



National Aeronautics and
Space Administration

MSFC-STD-2806

REVISION B

EFFECTIVE DATE: January 27, 2005

George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

ED03

**MULTIPROGRAM/PROJECT
COMMON-USE DOCUMENT**

**MSFC TAILORING STANDARD FOR
THE GLOBAL DRAWING
REQUIREMENTS MANUAL (GDRM)
TENTH EDITION**

Approved for Public Release; Distribution is Unlimited

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VERSION BEFORE USE**

Multiprogram/Project Common-Use Document ED03		
Title: MSFC Tailoring Standard for the GDRM Tenth Edition	Document No.: MSFC-STD-2806	Revision: B
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DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Baseline			
Revision	A		<p>FOREWORD, added new para;</p> <p>CONTENTS, added Figures 3 and 4, and deleted APPENDIX 1.</p> <p>1. Scope - Added “and the graphics data portion of the Engineering Order.”</p> <p>4.0.a. replaced “and use the Appendix as reference information” with “The NASA Technical Standards available at http://standards.nasa.gov/ and the Multiprogram/project Common-Use Documentation available at https://msfcmr03.msfc.nasa.gov/standards/standards.htm are to be used for the selection of design requirements (Applicable Documents) tailored to each project’s needs.”</p> <p>4.0.c, added after Exclude: “6.8.1 “Arrangement of Information on Standard Format Drawings.”</p> <p>4.0.h., added after last sentence: “Engineering Orders Graphics Data format shall comply with Figure 3.”</p> <p>5.1 Block 26 instruction added: “of the checking symbol (with the date and initials of the checker) and”; Block 29 instruction replaced “change authorization” with “EO”; Block 30 Instruction changed to read: “Enter the date that block (31) was initialed.”; Block 31 instruction changed to read: “Enter the initials of the responsible engineer/designer that verified the change was accomplished.”; Block 32 instruction added: “of the checking symbol (with the date and initials of the checker) and the”; Block 34 instruction added: “As an option, include this with part marking in the GENERAL NOTES.”; Block 36 added: “ and FLAGGED”; Block 37a. added: “As an option, this may be included in the GENERAL NOTES.”; Block 37b, added: “As an option, this may be included in the GENERAL NOTES.”; Added new 37d.; Block 38 added instruction inadvertently unprinted; Added new Block 39 and Instruction. Added new 5.2 including instructions and new Figures 3 and 4.</p> <p>6. –At the beginning of sentence replace “This” with “The basic” and changed the last sentence of the paragraph to read: “baseline approval of this standard...” Added second paragraph as follows: “Revision A supersedes MSFC Form 421.1. Deleted Appendix in its entirety.</p>
Revision	B	1/21/05	Revised to adopt the Global Drawing Requirements Manual (GDRM), Tenth Edition 2000, update document requirements, and address use of “shall” for requirements in accordance with the HQ Rules Review.

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FOREWORD

This tailoring standard has been generated to document the exceptions to the use of the Global Drawing Requirements Manual (GDRM) within MSFC. The design organizations committee, which selected the GDRM, also prepared a listing of recommended exceptions that have been included in Section 4.0 of this standard.

Revision A adds the requirement for preparation of an Engineering Order Graphics Data format and cancels the use of MSFC Form 421-1. This will facilitate use of design databases to generate the graphics information. In addition, the Appendix has been deleted and appropriate references have been added in the document to use the websites for selection of Applicable Documents for design requirements definition. In addition, the RCAR 177 team findings regarding Matched Set parts/assemblies have been incorporated.

Revision B incorporates the GDRM 10th Edition to replace MIL-STD-100 in the MSFC requirements with ASME Y14.100-2000. This revision also states that if there is a conflict between the GDRM interpretation and ASME Y14.100-2000 requirements, the ASME Y14.100-2000 requirements take precedence.

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1. SCOPE

This tailoring standard sets forth the Marshall Space Flight Center (MSFC) exceptions to the use of the Global Drawing Requirements Manual (GDRM), Tenth Edition 2000, in the preparation of MSFC engineering drawings and the graphics data portion of the Engineering Order. The GDRM is MSFC's Drafting Manual based on ASME Y14.100-2000 and associated documents, which in conjunction with MSFC-STD-555 and this Tailoring Standard provide top level drawing requirements. In the event of a conflict between the GDRM and the ASME Y14.100-2000 requirements, the ASME Y14.100-2000 requirements take precedence. This standard is only applicable to MSFC in-house programs/projects.

2. APPLICABLE DOCUMENTS

- | | |
|-----------------------|--|
| a. ASME Y14.100-2000 | Engineering Drawing Practices |
| b. ASME Y14.5M | Dimensioning & Tolerancing |
| c. Global Engineering | Drawing Requirements Manual Tenth Edition 2000 |
| d. MIL-STD-130 | Identification Marking of US Military Property |
| e. MPR 8040.2 | Product Identification and Traceability |
| f. MSFC-SPEC-250 | General Specification for Protective Finishes for Space Vehicles, Structures and Associated Flight Equipment |
| g. MSFC-STD-555 | MSFC Engineering Documentation Standard |
| h. MWI 7120.4 | Documentation Preparation, Programs/Projects |
| i. SAE AS478 | Identification Marking Methods |

3. DEFINITIONS

See GDRM, Tenth Edition, Section 25.

4. GENERAL REQUIREMENTS

Design and design support organizations shall utilize the GDRM, Tenth Edition 2000 for drawing preparation and checking except as specified below:

- Section 1.2, "Applicable Documents" – The current version of applicable documents listed in Section 2 of this document shall apply in all cases to the GDRM. The remaining documents listed in Section 1.2 of the GDRM shall apply at the discretion of the design activity given consideration to a particular application.
- Section 2, "Drawing/Data Elements & Management" – Shall exclude this section in its entirety and shall use the current MSFC program and configuration management requirements.

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- c. Section 4, "Types of Engineering Drawings" – Shall exclude pages 4-110 through 4-123, Printed-Board (Circuit Board) Assembly Drawings etc. and shall use Avionics Department current Requirements.
- d. Section 5, "Dimensions & Tolerances" – Geometric Dimensioning and Tolerancing (GD&T) according to ASME Y14.5M shall be used. Exceptions to the use of GD&T are allowed where the additional and unknown tolerances that result from not using datums are not critical to performance, in which case, conventional (non GD&T) dimensioning and tolerancing according to ASME Y14.5M may be used.
- e. Section 6, "Engineering Drawing Format" – Shall exclude 6.8.1 "Arrangement of Information on Standard Format Drawings". 6.8.7.2, 6.8.7.3 and 6.8.7.4 "zone locating symbol" may use existing method (a diagonally divided square block) and shall be consistent on each drawing. Shall exclude 6.9, "Title Block," and 6.10, "Supplementary Data Blocks," and shall use the format of Figure 1 and the block sizing information of Figure 2 of this document. See Paragraph 5.1 of this document for drawing format instructions. Shall exclude Section 6.14, "Distribution Statements," and shall use MWI 7120.4.
- f. Section 7, "Drawing and Part Numbering System" – Shall exclude this section in its entirety and shall use MSFC-STD-555.
- g. Section 9.7.2, "Location of General Notes Column" – Shall exclude and shall locate notes as defined in FIGURE 1. 9.7.16 "Flagged Notes" may use existing method (FLAG) and shall be consistent on each drawing.
- h. Section 10, "Parts List Preparation" – Shall exclude this section in its entirety and shall use MSFC-STD-555.
- i. Section 11, "Identification Marking" – Drawing notes shall specify MIL-STD-130 for What to Mark on Parts and SAE AS478 for How to Mark on Parts and shall include the Marking Method per SAE AS478.
- j. Section 15, "Protective Coatings" – Shall exclude this section in its entirety and shall use MSFC-SPEC-250, "General Specification for Protective Finishes for Space Vehicles, Structures, and Associated Flight Equipment."
- k. Section 22, "Electrical and Electronic Drawings" - Section 22 shall be excluded. The standard electrical symbols and reference designators used by Avionics Department personnel meet these requirements. But, for the electronics world, the symbol library used by Avionics has evolved beyond the standard requirements. All Avionics personnel have access to an Electronics Parts Library that contains numerous standard component symbols along with custom, state of the art, third party manufacturer symbols that have been directly imported into the Library. Each symbol in this Library has a mechanical footprint associated with it to allow the physical part to be electronically placed on a printed circuit board and routed per connections on the schematic. Also, in many cases, each symbol has a corresponding electronic component model that can be used for circuit simulation. The Avionics Design philosophy for schematics is to not focus so much on the symbology used to represent a part but to ensure that for each symbol identified on the schematic, the associated mechanical footprint and/or electrical model meets the part design specifications.
- l. Section 23, "Drawing Change Procedures" – Shall exclude this section in its entirety and use MSFC-STD-555. See Paragraph 5.2 of this standard for Engineering Order Graphic Data Format Instructions.

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5. DETAILED REQUIREMENTS

- 5.1 Drawing Format Instructions - The instructions for entering the data required are defined in Table I and Figure 1. Entries for all of the blocks shall be mandatory unless stated otherwise in the specific block instructions. Continuation sheets for multi-sheet drawings only require blocks 2 through 5, 27 through 31, 40 and 41, (except "A" size). Unless otherwise specified in Table I, the design activity is responsible for compliance with the instructions. Drawing format Block sizes are defined in Figure 2.

TABLE I. DRAWING FORMAT INSTRUCTIONS	
BLOCK	INSTRUCTION
(1)	Shall enter the information shown on the first sheet of each drawing.
(2)	Shall enter the drawing number.
(3)	Shall enter sheet number and total number of sheets.
(4)	Shall enter the drawing size.
(5)	Shall enter the MSFC design activity Cage Code = 14981.
(6)	Shall enter the scale of the drawing.
(7)	An entry for estimated weight is optional and at the discretion of the project manager/systems engineer. If the weight is a requirement to be verified for acceptance, a tolerance shall be specified. A note "SEE TAB" shall be printed in this block on tabulated drawings if the information is to be included on the drawing. If this block is not required, a diagonal line through the block shall be entered.
(8)	Shall enter drawing title according to Section 8 of GDRM.
(9)	Shall enter the date the responsible drafter/designer completed the drawing using the mo/day/yr format, example: 02/20/99. For drawing revisions, the original completion date shall be retained in this block.
(10-18)	Shall enter the headings as identified in the Documentation Approval Matrix contained in MPR 8040.1 Appendix A or the Program/Project CMP, and obtain the required signatures. For drawing revisions, the original signatures from the Basic revision shall be printed in these blocks.
(19-20)	Shall enter the tolerances. Two-place decimal dimensions shall be shown two places in the tolerance block (omit the zero before the decimal point). Three-place decimal dimensions shall be shown three places in the tolerance block (omit the zero before the decimal point). Angular dimensions on the drawing in degrees shall be shown in the tolerance block in degrees, and angular dimensions in degrees and minutes shall be shown in the tolerance block in degrees and minutes.
(21)	Shall enter the material specification. When there is insufficient room in the block, a flag note and the reference note number shall be placed in the block; and the requirements shall be called out in the GENERAL NOTE.
(22)	Shall enter the final heat treatment specification. Where there is not sufficient space in the block, the flag note procedure described in (21) shall be used.
(23)	Shall enter the final protective finish specification. Where there is not sufficient space in the block, the flag note procedure described in (21) shall be used and shall include

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TABLE I. DRAWING FORMAT INSTRUCTIONS

BLOCK	INSTRUCTION
	the applicable find number.
(24)	Shall list the applicable next assembly(ies) at time of initial release.
(25)	Shall enter the project name/project code.
(26)	This block shall be used by the Configuration and Data Management Group for initial release. It consists of the checking symbol (with the date and initials of the checker), and the release symbol (with the date and initials of Release Desk personnel) for non-electronic processing. Electronic processing shall be specified in the program/project CMP.
(27)	Optional - This block may be used to locate the revision on the drawing.
(28)	For revision, shall enter the applicable symbol.
(29)	For revision, enter the EO numbers being incorporated. (e.g., incorporate EO's 1, 2, and 3).
(30)	Shall enter the date that block (31) was initialed.
(31)	Shall enter the initials of the responsible engineer/designer that verified the change was accomplished.
(32)	This block shall be used by the Configuration and Data Management personnel for change processing. It consists of the checking symbol (with the date and initials of the checker), and the release symbol (with the date and initials of Release Desk personnel) for non-electronic processing. Electronic processing shall be specified in the configuration management plan.
(33)	Shall enter the appropriate distribution statement from MWI 7120.4 as specified by the project manager, or shall leave this area blank for the MSFC Documentation Repository to reflect the availability limitation (e.g., ITAR, EAR, etc.) specified on the MSFC Form 2896 that accompanies the drawing.
(34)	When serialization is required, the following note shall be entered: "SERIALIZATION IS REQUIRED." As an option, include this with part marking in the GENERAL NOTES. Part marking requirements, including serial numbers, shall be specified in the GENERAL NOTES.
(35)	For Tabulated Detail Drawings the tabulated blocks, the tabulated information shall be entered as defined in MSFC-STD-555.
(36)	GENERAL and FLAGGED NOTES location. Notes shall be numbered consecutively starting with Note 1.

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TABLE I. DRAWING FORMAT INSTRUCTIONS

BLOCK	INSTRUCTION
(37)	<p>a) When materials traceability is required, enter the following note: “MATERIALS TRACEABILITY IS REQUIRED PER MPR 8040.2 LEVEL ().” Enter the appropriate level 1, 2, 3, or 4 in the parentheses. As an option this may be included in the GENERAL NOTES.</p> <p>b) If lot/date traceability is required, enter “LOT/DATE TRACEABILITY IS REQUIRED PER MPR 8040.2.” As an option, this may be included in the GENERAL NOTES. Part marking requirements, including lot numbers and or date code, shall be specified in the GENERAL NOTES.</p> <p>c) Fracture critical parts shall be identified by the note “FRACTURE CRITICAL” in this space or in the GENERAL NOTES.</p> <p>d) Matched Set parts shall be identified by the note “MATCHED SET, INDIVIDUAL PARTS ARE NOT INTERCHANGEABLE.” As an option this may be included in the GENERAL NOTES. Manufacturing normally will assign and mark a tracking number. NOTE: Using assemblies shall include a flag note identifying matched set parts.</p>
(38)	This block is used to identify additional screening for EEE parts as required. The detailed requirements are to be specified in the GENERAL NOTES area of the drawing. When additional screening is required enter the following note: “EEE PARTS SCREENING REQUIRED. SEE GENERAL NOTES NUMBER(S) (enter the appropriate note numbers).”
(39)	This block shall denote the part number(s) as specified in MSFC-STD-555.
(40)	Supplementary Drawing Number Block, the drawing number shall be entered.
(41)	Supplementary Drawing Revision Block, the current revision symbol shall be entered.
(42)	Design Organization Block, Optional – enter design organization code.

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(32)		REVISIONS				
		ZONE (27)	SYM (28)	DESCRIPTION (29)	DATE (30)	APPROVAL (31)
		(36)				
		(40)				
		(41)				
		(37)		(33)		
		(38)		(34)		
(35)		(26)		(39)		
		(42)				
		TOLERANCE EXCEPT AS NOTED	ORIGINAL DATE OF DRAWING (9)		GEORGE C. MARSHALL SPACE FLIGHT CENTER NATIONAL AERONAUTICS AND SPACE ADMINISTRATION MARSHALL SPACE FLIGHT CENTER AL 38812 (1)	
		DIMENSIONS ARE IN INCHES	DRAFTSMAN (10)	STRESS (13)		
		DECIMAL	ENGINEER (11)	MNFG (14)		
(24)	(25)	ANGLE (19)	MATERIALS (12)	QA (15)		
NEXT ASSY	USED ON	MATERIAL (21)	CHECKER (16)	(8)		
		HEAT TREAT (22)	SUBMITTED (17)	EST WT (7)	SCALE (6)	CODE (5)
APPLICATION		FINAL FINISH (23)	APPROVED (18)			
						DWG SIZE (4) SHEET (2) OF (3)

FIGURE 1. DRAWING FORMAT
(Not to Scale)

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* NOTE

Dimensions are width x height in inches. A size width only shown. Height is same as other drawings. Av is A size vertical; Ah is Horizontal

APPLICATION			REVISIONS			
NEXT ASSY	USED ON	ZONE	SYM	DESCRIPTION	DATE	APPROVAL
(27)	(28)	(29)	(30)	(31)		
		<div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> <p>(1) 2 1/2 x 1 1/4 3/4 3/4</p> <p>(2) 2 x 5/8 1 1/4 1 1/4</p> <p>(3) 2 1/2 x 1 1/4 3/4 3/4</p> <p>(4) 1 1/2 x 5/8 1 1/2 1 1/2</p> <p>(5) 1 1/8 x 3/8 3/4 3/4</p> <p>(6) 1 1/8 x 3/8 3/4 3/4</p> <p>(7) 1 1/4 x 3/8 3/4 3/4</p> <p>(8) 3 1/2 x 1 3/4 2 1/4 2 1/4</p> <p>(9) 2 x 3/8 2 2</p> <p>(10-15) 1 x 1/4 1 1</p> <p>(16) 2 x 1/4 2 2</p> </div> <div style="width: 40%;"> <p>(17-18) 2 x 3/8 2 2</p> <p>(19-20) 3 1/2 x 1 2 2</p> <p>(21-23) 3 1/2 x 3/8 2 2</p> <p>(24-25) 1 1/4 x 1 1/4 1 1 *NOTE</p> <p>(27-28) 1 1/2 x 1/4 1 1/2 1 1/2</p> <p>(29) 3 3/8 x 1 3 3</p> <p>(30) 5 5/8 x 1 5/8 5/8</p> <p>(31) 1 x 1/4 1 1</p> <p>(40) 2 x 1/2</p> <p>(41) 1 1/2 x 1/2</p> <p>(42) 5 5/8 x 1 5/8 5/8</p> </div> </div>				

Item	Drawing Sizes	Av
B,C,D,E,F,J	Ah	
(1)	2 1/2 x 1 1/4	3/4
(2)	2 x 5/8	1 1/4
(3)	2 1/2 x 1 1/4	3/4
(4)	1 1/2 x 5/8	1 1/2
(5)	1 1/8 x 3/8	3/4
(6)	1 1/8 x 3/8	3/4
(7)	1 1/4 x 3/8	3/4
(8)	3 1/2 x 1 3/4	2 1/4
(9)	2 x 3/8	2
(10-15)	1 x 1/4	1
(16)	2 x 1/4	2

Item	Drawing Sizes	Av
B,C,D,E,F,J	Ah	
(17-18)	2 x 3/8	2
(19-20)	3 1/2 x 1	2
(21-23)	3 1/2 x 3/8	2
(24-25)	1 1/4 x 1 1/4	1
(27-28)	1 1/2 x 1/4	1 1/2
(29)	3 3/8 x 1	3
(30)	5 5/8 x 1	5/8
(31)	1 x 1/4	1
(40)	2 x 1/2	
(41)	1 1/2 x 1/2	
(42)	5 5/8 x 1	5/8

(24)	(25)	(20)	(19)
NEXT ASSY	USED ON	MATERIAL	HEAT TREAT

ORIGINAL DATE OF DRAWING (9)	DRAFTSMAN (10)	STRESS (13)
ENGINEER (11)	MANFG (14)	
MATERIALS (12)	QA (15)	
CHECKER (16)	SUBMITTED (17)	APPROVED (18)

EST WT (7)	SCALE (6)	CODE (5)

GEORGE C. MARSHALL SPACE FLIGHT CENTER NATIONAL AERONAUTICS AND SPACE ADMINISTRATION MARSHALL SPACE FLIGHT CENTER AL 35812

DWG SIZE (4)

SHEET OF (3)

(1)

(2)

(1)

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- 5.2 Engineering Order Graphic Data Format Instructions. - The instructions for entering the data required are defined in Table II and Figure 3. Entries for all of the blocks shall be mandatory on all sheets submitted. Unless otherwise specified in Table II, the design activity is responsible for compliance with the instructions. Engineering Order Graphic Data Format Block Sizes are defined in Figure 4.

TABLE II. - ENGINEERING ORDER GRAPHIC FORMAT INSTRUCTIONS

BLOCK	INSTRUCTION
(1)	Shall enter sheet number and total number of sheets.
(2)	Shall enter the EO dash number and the Dwg/part number of the first line item EO to appear on the first line of the EO "A" sheet. NOTE: All continuation sheets shall have this entered for tracking purposes.
(3)	Shall enter the identical data as it appears on the EO "A" sheet.
(4)	Shall enter the reason for the change in a clear, descriptive manner. Avoid indefinite phrases such as "because of change in design" or "documentation change."
(5)	<p>In determining the disposition of old parts/assemblies and/or rework, the preparing organization shall assume that parts/assemblies have been manufactured and inspected and conform exactly to the configuration established by previously released official engineering documentation. The disposition thus indicated shall be applicable only for those parts/assemblies for which the conditions do exist. Manufacturing and quality assurance organizations shall disregard the disposition indicated when the aforementioned conditions do not exist. The three approved dispositions shall be used and interpreted as follows:</p> <ul style="list-style-type: none"> a) N/A - This shall be used only when changes are made which in no way affect a physical part/assembly. Examples are: information drawings, schematics, specifications not released for a specific effectivity, etc. b) YES - This shall be used to indicate that rework of a part/assembly for exact conformance to the new configuration is both possible and permissible. c) NO - This shall be used to indicate that rework of a part/assembly for exact conformance to the new configuration is either not possible or not permissible. When so indicated, then the existing part/assembly cannot be used unless a waiver is issued to authorize its use as well as to document the deviations from the configuration required by the EO. d) Enter the applicable change identification symbol as line item identifiers. NOTE: the symbol shall match the block selected from a) to c) above.
(6)	Shall enter detailed description, using sketches as necessary, of the change(s) to be made.
(7)	Shall enter the DP/RS number. Use block of numbers assigned to the preparing organization, or obtain from the Release Desk.

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FILE NO	EO DASH	DWG/PART NO	ENGINEERING ORDER (GRAPHIC DATA)			SHEET B (1) OF SHEETS		
	(2)	(2)						
CHG IDENT SYM	ENGINEERING ORDER NO		REASON:	DISPOSITION OF OLD PART	REWORK:	CHANGE IDENTIFICATION SYMBOL/S		
	DASH	DWG/PART NO						
(3)	(3)	(3)				(4)	N/A (5a)	(5d)
							YES (5b)	(5d)
					NO (5c)	(5d)		
(6)								
(7)								

MSFC- Form 421-1 (Rev. March 1990)

FIGURE 3. ENGINEERING ORDER GRAPHIC DATA FORMAT
(Not to Scale)

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FILE NO	EO DASH (A)	DWG/PART NO (B)	(C)	ENGINEERING ORDER (GRAPHIC DATA)	(D)	SHEET B OF SHEETS
CHG IDENT SYM	ENGINEERING ORDER NO		REASON: (H)	DISPOSITION OF OLD PART	REWORK:	CHANGE IDENTIFICATION SYMBOL/S
(E)	DASH (F)	DWG/PART NO (G)			N/A (I)	(J)
					YES (I)	(J)
					NO (I)	(J)

Block sizing in inches width X height

(A)	$\frac{1}{2} \times \frac{1}{4}$
(B)	$1\frac{1}{2} \times \frac{1}{4}$
(C)	$5\frac{1}{8} \times \frac{3}{8}$
(D)	$2\frac{3}{8} \times \frac{3}{8}$
(E)	$\frac{1}{2} \times \frac{5}{8}$
(F)	$\frac{1}{2} \times \frac{5}{8}$
(G)	$1\frac{1}{2} \times \frac{5}{8}$
(H)	$3\frac{3}{8} \times \frac{7}{8}$
(I)	$\frac{7}{8} \times \frac{1}{4}$
(J)	$2\frac{3}{8} \times \frac{1}{4}$
(K)	$\frac{1}{2} \times 1$

PKG CONT NO.
(K)

MSFC- Form 421-1 (Rev. March 1990)

FIGURE 4. ENGINEERING ORDER GRAPHIC DATA FORMAT BLOCK SIZES
(Not to Scale)

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6. NOTES

None.

I. GENERAL INFORMATION

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