	Complexity Level	2	03, 05, 06, 07 (All Others Reserved)	R
STYPE	Standard Type	4	BF01	R
OSTAID	Originating Station ID	10	BCS-A (May not be all spaces)	R
FDT	File Date & Time	14	CCYYMMDDhhmmss	R
FTITLE	File Title	80	UT-1 (default is all spaces)	R
FSCLAS	File Security Classification	1	T, S, C, R, or U	R
FSCLSY	File Security Classification System	2	BCS-A (For the DOD/Intelligence Community, the value is US. Default is all spaces)	R
FSCODE	File Codewords	11	BCS-A (see codes in Table D-2, default is all spaces)	R
FSCTLH	File Control and Handling	2	BCS-A (see codes in Table D-2, default is all spaces)	R
FSREL	File Releasing Instructions	20	BCS-A (default is all spaces, FIPS10-4 or DIAM65-19)	R
FSDCTP	File Declassification Type	2	BCS-A (Valid values are DD, DE, GD, GE, O, or X. Default is all spaces)	R
FSDCDT	File Declassification Date	8	CCYYMMDD or all spaces	R
FSDCXM	File Declassification Exemption	4	BCS-A (Valid values are X1-X8 and X251-X259. Default is all spaces)	R
FSDG	File Downgrade	1	BCS-A (Valid values are S, C, or R. Default is all spaces)	R
FSDGDT	File Downgrade date	8	CCYYMMDD or all spaces	R
FSCLTX	File Classification Text	43	UT-1 (Default is all spaces)	R
FSCATP	File Classification Authority type	1	BCS-A (Valid values are O or D. Default is all spaces)	R
FSCAUT	File Classification Authority	40	UT-1 (default is all spaces)	R
FSCRSN	File Classification Reason	1	BCS-A (Valid values are A-G. Default is all spaces)	R
FSSRDT	File Security Source Date	8	CCYYMMDD or all spaces	R
FSCTLN	File Security Control Number	15	BCS-A (default is all spaces)	R
FSCOP	File Copy Number	5	00000 default, or actual copy #	R
FSCPYS	File Number of Copies	5	00000 default, or actual count	R
ENCRYP	Encryption	1	0 = Not Encrypted (This field must contain the value 0)	R
FBKGC	File Background Color	3	Unsigned Binary integer (0x00-0xFF, 0x00-0xFF, 0x00-0xFF in Red, Green, Blue order	R
ONAME	Originator's Name	24	UT-1 (default is all spaces)	R
OPHONE	Originator's Phone Number	18	BCS-A (default is all spaces)	R

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Table D-1. File Header (NITF 2.1) (cont'd.)

Field	Description	Size	Format Values	Type
FL	File Length	12	BCS-N 000000000388-999999999999 CLEVEL MAX FILE SIZE 03 50 mb - 1 05 1 Gb - 1 06 2 G - 1 07 10 G - 1	R
HL	NITF Header Length	6	BCS-N 000388-999999	R
NUMI	Number of Images	3	BCS-N 000-999 All CLEVELs must pack at least 1 image CLEVEL REQUIREMENT 03 &-05 pack no more than 20 images 03 &-05 must unpack 0 to 20 images 06 & 07 pack no more than 100 images 06 & 07 must unpack 0 to 100 images	R
LISHnnn	Length of Nth Image Subheader	6	000439-999999	C
LInnn	Length of Nth Image	10	BCS-N 0000000001-9999999999	C
NUMS	Number of Graphic Segments	3	BCS-N 000-100	R
LSSHnnn	Length of Nth Graphic SubHeader	4	BCS-N 0258-9999	C
Lsnnn	Length of Nth Graphic	6	BCS-N 000001-999999 CLEVEL MAX AGGREGATE 03 1 mb 05-07 2 mb 5 mb	C
NUMX	Reserved for Future Use	3	000	R

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Table D-1 File Header (NITF 2.1) (cont'd.)

Field	Description	Size	Format Values		Type
NUMT LTSHnnn Ltnnn	Number of Text Segments Length of Nth Text Subheader Length of Nth Text File	3 4 5	BCS-N 000-032 BCS-N 0282-9999 BCS-N 00001-99999		R C C
NUMDES LDSHnnn LDnnn	Number of Data Extension Segments (DES) Length of Nth data extension segment subheader Length of Nth DES Data	3 4 9	BCS-N 000-999 0200-9999 BCS-N 000000001-999999999	When receiving other than 0 Data Extension Segments, the system must at least adjust itself to move past data and unpack the remainder of the file correctly	R
NUMRES LRESHnnn LREnnn	Number of Reserved Extension Segments (RES) Length of Nth RES Subheader Length of Nth RES Data Field	3 4 7	BCS-N 000 BCS-N 0001-9999 (omitted) BCS-N 0000001-9999999 (omitted)		R C C
UDHDL UDHOFL UDHD	User Defined Header Data Length User Defined Header Overflow User Defined Header Data	5 3 *	BCS-N 00000 or 00003-99999 BCS-N 000-999[1] Tagged Record Extension(s)		R C C
XHDL XHDLOFL XHD	Extended Header Data Length Extended Header Data Overflow Extended Header Data	5 3 **	BCS-N 00000 or 00003-99999 BCS-N 000-999[2] Tagged Record Extension(s)		R C C

* As specified by User Defined Header Data Length minus 3 bytes
** As specified by Extended Header Data Length minus 3 bytes

[1] If present, this field shall contain "000" if the tagged record extensions in UDHD do not overflow into a DES, or shall contain the sequence number of the DES into which they overflow. This 3-byte field must be included in the total byte count of UDHDL, above. The UDHOFL field shall be omitted if the UDHDL field contains a value of zero.

[2] If present, this field shall contain "000" if the tagged record extensions in XHD do not overflow into a DES, or shall contain the sequence number of the DES into which they overflow. This 3-byte field must be included in the total byte count of XHDL, above. The XHOFL field shall be omitted if the XHDL field contains a value of zero.

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Table D-2. Security Control Markings

Codeword	Digraph
ORCON	OR
PROPIN	PI
US ONLY	UO
LIMDIS	DS
ATOMAL	AT
COSMIC	CS
CNWDI	CN
CRYPTO	CR
FOUO	FO
RESTRICTED DATA	RD
FORMREST DATA	RF
SIOP	SH
SIOP/ESI	SE
COPYRIGHT	PX
EFTO	TX
LIM OFF USE (UNCLAS)	LU
NONCOMPARTMENT	NT
PERSONAL DATA	IN
SAO	SA
SAO-1	SL
SAO-2	HA
SAO-3	HB
SAO-SI-2	SK
SAO-SI-3	HC
SAO-SI-4	HD
SPECIAL CONTROL	SC
SPECIAL INTEL	SI
WARNING NOTICE - SEC CLAS IS BASED ON THE FACT OF EXISTENCE AND AVAIL OF THIS GRAPHIC	WN

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Table D-3. Image Subheader (NITF 2.1)

Field	Description	Size	Format Values	Type
IM	File Part Type	2	IM	R
IID1	Image ID1	10	BCS-A non-blank; User defined	R
IDATIM	Image Date & Time	14	CCYYMMDDhhmmss	R
TGTID	Target ID	17	BBBBBBBBBBOOOOOCC BCS-A (Default is spaces)	R
IID2	Image IID2	80	BCS-A (Default is spaces)	R
ISCLAS	Image Security Classification	1	T, S, C, R, or U	R
ISCLSY	Image Security Classification	2	BCS-A (For DOD/Intelligence Community, value is US. Default is all spaces)	R
ISCODE	Image Codewords	11	BCS-A (see codes in Table D-2, default is all spaces)	R
ISCTLH	Image Control and Handling	2	BCS-A (see codes in Table D-2, default is all spaces)	R
ISREL	Image Releasing Instructions	20	BCS-A (default is all spaces, FIPS 10-4 or DIAM65-19)	R
ISDCTP	Image Declassification Type	2	BCS-A (Valid values are DD, DE, GD, GE, O, or X. Default is all spaces)	R
ISDCDT	Image Declassification Date	8	CCYYMMDD or all spaces	R
ISDCXM	Image Declassification Exemption	4	BCS-A (Valid values are X1-X8 and X251-X259. Default is all spaces)	R
ISDG	Image Downgrade	1	BCS-A (Valid values are S, C, or R. Default is all spaces)	R
ISDGDT	Image Downgrade Date	8	CCYYMMDD or all spaces	R
ISCLTX	Image Classification Text	43	BCS-A (Default is all spaces)	R
ISCATP	Image Classification Authority Type	1	BCS-A (Valid values are O or D. Default is all spaces)	R
ISCAUT	Image Classification Authority	40	BCS-A (default is all spaces)	R
ISCRSN	Image Classification Reason	1	BCS-A (Valid values are A-G. Default is all spaces)	R
ISSRDT	Image Security Source Date	8	CCYYMMDD or all spaces	R
ISCTLN	Image Security Control Number	15	BCS-A (Default is spaces)	R
ENCRYP	Encryption	1	0=Not Encrypted	R
ISORCE	Image Source	42	BCS-A (Default is spaces)	R
NROWS	Number of Significant Rows in image	8	BCS-N 00000002-99999999	R
NCOLS	Number of Significant Columns in image	8	BCS-N 00000002-99999999	R
PVTYPE	Pixel value type	3	INT, B, SI, R, C	R

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Table D-3. Image Subheader (NITF 2.1) (cont'd.)

Field	Description	Size	Format Values	Type
IREP	Image Representation	8	MONO, RGB, RGB/LUT, NODISPLY, MULTI, YCbCr601 RGB/LUT: Pack Optional RGB(24 bit color): Pack only if native YC_bC_r(3 bands) compress only (JPEG): Pack if native mode is color NODISPLY: CLEVELS 3, 5, 6, 7 for ICAT DTEM, Unpack 1 band for ICAT LOCG, Unpack 2 bands for ICAT MATR, Unpack 1-999 bands Pack is Optional MULTI Unpack CLEVELS 3 (Pack optional), 2-9 bands, 8bpp/band Unpack CLEVELS 5&6 (Pack optional) , 2-256 bands, 8bpp/band Unpack CLEVELS 7 (Pack optional), 2 - 999 bands, 8bpp/band	R
ICAT	Image Category	8	VIS, SL, TI, FL, RD, EO, OP, HR, HS, CP, BP, SAR, SARIQ, IR MS, FP, MRI, XRAY, CAT, MAP, PAT, LEG, DTEM, MATR, LOCG, VD (Default is VIS)	R
ABPP	Actual Bits-per-pixel Per Band	2	BCS-N 1, 8, 11, 12, 13, 14, 15, 16	R
PJUST	Pixel Justification	1	R	R
ICORDS	Image Coordinate System	1	U, G, N, S, D or (Default is spaces)	R

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Table D-3. Image Subheader (NITF 2.1) (cont'd.)

Field	Description	Size	Format Values	Type
IGEOLO	Image Geographic Location	60	±dd.ddd±ddd.ddd (four times) ddmmssXdddmmssY(four times) or zzBJKeeeeennnnn (four times) or zzeeeeeennnnnnn (four times)	C
NICOM	Number of Image Comments	1	BCS-N 0-9	R
ICOMn	Image Comment N	80	BCS-A	C
IC	Image Compression	2	NC/NM - No Compression, C1/M1- Bi-Level C3/M3 - JPEG, DCT Lossy C4/M4 - VQ C5/M5 - JPEG, Lossless C6/M6 - Multi Component Compression (TBD004) I1 - Downsampled JPEG	R
COMRAT	Compression Rate Code	4	IC COMRAT C1/M1 1D, 2DS, 2DH C3/M3 00.0,00.1,00.2,00.3,00.4, 00.5 C4/M4 n.nn C5/M5 00.0 C6/M6 00.0 (TBD004) I1 00.0	C
NBANDS	Number of Bands	1	BCS-N 0, 1 to 9	R
XBANDS	Number of Multi-Spectral Bands	5	BCS-N 00010-00999	C
IREPBANDnn	nnth Band Component Representation	2	BCS-A, (Default is spaces), R, G, B, Y, Cb, Cr, LU, MX, EL	C
ISUBCATnn	nnth Band Subcategory	6	BCS-A (All spaces)	C
IFCnn	nnth Band Image Filter Condition	1	N	R

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Field	Description	Size	Format Values	Type
IMFLTnn	nnth Band STD Image Filter Code	3	Fill with BCS spaces	C
NLUTSnn	nnth Band Number of LUTS	1	BCS-N 0-4	C
NELUTnn	nnth Band Number of LUT Entries	5	BCS-N 1-65536	C
LUTDnnn	nnth Band Data of the mth LUT	♦	LUT Values	C
ISYNC	Image Sync Code	1	0	R
IMODE	Image Mode	1	B, P, R, S	R
NBPR	Number of blocks per row	4	BCS-N 0001-9999	R
NBPC	Number of blocks per column	4	BCS-N 0001-9999	R
NPPBH	# of pixels per block(horiz.)	4	BCS-N 0002-8192	R
NPPBV	# Of pixels per block (vert.)	4	BCS-N 0002-8192	R
NBPP	# Of bits-per-pixel per band	2	BCS-N 01, 08, 12, 16, 32, 64	R
IDLVL	Display Level	3	BCS-N 001-999	R
IALVL	Attachment Level	3	BCS-N 000-998 (Default is 000)	R
ILOC	Image Location	10	RRRRRCCCCC relative to AL origin	R
IMAG	Image Magnification	4	BCS-A Default = 1.0 /2 , /4 , /8 , /16 , /32 , /64 , /128 or decimal value (Default is followed by a space)	R
UDIDL	User defined Image data length	5	BCS-N 00000 or 00003-99999	R
UDOFL	User defined overflow	3	BCS-N 000-999	C
UDID	User defined image data	*	Tagged Record Extensions	C
IXSHDL	Extended Subheader Data Length	5	BCS-N 00000 or 00003-99999	R
IXSOFL	Extended Subheader overflow	3	BCS-N 000-999	C
IXSHD	Extended Subheader Data	**	Tagged Record Extension(s)	C

♦ One byte each entry
* As specified by UDIDL
** As specified by IXSHDL

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Table D-3. Image Data Mask Table

TYPE "R" = Required, "C" = Conditional

Fields	Description	Size	Format Values	Type
IMDATOFF	Blocked Image Data Offset	4	Binary integer: 0x00000000 to 0xFFFFFFFF	C
BMRLNTH	Block Mask Record Length	2	Unsigned binary integer; 0x0000=No Block mask record; 0x0004=Block mask records (4 bytes each) are present	C
TMRLNTH	Pad Pixel Mask Record Length	2	Unsigned binary integer; 0x0000=No Pad pixel mask records; 0x0004=Pad pixel mask records (4 bytes each) are present	C
TPXCDLNTH	Pad Output Pixel Code Length	2	Unsigned binary integer; 0x0000=No pad pixels; 0x0001 to 0x0010=pad pixel code length in bits	C
TPXCD	Pad Output Pixel Code	♦	Binary integer; 0 to 2^n -1 where n=TPXCDLNTH	C
BMRnBNDm	Block n, Band m	4	Binary integer Increment n prior to m 0≤n≤NBPR*NBPC -1 0≤m≤max(NBANDS,XBANDS) (Default is 0xFFFFFFFF if the block is not recorded)	C
TMRnBNDm	Pad Pixel n, Band m	4	Binary integer Increment n prior to m 0≤n≤NBPR*NBPC.-1 0≤m≤max(NBANDS,XBANDS) (Default is 0xFFFFFFFF if the block is not recorded)	C

♦ The length of the TPXCD field is the next highest number of bytes that can contain the number of bits identified in the TPXCDLNTH field. For example, a TPXCDLNTH value of 12 would be stored in a TPXCD field of two bytes.

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Table D-4. Tested Variations of IREP and Associated Fields

IREP	PVTYPE	NBPP	ABPP	NBANDS/ XBANDS	IREPBANDn	NLUTSn	IMODE
MONO	B	1	1	1	M	0	B
	B	1	1	1	LU	1	B
	INT	8	8	1	M	0	B
	INT	8	8	1	LU	1	B
	INT	12	12	1	M	0	B
	INT	12	12	1	LU	1	B
	INT	16	11-16	1	M	0	B
	INT	16	11-16	1	M	1	B
	R	32	32	1	M	0	B
	C	64	64	1	M	0	B
RGB/LUT	B	1	1	1	LU	3	B
	INT	8	8	1	LU	3	B
	INT	12	12	1	LU	3	B
	INT	16	11-16	1	LU	3	B
RGB	INT	8	8	3	R, G, B	0	B, P, R, S
YCbCr601 (JPEG only)	INT	8	8	3	Y, Cb, Cr	0	P
MULTI	INT	8	8	2-9	M, R, G, B, or Spaces	0	B, P, R, S
	INT	8	8	2-9	M, R, G, B, LU, or Spaces	3	B, P, R, S
	INT	8	8	10-256	M, R, G, B, LU, or Spaces	3	B, P, R, S
	INT	8	8	257-999	M, R, G, B, LU, or Spaces	3	B, P, R, S

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Table D-4. Tested Variations of IREP and Associated Fields (Cont.)

IREP	PVTYPE	NBPP	ABPP	NBANDS/ XBANDS	IREPBANDn	NLUTSn	IMODE
NODISPLY	INT	8	8	1	BCS Spaces	0	B
	INT	8	8	2	BCS Spaces	0	B,P,R,S
	INT	8	8	3-9	BCS Spaces	0	B,P,R,S
	SI	8	8	1	BCS Spaces	0	B
	SI	8	8	2	BCS Spaces	0	B,P,R,S
	SI	8	8	3-9	BCS Spaces	0	B,P,R,S
	R	32	32	1	BCS Spaces	0	B
	R	32	32	2	BCS Spaces	0	B,P,R,S
	R	32	32	3-9	BCS Spaces	0	B,P,R,S
	C	64	64	1	BCS Spaces	0	B
	C	64	64	2	BCS Spaces	0	B,P,R,S
	C	64	32	3-9	BCS Spaces	0	B,P,R,S

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Table D-5 Graphic Subheader (NITF 2.1)

Fields	Description	Size	Format Values	Type
SY	File part type	2	SY	R
SID	Graphic id	10	BCS-A (May not be all spaces)	R
SNAME	Graphic name	20	BCS-A (Default is spaces)	R
SSCLAS	Graphic security classification	1	T,S,C,R, or U	R
SSCLSY	Graphic Security Class System	2	BCS-A (Default is spaces)	R
SSCODE	Graphic codewords	11	BCS-A (Default is spaces)	R
SSCTLH	Graphic control and handling	2	BCS-A (Default is spaces)	R
SSREL	Graphic releasing instruct	20	BCS-A (Default is spaces)	R
SSDCTP	Graphic Declassification Type	2	BCS-A (Default is spaces)	R
SSDCDT	Graphic Declassification Date	8	CCYYMMDD or all spaces	R
SSDCXM	Graphic Declass Exemption	4	BCS-A (Default is spaces)	R
SSDG	Graphic Downgrade	1	BCS-A (Default is spaces)	R
SSDGDT	Graphic Downgrade Date	8	CCYYMMDD or all spaces	R
SSCLTX	Graphic Classification Text	43	BCS-A (Default is spaces)	R
SSCATP	Graphic Class Authority Type	1	BCS-A (Default is spaces)	R
SSCAUT	Graphic classification authority	40	BCS-A (Default is spaces)	R
SSCRSN	Graphic Classification Reason	1	BCS-A (Default is spaces)	R
SSSRDT	Graphic Security Source Date	8	CCYYMMDD or all spaces	R
SSCTLN	Graphic security control number	15	BCS-A (Default is spaces)	R
ENCRYP	Encryption	1	0=Not encrypted	R
SFMT	Graphic format	1	C for CGM	R

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Table D-5 Graphic Subheader (NITF 2.1)

Fields	Description	Size	Format Values	Type
SRES1	Reserved for future use	13	BCS-N 0000000000000	R
SDLVL	Display level	3	BCS-N 001-999	R
SALVL	Attachment level	3	BCS-N 000-998 (Default is 000)	R
SLOC	Graphic location	10	BCS-N -9999≤rrrrr≤99999 to 9999≤ccccc≤99999 (Default is 0000000000)	R
SBND1	First graphic bound location	10	rrrrrccccc	R
SCOLOR	Graphic color	1	C, M	R
SBND2	Second Graphic bound location	10	rrrrrccccc	R
SRES2	Reserved for future use	2	BCS-N 00	R
SXSHDL	Extended Subheader data length	5	BCS-N 00000 or 00003-09741	R
SXSOFL	Extended Subheader overflow	3	BCS-N 000-999	C
SXSHD	Extended Subheader Data	**	Tagged Record Extensions	C

** As specified by Header Record Length minus 3 bytes

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Table D-6. Text Subheader (NITF 2.1)

Fields	Description	Size	Format Values	Type
TE	File part type	2	TE	R
TEXTID	Text ID	7	BCS-A (User defined, non-blank)	R
TXTALVL	Text attachment level	3	BCS-N 000-998	R
TXTDT	Text date and time	14	CCYYMMDDhhmmss	R
TXTITL	Text title	80	BCS-A (Default is spaces)	R
TSCLAS	Text security classification	1	T,S,C,R, OR U	R
TSCLSY	Text security classification system	2	BCS-A (Default is spaces)	R
TSCODE	Text codewords	11	BCS-A (Default is spaces)	R
TSCTLH	Text control and handling	2	BCS-A (Default is spaces)	R
TSREL	Text releasing instructions	20	BCS-A (Default is spaces)	R
TSDCTP	Text declassification type	2	BCS-A (Default is spaces)	R
TSDCDT	Text declassification date	8	CCYYMMDD (Default is spaces)	R
TSDCXM	Text declassification exemption	4	BCS-A (Default is spaces)	R
TSDG	Text downgrade	1	BCS-A (Default is spaces)	R
TSDGDT	Text downgrade date	8	CCYYMMDD (Default is spaces)	R
TSCLTX	Text classification text	43	BCS-A (Default is spaces)	R
TSCATP	Text classification authority type	1	BCS-A (Default is spaces)	R
TSCAUT	Text classification authority	40	BCS-A (Default is spaces)	R
TSCRSN	Text classification reason	1	BCS-A (Default is spaces)	R
TSSRDT	Text security source date	8	CCYYMMDD (Default is spaces)	R
TSCTLN	Text security control number	15	BCS-A (Default is spaces)	R
ENCRYP	Encryption	1	0=Not encrypted (This value must be 0)	R
TXTFMT	Text format	3	STA, MTF, UT1	R
TXSHDL	Extended Subheader data length	5	00000 or 00003-09717	R
TXSOFL	Extended Subheader overflow	3	BCS-N (000-999)	C
TXSHD	Extended Subheader data	**	BCS-A	C

** As specified by the value in the TXSHDL field minus 3 bytes

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Table D-7. Registered and Controlled Tagged Record Extension Format

(TYPE “R” = Required, “C” = Conditional)

Fields	Description	Size	Format Values	Type
RETAG or CETAG	Unique Extension type identifier	6	BCS-A	R
REL or CEL	Length of REDATA fields	5	BCS-N (00001-99988)	R
REDATA or CEDATA where appropriate	User-defined data	*	User defined	R

* As indicated in REL field

Table D-8. Data Extension Segment Subheader (NITF 2.1)

Fields	Description	Size	Format Values	Type
DE	File part type	2	DE	R
DESTAG	Unique DES type identifier	25	BCS-A (Registered value only)	R
DESVER	Version of the data field definition	2	BCS-N (01 to 99)	R
DESSG	Security group	167	Same as for File Header, FSCLAS through FSCNTL	R
DESOFLW	Overflowed header type This field only appears when DESTAG=TRE_OVERFLOW. Otherwise omitted.	6	BCS-A (UDHD, XHD, UDID, IXSHD, SXSHD, TXSHD)	C
DESITEM	Data item overflowed	3	BCS-N (000 TO 999)	C
DESSHL	Length of user-defined subheader fields	4	BCS-N (0000-9999)	R
DESSHF	User-defined subheader fields	*	BCS-A (User defined)	C
DESDATA	User-defined data field	**	User defined	R

* Value specified in DESSHL
** Determined by user. If DESTAG = "TRE-OVERFLOW" or Controlled Extensions," this signifies the sum of the lengths of the tagged records.

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Table D-8A. TRE_OVERFLOW DES (NITF 2.1)

Fields	Description	Size	Format Values	Type
DE	File part type	2	DE	R
DESTAG	Unique DES type identifier	25	TRE_OVERFLOW	R
DESVER	Version of the data field definition	2	01	R
DESSG	Security group	167	Refer to (Table IA8) of MIL-STD-2500B NITF Version 2.0	R
DESOFLW	Overflowed header	6	UDHD, XHD, UDID, IXSHD, SXSHD, TXSHD	R
DESITEM	Data item overflowed	3	000 to 999	R
DESSHL	Length of user-defined subheader fields	4	0000	R
DESDATA	User-defined data field	**	User defined	R

Table D-8B. STREAMING_FILE_HEADER DES (NITF 2.1)

Fields	Description	Size	Format Values	Type
DE	File part type	2	DE	R
DESTAG	Unique DES type identifier	25	STREAMING_FILE_HEADER	R
DESVER	Version of the data field definition	2	01	R
DESSG	Security group	167	Refer to (Table IA8) of MIL-STD-2500B NITF Version 2.	R
DESSHL	Length of user-defined subheader fields	4	0000	R
DESDATA	User-defined data field	**	User defined	R

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Table D-9. Reserved Extension Segment Subheader

Fields	Description	Size	Format Values	Type
RE	File part type	2	RE	R
RESTAG	Unique RES type identifier	25	BCS-A (Registered value only, non-blank)	R
RESVER	Version of the data field definition	2	BCS-N (01 to 99)	R
RESSG	Security group	167	Same as for File Header, FSCLAS through FSCNTL	R
RESSHL	Length of user-defined subheader fields	4	BCS-N (0000-9999)	R
RESSHF	User-defined subheader fields	*	BCS-A (User defined)	C
RESDATA	User-defined data field	**	User defined	R

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Appendix E -- Adaptive Recursive Interpolated Differential Pulse Code Modulation (ARIDPCM) Requirements

Table E-1. General ARIDPCM Requirements

O=Optional M=Mandatory

Item	Feature	Predicate	Status Pack/Unpack	Reference MIL-STD-188-197
E-1	Operates ARIDPCM Type 1; 8 bits/pixel.	NITF 1.1 files only	M / M	1.5
E-2	Operates ARIDPCM Type 2; 11 bits/pixel.	Not used	O / O	1.5
E-3	Image Compression (IC) field of the image subheader is set to C2.	See note 1	M / M	1.2, 3.7
E-4	ARIDPCM algorithm is defined with these four selectable compression rates (4.5, 2.3, 1.4 and 0.75 bits-per-pixel, bpp) for eight bit gray scale images.	Item E-1 See note 1	M / M	4.2
E-5	ARIDPCM algorithm is defined with these four selectable compression rates (6.4, 4.5, 2.3 and 1.4 bpp) for 11 bit gray scale images.	Item E-2 See note 1	O / O	4.2
E-6	Compression rate is specified in the COMRAT (compression rate code) field in the NITFS image subheader.	Items E-4, E-5 See note 1	M / M	4.2
E-7	Compression algorithm operates in the Non-driven mode. In the Non-driven mode the ARIDPCM algorithm is a one pass operation where the busyness class is determined for a neighborhood based upon the selected compression rate.	See Note 2	O / M	4.6.1, 5.2.2
E-8	Compression algorithm operates in the Driven mode. The Driven ARIDPCM algorithm is a two pass operation that guarantees a specific average number of bits-per-pixel over the entire image.	See Note 2	O / M	4.6.2, 5.2.3
E-9	Compression algorithm operates in the Composite mode. The Composite mode of the ARIDPCM algorithm combines the driven and non-driven techniques to compress areas of little interest as specified by the operator to a greater degree than those areas the operator specifies as high interest.	See Note 2	O / M	4.6.3, 5.2.4, 4.5.3(1)

Note 1: Although the use of ARIDPCM by an image packer is optional, if used, the IC field must be set to C2 and the COMRAT field must contain a valid entry. At least one of the four compression rates must be supported by a packer. Unpackers must support all four rates.
Note 2: Any 3 options may be used for compression as receive side must handle all three cases. If ARIDPCM is supported, then at least one mode must be supported.

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Appendix F -- Bi-Level Image Compression Requirements

Table F-1. General Bi-level Image Compression Requirements

Item	Feature	Predicate	Status Pack/Unpack	Reference (MIL-STD 188-196)
F-1	Encoding Method is consistent with applicable standards and requirements documents.	See Note 1	M / M	1.1
F-2	The image compression field of the image header is set to C1 to invoke Bi-level data compression.		M / M	4.3
F-3	The mode of operation is specified in the Compression Rate Code section of the image header, using codes:, 1D, 2DS and 2DH.	Items F-4, F- 5, F-6	M / M	1.5
F-4	Operates in Bi-level compression Mode 1.	See Note 2	O / M	1.5
F-5	Operates in Bi-level compression Mode 2.	See Note 2	O / M	1.5
F-6	Operates in Bi-level compression Mode 3.	See Note 2	O / M	1.5
F-7	Each coded image line is embedded within synchronization codes.	Items F-4, F-5, F-6	O / M	4.2
F-8	Uses Huffman Codes - As specified in MIL-STD-188-196 for one and two dimensional Bi-Level encoding.	Items F-4, F-5, F-6	M / M	5.1, 5.2, 5.3

Note 1: The NITF application of Bi-Level Image Compression will be consistent with the following:

- MIL-STD-188-161C for Group 3 (G3) facsimile devices.
- FIPS 147 G3 facsimile apparatus for document transmission.
- CCITT recommendations for T.4.
- ANSI X3,4-1986 standard.

Note 2: If Bi-Level is supported on pack side, at least one mode must be supported.

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Appendix G -- Joint Photographic Experts Group (JPEG) Requirements

Table G-1. General JPEG Requirements

O = Optional, M = Mandatory, N/A = Not Applicable

Item	Feature	Predicate	Status Pack/Unpack	Reference (MIL-STD 188-198A)
G1-1	Uses the full interchange JPEG format.		M/M	5.2.2.4.2, 5.2.2.5.1.9
G1-2	Uses the Q and H Tables found in the compressed JPEG stream versus any tables that may be specified by the COMRAT field of the NITF Imagery subheader.		NA/M	5.2.3.3.5
G1-3	Decompresses the abbreviated interchange JPEG format associated with NITF 2.0 files.	Only required for unpacking NITF2.0 files.	NA/M	5.2.2.5.1.8
G1-4	Implementations must include restart markers in entropy encoded data stream.		M/NA	5.2.3.1, 5.2.3.3.2
G1-5	Implementations must re-synchronize decompression at the next restart interval when the corrupted data is encountered in the entropy encoded data stream.		NA/M	6.3
G1-6	Implementation must replace any restart interval containing corrupted data with a pattern so that when the decoded data is displayed it is apparent that an error was encountered in that restart interval.		NA/M	5.2.3.3.1.4
G1-7	Implementation must be able to decode and display a JPEG compressed image in which no more than 10% of the restart intervals in the compressed data stream contain errors.		NA/M	5.2.3.3.1.4
G1-8	Implementations generating custom Huffman tables must build those tables according to MIL-STD-188-198		M/NA	5.2.2.5.1.9

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Table G-2. 8-bpp Lossy DCT JPEG Requirements

O = Optional M = Mandatory

Item	Feature	Predicate	Status Pack/Unpack	Reference MIL-STD 188-198A
G2-1	Operates in Sequential DCT based mode.		M / M	4.11.1, 5.2
G2-2	Uses Huffman Entropy encoding.		M / M	4.12, 5.2.2.5.1
G2-3	Uses 8 bit sample precision		M / M	4.13.1
G2-4	Converts 2 thru 7bpp imagery to 8bpp before JPEG compression.	Conversion is not required but only recommended.	O / NA	6.2
G2-5	Compression Accuracy: The quantized DCT coefficients, from the DCT based encoder, are within +/- 1 for each coefficient, when compared to reference test data.		M / NA	ISO Draft IS 10918-2
G2-6	Decompression Accuracy: The output of the DCT based decoder, when passed through a reference FDCT and Quantizer, is accurate to within +/- 1 when compared to reference test data for each coefficient.		NA / M	ISO Draft IS 10918-2

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Table G-3. 24-bpp Color Lossy DCT JPEG Requirements

O = Optional M = Mandatory

Item	Feature	Predicate	Status Pack/Unpac k	Reference MIL-STD 188-198A
G3-1	Operates in Sequential DCT based mode.		M / M	4.11.1, 5.2
G3-2	Implementation processes 24-bit RGB color imagery as IMODE S	Not allowed in defined CLEVELs.	O / O	4.14.1,
G3-3	Implementation processes 24-bit RGB color imagery as IMODE P		M / M	4.14.2,
G3-4	Implementation processes 24-bit RGB color imagery as IMODE B	Not allowed in defined CLEVELs.	O / O	4.14.2,
G3-5	A 24bpp RGB color image translated to 24bpp YCbCr color space, then JPEG encoded and decoded, must have the same general appearance as the original RGB image when JPEG encoded then decoded.		M / M	5.1.1.2.1.3
G3-6	Implementation processes YCbCr color imagery as IMODE P with no subsampling.		M / M	5.1.1.2.1.2
G3-7	Implementation processes YCbCr imagery as IMODE P with horizontal subsampling.		O / M	5.1.1.2.1.3
G3-8	Implementation processes YCbCr imagery as IMODE P with vertical subsampling.		O / M	5.1.1.2.1.3
G3-9	Implementation processes YCbCr imagery as IMODE P with both horizontal and vertical subsampling.		O / M	5.1.1.2.1.3
G3-10	Compression Accuracy: The quantized DCT coefficients, from the DCT based encoder, are within +/- 1 for each coefficient, when compared to reference test data. Mono & RGB		M / NA	ISO Draft IS 10918-2
G3-11	Decompression Accuracy: The output of the DCT based decoder, when passed through a reference FDCT and Quantizer, is accurate to within +/- 1 when compared to reference test data for each coefficient. Mono & RGB		NA / M	ISO Draft IS 10918-2

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Table G-4. 12-bpp Lossy DCT JPEG Requirements

O = Optional M = Mandatory

Item	Feature	Predicate	Status Pack/Unpack	Reference MIL-STD 188-198A
G4-1	Operates in Extended Sequential DCT based mode.		M / M	4.11.1, 5.2
G4-2	Uses Huffman Entropy encoding.		M / M	4.12, 5.2.2.5.1
G4-3	Implementation processes 12 bit monochrome imagery as IMODE B		M / M	4.13.1
G4-4	Converts greater than 8bpp imagery to 12bpp before JPEG compression.		M / NA	6.2
G4-5	Compression Accuracy: The quantized DCT coefficients, from the DCT based encoder, are within +/- 2 for each coefficient, when compared to reference test data.		M / NA	ISO Draft IS 10918-2
G4-6	Decompression Accuracy: The output of the DCT based decoder, when passed through a reference FDCT and Quantizer, is accurate to within +/- 2 when compared to reference test data for each coefficient.		NA / M	ISO Draft IS 10918-2

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Table G-5. Lossless JPEG Requirements

O = Optional M = Mandatory

Item	Feature	Predicate	Status Pack/Unpack	Reference MIL-STD 188-198A
G5-1	Operates in lossless sequential encoding mode.		M / M	4.10.1, 5.2
G5-2	Uses Huffman Entropy encoding.		M / M	4.12, 5.2.2.5.1
G5-3	Uses 8-bpp sample imagery, single band. IMODE B	Note 1	O / M	4.13.1
G5-4	Uses 12-bpp sample imagery, single band. IMODE B	Note 1	O / M	4.13.1
G5-5	Uses 16-bpp sample imagery, single band. IMODE B	Note 1	O / M	4.13.2
G5-6	Uses Multi-component(8-bits per band, two or more bands) imagery. IMODE B or S	Note 1	O / M	4.14
G5-7	Compression Accuracy: Implementation must accurately compress image data into an NITF formatted file so that the NITF file, when decompressed by a trusted lossless JPEG implementation, yields an image array exactly equal to the original image data.		M / NA	ISO Draft 10918-2
G5-8	Decompression Accuracy: Implementations must accurately decompress a NSIF lossless encoded JPEG stream, created by a trusted lossless, so that the resulting decompressed image array is exactly equal to the original image data.		NA / M	ISO Draft 10918-2

Note 1 - If the implementation does Lossless JPEG, it must compress using at least one of the allowed pixel depths: 8,12 or 16.

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Table G-6. Downsample JPEG Requirements

O = Optional M = Mandatory

Item	Feature	Predicate	Status Pack/Unpack	Reference MIL-STD 188-198A
G6-1	Operates in Sequential DCT based mode.		M / M	4.11.1, 5.2
G6-2	Uses Huffman Entropy encoding.		M / M	4.12, 5.2.2.5.1
G6-3	Uses 8bpp sample precision, single band.		M / M	4.13.1
G6-4	Converts 2 thru 7bpp imagery to 8bpp before JPEG compression.		M / NA	6.2
G6-5	Implementation compresses images no larger than 2048 x 2048 pixels, single block.		M / NA	N-0106-98 5.2.2.2.1.1
G6-6	Implementation downsamples image to dimensions that are multiples of 8.		M / NA	N-0106-98 5.2.1.1
G6-7	Implementation supports sync based mode of downsampling.		M / NA	N-0106-98 5.2.13
G6-8	Implementation mirrors edge pixels prior to downsampling.		M / NA	N-0106-98, 5.2.1.3.1
G6-9	Implementation downsamples/upsamples images according to methods and guidelines in NITFS Bandwidth Compression Standards and Guidelines document, N-0106-98		M / M	

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Appendix H -- Vector Quantization (VQ) Requirements

Table H-1. General VQ Requirements

Item	Feature	Predicate	Status Pack/Unpack	Reference (MIL-STD-188-199)
H-1	VQ compressed image segment contains VQ header when IC field is set to C4 or M4.		M / M	5.2.1, 5.2.3.2
H-2	Supports kernel-by-kernel compression/decompression and individual kernel rows for line-by-line compression/decompression.	Packer must support at least one of the options.	M / M	5.2.1.a
H-3	The first image code in the VQ image data field is used to spatially decompress the v x h indices in the upper left corner of image, continuing left to right across the columns of the first row of image codes, then down each of the image code rows sequentially.		M / M	5.2.1.b
H-4	Each value in a spatially decompressed image represents an index to the color table output (color compressed images only).		M / M	5.2.1.b
H-5	VQ implementations within NITFS are limited to 8-bit RGB with LUT, or monochrome with or without LUT.	Unpackers must support both options.	M / M	5.2.2
H-6	The compression ratio (COMRAT) field is present and contains a value in n.nn format.		M / M	5.2.3.1
H-7	The image compression (IC) field contains C4 if image is not masked; M4 if masked.	Packers must support at least one option.	M / M	5.2.3.2
H-8	The VQ image data section provides compression codes, utilizing a 4x4 kernel, organized in 4 tables.		M / M	5.2.3.3
H-9	Implementation utilizes a single band with associated LUT, IMODE B.		M / M	5.2.3.4
H-10	The number of spectral groups is 1.		M / M	5.2.3.4.a

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Table H-1. General VQ Requirements (cont.)

Item	Feature	Predicate	Status Pack/Unpack	Reference (MIL-STD-188-199)
H-12	Pixels within the image correspond to a single-valued quantity such as a gray scale value or single entry within a color table (for images with 1 or more spectral band tables).		M / M	5.2.3.4.c
H-13	The image row level of organization in the NITFS image subheader corresponds to the image row level in the VQ header.		M / M	5.2.3.4.d
H-14	The number of bands in the NITFS image subheader corresponds to the number of bands in the VQ header.	Always a single band.	M / M	5.2.3.4.e
H-15	Fields containing identification, origination, security, and the number and size of data items in the NITFS file are located in the NITFS file header.		M / M	5.3
H-16	Multi-byte fields within the image data section are written in the "big endian" format.		M / M	5.3
H-17	The VQ header follows the structure identified in MIL-STD-188-199.		M / M	5.2.3

Note 1. VQ recompression of decompressed VQ images is prohibited. The original codes and code tables must be used if the image is to be repacked as a VQ compressed image, even if only a portion of the image is repacked.

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Appendix I -- Computer Graphics Metafile (CGM) Requirements

Table I-1. General CGM Requirements, MIL-STD-2301

O = Optional M = Mandatory

Item	Feature	Predicate	Status Pack/Unpack	Reference (MIL-STD-2301)
I1-1	Binary Encoding Format		M/M	4.2, 5.1.2.6, 5.1.1.6.1
I1-2	Begin Metafile		M/M	5.1.1.1.1, 5.1.2.1.1, 5.2.1.1.1, 5.2.1.2.1, 5.2.2.2.3
I1-3	Metafile Version	Item I1-2	M/M	5.1.1.2.1, 5.1.2.2.1
I1-4	Metafile Description	Item I1-2	M/M	5.1.1.2.2, 5.1.2.2.2, 5.2.1.1.6, 5.2.2.1.2, 5.2.2.2.2,
I1-5	Metafile Element List	Item I1-2	M/M	5.1.1.2.3, 5.1.2.2.3
I1-6	Font List	Item I1-2	O/M	5.1.1.2.4, 5.1.2.2.4, 5.2.2.1.4, 5.2.2.2.12, 5.2.2.2.13
I1-7	Begin Picture	Item I1-2	M/M	5.1.1.1.2, 5.1.2.1.2, 5.2.1.1.2, 5.2.1.2.2, 5.2.2.2.3
I1-8	Color Selection Mode	Item I1-7	M/M	5.1.1.3.1, 5.1.2.3.1, 5.2.2.1.10, 5.2.2.2.9
I1-9	Edge Width Specification Mode	Item I1-7	O/M	5.1.1.3.2, 5.1.2.3.2, 5.2.2.1.8, 5.2.2.2.7
I1-10	Line Width Specification Mode	Item I1-7	O/M	5.1.1.3.3, 5.1.2.3.3, 5.2.2.1.9, 5.2.2.2.8
I1-11	VDC Extent	Item I1-7	M/M	5.1.1.3.4, 5.1.2.3.4, 5.2.2.1.7
I1-12	Begin Picture Body	Item I1-7	M/M	5.1.1.1.3, 5.1.2.1.3, 5.2.1.1.3, 5.2.1.2.3, 5.2.2.1.5, 5.2.2.2,5
I1-13	Text Color	Item I1-12	O/M	5.1.1.4.1, 5.1.2.4.1
I1-14	Character Height	Item I1-12	O/M	5.1.1.4.2, 5.1.2.4.2, 5.2.2.1.21, 5.2.2.2.20
I1-15	Text Font Index	Item I1-12	O/M	5.1.1.4.3, 5.1.2.4.3, 5.2.2.1.14, 5.2.2.2.13
I1-16	Character Orientation	Item I1-12	O/M	5.1.1.4.4, 5.1.2.4.4, 5.2.2.1.11, 5.2.2.2.10
I1-17	Text	Item I1-12	O/M	5.1.1.5.1, 5.1.2.5.1, 5.2.2.1.20, 5.2.2.2.19, 5.2.2.1.25, 5.2.2.2.24
I1-18	Fill Color	Item I1-12	O/M	5.1.1.4.5, 5.1.2.4.5
I1-19	Interior Style	Item I1-12	O/M	5.1.1.4.6, 5.1.2.4.6, 5.2.2.1.19, 5.2.2.2.18
I1-20	Edge Visibility	Item I1-12	O/M	5.1.1.4.7, 5.1.2.4.7

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Item	Feature	Predicate	Status Pack/Unpack	Reference (MIL-STD-2301)
I1-21	Edge Width	Item I1-12	O/M	5.1.1.4.8, 5.1.2.4.8
I1-22	Edge Type	Item I1-12	O/M	5.1.1.4.9, 5.1.2.4.9

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Table I-1. General CGM Requirements (cont'd.)

O = Optional M = Mandatory

Item	Feature	Predicate	Status Pack/Unpack	Reference (MIL-STD-2301)
I1-23	Edge Color	Item I1-12	O/M	5.1.1.4.10, 5.1.2.4.10
I1-24	Polygon	Item I1-12**	O/M	5.1.1.5.2, 5.1.2.5.2, 5.2.2.1.23, 5.2.2.2.22, 5.2.2.1.26, 5.2.2.2.25
I1-25	Ellipse	Item I1-12	O/M	5.1.1.5.3, 5.1.2.5.3, 5.2.2.1.27, 5.2.2.2.26
I1-26	Line Width	Item I1-12	O/M	5.1.1.4.11, 5.1.2.4.11, 5.2.2.1.16, 5.2.2.2.2.15
I1-27	Line Type	Item I1-12	O/M	5.1.1.4.12, 5.1.2.4.12, 5.2.2.1.18, 5.2.2.2.17
I1-28	Line Color	Item I1-12	O/M	5.1.1.4.13, 5.1.2.4.13
I1-29	Polyline	Item I1-12**	O/M	5.1.1.5.4, 5.1.2.5.4, 5.2.2.1.22, 5.2.2.2.21, 5.2.2.1.28, 5.2.2.2.27
I1-30	Elliptical Arc	Item I1-12	O/M	5.1.1.5.5, 5.1.2.5.5, 5.2.2.1.29, 5.2.2.2. 28
I1-31	Elliptical Arc Close	Item I1-12	O/M	5.1.1.5.6, 5.1.2.5.6, 5.2.2.1.30, 5.2.2.2.29
I1-32	Rectangle	Item I1-12	O/M	5.1.1.5.7, 5.1.2.5.7, 5.2.2.1.31, 5.2.2.2.30
I1-33	Circle	Item I1-12	O/M	5.1.1.5.8, 5.1.2.5.8, 5.2.2.1.32, 5.2.2.2.32
I1-34	Circular Arc Center	Item I1-12	O/M	5.1.1.5.9, 5.1.2.5.9, 5.2.2.1.33, 5.2.2.2.32
I1-35	Circular Arc Center Close	Item I1-12	O/M	5.1.1.5.9, 5.1.2.5.9, 5.2.2.1.34, 5.2.2.2.33
I1-36	End Picture	Item I1-36	M/M	5.1.1.1.4, 5.1.2.1.4, 5.2.1.1.4, 5.2.1.2.4, 5.2.2.1.6, 5.2.2.2.6
I1-37	End Metafile	Item I1-36	M/M	5.1.1.1.5, 5.1.2.1.5, 5.2.1.1.5, 5.2.1.2.5

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Table I-1. General CGM Requirements (cont'd.)

O = Optional M = Mandatory

Item	Feature	Predicate	Status Pack/Unpack	Reference (MIL-STD-2301)
I1-38	CGM Output required elements	Item I1-2, I1-3, I1-4, I1-5, I1-7, I1-8, (I1-9 or I1-10), I1-11, I1-12, (I1-24 or I1-31 with associated attributes), I1-39, I1-40	M/NA	5.2.2.2.1, 5.2.2.2.7, 5.2.2.2.8, 5.2.2.2.25, 5.2.2.2.27
I1-39	CGM Command		M/M	4.1
I1-40	Defaults colors for unsupported text.		NA/M	5.2.2.1.36
I1-41	CGM element substitution		NA/M	5.2.2.1.37
I1-42	CGM error message		NA/M	5.2.2.1.38
I1-43	Defaults		M/M	5.2.2.1.35, 5.2.2.2.34

** Must do either polygon or polyline with associated features as a minimum.

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Table I-2. General CGM Requirements, MIL-STD-2301A

O = Optional M = Mandatory

Item	Feature	Predicate	Status Pack/Unpack	Reference (MIL-STD-2301A)
I2-1	Binary Encoding Format		M/M	4.2, 5.1.2.7, 5.1.1.7.1
I2-2	Begin Metafile		M/M	5.1.1.1.1, 5.1.2.1.1, 5.2.1.1.1, 5.2.1.2.1, 5.2.2.2.3
I2-3	Metafile Version	Item I2-2	M/M	5.1.1.2.1, 5.1.2.2.1
I2-4	Metafile Description	Item I2-2	M/M	5.1.1.2.2, 5.1.2.2.2, 5.2.1.1.6, 5.2.2.1.2, 5.2.2.2.2,
I2-5	Metafile Element List	Item I2-2	M/M	5.1.1.2.3, 5.1.2.2.3
I2-6	Font List	Item I2-2	O/M	5.1.1.2.4, 5.1.2.2.4, 5.2.2.1.4, 5.2.2.2.12, 5.2.2.2.13
I2-7	Begin Picture	Item I2-2	M/M	5.1.1.1.2, 5.1.2.1.2, 5.2.1.1.2, 5.2.1.2.2, 5.2.2.2.3
I2-8	Color Selection Mode	Item I2-7	M/M	5.1.1.3.1, 5.1.2.3.1, 5.2.2.1.10, 5.2.2.2.9
I2-9	Edge Width Specification Mode	Item I2-7	O/M	5.1.1.3.2, 5.1.2.3.2, 5.2.2.1.8, 5.2.2.2.7
I2-10	Line Width Specification Mode	Item I2-7	O/M	5.1.1.3.3, 5.1.2.3.3, 5.2.2.1.9, 5.2.2.2.8
I2-11	VDC Extent	Item I2-7	M/M	5.1.1.3.4, 5.1.2.3.4, 5.2.2.1.7
I2-12	Begin Picture Body	Item I2-7	M/M	5.1.1.1.3, 5.1.2.1.3, 5.2.1.1.3, 5.2.1.2.3, 5.2.2.1.5, 5.2.2.2.5
I2-13	Text Color	Item I2-12	O/M	5.1.1.4.1, 5.1.2.4.1,
I2-14	Character Height	Item I2-12	O/M	5.1.1.4.2, 5.1.2.4.2, 5.2.2.1.21, 5.2.2.2.20
I2-15	Text Font Index	Item I2-12	O/M	5.1.1.4.3, 5.1.2.4.3, 5.2.2.1.14, 5.2.2.2.13
I2-16	Character Orientation	Item I2-12	O/M	5.1.1.4.4, 5.1.2.4.4, 5.2.2.1.11, 5.2.2.2.10
I2-17	Text	Item I2-12	O/M	5.1.1.5.1, 5.1.2.5.1, 5.2.2.1.20, 5.2.2.2.19, 5.2.2.1.25, 5.2.2.2.24
I2-18	Fill Color	Item I2-12	O/M	5.1.1.4.5, 5.1.2.4.5

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Table I-2. General CGM Requirements, MIL-STD-2301A (cont.)
O = Optional M = Mandatory

Item	Feature	Predicate	Status Pack/Unpack	Reference (MIL-STD-2301A)
I2-19	Interior Style	Item I2-12	O/M	5.1.1.4.6, 5.1.2.4.6, 5.2.2.1.19, 5.2.2.2.18
I2-20	Edge Visibility	Item I2-12	O/M	5.1.1.4.7, 5.1.2.4.7
I2-21	Edge Width	Item I2-12	O/M	5.1.1.4.8, 5.1.2.4.8
I2-22	Edge Type	Item I2-12	O/M	5.1.1.4.9, 5.1.2.4.9
I2-23	Edge Color	Item I2-12	O/M	5.1.1.4.10, 5.1.2.4.10
I2-24	Polygon	Item I2-12**	O/M	5.1.1.5.2, 5.1.2.5.2, 5.2.2.1.23, 5.2.2.2.22, 5.2.2.1.26, 5.2.2.2.25
I2-25	Ellipse	Item I2-12	O/M	5.1.1.5.3, 5.1.2.5.3, 5.2.2.1.27, 5.2.2.2.26
I2-26	Line Width	Item I2-12	O/M	5.1.1.4.11, 5.1.2.4.11, 5.2.2.1.16, 5.2.2.2.15
I2-27	Line Type	Item I2-12	O/M	5.1.1.4.12, 5.1.2.4.12, 5.2.2.1.18, 5.2.2.2.17
I2-28	Line Color	Item I2-12	O/M	5.1.1.4.13, 5.1.2.4.13
I2-29	Auxiliary Color	Item I2-12	O/M	5.1.1.6.1, 5.1.2.6.1, 5.2.2.1.35, 5.2.2.2.34
I2-30	Transparency	Item I2-12	O/M	5.1.1.6.2, 5.1.2.6.2, 5.2.2.1.36, 5.2.2.2.35
I2-31	Polyline	Item I2-12**	O/M	5.1.1.5.4, 5.1.2.5.4, 5.2.2.1.22, 5.2.2.2.21, 5.2.2.1.28, 5.2.2.2.27
I2-32	Elliptical Arc	Item I2-12	O/M	5.1.1.5.5, 5.1.2.5.5, 5.2.2.1.29, 5.2.2.2.28
I2-33	Elliptical Arc Close	Item I2-12	O/M	5.1.1.5.6, 5.1.2.5.6, 5.2.2.1.30, 5.2.2.2.29
I2-34	Rectangle	Item I2-12	O/M	5.1.1.5.7, 5.1.2.5.7, 5.2.2.1.31, 5.2.2.2.30
I2-35	Circle	Item I2-12	O/M	5.1.1.5.8, 5.1.2.5.8, 5.2.2.32, 5.2.2.2.31
I2-36	Polygon Set	Item I2-12	O/M	5.1.1.5.2.1, 5.1.2.5.2.1, 5.2.2.1.26, 5.2.2.2.25
I2-37	Circular Arc Center	Item I2-12	O/M	5.1.1.5.9, 5.1.2.5.9, 5.2.2.1.33, 5.2.2.2.33
I2-38	Circular Arc Center Close	Item I2-12	O/M	5.1.1.5.9, 5.1.2.5.9, 5.2.2.1.34, 5.2.2.2.33

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Table I-2. General CGM Requirements, MIL-STD-2301A (cont.)
O = Optional M = Mandatory

Item	Feature	Predicate	Status Pack/Unpack	Reference (MIL-STD-2301A)
I2-39	End Picture	Item I2-36	M/M	5.1.1.1.4, 5.1.2.1.4, 5.2.1.1.4, 5.2.1.2.4, 5.2.2.1.6, 5.2.2.2.6
I2-40	End Metafile	Item I2-36	M/M	5.1.1.1.5, 5.1.2.1.5, 5.2.1.2.5,
I2-41	CGM Output required elements	Item I2-2, I2-3, I2-4, I2-5, I2-7, I2-8, (I2-9 or I2-10), I2-11, I2-12, (I2-24 or I2-31 with associated attributes), I2-39, I2-40	M/N/A	5.2.2.2.1, 5.2.2.2.7, 5.2.2.2.8, 5.2.2.2.25, 5.2.2.2.27
I2-42	CGM Command		M/M	4.1
I2-43	Defaults colors for unsupported text.		N/A/M	5.2.2.1.38
I2-44	CGM element substitution		N/A/M	5.2.2.1.39
I2-45	CGM error message		N/A/M	5.2.2.1.40
I2-42	Degeneracy		M/N/A	5.2.2.2.37
I2-43	Defaults		M/M	5.2.2.1.37, 5.2.2.2.46

** Must do either polygon or polyline with associated features as a minimum.

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Appendix J -- Tactical Communications Protocol 2 (TACO2) Requirements

Table J-1. General TACO2 Requirements

O = Optional M = Mandatory

Item	Feature	Predicate	Status Xmit/Rcv	Reference (MIL-STD-2045-44500)
J-1	Protocol operates in a point to point configuration		M/M	
J-2	Protocol operates in point to multi-point configuration		O/O	
J-3	Protocol operates across a LAN		O/O	
J-4	Protocol operates across a WAN		O/O	
J-5	Protocol operates in simplex mode		M/M	5.2.8.1
J-6	Protocol operates in half-duplex mode		M/M	5.2.8.2
J-7	Protocol operates in full duplex mode		M/M	5.2.8.3
J-8	TACO2 operates using HDLC framing for synchronous communication	When equipped with sync port	M/M	5.4.3 (1)
J-9	TACO2 operates using SLIP framing for asynchronous communication	When equipped with async port	M/M	5.4.3. (2)
J-10	TACO2 uses Forward Error Correction (FEC)		O/O	5.4.2 (1)
J-11	TACO2 includes the FEC sublayer		O/O	5.4.2
J-12	Implementation checksums all DATA and LDATA packets		M/M	5.2.8.6.2 (1)
J-13	TACO2 implementation can be configured to interface and operate with a KY-57/58 as described in JIEO Specification 9137.		O/O	

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Table J-1. General TACO2 Requirements (cont'd.)

O = Optional M = Mandatory

Item	Feature	Predicate	Status Xmit/Rcv	Reference (MIL-STD-2045-44500)
J-14	TACO2 implementation can be configured to interface and operate with a KG-84 as described in JIEO Specification 9138		O/O	
J-15	TACO2 implementation can be configured to interface and operate with a KY-68 as described in JIEO Specification 9139		O/O	
J-16	TACO2 implementation can be configured to interface and operate with a STU-III as described in JIEO Specification 9140		M/M	
J-17	TACO2 implementation provides a mechanism for compressed packet headers		O/O	5.4.1
J-18	TACO2 implementation generates Echo reply messages in response to Echo request messages (Ping)		M/M	5.3.4.3.2
J-19	TACO2 Implementation shall provide the upper protocol layers with a Bit Error Rate Test facility		O/O	5.4.2.3.1
J-20	Bit Error Rate Test frame is formatted according to ref. paragraph 5.4.2.3.2		O/O	5.4.2.3.2
J-21	TACO2 implementation transfers the largest CLEVEL 3 file ~ 50 MB		O/M	

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Appendix K -- NITF 2.0 File Format Requirements

K.1 NITF 2.0 Compliance Tables

The following tables contain the file format constraints for minimum NITFS compliance and must be used with the NITF Version 2.0 military standard (Mil-Std-2500A).

- The term "NA" under Format Values indicates that this field is not applicable to a minimum compliant NITF 2.0 file.

Table K-1. File Header (NITF 2.0)

R = Required, O = Optional, C = Conditional

Field	Description	Size	Format Values	Type
FHDR	File Type & Version	9	NITF02.00	R
CLEVEL	Compliance Level	2	01-07, 00 & 08-99 Reserved	R
STYPE	System Type	4	4 Spaces (Reserved)	O
OSTAID	Originating Station ID	10	Alphanumeric (May not be all spaces)	R
FDT	File Date & Time	14	DDHHMMSSZMONYY	R
FTITLE	File Title	80	Alphanumeric	O
FSCLAS	File Security Classification	1	T, S, C, R, or U	R
FSCODE	File Codewords	40	Alphanumeric	O
FSCTLH	File Control and Handling	40	Alphanumeric	O
FSREL	File Releasing Instructions	40	Alphanumeric	O
FSCAUT	File Classification Authority	20	Alphanumeric	O
FSCTLN	File Security Control Number	20	Alphanumeric	O
FSDWNG	File Security Downgrade	6	Alphanumeric "______",YYMMDD,999998,999999	O
FSDEVT	File Downgrading Event	40	Alphanumeric If FSDWNG="999998"	C
FSCOP	File Copy Number	5	00000 default, or actual copy #	O
FSCPYS	File Number of Copies	5	00000 default, or actual count	O
ENCRYP	Encryption	1	0 = Not Encrypted (This field must contain the value 0)	R
FBKCG	File Background Color	3	0x00 to 0xFF	R
ONAME	Originator's Name	27	Alphanumeric	O
OPHONE	Originator's Phone Number	18	Alphanumeric	O

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Table K-1. File Header (NITF 2.0) (cont'd.)
R = Required, O = Optional, C = Conditional

Field	Description	Size	Format Values	Type
FL	File Length	12	000000000388-1213000 for CLEVEL 1 000000000388-999999999998 999999999999 for STREAMING_FILE_HEADER	R
HL	NITF Header Length	6	000388-002736	R
NUMI	Number of Images	3	000-020 All CLEVELs must pack at least 1 image CLEVEL REQUIREMENT 01-02 pack no more than 5 images 03-06 pack no more than 20 images 01-02 must unpack 0 to 5 images 03-06 must unpack 0 to 20 images	R
LISH001	Length of 1st Image Subheader	6	000439-202060	C
LI001	Length of 1st Image	10	Values calculated in bytes from image sizes ranging from 64 x 64 pixels to: CLEVEL REQUIREMENT 01 1K x 1K pixels by 1 & 8 bits (total file size not to exceed 1,213 kbs) 02 1k X 1k pixels by 1,8 & 24 bits 03 2K x 2K pixels by 1,8, & 24 bits 04 4K x 4K pixels by 1,8,12,16 & 24 bits 05 8K x 8K pixels by 1,8,12,16 & 24 bits 06 64K x 64K pixels 1,8,12 & 16 bits/pixel 07 9999999999 (CLEVEL 2-6 MAX FILE SIZE NOT TO EXCEED 2 GBYTES)	C

LISHn	Length of Nth Image Subheader	6	000439-202060	C
LIn	Length of Nth Image	10	Maximum aggregate of pixels of the 2nd to Nth Image must not exceed that of the maximum common coordinate system allowed per the respective CLEVEL	C
NUMS	Number of Symbols	3	000-100	R
LSSH001	Length of 1st Symbol Subheader	4	0258-0298	C

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Table K-1. File Header (NITF 2.0) (cont'd.)

R = Required, O = Optional, C = Conditional

Field	Description	Size	Format Values	Type
LS001	Length of 1st Symbol	6	Symbol data CLEVEL MAXIMUM AGGREGATE 01-02 131,072 (128k) 03 524,288 (.5 Meg) 04-06 1,048,576 (1 Meg)	C

LSSn	Length of Nth Symbol Subheader	4	0258-0298	C
LSn	Length of Nth Symbol	6	Symbol data	C
NUML	Number of Labels	3	000-100 Labels are discouraged, CGM text capability in Graphic Segment in encouraged.	R
LLSH001	Length of 1st Label Subheader	4	0212-0252	C
LL001	Length of 1st Label	3	Maximum aggregate size of all 100 labels: 2048 characters	C

LLSHn	Length of Nth Label Subheader	4	0212-0252	C
LLn	Length of Nth Label	3	Label data (1-320 characters)	C.
NUMT	Number of Text Segments	3	000-005 CLEVEL 01-02 000-032 CLEVEL 03-06	R
LTSH001	Length of 1st Text Subheader	4	0282-0322	C
LT001	Length of 1st Text Segment	5	Text data (1-99,999 characters) Maximum aggregate size of all text files: 100,000 characters	C

LTSHn	Length of Nth Text Subheader	4	0282-0322	C
LTn	Length of Nth Text Segment	5	Text data	C
NUMDES	Number of Data Extension Segments (DES)	3	000 (Will be 000 unless needed for TRE_OVERFLOW or STREAMING_FILE_HEADER data) However, if receiving other than 0 DES, the system must adjust itself to move past data and unpack the remainder of the file correctly	R
LDSH001	Length of 1st Data Extension Segment (DES) subheader	4	0200-9999	C
LD001	Length of 1st DES Data Field	9	000000000-999999999	C
LDSHn	Length of Nth data extension segment subheader	4	0200-9999	C
LDn	Length of Nth DES Data Field	9	000000000-999999999	C

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Table K-1. File Header (NITF 2.0) (cont'd.)
R = Required, O = Optional, C = Conditional

Field	Description	Size	Format Values		Type
NUMRES	Number of Reserved Extension Segments (RES)	3	000	However, if receiving other than 0 Data Extension segments, the system must adjust itself to move past data and unpack the remainder of the file correctly	R
LRSH001	Length of 1st RES subheader	4	0000-9999		C
LR001	Length of 1st RES	7	0000000-9999999		C
LRSHnnn	Length of Nth RES subheader	4	0000-9999		C
LRnnn	Length of Nth RES	7	0000000-9999999		C
UDHDL	User Defined Header Data Length	5	00000	If receiving user defined data, system must at least move past user data and unpack the remainder of the file correctly	R
UDHOFL	User Defined Header Overflow	3	000-999[3]		C
UDHD	User Defined Header Data	*	NA		C
XHDL	Extended Header Data Length	5	00000	If receiving Extended Data, the system must at least to move past Extended Data and unpack the remainder of the file correctly	R
XHOFL	Extended Header Overflow	3	000-999[4]		C
XHD	Extended Header Data	**	NA		C

* As specified by User Defined Header Data Length
** As specified by Extended Header Data Length

[3] If present, this field shall contain "000" if the tagged record extensions in UDHD do not overflow into a DES, or shall contain the sequence number of the DES into which they overflow. This 3-byte field must be included in the total byte count of UDHDL, above. The UDHOFL field shall be omitted if the UDHDL field contains a value of zero.

[4] If present, this field shall contain "000" if the tagged record extensions in XHD do not overflow into a DES, or shall contain the sequence number of the DES into which they overflow. This 3-byte field must be included in the total byte count of XHDL, above. The XHOFL field shall be omitted if the XHDL field contains a value of zero.

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Table K-2. Image Subheader (NITF 2.0)

Field	Description	Size	Format Values	Type
IM	File Part Type	2	IM	R
IID	Image ID	10	Must not be all spaces	R
IDATIM	Image Date & Time	14	DDHHMMSSZMONYY	O
TGTID	Target ID	17	BBBBBBBBBBFFFFFCC	O
ITITLE	Image Title	80	Alphanumeric	O
ISCLAS	Image Security Classification	1	T, S, C, R, or U	R
ISCODE	Image Codewords	40	Alphanumeric	O
ISCTLH	Image Control and Handling	40	Alphanumeric	O
ISREL	Image Releasing Instructions	40	Alphanumeric	O
ISCAUT	Image Classification Authority	20	Alphanumeric	O
ISCTLN	Image Security Control Number	20	Alphanumeric	O
ISDWNG	Image Security Downgrade	6	Alphanumeric,"______",YYMMDD,999999,999998	O
ISDEVT	Image Downgrading Event	40	Alphanumeric, IF ISDWNG=999998	C
ENCRYP	Encryption	1	0= Not Encrypted (This value must be 0)	R
ISORCE	Image Source	43	Alphanumeric	O
NROWS	Number of Significant Rows in image	8	00000064-00065536 (Based on CLEVEL) 00000064-00065536 (Based on CLEVEL)	R
NCOLS	Number of Significant Columns in image	8	INT,B	R
PVTYPE	Pixel value type	3	Alphanumeric Mono, RGB, RGB/LUT, YCbCr601	R
IREP	Image Representation	8	Monochrome: Pack and Unpack all CLEVELs RGB/LUT: Unpack CLEVELs 2-6 Pack Optional RGB(24 bit color): Unpack CLEVELs 2-6 Pack only if native YC_bC_r(3 bands) compress only (JPEG): Unpack CLEVELS 2-6 Pack if native color Multispectral: (MULTI)	R

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Table K-2. Image Subheader (NITF 2.0) (cont'd.)

Field	Description	Size	Format Values	Type
ICAT	Image Category	8	This field shall contain a valid indicator of the specific category (often revealing the nature of the collector or intended use) of imagery. Valid categories include: VIS, Visible imagery; SL, Side-looking radar; TI, Thermal Infrared, FL, Forward-Looking Infrared; RD, Radar; EO, Electro-Optical; OP, Optical; HR, High Resolution Radar; HS, Hyperspectral; VD, Video; CP, Frame Photography; BP, Black/White Frame Photography; MAP, for maps; SAR, Synthetic aperture Radar; MS, Multispectral; FP, Fingerprints; MRI, Magnetic Resonance Imagery; XRAY, for X-rays; and CAT, Computerized Axial Tomography.	R
ABPP	Actual Bits-per-pixel Per Band	2	01,08,11,12,13,14,15,16	O
PJUST	Pixel Justification	1	R	O
ICORDS	Image Coordinate System	1	U, G, C, or N	R
IGEOLO	Image Geographic Location	60	ddmmssXdddmmssY (4 times) or ggXYZmmmmmmmmmm (4 times)	C
NICOM	Number of Image Comments	1	0-9	R
ICOM1	Image Comment 1	80	Alphanumeric	C

ICOMn	Image Comment N	80	Alphanumeric	C
IC	Image Compression	2	NC - No Compression, C1- Bi-Level C3 - JPEG, C4 - VQ(not masked), M4 - VQ(masked), NM, M0, M3	R
COMRAT	Compression Rate	4	<u>IC</u> <u>COMRAT</u> C1 1D, 2DS, 2DH C3 00.0, 00.1, 00.2, 00.3, 00.4, 00.5 C4 nn.n M4 nn.n	C

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Table K-2. Image Subheader (NITF 2.0) (cont'd.)

Field	Description	Size	Format Values	Type
NBANDS	Number of Bands	1	1 or 3 CLEVEL NBANDS 1 1 2-6 1 or 3	R
IREPBAND1	1st Band Component Representation	2	Alphanumeric "__" (2 spaces) or "R_", or "Y_"	R
ISUBCAT1	1st Band Significance for Image Representation	6	Alphanumeric - (Default 6 spaces)	R
IFC1	1st Band Image Filter Condition	1	N	R
IMFLT1	1st Band STD Image Filter Code	3	Reserved - 3 spaces	R
NLUTS1	1st Band Number of LUTS	1	0 (mono w/o LUT), 1 (mono w/LUT), 3 (RGB/LUT)	R
NELUT1	1st Band Number of LUT Entries	5	Calculated	C
LUTD1 ---	1st Band Data of 1st LUT	♦	LUT data	C
LUTDmm ---	1st Band Data of mmth LUT	♦	LUT data	C
IREPBANDn	nnth Band Component Representation	2	For N=2 G or Cb, For N=3 B or Cr	C
ISUBCATn	nnth Band Significance for Image Representation	6	6 spaces	C
IFCn	nnth Band Image Filter Condition	1	N	C
IMFLTn	nnth Band STD Image Filter Code	3	Reserved - 3 Spaces	C
NLUTSn	nnth Band Number of LUTS	1	0 (No LUT except in band 1	C
NELUTn	nnth Band Number of LUT Entries	5	Calculated	C
LUTD1 ---	nnth Band Data of 1st LUT	♦	LUT Data	C
LUTDm	nnth Band Data of mmth LUT	♦	LUT Data	C

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Table K-2. Image Subheader (NITF 2.0) (cont'd.)

Field	Description	Size	Format Values		Type
ISYNC	Image Sync Code	1	0		R
IMODE	Image Mode	1	B (Band interleaved by block), P (Band interleaved by pixel), S (Band sequential (only valid for multiple block images and multiple bands))		R
NBPR	Number of blocks per row	4	0001-0256		R
NBPC	Number of blocks per column	4	0001-0256		R
NPPBH	# of pixels per block(horiz.)	4	0032-8192		R
NPPBV	# of pixels per block(vert.)	4	0032-8192		R
NBPP	# of bits-per-pixel per band	2	01,08,12,16		R
IDLVL	Display Level	3	001-999		R
IALVL	Attachment Level	3	000-998		R
ILOC	Image Location	10	RRRRRCCCCC relative to AL origin		R
IMAG	Image Magnification	4	Alphanumeric 1.0, /2 for 1/2, /4 for ¼, /8 for 1/8 /16 for 1/16, /32 for 1/32, /64 for 1/64, /128 for 1/128		R
UDIDL	User def. Img. data length	5	00000-99999	If receiving user defined data, the system must at least move past user data and unpack the remainder of the file correctly	R
UDOFL	User def overflow	3	000-999		C
UDID	User defined image data	*	Registered tagged record extensions		C
IXSHDL	Extended Subheader data	5	00000-99999	If receiving Extended Data, the system must at least move past the data and unpack the remainder of the file correctly	R
IXSOFL	Extended Subheader overflow	3	000-999		C
IXSHD	Extended Subheader data	**	Controlled tagged record extensions		C

♦ One byte each entry
* As specified by UDIDL
** As specified by IXSHDL

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Table K-3. Symbol Subheader (NITF 2.0)

Fields	Description	Size	Format Values	Type
SY	File part type	2	SY	R
SID	Symbol id	10	Alphanumeric (May not be all spaces)	R
SNAME	Symbol name	20	Alphanumeric	O
SSCLAS	Symbol security classification	1	T,S,C,R, OR U	R
SSCODE	Symbol codewords	40	Alphanumeric	O
SSCTLH	Symbol control and handling	40	Alphanumeric	O
SSREL	Symbol releasing instruct	40	Alphanumeric	O
SSCAUT	Symbol classification authority	20	Alphanumeric	O
SSCTLN	Symbol security control number	20	Alphanumeric	O
SSDWNG	Symbol security downgrade	6	Alphanumeric "______",YYMMDD,999999,999998	O
SSDEVT	Symbol downgrading event	40	Alphanumeric If FSDWNG="999998"	C
ENCRYP	Encryption	1	0=NOT ENCRYPTED (This value must be 0)	R
STYPE	Symbol type	1	B=Bit-mapped C=CGM O=Object (not used)	R
NLIPS	Number of lines per symbol	4	0000-9999	R
NPIXPL	Number of pixels per line	4	0000-9999	R
NWDTH	Line width	4	0000-9999 (Not used, default=0000)	R
NBPP	Number of bits-per-pixel	1	1 for Bit Mapped 0 for CGM symbols	R
SDLVL	Display level	3	001-999	R
SALVL	Attachment level	3	000-998	R
SLOC	Symbol location	10	RRRRRCCCCC	R
SLOC2	Second symbol location	10	RRRRRCCCCC	O
SCOLOR	Symbol color	1	N,K,W,R,O,B, & Y (Not applicable for CGM use space)	R
SNUM	Symbol number	6	000000 for Bit-map & CGM	O
SROT	Symbol rotation	3	000	R
NELUT	Number of LUT entries	3	000	R
DLUT	Symbol LUT data	*	(NEVER APPEAR)	C
SXSHDL	Extended Subheader data length	5	00000 — If receiving Extended Data, the system must at least move past the data and unpack the remainder of the file correctly	R
SXSOFL	Extended Subheader overflow	3	000-999	C
SXSHD	Extended Subheader Data	**	NA	C

* As specified by number of LUT entries
** As specified by Header Record Length

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Table K-4. Label Subheader (NITF 2.0)

Fields	Description	Size	Format Values	Type
LA	File part type	2	LA	R
LID	Label ID	10	Alphanumeric (May not be all spaces)	R
LSCLAS	Label security classification	1	T,S,C,R, OR U	R
LSCODE	Label codewords	40	Alphanumeric	O
LSCTLH	Label control and handling	40	Alphanumeric	O
LSREL	Label releasing instruct	40	Alphanumeric	O
LSCAUT	Label classification authority	20	Alphanumeric	O
LSCTLN	Label security control number	20	Alphanumeric	O
LSDWNG	Label security downgrade	6	Alphanumeric "______",YYMMDD,999999,999998	O
LSDEVT	Label downgrading event	40	Alphanumeric	C
ENCRYP	Encryption	1	0=Not encrypted (value must be 0)	R
LFS	Label font style	1	`Default "Space"	R
LCW	Label cell width	2	00 (Note: May provide font size if label fits in CLEVEL display area)	O
LCH	Label cell height	2	00-99 (Note: May provide font size if label fits in CLEVEL display area)	O
LDLVL	Display level	3	001-999	R
LALVL	Attachment level	3	000-998	R
LLOC	Label location	10	RRRRRCCCCC	R
LTC	Label text color	3	For CLEVEL 01 1,1,1 (Black) 255,255,255 (White) For CLEVEL 02-06 1,1,1 (Black) 255,255,255 (White) 255,0,0 (Red) 250,125,0 (Orange) 0,0,255, (Blue) 0,255,0 (Green) 250,250,0 (Yellow)	R
LBC	Label background color	3	1 byte R,G and B 0,0,0 (Transparent) 1,1,1 (Black) & 255,255,255 (White)	R
LXSHDL	Extended subheader data length	5	00000	R
LXSOFL	Extended subheader overflow	3	000-999	C
LXSHD	Extended Subheader data	**	NA	
			If receiving Extended Data, the system must at least move past the data and unpack the remainder of the file correctly	

** As specified by Header Record Length

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Table K-5. Text Subheader (NITF 2.0)

Fields	Description	Size	Format Values		Type
TE	File part type	2	TE		R
TEXTID	Text ID	10	Alphanumeric (May not be all spaces)		R
TXTDT	Text date and time	14	DDHHMMSSZMONYY		R
TXTITL	Text title	80	Alphanumeric		O
TSCLAS	Text security classification	1	T,S,C,R, OR U		R
TSCODE	Text codewords	40	Alphanumeric		O
TSCTLH	Text control and handling	40	Alphanumeric		O
TSREL	Text releasing instructions	40	Alphanumeric		O
TSCAUT	Text classification authority	20	Alphanumeric		O
TSCTLN	Text security control number	20	Alphanumeric		O
TSDWNG	Text security downgrade	6	Alphanumeric "______",yymmdd,999999,999998		O
TSDEVT	Text downgrading event	40	Alphanumeric		O
ENCRYP	Encryption	1	0=Not encrypted (This value must be 0)		R
TXTFMT	Text format	3	STA or MTF		R
TXSHDL	Extended Subheader data length	5	00000	If receiving Extended Data, the system must at least move past the data and unpack the remainder of the file correctly	R
TXSOFL	Extended Subheader overflow	3	000-999		C
TXSHD	Extended Subheader data length	**	NA		C

** As specified by Header Record Length

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Table K-6. Data Extension Segment Subheader (NITF 2.0)

Fields	Description	Size	Format Values	Type
DE	FILE PART TYPE	2	DE	R
DESTAG	UNIQUE DES TYPE IDENTIFIER	25	Alphanumeric	R
DESVER	VERSION OF THE DATA FIELD DEFINITION	2	01-99	R
DESSG	SECURITY GROUP	♦	Refer to (table xviii) of MIL-STD-2500 NITF Version 2.0	R
DESOFLW	OVERFLOWED HEADER TYPE	6	Alphanumeric	C
DESITEM	DATA ITEM OVERFLOWED	3	000 TO 999	C
DESSHL	LENGTH OF USER-DEFINED SUBHEADER FIELDS	4	0000-9999	R
DESSHF	USER DEFINED SUBHEADER FIELDS	*	Alphanumeric	C
DESDATA	USER-DEFINED DATA FIELD	**	User defined	R

♦ 167 OR 207- Refer to Table XVII of MIL-STD-2500 NITF VERSION 2.0

* Value specified in DESSHL

** Determined by user. If DESTAG = "Registered Extensions" or Controlled Extensions," this signifies the sum of the lengths of the tagged records

Table K-6A. Data Extension Segment Subheader (NITF 2.0) Controlled Extensions

Fields	Description	Size	Format Values	Type
DE	FILE PART TYPE	2	DE	R
DESTAG	UNIQUE DES TYPE IDENTIFIER	25	Controlled Extensions	R
DESVER	VERSION OF THE DATA FIELD DEFINITION	2	01-99	R
DESSG	SECURITY GROUP	†	Refer to (table xviii) of MIL-STD-2500 NITF Version 2.0	R
DESOFLW	OVERFLOWED HEADER TYPE	6	"XHD, IXSHD, SXSHD, TXSHD	R
DESITEM	DATA ITEM OVERFLOWED	3	000 TO 999	R
DESSHL	LENGTH OF USER-DEFINED SUBHEADER FIELDS	4	0000	R
DESDATA	USER-DEFINED DATA FIELD	**	Controlled Extensions	R

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Table K-6B. Data Extension Segment Subheader (NITF 2.0), Registered Extensions

Fields	Description	Size	Format Values	Type
DE	FILE PART TYPE	2	DE	R
DESTAG	UNIQUE DES TYPE IDENTIFIER	25	"Registered Extensions "	R
DESVER	VERSION OF THE DATA FIELD DEFINITION	2	01-99	R
DESSG	SECURITY GROUP	†	Refer to (table xviii) of MIL-STD-2500 NITF Version 2.0	R
DESOFLW	OVERFLOWED HEADER TYPE	6	UDHD, UDID	R
DESITEM	DATA ITEM OVERFLOWED	3	000 TO 999	R
DESSHL	LENGTH OF USER-DEFINED SUBHEADER FIELDS	4	0000	R
DESDATA	USER-DEFINED DATA FIELD	**	Registered Extensions	R

Table K-6C. Data Extension Segment Subheader (NITF 2.0) STREAMING_FILE_HEADER

Fields	Description	Size	Format Values	Type
DE	FILE PART TYPE	2	DE	R
DESTAG	UNIQUE DES TYPE IDENTIFIER	25	STREAMING_FILE_HEADER	R
DESVER	VERSION OF THE DATA FIELD DEFINITION	2	01	R
DESSG	SECURITY GROUP	†	Refer to (table xviii) of MIL-STD-2500 NITF Version 2.0	R
DESSHL	LENGTH OF USER-DEFINED SUBHEADER FIELDS	4	0000	R
SFHL	Length of SFHDR field	7	0000000-9999999	R
SFHDELIM1	Unique Delimiter 1	4	0x0A6E1D97	R
SFHDR	Replacement Data			R
SFHDELM2	Unique Delimiter 2	4	0x0ECA14BF	R
SFHL	Length of SFHDR field	7	0000000-9999999	R

† 167 OR 207- Refer to TABLE XVII of MIL-STD-2500A NITF VERSION 2.0

DESTAG = "Registered Extensions" or Controlled Extensions," this signifies the sum of the lengths of the tagged records.

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Appendix L -- NITF Version 1.1 Requirements

Table L-1. NITF 1.1 Minimum Compliance

(See note 1)

Message Constraints for NITF 1.1

Compliance Header

Field	Description	Size	Format Values	Type
MHDR	Message Type & Version	9	NITF01.10	R
STYPE	System Type	6	6 spaces	O
OSTAID	Originating Station ID	10	ASCII	R
MDT	Message Date & Time	14	DDHHMMSSZMONYY	
MTITLE	Message Title	80	ASCII	O
MSCLAS	Message Security Classification	1	T, S,C R, or U	R
MSCODE	Message Codewords	40	Alphanumeric	O
MSCTLH	Message Control and Handling	40	Alphanumeric	O
MSREL	Message Releasing Instructions	40	Alphanumeric	O
MSCAUT	Message Classification Authority	20	Alphanumeric	O
MSCTLN	Message Security Control Number	20	Alphanumeric	O
MSDWNG	Message Security Downgrade	6	Alphanumeric	O
MSDEVT	Message Downgrading Event	40	Alphanumeric	C
MSCOP	Message Copy Number	5	0-99999	O
MSCPYS	Message Number of Copies	5	0-99999	O
ONAME	Originator's Name	27	ASCII	O
OPHONE	Originator's Phone Number	18	ASCII	O
ML	Message Length	12	Calculated	R
HL	NITF Header Length	6	Calculated	R
NUMI	Number of Images	3	0-5	R
LISH001	Length of 1st Image Subheader	6	Calculated	C
LI001	Length of 1st Image	10	Values obtained from image sizes 8x8 to 512x512 by 1-8 bits	C
LISHnnn	Length of Nth Image Subheader	6	Calculated	C
Linnn	Length of Nth Image	10	Maximum aggregate size of 2nd to Nth Image is 50% of 512^2 X 8 bits (uncompressed)	

Note 1: This table is taken directly from NITF version 1.1 Certification Plan Volume II, January 1990.
Shaded areas indicate a constrained format value which deviates from the NITF version 1.1 document.

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Message Constraints for NITF 1.1

Compliance Header (cont'd.)

Field	Description	Size	Format Values	Type
NUMS	Number of Symbols	3	000-100	R
LSSH001	Length of 1st Symbol Subheader	4	Calculated	C
LS001	Length of 1st Symbol	6	Max aggregate size for all 100 symbols is 512^2 bits	

LSSHnnn	Length of Nth Symbol Subheader	4	Calculated	C
LSnnn	Length of Nth Image	6	Superseded by LS001	
NUML	Number of Labels	3	000-100	R
LLSH001	Length of 1st Label Subheader	4	Calculated	C
LL001	Length of 1st Label	3	Max aggregate size for all 100 labels is 2000 characters	C

LLSHnnn	Length of Nth Label Subheader	4	Calculated	C
LLnnn	Length of Nth Label	3	Superseded by LL001	C
NUMT	Number of Text Files	3	0-5	R
LTSH001	Length of 1st Text Subheader	4	Calculated	C
LT001	Length of 1st Text File	5	Max aggregate size for all 5 text files is 10,000 characters	

LTSHnnn	Length of Nth Text Subheader	4	Calculated	C
LTnnn	Length of Nth Text File	5	Superseded by LT001	
NUMA	Number of Audio Segments	3	000	R
LASH001	Length of 1st Audio Subheader	4	NA	C
LA001	Length of 1st Audio Segment	9	NA	C

LASHnnn	Length of Nth Audio Subheader	4	NA	C
LAnnn	Length of Nth Audio Segment	9	NA	C
NUMF	Number of Non-Static Presentation Information Files (NPI)	3	000	R

LFSH001	Length of 1st NPI Subheader	4	NA	C
LF001	Length of 1st NPI File	7	NA	C

LFSHnnn	Length of Nth NPI Subheader	4	NA	C
LFnnn	Length of Nth NPI File	7	NA	C

UDHDL	User Defined Header Data Length	5	00000	R
UDHD	User Defined header Data	*	NA	C
XHDL	Extended Header Data length	5	00000	R
XHD	Extended Header Data	**	NA	C

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Message Constraints for NITF 1.1 Compliance

Image Subheader

Field	Description	Size	Format Values	Type
IM	Message Part Type	2	IM	R
IID	Image ID	10	ASCII	R
IDATIM	Image Date & Time	14	DDHHMMSSZMONYY	O
TGTID	Target ID	17	BBBBBBBBBBFFFFFC C	O
ITITLE	Image Title	80	ASCII	O
ISCLAS	Image Security Classification	1	T, S, C, R or U	R
ISCODE	Image Codewords	40	Alphanumeric	O
ISCTLH	Image Control and Handling	40	Alphanumeric	O
ISREL	Image Releasing Instructions	40	Alphanumeric	O
ISCAUT	Image Classification Authority	20	Alphanumeric	O
ISCTLN	Image Security Control Number	20	Alphanumeric	O
ISDWNG	Image Security Downgrade	6	Alphanumeric	O
ISDEVT	Image Downgrading Event	40	Alphanumeric	C
ENCRYP	Encryption	1	0= Not Encrypted 1=Encrypted	R
ISORCE	Image Source	80	ASCII	O
ICORDS	Image Coordinate System	1	U, G, C, or N	R
IGEOLO	Image Geographic Location	60	ddmmssXdddmmssY (4 times) or, ggxyzmmmmmmmmm m (4 times)	
NICOM	Number of Image Comments	1	0-9	R
ICOM1	Image Comment 1	80	ASCII	C

ICOMnn	Image Comment N	80	ASCII	C
IC	Image Compression	2	NC or C2	R
COMRAT	Compression Rate Code	4	All C2 Values	C
NBANDS	Number of Bands	1	1	R
ITYPE1	1st Band Image Type	8	ASCII	R
IFC1	1st Band Image Filter Condition	1	N	
IMFLT1	1st Band Standard Image Filter Code	3	Reserved	
NLUTS1	1st Band Number of LUTS	1	0 (assume linear ramp)	
NELUT1	1st Band Number of LUT Entries	5	NA	C
LUTD1	1st Band Data of 1st LUT	+	NA	

LUTDnn	1st Band Data of Nth LUT	+	NA	C

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Message Constraints for NITF 1.1 Compliance

Image Subheader (cont'd.)

Field	Description	Size	Format Values	Type
ITYPEnn	Nth Band Image Type	8	NA	
IFCnn	Nth Band Image Filter Condition	1	NA	
IMFLTnn	Nth Band Standard Image Filter Code	3	NA	
NLUTSnn	Nth Band Number of LUTS	1	NA	
NELUTnn	Nth Band Number of LUT Entries	5	NA	C
LUTD1	Nth Band Data of 1st LUT	+	NA	

LUTDnn	Nth Band Data of Nth LUT	+	NA	C
ISYNC	Image SYNC Code	1	0	
IMODE	Image Mode	1	S	R
NBPR	Number of Blocks Per Row	4	0001	
NBPC	Number of Blocks Per Column	4	0001	
NPPBH	Number of Pixels Per Block Horizontal	4	0008-0512	
NPPBV	Number of Pixels Per Block Vertical	4	0008-0512	
NBPP	Number of Bits-Per-Pixel Per Band	2	01-08	
DLVL	Display Level	3	000-999	R
ALVL	Attachment Level	3	000-998	R
ILOC	Image Location	10	rrrrrccccc	
IMAG	Image Magnification	4	Alphanumeric	R
UDIDL	User Defined Image Data Length	5	00000	
UDID	User Defined Image Data	*	NA	C
XSHDL	Extended Subheader Data Length	5	00000	
XSHD	Extended Subheader Data	**	NA	C

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Message Constraints for NITF 1.1 Compliance

Symbol Subheader

Field	Description	Size	Format Values	Type
SY	Message Part Type	2	SY	R
SID	Symbol ID	10	ASCII	R
SNAME	Symbol Name	20	Alphanumeric	O
SSCLAS	Symbol Security Classification	1	T, S, C, R or U	R
SSCODE	Symbol Codewords	40	Alphanumeric	O
SSCTLH	Symbol Control and Handling	40	Alphanumeric	O
SSREL	Symbol Releasing Instructions	40	Alphanumeric	
SSCAUT	Symbol Classification Authority	20	Alphanumeric	O
SSCTLN	Symbol Security Control Number	20	Alphanumeric	O
SSDWNG	Symbol Security Downgrade	6	Alphanumeric	O
SSDEVT	Symbol Downgrading Event	40	Alphanumeric	C
ENCRYP	Encryption	1	0=Not Encrypted 1=Encrypted	R
STYPE	Symbol Type	1	B=Bit-Mapped	R
NLIPS	Number of Lines Per Symbol	4	0001-0512	R
NPIXPL	Number of Pixels Per Line	4	0001-0512	R
NWDTH	Line Width	4	0000-9999	R
NBPP	Number of Bits-Per-Pixel	1	1	R
DLVL	Display Level	3	000-999	R
ALVL	Attachment Level	3	000-998	R
SLOC	Symbol Location	10	rrrrrccccc	R
SLOC2	Second Symbol Location	10	rrrrrccccc	O
SCOLOR	Symbol Color	1	N, K, and W	R
SNUM	Symbol Number	6	Alphanumeric	O
SROT	Symbol Rotation	3	000	R
NELUT	Number of LUT Entries	3	000	R
DLUT	Symbol LUT Data	+	Pixel value in order	C
XSHDL	Extended Subheader Data Length	5	00000	R
XSHD	Extended Subheader Data	*	NA	C

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Message Constraints for NITF 1.1 Compliance

Label Subheader

Field	Description	Size	Format Values	Type
LA		2	LA	R
LID		10	ASCII	R
LSCLAS		1	T, S, C, R, or U	
LSCODE		40	Alphanumeric	O
LSCTLH		40	Alphanumeric	
LSREL		40	Alphanumeric	
LSCAUT		20	Alphanumeric	
LSCTLN		20	Alphanumeric	
LSDWNG		6	Alphanumeric	O
LSDEVT		40	Alphanumeric	C
ENCRYP		1	0=Not Encrypted 1=Encrypted	
LFS		3	3 Spaces	R
LFZ		2	00	
DLVL		3	000-999	R
ALVL		3	000-998	R
LLOC		10	rrrrrccccc	
LTC		3	0, 0, 0 (Transparent) and 1, 1, 1 (Black) and	
LBC		3	0, 0, 0 (Transparent) and 1, 1, 1 (Black)	
XSHDL		5	00000	
XSHD		*	NA	C

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Message Constraints for NITF 1.1 Compliance

Text Subheader

Field	Description	Size	Format Values	Type
TE		2	TE	R
TEXTID		10	ASCII	
TXTDT		14	DDHHMMSSZMONYY	R
TXTITL		80	ASCII	O
TSCLAS		1	T, S, C, R, or U	
TSCODE		40	Alphanumeric	O
TSCTLH		40	Alphanumeric	O
TSREL		40	Alphanumeric	
TSCAUT		20	Alphanumeric	
TSCTLN		20	Alphanumeric	
TSDWNG		6	Alphanumeric	O
TSDEVT		40	Alphanumeric	C
ENCRYP		1	0=Not Encrypted 1=Encrypted	
TXTFMT		3	STA	R
XSHDL		5	00000	
XSHD		*	NA	C