MILITARY STANDARD

INTEROPERABILITY STANDARDS FOR

DATA ADAPTER CONTROL MODE

TO ALL HOLDERS OF MIL-STD-188-216:

1. THE FOLLOWING PAGES OF MIL-STD-188-216 HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
Cover Sheet	printed without change	N/A	19 March 1987
ii	15 June 1990	ii	19 March 1987
xi	printed without change	xi	19 March 1987
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2. THE FOLLOWING PAGES ARE TO BE ADDED:

NEW PAGES	DATE
70A-70D	15 June 90

3. Holders of MIL-STD-188-216 will verify that page changes and additions indicated above have been entered. Pages 70A through 70D are to be inserted between pages 70 and 71. Replace DD1426 with the attached DD1426. Each notice is to be retained by stocking points until the Military Standard is completely revised or cancelled.

Custodians:
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Army - AC
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User Activities:
Army - CR
Navy - MC
Air Force - 13

MIL-STD-188-216
9 MARCH 1987
SUPERSEDING:
SEE FOREWORD

MILITARY STANDARD

INTEROPERABILITY STANDARDS FOR DATA ADAPTER CONTROL MODE

AMSC N/A

AREA TCTS

FOREWORD

1. This military standard is approved and mandatory for use by all Departments and Agencies of the Department of Defense in accordance with Department of Defense Directive Number 4640.11, December 21, 1987 (appendix A).

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to:

Joint Tactical Command, Control, and Communications Agency
ATTN: C3A-ADW-S
11440 Isaac Newton Square North
Reston, Virginia 22090-5006

by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

3. Originally, Military Standard 188 (MIL-STD-188) covered technical standards for tactical and long haul communications, but later evolved through revisions (MIL-STD-188A, MIL-STD-188B) into a document applicable to tactical communications only (MIL-STD-188C).

4. The Defense Communications Agency (DCA) published DCA circulars (DCAC) promulgating standards and engineering criteria applicable to the long haul Defense Communications System (DCS) and to the technical support of the National Military Command System (NMCS).

5. As a result of a Joint Chiefs of Staff (JCS) action, standards for all military communications are now being published in a MIL-STD-188 series of documents. The MIL-STD-188 series is subdivided into a MIL-STD-188-100 series covering common standards for tactical and long haul communications, a MIL-STD-188-200 series covering standards for tactical communications only, and a MIL-STD-188-300 series covering standards for long haul communications only. Emphasis is being placed on developing common standards for tactical and long haul communications published in the MIL-STD-188-100 series.

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FIGURES

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APPENDIXES

1. SCOPE

1.1 Purpose. The purpose of this document is to establish technical standards and design objectives (DOs) that are necessary to ensure interoperability and to promote commonality for communications equipment and subsystems using data adapter control mode (DACM) procedures. Another purpose of this document is to establish acceptable overall system performance in order to satisfy diverse user requirements without the restrictions caused by interface incompatibility problems. Message formats specified for use by the DACM are defined in Allied Communications Procedures (ACP)-127, Communications Instructions Tape Relay Procedures; Defense Operating Instruction (DOI)-103, Defense Special Security Communications System (DSSCS) Operating Instructions (U) System/Data Procedures; and Joint Army Navy Allied Procedures (JANAP)-128, Automatic Digital Network (AUTODIN) Operating Procedures.

1.2 Scope. This document specifies the minimum requirements necessary to develop a Data Adapter Control Mode (DACM) protocol procedure. It is not the intent of this document to specify any particular hardware or software design or implementation.

1.3 Application. This document is applicable to the design and development of new equipment, assemblages, and systems using DACM. This document is applicable also to the engineering and operation of existing DACM systems. It is not intended that existing DACM systems be immediately converted to comply with the standards contained in this document. New DACM systems and those undergoing major modification or rehabilitation shall comply with the standards contained in this document subject to applicable requirements of current procurement regulations. DACM can be used over common long haul and tactical communications circuits. In this case, both this document and Military Standard (MIL-STD)-188-100 shall apply.

1.4 Objectives. The objectives of this document are to provide system performance requirements that ensure interoperation of equipment and systems consistent with military requirements; to achieve the necessary degree of performance and interoperation in the most economical way; and to prevent proliferation of equipment serving the same or a similar function. The variety of equipment shall be the minimum necessary to effectively support the missions of the tactical forces in accordance with Department of Defense Directive (DODD) 4630.5, Compatibility and Commonality of Equipment for Tactical Command, Control, and Communications. These objectives will be accomplished by continuing efforts in the following areas:

a. Standardizing user-to-user performance characteristics.

b. Standardizing the type of signals at various interface points in the applicable system.

c. Specifying maximum permissable degradation of a signal in the process of transmission and allocating the permissable degradation among various parts of a system.

d. Defining performance parameters without specifying the technology that should be used to obtain the required performance.

1.5 System standards and DOs. The parameters and other requirements specified in this document are mandatory system standards (see Appendix A) if the word "shall" is used in connection with the parameter value or requirement under consideration. Nonmandatory system parameters and DOs are indicated as optional by the word "should" in connection with the parameter value or requirement under consideration. For a definition of the terms "system standards" and "design objective," see federal standard (FED-STD)-1037, Glossary of Telecommunications Terms. Information paragraphs, shown as notes, have been included to better define certain methods currently in use with the DACM.

1.6 Tailoring. As a minimum, only those features or functions specified herein, necessary to ensure interoperability among systems, shall be implemented in an equipment item. While every effort has been made to include all the features necessary for protocol implementation, certain aspects are dependent upon system application and must be tailored by the specification writer. These aspects include alarm functions, Mode VI block group size, data rates, codes, message formats, etc.

2. APPLICABLE DOCUMENTS

2.1 Government documents

2.1.1 Standards. The following standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto.

STANDARDS

FEDERAL

FED-STD-1037	Glossary of Telecommunication Terms

MILITARY

MIL-STD-188-100	Common Long Haul and Tactical Communication System Technical Standards

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this standard to the extent specified herein.

JANAP-128	Automatic Digital Network (AUTODIN) Operating Procedures
DOI-103	Defense Special Security Communications System (DSSCS) Operating Instructions (U) System/Data Procedures
DCAC 370 - D175-1	DCS AUTODIN Interface and Control Criteria
ACP-117	Allied Routing Indicator Book
ACP-127	Communications Instructions Tape Relay Procedures
Department of Defense Directive (DODD) 4630.5	Compatibility and Commonality of Equipment for Tactical Command, Control and Communications

2.2 Order of precedence. In the event of a conflict between the text of this standard and the reference cited herein, the text of this standard takes precedence. Nothing in this standard, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.3 Source of documents

2.3.1 Government specifications, standards, and handbooks. Copies of the referenced federal and military specifications, standards, and handbooks are available from:

Department of Defense Single Stock Point
Commanding Officer
Naval Publications and Forms Center
5801 Tabor Avenue
Philadelphia, PA 19120-5099

For specific acquisition functions, these documents should be obtained from the contracting activity or as directed by the contracting activity.

2.3.2 Other Government documents. Copies or other Government documents required by contractors in connection with specification acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.

3. DEFINITIONS

3.1 Definition of terms. Definition of terms used in this document shall be specified in FED-STD-1037. Those definitions of terms unique to DACM and not defined in FED-STD-1037 are provided in the following subparagraphs.

3.1.1 Excessive unexpected characters. A situation where a data adapter/message switch (DA/MS) receives 170 or more contiguous characters that are not acceptable when received.

3.1.2 Glare. A situation where two DA/MSs try to initiate DACM signaling to each other at the same time.

3.1.3 Handback. The process of going from the traffic mode back to the DACM.

3.1.4 Handover. The process of going from DACM to the traffic mode.

3.1.5 Information rate. The minimum number of bits (1's and 0's) per unit of time, usually seconds, required to convey useful information (for example, 2400 bps).

3.1.6 Initiator. The party starting a procedure and leading in the steps of the procedure.

3.1.7 Loop rate. The rate at which bits are exchanged between a DA/MS and the transmission/cryptographic equipment.

3.1.8 Master-slave relationships. On circuit switched connections, calling equals master, called equals slave. On dedicated connections, predefined data base parameters define the relationship. The master-slave relationship should not be confused with the initiator-responder relationship.

3.1.9 Message synchronization. Message synchronization is the process whereby the DA/MS sharing a connection cooperatively progresses from an unknown or ambiguous message state to a common known start-of-message state, i.e., to either sending the first block of a message or to expecting the next input block to be the first block of a message.

3.1.10 Responder. The party reacting to the start of a procedure and following in the execution of the procedure.

3.1.11 Traffic mode. The mode between DA/MSs in which message traffic (Modes I through VII) is sent.

3.2 Abbreviations and acronyms. Abbreviations and acronyms used in this document are as defined in FED-STD-1037. Those abbreviations and acronyms unique to this document and not defined in FED-STD-1037 are provided in Appendix B.

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Table IV. Data adapter control block format.

Character Position	Character Description	Function	Reference Table
1	Framing	Start of Block Character - STX	N/A
2	Framing	Start of Block Character - 31	N/A
3-4	Security	Security of Message Repeated Identifier (2 character)	VIII
5	Information Rate	Identifies the Information Rate	IX
6	Spare	Available for Future Use - NUL	N/A
7	Codes	Message Code	X
8	DTE Select	Identifies the DTE Channel Selected or Identified	XI
9	Message Format	Identifies Message Format Utilized	XII
10	Channel Control Procedures	Identifies Channel Control Procedures Utilized	XIII
11	Error Control	Identification of Error Control Technique Utilized	XIV
12	Precedence	Identifies Precedence of Message	XV
13	DACB Types	Identifies Purpose for Transmission of DACB	XVI
14	Mode VI Group Size	Defines Number of Blocks Per Group	XVII
15	Data Mode Control	Identifies Whether Data Mode Control Shall be Inhibited	XVIII

Table IV. Data adapter control block format - Continued.

Character Position	Character Description			Function	Reference Table
16	Address	Telephone Number	Area Code	First Digit of Area Code	N/A
17				Second Digit of Area Code	N/A
18				Third Digit of Area Code	N/A
19			Switch Code	First Digit of Switch Code	N/A
20				Second Digit of Switch Code	N/A
21				Third Digit of Switch Code	N/A
22			Subscriber Address	First Digit of Subscriber Address	N/A
23				Second Digit of Subscriber Address	N/A
24				Third Digit of Subscriber Address	N/A
25				Fourth Digit of Subscriber Address	N/A
26		Routing Indicator (RI)		First Character of RI	N/A
27				Second Character of RI	N/A
28				Third Character of RI	N/A
29				Fourth Character of RI	N/A
30				Fifth Character of RI	N/A
31				Sixth Character of RI	N/A
32				Seventh Character of RI (Left Most Character)	N/A

Table IV. Data adapter control block format - Concluded.

Character Position	Character Description	Function	Reference Table
33*	DTE Type	Identification of DA Capabilities or Request for Specified DTE Capabilities	N/A
34	DACB change	Identification of DACB (same as previous or changed)	XIX
35	Framing	EM - End of Medium	N/A
36	Framing	ETX - End of Text	N/A
37	Framing	BP - Block Parity	N/A

*Construction of Character Position 33

Bit Position	Function
1	page printer
2	paper tape
3	card unit
4	terminal acting as a display or storage device
5	mag tape
6	facsimile
7	logical 0 (spare)
8	sum of logical 1's such that the number of logical 1's are odd

Table V. DACB character generation.

DACM Identifier Character Position(s)	Description	Character Setting by DACB Type										
		NUL *	DC2 *	ENQ *	INV *	A*	B*	C*	D*	E*	F*	G*
1	Framing	STX	STX	STX	STX	STX	STX	STX	STX	STX	STX	STX
2	Framing	31	31	31	31	31	31	31	31	31	31	31
3 & 4	Security	4/	NUL	NUL	NUL	NUL	4/	NUL	NUL	4/	NUL	NUL
5	Info Rate	4/	Z	H	2/	H	4/	H	H	4/	H	NUL
6	Spare	NUL	NUL	NUL	NUL	NUL	NUL	NUL	NUL	NUL	NUL	NUL
7	Codes	4/	4/	NUL	2/	NUL	4/	NUL	NUL	4/	NUL	NUL
8	DTE Select	5/	5/	5/	2/	NUL	5/	NUL	NUL	5/	5/	NUL
9	Format	4/	4/	NUL	2/	NUL	4/	NUL	NUL	4/	NUL	NUL
10	Channel Control	4/	4/	NUL	2/	NUL	4/	NUL	NUL	4/	NUL	NUL
11	Error Control	4/	4/	NUL	2/	NUL	4/	NUL	NUL	4/	NUL	NUL
12	Precedence	4/	4/	NUL	NUL	NUL	4/	NUL	NUL	4/	NUL	NUL
13	DACB Types	NUL	DC2	ENQ	INV	A	B	C	D	E	F	G
14	Mode VI Group Size	4/	4/	NUL	2/	NUL	4/	NUL	NUL	4/	NUL	NUL
15	Data Mode Control	4/	Z	Z	2/	Z	Z	Z	Z	Z	Z	Z
16-32	Address & RI	3/	3/	3/	3/	3/	3/	3/	3/	3/	3/	3/

Table V. DACB character generation - Continued.

DACM Identifier Character Position(s)	Description	Character Setting by DACB Type										
		NUL *	DC2 *	ENQ *	INV *	A*	B*	C*	D*	E*	F*	G*
$33b_1$	Page Printer	4/	4/	Ø	2/	Ø	4/	Ø	Ø	4/	4/	Ø
$33b_2$	Paper Tape	4/	4/	Ø	2/	Ø	4/	Ø	Ø	4/	4/	Ø
$33b_3$	Card Unit	4/	4/	Ø	2/	Ø	4/	Ø	Ø	4/	4/	Ø
$33b_4$	Terminal Display/Storage	4/	4/	Ø	2/	Ø	4/	Ø	Ø	4/	4/	Ø
$33b_5$	Mag Tape	4/	4/	Ø	2/	Ø	4/	Ø	Ø	4/	4/	Ø
$33b_6$	FAX	4/	4/	Ø	2/	Ø	4/	Ø	Ø	4/	4/	Ø
$33b_7$ 1/	SPARE	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
$33b_8$	Parity	7/	7/	7/	7/	7/	7/	7/	7/	7/	7/	7/
34	DACB Change	4/	NUL	NUL	4/	NUL	4/	NUL	NUL	4/	NUL	NUL
35	Framing	EM	EM	EM	EM	EM	EM	EM	EM	EM	EM	EM
36	Framing	ETX	ETX	ETX	ETX	ETX	ETX	ETX	ETX	ETX	ETX	ETX
37	Framing	6/	6/	6/	6/	6/	6/	6/	6/	6/	6/	6/

NOTES:

1/ - This bit position is a spare and shall be set to logical Ø

2/ - If a DACB (INV) is sent because:

a. the received DACB characteristics cannot be accommodated or
b. the received DACB characters are inconsistent with the stored classmarks associated with the RI in the received DACB.

Then each character position shall contain a valid character. The DACB (INV) character positions, except for 3, 4 and 12, shall specify the characteristics acceptable to the MS/DA sending the DACB (INV).

3/ - The Message Switch/Data Adapter shall have the option of placing NUL characters in positions 16 through 25, inclusive where appropriate (i.e., dedicated circuits). Valid RI characters shall always be inserted in positions 26 through 32, inclusive.

4/ - The Message Switch/Data Adapter transmitting this DACB must place one of the valid characters or bits in this position. The characters or bits to be used are those specified in 5.2.1.1 through 5.2.1.15.

5/ - Multiple DTE Data Adapters and Message Switches shall place an appropriate valid character in this position. Single DTE Data Adapters shall place NUL in this position.

6/ - This position is a block parity character and is defined in paragraph 5.2.3.1.

7/ - This position is a parity bit and is the logical sum of all the bits of the character such that the number of logical 1's is odd.

* - DACB types (see 5.2.1.10), position 13 of DACB.

Table VI. DACM characters - numerically.

DACM Characters	DACM Characters Bit Positions							
	b_8	b_7	b_6	b_5	b_4	b_3	b_2	b_1
ETX	0	0	0	0	0	0	1	1
ACK	0	0	0	0	0	1	1	0
INV	0	0	0	0	0	1	1	1
DC3	0	0	0	1	0	0	1	1
DC4	0	0	0	1	0	1	0	0
ESC	0	0	0	1	1	0	1	1
WBT	0	0	0	1	1	1	1	0
1	0	0	1	1	0	0	0	1
4	0	0	1	1	0	1	0	0
7	0	0	1	1	0	1	1	1
8	0	0	1	1	1	0	0	0
C	0	1	0	0	0	0	1	1
E	0	1	0	0	0	1	0	1
F	0	1	0	0	0	1	1	0
I	0	1	0	0	1	0	0	1
J	0	1	0	0	1	0	1	0
L	0	1	0	0	1	1	0	0
O	0	1	0	0	1	1	1	1
Q	0	1	0	1	0	0	0	1
R	0	1	0	1	0	0	1	0
T	0	1	0	1	0	1	0	0
W	0	1	0	1	0	1	1	1
X	0	1	0	1	1	0	0	0
NUL	1	0	0	0	0	0	0	0
STX	1	0	0	0	0	0	1	0
ENQ	1	0	0	0	0	1	0	1
DC1	1	0	0	1	0	0	0	1
DC2	1	0	0	1	0	0	1	0

DACM Characters	DACM Characters Bit Positions							
	b_8	b_7	b_6	b_5	b_4	b_3	b_2	b_1
EM	1	0	0	1	1	0	0	1
31	1	0	0	1	1	1	1	1
Ø	1	0	1	1	0	0	0	0
2	1	0	1	1	0	0	1	0
3	1	0	1	1	0	0	1	1
5	1	0	1	1	0	1	0	1
6	1	0	1	1	0	1	1	0
9	1	0	1	1	1	0	0	1
A	1	1	0	0	0	0	0	1
B	1	1	0	0	0	0	1	0
D	1	1	0	0	0	1	0	0
G	1	1	0	0	0	1	1	1
H	1	1	0	0	1	0	0	0
K	1	1	0	0	1	0	1	1
M	1	1	0	0	1	1	0	1
N	1	1	0	0	1	1	1	0
P	1	1	0	1	0	0	0	0
S	1	1	0	1	0	0	1	1
U	1	1	0	1	0	1	0	1
V	1	1	0	1	0	1	1	0
Y	1	1	0	1	1	0	0	1
Z	1	1	0	1	1	0	1	0

NOTES:
a) b_1 is least significant bit (LSB)
b) LSB is first bit of a character transmitted
c) b_8 is most significant bit (MSB)
d) MSB is last bit of a character transmitted
e) Bits are transmitted from right to left (b_1 first and b_8 last).

Table VI (A). DACM characters - alphabetically.

DACM Characters	DACM Characters Bit Positions							
	b_8	b_7	b_6	b_5	b_4	b_3	b_2	b_1
A	1	1	0	0	0	0	0	1
ACK	0	0	0	0	0	1	1	0
B	1	1	0	0	0	0	1	0
C	0	1	0	0	0	0	1	1
D	1	1	0	0	0	1	0	0
DC1	1	0	0	1	0	0	0	1
DC2	1	0	0	1	0	0	1	0
DC3	0	0	0	1	0	0	1	1
DC4	0	0	0	1	0	1	0	0
E	0	1	0	0	0	1	0	1
EM	1	0	0	1	1	0	0	1
ENQ	1	0	0	0	0	1	0	1
ETX	0	0	0	0	0	0	1	1
ESC	0	0	0	1	1	0	1	1
F	0	1	0	0	0	1	1	0
G	1	1	0	0	0	1	1	1
H	1	1	0	0	1	0	0	0
I	0	1	0	0	1	0	0	1
INV	0	0	0	0	0	1	1	1
J	0	1	0	0	1	0	1	0
K	1	1	0	0	1	0	1	1
L	0	1	0	0	1	1	0	0
M	1	1	0	0	1	1	0	1
N	1	1	0	0	1	1	1	0
NUL	1	0	0	0	0	0	0	0
O	0	1	0	0	1	1	1	1
P	1	1	0	1	0	0	0	0
Q	0	1	0	1	0	0	0	1
R	0	1	0	1	0	0	1	0
S	1	1	0	1	0	0	1	1
STX	1	0	0	0	0	0	1	0
T	0	1	0	1	0	1	0	0
U	1	1	0	1	0	1	0	1
V	1	1	0	1	0	1	1	0
W	0	1	0	1	0	1	1	1
WBT	0	0	0	1	1	1	1	0
X	0	1	0	1	1	0	0	0
Y	1	1	0	1	1	0	0	1
Z	1	1	0	1	1	0	1	0
Ø	1	0	1	1	0	0	0	0
1	0	0	1	1	0	0	0	1
2	1	0	1	1	0	0	1	0
3	1	0	1	1	0	0	1	1
4	0	0	1	1	0	1	0	0
5	1	0	1	1	0	1	0	1
6	1	0	1	1	0	1	1	0
7	0	0	1	1	0	1	1	1
8	0	0	1	1	1	0	0	0
9	1	0	1	1	1	0	0	1
31	1	0	0	1	1	1	1	1

NOTES:
a) b_1 is least significant bit (LSB)
b) LSB is first bit of a character transmitted
c) b_8 is most significant bit (MSB)
d) MSB is last bit of a character transmitted
e) Bits are transmitted from right to left (b_1 first and b_8 last).

Table VII. DACB identifier characters.

IDENTIFIER CHARACTERS	8 BIT CODE							
	b_8	b_7	b_6	b_5	b_4	b_3	b_2	b_1
NUL	1	0	0	0	0	0	0	0
ENQ	1	0	0	0	0	1	0	1
INV	0	0	0	0	0	1	1	1
DC1	1	0	0	1	0	0	0	1
DC2	1	0	0	1	0	0	1	0
DC3	0	0	0	1	0	0	1	1
Ø	1	0	1	1	0	0	0	0
1	0	0	1	1	0	0	0	1
2	0	0	1	1	0	0	1	0
3	1	0	1	1	0	0	1	1
4	0	0	1	1	0	1	0	0
5	1	0	1	1	0	1	0	1
6	1	0	1	1	0	1	1	0
7	0	0	1	1	0	1	1	1
8	0	0	1	1	1	0	0	0
9	1	0	1	1	1	0	0	1
A	1	1	0	0	0	0	0	1
B	1	1	0	0	0	0	1	0
C	0	1	0	0	0	0	1	1
D	1	1	0	0	0	1	0	0
E	0	1	0	0	0	1	0	1
F	0	1	0	0	0	1	1	0
G	1	1	0	0	0	1	1	1
H	1	1	0	0	1	0	0	0
I	0	1	0	0	1	0	0	1
J	0	1	0	0	1	0	1	0
K	1	1	0	0	1	0	1	1
L	1	1	0	0	1	1	0	0
M	1	1	0	0	1	1	0	1
N	1	1	0	0	1	1	1	0

TABLE VII. DACM identifier characters - Continued.

IDENTIFIER CHARACTERS	8 BIT CODE							
	b_8	b_7	b_6	b_5	b_4	b_3	b_2	b_1
O	0	1	0	0	1	1	1	1
P	1	1	0	1	0	0	0	0
Q	0	1	0	1	0	0	0	1
R	0	1	0	1	0	0	1	0
S	1	1	0	1	0	0	1	1
T	0	1	0	1	0	1	0	0
U	1	1	0	1	0	1	0	1
V	1	1	0	1	0	1	1	0
W	0	1	0	1	0	1	1	1
X	0	1	0	1	1	0	0	0
Y	1	1	0	1	1	0	0	1
Z	1	1	0	1	1	0	1	0

Notes:

a) b_1 is least significant bit (LSB)
b) LSB is first bit of a character transmitted
c) b_8 is most significant bit (MSB)
d) MSB is last bit of a character transmitted
e) Bits are transmitted from right to left (b_1 first and b_8 last).

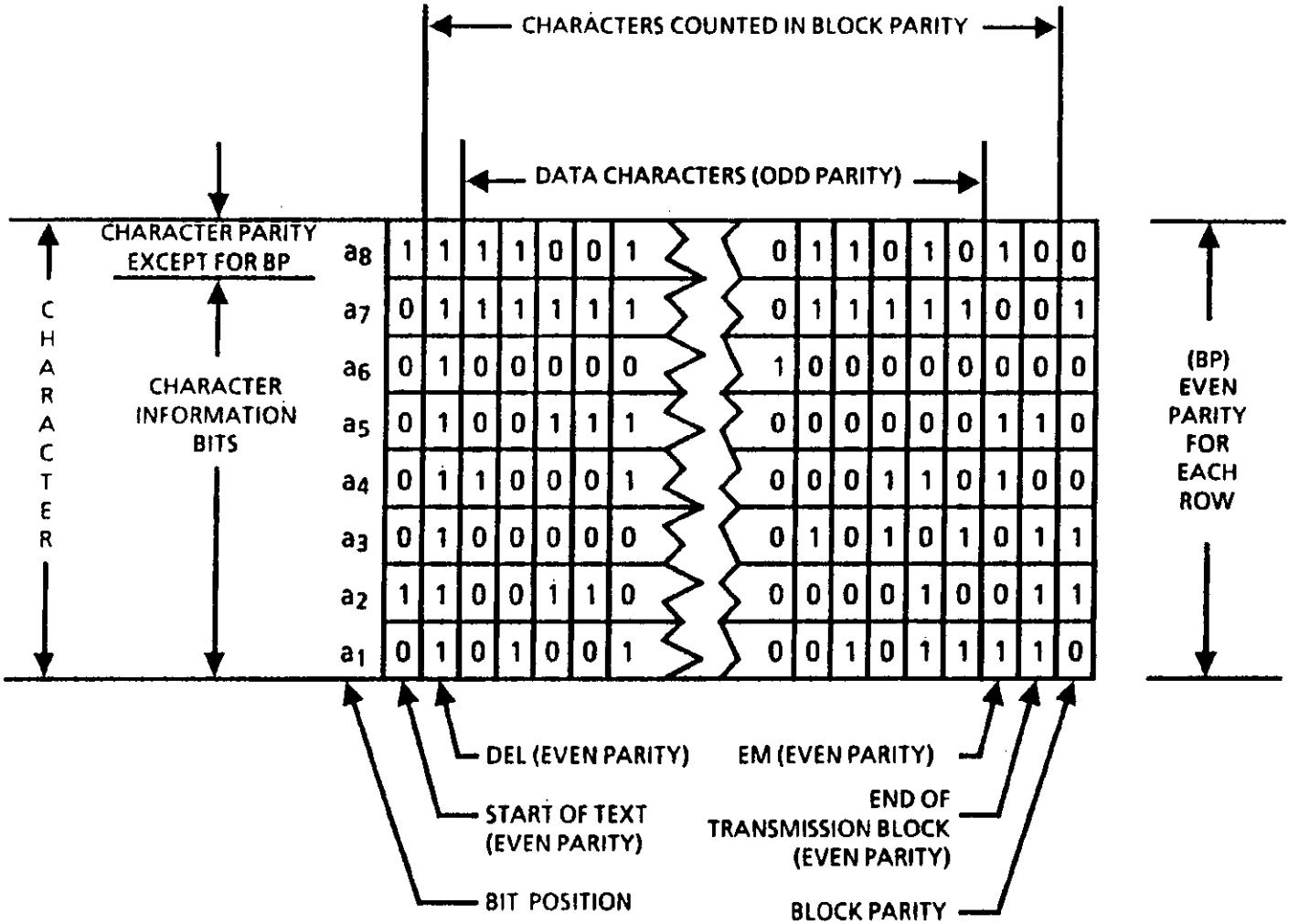

FIGURE 3. Parity checking rules for DACB.

5.2.1.4 Codes. This identifier character (position 7 of DACB) shall identify the DTE message code. The indicators shall be in accordance with table X.

Table X. Codes.

Identifier Characters	Identification
A	ASCII odd parity
B	IA No. 2
C	Continuous random bit stream and facsimile
D	4 out of 8 (IBM) code 10 unit start-stop
E	EBCDIC. (Extended Binary Coded Decimal Interchange Code)
F	Fieldata
G	ASCII even parity (data)
N	Nonstructured format magnetic tape
O	Structured format magnetic tape
NUL	No code identified by this DACB

5.2.1.5 DTE select. This identifier character (position 8 of DACB) shall identify the DTE terminal requested within the DACB, for DACB(F) (see 5.2.2.4). MSs and DAs with a single DTE channel shall not transmit DACB (INV) due solely to receipt of DC1, DC2, or DC3 in this character position. A multiple DTE DA shall transmit a DACB(INV) if an incompatible identifier character is received in a DACB. The indicators shall be in accordance with table XI.

Table XI. DTE select.

Identifier Characters	Identification
DC1	DTE-1
DC2	DTE-2
DC3	DTE-3
NUL	Only DTE or selection based on character 33 of DACB

5.2.1.6 Message format. This identifier character (position 9 of DACB) shall identify the format of the message(s) to be transmitted. The indicators shall be in accordance with table XII.

Table XII. Message format.

Identifier Characters	Identification
A	ACP-127
B	JANAP-128, Data
C	ACP-127 modified (DOI-103 Special)
D	JANAP-128, Teletypewriter
E	Special Format 1
F	Special Format 2
G	JANAP-128 modified (DOI-103 Standard
H	ACP-127 NATO SUPP 3
NUL	No special format (a valid format coordinated by means other than by DACBs)

5.2.1.7 Channel control procedures. This identifier character (position 10 of DACB) shall identify the operational mode of the DA (or the DTE connected to the DA) or the operational mode of the MS during message transmission. Modes I, II, V, and VI are defined in MIL-STD-188-171, 172, 173, and 174. All modes are as specified in MIL-STD-188-171 through MIL-STD-188-174. The indicators shall be in accordance with table XIII.

Table XIII. Channel control procedures.

Identifier Characters	Identification
A	Mode I - Continuous
B	Mode II
E	Mode V
F	Mode VI
G	Mode I - Block-by-Block
NUL	Unspecified - utilized between DAs for facsimile and special DTE
H	Mode VII
J	Generic Gateway

Table XVI. DACB types - (Continued).

Rate	Characters Identifier	Identification
Msg	C	C is sent in a DACB to indicate transmission of message(s) is complete, hold connection in idle state. Further message transmission will be preceded by another DACB.
Msg	D	D is sent in a DACB to indicate cancellation of all transmission since the last start of message sequence, and to terminate the connection or go back to idle if dedicated (non-ARQ modes only) (see note 1)
Msg	E	E is sent in a DACB to indicate cancellation of all transmission since previous start of message sequence and to specify the characteristics for continued transmission (non-ARQ modes only) (see note 1)
Idle	F	F is sent in a DACB to indicate the DACB is being sent in response to a DACB (ENQ)
Idle/Msg	G	G is sent in a DACB to indicate "Go-to-Voice"
Idle/Msg	NUL	NUL character is sent in a DACB during call initiation to specify and validate characteristics for subsequent data transmission
Idle/Msg	K	K is reserved for future use of cryptokey exchange.

NOTE 1: The provision of special DACB signaling for non-ARQ modes does not imply a requirement to use this signaling. Individual D/A MS specifications defines when this signaling is required.

5.2.1.11 Mode VI group size. This identifier character (position 14 of DACB) shall identify the group size in terms of line blocks to be utilized in the ensuring Mode VI transmission when a DACB(NUL), DACB(B), or DACB(E) is sent. A responder shall not send a DACB(INV) due solely to the initiator requesting a smaller group size capability than the responder can provide. For all modes, except for Mode VI, the DA/MS shall place a NUL in this position. The indicators shall be in accordance with table XVII.

Table XVII. Mode VI group size.

Identifier Characters	Identification
A	32
B	64
C	96
D	16
NUL	Not applicable

5.2.1.12 Data mode control. This identifier character (position 15 of DACB) shall identify whether data mode control (DMC) mode of operation shall be used (see 5.5.2) or inhibited. Upon initial establishment of a call (circuit), the DMC shall be enabled. The indicators shall be in accordance with table XVIII.

Table XVIII. Data mode control.

Identifier Characters	Identification
NUL	Data mode control employed
A	Data mode control inhibited
Z	Not applicable - remains in present state

5.2.1.13 Address. The address (positions 16 through 32 of the DACB) shall contain addressing information of the DA/MS originating the DACB and shall consist of two fields; the telephone number of the station and the routing indicator (RI) of the station. The station telephone number shall be constructed in accordance with the associated digital circuit switch numbering plan. The 10-digit number (area code, switch code and subscriber address) shall be used. The RI field shall be constructed in accordance with the applicable community RI directory; e.g., ACP-117. The RI shall be left-justified in the field. Unused portions in the RI field shall be filled with NUL characters. For DA/MSs with multiple channel capability, the RI, for the specific DTE channel in character position 8 of the DACB, shall be inserted in characters 26-32 of DACB. If no DTE is connected to a specific channel, positions 26-32 of DACB shall be filled with "NULS."

5.2.1.14 DTE type. This identifier character (position 33 of the DACB) shall identify specific terminal equiment. A DA/MS sending a DACB(F) or DACB(INV) shall set the appropriate bit(s) for the DTE(s) attached to the specific DTE channel when position 8 of the DACB being responded to is DC1, DC2, or DC3 or set the "logical or" of all the DTE types on all channels in character position 33 when position 8 of the DACB is NUL. In DACB(NUL), DACB(B), and DACB(E) a specific bit shall be set for the type of terminal equiment requested. If a specified DTE channel (DC1, DC2, DC3, or NUL in position 8) does not have specified terminal type, a DACB(INV) shall be sent indicating the terminal types available on the specified DTE channel as follows.

a. A logical 1 in bit position 1 shall indicate page printer.

b. A logical 1 in bit position 2 shall indicate a paper tape unit.

c. A logical 1 in bit position 3 shall indicate a card unit.

d. A logical 1 in bit position 4 shall indicate a terminal acting as a display or storage device.

e. A logical 1 in bit position 5 shall indicate a magnetic tape unit.

f. A logical 1 in bit position 6 shall indicate a facsimile unit.

g. Bit position 7 shall be a spare and shall be set to logical 0.

h. A logical 1 in more than one position shall indicate a combination of the above devices and capabilities.

5.2.1.15 DACB change. This identifier character (position 34 of the DACB) shall identify whether the DA/MS transmitting a DACB is capable of changing its characteristics or has changed any of its characteristics from the previously transmitted DACB (provided position 13, DACB type, has not changed). Whenever DACB (DC2), DACB (ENQ), DACB(A), DACB(C), DACB(D), DACB(F), or DACB(G) is transmitted, character position 34 shall always be a NUL character. Whenever a DACB (INV) is transmitted, character position 34 of the DACB(INV) shall be the same as that of the received DACB to which the DACB(INV) responds. Whenever DACB(NUL), DACB(B), or DACB(E) is transmitted, character position 34 shall be in accordance with table XIX.

Table XIX. DACB change.

Identifier Characters	Identification
A	DA/MS is capable of changing its characteristics. This ASCII character (A) shall be used with first DACB transmission. It shall also be transmitted with each changed DACB when previously transmitted DACB had a "B" in position 34
B	DA/MS is capable of changing its characteristics. Transmitted with each changed DACB when previously transmitted DACB had an "A" in position 34
NUL	DA/MS not capable of changing its DACB characteristics

5.2.5.2 Escape characters (ESC). The ESC character is the transition synchronization character which shall be used during the transition between two lines states; e.g., idle rate to message rate or old message rate to new message rate. The ESC shall be sent as a synchronous character with the necessary encoding. When a transition is being made to a new message rate, the forward error correction (FEC), bit stuffing, or multisampling that is specified for the new message rate shall be used to encode the ESC. When a transition is being made to idle rate, multisampling to 2400 baud information rate shall be used if the loop rate is greater than 2400 baud.

5.2.6 Handback request detection. While in the traffic state, the decoded information rate bit stream shall be constantly examined for synchronous DC4 characters. A DC4 character boundary may be different than the character boundary of the traffic mode. The detection of the DC4 stream shall indicate that the distant end is requesting a handback to DACM. Appendix C gives details of handback synchronization.

5.2.7 Break sequence. A break sequence shall be sent to "wake up" a distant end and shall force a return to the idle line state (see table XXI).

5.2.7.1 Break generation. A generated break sequence shall consist of one second of continuous "space" (logic zero) loop bits. After having sent a break sequence, the sender shall go to idle line state.

5.2.7.2 Break detection. A break shall be recognized when 750 milliseconds of spacing line are detected. The break detector shall be implemented using a loop bit error filtering algorithm to ensure that a break, in a worst case noise environment, shall be detected. False detection shall also be guarded against by use of a filtering algorithm. To protect against false detection of break during idle-to-information and information-to-idle rate transitions, marks shall be sent (see tables XXII and XXIII). The break detector shall be active at all times.

Table XXI. Example of generation of break - return to idle.

INITIATOR		RESPONDER		DESCRIPTION
STATE	ACTION	ACTION	STATE	
IDLE LINE	Break → (Loop Rate)		IDLE LINE	Initiator recognizes loss of SYNC during DACM and performs Crypto Resync then sends break (logical zero (Ø) for one second) at loop rate. FEC and bit stuffing are inhibited as required. Initiator prepares for Idle sync by sending ESC.
		← Mark (Loop Rate)		Responder recognizes break and sends Mark. FEC and bit stuffing inhibited as required.
IDLE SYNC	ESC → (2400)		IDLE SYNC	Initiator sends ESC.
		← ESC (2400)		Responder detects ESC and sends ESC.
	DC4 → (2400)			Initiator syncs on ESC and sends DC4.
		← DC4 (2400)		Responder syncs on DC4 and sends DC4.
	DC4 → (2400)			Initiator syncs on DC4. System is ready for transmission of DACBs.

Table XXII. Example of call termination.

INITIATOR		RESPONDER		DESCRIPTION
STATE	ACTION	ACTION	STATE	
TRAFFIC	SYN/MARK/DATA (Encoded)** (Msg Rate) →	← SYN/MARK/DATA (Encoded)** (Msg Rate)	TRAFFIC	Initiator completes message transmission and sends encoded SYN/MARK.
HANDBACK SYNC	DC4 (Encoded)** (Msg Rate) →	← SYN/MARK/DATA (Encoded)** (Msg Rate)		Initiator desires termination and signals hand-back by sending DC4s.
	DC4 (Encoded)** (Msg Rate) →	← DC4 (Encoded)** (Msg Rate)	HANDBACK SYNC	Responder detects and syncs on DC4 and sends DC4.
MSG RATE DACM	DACB (A/D) (Encoded)** (Msg Rate) →	← DC4 (Encoded)** (Msg Rate)		The initiator syncs on DC4 and sends DACB (A) or DACB(D) continuously.

TABLE XXII. Example of call termination - Continued.

INITIATOR		RESPONDER		DESCRIPTION
STATE	ACTION	ACTION	STATE	
MSG RATE DACM	DACB (A/D) (Encoded)** (Msg Rate) →	← ACK 31 (Encoded)** (Msg Rate)	MSG RATE DACM	The responder ACKs DACB. Responder sends 10 ACKs for each DACB received.
		IF DEDICATED		
	MARK * (Loop Rate) →			If circuit switched call, initiator detects ACK 31 and goes on hook. Responder detects Mark and goes on hook.
	MARK * (2400) →			If dedicated connection, initiator detects ACK 31 sequence, inhibits FEC coding and stuffing, if applicable, and sends Mark.
		← MARK * (2400)		Responder detects loss of DACB/DC4 and inhibits FEC coding and stuffing, if applicable, and searches for Mark.
				Responder detects Mark and sends Mark.

5.2.8 Mark detection criteria.

5.2.8.1 Mark sequence. A detection of 32 contiguous bits at information rate in the Mark (logical 1) state shall be considered as "detecting mark."

5.2.8.2 Detection of loss of mark sequence. When in the mark detection sequence state, the DA/MS shall declare itself out of mark sequence state if any 720 bit sample contains less than 32 contiguous mark bits.

5.2.9 Error control/message to loop rate transformation. The DA/MS shall implement bit stuffing, multisampling, FEC (see appendix D), and automatic repeat-request (ARQ) error control techniques. Depending on the DA/MS capabilities, various combinations of these shall be used as specified in table XXIV. Error control and message to loop rate transformation configuration compatibility shall be coordinated through the DACB.

5.2.9.1 Multisampling. The multisampling technique shall be used with information rates as specified in table XXIV. Multisampling shall not be used in conjunction with bit stuffing or FEC.

5.2.9.1.1 Bit framing. In this mode of operation, all bits (data and idle) shall be transmitted using the information rate clock, which shall be derived from the loop rate clock according to the sampling sequences shown in table XXIV. This shall ensure that information bits contained in the loop rate data stream between the transmitter and receiver have a fixed and known relationship to the loop bits.

5.2.9.1.1.1 Start-stop data. The DA and MS shall only transmit an integral number of stop bits. For International Alphabet No. 2 (IA No. 2) start-stop code, one start, five data, and at least two stop bits (eight unit IA No. 2 code) shall be transmitted. In all cases, if there are no characters available for transmission, an integral number of information bit times of marking line shall be generated before starting the next character.

5.2.9.1.1.2 Quantizing information bits. When the message rate to loop rate transformation results in a fractional number of loop samples per information bit, the fractional loop bit shall be intergerized by addition or subtraction of the fractional unit in a manner such that the average information rate is maintained (see figure 4).

Table XXIV. Conversion tables from loop rates to information rates.

Loop Transmission Rate (bps)	Information Rate (Bauds)	Sampling Rate	Sampling Sequence 2/
2400	45.45	52.8	52, 53, 53, 53, 53, . . .
	50	48	48, 48, 48, 48, . . .
	75	32	32, 32, 32, 32, . . .
	150	16	16, 16, 16, 16, . . .
	300	8	8, 8, 8, 8, 8, . . .
	600	4	4, 4, 4, 4, 4, . . .
	1200	2	2, 2, 2, 2, 2, . . .
	2400	1	1, 1, 1, 1, 1, . . .
4800	45.45	105.6	105, 106, 105, 106, 106, . . .
	50	96	96, 96, 96, 96, . . .
	75	64	64, 64, 64, 64, . . .
	150	32	32, 32, 32, 32, . . .
	300	16	16, 16, 16, 16, . . .
	600	8	8, 8, 8, 8, 8, . . .
	1200	4	4, 4, 4, 4, 4, . . .
	2400	2	2, 2, 2, 2, 2, . . .
	4800	1	1, 1, 1, 1, 1, . . .
9600	45.45	211.2	211, 211, 211, 211, 212, . . .
	50	192	192, 192, 192, . . .
	75	128	128, 128, 128, . . .
	150	64	64, 64, 64, 64, . . .
	300	32	32, 32, 32, 32, . . .
	600	16	16, 16, 16, 16, . . .
	1200	8	8, 8, 8, 8, 8, . . .
	2000	4.8	4, 5, 5, 5, 5, . . .
	2400	4	4, 4, 4, 4, . .
	4800	2	2, 2, 2, 2, 2, . . .
	9600	1	1, 1, 1, 1, 1, . . .

Table XXIV. Conversion tables from loop rates to information rates - Continued.

Loop Transmission Rate (bps)	Information Rate (Bauds)	Sampling Rate	Sampling Sequence 2/
16000	45.45	352.0	352, 352, 352, 352, . . .
	50	320	320, 320, 320, 320, . . .
	75	213-1/3	213, 213, 214, . .
	150	106-2/3	106, 107, 107, . . .
	300	53-1/3	53, 53, 54, 53, 53, 54, . . .
	600	26-2/3	26, 27, 27, . . .
	1200	13-1/3	13, 13, 14, . . .
	2400	16-2/3	6, 7, 7, 6, 7, 7, . . .
	4800	3-1/3	3, 3, 4, 3, 3, 4, . . .
	9600	Stuffed to 16000	1/ 3 + 2, 3 + 2, 3 + 2, . . .
	2000	8	8, 8, 8, 8, 8, . . .
	4000	4	4, 4, 4, 4, 4, . . .
	8000	2	2, 2, 2, 2, 2, . . .
	16000	1	1, 1, 1, 1, 1, . . .
32000	45.45	704.1	704, 704, 704, 704, 704, . . .
	50	640	640, 640, 640, . . .
	75	426-2/3	426, 427, 427, . . .
	150	213-1/3	213, 213, 214, . . .
	300	106-2/3	106, 107, 107, . . .
	600	53-1/3	53, 53, 54, . . .
	1200	26-2/3	26, 27, 27, . . .
	2400	13-1/3	13, 13, 14, . . .
	4800	6-2/3	6, 7, 7, 6, 7, 7, . . .
	9600	3-1/3	3, 3, 4, 3, 3, 4, 3, . . .
	2000	16	16, 16, 16, . . .
	4000	8	8, 8, 8, 8, . . .
	8000	4	4, 4, 4, 4, 4, . . .
	16000	2	2, 2, 2, 2, 2, . . .
	32000	1	1, 1, 1, 1, 1, . . .

NOTE: 1/ 3 + 2 = 3 data bits plus 2 stuff bits 2/ . . .; repeat previous sequences

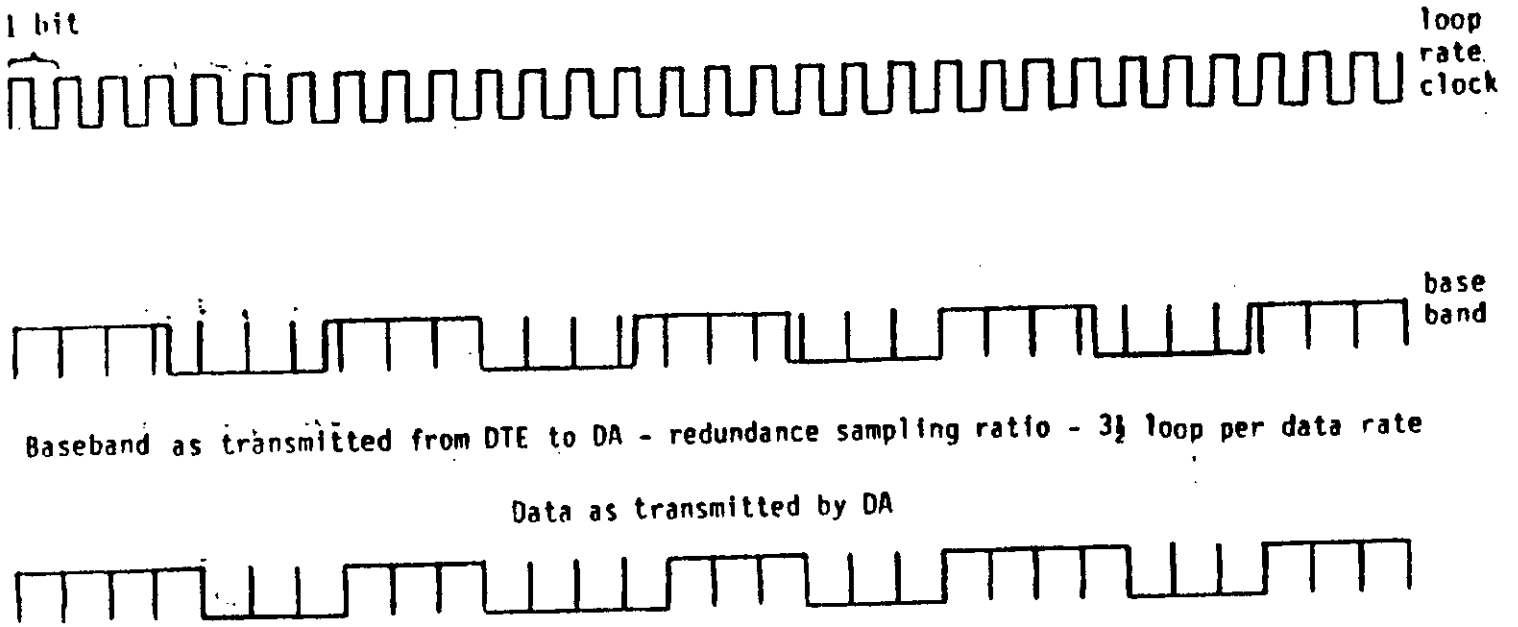

Figure 4. Example of quantizing information bits.
Data rate = 4800 bps, loop rate = 16000 bps.

APPENDIX A

DEPARTMENT OF DEFENSE DIRECTIVE 4646.11
21 DECEMBER 1987
SUBJECT: MANDATORY USE OF MILITARY TELECOMMUNICATIONS STANDARDS IN THE MIL-STD-188 SERIES

This appendix contains information related to MIL-STD-188-216. Appendix A is a mandatory part of this document.

APPENDIX A

Department of Defense
DIRECTIVE

December 21, 1987
NUMBER 4640.11

USD(A)

SUBJECT: Mandatory Use of Military Telecommunications Standards in the MIL-STD-188 Series

References: (a) DoD Directive 5137.1, "Assistant Secretary of Defense (Command, Control, Communications, and Intelligence)," April 2, 1985
(b) DoD Directive 4120.3, "Defense Standardization and Specification Program," February 10, 1979
(c) DoD 4120.3-M, "Defense Standardization and Specification Program Policies, Procedures and Instructions," August 1978, authorized by DoD Directive 4120.3, February 10, 1979
(d) through (l), see enclosure 1

A. PURPOSE

This Directive establishes policy governing the application and use of the MIL-STD-188-100, -200, and -300 series of telecommunications standards; prescribes procedures; and assigns responsibilities.

B. APPLICABILITY AND SCOPE

1. This Directive applies to the Office of the Secretary of Defense (OSD), the Military Departments, the Organization of the Joint Chiefs of Staff (OJCS), the Unified and Specified Commands, and the Defense Agencies (hereafter referred to collectively as "DoD Components").

2. Its provisions cover the development and application of military telecommunications standards, specifically, the following:

a. MIL-STD-188-100 series, containing standards common to long-haul and tactical communications.

b. MIL-STD-188-200 series, containing standards exclusive to tactical telecommunications.

c. MIL-STD-188-300 series, containing standards exclusive to long-haul telecommunications.

C. POLICY

It is DoD policy that the interoperability and performance standards in the MIL-STD-188 series that are required for interoperability and compatibility of DoD telecommunications equipment and systems are mandatory for use for all inter- and intra-DoD Component systems and equipment.

APPENDIX A

D. RESPONSIBILITIES

1. The Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) (ASD(C^{3}I)) shall interact with affected DoD Components under DoD Directive 5137.1 (reference (a)).

2. The Assistant Secretary of Defense for Production and Logistics (ASD(P&L)) is responsible for Defense Standardization and Specification Program (DSSP) policy, administration, and guidance.

3. The Director, Standardization and Data Management (SDM), Office of the Deputy Assistant Secretary of Defense (Production Support) (ODASD(PS)), manages and administers the DSSP and establishes policy, program guidance, and controls under DoD Directive 4120.3 (reference (b)).

4. The Director, Defense Standardization Program Office (DSPO), Defense Product Standards Office (DPSO), Defense Data Management Office (DDMO), ODASD(PS), shall assist the Director, SDM, in managing and administering the DoD communications standardization program for developing and establishing DSSP policies, program guidance, and controls.

5. The Heads of DoD Components shall:

a. Comply with this Directive, so that:

(1) Developers of the MIL-STD-188 series ensure that each standard is not only essential but of uniformly high quality, clear and concise as to application suitable for use in acquisition packages and, to the maximum extent possible, compatible with existing or proposed national and international (both Government and non-Government) telecommunications standards.

(2) Users of these standards cite in their procurement specifications only those standards essential to the proper functioning of the device or system over its projected lifetime.

b. Ensure the application of the MIL-STD-188 series in their organic acquisition specifications.

c. Be responsible for policing and enforcing the use of the MIL-STD-188 series standards within the DoD Component.

d. Support the development, revision, and use of the MIL-STD-188 series documents and, when necessary, provide personnel and funding resources.

e. Incorporate in each activity's internal review process a method for ensuring that the telecommunications standards are referenced to the extent necessary in acquisition documents.

f. Be the granting authority for waivers and deviations for intra-DoD Component systems and equipment, and shall forward any consideration of and granting of waivers and deviations to the standardization office responsible for the maintenance of the MIL-STD-188 series standard concerned.

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g. Ensure that their standardization offices forward waivers and deviations for intra-DoD Component systems and equipment to the Defense Communications Agency (DCA) and the Joint Tactical Command, Control, and Communications Agency (JTC3A).

6. Director, Defense Communications Agency, and Director, Joint Tactical Command, Control, and Communication Agency, as the lead activities for the MIL-STD-188 series of standards, shall be the granting authorities for waivers and deviations for inter-DoD Component systems and equipment and shall review intra-DoD waivers and deviations granted by DoD Components.

E. PROCEDURES

1. DSSP. Under DoD Directive 4120.3 and DoD 4120.3-M (references (b) and (c)), the objectives of the DSSP are to improve the operational readiness of the DoD Components and ensure the cost-effectiveness of systems and equipment. The SDM is responsible for administering and managing the DSSP, which provides a uniform series of specifications, standards, and related documents. Under the DSSP, DoD Components develop military specifications and standards related to equipment acquisitions, including telecommunications equipment.

2. Tailoring of Military Standards. It is neither cost- nor mission-effective to impose military standards on all systems and equipment specifications blindly without consideration and review of each individual case. The applicability and relevance of the standard to the intended use of the equipment must be considered. DoD Directive 5000.43 (reference (d)) outlines DoD policies for the selection and tailoring of specifications used for acquisition. To prevent the misapplication of standards, the Department of Defense classifies most military standards as "approved for use," rather than "mandatory for use."

3. Application of Standards in System Acquisition. The required telecommunications standards selected from the MIL-STD-188 series shall be included, as appropriate, in defense acquisition documents (e.g., Statements of Work (SOWs), etc.). This direction is in addition to the authority and procedures contained in references (b), (c), (d) and DoD Directive 5000.1 and DoD Instruction 5000.2 (references (e) and (f)). DoD Directive 4630.5 (reference (g)), DoD Directive 5105.19 (reference (h)), and DoD Directive 5154.28 (reference (i)) highlight the development and application of interoperability and compatibility standards in the areas of tactical long-haul telecommunications.

4. Interoperability and Standardization

a. As stated in DoD Directives 2010.6, 2010.7, and 3100.4 (references (j) through (l)), the United States shall maximize the utility and effectiveness of allied telecommunications resources through equipment interoperability and standardization.

b. The MIL-STD-188 series addresses telecommunications design parameters, influences the functional integrity of telecommunications systems and their ability to interoperate efficiently with other functionally similar Government and commercial systems, and shall be mandatory for use within the Department of Defense.

APPENDIX A

F. EFFECTIVE DATE AND IMPLEMENTATION

This Directive is effective immediately. Forward one copy of implementing documents to the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) within 120 days.

William H. Taft, IV
Deputy Secretary of Defense

Enclosure - 1
References

APPENDIX A

REFERENCES, continued

(d) DoD Directive 5000.43, "Acquisition Streamlining," January 15, 1986
(e) DoD Directive 5000.1, "Major and Non-Major Defense Acquisition Programs," September 1, 1987
(f) DoD Instruction 5000.2, "Defense Acquisition Program Procedures," September 1, 1987
(g) DoD Directive 4630.5, "Compatibility and Interoperability of Tactical Command and Control, Communications, and Intelligence Systems," October 9, 1985
(h) DoD Directive 5105.19, "Defense Communications Agency (DCA)," August 10, 1978
(i) DoD Directive 5154.28, "Joint Tactical Command, Control, and Communications Agency (JTC3A)," July 5, 1984
(j) DoD Directive 2010.6, "Standardization and Interoperability of Weapons Systems and Equipment within the North Atlantic Treaty Organization," March 5, 1980
(k) DoD Directive 2010.7, "Policy on Rationalization of NATO and NATO Member Telecommunications Facilities," July 6, 1981
(l) DoD Directive 3100.4, "Harmonization of Qualitative Requirements for Defense Equipment of the United States and Its Allies," September 27, 1963

APPENDIX B

LIST OF ABBREVIATIONS AND ACRONYMS USED IN MIL-STD-188-216

This appendix contains general information in support of MIL-STD-188-216. Appendix B is a nonmandatory part of this document.

APPENDIX B

ACRONYMS AND ABBREVIATIONS

This appendix provides definitions of acronyms and abbreviations used in this standard. This appendix is not a mandatory part of this standard.

ACK	Positive acknowledgement
ACP	Allied communication publication
ARQ	Automatic repeat - request
ASCII	American Standard Code for Information Interchange
AUTODIN	Automatic digital network
BP	Block parity - framing character
bps	Bits per second
COMSEC	Communications security
CS	Circuit switch
CTL	Control
DA	Data adapter
DACB	Data adapter control block
DACB(A)	DACB with identifier character A in position 13. Transmission complete - terminate call (GO-ON-HOOK if switched).
DACB(B)	DACB with identifier character B in position 13. Transmission complete -- read contents of this DACB for new characteristics and continue.
DACB(C)	DACB with identifer character C in position 13. Transmission complete - return to idle rate.

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DACB(D)	DACB with identifier character D in position 13. Cancel all transmission since last start of message sequence then terminate the call (GO-ON-HOOK if switched.
DACB(DC2)	DACB with identifier characters 'DC2' in position 13 - reject message.
DACB(E)	DACB with identifier character E in position 13. Cancel reading of DACB contents for new characteristics and continue.
DACB(ENQ)	DACB with identifier characters 'ENQ' in position 13. Request receiving DA send its DACB(F).
DACB(G)	DACB with identifier character G in position 13. Go to voice.
DACB(INV)	DACB with identifier characters 'INV' in position 13. Response when invalid DACB is received.
DACB(NUL)	DACB with identifier characters 'NUL' in position 13. Sent during call initiation.
DACM	Data adapter control mode. This is the state between DA/MSs in which DACBs may be sent.
DA/MS	Data adapter/message switch; data adapter to message switch; between data adapter and message switch.
DCAC	Defense Communications Agency Circular
DC4	DACM idle character
DLED	Dedicated loop encryption device
DMC	Data mode control
DO	Design objective
DODD	Department of Defense Directive

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DODISS	Department of Defense Index of Specifications and Standards
DOI	DSSCS operating instruction
DSSCS	Defense Special Security Communications System
DSVT	Digital subscriber voice terminal - secure voice/data digital telephone
DTE	Data terminal equipment
DTE-1	DTE connected to terminal 1 of DA
DTE-2	DTE connected to terminal 2 of DA
DTE-3	DTE connected to terminal 3 of DA
EBCDIC	Extended Binary Coded Decimal Interchange Code
ECP	Emergency command precedence
EFTO	Encrypted for transmission only
EM	End of Medium framing character
ENABLE AUTO RESYNC	Enable automatic resynchronization
ENQ	Enquiry DACM character
ESC	DACM message rate idle character and/or idle synchronization character
ETX	End of transmission - framing character
FEC	Forward error correction
FED-STD	Federal standard
INV	Invalid DACM character
IR	Idle rate
IA No. 2	International Alphabet No. 2

APPENDIX C

STATE DIAGRAMS FOR DACM PROTOCOL

Appendix C contains specific information in support of MIL-STD-188-216. Appendix C is a nonmandatory part of this document.

APPENDIX C

10. GENERAL

10.1 Purpose. The purpose of this appendix is to define the DACM protocol as a tool with many capabilities in a manner which provides for a consistent but flexible implementation.

10.2 Scope. This appendix contains state diagrams illustrating the DACM protocol. The intent is to clearly define both the normal and abnormal data and control system modes.

20. APPLICABLE DOCUMENTS

Not applicable.

30. DEFINITIONS

For purposes of this appendix, the definitions of FED-STD-1037A apply.

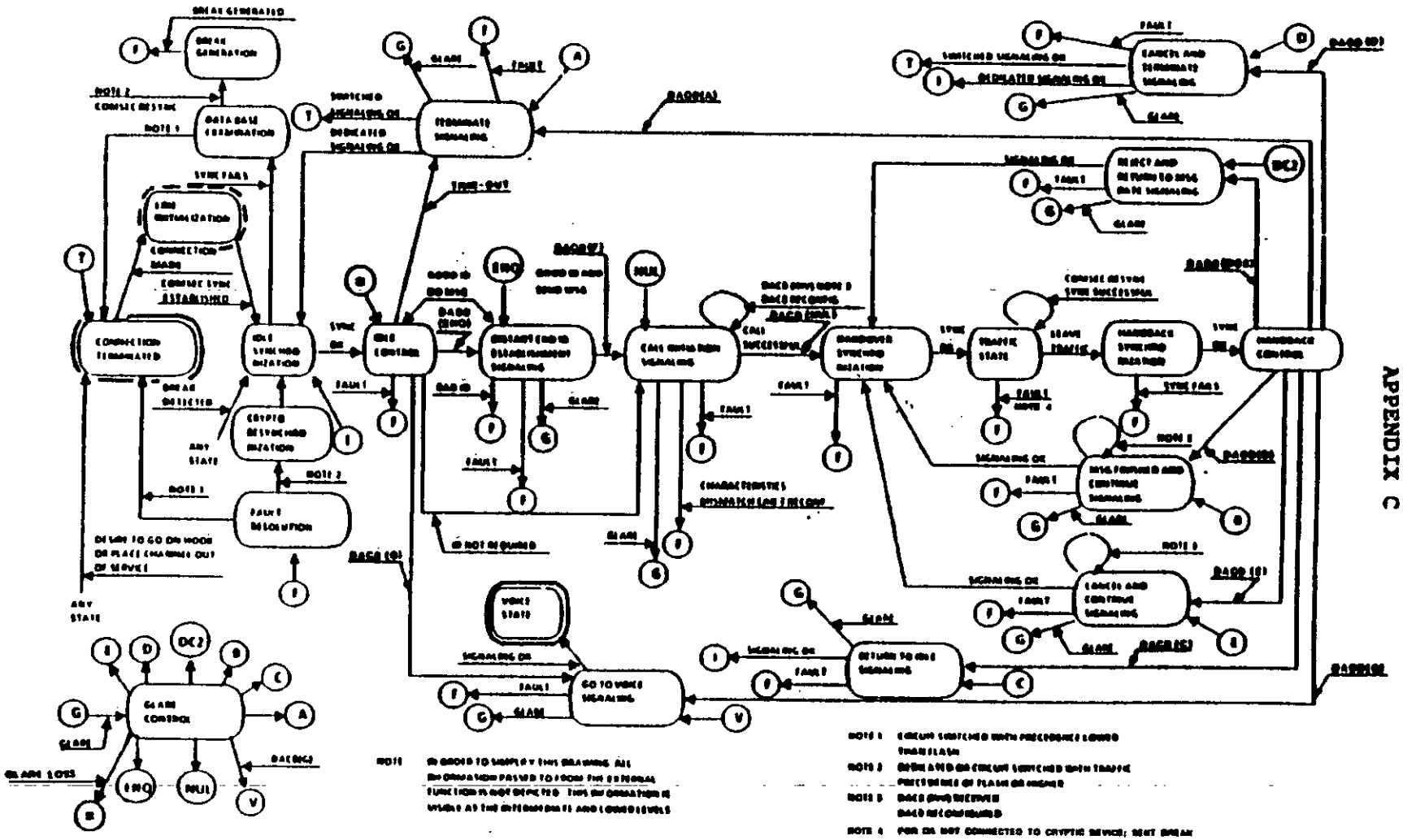
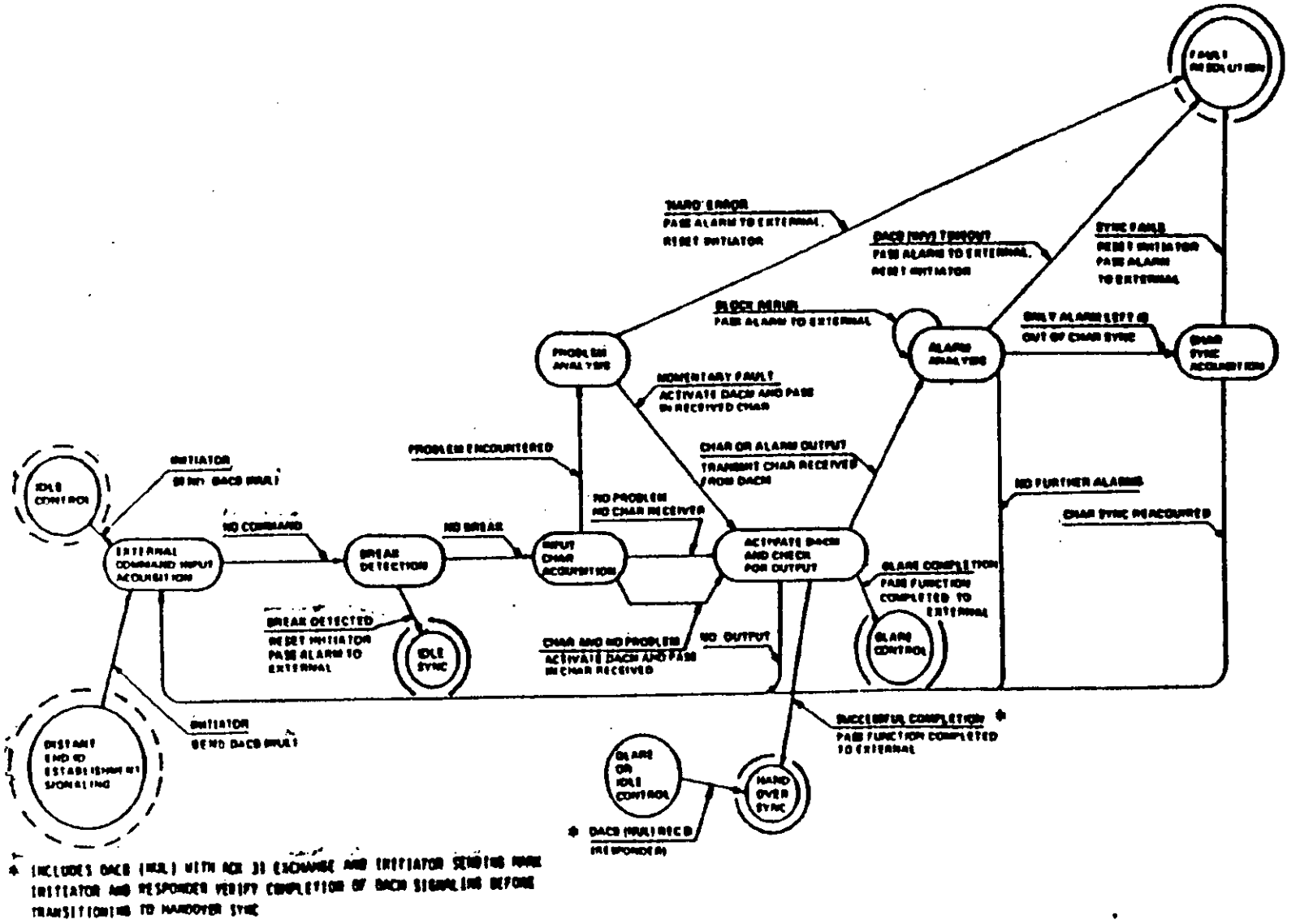


FIGURE 8. Top-level diagram.



* INCLUDES DACR (FAIL) WITH ACK TO EXCHANGE AND INITIATOR SENDING PASS INITIATOR AND RESPONDER VERIFY COMPLETION OF DACR SIGNALING BEFORE TRANSITIONING TO HANDOVER SYNC

FIGURE 9. Call initiation.

APPENDIX D

40. GENERAL REQUIREMENTS

40.1 Forward error correction (FEC) capability. FEC is capable of being utilized for data rate transformations listed in table XXVIII. For start-stop data, Golay Coding shall only be utilized with data which are bit synchronized to the DA clock and have integral bit length start-stop bits.

40.1.1 The 1/2 rate Golay code. The 1/2 rate Golay code is based on use of the 23 12-Golay code, extended to 24 bits total length by addition of a zero bit. The transmitting DA/MS shall use the following generator polynomial.

$$g(x) = X^{11} + X^{10} + X^6 + X^5 + X^4 + X^2 + 1$$

After deriving the 11 check bits by division of the 12 net information bits by the above polynomial, the twenty-fourth bit is set to zero. Transmission of the resulting 24 bit codeword shall constitute 1/2 rate Golay code transmission (see figures 20 and 30). Bit 1 of the 24 bit FEC codeword is bit 1 (b_1) or bit 5 (b_5) of a DACM character. DACM characters are the ESC, DC4, DACB characters, and DACB acknowledgements. Bit 1 of the 24 bit FEC codeword is bit 1 (b_1) or bit 5 (b_5) of the Mode I or Mode VI characters (data, control, framing, sync, ACKs, CAN, CAK, etc.).

40.1.2 Double codeword transmission. Double codeword transmission (1/4 rate Golay) is the transmission of a 1/2 rate Golay codeword twice contiguously (see figure 31).

40.1.3 Quadruple codeword transmission. Quadruple codeword transmission (1/8 rate Golay) is the transmission of a 1/2 rate Golay codeword four times contiguously (see figure 31).

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TABLE XXVIII. Forward error correcting technique.

Loop Transmission Rate (b/s)	Information Rate (Bauds) (Bit Synchronous)	FEC TECHNIQUE Golay Code
2400	300 600 1200	Quadruple Codeword (1/8 Rate) Double Codeword (1/4 Rate) Half Rate (1/2 Rate)
4800	600 1200 2400	1/8 Rate 1/4 Rate 1/2 Rate
9600	1200 2400 4800	1/8 Rate 1/4 Rate 1/2 Rate
16000	1200 2400 4800 2000 4000 8000	1/8 Rate, Stuffed to 16000 1/4 Rate, Stuffed to 16000 1/2 Rate, Stuffed to 16000 1/8 Rate 1/4 Rate 1/2 Rate
32000	2400 4800 9600 4000 8000 16000	1/8 Rate, Stuffed to 32000 1/4 Rate, Stuffed to 32000 1/2 Rate, Stuffed to 32000 1/8 Rate 1/4 Rate 1/2 Rate

[1] Error-Correcting Codes, by W. Wesley Peterson and E. J. Weldon, Jr., The MIT Press, Second Edition, 1972.

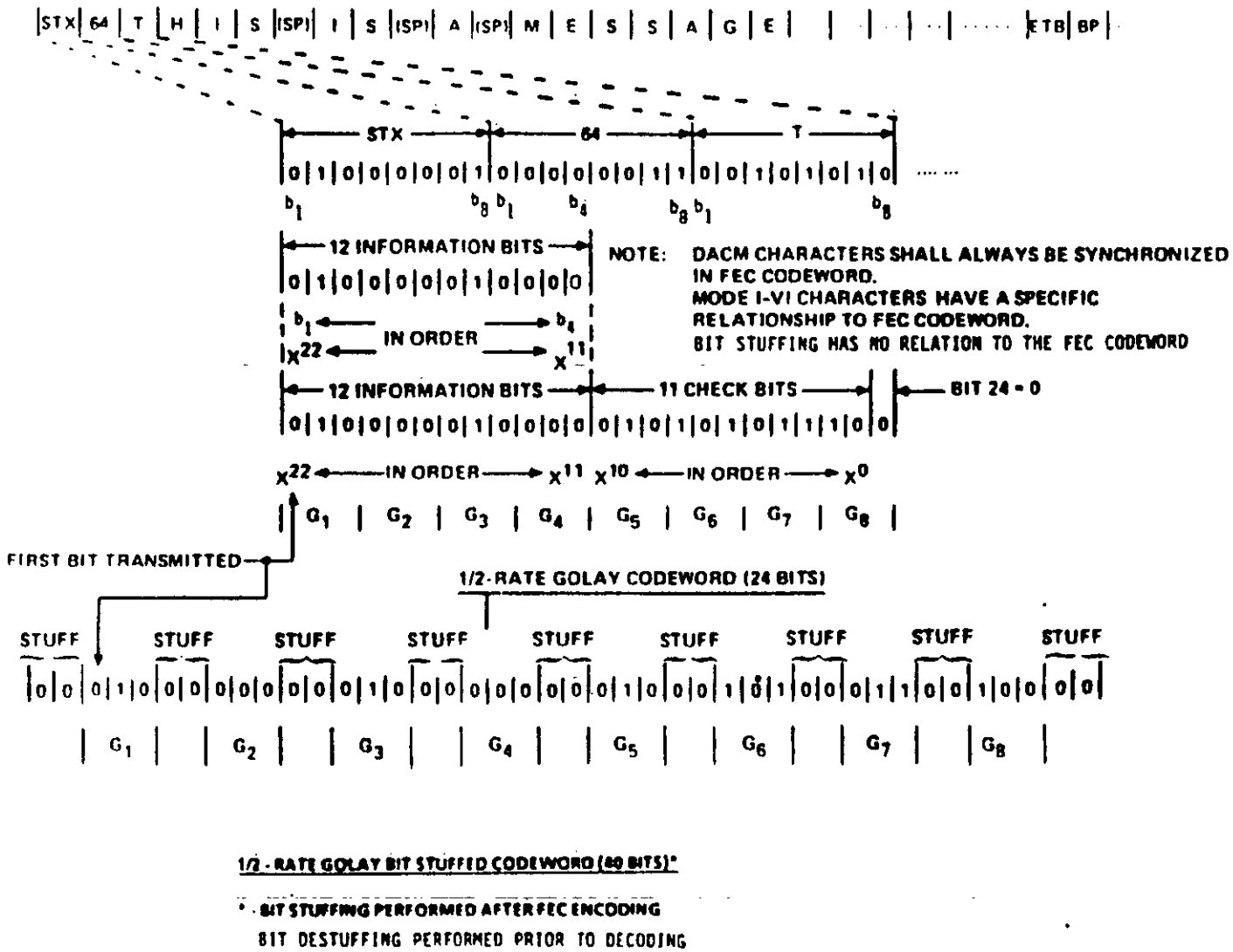


FIGURE 29. 1/2 rate Golay codeword generation.

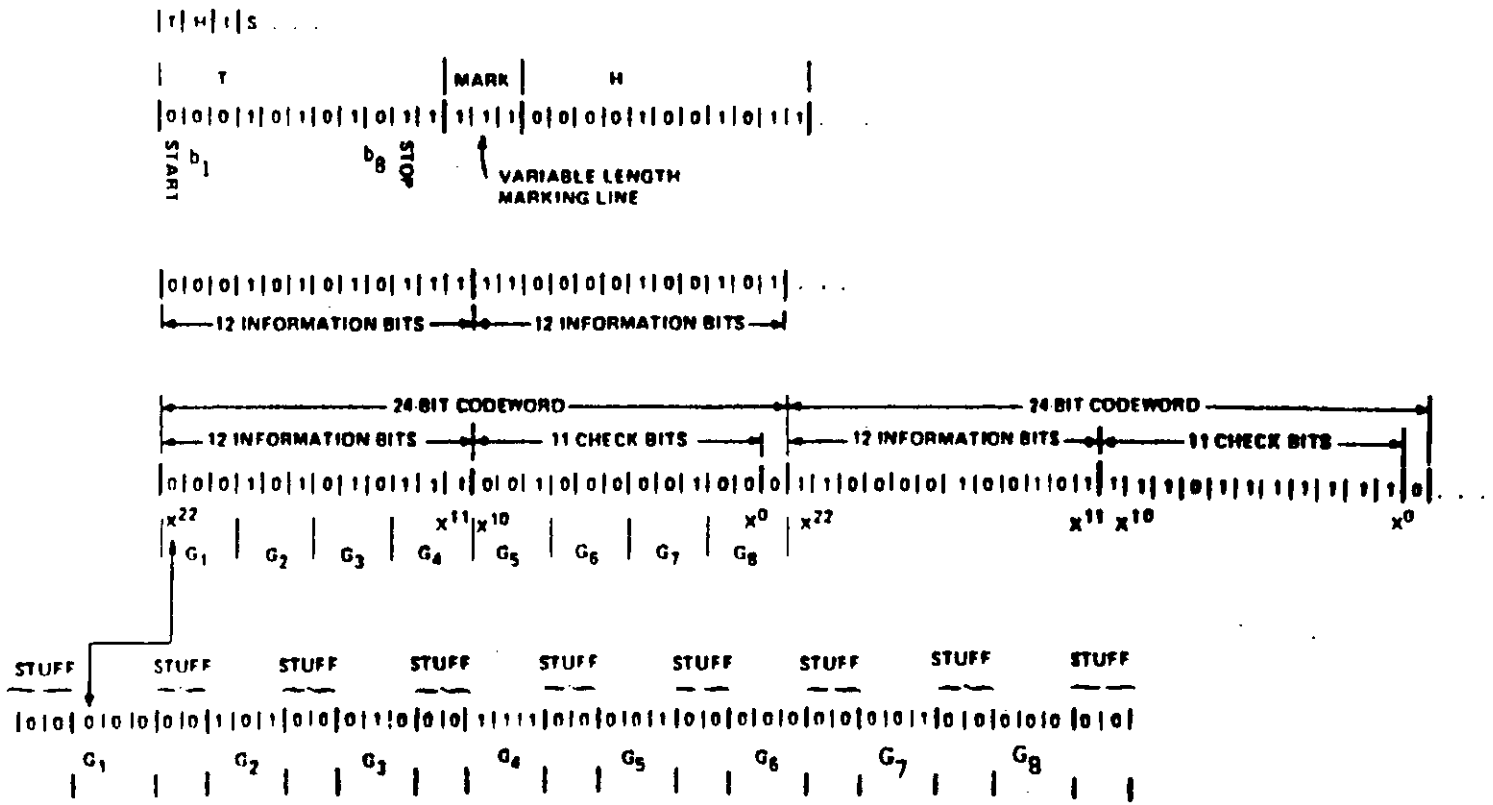
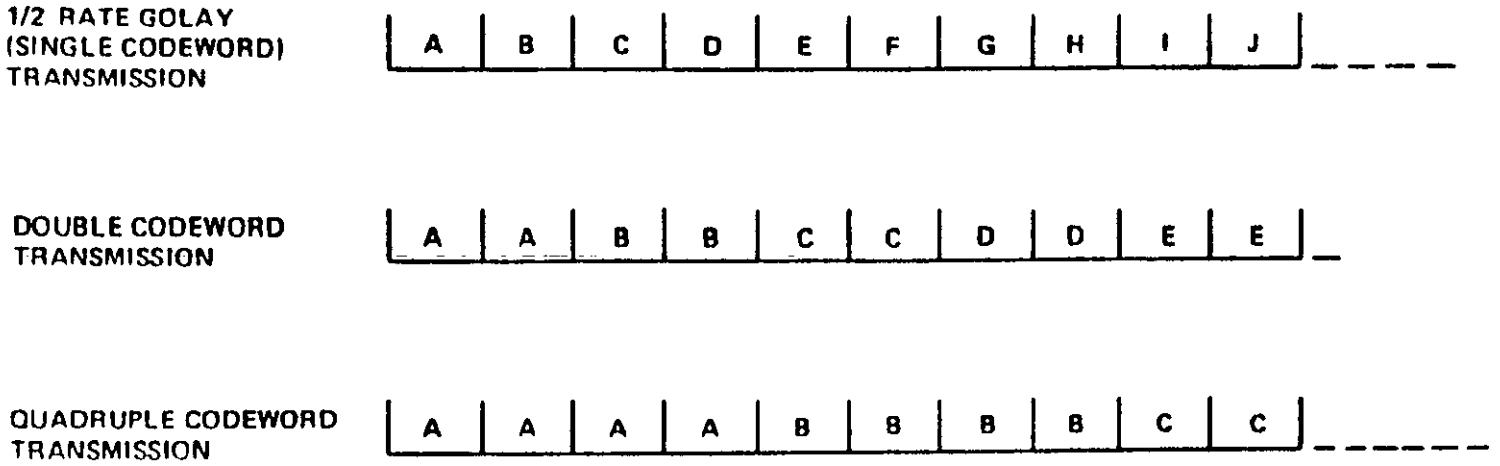


FIGURE 30. Start-stop example 1/2 rate Golay codeword generation (ASCII, 2 stop bits).



A,B,C,. . . . . ARE 1/2 RATE GOLAY CODEWORDS.

CODEWORDS ARE EITHER NOT STUFFED (24 BIT) OR STUFFED (40 BIT) AS REQUIRED FOR DTE TO LOOP TRANSFORMATION (SEE TABLE I).

CODEWORD BITS ARE SINGULARLY SAMPLED AT LOOP BIT RATE.

FIGURE 31. Types of codeword transmission.

CONCLUDING MATERIAL

Custodians:

Army - SC

Navy - EC

Air Force - 90

DCA - DC

Review Activities:

Army - AC

Navy - NC, TD, OM

Air Force - 02, 17

DCA

DODECAC

User Activities:

Army - CR

Navy - MC

Air Force - 13

DCA

Preparing Activity:
DLA - JT

JTC^3A-JT
(Project TCTS-2610)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-STD-188-216	Interoperability Standards for Data Adapter Control Mode

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR ☐ USER ☐ MANUFACTURER ☐ OTHER *(Specify)*: _____
b. ADDRESS *(Street, City, State, ZIP Code)*	

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation.

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

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