

# Space Station Inventory Management System Bar Code Label Requirements and Specification

## International Space Station Program

Revision B

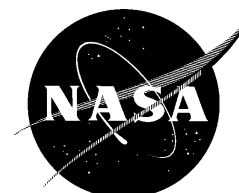
May 2001



*Russian  
Space  
Agency*



National Aeronautics and Space Administration  
International Space Station Program  
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Houston, Texas



REVISION AND HISTORY PAGE

REV.	DESCRIPTION	PUB. DATE
-	Initial Release (Reference per SSCBD 000008R1, EFF. 06-03-94)	06-21-94
	SCN 001 (Reference per ECP 000264)	07-30-98
A	Revision A (Reference per SSCN 000258, EFF. 07-30-98)	10-16-98
B	Revision B (Reference per SSCN 001939, EFF. 06-19-01)	07-17-01

ERU: /s/ Mary C. Nooney 7-17-01

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**Revision B**

**INTERNATIONAL SPACE STATION PROGRAM**

**SPACE STATION INVENTORY MANAGEMENT**  
**SYSTEM BAR CODE LABEL REQUIREMENTS AND SPECIFICATION**

**MAY 2001**

PREFACE

**SPACE STATION INVENTORY MANAGEMENT  
SYSTEM BAR CODE LABEL REQUIREMENTS AND SPECIFICATION**

The contents of this document are intended to be consistent with the tasks and products to be prepared by the International Space Station (ISS) Program Participants as defined in SSP 41000, System Specification for the International Space Station, modified by Space Station Change Notice (SSCN) 001939. This document is under the control of the Space Station Control Board (SSCB), and any changes or revisions will be approved by the Program Manager.

This document includes the introduction, scope, authority, and responsibilities for the management of Inventory Management System (IMS) labels with respect to all of the Space Station elements.

This document establishes the IMS label specification and requirements for the ISS Program including International Partners (IPs). The IMS label is used on the interior (pressurized) and exterior (unpressurized) regions of the ISS. The IMS label is designed for tracking and monitoring of loose, stowed, and installed hardware while on-orbit and on the ground.

  
Tommy W. Holloway  
Space Station Control Board Chair

6-11-01  
Date

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SYSTEM BAR CODE LABEL REQUIREMENTS AND SPECIFICATION

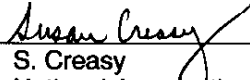
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MAY 2001

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SYSTEM BAR CODE LABEL REQUIREMENTS AND SPECIFICATION

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SYSTEM BAR CODE LABEL REQUIREMENTS AND SPECIFICATION

LIST OF CHANGES

MAY 2001

All changes to paragraphs, tables, and figures in this document are shown below:

<b>SSCB</b>	<b>Entry Date</b>	<b>Change</b>	<b>Paragraph(s)</b>
	March 1994	Baseline	All
	November 1996	Revision A	All
	June 2001	Revision B	All

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## **1.0 INTRODUCTION**

This document provides the requirements and specifications for the Inventory Management System (IMS) bar code labels for the International Space Station (ISS). Related rationale and background information is found in the appendices.

### **1.1 PURPOSE**

This document prescribes the specifications, requirements, and processes for using IMS bar code labels on the ISS. The IMS bar code labels shall be used for automated identification and tracking of consumables, loose equipment, Line Replacement Units (LRUs), Orbital Replacement Units (ORUs), assemblies, and subassemblies while on-orbit and on the ground.

### **1.2 SCOPE**

This specification is applicable to all ISS orbital and ground training segment loose or replaceable hardware requiring handling or processing.

### **1.3 PRECEDENCE**

IMS label requirements in this document are applicable as referenced by: SSP 41000, System Specification for the International Space Station; ISS System and Segment Specifications; Prime Item Development Specifications (PIDS) and component specifications; SSP 57000, Pressurized Payloads Interface Requirements Document; and SSP 50158, International Space Station Supporting Development Implementation Document (SDID) Government Furnished Equipment (GFE) and Flight Crew Equipment (FCE). Requirements for labeling Russian hardware are included in the Russian Standards Documents, the Design and Engineering Documents, and the Operational Procedures Documents.

The precedence for applying labels and documentation configuration management is referenced in JSC-SPEC-M1, Specification Marking and Identification, NSTS 5300.4 (1D-2), Safety, Reliability, Maintainability and Quality Provisions for the Space Shuttle Program, and MIL-STD-1472E, Human Engineering Design Criteria for Military Systems, Equipment, and Facilities.

In case of conflict between this document and any of the ISS specifications, the requirements of the referencing specification will take precedence.

### **1.4 DELEGATION OF AUTHORITY**

This specification is the responsibility of the ISS Program office. This document is subject to Space Station Control Board (SSCB) change control.

## **2.0 DOCUMENTS**

### **2.1 APPLICABLE DOCUMENTS**

The following documents include specifications, models, standards, guidelines, handbooks, and other special publications. The current issue of the following documents is identified in the Program Automated Library System (PALS) (<http://issa-www.jsc.nasa.gov/cgi-bin/dsdl+ORAP?-h+palshome>). The documents listed in this paragraph are applicable to the extent specified herein. Inclusion of applicable documents herein does not in any way supersede the order of precedence identified in Paragraph 1.3 of this document.

SSP 30233	Space Station Requirements for Materials and Processes
SSP 41000	System Specification for the International Space Station
SSP 50158	International Space Station Supporting Development Implementation Document (SDID) Government Furnished Equipment (GFE) and Flight Crew Equipment (FCE)
SSP 50254	Operations Nomenclature
SSP 57000	Pressurized Payloads Interface Requirements Document
NASA-STD-6001	Flammability, Odor, Offgassing, and Compatibility Requirements and Test Procedures for Materials in Environments That Support Combustion
NSTS 22648	Flammability Configuration Analysis for Spacecraft Applications
JSC 27260	Decal Process Document and Catalog
JSC SPEC-M1	Specification Marking and Identification
ANSI/AIM-BC1-1995	Uniform Symbology Specification Code 39 (replaces MIL-STD-1189B)
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-810	Environmental Engineering Considerations and Laboratory Tests
SP-R-0022A	Vacuum Stability Requirements of Polymeric Materials for Spacecraft Application

## **2.2 REFERENCE DOCUMENTS**

The following documents contain supplemental information to guide the user in the application of this document. These reference documents may or may not be specifically cited within the text of this document.

SSP 41160	Segment Specification for the European Space Agency Attached Pressurized Module
SSP 41162	Segment Specification for the United States On-Orbit
SSP 41164	Italian Mini-Pressurized Logistics Segment
SSP 41165	Segment Specification for the Japanese Experiment Module
SSP 41167	Mobile Servicing System Segment Specification for the International Space Station Program
SSP 50005	International Space Station Flight Crew Integration Standard (NASA-STD-3000/T)
SSP 50094	NASA/RSA Joint Specifications Standards Document for the ISS Russian Segment
SSP 50200-05 Part 1	Station Program Implementation Plan, Volume 5: Logistics and Maintenance Part 1: Maintenance
SSP 50200-05 Part 2	Station Program Implementation Plan, Volume 5: Logistics and Maintenance Part 2: Logistics
SSP 50200-08	Station Program Implementation Plan, Volume 8: Increment Execution Preparation
SSP 50200-09	Station Program Implementation Plan, Volume 9: Real-Time Operations
SSP 50290	Prime Item Development Specification for Node 2
SSP 50452	Prime Item Development Specification for Habitation Element A (HAB A)
SSP 5410X-XX	Increment Definition and Requirements Document for Planning Period X, Annex 1: Station Manifest (Series of Annexes of Flight-Specific Station Manifests)

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NSTS 5300.4 (ID-2)	Safety, Reliability, Maintainability and Quality Provisions for the Space Shuttle Program
MIL-STD-1472E	Human Engineering Design Criteria for Military Systems, Equipment, and Facilities
S684-10101	Critical Item Development Specification for Rack Standard/Payload
S684-10102	Prime Item Development Specification for Node 1
S684-10109	Prime Item Development Specification for Photovoltaic Module S4, International Space Station
S684-10111	Prime Item Development Specification for Integrated Truss Segment S0
S684-10115	Prime Item Development Specification Pressurized Mating Adapter-1 (PMA-1)
S684-10117	Prime Item Development Specification for Cupola
S684-10122	Prime Item Development Specification for Photovoltaic Module P4, International Space Station
S684-10123	Prime Item Development Specification for Truss Element, Short Spacer, S5
S684-10124	Prime Item Development Specification for Photovoltaic Module S6, International Space Station
S684-10126	Prime Item Development Specification for Extravehicular Activity (EVA) Aids
S684-10127	Prime Item Development Specification for Resupply/Return Containment
S684-10142	Prime Item Development Specification for Airlock, International Space Station
S684-10143	Prime Item Development Specification for Station Management and Control
S684-10150	Prime Item Development Specification for Truss Element, Short Spacer, P5, International Space Station

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S685-10151	Prime Item Development Specification for Photovoltaic Module P6, International Space Station
S684-10154	Prime Item Development Specification for Truss Segment Z1
S684-10158	Prime Item Development Specification for the Active Rack Isolation System
S684-10159	Critical Item Development Specification for the Assembly Power Converter Unit
S683-29523	Prime Item Development Specification for United States Laboratory
S683-29823	Prime Item Development Specification for the Refrigerator/Freezer Rack
SP-M-010	Critical Item Development Specification for Mobile Transporter
SP-M-229	Prime Item Development Specification for Integrated Truss Segment, S3
SP-M-231	Prime Item Development Specification for Integrated Truss Segment S1
SP-M-235	Prime Item Development Specification for Integrated Truss Segment P3
SP-M-301	Prime Item Development Specification for the Pressurized Mating Adapter

### **3.0 REQUIREMENTS**

#### **3.1 GENERAL**

All items in the ISS IMS shall be tracked electronically using IMS bar code labels attached to the hardware, except when the hardware is too small to support a label or when application of a label to the hardware will impede its functionality.

The IMS label is separate and distinct from the manufacturer or vendor labels, which contain the nomenclature, manufacturer's code, part number or batch-serial number, and stock or equivalent number per MIL-STD-130, Identification Marking of U.S. Military Property, Paragraph 5.3.1.

The IMS label shall provide information to access the inventory and maintenance databases for location, status, maintenance, and resupply information.

IMS labels shall be capable of being read by an automated type reader device.

#### **3.2 IMS LABEL APPLICATION REQUIREMENTS**

A. The following Space Station items shall have IMS bar code labels attached:

1. All stowage containers including racks, lockers, trays, bags, refrigerators/ freezers, and glove boxes.
2. All loose equipment, e.g., cables, instruments, Flight Support Equipment (FSE), and Orbital Support Equipment (OSE).
3. Consumables (e.g., food containers, batteries, film, etc., in multipack containers).
4. All LRUs and ORUs.
5. All payload equipment and experiment items that will require inventory tracking.

B. Installed ORUs and hardware that may be removed and stowed on-orbit for return to the ground shall be labeled, if accessible, by ground processing personnel prior to final closeout and launch package integration. If these items are not labeled due to accessibility or ground processing constraints and will eventually return to orbit, then labels shall be applied to each item after it has been returned to the ground and before it is returned to orbit.

C. Loose equipment is defined as any Extravehicular Activity (EVA) or Intravehicular Activity (IVA) item on a resupply, utilization, or assembly flight. As such, loose equipment includes all consumables, items stowed in stowage trays, replacement ORUs, etc., as listed above. Kits and, when appropriate, kit contents shall require an IMS label. In the event kit components are too small for labels, their identity will still be recorded and tracked in the IMS.

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- D. The label size chosen from the available options shall be the largest standard label the item can accept to optimize readability.
- E. Special use labels shall be available for special applications.

**3.3 IMS LABEL LOCATION SPECIFICATIONS AND REQUIREMENTS**

**3.3.1 LOCATION SPECIFICATIONS**

Labels shall be applied in accordance with JSC-SPEC-M1, Paragraph 3.2, whereby the locations of labels are specified on the engineering drawings and the labels are applied such that they can be read after assembly or installation when practical. Labels on items without being included in engineering drawings do not constitute a discrepancy, and the item shall not be out of configuration.

**3.3.2 LOCATION REQUIREMENTS**

- A. IMS labels shall be secured to all installed and loose equipment and items requiring handling (such as trays, racks, bags, consumables, crew equipment, ORUs, etc.) in such a manner that they are readable by the unaided human eye and by an automated reader device.
- B. IMS labels shall be applied in accordance with applicable manufacturer drawings. However, if manufacturer drawings do not include IMS labels, then labels shall be applied adjacent to the manufacturer or vendor label. If there is no room adjacent to the manufacture or vendor label, then the IMS label shall be applied to the nearest available surface that will not impede the unit's functionality.
  - 1. The preferred method of assuring IMS labels are applied to all hardware to be delivered to the ISS is for the hardware provider to apply these labels to their hardware. Hardware providers that do not apply IMS labels to their hardware shall be responsible for providing engineering drawings, sketches, or text instructions for label application to the applicable hardware integrator or activity responsible for applying labels.
  - 2. IMS labels shall be applied so as to be visible on stowed equipment items (label up) when practical.
  - 3. Placement on curved surfaces, e.g., the radius of the curve extends horizontally across the label, shall be avoided whenever possible. Curved surfaces, such as tubing, are suitable for labels as long as the label is placed along the length of the tube so that the label curve radius is perpendicular to the bar code.
- C. IMS flag style labels applied to cables shall be positioned in the center of the cable.



**3.4 EXCEPTIONS**

- A. Small loose items, such as screws and other consumables, shall be bagged and IMS labels shall be placed on the bag.
- B. When the science can be compromised, labels shall not be placed on experiment samples.

**3.4.1 BAR CODE LABEL WAIVERS**

Requests for waivers to not apply labels to hardware shall be submitted to the Cargo Planning and Imagery Office for concurrence and subsequent approval by the Mission Integration and Operations Control Board (MIOCB). Examples of items that may be approved for a waiver are presented in Figure 3.4.1-1, Bar Code Labeling Waiver Examples. Items that are exempt from labels and do not require waivers are shown in the table in Appendix B.

- A. The agency or equipment provider shall request a waiver to not apply a label for items that are not obviously incapable of having an IMS bar code label applied such as small tools, individual consumables, and other small items.
- B. The Cargo Planning and Imagery IMS activity shall receive requests for waivers and present the requests to the MIOCB for approval. After approval from the MIOCB, the waivers shall serve as the authority for granting a no-label exception and shall support the requirements for Certification of Flight Readiness (CoFR).

<b>Items</b>	<b>No Label Rationale</b>	<b>Other Markings Used For Tracking</b>	<b>Comments</b>
Small tools.	Too small or interferes with functional surface.	Part number, tool size.	Unique IMS number assigned.
Disposable waste containers, small batteries.	Consumable and no real estate for label on individual items.	No other markings.	Bar code label shall be placed on container for multiple items. IMS database will reflect a multiple quantity per package.
Small electronic parts (cards, adapter pins, bezels, etc.).	No real estate for label.	Part number, serial number.	Bar code label shall be placed on the item bag or protective covering. If stowed without covering, then a unique IMS number shall be assigned.
Pantry consumables, administrative supplies, crew clothing.	No real estate, adhesive will not stick to material, consumables too small. Ground rules prohibit tracking individual personal crew items.	Name, part numbers.	Bar code label shall be placed on container for multiple items. IMS database will reflect a multiple quantity per individually stowed package.

**FIGURE 3.4.1-1 BAR CODE LABELING WAIVER EXAMPLES**

### **3.5 RESPONSIBILITIES**

#### **3.5.1 IMS BAR CODE LABEL MANUFACTURING AND DISTRIBUTION**

IMS labels are provided as GFE by the Johnson Space Center (JSC) Decal Design and Production Facility (DDPF) to ISS Participants as standard labels in accordance with JSC 27260, Decal Process Document and Catalog. Kennedy Space Center (KSC) may produce and apply IMS labels during their physical integration process but must assure duplicate numbers are never produced. International Partners (IPs) and Payload Developers (PDs) may produce and apply their own labels after coordinating IMS number assignment with the Cargo Planning and Imagery Office and in accordance with the manufacturing standards in this document.

#### **3.5.2 AGENCY AND EQUIPMENT PROVIDERS**

- A. The agency or equipment provider requiring labels shall request IMS labels by submitting JSC Forms 733 and 733A, IMS Label Request Form, to the Cargo Planning and Imagery Office for IMS number approval and assignment. The Cargo Planning and Imagery Office will route the approved JSC Forms 733/733A to the JSC DDPF for manufacturing and distribution.
- B. Blocks of IMS numbers ranging from 00,000,001 to ZZ,ZZZ,ZZZ are reserved for each hardware provider and are controlled by the Cargo Planning and Imagery Office.
- C. Specific IMS numbers that may assist in identifying items to the hardware owner may be requested by the agency or equipment provider by submitting form JSC 733A along with the basic form JSC 733 to the Cargo Planning and Imagery Office for approval and assignment.
- D. The agency or equipment provider shall assure engineering drawings, illustrations, or other authoritative documentation indicating the IMS label location is available to the activity responsible for applying labels.
- E. The agency or equipment provider shall provide to the Cargo Planning and Imagery Office barcode and serial numbers of manifested hardware to which barcode labels have been applied.

#### **3.5.3 NASA JSC ISS PROGRAM OFFICE**

- A. The Cargo Planning and Imagery Office is responsible for providing IMS label requirements and specifications to all ISS Participants. The IMS function shall control and maintain a log of all IMS numbers assigned to ensure that labels with duplicate numbers are not produced.
- B. The Cargo Planning and Imagery Office shall assign IMS numbers sequentially as requests for the labels are received. When requests for specific IMS numbers are received, the Cargo Planning and Imagery Office will ensure that the numbers have not been previously assigned. In the event of a duplicate number request, the

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Cargo Planning and Imagery Office will contact the requester to identify alternate numbers available prior to assigning the next sequentially available numbers.

- C. The Cargo Planning and Imagery Office will assure that barcode label data is provided to the Mission Operations Directorate IMS function for inclusion into the on-orbit IMS.

**3.6 IMS DATABASE**

The IMS operation and database is described in SSP 50200-08, Station Program Implementation Plan, Volume 8: Increment Execution Preparation, and SSP 50200-09, Station Program Implementation Plan, Volume 9: Real-Time Operations. The database provides traceability between the IMS number and the part number, serial number, manufacturer's code, and other hardware data.

- A. The IMS number for each item shall be provided to the Vehicle Master Database (VMDB) during increment planning and manifest development. Initial stowage location data for each item shall be established during hardware physical integration at hardware integration facilities.
- B. KSC shall provide the VMDB with IMS numbers and establish the location links for hardware during the Multi-Purpose Logistics Module and unpressurized logistics carriers physical integration process. This is accomplished through interfaces between the KSC Payload Data Management System (PDMS) and the Mission Integration Database Applications System (MIDAS).
- C. Payloads shall identify kitted items and shall provide the location links between the IMS numbers of each item within a kit to the kit IMS number. This is accomplished through interfaces between the Marshall Space Flight Center (MSFC) Payload Data Library (PDL) and the VMDB.
- D. Rocket Space Corporation - Energia (RSC-E) shall provide the IMS number link to the IMS database for Russian hardware manifested and flown on all Russian resupply vehicles. This is accomplished by entering data directly into the on-orbit IMS.

## **4.0 IMS BAR CODE LABEL GENERAL SPECIFICATIONS**

IMS labels shall be prepared in accordance with applicable material specifications and ergonomic standards approved for space flight hardware. As shown in Figures 4.1.1-1, Standard IMS Label Number Examples, and 4.1.2-1, Special IMS Labels, several sizes and styles of labels are approved for use on ISS hardware, depending on the size and functionality of the hardware. Additional labels that meet the basic general requirements for readability may be designed and submitted to the Cargo Planning and Imagery Office for approval and subsequent submission to the Decal Design and Production Facility for configuration management and manufacturing.

### **4.1 IMS LABEL FORMAT**

The standard IMS label format consists of two elements of human readable text and one element of machine readable bar code 39 symbology. The text elements are a mandatory IMS number at the bottom of the label and an optional operations nomenclature at the top of the label. The operations nomenclature enables the crew to identify similarly looking hardware such as coiled cables with different lengths and may be necessary as the only visible means of item identification to the crew.

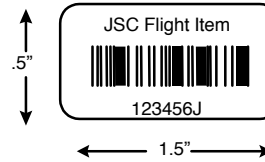
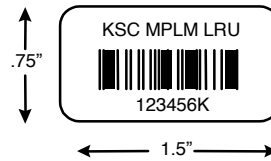
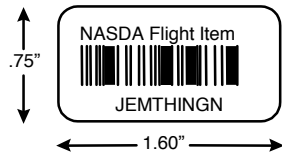
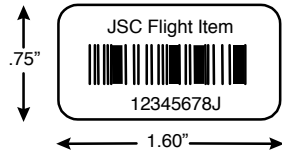
#### **4.1.1 STANDARD IMS LABELS**

Standard IMS bar code labels are shown in Figure 4.1.1-1. These labels are produced in several sizes and from different materials to accommodate the size and function of the item to which they will be applied.

### Standard IMS Bar Code

#### DDPF Photo Process Labels (EVA Metalphoto)

#### Bar Code Printer Produced Labels



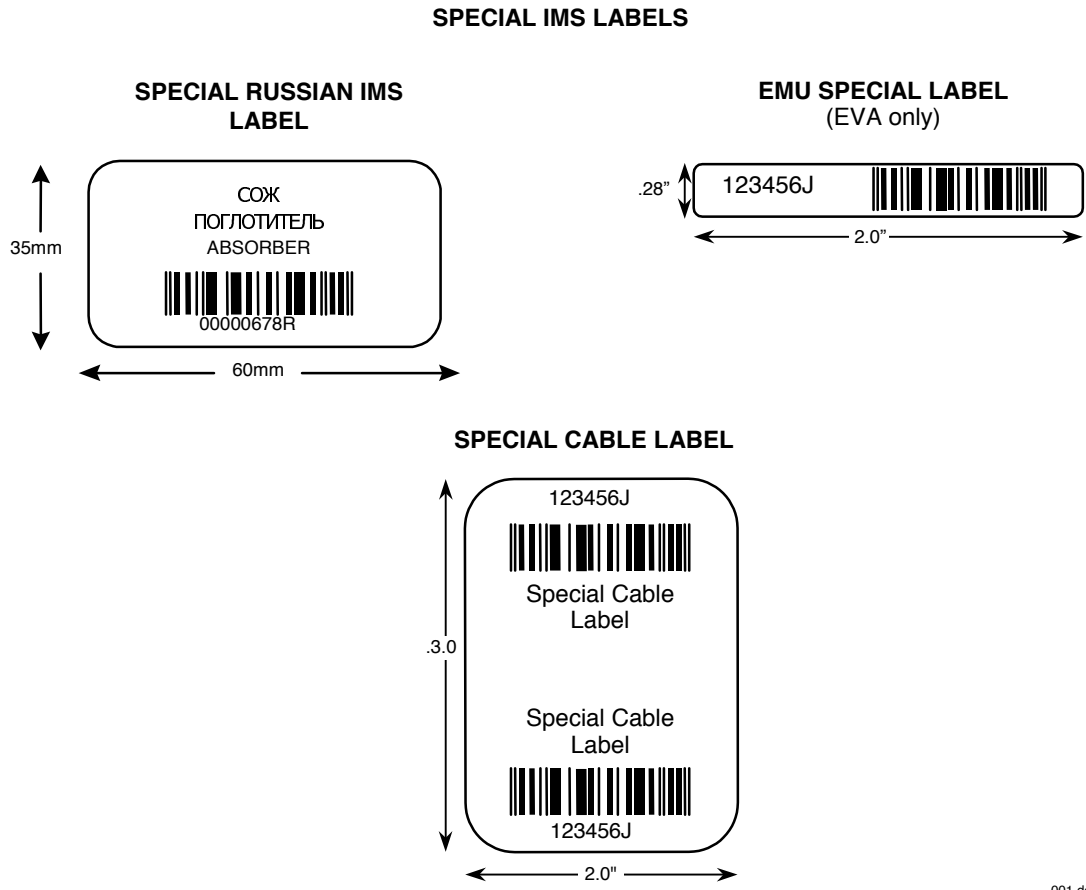
#### STANDARD RUSSIAN IMS LABEL



FIGURE 4.1.1-1 STANDARD IMS LABEL NUMBER EXAMPLES

### 4.1.2 SPECIAL USE LABELS

Special use IMS bar code labels are shown in Figure 4.1.2-1. These labels are produced for special applications where a standard label is inappropriate. Labels with unique special designs may be used when coordinated through the Cargo Planning and Imagery Office. Such labels may be requested for use on cables, EVA hardware (text large enough for an EVA crewmember to read), or other materials to which the flight approved adhesive will not adhere.



001.doc

FIGURE 4.1.2-1 SPECIAL IMS LABELS

#### 4.1.3 IMS NUMBERING SYSTEM

A. The standard IMS number is a nine character alphanumeric non-significant number as shown in Figure 4.1.1-1, depending on label size. This number will uniquely identify an item to a specific part number, serial number, batch number, etc. The hardware owner may opt to use characters in the IMS number that convey a particular meaning useful to activities involved in ground processing and hardware owner inventory control. The significance of the characters is as follows:

1. For flight hardware with bar code labels, the first eight characters of the number are typically numeric and represent a non-significant number, which is sequentially issued. Hardware owners may request alphanumeric numbers. These numbers or letters may contain an abbreviation to further identify a system, subsystem, etc., as deemed appropriate in SSP 50254.
2. The last character is significant and shall be the agency or equipment provider code. Each agency or provider is represented by a unique letter as shown in the following table (J = JSC, M = MSFC, R = Russian Space Agency (RSA), etc.).
3. For training hardware, the first character shall be "T." The remaining seven characters may be all numeric or alphanumeric at the hardware owners' option. The last character shall be the agency or provider code.

B. The following agency/provider codes are established:

<u>Code</u>	<u>Agency</u>
A	Ames Research Center (ARC)
B	Product Support Center - Huntington Beach
C	Canadian Space Agency (CSA)
E	European Space Agency (ESA)
F	Agenzia Spaziale Italiana (ASI)
G	Goddard Space Flight Center (GSFC)
H	Product Support Center - Huntsville
J	Johnson Space Center (JSC)
K	Kennedy Space Center (KSC)
L	Glenn Research Center (GRC)
M	Marshall Space Flight Center (MSFC)
N	National Space Development Agency of Japan (NASDA)
P	Jet Propulsion Lab (JPL)
R	Russian Space Agency (RSA)
V	Langley Research Center (LaRC)
W	White Sands Test Facility (WSTF)
Z	Product Support Center - Canoga Park

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C. Other provider, center, or agency codes may be added, if required, by revision of this document.

**4.1.4 ABBREVIATIONS**

In accordance with SSP 50254, abbreviations will not be used if the full operations nomenclature will fit above the bar code symbology. Detailed label specification drawings are included in JSC 27260. In many cases, larger labels, such as special cable labels, are capable of accommodating the entire operations nomenclature without having to use abbreviations. If the name will not fit, then only an appropriate abbreviation meeting the requirements in SSP 50254 may be used.

**4.2 IMS BAR CODE LABEL DETAIL SPECIFICATIONS**

**4.2.1 CODE 39 STANDARD**

The machine readable symbology specifications for ISS IMS barcode labels are detailed in ANSI/AIM-BC1-1995, Uniform Symbology Specification Code 39. All agencies that will produce ISS IMS barcode labels must comply with the requirements and recommendations of this standard except the minimum height for the machine readable bar symbology shall be no less than .25 inches.

**4.2.2 QUALITY**

Each label must pass a machine readability quality check by an approved bar code scanner/verifier before being released to the requesting activity.

**4.2.3 HUMAN READABLE TEXT SPECIFICATION**

The human readable IMS number corresponding to the machine readable bar code shall be printed and centered beneath the bar code and centered between the bottom edge of the label and the bottom edge of the machine readable code.

The text shall be in English using an Arial or Helvetica 9 point font. The operations nomenclature located at the top and center of the label shall be printed in English using the largest Arial or Helvetica font (no larger than 12 points) that can accommodate the operations nomenclature (no smaller than 7 points).

For Russian manufactured labels and for labels provided to Russia by the JSC DDPF, the English text will be as described above and the Russian text shall be printed in Cyrillic no larger than 12 and no smaller than 8 points.

The operations nomenclature, both single and double line text, at the top of the label shall be centered between the top edge of the label and the top edge of the machine readable code.



#### **4.2.4 MATERIAL**

All materials (adhesives, label material, etc.) shall be in accordance with SSP 30233, Space Station Requirements for Materials and Processes. The materials used to fabricate flight decals and placards shall be evaluated for flammability, toxic offgassing, odor, and fungus resistance for use in the habitable volumes (IVA); for thermal vacuum stability for uses with short-term Low Earth Orbit (LEO) exposure (less than 180 days); and for thermal vacuum stability, atomic oxygen and ultraviolet resistance, and thermal cycling for uses with long-term LEO exposure (greater than 180 days).

##### **4.2.4.1 SPECIFIC MATERIAL REQUIREMENTS FOR DECALS AND PLACARDS**

###### **4.2.4.1.1 IVA**

###### **4.2.4.1.1.1 FLAMMABILITY**

- A. Flight decals and placards shall be fabricated from materials that are “A” rated for flammability for applicable oxygen concentration for the pressurized volume in which the flight decal or placard is to be located. A material is rated “A” for flammability when that material meets the test criteria of NASA-STD-6001, Flammability, Odor, Offgassing, and Compatibility Requirements and Test Procedures for Materials in Environments That Support Combustion, Test 1.
- B. If “A” rated materials cannot be used, then the configuration as assessed for flammability per NSTS 22648, Flammability Configuration Analysis for Spacecraft Applications, which does not require a Material User Agreement, shall not allow a fire to propagate beyond 6 inches. Otherwise, approval of an Material Usage Agreement shall be required. Flight decals/placards made of non “A” rated materials, but in configuration meet any one of the following conditions, are considered acceptable per NSTS 22648.
  - 1. Decal or placard with a maximum dimension of less than 6 inches and separated by a minimum of 2 inches from other flammable decals or hook or loop fastener materials.
  - 2. Decal or placard of any length or width for which the entire surface area is applied flush to the surface of a bare or inorganic coated (including anodized) metallic substrate that is at least 0.0030 inches thick.
  - 3. Decal attached to a highly curved surface, such as a pipe, which meets the size and placement restrictions of 6-inch maximum dimension along the length of the pipe (circumference dimension is unrestricted) and 2-inch separation both along the length of the pipe and with respect to the decal’s adjacent pipes.
  - 4. Decal attached to a small diameter pipe where the decal is wrapped around the diameter. The excess decal material extends beyond the surface of the pipe itself and is covered completely with a nonflammable tape such as Fluorinated Ethylene Propylene (FEP) Teflon tape.

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NOTE: If unable to control the overall configuration of flammable decals in any area where they are installed, then flight decals and placards shall be made from only "A" rated materials.

**4.2.4.1.1.2 ODOR**

Flight decals and placards shall be fabricated from materials that have an odor rating of less than 2.5 when tested per NASA-STD-6001, Test 6.

**4.2.4.1.1.3 TOXIC OFFGASSING**

Flight decals and placards shall be fabricated from materials that are "A" rated or better for toxic offgassing. A material is rated "A" for toxic offgassing when that material has a t-value of less than 0.5 for a 10 pound quantity when tested per NASA-STD-6001 test. Toners and developers used in the Xerographic process are exempted from testing for offgassing by EM2/Materials and Failure Analysis Branch with the concurrence of the JSC toxicologist because of the benign nature of all toners and developers previously tested for toxic offgassing.

**4.2.4.1.1.4 FUNGUS**

Flight decals or placards with exposed materials that are fungus nutrient as defined by MIL-STD-810, Environmental Engineering Consideration and Laboratory Tests, Method 508, shall be restricted to those applications that have adequate ventilation and lighting and easy accessibility.

**4.2.4.1.1.5 POLYVINYL CHLORIDE**

Flight decals or placards made from polyvinyl chloride (PVC) shall be restricted to those applications where the maximum temperature is less than 120 degrees Fahrenheit.

NOTES:

1. PVC is also fungus nutrient and should be restricted to those applications that have adequate ventilation and lighting and easy accessibility.
2. PVC is also flammable and should be restricted from those applications where the overall configuration can be controlled in accordance with NASA-STD-6001, Section B.3.1.1.1.

**4.2.4.1.2 LEO EXPOSURE**

**4.2.4.1.2.1 THERMAL VACUUM STABILITY**

Flight decal and placard materials that are exposed to LEO shall be "A" rated for Thermal Vacuum Stability or meet the requirements of SP-R-0022A, Vacuum Stability Requirements of Polymeric Materials for Spacecraft Application, in configuration. A material is rated "A" for Thermal Vacuum Stability when that material has volatile condensable material content less than 0.1% and a total mass loss (minus water vapor recovery) less than 1.00% when tested per SP-R-0022A.

#### **4.2.4.1.2.2 ATOMIC OXYGEN AND ULTRAVIOLET**

Flight placard and decal materials that are exposed long-term to the LEO environment shall be resistant to degradation when exposed to a ram atomic oxygen fluence of  $5.0 \times 10^{21}$  atoms per square centimeter per year for the on-orbit exposure duration. They shall also be resistant to degradation from ultraviolet radiation.

#### **4.2.4.1.2.3 THERMAL CYCLING**

Flight decal and placard materials including adhesives that are exposed long-term to the LEO environment shall maintain their functional properties when exposed to cycles of the extreme hot and cold thermal environment expected for the ISS.

#### **4.2.4.2 EVALUATION OF FLIGHT DECAL AND PLACARD MATERIALS**

The following materials have been reviewed and evaluated as indicated by EM2/Materials and Failure Analysis Branch for use in fabricating flight decals and placards. If there is a choice of base materials after all functional and materials requirements are considered, then the preferred order of materials is as follows (with the first listed being the most preferred material).

- A. Aluminum, photosensitive (Metalphoto, Ultracolor, Dye-N-Seal).
- B. Polyester, photosensitive (Helioscan, Anitec).
- C. Heat Stabilized Polyester (Intermec 2 mil Gloss White High-Tack) with Intermec smear resistant, super premium thermal transfer ribbon (P/Ns 13023006 and 13043518).
- D. Vinyl (GERBER Scotchcal 220, MACTAC Starliner) - See PVC restriction in NASA-STD-6001, Section B.3.1.1.5.

#### **4.2.4.3 ADHESIVES**

The following adhesives are approved for use and are currently used on Shuttle bar code labels:

- A. 3M #966 Adhesive
- B. Scotch #300 "Hi-Strength" Acrylic Adhesive

#### **4.2.4.4 SUPPLIER/VENDOR**

Material specifications and manufacturers of materials used in producing ISS IMS bar code labels for IVA and EVA environments are included in JSC 27260. Intermec Technologies Corporation provides flight-approved bar code label material cited above in Section 4.2.4.2, C. Additional suppliers and vendors may be used providing only flight certified materials are used.

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#### **4.2.4.5 COLOR**

White or Light Gray: Color #L87.5N

#### **4.2.5 PRINTING PROCESS**

Direct Thermal Printing and Photographic Transfer

#### **4.2.6 APPLICATION**

##### **4.2.6.1 PREPARATION OF SURFACE**

Clean the host surface well to remove dirt, grease, dust, moisture, or film that might weaken the adhesive bond.

##### **4.2.6.2 APPLICATION**

To apply the decal, first align and place the decal with the adhesive protection intact. Peel the backing partially. Making sure not to wrinkle the surface of the decal, tack down the whole side of which the corner is already in place. Pulling the backing as evenly as possible so as to avoid creases or wrinkles, rub the top of the decal by hand (if a roller is not available), being careful to avoid leaving air bubbles under the surface.

**APPENDIX A**  
**ACRONYMS AND ABBREVIATIONS**

## APPENDIX A - ACRONYMS AND ABBREVIATIONS

ARC	Ames Research Center
ASI	Agenzia Spaziale Italiana
CoFR	Certification of Flight Readiness
CPI	Cargo Planning and Imagery
CSA	Canadian Space Agency
CSVS	Centerline Space Vision System
CWC	Contingency Water Container
DDPF	Decal Design and Production Facility
DQA	Data Quality Assurance
EMU	Extravehicular Mobility Unit
ESA	European Space Agency
EVA	Extravehicular Activity
FCE	Flight Crew Equipment
FEP	Fluorinated Ethylene Propylene
FOD	Foreign Object Debris
FSE	Flight Support Equipment
FU	Fungus
GFE	Government Furnished Equipment
GRC	Glenn Research Center
GSFC	Goddard Space Flight Center
HAB A	Habitation Element A
IDRD	Increment Definition and Requirements Document
ILIMS	Integrated Logistics and Inventory Management System
IMS	Inventory Management System
IMV	Intermodule Ventilation
in	inch
IP	International Partner
ISS	International Space Station
IVA	Intravehicular Activity
JF	JSC Form
JPL	Jet Propulsion Laboratory
JSC	Johnson Space Center
KSC	Kennedy Space Center
L&M	Logistics and Maintenance
LaRC	Langley Research Center

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LEO	Low Earth Orbit
LRU	Line Replacement Unit
MB	Megabyte
mil	thousandths of an inch
MIDAS	Mission Integration Database Applications System
MIOCB	Mission Integration and Operations Control Board
mm	millimeter
MPLM	Multi-Purpose Logistics Module
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NASDA	National Space Development Agency of Japan
ORU	Orbital Replacement Unit
OSE	Orbital Support Equipment
P/N	Part Number
PALS	Program Automated Library System
PC	Personal Computer
PD	Payload Developer
PDL	Payload Data Library
PDMS	Payload Data Management System
PIDS	Prime Item Development Specification
PMA-1	Pressurized Mating Adapter-1
PT	Point
PVC	Polyvinyl Chloride
R	Radius
RSA	Russian Space Agency
RSC-E	Rocket Space Corporation – Energia
SDID	Supporting Development Implementation Document
SSCB	Space Station Control Board
SSCN	Space Station Change Notice
U.S.	United States
VMDB	Vehicle Master Database
WSTF	White Sands Test Facility

**APPENDIX B**

**FLIGHT HARDWARE EXEMPT FROM BAR CODE  
LABELS AND WAIVERS**



**APPENDIX B – FLIGHT HARDWARE EXEMPT FROM BAR CODE LABELS AND WAIVERS**

**TABLE B-1 JSC BAR CODE LABEL WAIVER EXEMPTIONS**

Ref #	Items	Notes
J-1	Batteries: individual alkaline and rechargeable AAA, AA, C, D, 9V, and button batteries of all brands	Bags, boxes, or other containers of batteries shall have a single IMS bar code label.
J-2	Small hardware and tools with area < 1"x½"	Kit bags and containers shall be labeled.
J-3	Crew restraints: Velcro, tethers, bungees, and straps	Kit bags and containers shall be labeled.
J-4	Waste containers: urine, fecal, and emesis bags	Kit bags and containers shall be labeled.
J-5	Ziploc bags (individual)	Bags of empty bags shall be labeled.
J-6	Personal crew items	Bags and containers shall be labeled. Contents are included in storage drawings and IDRD Annex 1, Part 4 (restricted).
J-7	Pantry supplies: office, hygiene, towel, and napkin	Pantry items not tracked.
J-8	Active Compression Plate Assemblies	Too small.
J-9	IMAX Left- and Right-hand Removal Tools	Too small.
J-10	IMAX Magazine Assembly	Too small.
J-11	Blower screen assemblies	Blocks air flow.
J-12	IMV caps and flanges	Too small.
J-13	Wipes: individual tissues, towels, alcohol pads, medical gauze, bandages, etc.	Containers shall be labeled.
J-14	Filters: individual fabric or paper (disposable)	Label shall be placed on external wrapping or container, if applicable.
J-15	Cushions, dividers, and mesh bag liners	Bulk consumables; material does not support adhesive.
J-16	Photosensitive hardware	Equipment whose functionality prohibits reflective surfaces.
J-17	CSVS targets	Impedes optical function.
J-18	Purge bags	Consumables; material does not support adhesive.
J-19	Protective caps and plugs	Too small.
J-20	Printer cartridges	Too small.
J-21	Decals	Impedes functionality.
J-22	1553 PC cards and cables	Impedes functionality.
J-23	Film rolls and cassettes	Too small.
J-24	PC Hard Cards: 520 MB Callunac	Micro-FOD threat.
J-25	Photo filters and small lenses	Impedes functionality.
J-26	CWC water sample and purge bags	Consumables; material does not support adhesive.
J-27	Actex Water Filters	Impedes functionality.
J-28	Experiment vials, test tubes, and syringes with area < 1"x½"	Experiment kits and containers shall be labeled.
J-29	Small hand tools with area < 1" x ½"	Kit bags and containers shall be labeled.

**TABLE B-2 RSA BAR CODE LABEL WAIVER EXEMPTIONS**

Ref #	Items (Russian Name)	Items (English Name)	Notes
R-1			
R-2			
R-3			
R-4			
R-5			
R-6			
R-7			
R-8			
R-9			
R-10			
R-11			
R-12			
R-13			
R-14			
R-15			
R-16			
R-17			
R-18			
R-19			
R-20			
R-21			
R-22			
R-23			
R-24			
R-25			
R-26			
R-27			
R-28			

**TABLE B-3 ESA BAR CODE LABEL WAIVER EXEMPTIONS**

Ref #	Items	Notes
E-1		
E-2		
E-3		
E-4		
E-5		
E-6		
E-7		
E-8		
E-9		
E-10		
E-11		
E-12		
E-13		
E-14		
E-15		
E-16		
E-17		
E-18		
E-19		
E-20		
E-21		
E-22		
E-23		
E-24		
E-25		
E-26		
E-27		
E-28		

TABLE B-4 NASDA BAR CODE LABEL WAIVER EXEMPTIONS

Ref #	Items	Notes
N-1		
N-2		
N-3		
N-4		
N-5		
N-6		
N-7		
N-8		
N-9		
N-10		
N-11		
N-12		
N-13		
N-14		
N-15		
N-16		
N-17		
N-18		
N-19		
N-20		
N-21		
N-22		
N-23		
N-24		
N-25		
N-26		
N-27		
N-28		

**TABLE B-5 CSA BAR CODE LABEL WAIVER EXEMPTIONS**

Ref #	Items	Notes
C-1	Payload Data Grapple Fixture Shafts	Label will comprise proper utilization.
C-2	Bolts	No surface to apply label that won't affect functionality.
C-3	Lamps	Labels will impede illumination characteristics.
C-4		
C-5		
C-6		
C-7		
C-8		
C-9		
C-10		
C-11		
C-12		
C-13		
C-14		
C-15		
C-16		
C-17		
C-18		
C-19		
C-20		
C-21		
C-22		
C-23		
C-24		
C-25		
C-26		
C-27		
C-28		

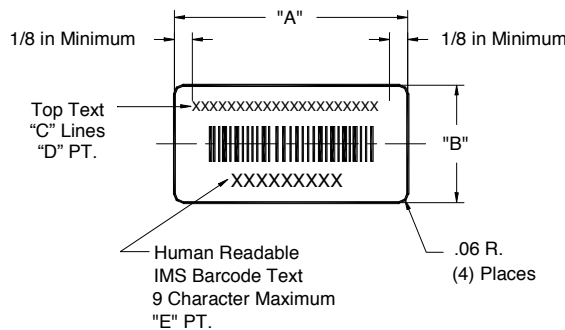
**APPENDIX C**  
**IMS BAR CODE LABEL SPECIFICATIONS**

**APPENDIX C - IMS BAR CODE LABEL SPECIFICATIONS**

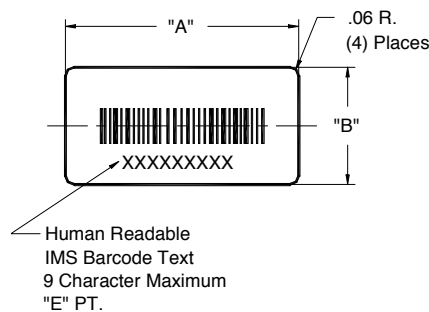
Figure C-1 details the specifications for bar code labels.

Drawing Number	Dimension		Operational Nomenclature Font Size	Restrictions
	Length	Height		
SDG32105719-001	3.00 in	4.00 in	9 or less	IVA Only, Flammability
SDG32105719-002	2.00 in	3.00 in	9 or less	IVA Only, Flammability
SDG32105719-003	1.65 in	2.75 in	9 or less	IVA Only, Flammability

Below are examples of one- and two-line text labels. This IVA IMS Cable label is made from white Brady material. All text information and the barcode are mirrored on the centerline. Operational nomenclature is preferred, but can be left blank. There is a 1/8 of an inch “quiet space” between the barcode and the edge of the label. This is used to show the requestor that the maximum amount of characters cannot exceed the “quiet space.”



**FIGURE 1**



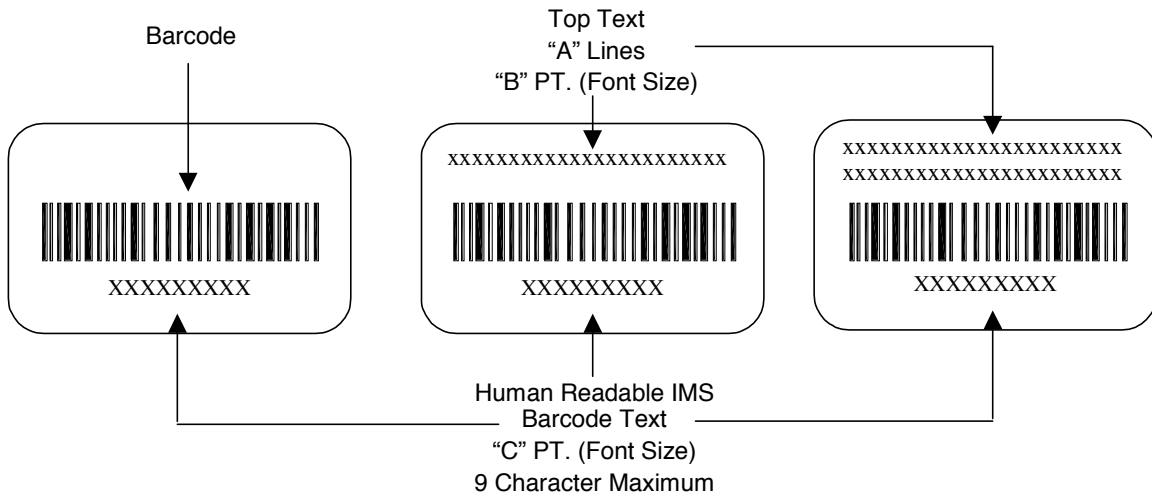
**FIGURE 2**

When Ordering: Use JSC Form 733, Support Request, to specify part number, job description, barcode numbers, and human readable code. The requester shall provide official nomenclature that will be placed on each label. The requester is responsible for accuracy of data within the table and any required coordination with the Mission Operations Directorate and the Inventory Management System offices. Special care should be taken to insure that the proper dash number (e.g., SDG32105719-001) is entered for each label ordered as label size, font size, and the number of lines, vary as a function of dash numbers.

**FIGURE C-1 BAR CODE LABELS (PAGE 1 OF 3)**

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This Inventory Management System (IMS) label is available on 3 or 5 thousandths of an inch (mil) Metalphoto (with and without adhesive), Helioscan, or Brady.



**When Ordering:** Use JSC Form 733 Support Request, to specify part number, job description, barcode numbers, and optional human readable code. The requester shall provide official operational nomenclature that will be placed on each label. The requester is responsible for accuracy of data within the table and any required coordination with the Mission Operations Directorate and the Inventory Management System offices. Special care should be taken to insure that the proper dash number (e.g., SDG32105720-005) is entered for each label ordered as label size, font size, number of lines, and the allowable maximum amount of characters, vary as a function of dash numbers.

**FIGURE C-1 BAR CODE LABELS (PAGE 2 OF 3)**



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Drawing Number	Dimension		Adhesive	Number of Text Lines "A"	Top Text Font Size "B"	Barcode Text Font Size "C"/	Material
	Length	Height					
SDG-32105720-001	1.60 in	0.75 in	Yes	1	≤9	9	Metalphoto
SDG-32105720-002	1.60 in	0.75 in	No	1	≤9	9	Metalphoto
SDG-32105720-003	1.40 in	0.60 in	Yes	1	≤9	9	Metalphoto
SDG-32105720-004	1.40 in	0.60 in	No	1	≤9	9	Metalphoto
SDG-32105720-005	1.60 in	0.50 in	Yes	0	0	9	Metalphoto
SDG-32105720-006	1.60 in	0.50 in	No	0	0	9	Metalphoto
SDG-32105720-007	1.60 in	0.75 in	Yes	2	≤9	9	Metalphoto
SDG-32105720-008	1.60 in	0.75 in	No	2	≤9	9	Metalphoto
SDG-32105720-009	1.60 in	0.60 in	Yes	1	≤9	9	Metalphoto
SDG-32105720-010	1.60 in	0.60 in	No	1	≤9	9	Metalphoto
SDG-32105720-011	1.40 in	0.50 in	Yes	0	0	9	Metalphoto
SDG-32105720-012	1.40 in	0.50 in	No	0	0	9	Metalphoto
SDG-32105720-013	1.5 in	0.5 in	Yes	1	7	9	Polyester
SDG-32105720-014	1.5 in	0.75 in	Yes	1	≤9	9	Polyester
SDG-32105720-015	1.75 in	0.75 in	Yes	1	≤9	9	Polyester
SDG-32105720-016	1.5 in	0.75 in	Yes	2	≤9	9	Polyester
SDG-32105720-017	1.75 in	0.75 in	Yes	2	≤9	9	Polyester
SDG-32105720-018	2.25 in	1.0 in	No	1	18	18	Metalphoto
SDG-32105720-019	2.25 in	1.0 in	Yes	1	18	18	Metalphoto
SDG-32105720-020	1.05 in	0.47 in	Yes	0	0	9	Metalphoto
SDG-32105720-021	1.05 in	0.47 in	No	0	0	9	Metalphoto
SDG-32105720-022	1.05 in	0.47 in	Yes	0	0	9	Polyester
SDG-32105720-023	1.05 in	0.47 in	No	0	0	9	Helioscan
SDG-32105720-024	1.5 in	0.5 in	Yes	0	0	9	Polyester
SDG-32105720-025	1.5 in	0.5 in	No	1	7	9	Helioscan
SDG-32105720-026	1.5 in	0.75 in	No	1	≤9	9	Helioscan
SDG-32105720-027	1.75 in	0.75 in	No	1	≤9	9	Helioscan
SDG-32105720-028	1.5 in	0.75 in	No	2	≤9	9	Helioscan
SDG-32105720-029	1.75 in	0.75 in	No	2	≤9	9	Helioscan

Restrictions: None for Metalphoto. IVA only and flammability for Helioscan and Brady.

**FIGURE C-1 BAR CODE LABELS (PAGE 3 OF 3)**

<b>INTERNATIONAL SPACE STATION INVENTORY MANAGEMENT SYSTEM BAR CODE LABEL REQUEST FOR WAIVER</b>		Control Number:	Date:
<p>General: IMS bar code labels shall be applied to all ORUs, loose items and consumables in accordance with SSP 50007, ISS Inventory Management System Bar Code Label Requirements and Specification Document. Requests to waive this requirement for individual or groups of items shall be submitted to the Cargo Planning and Imagery Office (OC5) not later than twelve weeks prior to the last bench review for coordination and concurrence. The CPI Office shall forward this form, with attachments, to the Mission Integration and Operations Control Board for final disposition.</p>			
1. Originator Name, Mail Code and Phone/Fax	2. Flight Applicability:	3. Type Hardware: <input type="checkbox"/> GFE <input type="checkbox"/> ORU/Spare	
4. Part Number(s) (or attached list of common items, e.g. AA batteries, drill bits, Velcro tabs. Separate waivers are required for each category of item e.g. camera bodies, lenses) and quantities	5. Drawing Number(s) and Operations Nomenclatures	<input type="checkbox"/> FCE <input type="checkbox"/> Consumable <input type="checkbox"/> Experiment/Payload	
6. Justification / Authority for waiver (State reason item(s) is incapable of supporting the application of an IMS bar code label. Multiple items such as small consumable items or tools may be included in an attachment to this request along with supporting documentation, drawings, analyses etc. referencing this paragraph.)			
7. Impact of non-approval (Describe impact of applying bar code labels to hardware or operation if waiver is not approved)			
8. Approval/Disapproval			
a. Concurrence <input type="checkbox"/> Concur <input type="checkbox"/> Concur w/ Modifications <input type="checkbox"/> Non-concur	NASA Cargo Planning and Imagery	Signature	Date:
b. Approval <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/ Modifications <input type="checkbox"/> Disapproved	NASA Mission Integration and Operations Control Board	Signature	Date:
9. Comments / Disposition			

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**FIGURE C-2 IMS BAR CODE LABEL REQUEST FOR WAIVER (PAGE 1 OF 2)**

**Instructions for Preparation of  
JSC Form (JF 1345, IMS Bar Code Label Waiver Request**

JSC Form 1345 is used to waive the requirement for applying IMS bar code labels to International Space Station flight hardware. It is used by the hardware provider to provide essential rationale for not applying IMS bar code labels to hardware as required by SSP 50007, IMS Bar Code Label Requirements and Specification Document. This document specifies all Orbital Replaceable Units (ORUs), Loose Items, and Consumables shall have IMS bar code labels. The rationale behind this requirement is to provide an automated means for ISS crew members to track on-board hardware in the on-orbit inventory management system. Therefore, the requirement for IMS labels on all ORUs, loose items and consumables is mandatory unless waived by approval of this request. Waiver approval authority is at the Mission Integration and Operations Control Board (MIOCB). This request shall be submitted to the Cargo Planning and Imagery Office (OC5) by the hardware provider immediately after the item(s) is (are) approved for inclusion to the manifest.

**Please submit this form for each item (or list of common items) to be waived. Common items listed on the manifest such as small tools, Velcro crew aids, bungees, etc. may be included on an attached list.**

1. **Originator Name and Phone:** Enter hardware provider's name and telephone
2. **Flight Applicability:** Enter the flight (or flights) on which the hardware is to be manifested. (e.g., "applicable for flight 3A or "3A and subsequent flights").
3. **Type Hardware:** Check the blocks that apply for Government Furnished Equipment (GFE), Flight Crew Equipment (FCE), Experimental/Payloads Hardware, ORUs/Spares, and Consumables.
4. **Part Number(s) / Quantity:** Enter the part number and quantity for each item requested to be waived (a list of common items described in the example above may be attached to this waiver form).
5. **Drawing Number / Operations Nomenclature:** Enter the engineering drawing number and operations nomenclature for the items(s) to be waived. The hardware provider shall attach pertinent available drawings as support documentation.
6. **Justification / Authority for Waiver:** Hardware provider shall provide adequate justification to mitigate applying bar code labels to the hardware. Justification includes, for example, rationale stating the item is too small to accommodate the smallest bar code label, hardware material will not permit adhesion of the label (Teflon, Nomex), or there is no space available on the hardware for a label that would allow placement without adversely affecting the functionality. Supporting documentation (drawings, analyses, etc.) must be included with this request.
7. **Impact of Non-approval:** The hardware provider shall address the impact of waiver disapproval. Impacts may include possible damage to hardware, threat of label not adhering, risk of contamination, or threat to functionality etc.
8. **Approval / Disapproval:** Concurrence/Concurrence by the Cargo Planning and Imagery Office shall be obtained before forwarding to the Mission Integration and Operations Control Board for approval.
9. **Comments / Disposition:** Conditional approval, disapproval comments/rationale, or recommendations may be entered by the concurring or approval authorities.

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**FIGURE C-2 IMS BAR CODE LABEL REQUEST FOR WAIVER (PAGE 2 OF 2)**