U.S. DEPARTMENT OF COMMERCE / National Oceanic and Atmospheric Administration

FEDERAL COORDINATOR FOR METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH

Standard Formats for Weather Data Exchange Among Automated Weather Information Systems

FCM-S2-1982

Washington, D.C.
August 1982

THE FEDERAL COMMITTEE FOR
OROLOGICAL SERVICES AND SUPPORTING RESEARCH (FCMSSR)

E, Chairman
mmerce

, JR.
riculture

RTIN
Department of Defense

MR. DAVID SLADE
Department of Energy

VACANT
Environmental Protection Agency

MR. JOHN R. BRINKERHOFF
Federal Emergency Management Agency

MR. LEWIS T. MOORE
Department of Interior

DR. BURTON I. EDELSON
National Aeronautics and Space
Administration

DR. FRANCIS S. JOHNSON
National Science Foundation

MR. S. AHMED MEER
Department of State

MR. NEAL BLAKE
Federal Aviation Administration
Department of Transportation

DR. ROBERT F. ABBEY, JR.
U. S. Nuclear Regulatory Commission

MR. WILLIAM S. BARNEY
Federal Coordinator
Department of Commerce

ALONZO SMITH, JR., Executive Secretary
Office of the Federal Coordinator
Department of Commerce

THE INTERDEPARTMENTAL COMMITTEE FOR
METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH (ICMSSR)

WILLIAM S. BARNEY, Chairman
Federal Coordinator
Department of Commerce

DR. T. B. KINNEY, JR.
Department of Agriculture

MR. JAMES McLEAN
National Transportation Safety Board

COLONEL PAUL D. TRY, USAF
Department of Defense

DR. HARRY MOSES
Department of Energy

MR. WILLIAM H. KEITH
Environmental Protection Agency

MR. JAMES W. KERR
Federal Emergency Management Agency

DR. SHELBY TILFORD
National Aeronautics and Space
Administration

DR. ELBERT W. FRIDAY
National Weather Service
Department of Commerce

MR. EARL H. MARKEE, JR.
U. S. Nuclear Regulatory Commission

MR. JAMES C. DZIUK
Federal Aviation Administration
Department of Transportation

MR. RICHARD HAYES
U. S. Coast Guard
Department of Transportation

MR. LEWIS T. MOORE
Department of Interior

ALONZO SMITH, JR., Executive Secretary
Office of the Federal Coordinator
Department of Commerce

U. S. DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Federal Coordinator for
Meteorological Services and Supporting Research

Standard Formats for Weather Data Exchange Among Automated Weather Information Systems

Washington, D. C.
August 1982
FCM-S2-1982

I/2294

CHANGE LOG

Change No.	Page Number	Date Posted	Signature
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

FOREWORD

Computers and microprocessors are being widely introduced into the field level of operations of the several weather services and among their various users. These new systems provide a capability for organizing information in a variety of ways. The observance of standards in the format of the weather information and protocols of communication is essential to the efficient exchange of information among the providers and efficient application by the users.

This report establishes standards of data formats for a number of product types, together with the elements of identification. This initial report was prepared by the Task Group on Communication Interfaces and Data Exchanges, established by the Working Group on Automated Weather Information Systems.

The rapidly evolving character of the technology of information handling and the newness of these systems within the meteorological community will undoubtedly present many opportunities and requests for modification of these standards and the addition of others. It is anticipated that a standing group will be appointed to recommend changes and maintain the current set of operating standards.

William S. Barney
Federal Coordinator for
Meteorological Services and
Supporting Research

TABLE OF CONTENTS

TABLE OF CONTENTS (cont.)

TABLE OF CONTENTS (cont.)

LIST OF FIGURES

LIST OF FIGURES (cont.)

LIST OF TABLES

ANNEXES

1.0 INTRODUCTION

1.1 Purpose. This Weather Data Exchange Format Document presents a common set of formats to be used for the transfer of weather data among agencies. The document includes formats which meet current and planned requirements of the Air Force, Navy, National Weather Service (NWS) and Federal Aviation Administration (FAA). For a complete understanding of the formats and their applications, it is necessary to be familiar with the entire document. The user should not attempt to apply specific formats without a thorough knowledge of the format contents and an understanding of the product data set format syntax necessary to organize the data.

1.2 Objective. The objectives of this standard formats document are:

A. To provide a level of data structuring above the communications level, that is not dependent on the networking and data link procedures.

B. To provide a format that will support all existing products and message data, both graphic and nongraphic.

C. To provide a device independent format that will allow for expansion to handle new data structures or graphics devices without having to redefine the general structure of the format.

D. To provide a format that will be both convenient for the host machine to generate and for the receiving equipment to process.

E. To provide a format that readily allows receivers to bypass data formats not usable at the receiving station.

F. To provide a format which is byte oriented with 8 bits per byte.

1.3 Scope. This document specifies the format structure for data transfer, identifies categories of products covered by the formats and defines the formats for each data category to the byte level. Communications protocols are not covered in this document.

2.0 GENERAL FORMAT DEFINITION

2.1 Format Structure. The format structure is constructed with information blocks. Information blocks provide control information and contain data. Figure 2.1 displays the general format of information blocks. A specific grouping of these blocks is used to create a product and is considered a product data set.

2.1.1 Information Blocks Definition. An information block is a series of bytes identifying, controlling, or containing information used to create products. These blocks are characterized as control blocks, product definition blocks, data description blocks and data blocks.

2.1.1.1 Control Blocks. The control blocks are Product Identification, End of Product and parameter control blocks. The Product Identification Block is a standard block used for all products. Its purpose is to convey the information needed to uniquely identify each product so that appropriate processing routines may be initiated by the receiving system. The End of Product block is a standard block that signifies the end of the product data set. The other control blocks provide product data set wide control of parameters in the data blocks.

2.1.1.2 Product Definition Block. The Product Definition Block shall contain all information required to define the nature of the product being transferred (product area, scale, orientation, etc.).

2.1.1.3 Data Description Block. The Data Description Block shall contain all information required to describe the contents of the data block(s) that follow (number and type of elements, element arrangement, units, etc.). The data description block shall be used when additional information about the structure and content of the data block(s) is required.

2.1.1.4 Data Block. The Data Block(s) shall contain the data in the format, units, etc., specified by the data description block, if not inherent in the data block itself.

2.1.2 Blocking Conventions. Multiple information blocks are used to fully define a product.

2.1.2.1 Product Data Set Structure. The product data set components shall be: a Product Identification Block; a Product Definition Block; one or more sets of control, data description, and data blocks; and each product data set shall be terminated by an End Of Product Block. Figure 2.2 displays the general Product Data Set Structure.

2.1.2.2 Block Sequencing. The Product Identification Block shall always be the first block in the product data set. Define Plot Parameters and Define Datawidth/Fieldwidth blocks may be interspersed with the data blocks and may appear anywhere in the product data set after the Product Identification block but before the data to which it applies. Multiple sets of Data Description Blocks (when used), followed by one or more Data Blocks, may be used as required by the product originator to define all components of the product.

2.2 Block Format.

2.2.1 General Format. In general, each block shall contain the following fields: a LENGTH field, the MODE and SUBMODE fields, the DATA field, and a CHECKSUM field. These fields are defined in the notes following Figure 2.1. The LENGTH and CHECKSUM fields provide internal block information. The MODE and SUBMODE fields indicate the general content of the DATA field in the block.

2.2.1.1 Block Termination. The LENGTH field identifies the end of the block by providing a count of all byte pairs contained in the block. If the LENGTH field is not used, termination of a block can be accomplished by setting the most significant bit of the last byte in the data field. The originator must be able to guarantee that all other bytes in the data field have a zero in the most significant bit; otherwise, the LENGTH field will be necessary. In the case of non-graphic data, where a subset of the ASCII code is specified, ETX and ETB are used to end a block. (See Section 2.2.2.2b.)

2.2.1.2 Block Size. Block length shall be variable but shall not exceed 4096 bytes, including the LENGTH and CHECKSUM when used. Multiple data blocks shall be used as required by the product originator to conform to the block length restriction and enhance circuit efficiency.

2.2.2 Block Format Conventions. The following general format conventions shall be observed within all blocks:

a. Byte (and bit) numbering shall be referenced to byte (bit) zero (0), i.e., the second byte (bit) is numbered one (1). The byte (bit) order shall be left to right.

b. All fields in the blocks shall be in one or more byte unless otherwise specified in the block format or the data description block.

c. All block formats shall be arranged into two byte pairs with the bytes ordered left to right.

d. The LENGTH and CHECKSUM fields shall be used as required by the product originator. The presence or absence of the LENGTH and CHECKSUM fields shall be indicated by the flag in the LENGTH field. If the LENGTH and CHECKSUM fields are not used, the two left-most bits in the first byte of the block (i.e., the two most significant bits in the MODE bytes) become the flag bits.

2.2.2.1 Graphic Display Information. The data contained in blocks which are display-oriented shall observe the following conventions:

a. All binary data shall be in two's complement form.

b. Binary data shall be right justified and zero filled.

c. All data is represented in octal notation unless otherwise noted.

2.2.2.2 Nongraphic Information. The data contained in non-graphic blocks (e.g., man-readable messages) shall observe the following conventions:

a. All nongraphic data shall be seven (7) bit ASCII (ANSI X3.4-1977). Parity, if used, is transparent to these formats, except when the uppermost bit of the last data byte is being used to identify the last byte for recognition of block termination. (See Section 2.2.1.1.) An interagency common assignment of ASCII control characters to represent symbolic information (e.g., weather symbols) is found in Annex C (Table C2-1).

b. Alphanumeric data shall be left justified within a field and blank filled. When using ASCII code, the following conventions will apply to separate information within and terminate a block. The control character RS will be used to separate records within a data block. The control character ETB will be used at the end of blocks which are not the final block of a product data set. The character ETX will be the final character of an ASCII block which is the final block in a product data set. The most significant bit of the final byte (ETB or ETX) in the block may also be used for termination of a block when the previous bytes contain zeros in the most significant bit.

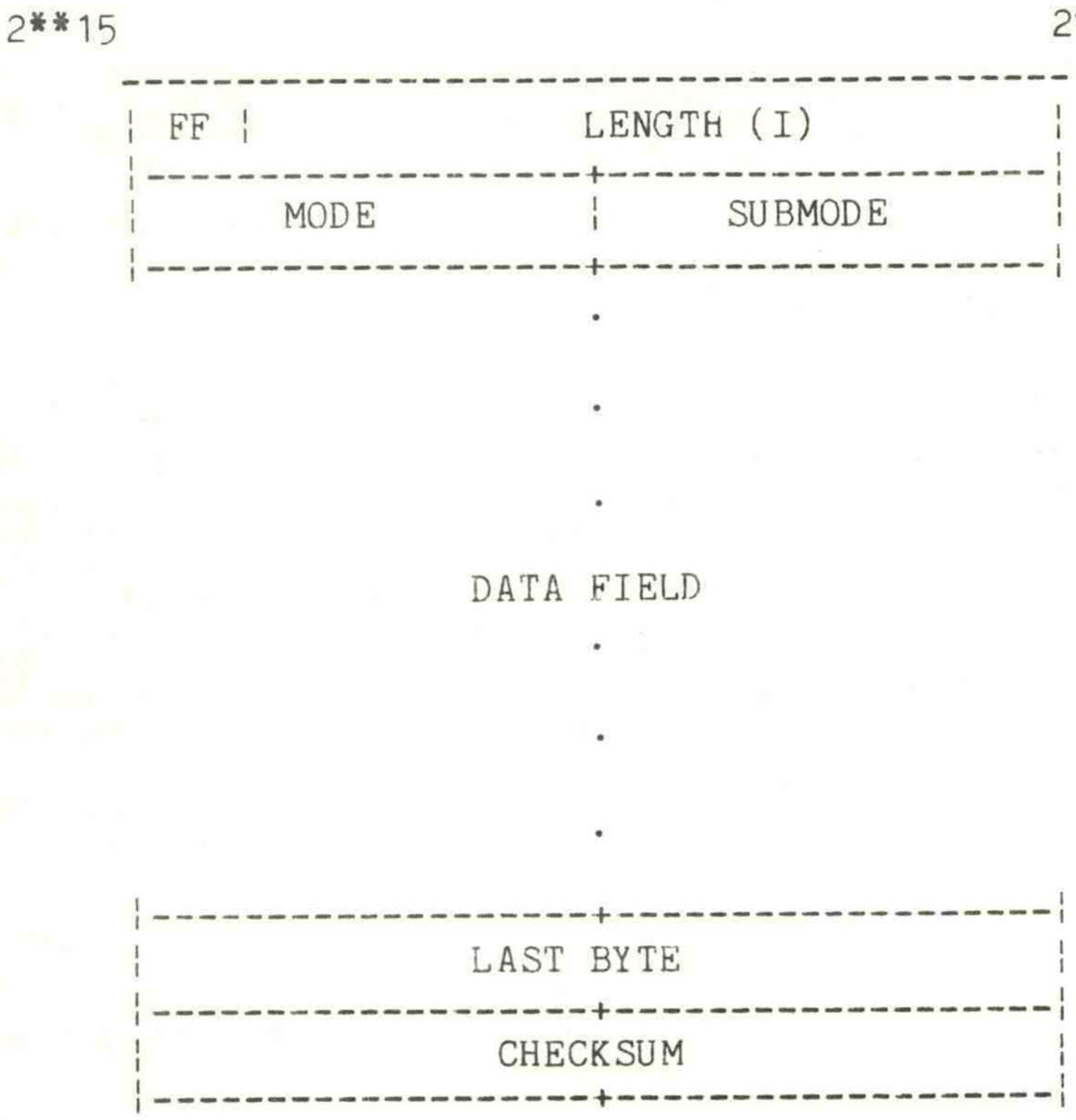


Figure 2.1
General Block Format
Mode X, Submode X

NOTES: Figure 2.1 General Block Format, Mode X, Submode X

1. FF = Flag: The Flag is a two-bit LENGTH/CHECKSUM indicator. Possible combinations of these two bits are:

Flag Bits	LENGTH	CHECKSUM
00	YES	YES
01	YES	NO
11	NO	NO

If the first Flag bit is one (1), the lower six bits of the byte will contain the Mode. The Flag bit combination 10 is not used as an indicator since there will never be a CHECKSUM if the LENGTH is not present. Blocks that contain data where the most significant bit of a byte could contain a one (1) shall always have a LENGTH.

2. LENGTH: The LENGTH gives the total number of two byte pairs in the current block, including the bytes containing the LENGTH and CHECKSUM if present.

3. MODE: The MODE indicator byte is contained in all transmission blocks and indicates, to the receiver, the type of block being transferred. Note that the most significant bit will be a one (1) if LENGTH and CHECKSUM are not present.

4. SUBMODE: The SUBMODE is used to classify each MODE into its logical subdivisions for the purpose of clarity in defining a block of data within a transmission mode.

5. DATA FIELD: The DATA FIELD contains information about the data and/or the data itself. Each block (i.e., MODE and SUBMODE combination) has information defined in this field for specific applications. The DATA FIELD will end on a two byte boundary, with binary data being zero filled and alphanumeric data being blank filled if necessary.

6. CHECKSUM: The CHECKSUM is a two's complement 16 bit word containing the arithmetic sum of all 16 bit byte pairs in the block with no end around carry.

7. The notation (I) indicates an unsigned integer quantity, e.g., LENGTH (I) indicates the LENGTH is an integer number.

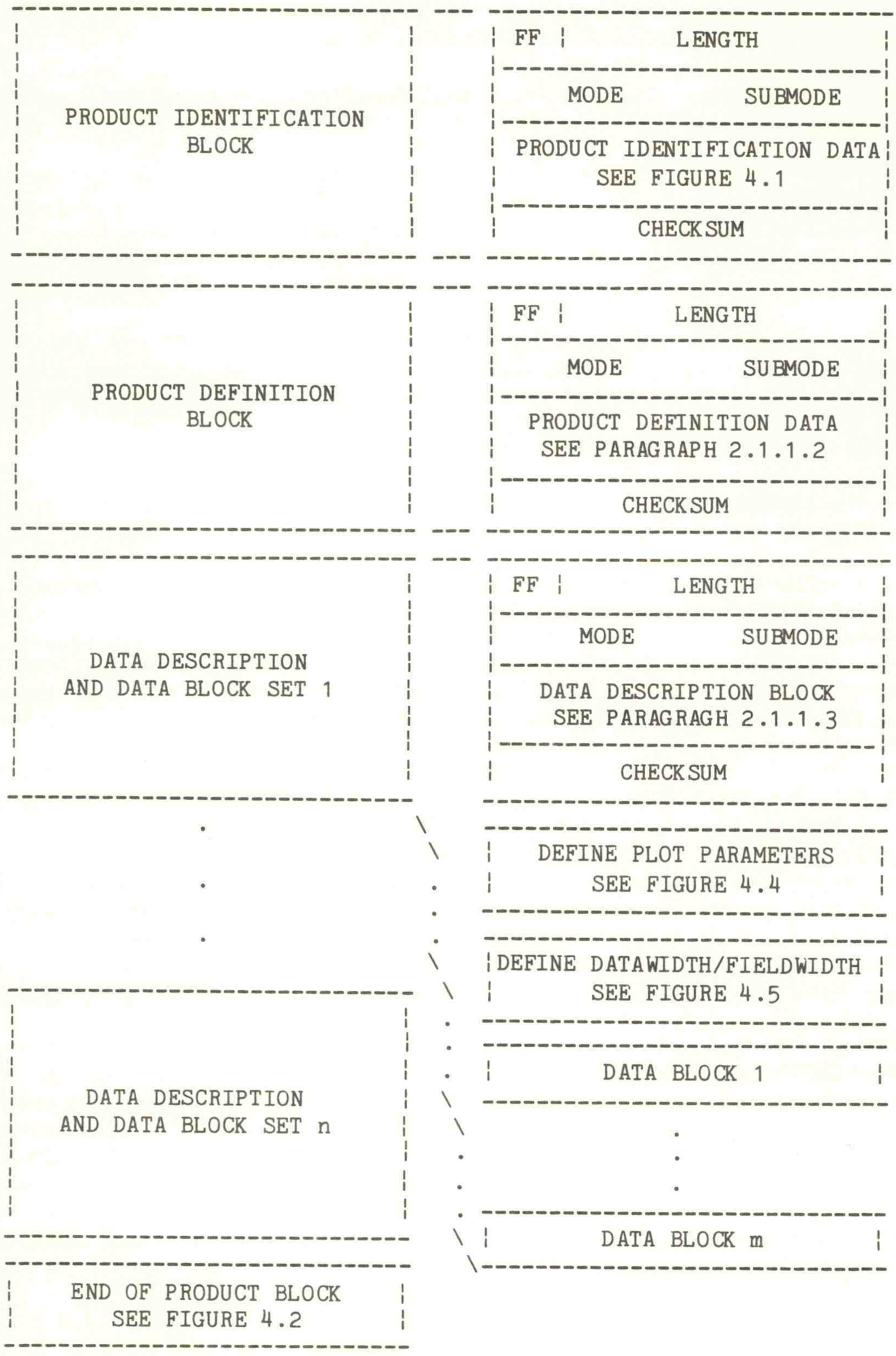


Figure 2.2
General Product Data Set Structure

3.0 PRODUCT CONTENT

3.1 Data Categories. The formats contain information blocks of two basic types: 1) product data set control and 2) product data.

3.1.1 Product Data Set Control. The product data set control information includes the blocks for beginning and ending the product data set, for defining parameter values and fields within the product data set, and which contain other product related information. Also, user specific internal system data control is provided for.

3.1.2 Product Data. The product data can be specified by the following categories:

A. Formatted Binary
B. Vector Graphic
C. Alphanumeric
D. Raster Scan
E. Gridded

3.1.2.1 Formatted Binary Data. Formatted binary data consists of machine-readable decoded weather observation/forecast data.

3.1.2.2 Vector Graphic Data. Vector graphic data shall be used to describe weather maps/charts. Vector graphic data includes vectors, graphic symbols and geographic background.

3.1.2.3 Alphanumeric Data. Alphanumeric (A/N) data shall be used for man-readable messages consisting of A/N character strings and labels for display products.

3.1.2.4 Raster Scan Data. Raster scan data shall be pixel data describing visual imagery such as satellite pictures, radar pictures, gray level imagery or facsimile images. This data may be in either packed or unpacked form.

3.1.2.5 Gridded Data. Gridded data shall consist of sets of machine readable weather data located at uniformly spaced geographical points.

3.2 Mode/Submode Designations. All format blocks are identified by mode and submode values. These values are octal integers. The key to general mode/submode assignments is found in Table 3.1. In general, mode numbers represent data categories and Submode numbers represent the specific product definition, data description and data blocks within a data category. Currently defined modes and submodes are shown in Tables 3.2 and 3.3; however, new mode/submode combinations shall be added based on agency needs and committee agreement.

3.2.1 Mode Designations. The data categories in Section 3.1.2 are identified by mode numbers. Mode 1 contains control blocks, Mode 2 is for individual user internal system applications, and Modes 3 through 7 are for the product data. See Table 3.2.

3.2.2 Submode Designations. The submodes within each mode are listed and referenced to figures in Table 3.3.

3.3 Product Format. A product data set is formed to create a product. A complete product shall consist of all information required to describe a bounded group of related data. A product data set contains the product identification, definition, data description and data blocks (the format specified in Section 2.0) as necessary to create the desired product. The product definition block identifies the type of product (e.g., alphanumeric message, graphic display, or satellite image, etc.). Data descriptions and data blocks from any data category may be included in a single product data set if that data is needed for the product (e.g., alphanumeric labels applied to a graphic product). A representative example of a vector graphic product is found in Annex F.

Table 3.1

Key to Mode/Submode Designations

	Number (Octal)	Type of Information
Modes	001-002	Product Control/Internal System Data
Submodes	001-017	Control or Data Blocks
Modes	003-077	Product Type (only 3-7 are currently assigned)
Submodes	001-017	Data Blocks (DB)
	020, 030, ..., 070	Product Definition Blocks (PDB)
	021-027, 031-037, ..., 071-077	Data Description Blocks (DDB) associated with PDB, (e.g., 21-27 => 20)
	100-377	Unassigned, to be designated if the assigned ranges are exhausted.

Table 3.2

Mode Designations

Mode (Octal)	Definition
001	Product Data Set Control
002	Systems Data
003	Formatted Binary
004	Vector Graphic
005	Alphanumeric
006	Raster Scan
007	Gridded
010-377	Open

Table 3.3

Submode Designations

Description	Submode (Octal)	Figure No.
Mode 1 Product Data Set Control		
Product Identification	1	4.1
End of Product	2	4.2
Classification	3	4.3
Define Plot Parameters	4	4.4
Define Datawidth/Fieldwidth	5	4.5
Open	6-377	
Mode 2 Systems Data		
Internal Use Blocks	User Definable	5.1
Mode 3 Formatted Binary		
Formatted Binary Product Definition	20	6.1
Formatted Binary Data Description	21	6.2
Formatted Binary Data Block	1	6.3
Open	2-377	
Mode 4 Vector Graphic		
Graphics Product Definition	20	7.1
Define Graphics Parameters	30	7.2
Absolute Vectors Block	1	7.3
Relative Vectors Block	2	7.4
CPC Vectors Block	3	7.5
Variable Exception Vectors (VEV) Block	4	7.6
Long/Short Relative Vectors Block	5	7.7
Point/Slope Vectors Block	6	7.8
Wind Barbs Vectors Block	7	7.9
Vector (Arrow) Plot Block	10	7.10
Open	11-377	

Table 3.3 (cont.)

Submode Designations

Description	Submode (Octal)	Figure No.
Mode 5 Alphanumeric		
Alphanumeric Product Definition	20	8.1
Alphanumeric Character Block	1	8.2
Data Plot Block	2	8.3
Wind Barbs Data Block	3	8.4
Alphanumeric Data Block	4	8.5
Open	5-377	
Mode 6 Raster Scan		
Satellite Product Definition	20	9.1
Pixel Product Definition	30	9.2
Raster Scan Data Block	1	9.3
Open	2-377	
Mode 7 Gridded		
Gridded Data Product Definition	20	10.1
Band Index Data	1	10.2
Open	2-377	

4.0 CONTROL BLOCKS

4.1 Product Identification Block. This block shall be formatted as shown in Figure 4.1. The data field shall identify the origin of the product, the classification, retention time, product identifier, and file time. These fields shall be as defined in Figure 4.1 except as otherwise noted below or under individual data type format discussions.

4.2 End of Product Block. The End of Product Block format is shown in Figure 4.2. This block shall be standard for all data types.

4.3 Classification Block. The Classification Block format is shown in Figure 4.3. This block shall be used if additional information regarding the classification of the product data set (other than that information provided in the CLASSIFICATION byte of the Product Identification Block - Figure 4.1) is required.

4.4 Define Plot Parameters Block. This block shall be formatted as shown in Figure 4.4. When used the fields required will be filled and all other fields will be either zero or blank filled, unless the length is used to foreshorten the block when the latter fields are not needed. IF LENGTH is not used, the full format is required. The Define Plot Parameters Block may be used prior to any data block to indicate the settings of display parameters. Once set, the parameters remain in that state until superseded by another Define Plot Parameters Block.

4.5 Define Datawidth/Fieldwidth Block. The Define Datawidth/Fieldwidth Block shall be formatted as shown in Figure 4.5. It may be used to redefine the number of bits allocated to (field width) and used by (data width) each data element in the specified mode/submode. The following rules shall apply to the use of this block:

a. Redefined datawidth/fieldwidth values shall not apply to the LENGTH, MODE, SUBMODE, CHECKSUM, or other informational elements in the specified MODE/SUBMODE, i.e., redefined values apply only to the data itself.

b. Redefined values shall remain in effect for all subsequent blocks with the specified MODE/SUBMODE until reset by another Define Datawidth/Fieldwidth Block or End of Product Block, whichever comes first in the product data set sequence.

c. The Define Datawidth/Fieldwidth Block may be inserted anywhere in the product data set but applies only to the blocks that follow it in the product data set sequence.

d. Each block may be used to redefine values for one MODE/SUBMODE. Additional blocks may be used, as required, to redefine values for additional mode/submode blocks.

FF	LENGTH (I)		
001	001		
CHARACTER 1	CHARACTER 2	\	Originator Identification
CHARACTER 3	CHARACTER 4	/	
CLASSIFICATION	RETENTION TIME		
FILE INDICATOR	CHARACTER 2	\	
CHARACTER 3	CHARACTER 4		Product
CHARACTER 5	CHARACTER 6		Identifier
CHARACTER 7	CHARACTER 8		
CHARACTER 9	CHARACTER 10	/	
YEAR		\	
MONTH	DAY		Product File Time
HOUR	MINUTE	/	
CHECKSUM			

Figure 4.1
Product Identification Block Format
Mode 1, Submode 1

NOTES: Figure 4.1: Product Identification Block Format; Mode 1, Submode 1

1. Originator Identification: A four character identifier of the facility that generates or compiles the product.

2. CLASSIFICATION: The classification code is a single ASCII character defining the classification for this product as follows:

U = Unclassified
C = Confidential
S = Secret
T = Top Secret
E = Encrypt for Transmission Only (EFTO)

3. RETENTION TIME: The RETENTION TIME is the default time, in days, the system shall use to retain the product before purging it. This byte will contain 377 when this value is not furnished.

4. FILE INDICATOR: The FILE INDICATOR byte specifies the naming convention used to identify the product being transmitted. This byte plus the succeeding nine bytes contain the product identifier. The indicator is defined as follows:

File Indicator (Octal)	File Naming Convention
000 to 077	The file indicator is a value determined by interagency agreement. The values are found in Annex D. The remaining nine characters are defined as: CHARACTERS 2-5: Catalog Number (See Annex D). CHARACTERS 6-7: Three character number representing the time in hours from product generation time. CHARACTERS 9-10: Two ASCII characters defined for products that are transmitted without a background. Interagency common background descriptions are used. (See Annex C, Table C2-2.)

100 to 177	The file indicator is the first ASCII character of a 10 character product identifier. The file name is left justified, blank filled. The following ASCII charater assignments are given to each agency:

Air Force	A-G
NWS	H-M
FAA	N-S
Navy	T-Z

If the file indicator contains the value 177, the file name is for internal use only.

200 to 377	Reserved for future

5. Product File Time: The Product File Time shall consist of a full century year (16 bit integer), month, day, hour, and minute (8 bit integers). It represents a means of further identifying products with identical Product Identifiers. Unless otherwise specified, this time shall be the date/time the product was generated.

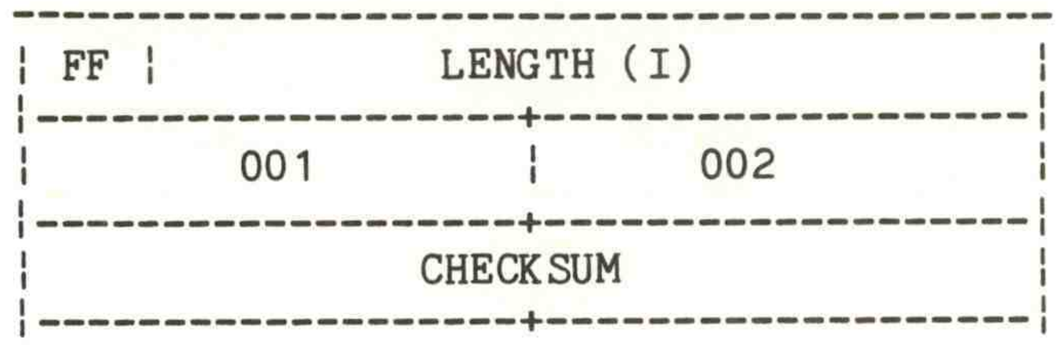


Figure 4.2
End of Product Block
Mode 1, Submode 2

FF	LENGTH (I)
001	003
CHARACTER 1	CHARACTER 2
CHARACTER 3	CHARACTER 4
.	
.	
.	
	LAST CHARACTER
CHECKSUM	

Figure 4.3
Classification Block
Mode 1, Submode 3

NOTES: Figure 4.3: Classification Block; Mode 1, Submode 3

1. CHARACTER: The information in ASCII code.

2. This block follows the rules for non-graphic blocks. See Section 2.2.2.2.

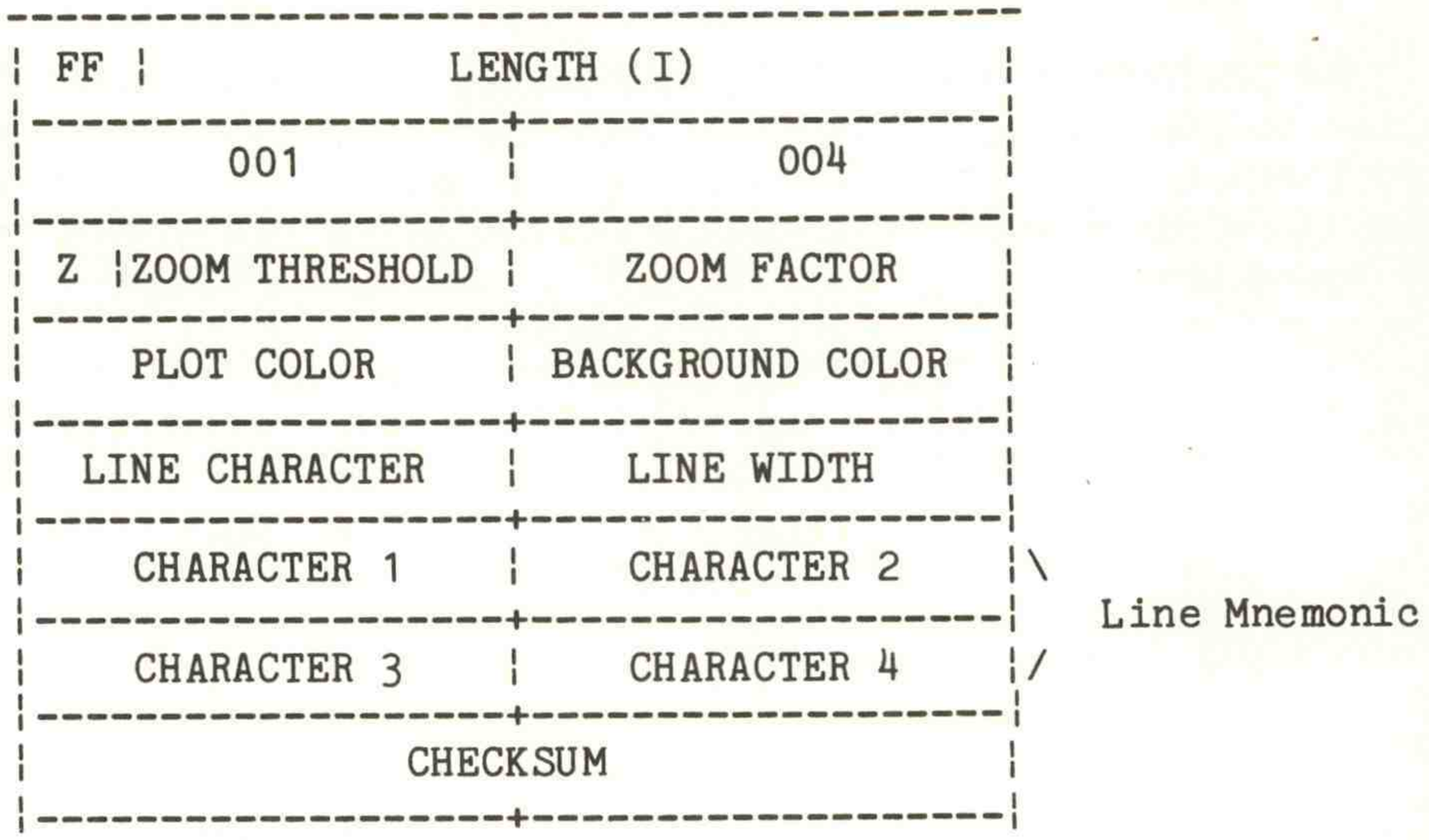


Figure 4.4
Define Plot Parameters Block
Mode 1, Submode 4

NOTES: Figure 4.4: Define Plot Parameters Block; Mode 1, Submode 4

1. Z = Zoom Disable: If Z=1, the displayable data will be invariant in display size regardless of zoom selection. If Z=0, displayed data are sized according to zoom selection.

2. ZOOM THRESHOLD: The ZOOM THRESHOLD is the maximum magnification that may be applied to the product within the constraints of the data density from which the product was built. This value is the denominator of the fractional area of the entire viewing space. Currently assigned codes which are representative of the zoom value are:

00 - Display at all zoom levels (default)
01 - Display at 1X or lower magnification
02 - Display at 2X or lower magnification
03 - Display at 3X or lower magnification
04 - Display at 4X or lower magnification
.
.
.

16 - Display at 16X or lower magnification

3. ZOOM FACTOR: An optional zoom (magnification) factor to be assigned to strings selectively at a local level. Currently assigned values are:

0 - No zoom, (default)
1 - 1X
2 - 2X
3 - 3X
.
.
.

16 - 16X

4. PLOT COLOR and BACKGROUND COLOR: These values range from 0 to 255. Application of National Bureau of Standards (NBS) color standards is to be determined.

5. LINE CHARACTER: Assigned values are:

0 - Continuous (default)
1 - Dotted line (alternate pixels)
2 - Dashed line (short dashes)
3 - Dashed line (long dashes)
4 - Dotted line (every 4th pixel)
5 - Symbolic line

6. LINE WIDTH: This value indicates the thickness of line in pixels.

7. Line Mnemonic: Four character line mnemonic as specified in Table A2-1.

8. Values defined by this submode are effective on all subsequent modes until redefined.

9. This block can be shortened by using a LENGTH value less than the maximum number of byte pairs shown in the figure. The fields past the LENGTH count will be truncated and the information they control not changed.

FF	LENGTH (I)	
	001	005
	FIELDWIDTH	DATAWIDTH
	MODE	SUBMODE
	CHECKSUM	

Figure 4.5
Define Datawidth/Fieldwidth Block
Mode 1, Submode 5

NOTES: Figure 4.5: Define Datawidth/Fieldwidth Block; Mode 1, Submode 5

1. FIELDWIDTH: An integer number that defines the number of bits allocated to each data element in the specified mode/submode. The legal range is 1 through 16.

2. DATAWIDTH: An integer number that defines the number of bits used by the actual data within the FIELDWIDTH. The legal range is 1 through FIELDWIDTH. Example: If the data are three bits wide and are repeated every four bits, then FIELDWIDTH = 4, DATAWIDTH = 3.

3. MODE and SUBMODE: The mode and submode to which the redefined fieldwidth and datawidth apply.

5.0 SYSTEMS DATA

5.1 General Information. This mode is provided to support the transmission of system or application binary data. The submodes are user definable internally within the user system and not intended for any other agency use.

5.2 Binary Data Block. The format for this block is depicted in Figure 5.1. No Product Definition or Data Description blocks are necessary with this data block.

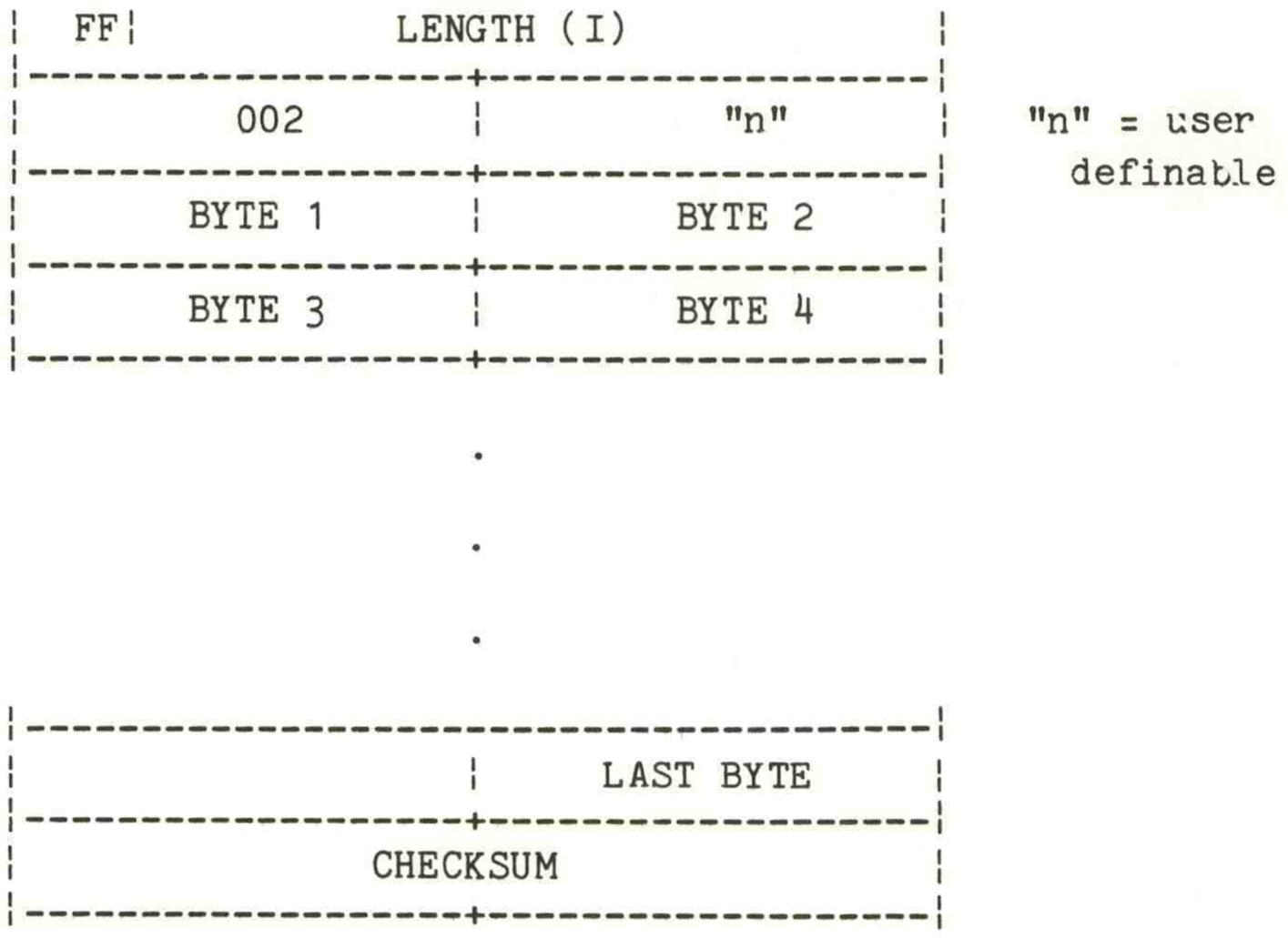


Figure 5.1
Binary Data Block
Mode 2, Submode "n"

6.0 FORMATTED BINARY BLOCKS

6.1 Product Definition Block. This block shall be an 18 byte block, including the LENGTH and CHECKSUM. The specific format and content shall be as shown in Figure 6.1.

6.2 Data Description Block. The Formatted Binary Data Description block, shown in Figure 6.2, acts as a data interpretation table for the data in the following binary data block(s). It describes the data in the formatted binary data block(s) in sufficient detail to allow the receiver to use the data. The length of the formatted binary data description block shall depend on the number of repeating data sections required to define the product. (See Note 3 of Figure 6.2)

6.3 Data Block. The Formatted Binary Data block shall be formatted as shown in Figure 6.3. The data field shall be formatted as specified in the Formatted Binary Data Description block.

FF	LENGTH (I)	
003	020	
CHARACTER 1	CHARACTER 2	\
CHARACTER 3	CHARACTER 4	/ Data Call Letters
WMO BLOCK NUMBER (I)		
STATION NUMBER (I)		
LATITUDE (I)		
LONGITUDE (I)		
CHECKSUM		

Figure 6.1
Formatted Binary Product Definition Block
Mode 3, Submode 20

NOTES: Figure 6.1: Formatted Binary Product Definition Block;
Mode 3, Submode 20

1. Data Call Letters: The International Civil Aviation Organization (ICAO) identification of the originator station.

2. WMO BLOCK NUMBER: A two digit identifier of a section of the earth based on a system developed by the World Meteorological Organization (WMO).

3. STATION NUMBER: A three digit station identification within the region identified by the WMO BLOCK NUMBER.

4. LATITUDE, LONGITUDE (I): Latitude and Longitude must be multiplied by .01 to get the actual value. Negative latitude indicates South, negative longitude indicates East.

FF	LENGTH (I)	
003	021	
NUMBER OF ELEMENTS	# OF BYTES/SECTION	
NUMBER OF SECTIONS		\
CHARACTER 1	CHARACTER 2	Element Mnemonic
CHARACTER 3	CHARACTER 4	/
START BYTE	# BYTES/ELEMENT	
UNUSED (ZEROES)	UNITS CODE	
MULT. MANTISSA	MULT. CHAR.	
ADDITIVE CONSTANT		
CHARACTER 1		
Repeated bytes		
ADDITIVE CONSTANT		
CHECKSUM		

Figure 6.2
Formatted Binary Data Description Block
Mode 3, Submode 21

NOTES: Figure 6.2: Formatted Binary Data Description Block; Submode 21

1. NUMBER OF ELEMENTS: The number of elements contained in each section of the data block. This field indicates the number of 12 byte repeating sections in the data description block.

2. NUMBER OF BYTES/SECTION: Total number of bytes contained in a repeating section. This is the number of bytes that must be skipped to read a given element from each repeating section.

3. NUMBER OF SECTIONS: The total number of repeating sections in the data block.

4. ELEMENT MNEMONIC: A four character set that identifies the element being described. Table A2-1 (Annex A) contains the mnemonics list.

5. START BYTE: The byte number in the data block where the first occurrence of the element can be found. Succeeding occurrences of the element can be found by successively adding the number of bytes per section to the start byte number.

6. NUMBER OF BYTES/ELEMENT: The number of bytes in the data block occupied by the element.

7. UNITS CODE: A code specifying the units of the data elements. The list of units codes is found in Table C2-6 (Annex C).

8. MULTIPLIER MANTISSA: Integer constant to be multiplied by the element value to obtain the actual value of the element. Used in conjunction with the multiplier characteristic.

9. MULTIPLIER CHARACTERISTIC: Exponent of 10 to be used with the multiplier mantissa to obtain the true value of the element.

10. ADDITIVE CONSTANT: Integer constant to be added to the element value to obtain the true value of the element.

11. The ninth through twentieth bytes are repeated for each element in the data type being transmitted. These 12 bytes may be repeated for up to 341 parameters. The actual number of 12 byte fields required depends on the data being transmitted.

12. The actual value of the element is calculated as shown below:

$$\text{Element Value} = \text{Element Value} * \text{Mult. Mantissa} * 10^{\text{Mult. Char.}} + \text{Additive Constant}$$

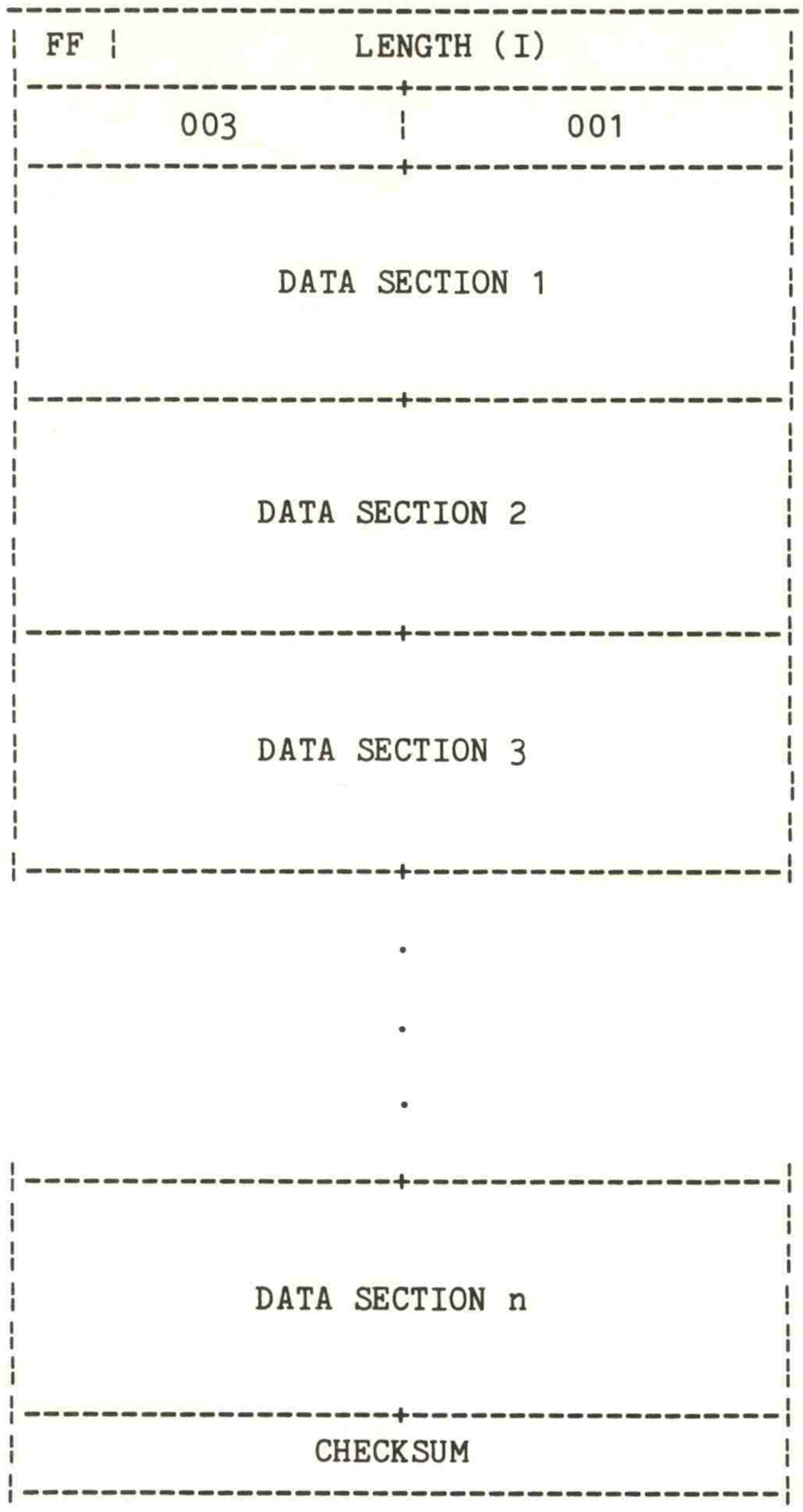


Figure 6.3
Formatted Binary Data Block
Mode 3, Submode 1

7.0 VECTOR GRAPHIC BLOCKS

7.1 Product Definition Blocks. One of the following product definition blocks (the Vector Graphic Product Definition Block or the Define Graphics Parameters Product Definition Block) must be used to define the product. A product data set contains only one of the Product Definition blocks.

7.1.1 Vector Graphic Product Definition Block. The specific format and information content shall be as shown in Figure 7.1. Most vector graphic data is transmitted so that each point can be registered to its true earth location (latitude/longitude) or to Cartesian coordinates. Specifically, the earth locatable vector graphic data applies to the vector lines (isopleths, geopolitical lines and latitude/longitude lines), data plots, and wind barbs, and line labels. Other data to further describe the product, such as legends, are registered with respect to product locations (e.g., upper left hand corner) rather than to earth locations. This data may include line labels and legends.

7.1.1.1 Product Area. The AREA CODE and SCALE elements define the area of the product to the display device. The AREA CODE shall specify the number and location of the point(s) used to define the product area. When one point is used, the SCALE must also be used for area definition.

7.1.1.2 Registration. Registration to the display device may be accomplished by applying the reference latitudes and longitudes in accordance with the AREA CODE specification. Registration of the product to background information is accomplished through the PI set. If PI=0, the appropriate background data is sent with the product or the product is not geographical in nature. Otherwise background data resident in the receiving system is to be used.

7.1.2 Define Graphics Parameters Product Definition Block. This block shall be formatted as shown in Figure 7.2. This product definition block is similar to the Vector Graphic Product Definition Block except that it contains additional information to allow contouring at the user site. Normalized values of a contour are provided to allow calculation of successive contours.

7.2 Data Description Blocks. No data description blocks are currently used for the Vector Graphic products.

7.3 Data Blocks.

7.3.1 Absolute Vectors Block. This block shall be formatted as shown in Figure 7.3. Each block shall contain coordinates of the vector end points that define one line on the product. If the length of the line requires more vectors than can be contained in a single block, additional blocks shall be used with the starting M/N coordinates set to the last M/N coordinate of the proceeding block. One or more data blocks may follow, as required to define all lines on the product.

7.3.2 Relative Vectors Block. This block shall be formatted as shown in Figure 7.4. Each block shall contain vector pairs (with coordinates as specified by the coordinate flag in the product definition block) that define one line on the product. This block is used to transmit lines consisting of only

short vectors, i.e., vectors for which the vector deltas can be put in one byte. If the length of the line requires more vectors than can be contained in a single block, additional blocks shall be used with the starting M/N coordinates set to the last M/N coordinate of the proceeding block. One or more data blocks may follow as required, to define all lines on the product.

7.3.3 "Calcomp Pen Command" (CPC) Vectors Block. This block shall be formatted as shown in Figure 7.5. This block contains a series of three bit direction vectors of unit length. If the length of the line requires more vectors than can be contained in a single block, additional blocks shall be used with the starting M/N coordinates set to the last M/N coordinate of the proceeding block. One or more data blocks may follow as required, to define all lines on the product.

7.3.4 Variable Exception Vectors (VEV) Block. This block shall be formatted as shown in Figure 7.6. The format provides a convenient method of packing vector graphic lines to conserve transmission time. Each vector graphic line is defined by a series of vectors whose lengths are given by the Increment Length (IL) and whose directions are given by changes dictated by the VEV data bits. The direction of the first increment in the vector graphic line is given by the initial direction (IDV) element. Starting with the most significant bit in the first byte of the VEV data bits, each bit represents either a trend (continue in the same direction) or an exception movement (change in direction) along successive vector increments. If the bit is zero (0), the movement is along the direction last established as the current trend direction. Initially, this is the direction defined by the initial direction element. For bit zero (0) and all other even numbered bits, if the bit is one, then the movement is turned counterclockwise by a 45 degree increment and the new direction is established as the current trend direction. For bit one (1), and all successive odd-numbered bits, if the bit is one (1), then movement is turned clockwise 45 degrees and established as the new trend direction. This cycle continues until the bit count indicated by the VEV bit count element is exhausted.

7.3.5 Long/Short Relative Vectors Block. This block shall be formatted as shown in Figure 7.7. Each block shall contain vector pairs that define one line on the product. If the length of the line requires more vectors than can be contained in a single block, additional blocks shall be used with the M and N coordinate set to the end point of the last vector in the proceeding block. One or more additional blocks may follow, as required, to define all lines on the product. This block is used to transmit lines consisting of both vectors that can be put into one byte and vectors that require 16 bits.

7.3.6 Point-Slope Vectors Block. This block shall be formatted as shown in Figure 7.8. This block provides the minimum amount of information to draw a straight line. The information for only one line is sent with each block. One or more additional blocks may follow to define more lines on a product.

7.3.7 Wind Barbs Vectors Block. This block shall be formatted as shown in Figure 7.9. The block is used to transmit wind direction and speed in symbolic form. Multiple wind barbs may be transmitted in a single block. Additional blocks may be used, as required, to transmit all wind barbs associated with a product.

7.3.8 Vector (Arrow) Plot Block. This block shall be formatted as shown in Figure 7.10. This block contains a code for drawing arrows and numerical values at point locations on a product. One or more data blocks may follow to define all arrows on a product.

FF	LENGTH (I)	
004	020	
PI SET	COORDINATE FLAG	
SCALE FACTOR		
AREA CODE	LABEL CODE	
REFERENCE M COORDINATE		
REFERENCE N COORDINATE		
REFERENCE M COORDINATE		
REFERENCE N COORDINATE		
: REFERENCE M COORDINATE		
REFERENCE N COORDINATE		
MONTH	DAY	\
HOUR	MINUTE	/ Valid Time
MONTH	DAY	\
HOUR	MINUTE	/ End of Valid Period
CHECKSUM		

Figure 7.1
Vector Graphic Product Definition Block
Mode 4, Submode 20

NOTES: Figure 7.1: Vector Graphic Product Definition Block; Mode 4, Submode 20

1. PI SET: The PI SET defines the background projection on which the product is valid. The codes are shown in Table C2-2. If a product is not associated with a background field, PI SET will be zero filled.

2. COORDINATE FLAG: Coordinate System Indicator as follows:

Flag	M =	N =	
0	Latitude	Longitude	(Earth surface grid in latitude and longitude coordinates)
1	I	J	(Cartesian coordinates of the earth's surface)
2	X	Y	(Pixel coordinates of the product background projection)

3. SCALE FACTOR: SCALE FACTOR shall define the scale of the product. It is set to the numeric ratio of the projection in ten thousands (e.g., if the projection is at a scale of 1:60 million, SCALE FACTOR = 13560 (6000_{10}). SCALE FACTOR must be used if one reference point is used to define the area.

4. AREA CODE: The AREA CODE is an integer code that defines the relative product reference point(s) and scheme used to define the geographical area and product orientation. The currently defined codes are:

11 - One (1) reference point is used to define the upper left corner of the product. If this code is used, a scale is required.

12 - One (1) reference point is used to define the lower left corner of the product. If this code is used, a scale is required.

13 - One (1) reference point is used to define the center of the product. If this code is used, a scale is required.

21 - Two (2) reference points are used to define the upper left and upper right corners of the product.

22 - Two (2) reference points are used to define the lower left and upper right corners of the product.

23 - Two (2) reference points are used to define the upper left and center of the product.

24 - Two (2) reference points are used. The first reference point gives the coordinates of the lower left corner of the product in units of the grid from which it was extracted. The second set of reference coordinates will give the maximum horizontal and maximum vertical size of the product in pixels (M maximum and N maximum).

25 - Same as code 24 except the reference point is located at the center of the product.

33 - Three (3) reference points are used to define the upper left, upper right, and lower right corners of the product.

When only one reference point is required, this block is shortened by two byte pairs; when two reference points are required the block is shortened by one byte pair.

5. LABEL CODE: If LABEL CODE = 0, the label to be used with the product is not a standard label and the label will be sent in an alphanumeric block. For interagency use this field will be zero. If a standard label is to be used, the LABEL CODE will contain a code for that label. Label codes are user definable and unique to each system.

6. Reference Coordinates: The Reference Coordinates uniquely define the boundary and orientation of the product. M and N are determined by the COORDINATE FLAG above. If given in latitude/longitude, values will be in hundredths of a degree. If given in I/J or X/Y coordinates, values will be integers. These reference points will be in the order specified by the area code (e.g., for area code 33, the first point defines the upper left corner, the second the upper right corner and the third the lower right corner.)

7. Valid Time: The Valid Time is the time for which the product is valid. For analysis products, the valid time will be the time the data used to generate the product was observed. For forecast products, the valid time will be either the time in the future for which the forecast is valid or the start of the time period for which the forecast is valid. The End of Valid Period time indicates the termination time of the valid period. If the day element of the End of Valid Period is zero, the product is valid only at the valid time. If not, the product is valid for the period given.

FF	LENGTH (I)
004	030
PI SET	COORDINATE FLAG
SCALE FACTOR	
LONGITUDE X (HUNDREDTHS OF DEGREES)	
CONTOUR INTERVAL (I)	
CONTOUR INTERVAL (FRACTION)	
CONTOUR ORIGIN (I)	
CONTOUR ORIGIN (FRACTION)	
M MAXIMUM (I)	
N MAXIMUM (I)	
M CENTER	N CENTER
UNITS CODE	NCHAR (TITLE)
CHARACTER 1	CHARACTER 2

.

.

.

	LAST CHARACTER
CHECKSUM	

Figure 7.2
Define Graphics Parameters Product Definition Block
Mode 4, Submode 30

NOTES: Figure 7.2: Define Graphics Parameters Product Definition Block; Mode 4, Submode 30

1. PI SET: The PI SET defines the background projection on which the product is valid. Currently defined codes are shown in Table C2-2.

2. COORDINATE FLAG: Coordinate System Indicator as follows:

Flag	M =	N =	
0	Latitude	Longitude	(An earth surface grid in latitude and longitude coordinates.)
1	I	J	(Cartesian coordinates of the earth's surface)
2	X	Y	(Pixel coordinates of the product background projection)

3. SCALE FACTOR: SCALE FACTOR shall define the scale of the product. It is set to the numeric ratio of the projection in ten thousands (e.g., if the projection is at a scale of 1: 60 million, SCALE FACTOR = 13560 (6000_{10}). SCALE FACTOR must be used if one reference point is used to define the area.

4. LONGITUDE X: For polar stereographic grids, the LONGITUDE X is defined as the longitude line which is parallel to the vertical axis of the grid, such that a vector along that longitude from the pole to the equator (in the hemispheric grid from which the subject grid has been extracted in the case of a zoom) is (1) in the opposite direction from the vertical axis in the northern hemisphere and (2) in the same direction as the vertical axis in the southern hemisphere. The longitude is defined on a compass which sweeps from 0 to 360 degrees, east to west. The element will be zero (0) filled for standard mercator and spherical grids. LONGITUDE X is given in hundredths of degrees and must therefore be multipied by .01 to obtain the true value.

5. CONTOUR INTERVAL and CONTOUR ORIGIN: The CONTOUR INTERVAL (CI) and CONTOUR ORIGIN (CO) are used to relate the Band Index (BI) value of the first contour in the product to the value of other contours in the product as follows:

$$\text{Value} = \text{BI} * \text{CI} + \text{CO}$$

The BI is sent in the Data Block.

6. M,N MAXIMUM: The maximum horizontal and vertical size of the product. The type of coordinates are determined by the COORDINATE FLAG above.

7. M,N CENTER: The coordinates of the center of the product in units of the grid from which the product was originally extracted.

8. UNITS CODE: A code specifying the units of the contours in the product. The list of units is found in Table C2-6.

9. NCHAR: The number of characters in the product title.

10. CHARACTERs 1-n: The ASCII characters that make up the product title.

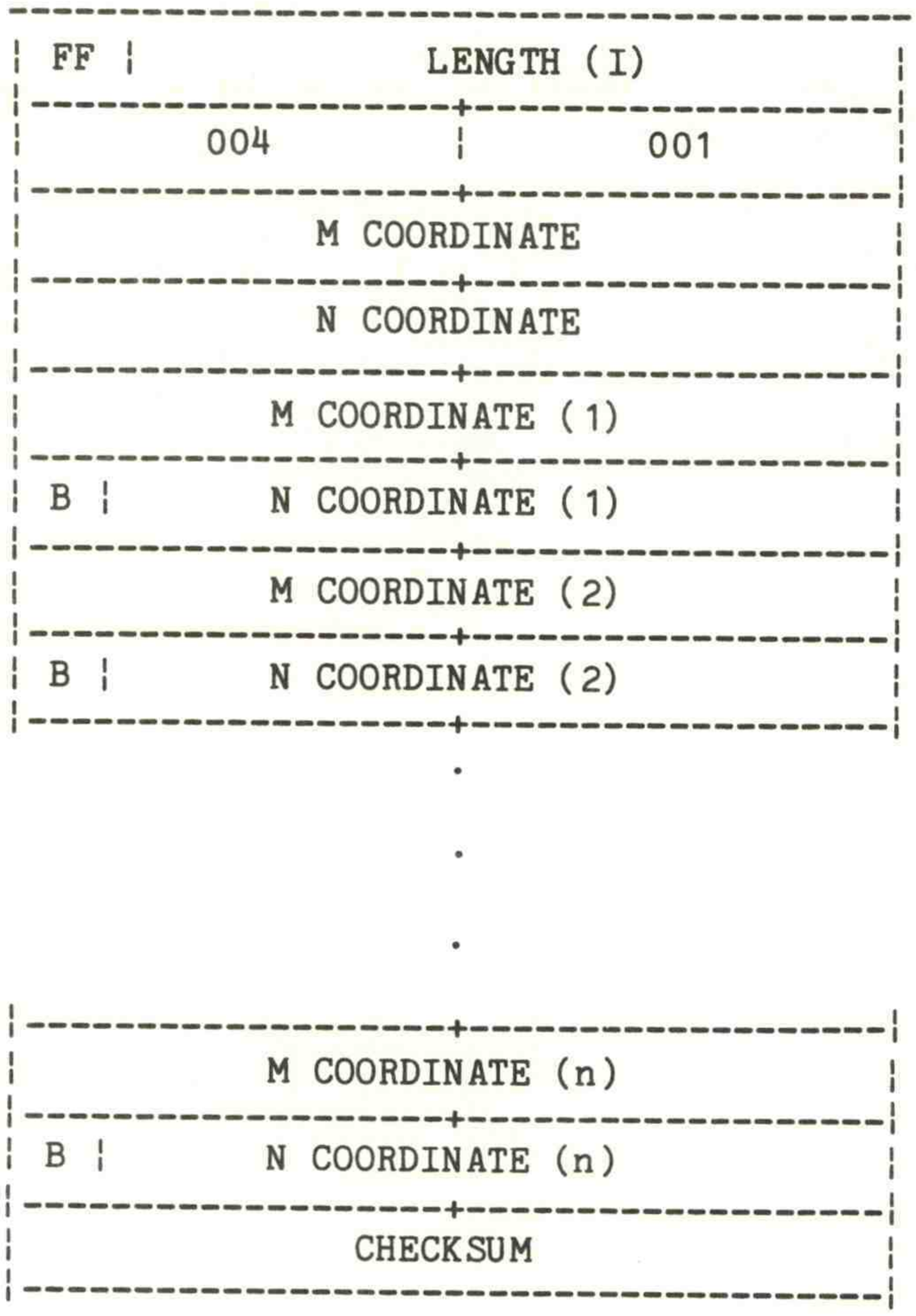


Figure 7.3
Absolute Vectors Block
Mode 4, Submode 1

NOTES: Figure 7.3: Absolute Vectors Block; Mode 4, Submode 1

1. M,N COORDINATE: First set of coordinates of the line. M and N are determined by the COORDINATE FLAG in the Product Definition Block.

2. M,N COORDINATEs (n): Successive coordinates which form the line.

3. B = Blanking Flag: If B=0, pen is up (beam off), and a new line starts. If B=1, pen is down (beam on), and a line is drawn between the coordinate pairs.

FF	LENGTH (I)
004	002
M COORDINATE	
N COORDINATE	
DELTA M(1)	DELTA N(1)
DELTA M(2)	DELTA N(2)
DELTA M(3)	DELTA N(3)

.

.

.

DELTA M(n)	DELTA N(n)
CHECKSUM	

Figure 7.4
Relative Vectors Block
Mode 4, Submode 2

NOTES: Figure 7.4: Relative Vectors Block; Mode 4, Submode 2

1. M,N COORDINATE: Defines vector string starting point. M and N are determined by the COORDINATE FLAG in the Product Definition Block.

2. DELTA M,N Values: Successive values are added algebraically to the last computed M, N coordinate position to produce a series of vectors defining a line. The positive direction for M values is to the right, negative to the left. The positive direction for N values is up, negative is down. Negative values are entered in 2's complement notation.

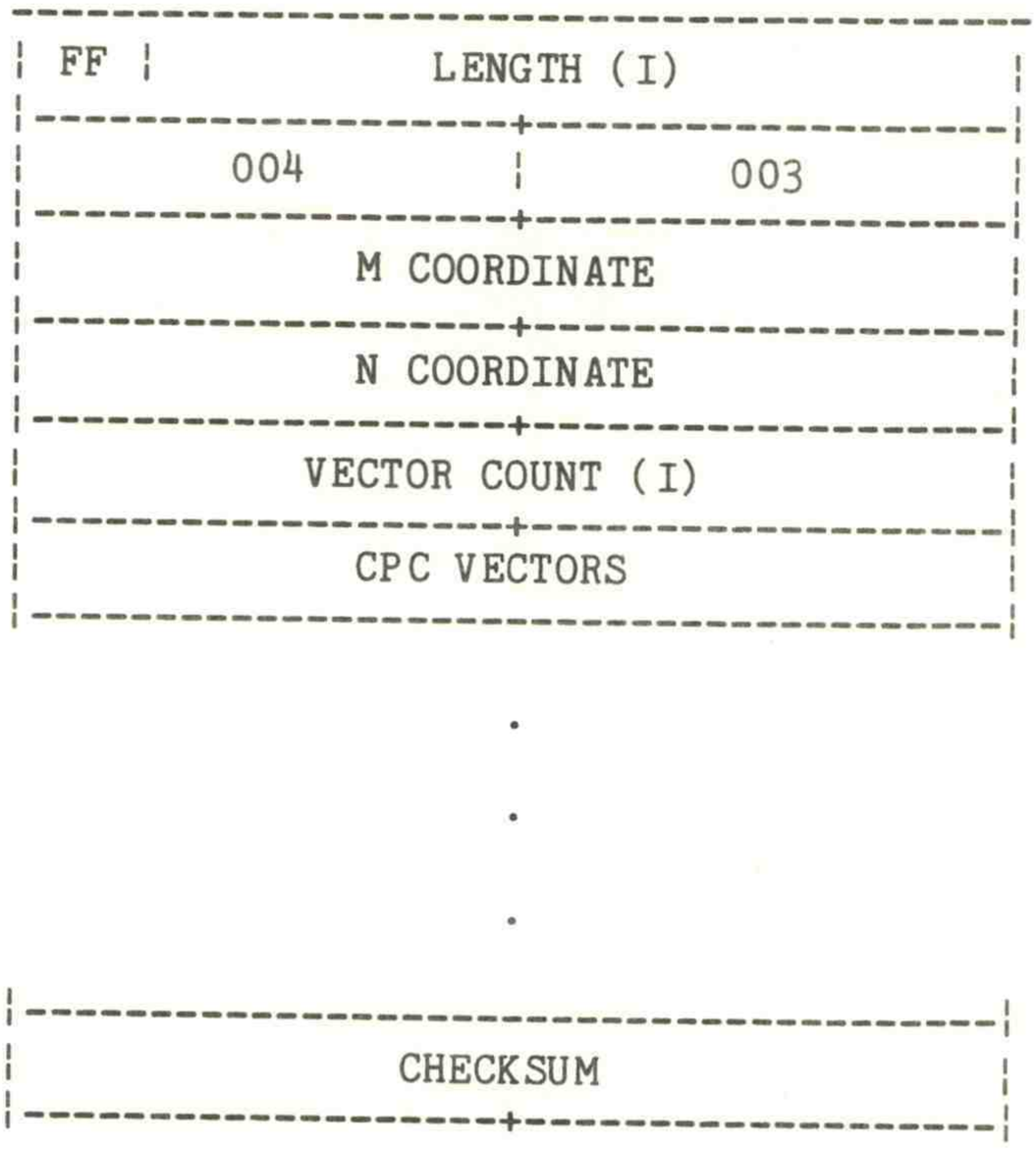


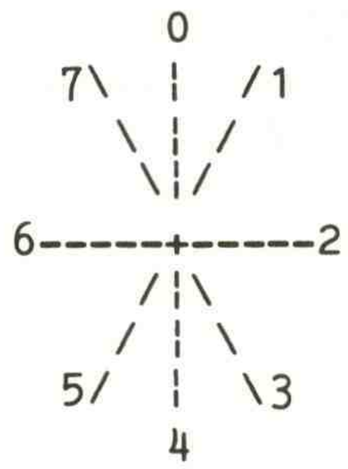
Figure 7.5
CPC Vectors Block
Mode 4, Submode 3

NOTES: Figure 7.5: CPC Vectors Block; Mode 4, Submode 3

1. M,N COORDINATE: Defines vector string starting point. M and N are determined by the COORDINATE FLAG in the Product Definition Block.

2. VECTOR COUNT: Number of vectors following.

3. CPC Vectors: Successive fields containing values defining the vector direction corresponding to the sketch below. The field width is variable depending on the Define Datawidth/Fieldwidth Block. The data width = 3. To end on a byte pair boundary the last two bytes are zero filled if necessary.



4. The vector length is one pixel.

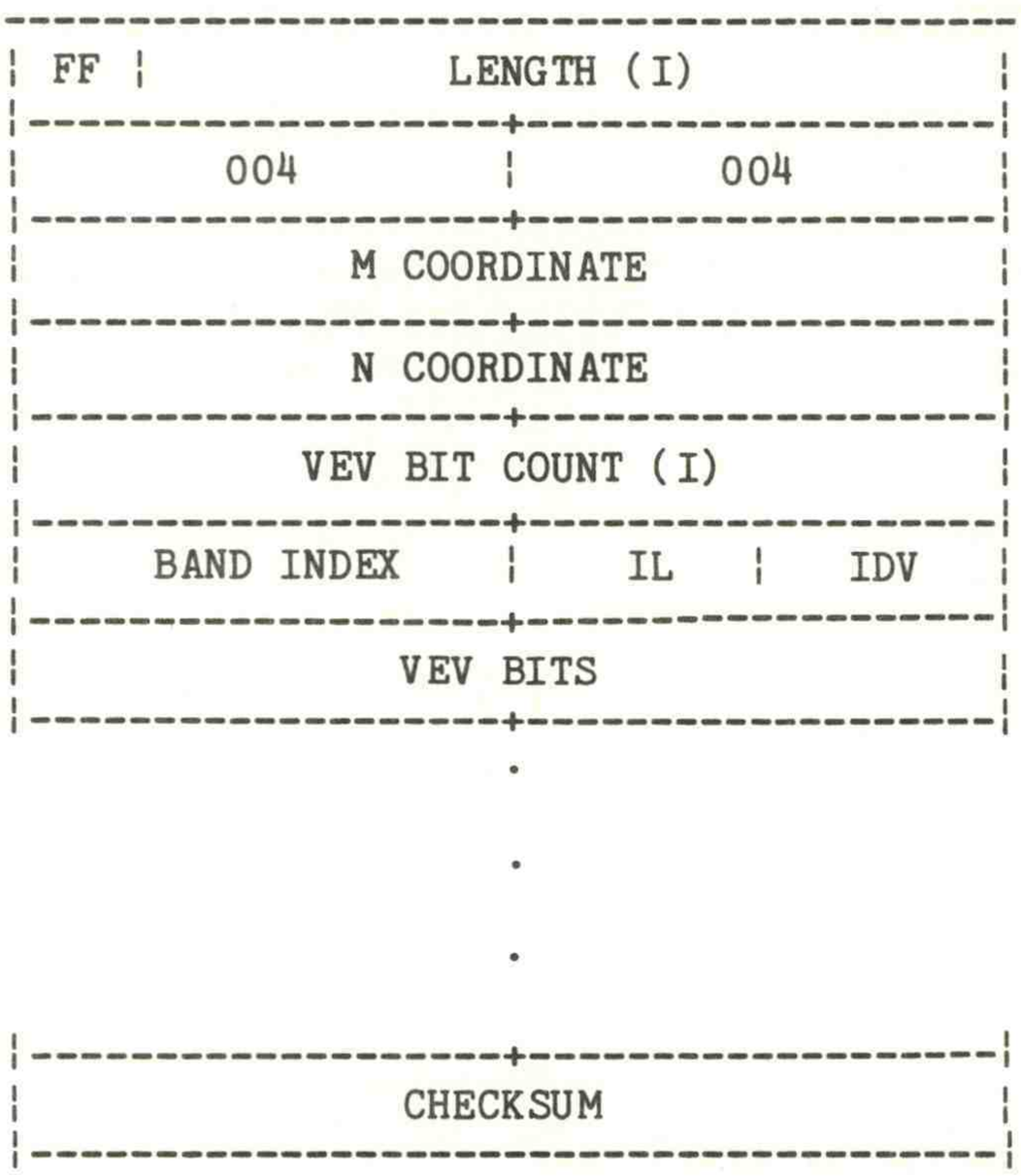


Figure 7.6
Variable Exception Vectors (VEV) Block
Mode 4, Submode 4

NOTES: Figure 7.6: Variable Exception Vectors (VEV) Block; Mode 4, Submode 4

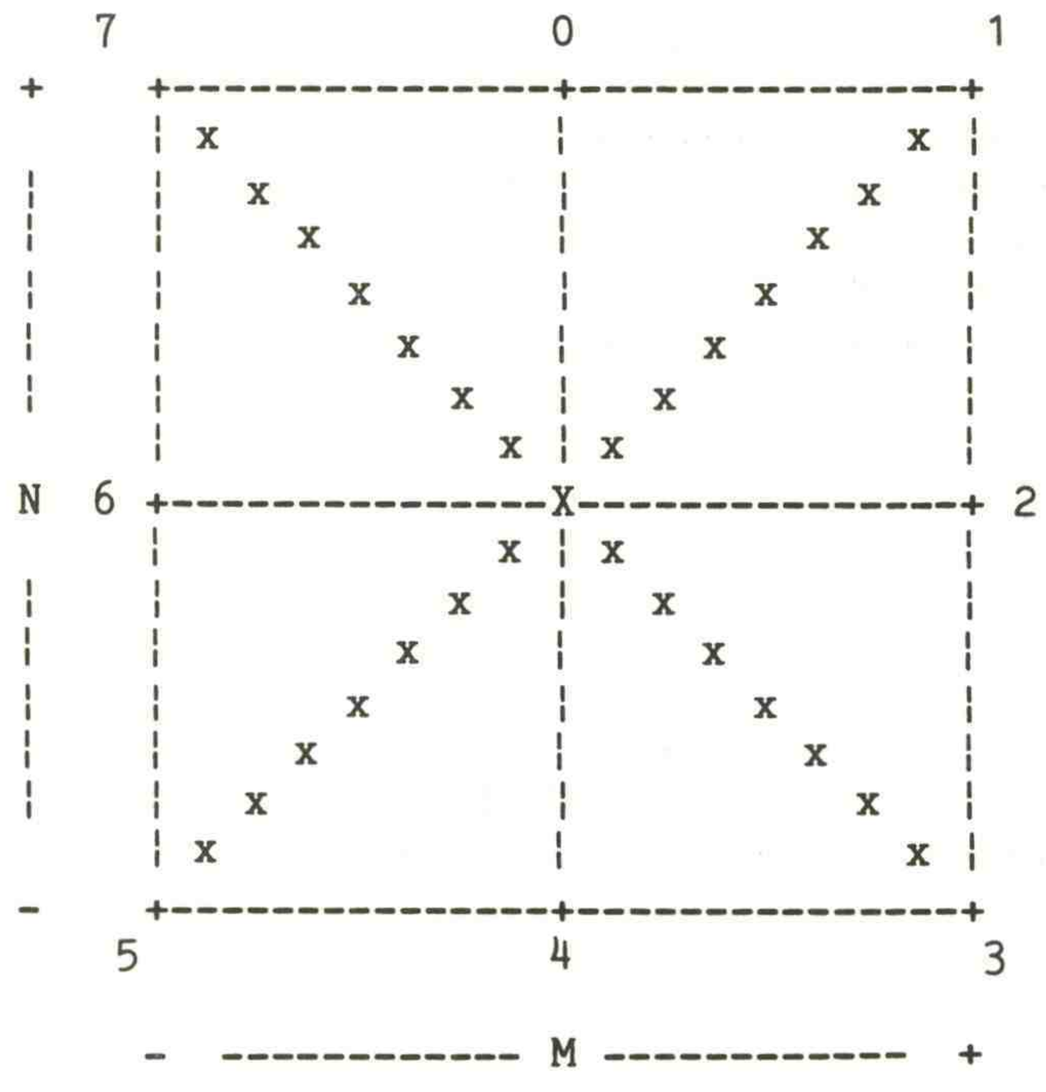
1. M,N COORDINATE: Defines vector string starting point. M and N are determined by the COORDINATE FLAG in the Product Definition Block.

2. BAND INDEX: The BAND INDEX (BI) is the normalized value of a contour or line, where BI = (Value - Origin)/Interval. If BI is not used this field will contain 377 octal (all one bits).

3. IL = Increment Length: IL is the indicator for the incremental vector length (e.g., 1=1 pixel, 2=2, 3=3, ..., 15=15).

4. IDV = Initial Direction Vector: IDV values are 0 through 7 as represented in the sketch below:

Direction vector definition:



5. VEV BIT COUNT: The number of data bits following.

6. VEV BITS: The string of bits determining the VEV vectors. If this bit string does not fill the last byte pair, the remaining bits are set to zero to end on a byte pair boundary.

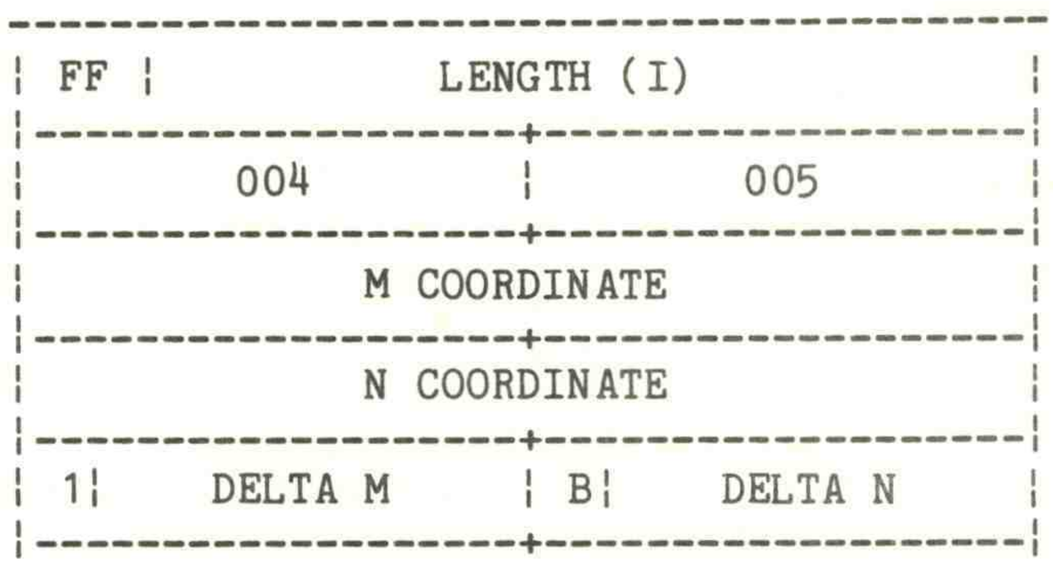


Figure 7.7
Long/Short Relative Vectors Block
Mode 4, Submode 5

NOTES: Figure 7.7: Long/Short Relative Vectors Block; Mode 4, Submode 5

1. M, N COORDINATE: Defines vector string starting points. M and N are determined by the COORDINATE FLAG in the Product Definition Block.

2. Left-most Bit: If the left-most bit = 1, the DELTA M and N are short (contained in one byte) vector values. If the left-most bit = 0, the DELTA M and N are long (each contained in two bytes) vector values.

3. B = Blanking Flag: If B=1, no line is drawn between coordinate pairs. If B=0, the line is drawn.

4. X: This bit not used.

5. DELTA I,J: Each successive delta value is added algebraically to the last computed M, N coordinate position to produce a series of vectors defining a line. The positive direction for M values is to the right, negative is to the left. The positive direction for N values is up, negative is down. Negative values are entered in two's complement notation.

FF	LENGTH (I)	
	004	006
M COORDINATE		
N COORDINATE		
VECTOR LENGTH		
	SLOPE	OCT
CHECKSUM		

Figure 7.8
Point-Slope Vectors Block
Mode 4, Submode 6

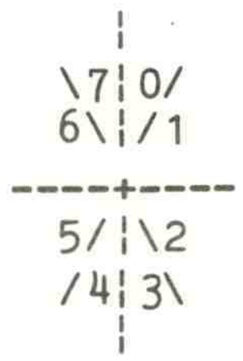
NOTES: Figure 7.8: Point-Slope Vectors Block; Mode 4, Submode 6

1. M,N COORDINATE: Defines vector string starting point. M and N are defined by the COORDINATE FLAG in the Product Definition Block.

2. VECTOR LENGTH: VECTOR LENGTH is the larger of the absolute values of the delta M and delta N differences for the two points between which the line is to be drawn.

3. SLOPE: SLOPE is the fractional value of the ratio (shorter delta)/(longer delta). This value is multiplied by 2**12.

4. OCT: OCT is a four bit field and contains the value for an octant defined in the following sketch:



FF	LENGTH (1)		
004		007	
SHAFT LENGTH		UNUSED	
M COORDINATE(1)			
N COORDINATE(1)			
DIRECTION	H	5kt	10 kt	50 kt
M COORDINATE(2)			
N COORDINATE(2)			
DIRECTION	H	5kt	10 kt	50 kt

.

.

.

M COORDINATE(n)			
N COORDINATE(n)			
DIRECTION	H	5kt	10 kt	50 kt
CHECKSUM			

Figure 7.9
Wind Barbs Vectors Block
Mode 4, Submode 7

NOTES: Figure 7.9: Wind Barbs Vectors Block; Mode 4, Submode 7

1. SHAFT LENGTH: Number of pixels for the shaft line (from base to first barb).

2. M,N COORDINATE: Position of the base of the shaft. M and N are determined by the COORDINATE FLAG in the Product Definition Block.

3. DIRECTION: A six bit field containing an integer number in tens of degrees. It specifies the direction from which the wind is blowing.

4. H = HEMISPHERE: A one bit field where H=0 represents the Northern Hemisphere. H=1 represents the Southern Hemisphere.

5. 5Kt: A one bit field indicating the number of five knot flags.

6. 10Kt: A four bit field containg the number of ten knot flags.

7. 50Kt: A four bit field containing the number of fifty knot flags.

FF	LENGTH (I)
004	010
M COORDINATE(1)	
N COORDINATE(1)	
CODE	DIRECTION
ARROW LENGTH	VALUE
M COORDINATE(2)	
N COORDINATE(2)	
CODE	DIRECTION
ARROW LENGTH	VALUE

.

.

.

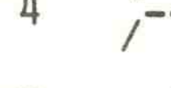
M COORDINATE(n)	
N COORDINATE(n)	
CODE	DIRECTION
ARROW LENGTH	VALUE
CHECKSUM	

Figure 7.10
Vector (Arrow) Plot Block
Mode 4, Submode 10

NOTES: Figure 7.10: Vector (Arrow) Plot Block; Mode 4, Submode 10

1. M,N COORDINATE: The coordinate where the arrow and/or value is to be centered. M and N are determined by the COORDINATE FLAG in the Product Definition Block.

2. CODE: An integer value defining the type of information to be plotted. The currently defined codes are:

Code		
1		Arrow through point M,N
2		Arrow from point M,N
3		Arrow to point M,N
4		Arrow with value plotted at M,N
5		Arrow from M,N with VALUE plotted left of M,N
6		Arrow to M,N with VALUE plotted to right of M,N
7		Vector of length (in pixels)

3. DIRECTION: The arrow direction in tens of degrees.

4. Arrow Length: The length of the arrow in pixels for CODEs 1 through 6.

5. VALUE: An integer value to be plotted for CODEs 4, 5 and 6. If CODE = 7, the VALUE contains the length of the vector in pixels.

8.0 ALPHANUMERIC BLOCKS

8.1 Product Definition Block. This block shall be a variable length block including the LENGTH and CHECKSUM when used. The format shall be as shown in Figure 8.1. This block is optional. An example of an application would be to provide additional routing information for alphanumeric messages.

8.2 Data Description Block. This block is not currently used for alphanumeric data.

8.3 Data Blocks.

8.3.1 Alphanumeric Characters Block. This block shall be formatted as shown in Figure 8.2. This block is used to transmit textual information to be placed on displayed products (e.g., graphics products). Each block shall transmit one complete string of ASCII characters, including control characters. This block will normally be used to transmit nonstandard product labels/legends or variable information to be placed in a standard label/legend.

8.3.2 Plot Data Block. This block shall be formatted as shown in Figure 8.3. This block is used to transmit alphanumeric characters to be displayed at a specific location on a product in a specified format. Each block may be used to transmit labels for one or more lines on the product. It may be used to transmit weather symbols (such as thunderstorm symbols) that are to be displayed at a specified location on the product. The block may transmit any number of symbols as long as they are all to be displayed in the same size and color. The display format to be used is specified by a plot code. The Plot Process Code options are listed in Table C2-3.

8.3.3 Wind Barbs Data Block. This block shall be formatted as shown in Figure 8.4. The block is used to transmit wind direction and speed observations or forecasts to place a wind barb symbol at the specified location on the product. Multiple wind barbs may be transmitted in a single block. Additional blocks may be used, as required, to transmit all wind barbs associated with a product.

8.3.4 Alphanumeric Data Block. This block shall be as shown in Figure 8.5. The data field shall contain an even number of ASCII characters which comprise all or part of the message text. All man-readable messages not intended for display shall use this block. The block follows the conventions for non-graphic data outlined in Section 2.2.2.2.

FF	LENGTH (I)
005	020
CHARACTER 1	CHARACTER 2
CHARACTER 3	CHARACTER 4
CHARACTER 5	CHARACTER 6

.

.

	LAST CHARACTER
CHECKSUM	

Figure 8.1
Alphanumeric Product Definition Block
Mode 5, Submode 20

NOTES: Figure 8.1: Alphanumeric Product Definition Block; Mode 5, Submode 20.

1. CHARACTERS: The CHARACTER fields may be used to define additional information concerning the alphanumeric blocks. The block contains an even number of ASCII characters. This block follows the conventions for non-graphic data outlined in Section 2.2.2.2.

FF	LENGTH (I)	
005		001
M COORDINATE		
N COORDINATE		
DELTA M		DELTA N
B	R	CHAR. SIZE	CHARACTER 1
CHARACTER 2		CHARACTER 3
CHARACTER 4		CHARACTER 5

.

.

.

CHARACTER n-1	CHARACTER n
CHECKSUM	

Figure 8.2
Alphanumeric Characters Block
Mode 5, Submode 1

NOTES: Figure 8.2: Alphanumeric Characters Block; Mode 5, Submode 1

1. M,N COORDINATE: The M and N coordinate element identifies of the starting position of the textual string. It references the lower left corner of the first character in the string. M and N are determined by the COORDINATE FLAG in the Product Definition Block.

2. DELTA M, N: The DELTA M and DELTA N identify the start point of the first character in the string at some desired distance from the M and N coordinate element. The distance remains fixed despite whatever zoom value is used.

3. B = Block Mode: The Block Mode is the indicator for the blanking area covered by a character. If B = 1, a rectrangular display area is cleared beneath the standard generated character. If B = 0, the character is displayed normally unless R = 1.

4. R = Reverse Block Mode: The Reverse Block Mode is an indicator for reverse video (negative image). R = 0 is for normal image. R = 1 is the same as B = 1, except the display polarity is reversed.

5. CHAR SIZE: Defines the height/width of a character relative to the font size. Zero indicates standard font size of the display device. If the element is non-zero, it represents a multiplicative factor applied to the standard character size, e.g., 0 = 5 x 7, 1 = 10 x 14, 2 = 15 x 21, etc.

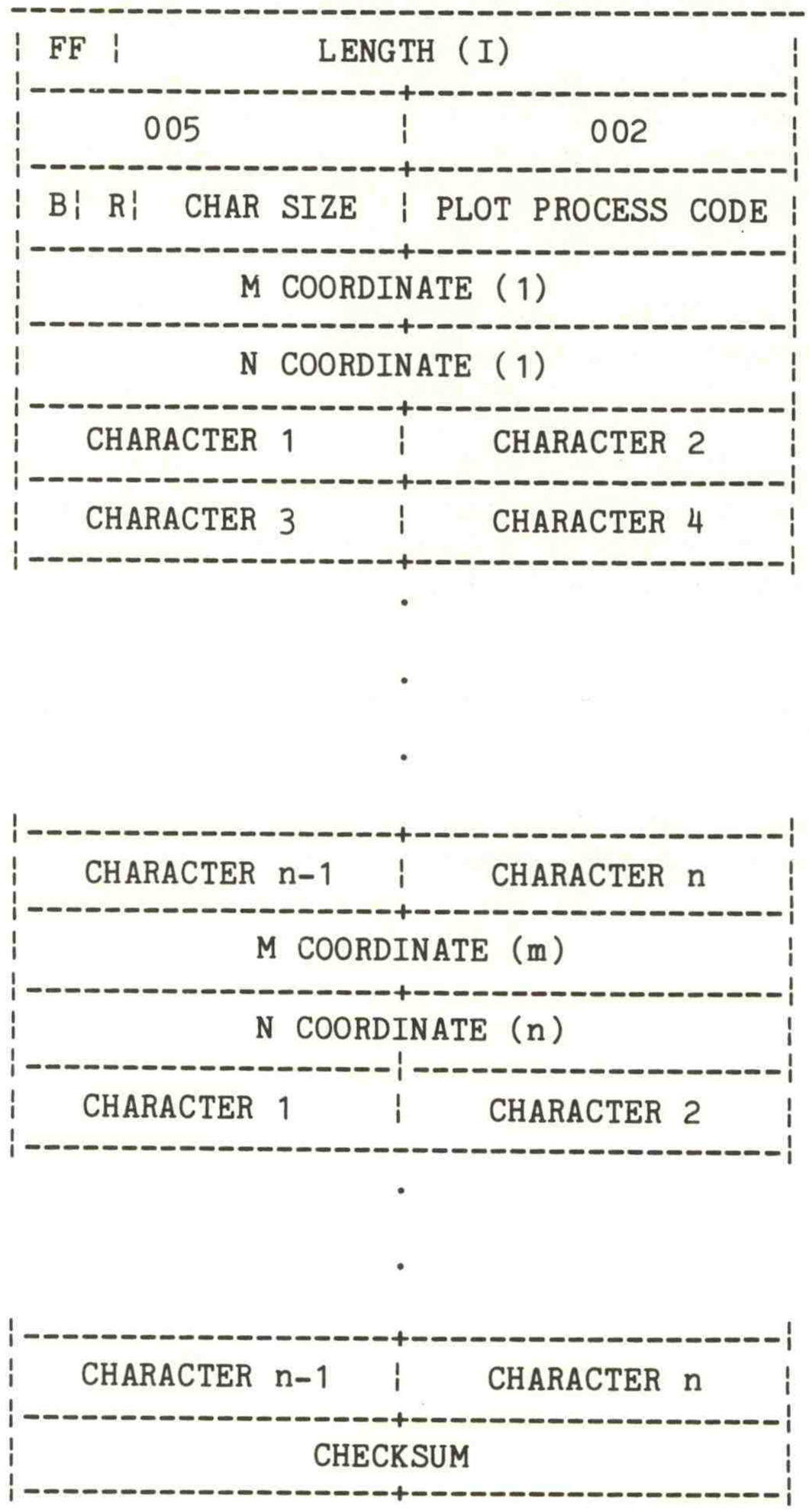


Figure 8.3
Plot Data Block
Mode 5, Submode 2

NOTES: Figure 8.3: Plot Data Block; Mode 5, Submode 2

1. B = Block Mode: The Block Mode is the indicator for the blanking area covered by a character. If B = 1, a rectangular display area is cleared beneath the standard generated character. If B = 0, the character is displayed normally unless R = 1.

2. R = Reverse Block Mode: The Reverse Block Mode is an indicator for reverse video (negative image). R = 0 is for normal image. R = 1 is the same as B = 1, except the display polarity is reversed.

3. CHAR SIZE: Defines the height/width of a character relative to the font size. Zero indicates standard font size of the display device. If the element is nonzero, it represents a multiplicative factor applied to the standard character size, e.g., 0 = 5 x 7, 1 = 10 x 14, 2 = 15 x 21, etc.

4. PLOT PROCESS CODE: The PLOT PROCESS CODE is a binary value identifying the positions for characters around the M,N coordinate. The PLOT PROCESS CODES are found in Table C2-3.

5. M, N COORDINATE: Specifies the geographical point about which the data is to be plotted. M and N are determined by the coordinate flage in the Product Definition Block.

FF	LENGTH (I)
005	003
SHAFT LENGTH	BLANKING FLAG
M COORDINATE (1)	
N COORDINATE (1)	
DIRECTION (1)	
SPEED (1)	
GUST (1)	HEMISPHERE (1)

.

.

.

I COORDINATE (n)	
J COORDINATE (n)	
DIRECTION (n)	
SPEED (n)	
GUST (n)	HEMISPHERE (n)
CHECKSUM	

Figure 8.4
Wind Barbs Data Block
Mode 5, Submode 3

NOTES: Figure 8.4: Wind Barbs Data Block; Mode 5, Submode 3

1. SHAFT LENGTH: The number of pixels for the shaft line (from base to first barb).

2. BLANKING FLAG: An indicator for blanking the area covered by the wind barb font. If left-most bit is set (i.e., a "1") the area is blanked, if the left-most bit is off (i.e., a "0") blanking is not done.

3. M,N COORDINATES: Defines the location of the base of the wind barb shaft. M and N are determined by the COORDINATE FLAG in the Product Definition Block.

4. DIRECTION: An integer number in whole degrees. It specifies the direction from which the wind is blowing.

5. SPEED: An integer number in whole knots.

6. GUST: An integer number in whole knots.

7. HEMISPHERE: An indicator for Northern or Southern Hemisphere. If the right-most bit is set (1), the wind flags go to the left of the shaft (Southern Hemisphere) as viewed from the head of the shaft. If not set (0), the flags go to the right of the shaft (Northern Hemisphere).

FF	LENGTH (I)	
005		004
CHARACTER 1		CHARACTER 2
CHARACTER 3		CHARACTER 4
.		
.		
.		
CHARACTER n-1	B	ETB or ETX
CHECKSUM		

Figure 8.5
Alphanumeric Data Block
Mode 5, Submode 4

NOTES: Figure 8.5: Alphanumeric Data Block; Mode 5, Submode 4.

1. CHARACTERS: The data field is an even number of ASCII characters (both alphanumeric and control characters).

2. B. If B (high order bit) = 1, this byte contains the last character of the data set. This field is optional.

3. ETB or ETX: The last byte in the block contains the ASCII control character ETB if the block is not the final block in the product data set. The last byte is ASCII control character ETX if the block is the last block in the Product Data Set. See Section 2.2.2.2.

9.0 RASTER SCAN BLOCKS

9.1 Product Definition Blocks.

9.1.1 Satellite Product Definition Block. This block shall be formatted as shown in Figure 9.1. This block shall be used to define all raster scan products that are in the form of visual imagery, i.e., satellite data as opposed to facsimile products.

9.1.2 Pixel Product Definition Block. This block shall be formatted as shown in Figure 9.2. This block shall be used for all non-satellite raster scan products (such as radar or facsimile). The data may be packed to conserve transmission time. The algorithm used to pack the data shall be indicated by the pack code.

9.2 Data Description Block.

No data description blocks are currently used for raster scan products.

9.3 Data Block.

This Raster Scan Data block shall be formatted as shown in Figure 9.3. All raster scan products shall use this format with the XROW, YCOL, and RESOLUTION fields set to one (all bits on) if not used. The origin is 0,0. Pixel data in the data field shall be packed as specified by the pack code and arranged as specified by the pack code in the Product Definition block. The currently defined packing algorithms are described in succeeding sections.

9.3.1 Block Organization.

9.3.1.1 AFGWC Packing Scheme. Each data block shall contain a field giving the row and column location of the first pixel in the block and the resolution of the data, followed by a data field containing the pixel data. Succeeding pixels for the remainder of the scan line proceed as specified by the scan code. For multi-bit deep raster scan products, the pixel data shall consist of a pixel value for each pixel location. For single bit deep raster scan products, the pixel data shall specify state (on or off). The pixel data shall be organized in the data field as a continuous string of bits. The number of bits per pixel shall be specified by the matrix code, i.e., matrix code 01, 11, 21, 41 indicate one bit pixels, 04, 14, 24, 44, represent four bit pixels, etc.

9.3.1.2 National Weather Service Packing Scheme. Products packed in accordance with this scheme shall have the XROW, YCOL, and the resolution elements zero (0) filled. The data field shall be organized such that the pixel data is given in 8-bit bytes and packed within the bytes as follows:

Bit 0
and These bits are never used.
Bit 1

Bit 2 -
and Bit 3 These two bits determine the type of data described in the byte.

00 = Number or consecutive pixels in the line in the ON (white) state.

01 = Number of consecutive pixels in the OFF (black) state.

10 = Unpacked pixel data.

11 = Recorder control character.

Bit 4 - Bit 7 These bits contain the pixel count, unpacked pixel data, or the control character's lower half. For pixel count, the bits give the number of pixels OFF or ON in groups of four pixels, as indicated by bits 2 and 3. For unpacked pixel data, they give the state (ON and OFF) of the next four pixels in the scan line. If the byte contains the end-of-scan (EOS) control character, bits 4 through 7 are off. If the byte contains the end-of-map (EOM) character, bits 4 and 5 are off and bits 6 and 7 are on.

One byte of the packed pixel data stream can represent, at most, sixty (4*15) pixels of all white or all black data (i.e., UU001111 or UU011111). If bits two and three are the same in two, and at most three, consecutive bytes (e.g., two or three bytes containing UU00, or two or three bytes containing UU01), then the pixel count in the second byte represents multiples of sixteen, and the third, if present, represents multiples of sixteen squared. For example:

UU001010 UU000101 UU000001 = 10 + (5 * 16) + (1 * 256)
= 346 groups = 1384 white pixels (346*4)

UU000111 UU010011 UU011100 UU110000 = 7 groups of white, 3 + (12 * 16) groups of black, and end of scan
= 28 white pixels, 1780 black pixels and end of scan

Each block will contain one or more scan lines of the product (or partial lines) as required to fill the data block. Each complete scan line will be followed by an end-of-scan (EOS) sequence (UU110000). If a scan line is not completed before the last byte of a data block, the scan information will continue in the next block and the data shall be treated as if it had been in the same block. If an EOS is encountered before the end of a scan line, then the remainder of the scan line is white, and the next byte begins the next scan line. The final EOS for the product will be followed by an end-of-map (EOM) sequence (UU110011). If the EOM sequence is reached before the end of a data block, the remainder of the block will be filled with EOM sequences and the next block will be the End of Product block.

9.3.2 Block Length.

9.3.2.1 AFGWC Packing Scheme. Data blocks will be of fixed length for a given product as determined by the number of pixels required to define one

complete scan line of the product. Data block length shall be variable from one product to another depending on the size of the product. For example, one product may be a 512 x 512 bit array and another may be a 1024 x 1024 x 6 array.

9.3.2.2 National Weather Service Packing Scheme. Data blocks will be of fixed length for a given product. For example, NWS pixel products are blocked into 960 byte strings. Each block may contain any number of complete or partial scan lines as required to fill the block. Data block length will be variable from one product to another.

FF	LENGTH (I)
006	020
PI SET	GI SET
SATELLITE ID	
LONGITUDE X	
RESOLUTION CODE	DATA TYPE
X MAX	
Y MAX	
ENHANCE MAX	ENHANCE MIN
ENHANCE ID	LENGTH (MM)
X CENTER	Y CENTER
LATITUDE	
LONGITUDE	
NCHAR	CHARACTER 1
CHARACTER 2	CHARACTER 3
CHARACTER 4	CHARACTER 5

.

.

.

CHARACTER n-1	CHARACTER n
CHECKSUM	

Figure 9.1
Satellite Product Definition Block
Mode 6, Submode 20

NOTES: Figure 9.1: Satellite Product Definition Block; Mode 6, Submode 20

1. PI SET: The PI SET defines the background projection on which the product is valid. The currently defined codes are shown in Table C2-2. If a product is not associated with a background, PI SET will be zero (0) filled.

2. GI SET: The Grid Indicator defines the grid on which the data is valid. Currently defined codes are shown in Table C2-4.

3. SATELLITE IDENTIFICATION: Two ASCII characters that identify the satellite from which the product was produced.

The first character identifies the agency. Currently assigned values are:

A - Air Force
E - European
I - Indian
J - Japan
N - NOAA
R - Russian
S - NASA
V - Navy

The second byte may contain a letter or number to designate a specific satellite.

4. LONGITUDE X: For polar stereographic grids, the LONGITUDE X is defined as the longitude line which is parallel to the Y axis of the grid, such that a vector along that longitude from the pole to the equator (in the hemispheric grid from which the subject grid has been extracted in the case of a zoom) is (1) in the opposite direction from the Y axis in the northern hemisphere and (2) in the same direction as the Y axis in the southern hemisphere. The longitude is defined on a compass which sweeps from 0 to 360 degrees, east to west. The element will be zero (0) filled for standard mercator and spherical grids. LONGITUDE X is given in hundredths of degrees and must therefore be multipied by .01 to obtain the true value.

5. RESOLUTION CODE: This element specifies the resolution of the satellite data in the product in tens of nautical miles, i.e., the resolution must be multiplied by .1 to obtain the actual value.

6. DATA TYPE: An integer code that specifies the type of satellite data contained in the product. The currently defined codes are:

0 = Visual (VIS) only
1 = Infrared (IR) only
2 = Alternating lines of IR/VIS both day or both night
3 = Alternating bytes IR/VIS both day or both night
4 = Alternating lines of night and day both IR or both VIS
5 = Alternating bytes of night and day both IR or both VIS

7. XMAX and YMAX: The maximum horizontal (XMAX) and vertical (YMAX) size of the product in pixels.

8. ENHANCE MAX and MIN: The limits of the gray scale referenced by ENHANCE ID.

9. ENHANCE ID: An enhancement identification which points to a table of gray scales or an algorithm. Some values are common (for interagency use-Table C2-5) and some are user defined.

10. LENGTH: Length of each scan line in the product in tens of minutes of arc, i.e., length must be multiplied by ten to obtain the actual value.

11. X,Y CENTER: The coordinates of the center of the product in units of the grid from which the product was extracted.

12. LATITUDE and LONGITUDE: The latitude and longitude of the center of the product in hundredths of degree, i.e., latitude and longitude must be multiplied by .01 to obtain the actual value.

13. NCHAR: The number of characters contained in the product title that follows.

14. CHARACTERs 1-n: The ASCII characters that make up the product title.

FF	LENGTH (I)	
	006	030
PI SET		MATRIX CODE
SCAN CODE		PACK CODE
CHECKSUM		

Figure 9.2
Pixel Product Definition Block
Mode 6, Submode 30

NOTES: Figure 9.2: Pixel Product Definition Block; Mode 6, Submode 30

1. PI SET: The PI SET defines the background projection on which the product is valid. The currently defined codes are shown in Table C2-2. If a product is not associated with a background, PI SET will be zero (0) filled.

2. MATRIX CODE: A code defining the dimensions of the pixel array being sent in the product. Currently defined codes are:

01 - 512 x 512 x 1	11 - 1024 x 1024 x 1
02 - 512 x 512 x 2	12 - 1024 x 1024 x 2
03 - 512 x 512 x 3	13 - 1024 x 1024 x 3
04 - 512 x 512 x 4	14 - 1024 x 1024 x 4
05 - 512 x 512 x 5	15 - 1024 x 1024 x 5
06 - 512 x 512 x 6	16 - 1024 x 1024 x 6
07 - 512 x 512 x 7	17 - 1024 x 1024 x 7
10 - 512 x 512 x 8	20 - 1024 x 1024 x 8
21 - 2048 x 2048 x 1	41 - 4096 x 4096 x 1
22 - 2048 x 2048 x 2	42 - 4096 x 4096 x 2
23 - 2048 x 2048 x 3	43 - 4096 x 4096 x 3
24 - 2048 x 2048 x 4	44 - 4096 x 4096 x 4
25 - 2048 x 2048 x 5	45 - 4096 x 4096 x 5
26 - 2048 x 2048 x 6	46 - 4096 x 4096 x 6
27 - 2048 x 2048 x 7	47 - 4096 x 4096 x 7
30 - 2048 x 2048 x 8	50 - 4096 x 4096 x 8

63 - 1728 x n x 1 where n is dependent on the size of the product. In this case the number of data blocks must be counted during processing to determine n.

0 - M x N x 1 where M and N are dependent on the size of the product. In this case, M will be specified by the resolution element in the data block and the number of data blocks must be counted during processing to determine N.

3. SCAN CODE: Used to indicate the order in which the raster scan pixels are arranged in the data block. The currently used scan codes are:

1 - Data are arranged in the data block such that pixels are defined row by row (raster scan) from the upper left corner.

2 - Data are arranged in the data block such that the pixels are defined row by row (bottom up raster scan) from the lower left corner.

4. PACK CODE: A code defining the algorithm which was used to pack the product. Currently defined codes are:

0 - Pixels are unpacked, i.e., each byte contains one pixel.

1 - Pixels are packed in accordance with the AFGWC packing scheme. See Section 9.3.1.1.

2 - Pixels are packed as specified by the Define Datawidth/Fieldwidth block. See Mode 1, Submode 5.

128 - Pixels are packed in accordance with the National Weather Service scheme. See Section 9.3.1.2.

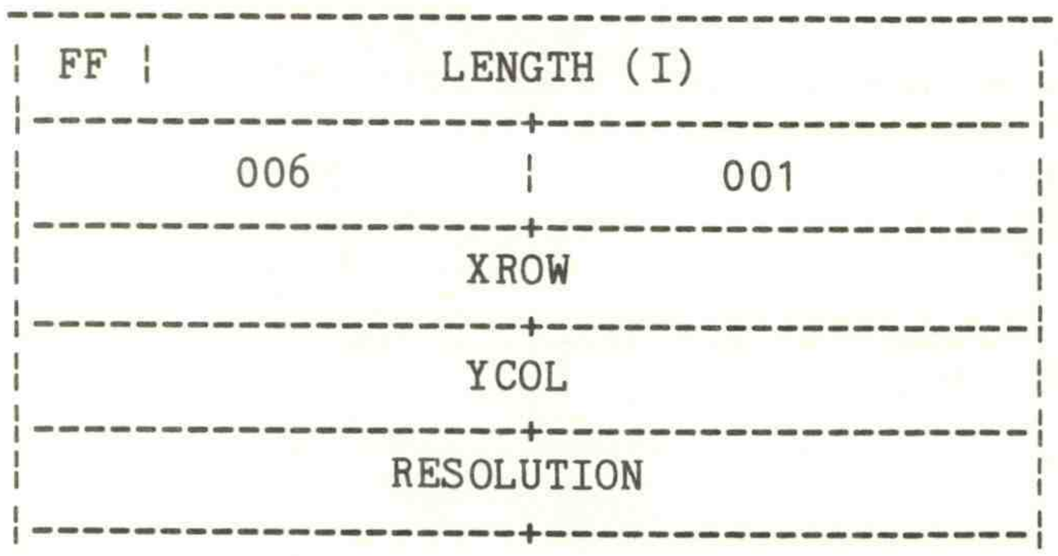


Figure 9.3
Raster Scan Data Block
Mode 6, Submode 1

NOTES: Figure 9.3: Raster Scan Data Block; Mode 6, Submode 1

1. XROW and YCOL: The row and column number, within the product, where the first pixel in the data block is located. For example, 0,0 specifies the first pixel is in row 0, column 0 while 36,492 specifies the first pixel is in row 36, column 492. This location is referenced to the scan direction indicated by the scan code, i.e., for top down scan sequence, 0,0 specifies the upper left corner while 36,492 specifies the 36th row from the top and the 492nd column from the left.

2. RESOLUTION: The number of pixels per scan line.

3. PIXEL DATA: The value, or state, of each pixel in the scan line.

10.0 GRIDDED DATA BLOCKS

10.1 Product Definition Block. The Gridded Data Product Definition Block shall be formatted as shown in Figure 10.1. Gridded data may be transmitted in packed or unpacked format, and as latitude/ longitude or I/J grid data, as determined by the product originator.

10.2 Data Description Block. The data description block for unpacked Gridded Data products shall be in the format shown in Figure 6.2. No data description block is used for packed Gridded Data products. The following conventions shall apply to the Gridded Data data description block when used.

10.2.1 Length and Arrangement of Block. Each element being transmitted in the data block shall be described in the ninth through twentieth bytes and succeeding twelve byte sections. The sections shall be in the same order as the elements appear in the element sets of the data block. The length of the data description block shall be sufficient to describe one or more elements, as required by the originator of the product.

10.3 Data Blocks. Due to the significant differences in formal requirements for packed and unpacked Gridded Data products, different data blocks are used.

10.3.1 Unpacked Gridded Data Block. The unpacked Gridded Data data block(s) for both latitude/longitude Gridded Data products and I/J Gridded Data products shall be formatted as shown in Figure 6.3. The data field of the block shall be formatted as specified in the Gridded Data data description block. The data field within the data block shall contain element sets aligned end-to-end as shown in Figure 6.3.

10.3.2 Band Index Data Block. This block applies to packed Gridded Data products. Each data block will be used to transmit all grid points in a product for each parameter (e.g., temperature, pressure). One or more additional data blocks may be transmitted sequentially to define all parameters in the product. Blocks shall be formatted as shown in Figure 10.2.

10.3.2.1 Data Unpacking Method. In order to discuss unpacking the data, the method and terms involved in packing the scaled integer grid value must be defined. One constant is chosen and included for each type of data field. This constant is divided into each grid value during the packing process in order to reduce the number of least significant digits. Use of this Multiplier Constant (termed MC in the explanation) produces a value called the Band Index (BI). Thus for any given grid point value (GV):

$$BI=(GV)/MC$$

A first order difference value is then calculated between consecutive Band Index Values:

$$\text{Delta } BI_n = BI_{n+1} - BI_n$$

Note that BI_1 and Delta BI_1 are given in the Gridded Data Product Definition Block. Now second order derivatives are computed from the first order differences:

$$\text{Delta}^2 \text{ BI} = \text{Delta BI}_{n+1} - \text{Delta BI}_n$$

The data part of the data block consists entirely of $\text{Delta}^2 \text{ BI}_1$, ..., $\text{Delta}^2 \text{ BI}_{p-2}$ for a data field with p data points. During packing, the Delta BI computed between the last element of each row and the first element of the next row is computed using the next element directly above rather than beginning at the left side of the next row. Therefore, the scanning computation proceeds left-to-right for the 1st, 3rd, ..., rows and right-to-left for the 2nd, 4th, ..., rows. Decoding grid point value n, then, is done as:

$$GV_n = (BI_{n-1} + \text{Delta BI}_{n-2} + \text{Delta}^2 \text{ BI}_{n-2}) * MC$$

FF	LENGTH (I)	
007	020	
PI SET	GI SET	
SCALE FACTOR	SCALE FACTOR FRAC	
COORDINATE FLAG	UNITS CODE	
SCALE EXPONENT	MULTIPLIER CONST.	
FIRST BAND INDEX VALUE		
FIRST DELTA BI IN FIELD		
NUMBER OF COLUMNS		
NUMBER OF ROWS		
REFERENCE M COORDINATE		
REFERENCE N COORDINATE		
I START		
J START		
MONTH	DAY	
HOUR	MINUTE	Product Valid Time
MONTH	DAY	Product Valid Time
HOUR	MINUTE	End of Product Valid Time
I POLE		End of Product Valid Time
J POLE		
RE/D INTEGER	RE/D FRACTION	
LONGITUDE ORIENTATION		
REFERENCE CODE	SCAN CODE	
CHECKSUM		

Figure 10.1
Gridded Data Product Definition Block
Mode 7, Submode 20

NOTES: Figure 10.1: Gridded Data Product Definition Block; Mode 7, Submode 20

1. PI SET: The PI SET defines the background projection on which the product is valid. The currently defined codes are shown in Table C2-2 (Annex C). If a product is not associated with a background, PI SET will be zero (0) filled.

2. GI SET: The Grid Indicator defines the grid on which the data is valid. Currently defined codes are shown in Table C2-4.

3. SCALE FACTOR and SCALE FACTOR FRACTION: The real world map scale in millions. The first byte contains the integer part, the second byte contains the fraction.

4. COORDINATE FLAG: Coordinate System Indicator as follows:

Flag	M =	N =	
0	Latitude	Longitude	(An earth surface grid in latitude and longitude coordinates.)
1	I	J	(Cartesian coordinates of the earth's surface.)
2	X	Y	(Pixel coordinates of the product background projection.)

5. UNITS CODE: A code specifying the units of the data elements. The list of units codes is found in Table C2-6 (Annex C).

6. SCALE EXPONENT: The number of binary digits scaling which the unpacked integer carries. For example, if N = Scale Exponent, then the Fortran statement V = FLOAT(IGRID(J))/2**N will convert an unpacked grid value from IGRID(j) into the real parameter value V.

7. MULTIPLIER CONSTANT: The value that each grid value has been divided by to reduce the number of least significant digits.

8. FIRST BAND INDEX VALUE (BI): This is the Band Index Value at the first grid point. BI(1) = GV(1)/MC. In other words, the BI is the value at the grid point divided by the Multiplier Constant (MC).

9. FIRST DELTA BI IN FIELD: The difference between the first two BI's. Delta BI(1) = BI(2) - BI(1).

10. NUMBER OF COLUMNS: The number of horizontal grids in the grid data area.

11. NUMBER OF ROWS: The number of vertical grids in the grid data area.

12. REFERENCE M and N COORDINATE: These reference coordinates shall specify the first grid point for which data is transmitted and may represent any point in the grid system, usually one of the four corners. M and N are determined by the COORDINATE FLAG.

13. ISTART, JSTART: These values designate the starting coordinate of the first grid point in the first row. The grid points proceed row-wise left-to-right NCOLS, then to the next row above and proceed right-to-left and so on up to NROWS.

14. Product/End of Product Valid Time. The Product Valid Time is the time for which the transmitted data is valid or the start time of the valiid period. If the 'DAY' element of the End of Product Valid Time is zero (0), the product is valid only at the Product Valid Time. For observed data, the valid time approximates, or may be identical to, the product generation time.

15. IPOLE/JPOLE INTEGER: The IPOLE/JPOLE field defines the location of the north or south pole in I/J coordinates (integer and hundredths). For products that do not contain one of the poles (i.e., Tropical Mercator), or if the coordinate flag = 0, these values shall be zero (0) filled. If the pole is to the left of the grid, IPOLE shall be negative. If the pole is below the grid, JPOLE shall be negative.

16. RE/D INTEGER and FRACTION: These values specify the effective number of grid lengths from the pole to the equator. It is derived by dividing the distance from the pole to the equator by the grid length. See Table C2-4 for a list of corresponding RE/D's. The actual entry is scaled 2**6.

17. LONGITUDE ORIENTATION: The hemispheric meridian (east or west) which is parallel to the J (column) axis of the grid and which extends from the bottom of the grid to the pole. This is used only for polar stereographic grids. The numbering system used sweeps 0 to 360 degrees east to west. The NMC LFM grid, for example, would have an entry of 105 (decimal) for this parameter.

18. REFERENCE CODE: This code indicates where, in the grid, the reference coordinates are located. The currently used reference codes are:

1 - Reference coordinates are located in the upper left corner of the grid.

2 - Reference coordinates are located in the lower left corner of the grid.

19. SCAN CODE: This code is used to indicate the order in which the data for the grid points appear in the data block. The currently used scan codes are:

1 - Data are arranged in the data block such that the grid is defined row by row (raster scan) from the upper left corner.

2 - Data are arranged in the data block such that the grid is defined row by row (bottom up raster scan) from the left corner.

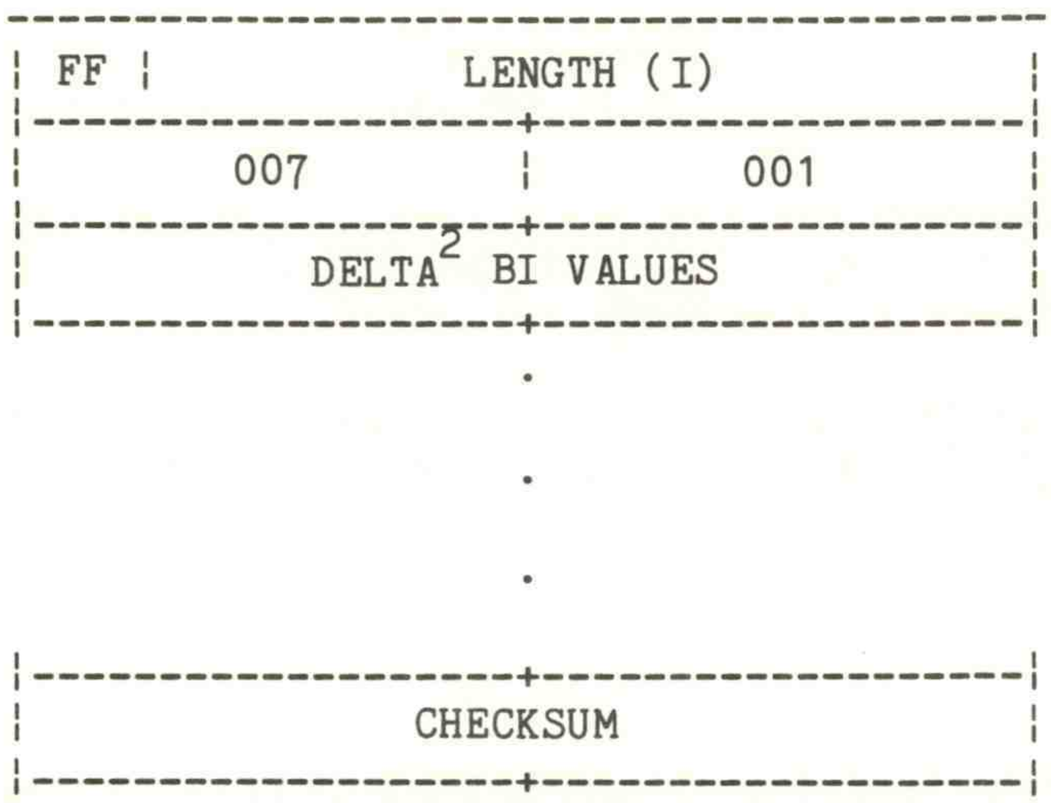


Figure 10.2
Band Index Data Block
Mode 7, Submode 1

NOTES: Figure 10.2: Band Index Data Block; Mode 7, Submode 1

1. DELTA^2 BI VALUES: These values are the second derivative of the Band Index Values. The field width is set by the Define Datawidth/Fieldwidth Block (Mode 1, Submode 5). The default is 8 bits (one byte).

ANNEX A

TERMS, DEFINITIONS AND STANDARD VALUES

SECTION 1 - GLOSSARY

SECTION 2 - MNEMONICS

SECTION 3 - CONSTANTS AND CONVERSION FACTORS

ANNEX A - SECTION 1

Glossary

Accuracy	The degree of conformity of a measured or calculated value to some recognized standard or specified value.
Analysis	The process of interpreting and collating independent data to obtain a comprehensive definition of the state of the environment.
Block	A string of records, a string of words, or a character string, formed for technical or logic reasons to be treated as an entity.
Byte	Eight contiguous bits (an octet).
Call Letters	A location identifier expressed as a string of alphabetic characters.
Code	A set of items, such as abbreviations, numbers, or string of alphanumeric characters, that represent the members of another set of items. For example, the PI SET is a code that represents the geographical background to be used with a product. The term is also used to describe a string of alphanumeric characters who structure conveys meaningful information as in weather reporting codes.
Decode	To convert data by reversing the effect of encoding.
Element	The smallest intelligible component of a product, e.g., wind speed, wind direction, a four character mnemonic that defines a parameter, symbol, etc.
Element Set	A collection of two or more elements related to a component of a product, e.g., a weather observation (report), group of vectors describing a graphic line, etc.
Environment	A general term describing three physical areas: the terrestrial environment (the earth itself), the atmospheric environment (the area above the surface of the earth where weather phenomena occur), and the space environment (the area extending from approximately the bottom of the ionosphere to the sun).
Encode	To convert data by the use of a code or a code character set in such a manner that reconversion to the original form is possible.

Field	A bounded collection of data. This term will normally be used with a descriptive adjective that defines the nature of the field, e.g., Gridded Data Field, product identification field, etc.
File Time	The date and time (zulu) a message is made available for transmission purposes.
Flag	A bit, combination of bits, or a character, used to indicate a class of information, a step in a program, or some classification of a value (commonly used for branching).
Forecast	A prediction of the future state of the environment.
Grid	A system of uniformly spaced points referenced to the physical surface of the earth. A grid may be in the form of uniformly space latitude and longitude points with the spacing expressed in degrees or in the form of an array of points with rows designated by an integer (I), columns designated by an integer (J), and spacing expressed in nautical miles, kilometers, or some other appropriate linear distance. The latter form of grid is usually referred to as an I/J grid.
I/J Grid	I/J Grid is an array of points in a mapped representation of the earth surface and spaced at a uniform interval in the map. The points are referenced by an integer row number (I) and column number (J). There is a unique algorithm for reference to latitude/longitude from I/J depending on the map transformation formula (i.e., polar stereographic, mercator, Lambert conformal, etc.) and there is an algorithm for determing the true earth distance between grid points (which will in general vary over the map).
Image	The visual depiction of information (e.g., a satellite picture or a vector graphic product displayed on a CRT).
Level	A surface above the surface of the earth defined by the locus of points of equal atmospheric pressure. It is used in connection with upper air data which is reported at altitudes dependent on the atmospheric pressure. A level is therefore a surface on which the pressure is everywhere the same.
Location Identifier	A number, or string, of A/N characters that identifies a geographic location (a shorthand notation for name of the location). Location identifiers are assigned by several different oragnizations (WMO, ICAO, etc.).
Model	An automated set of analysis or forecast algorithms that simulates the dynamics of the environment.

Observation	A collection of information describing weather conditions at a specified location within a specified area.
Octet	Eight contiguous bits (byte).
Precision	A measure of the ability to distinguish between nearly equal values. The degree of mutual agreement between individual measurements, namely repeatibility and reproducibility.
Product	A collection of information (element sets) that completely defines a bounded group of related information.
Record	A collection of related data or words treated as a unit, e.g., a synoptic observation.
Rounding	When a figure is to be rounded to fewer digits than the total number available, the procedure should be as follows: a. When the first digit discarded is less than five, the last digit retained should not be changed. b. When the first digit discarded is five or greater, the last figure retained should be increased by one unit.
Set	A finite or infinite number of objects of any kind, or entities, (of components) or concepts, that have a given property or properties in common.

ANNEX A - SECTION 2

MNEMONICS

Table A2-1

Weather Element and Line Mnemonics
(Ref. Figures 4.4 and 6.2)

Mnemonic	Description
A	Hail
AC	Altocumulus
ACC	Anticyclonic Circulation Center
AGE	Snow Age
AH 1-6	Arrowhead
ALT	Altimeter
AMX	Amount of Obscuration
AOA	Axis of Advection
AS	Altrostratus
AUX	Auxiliary Upper Level Contour
AW	Hail Shower
AZR	Hail Diameter
BC	Pressure Characteristic
BC1-8	Barometric Characteristic
BKN	Sky-Condition - Broken
BSH	Blowing Snow-High
BSL	Blowing Snow-Low
B11	Ceiling less than 1000 Ft and/or Visibility less than 1 mile
CAL	ICAO Call Letters
CAT	Clear Air Turbulence Outline
CB	Cumulonimbus
CC	Cirrocumulus
CCT	Climatological Temperature
CCW	Climatological Wind
CDB	Cloud Base
CDP	Cold Pool
CDT	Cloud Top
CFA	Cold Front Aloft
CFG	Cold Front Frontogenesis
CFS	Cold Front Surface
CFX	Cold Front Frontolysis
CHA	High Cloud Amount
CHH	High Cloud Height
CHT	High Cloud Type
CI	Cirrus
CIG	Ceiling Height
CLA	Low Cloud Amount
CLH	Low Cloud Height
CLR	Sky Condition - Clear

CLT	Low Cloud Type
CMA	Middle Cloud Amount
CMH	Middle Cloud Height
CMT	Middle Cloud Type
CS	Cirrostratus
CT	Cloud Type
CU	Cumulus
CVA	Thunderstorm Area Outline
CVG	Convergence Area Outline
CYC	Cyclonic Circulation Center
C1A	First Cloud Layer Amount
C1B	Contrail Base 1
C1C	Contrail Top 1
C1H	First Cloud Layer Height
C1T	First Cloud Layer Type
C2A	Second Cloud Layer Amount
C2B	Contrail Base 2
C2C	Contrail Top 2
C2H	Second Cloud Layer Height
C2T	Second Cloud Layer Type
C3A	Third Cloud Layer - Amount
C3H	Third Cloud Layer - Height
C3T	Third Cloud Layer - Type
C33	Ceiling less than 3000 Ft and/or Visibility less than 3 miles
D	Dust/Sand-Slight
DAY	Day of the Month
DIR	Wind Direction
DPD	Dewpoint Depression
DPT	Dewpoint
DRY	Dry Line
DVL	Height (D value)
D10	Ceiling less than 10,000 Ft.
EPT	Equivalent Potential Temp
F	Fog/Ice Fog
FNL	Funnel Cloud
GF	Ground Fog
GPH	Geopotential Height
GST	Wind Gust
H	Haze
HI	High Pressure Center
HR	Hour
HSS	Horizontal Speed Shear
HTF	Height Fall Area Outline
I	Icing
ICE	Ice Cover
ICG	Icing Area Outline
ICL	Clear Icing-Light
ICM	Clear Icing-Moderate

ICS	Clear Icing-Severe
ICT	Clear Icing-Trace
IML	Mixed Icing-Light
IMM	Mixed Icing-Moderate
IMS	Mixed Icing-Severe
IMT	Mixed Icing-Trace
INS	Shear/Instability Line
IP	Ice Pellets
IPZ	Ice Prisms
IPW	Ice Pellet Shower
IRL	Rime Icing Light
IRM	Rime Icing Moderate
IRS	Rime Icing Severe
IRT	Rime Icing-Trace
JLH	Julian Hour
K	Smoke
L	Drizzle
LAT	Latitude
LO	Low Pressure
LON	Longitude
LTG	Lightning
MDV	Medium Range D-Value
MN	Minute
MW1-3	Maximum Wind Level 1-3
NS	Nimbostratus
OBS	Sky Condition - Obscured
OFA	Occluded Front Aloft
OFS	Occluded Front Surface
OFX	Occluded Frontolysis
OVC	Sky Condition - Overcast
OVV	Omega/Vertical Velocity
PC3	Pressure Characteristic - 3 Hr.
PKG	Peak Gust
PP	Pressure Change - 3 Hour
PPP	Sea Level Pressure
PPW	Precipitable Water
PRS	Pressure
PVA	Positive Vorticity Advection, Line
PWX	Past Weather
QRF	Quantitative Precipitation Forecast
QQ1-9	Special Symbol 1-9
R	Rain
RDG	Ridge Axis
RW	Rain Shower

R06	Precipitation-6 Hour
R24	Precipitation-24 Hour
S	Snow
SC	Stratocumulus
SCT	Sky Condition - Scattered
SDD	Ship Direction
SDP	Subtropical Depression
SFA	Stationary Front Aloft
SFG	Stationary Front Frontogensis
SFS	Stationary Front Surface
SFX	Stationary Front Frontolysis
SGR	Snow Grains
SKY	Sky Cover
SNO	Snow Depth
SOA	Stationary Occluded Front Aloft
SOS	Stationary Occluded Front Surface
SOX	Stationary Occluded Frontolysis
SO6	Snowfall-6 Hr.
SPD	Wind Speed
SQL	Squalls
SSN	Subtropical Storm - North
SSS	Subtropical Storm - South
SST	Sea Surface Temperature
ST	Stratus
STF	Stream Function Value
STN	WMO Station Number
SVV	Ship Speed
SW	Snow Showers
SWT	SWEAT Index
T	Thunderstorm
TA	Thunderstorm With Hail
TBL	Turbulence - Light
TBM	Turbulence - Moderate
TBS	Turbulence - Severe
TCN	Tropical Cyclone - North
TCS	Tropical Cyclone - South
TDP	Tropical Depression
TMP	Temperature
TP1-3	Tropopause Level 1-3
TRO	Trough Axis
TRP	Triple Point
TRW	Thunderstorm With Rainshower
TR7	Temperature Ridge-700MB
TSN	Tropical Storm - North
TSS	Tropical Storm - South
TSW	Thunderstorm With Snowshower
TTN	Minimum Temperature
TTX	Maximum Temperature
UWC	U Wind Component

VIS	Visibility
VMC	Vorticity Maximum
VRT	Vorticity
VWC	V Wind Component
WBC	Wind Barb - 100 Knots
WBI	Wind Barb - 1, 2 Knots
WBL	Wind Barb - 50 Knots
WBV	Wind Barb - 5 Knots
WBX	Wind Barb - 10 Knots
WET	Non-Convective/Intermittent Precipitation Outline
WFA	Warm Front Aloft
WFG	Warm Front Frontogenesis
WFS	Warm Front Surface
WFX	Warm Front Frontolysis
WMP	Warm Pool
WNC	Wind Calm
WVD	Wave Direction
WVH	Wave Height
WW1-3	Present Weather 1-3
ZL	Freezing Drizzle
ZR	Freezing Rain
ZZ1-9	Special Parameter 1-9

Table A2-2

Other Mnemonics Used in This Report

Mnemomics	Description
AFGWC	Air Force Global Weather Central
ANSI	American National Standards Institute
ASCII	American Standard Code for Information Interchange
AWS	Air Weather Service
A/N	Alphanumeric
BI	Band Index
CPC	Calcomp Pen Command
CPU	Central Processing Unit
DB	Data Blocks
DDB	Data Description Block
EOM	End of Map
EOS	End of Scan
ETB	End of Text Block
ETX	End of Text
FAA	Federal Aviation Administration
FF	Flag (2-bit indicator)
GI	Grid Indicator
GMT	Greenwich Mean Time
GV	Grid Value
H	Hemisphere
ICAO	International Civil Aviation Organization
IDV	Initial Direction (Vector)
I/J	Cartesian Coordinate Set (reference earth surface)
IL	Increment Length (Vector)
IPOLE/JPOLE	Grid Coordinates of the North or South Pole
LAT/LON	Latitude/Longitude Coordinates
MC	Multiplier Constant
M/N	Generalized Coordinate Set
NBS	National Bureau of Standards
NCHAR	Number of Characters (in product title)
NWS	National Weather Service
OCT	Octant
PDB	Product Definition Block
PI	Projection (map) Indicator

PI SET	Projection Indicator Set. A code that defines the background geographic projection on which the transmitted product is valid. The PI SET provides the means by which products can be registered to geography.
RE/D	Effective Number of Grid Points from Pole to Equator
VEV	Variable Exception Vector
WMO	World Meteorological Organization
XMAX	Maximum Horizontal Size
XROW/YCOL	Pixel Coordinates for Scan Lines
X/Y	Pixel Coordinate Set (reference display area)
YMAX	Maximum Vertical Size
Z	Greenwich Mean Time (GMT)
Z	Zoom Disable Indicator

ANNEX B

REFERENCES

(TBA)

(Refer to applicable FIPS and other accepted standards).

ANNEX C

CODE TABLES

SECTION 1 GENERAL

SECTION 2 METEOROLOGICAL PROGRAM CODES

SECTION 3 MISCELLANEOUS

ANNEX C - SECTION 1

Table 1

Standard ASCII Code

OCTAL	HEXADECIMAL	MNEMONIC	MEANING
000	00	NUL	Null
001	01	SOH	Start of Heading
002	02	STX	Start of Text
003	03	ETX	End of Text
004	04	EOT	End of Transmission
005	05	ENQ	Enquiry
006	06	ACK	Acknowledge
007	07	BEL	Bell
010	08	BS	Backspace
011	09	HT	Horizontal Tabulation
012	0A	LF	Line Feed
013	0B	VT	Vertical Tabulation
014	0C	FF	Form Feed
015	0D	CR	Carriage Return
016	0E	SO	Shift Out
017	0F	SI	Shift In
020	10	DLE	Data Link Escape
021	11	DC1	Device Control 1
022	12	DC2	Device Control 2
023	13	DC3	Device Control 3
024	14	DC4	Device Control 4
025	15	NAK	Negative Acknowledge
026	16	SYN	Synchronous Idle
027	17	ETB	End of Transmission Block
030	18	CAN	Cancel
031	19	EM	End of Medium
032	1A	SUB	Substitute
033	1B	ESC	Escape
034	1C	FS	File Separator
035	1D	GS	Group Separator
036	1E	RS	Record Separator
037	1F	US	Unit Separator
040	20	SP	Space (nonprinting)
041	21	!	Exclamation Point
042	22	"	Quotation Marks (Diaeresis)
043	23	#	Number Sign (Note 1)
044	24	$	Dollar Sign
045	25	%	Percent Sign
046	26	&	Ampersand
047	27	'	Apostrophe (Closing single quote, Acute Accent)

050	28	(	Opening Parenthesis
051	29	)	Closing Parenthesis
052	2A	*	Asterisk
053	2B	+	Plus
054	2C	,	Comma (Cedilla)
055	2D	-	Hyphen (Minus)
056	2E	.	Period (Decimal Point)
057	2F	/	Slant
060	30	0	Digit
061	31	1	Digit
062	32	2	Digit
063	33	3	Digit
064	34	4	Digit
065	35	5	Digit
066	36	6	Digit
067	37	7	Digit
070	38	8	Digit
071	39	9	Digit
072	3A	:	Colon
073	3B	;	Semicolon
074	3C	<	Less Than
075	3D	=	Equals
076	3E	>	Greater Than
077	3F	?	Question Mark
100	40	@	Commercial At (Note 1)
101	41	A	Upper Case Latin Letter
102	42	B	Upper Case Latin Letter
103	43	C	Upper Case Latin Letter
104	44	D	Upper Case Latin Letter
105	45	E	Upper Case Latin Letter
106	46	F	Upper Case Latin Letter
107	47	G	Upper Case Latin Letter
110	48	H	Upper Case Latin Letter
111	49	I	Upper Case Latin Letter
112	4A	J	Upper Case Latin Letter
113	4B	K	Upper Case Latin Letter
114	4C	L	Upper Case Latin Letter
115	4D	M	Upper Case Latin Letter
116	4E	N	Upper Case Latin Letter
117	4F	O	Upper Case Latin Letter
120	50	P	Upper Case Latin Letter
121	51	Q	Upper Case Latin Letter
122	52	R	Upper Case Latin Letter
123	53	S	Upper Case Latin Letter
124	54	T	Upper Case Latin Letter
125	55	U	Upper Case Latin Letter
126	56	V	Upper Case Latin Letter
127	57	W	Upper Case Latin Letter

130	58	X	Upper Case Latin Letter
131	59	Y	Upper Case Latin Letter
132	5A	Z	Upper Case Latin Letter
133	5B	[	Opening Bracket (Note 1)
134	5C	\	Reverse Slant (Note 1)
135	5D	]	Closing Bracket (Note 1)
136	5E	^	Circumflex (Note 1)
137	5F	___	Underline
140	60	'	Opening Single Quotation Mark (Grave Accent) (Note 1)
141	61	a	Lower Case Latin Letter
142	62	b	Lower Case Latin Letter
143	63	c	Lower Case Latin Letter
144	64	d	Lower Case Latin Letter
145	65	e	Lower Case Latin Letter
146	66	f	Lower Case Latin Letter
147	67	g	Lower Case Latin Letter
150	68	h	Lower Case Latin Letter
151	69	i	Lower Case Latin Letter
152	6A	j	Lower Case Latin Letter
153	6B	k	Lower Case Latin Letter
154	6C	l	Lower Case Latin Letter
155	6D	m	Lower Case Latin Letter
156	6E	n	Lower Case Latin Letter
157	6F	o	Lower Case Latin Letter
160	70	p	Lower Case Latin Letter
161	71	q	Lower Case Latin Letter
162	72	r	Lower Case Latin Letter
163	73	s	Lower Case Latin Letter
164	74	t	Lower Case Latin Letter
165	75	u	Lower Case Latin Letter
166	76	v	Lower Case Latin Letter
167	77	w	Lower Case Latin Letter
170	78	x	Lower Case Latin Letter
171	79	y	Lower Case Latin Letter
172	7A	z	Lower Case Latin Letter
173	7B	{	Opening Brace (Note 1)
174	7C	|	Vertical Line (Note 1)
175	7D	}	Closing Brace (Note 1)
176	7E	~	Tilde (Note 1)
177	7F	DEL	Delete

NOTE 1: Should be checked for international exchange.

ANNEX C - SECTION 2

Table C2-1

ASCII - Symbology Conventions

ANNEX C - SECTION 2

Table C2-2

Projection (Map) Indicator Codes

ANNEX C - SECTION 2

Table C2-3

Plot Process Codes

ANNEX C - SECTION 2

Table C2-4

Grid Indicator Codes

ANNEX C - SECTION 2

Table C2-5

Gray Level Codes

ANNEX C, SECTION 2

Table C2-6

UNITS CODE (OCTAL)

CODE UNITS	SYMBOL
0 = Degrees Fahrenheit	^{o}F
1 = Degrees Kelvin	K
2 = Degrees Celsius	^{o}C
3 = Meters	m
4 = Meters per Second	m/s
5 = Knots	Kts
6 = Miles per Hour	mph
7 = Hectopascals (Millibars)	hPa (mbar)
10 = Centimeters	cm
11 = Meters per Second Squared	m/s^2 (m/s**2)
12 = Feet	ft
13 = Geopotential Meter	m
14 = Seconds	s_{gp}
15 = Gram-calories per square centimeter per day	$g.cal/cm^2/d$ (g*cal/cm**2/d)
16 = Nautical Miles Per Day	NM/d
17 = Centimeters per Second	cm/s
20 = Probability Code	
21 = Hectopascals per Second	hPa/s (mbar/s)
22 = Per Second	1/s
23 = Dimensionless	
24 = Percent	%
25 = Meters Squared per Second	m^2/s_2 (m**2/s)
26 = Kilograms per Square Meter	kg/m_2 (kg/m**2)
27 = Kilograms per Square Meter per Second	$kg/m^2/s$ (kg/m**2/s)
30 = Hectopascals per Meter	hPa/m (mbar/m)
31 = Percent per Meter	%/m
32 = Degrees Kelvin per Meter	K/m_2
33 = Watts per Square Meter	W/m^2 (W/m**2)
34 = Degrees Kelvin per Second	K/s
35 = Degrees per 10 (Compass)	$^{o}/10$
36 = Degrees Celsius per 10^4 Square Kilometers	$^{o}C/10^4\ km^2$ (^{o}C/10**4 km**2)
37 = Degrees (Compass Direction)	
40 = Centimeters Squared per Second	cm^2/s ($_{o}$cm**2/s)
41 = Degrees Celsius per 100 feet (Gradient)	$^{o}C/100$ ft
42 = (To be determined)	

CODE UNITS		SYMBOL	
43	= Gram-Calories per Square Centimeter per hour	$g \cdot cal/cm^2/h$	(g*cal/cm**2/h)
44	= Refractive N Units		
45	= Meters Squared per 3 times 10^{15}	$m^2 \cdot 3 \cdot 10^{15}$	(m**2/3*10**15)
46	= Microbars Per Second	ubar/s	
47	= Millimeters	mm	
50	= Kilometers	km	
51	= Inches	in	
52	= Yards	yd	
53	= Statute Miles	mi	
54	= Nautical Miles	NM	
55	= Degrees of Latitude	Lat	
56	= Eights		
57	= Square Kilometers	km^2	(km**2)
60	= Square Statute Miles	mi^2	(mi**2)
61	= Mean Solar Minutes	min	
62	= Mean Solar Hours	h	
63	= Mean Solar Days	d	
64	= Months	mo	
65	= Years	yr	
66	= Per Second to the Fifth Power	$1/s^5$	(1/s**5)
67	= Kilometers per Hour	km/h	
70	= Degrees of Latitude per Day	Lat/d	
71	= Grams	g	
72	= Kilograms	kg	
73	= Grams per Cubic Centimeter	g/cm^3	(g/cm**3)
74	= Langleys	ly	
75	= Grams per Kilogram	g/kg	
76	= Millimeters per Hour	mm/h	

NOTES:

1. * = Multiplied by

2. ** = Raised to the power of

3. / = Divided by or per

4. Unit symbols shown in the symbol column are the preferred International Standard symbols which correspond to the Federal and American National standards. Non ISO symbols correspond to practice that does not conflict with ISO, ANSI, and Federal practice.

5. Code units 15, 43, 46 and 74 have not been changed to conform with the ISO, ANSI, Federal and DOD standards and practice. These will probably be changed in future editions of this document to conform with metric practice.

ANNEX D

PRODUCT CATALOG NUMBERS

ANNEX D

Table D-1

File Indicators

ANNEX E

LOCATION IDENTIFIERS

SECTION 1 GENERAL

SECTION 2 METEOROLOGICAL PROGRAM

SECTION 3 MISCELLANEOUS

ANNEX F

EXAMPLES

No. 1 VECTOR GRAPHIC PRODUCT STRUCTURE

ANNEX F

EXAMPLES

No. 1. Vector Graphic Product Structure

		NOTES
Mode 01, Submode 01	Product Identification Block	1
Mode 04, Submode 20	Vector Graphic Product Definition Block	2
Mode 01, Submode 04	Define Plot Parameters Block	3
Mode 04, Submode 02	Relative Vectors Block for temperature contour 1	4
.	.	.
.	.	.
Mode 04, Submode 02	Relative Vectors Block for temperature contour n	4
Mode 05, Submode 03	Line Labels Character Block for temperature contours 1-n	5
Mode 01, Submode 04	Define Plot Parameters Block	6
Mode 04, Submode 02	Relative Vectors Block for pressure contour 1	7
.	.	.
.	.	.
Mode 04, Submode 02	Relative Vectors Block for pressure contour m	7
Mode 05, Submode 03	Line Labels Character Block for pressure contours 1-m	8
Mode 01, Submode 04	Define Plot Parameters Block \`	9
Mode 04, Submode 02	Relative Vectors Block for cold front	10

ANNEX F (cont.)

Vector Graphic Product Structure

		NOTES
Mode 05, Submode 03	Line Labels Character Block for cold front	11
Mode 01, Submode 04	Define Plot Parameters Block	12
Mode 05, Submode 06	Wind Barbs Data Plot	13
Mode 01, Submode 04	Define Plot Parameters Block	14
Mode 05, Submode 02	Data Plot Block for station 1	15
.	.	.
.	.	.
Mode 05, Submode 02	Data Plot Block for station 1	15
Mode 01, Submode 04	Define Plot Parameters Block	16
Mode 05, Submode 05	Weather Symbols Block	17
Mode 01, Submode 04	Define Plot Parameters Block	18
Mode 05, Submode 01	Alphanumeric Characters Block for line 1	19
.	.	.
.	.	.
Mode 05, Submode 01	Alphanumeric Characters Block for line k	19
Mode 01, Submode 02	End of Product Block	20

Vector Graphic Product Structure

NOTES:

1. Identifies the product.

2. Gives product related information.

3. Set up parameters for plotting temperature contours, e.g., line character - dashed, line color - red.

4. Transmits vectors defining temperature contours 1-n.

5. Transmits labels to be associated with temperature contours.

6. Set up parameters for plotting pressure contours, e.g., line character - solid, line color - blue.

7. Transmits vectors defining pressure contours 1-m.

8. Transmits labels to be associated with pressure contours.

9. Set up parameters for plotting cold front, e.g., line character - symbolic, line color - blue.

10. Transmits vectors defining cold front line.

11. Transmits labels to be associated with cold front.

12. Set up parameters for plotting wind barbs, e.g., line character - reset, line color - green.

13. Transmits wind barbs.

14. Set up parameters for plotting station plots, e.g., line color - orange.

15. Transmits data plots for stations 1-l.

16. Set up parameters for plotting weather symbols, e.g., line color - red.

17. Transmits weather symbols to be plotted.

18. Set up parameters for plotting product legend, e.g., line color - black.

19. Transmits data for product legend.

20. Termination of product.

FEDERAL COMMITTEE FOR
METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH (FCMSSR)

FEDERAL COORDINATOR FOR
METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH

INTERDEPARTMENTAL COMMITTEE FOR
METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH (ICMSSR)

SUBCOMMITTEES

AVIATION SERVICES

SPACE ENVIRONMENT FORECASTING

SYSTEMS DEVELOPMENT

Working Groups

- o Automated Surface Observations
- o Automated Weather Information
- o Radiological, Gaseous and Particulate Transport Models
- o Weather Radar Systems

OPERATIONAL ENVIRONMENTAL SATELLITES

BASIC SERVICES

Working Groups

- o Agricultural Meteorological Services
- o Cooperative Backup Among Operational Processing Centers
- o Dissemination of NMC Products
- o Hurricane Operations
- o Marine Environmental Predictions
- o Meteorological Codes
- o Metric Implementation
- o Operational Processing Centers
- o Severe Local Storms Operations
- o Surface Observations
- o Upper Air Observations
- o Weather Radar Observations
- o Winter Storms Operations
- o World Weather Program

WORKING GROUP ON AUTOMATED WEATHER INFORMATION SYSTEMS

MR. RUSSELL G. MCGREW, Chairman
Department of Commerce, NWS

CAPT. DANIEL MCMORROW, AWS
Department of Defense, USAF

MR. A. F. PYLE
Department of Defense, USN

MR. STANLEY A. CHREST
Department of Defense, USAF

MR. BILLIE CAMPBELL
Department of Defense, USA

MR. LOUIS BOEZI
Department of Commerce, NWS

DR. WILLIAM T. SOMMERS
Department of Agriculture, USFS

DR. RICHARD A. DIRKS
National Science Foundation

MR. JOHN THEON
National Aeronautics and Space Administration

MR. ERIC MANDEL
Department of Transportation, FAA

MR. H. DALE SELLHEIM, Secretary
Office of the Federal Coordinator

TASK GROUP ON COMMUNICATIONS INTERFACES AND DATA EXCHANGES

MR. HAROLD A. BEDIENT, Chairman
Department of Commerce, NWS

MR. CHARLES LARUE
Department of Transportation, FAA

LT. COL. WILLIAM J. SANDS, USAF
Department of Defense, AWS

CDR. L FRIESE, USN
Department of Defense, NOC

MR. RUSSELL L. HOVEY, Secretary
Department of Commerce, NWS