NOTICE OF CHANGE

NOT MEASUREMENT SENSITIVE

MIL-STD-188-105
NOTICE 1
16 April 1996

DEPARTMENT OF DEFENSE
INTERFACE STANDARD

INTEROPERABILITY AND PERFORMANCE STANDARD
FOR THE
ALL-DIGITAL
TACTICAL-TO-STRATEGIC GATEWAY

TO ALL HOLDERS OF MIL-STD-188-105:
1. THE FOLLOWING PAGES OF MIL-STD-188-105 HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
iii	16 April 1996	iii	1 February 1994
iv	16 April 1996	iv	1 February 1994
v	16 April 1996	v	1 February 1994
vi	16 April 1996	vi	1 February 1994
5	16 April 1996	5	1 February 1994
6	1 February 1994	6	Reprinted w/o change
13	16 April 1996	13	1 February 1994
14	1 February 1994	14	Reprinted w/o change
17/18	16 April 1996	17/18	1 February 1994
19	16 April 1996	19	1 February 1994
20	1 February 1994	20	Reprinted w/o change
67	1 February 1994	67	Reprinted w/o change
68	16 April 1996	New page	1 February 1994
69a/69b	16 April 1996	New page	1 February 1994

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-STD-188-105 will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the standard is completely revised or canceled.

Custodians:

Army - CR
Navy - EC
Air Force - 90
DISA - DC
NSA - NS

Preparing activity:

DISA (JIEO) DC

(Project SLHC-1050)

AMSC N/A

AREA TCSS

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FIGURES

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CONTENTS (Concluded)

TABLES

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2. APPLICABLE DOCUMENTS

2.1 Government documents

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this MIL-STD to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the current issue of the DOD Index of Specifications and Standards (DODISS) and supplements thereto. Only applicable sections of the referenced documents, as identified in sections 4 and 5, are intended to be used.

STANDARDS

Federal

FED-STD-1037	*Glossary of Telecommunication Terms*
FIPS PUB-182	*Integrated Services Digital Network (ISDN)*

Military

MIL-STD-187-700	*Interoperability and Performance Standards for the Defense Information System*
MIL-STD-188-113	*Interoperability and Performance Standards for Analog-to-Digital Conversion Techniques*
MIL-STD-188-202	*Interoperability and Performance Standards for Tactical Digital Transmission Groups (Coaxial Cable)*

[Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Commanding Officer, Naval Publications and Forms Center (ATTN: NPODS), 5901 Tabor Avenue, Philadelphia, PA 19120-5099.]

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2.1.2 Other government documents, drawings, and publications

DOCUMENTS

Joint Interoperability and Engineering Organization (JIEO)

ICD-003	*Framing and Synchronization Protocols*
TIS-9115	*Defense Switched Network (AUTOVON) to Tactical Analog Gateways*
TT-A3-9016-0056	*Digital Common Channel Signaling/Supervision Plan* (U)
TT-C1-7205-0102 Specification NSA No. 79-20	*Performance and Interface Specification for TSEC/KY-68 Digital Subscriber Voice Terminal, and Ancillaries*

(To obtain other DOD publications not found in the DODISS, contact the Defense Information Systems Agency, Center for Standards, ATTN: TBBF, Fort Monmouth, NJ 07703-5613.)

2.2 Nongovernment documents

2.2.1 ITU-T (CCITT) Recommendations. The International Telecommunications Union-Telecommunication Standardization Sector (ITU-T), formerly known as the International Telegraph and Telephone Consultative Committee (CCITT), is part of the United Nations, a treaty organization. The United States Government participates in it through the Department of State, and although industry representatives may work on its committees, approval of standards (called Recommendations) is by governments. For the purpose of this MIL-STD, the CCITT designation has been retained for standards published before the name change.

CCITT G.711	*Pulse-Code Modulation of Voice Frequencies*
CCITT I.460	*Multiplexing, Rate Adaptation, and Support of Existing Interfaces*
CCITT V.110	*Support of Data Terminal Equipment (DTEs) with V-Series Type Interfaces by an Integrated Services Digital Network (ISDN)*

4. GENERAL REQUIREMENTS

4.1 System requirements. The following general system requirements affect not only the design of the gateway, but also the design of the terminal equipment (information sources and sinks), local-network elements, and wide-network elements, as described in the Defense Information System (DIS) framework (see 1.4 and Figure 1). New switching systems that support Integrated Services Digital Network (ISDN) features shall comply with FIPS PUB-182.

4.1.1 End-to-end digital services. All signals entering the local- and wide-network elements shall be digital and shall remain in a digital form until the signals exit the local network at reference point A. Analog-to-digital and digital-to-analog conversion, when required, shall be accomplished in the terminal equipment or in a terminal adapter. Bit-count integrity (BCI) shall be preserved through the aggregate of network elements for voice and data service.

4.1.2 Gateway signaling. The gateway shall provide for internetwork signaling between Tri-Service Tactical Communications (TRI-TAC) common-channel signaling trunks and ISDN Digital Subscriber Signaling System No.1 (DSS1) trunks.

4.1.3 Gateway function. Reference point B, as defined in the DIS framework, shall include a gateway to achieve interoperability between tactical and strategic subscribers. Tactical subscribers are serviced by TRI-TAC-type switching equipment, and strategic subscribers are serviced by ISDN equipment. The gateway function consists of signaling message conversion, negotiation during call setup, transcoding, and rate adaptation.

4.1.3.1 Signaling message conversion. The gateway shall convert common-channel signaling messages associated with the ISDN DSS1 to appropriate signaling messages associated with TRI-TAC common-channel signaling.

4.1.3.2 Negotiation during call setup. The gateway function shall perform mode negotiation with ISDN terminals to determine if the terminal has a voice-encoding mode common to the voice-encoding mode used in tactical networks. This negotiation, which will take place in the signaling channel, is described in section 5. If commonality exists, the gateway function will perform rate adaptation, as described in 5.6. Negotiation may continue in-band between the tactical and strategic terminals to setup an end-to-end secure call after a circuit-switched connection has been established (see 4.1.4). If the ISDN terminal does not have the common voice-encoding mode, only

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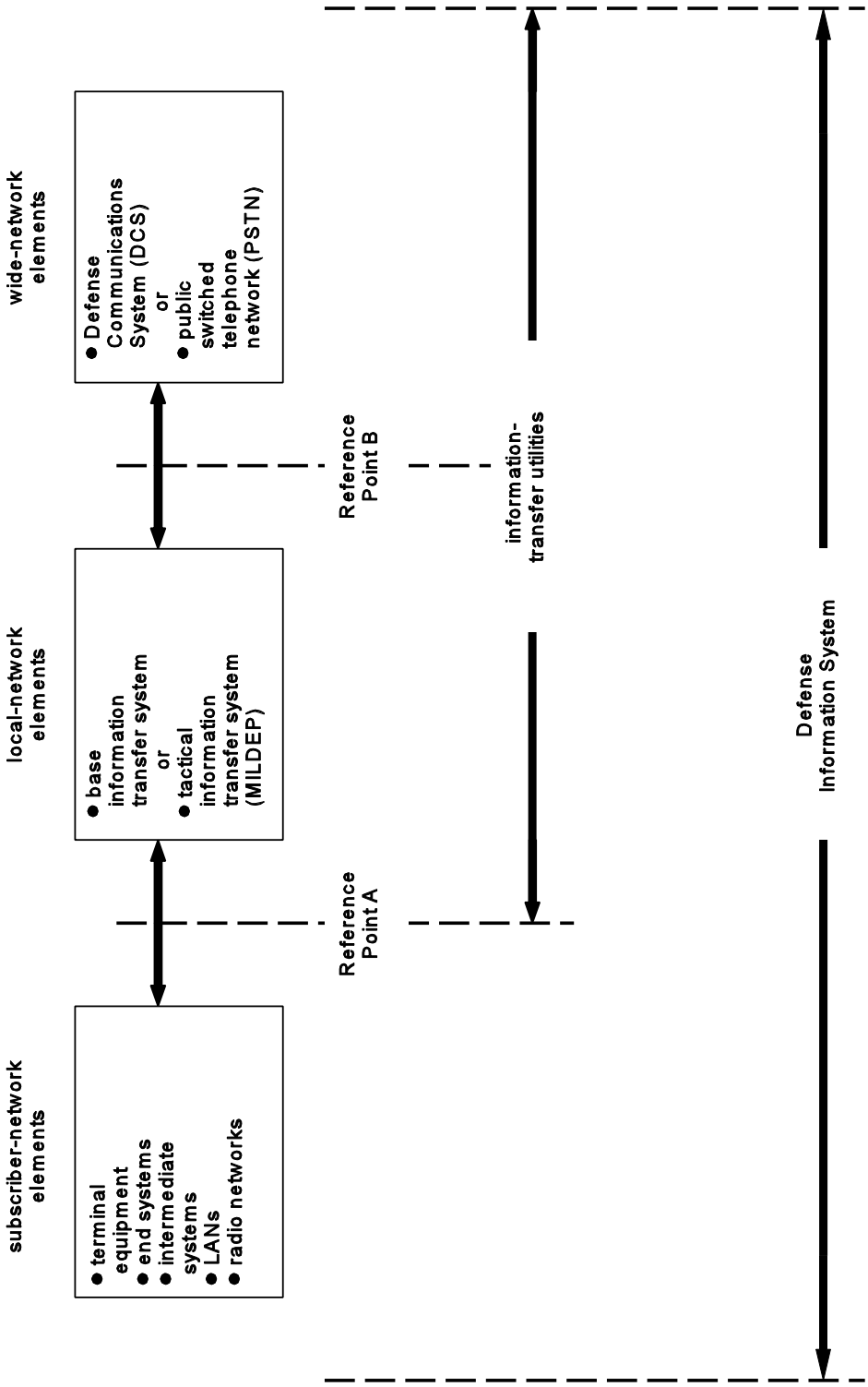

Figure 1. DIS framework.

Voice digitization, encryption, and key management shall be common to all New Terminals.

4.1.4.2 Gateway. The gateway shall be transparent to terminals making end-to-end secure calls, when the gateway is in the rate adaptation mode. The gateway shall further be required to maintain BCI. This is necessary to maintain cryptographic synchronization between calling and called secure terminals.

4.1.5 Voice digitization. CVSD, and PCM voice digitization methods, shall be employed in strategic and tactical terminals, as defined in 5.7.

4.1.6 Circuit-switched data services. Transmission of nonsecure data is not permitted, due to present tactical network specifications. Secure data may be transmitted by first establishing a circuit-switched call and then using rate adaptation to transfer the encrypted data.

4.1.7 Permanent and semipermanent connections. The gateway shall support dedicated channels, at data rates that exceed the basic channel rate in one or both networks. For example, a 64-kbps channel can be dedicated for use between a tactical packet-switched network and a strategic packet-switched network by assigning multiple 16-kbps channels in the tactical network. Video and video teleconferencing can be extended to tactical subscribers on an "as needed" basis by using multiple channels in both networks. Use of permanent and semipermanent connections, in support of these services, is described in 5.9.

4.2 Supplementary services. The gateway shall be transparent to all supplementary services, except for multilevel precedence and preemption (MLPP) and a restricted usage of "User-to-User signaling." The detailed requirements for MLPP are given in section 5.4.6. The gateway invokes the User-to-User signaling supplementary service only to allow end-to-end encrypted calls to be established (see sections 4.1.3 through 4.1.4 and Tables II, III, IV, VI, and VIII through XIII).

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5. DETAILED REQUIREMENTS

5.1 Introduction. This section defines the standards applicable to the interface between tactical-network elements and strategic-network elements. This interface corresponds to reference point B, as described in the DIS framework (see 1.4) and illustrated in Figure 1. A gateway function is required at reference point B. The standards applicable to the strategic side of the gateway function are provided in 5.2. The standards applicable to the tactical side of the gateway function are provided in 5.3. Standards applicable to signaling and signaling message conversion are provided in 5.4. Transcoding of dissimilar voice-encoding methods is addressed in 5.5. The standard method for bit-rate adaptation necessary to exchange data between tactical and strategic subscribers is covered in 5.6. The standards applicable to terminal equipment and reference point A that are necessary for end-to-end secure voice interoperability are discussed in 5.7.

5.2 Strategic network interface to reference point B. The strategic network interface shall comply with 5.2.1 to 5.2.3 at reference point B. [Note: For operation with NATO forces, the strategic trunk group shall comply with ITU-T G.703 and G.704, the sections applicable to 2.048 Mbps operation.]

5.2.1 Layer 1. The strategic-network layer 1 interface to reference point B shall comply with the following parameters, as specified in American National Standards Institute (ANSI) T1.408 for primary rate interfaces:

a. Line code. Bipolar with 8-zero substitution (B8ZS) and 50% duty cycle.

b. B8ZS. Eight consecutive zeros shall be replaced with 000+-0-+ if the preceding pulse was positive, and with 000-+0+- if the preceding pulse was negative.

c. Bit rate. 1.544 Mbps

d. Number of channels. 24 (Normally 23 channels are used as information-bearer channels, and 1 channel is reserved for common-channel signaling.)

e. Framing format. 193-bit frame. (See Figure 3.)

f. Frame repetition rate. 8000 frames per second.

g. Extended super frame format. 24 frames. (See Table I.)

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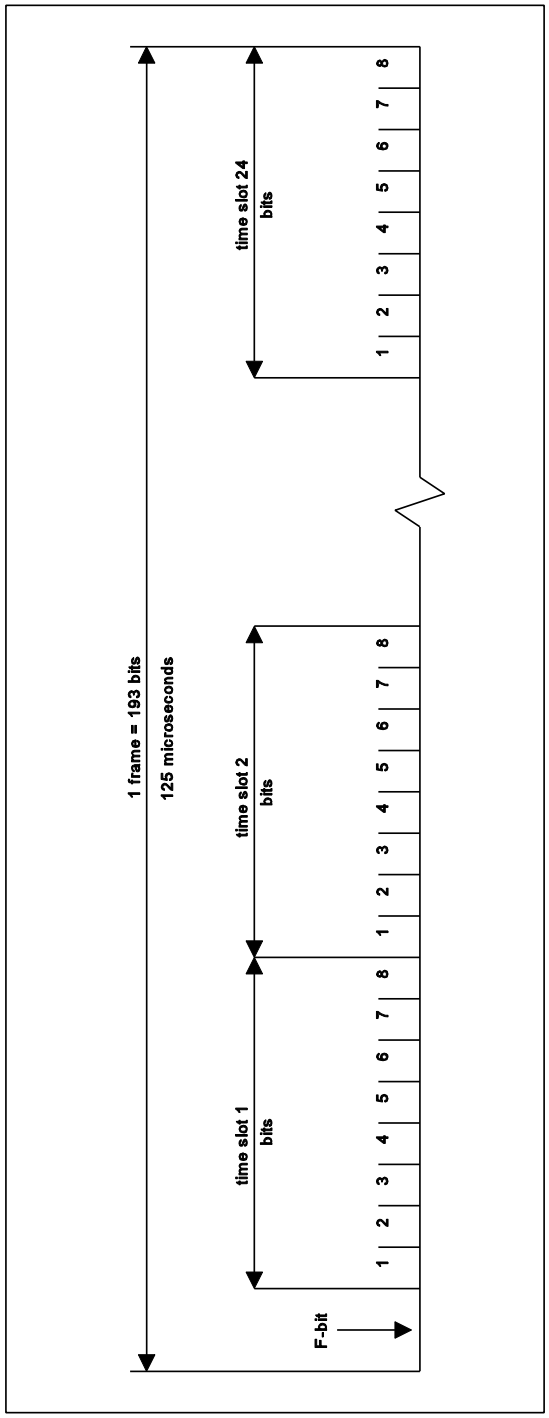

Figure 3. Frame format for a 1.544-Mbps signal.

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DSS1. This is accomplished by using the Locking-shift procedure described in ANSI T1. 607-1990, the section titled *Locking-shift procedure*.

5.8.1 Locking-shift procedure. The Locking-shift procedure is based on the introduction of a Locking-shift information element into a DSS1 message to shift to a new active codeset. The new codeset is valid only within the message that contains the Locking-shift information element.

The Locking-shift information element consists of a single octet and has the following format:

8	7	6	5	4	3	2	1	
1	0	0	1	0	1	1	0	Octet 1

It shall contain the *New codeset identification* field (bits 1-3) set to codeset 6 ("110"). When the gateway sees this, it shall shift out of the original codeset to codeset 6. The SLC information element, as specified in 5.8.2, shall follow this Locking-shift information element.

Since networks other than DISN might use codeset 6 for information elements different from those used by DISN, the MLPP Precedence-level information element must also appear in the SETUP message. Octet 4a, bits 1-7 ("0000000"), of this information element identifies the private network as "Defense Switched Network." The MLPP information element is shown as a gateway action for the SETUP message in Table II of this MIL-STD. Thus, codeset 6 is made unique to the DISN.

5.8.2 Satellite-link-count information element. The SLC information element in codeset 6 has the format and coding as indicated in Figure 13:

8	7	6	5	4	3	2	1
Spare						SLC	

(1) The following codes are used for the SLC indicator:

Bits 2 1	
0 0	No satellite link present
0 1	One satellite link present
1 0	Two satellite links present
1 1	Three or more satellite links present

(2) Bits 3-8 are spare.

Figure 13. Satellite-link-count information element.

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5.9 Permanent and semipermanent connection data services. Data rates of *n* x 16 kbps, where *n* = 1, 2, 3, 4, 8, 16, or 32 and *m* x 64 kbps, where *m* = 1, 2, 4, or 8, shall be provided across the gateway by means of permanent and semipermanent connections established by technical controllers. Multirate channels shall be treated as single highrate channels. It is an operational requirement that multirate channels shall be transmitted on the same trunk group at all intervening tech control facilities in both the strategic and tactical networks. Available rates are shown in Table XVI.

Table XVI. Available data rates.

Number of 16-kbps Channels (*n*)	Number of 64-kbps Channels (*m*)	Data Rate (kbps)
1	1	16
2	1	32
3	1	48
4	1	64
8	2	128
16	4	256
32	8	512

5.9.1 Data services up to 64 kbps. For *n* = 1, 2, 3, or 4, rate adaptation shall be in accordance with CCITT I.460, section 2.1. Bit sequence integrity shall be preserved.

5.9.2 Data services at multiple 64 kbps. Multirate channels shall be established, for *m* = 2, 4, or 8, by assigning any *m* time slots in the strategic frame, in numerical order (not necessarily consecutive). Any *m* x 4 time slots in the tactical frame, in numerical order (not necessarily consecutive), may be assigned to the multirate channel. The first strategic channel shall be assigned the first 4 time slots, and the next strategic channel shall be assigned the next 4 time slots, until all *m* x 4 time slots are assigned. Bit sequence integrity shall be preserved. The higher data rates support video or high-speed data services.

5.9.3 Inverse multiplexing. Use of multiple channels in one or both networks requires use of inverse multiplexers at one or both network end-points. An example is shown in Figure 14. Inverse multiplexing at end systems is not part of the tactical-to-strategic gateway and is beyond the scope of this MIL-STD.

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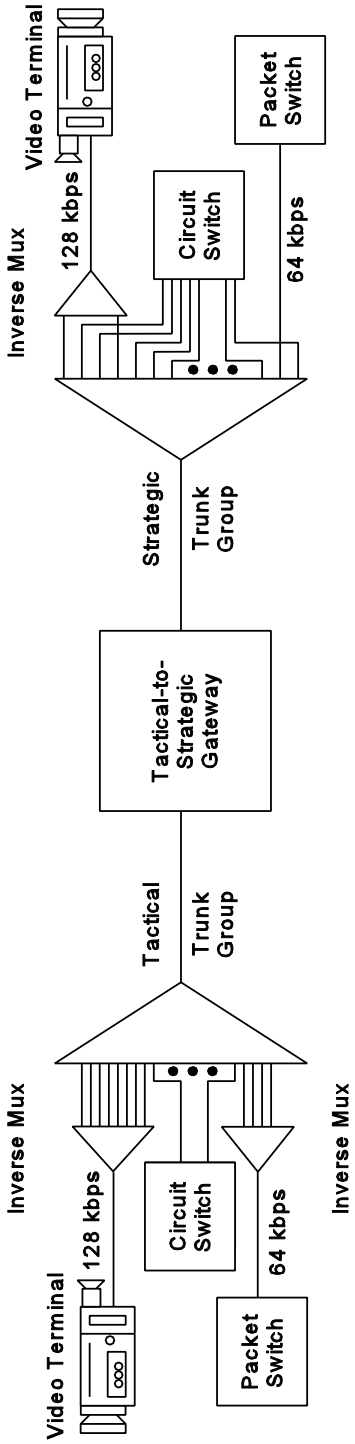

Figure 14. Inverse multiplexing example.

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