



**DEFENSE INFORMATION SYSTEMS AGENCY**  
JOINT INTEROPERABILITY TEST COMMAND  
2001 BRAINARD ROAD  
FORT HUACHUCA, ARIZONA 85613-7051

IN REPLY  
REFER TO: Networks, Transmission and  
Integration Division (JTE)

MEMORANDUM FOR DISTRIBUTION

*SIGNED October 7, 2003*

SUBJECT: Joint Interoperability Test Certification of ECI Telecom-Veraz Networks  
DTX-600 Digital Compression Multiplex Equipment with Software  
Release JITC008

References: (a) DOD Directive 4630.5, "Interoperability and Supportability of  
Information Technology (IT) and National Security Systems  
(NSS)," 11 January 2002  
  
(b) CJCSI 6212.01B, "Interoperability and Supportability of National  
Security Systems, and Information Technology Systems," 8 May  
2000

1. References (a) and (b) establish the Defense Information Systems Agency, Joint Interoperability Test Command (JITC), as the responsible organization for interoperability test certification. Additional references are provided in enclosure 1.

2. The ECI Telecom-Veraz Networks DTX-600 Digital Compression Multiplex Equipment with Software Release JITC008, hereafter referred to as the DTX-600, meets all of its critical interoperability requirements and is certified as interoperable for joint use within the Defense Switched Network (DSN). This interoperability certification is based upon evaluation of user-validated critical interfaces with associated interface Capability Requirements (CRs) and the overall system interoperability performance. Test discrepancies that remained open after software patches were applied and regression testing was completed are discussed in the enclosed Certification Testing Summary and have only minor operational impacts. This certification expires upon changes that could affect interoperability, but no later than three years from the date of this memorandum.

3. This finding is based on interoperability testing conducted at the JITC, Ft. Huachuca, AZ. The Certification Testing Summary in enclosure 2 provides more details about the test, documents the test results, and describes the tested network and system configurations. Testing was conducted in an operationally realistic environment that is similar to the DSN. System interoperability should be verified before deployment in an operational environment that varies significantly from the test environment.

JITC Memo, Networks, Transmission and Integration Division (JTE), Joint Interoperability Test Certification of ECI Telecom-Veraz Networks DTX-600 Digital Compression Multiplex Equipment with Software Release JITC008

4. The interoperability status of the DTX-600 is indicated below in table 1. The user-validated critical interfaces and CRs used to evaluate the status are listed in table 2. The DTX-600 was capable of meeting all critical and non-critical CRs with the exception of End-to-End Compression (EtEC). The DTX-600 cannot do EtEC with Channel Associated Signaling (CAS) Alternate Mark Inversion (AMI) line coding or where E1/T1 (a-law/ $\mu$ -law) conversions occur. Both limitations will only cause minor operational impacts. CAS trunk groups can be configured to use Bipolar Eight Zero Substitution (B8ZS) instead of AMI and the use of the DTX-600s in the European E1 environment can be deployed to minimize E1/T1 conversions.

**Table 1. DTX-600 Interoperability Status**

	<b>Input/Output Interfaces</b>				
	<b>Interface &amp; Signaling<sup>1</sup></b>	<b>Critical</b>	<b>Status</b>	<b>Remarks</b>	
<b>DSN</b>	PCM-24 T1 CAS DTMF	Yes	Certified	Met all critical CRs. EtEC does not work for AMI line coding. Minor operational impact.	
	PCM-24 T1 CAS MFR1	Yes	Certified	Met all critical CRs. EtEC does not work for AMI line coding. Minor operational impact.	
	PCM-24 T1 CAS DP	Yes	Certified	Met all critical CRs. EtEC does not work for AMI line coding. Minor operational impact.	
	PCM-24 T1 SS7	Yes	Certified	Met all critical CRs. EtEC does not work for AMI. Minor operational impact.	
	PCM-24 T1 ISDN PRI	Yes	Certified	Met all critical CRs. EtEC does not work for AMI line coding. Minor operational impact.	
	PCM-30 E1 CAS MFR1	Yes	Certified	Met all critical CRs. EtEC does not work for a-law/ $\mu$ -law conversions. Minor operational impact.	
	PCM-30 E1 SS7	Yes	Certified	Met all critical CRs. EtEC does not work for a-law/ $\mu$ -law conversions. Minor operational impact.	
	<b>Network Management Interfaces</b>				
		<b>Interface &amp; Protocol<sup>2</sup></b>	<b>Critical</b>	<b>Status</b>	<b>Remarks</b>
		CAT 5 TPC 10Base-T Ethernet, TCP/IP	Yes	Certified	Met all critical CRs.
	TPC RS-232 Async Ethernet, TCP/IP	Yes	Certified	Met all critical CRs.	
<b>Congestion Control Interface</b>					
	<b>Interface<sup>3</sup></b>	<b>Critical</b>	<b>Status</b>	<b>Remarks</b>	
	TPC	Yes	Certified	Met all critical CRs.	
<b>DISN Transport (ATM)</b>	<b>Trunk Interfaces</b>				
		<b>Interface &amp; Line Code<sup>4</sup></b>	<b>Critical</b>	<b>Status</b>	<b>Remarks</b>
		PCM-24 T1 B8ZS/ESF or AMI/SF	Yes	Certified	Met all critical CRs.
	PCM-30 E1 HDB3	Yes	Certified	Met all Critical CRs.	

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**Table 1. DTX-600 Interoperability Status (continued)**

DISN Transport (Promina/IDNX)	Trunk Interfaces			
	Interface & Line Code	Critical	Status	Remarks
	PCM-24 T1 B8ZS/ESF or AMI/SF	Yes	Certified	Met all critical CRs.
PCM-30 E1 HDB3	Yes	Certified	Met all critical CRs.	

Legend:

10BaseT - Ethernet Based Operation, Twisted Pair	GSCR - Generic Switching Center Requirements
AMI - Alternate Mark Inversion	HDB3 - High Density Bipolar Three
Async - Asynchronous	IAW - In Accordance With
ATM - Asynchronous Transfer Mode	IDNX - Integrated Digital Network Exchange
B8ZS - Bipolar Eight Zero Substitution	ISDN - Integrated Services Digital Network
CAS - Channel Associated Signaling	Mbps - Megabits per second
CAT - Category	MFR1 - Multi-Frequency R1
CR - Capability Requirement	PCM-24 - Pulse Code Modulation 24 Channels
DCME - Digital Compression Multiplex Equipment	PCM-30 - Pulse Code Modulation 30 Channels
DISA - Defense Information Systems Agency	PRI - Primary Rate Interface
DISN - Defense Information Systems Network	RS - Recommended Standard
DP - Dial Pulse	SF - Superframe
DSN - Defense Switched Network	SS7 - Signaling System Number 7
DTMF - Dual Tone Multi-Frequency	T1 - Digital Transmission Link level 1 (1.544 Mbps)
E1 - European Basic Rate (2.048 Mbps)	TPC - Twisted Pair Copper
ESF - Extended Superframe	TCP/IP - Transmission Control Protocol/Internet Protocol
E1EC - End-to-End Compression	

Notes:

- 1 Requirements for connectivity to the DSN are specified as physical interface and type of signaling IAW GSCR.
- 2 For Network Management interfaces, DISA requirements are specified to the protocol level.
- 3 The Congestion Control Interface is specified to the electrical interface IAW the System Interface Criteria DCAC 370-175-13 dated 1994.
- 4 For DISN Transport, requirements are specified only as physical interfaces and line code. For DCME such as the DTX-600, DISN Transport devices pass the entire T1/E1 and are oblivious to the type of signaling.

**Table 2. DTX-600 Capability Requirements**

DSN	Input/Output Interfaces	
	Interface & Signaling	Capability Requirement {Critical (C)/Non-Critical (NC)}
	PCM-24 T1 CAS DTMF	<ul style="list-style-type: none"> <li>- Non-secure Voice (C)                             <ul style="list-style-type: none"> <li>• G.711 PCM 64 kbps (C)</li> <li>• G.726 ADPCM 32/24/16 kbps (NC)</li> <li>• G.729 CS-ACELP 8 kbps (C)</li> </ul> </li> <li>- End-to-End Compression<sup>1</sup> (NC)</li> <li>- Digital Speech Interpolation/Silence Suppression (NC)</li> <li>- Modem Async VBD (C)</li> <li>- Secure Voice (C)                             <ul style="list-style-type: none"> <li>• STU-III (C)</li> <li>• STE (NC)</li> <li>• Satellite delay<sup>2</sup> (C)</li> </ul> </li> <li>- Secure Data (NC)</li> <li>- Non-secure Facsimile (C)</li> <li>- Secure Facsimile (C)</li> <li>- MLPP (C)                             <ul style="list-style-type: none"> <li>• ANSI T1.619a (ISDN and SS7 only)(C)</li> </ul> </li> <li>- VTC (C)                             <ul style="list-style-type: none"> <li>• Nx64 (ISDN and SS7 only) (C)</li> <li>• Nx56 (C)</li> </ul> </li> <li>- Alarms (C)                             <ul style="list-style-type: none"> <li>• Carrier Group Alarms (C)</li> <li>• Channel Alarms<sup>3</sup> (C)</li> </ul> </li> <li>- Echo Cancellation - 64 msec tail delay (C)</li> <li>- QoS<sup>4</sup> (NC)</li> </ul>
	PCM-24 T1 CAS MFR1	
	PCM-24 T1 CAS DP	
	PCM-24 T1 SS7	
	PCM-24 T1 ISDN PRI	
	PCM-30 E1 CAS MFR1	
	PCM-30 E1 SS7	

JITC Memo, Networks, Transmission and Integration Division (JTE), Joint Interoperability Test Certification of ECI Telecom-Veraz Networks DTX-600 Digital Compression Multiplex Equipment with Software Release JITC008

**Table 2. DTX-600 Capability Requirements (continued)**

	Network Management Interfaces																																																																																													
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DSN (continued)	CAT 5 TPC 10Base-T Ethernet, TCP/IP	- Alarms (C) - Man Machine Language (C) - Access Control <sup>5</sup> (C)																																																																																												
	TPC RS-232 Async	- Remote Management (C) - xMS <sup>6</sup> (NC)																																																																																												
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	Interface	Capability Requirement {Critical (C)/Non-Critical (NC)}																																																																																												
	TPC	- Congestion Control Scan Point (C)																																																																																												
DISN Transport (ATM)	<b>Trunk Interfaces</b>																																																																																													
	Interface & Line Code	Capability Requirement {Critical (C)/Non-Critical (NC)}																																																																																												
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<p>Notes:</p> <ol style="list-style-type: none"> <li>1 End-to-End Compression (EIEC) is an ECI proprietary technology; its incorporation for testing is a user-defined non-critical requirement.</li> <li>2 Satellite delay is a user-defined requirement. One hop deemed critical; above one hop not critical.</li> <li>3 Common Channel Alarms not a critical capability requirement because DCME equipment does not react to individual channel alarms.</li> <li>4 The DTX-600 has an internal proprietary QoS prioritization scheme; its incorporation for testing is a user defined requirement.</li> <li>5 Access Control (i.e., restrictive access to the device) is a user-defined requirement.</li> <li>6 xMS is ECI's network management tool; it is a user-defined requirement.</li> </ol>																																																																																														

5. JITC distributes interoperability information via the JITC Electronic Report Distribution (ERD) system -- ERD uses unclassified (NIPRNET) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program (STP). The STP is accessible by .mil/gov users on the NIPRNET at <https://stp.fhu.disa.mil/>. Test

JITC Memo, Networks, Transmission and Integration Division (JTE), Joint Interoperability Test Certification of ECI Telecom-Veraz Networks DTX-600 Digital Compression Multiplex Equipment with Software Release JITC008

reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool (JIT) at <http://jit.fhu.disa.mil> (NIPRNET), or <http://199.208.204.125/> (SIPRNET). Information related to DSN testing is on the Telecom Switched Services Interoperability (TSSI) website at <http://jitc.fhu.disa.mil/tssi>.

6. The JITC point of contact is LCDR Michael Wojcik, DSN 879-6787, commercial (520) 538-6787, FAX DSN 879-4347 or e-mail to [wojcikm@fhu.disa.mil](mailto:wojcikm@fhu.disa.mil).

FOR THE COMMANDER:

2 Enclosures:  
1 Additional References  
2 Certification Testing Summary

LESLIE F. CLAUDIO  
Chief  
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Integration Division

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Joint Staff J6E, Room-1E834, Pentagon, Washington, DC 20318-6000

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Department of the Army, Office of the Secretary of the Army, CIO/G6, Attn: SAIS-IOE-A, 107 Army Pentagon, Washington, DC 20310-0107

US Marine Corp (C4ISR), MARCORSSYSCOM, Suite 315, 2033 Barnett Avenue, Quantico, VA 22134-5010

DOT&E, Strategic and C3I Systems, 1700 Defense Pentagon, Washington, DC 20301-1700

US Coast Guard, Office of Electronics, 2100 2nd Street SW, Washington, DC 20593

Office of Assistant Secretary of Defense, C3I, 6000 Defense Pentagon, Washington, DC 20301

Office of Under Secretary of Defense, AT&L, Room 3E144, 3070 Defense Pentagon, Washington, DC 20301

US Joint Forces Command, J6I, C4 Plans and Policy, 1562 Mitscher Ave, Norfolk, VA 23551-2488

Commander, Defense Information Systems Agency (DISA), ATTN: NS53 (Mr. Osman), Room 5w23, 5275 Leesburg Pike (RTE 7) Falls Church, VA 22041

## **ADDITIONAL REFERENCES**

- (c) Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 6215.01B, "Policy for Department of Defense Voice Services," 23 September 2001
- (d) Defense Information Systems Agency (DISA), Joint Interoperability and Engineering Organization (JIEO), Technical Report 8249, "Defense Information Systems Network (DISN) Circuit Switched Subsystem, Defense Switched Network (DSN) Generic Switching Center Requirements (GSCR)," March 1997
- (e) Defense Information Systems Agency, "Defense Switched Network, ECI DTX-600 Certification Test Plan," 22 January 2003
- (f) Joint Interoperability Test Command, "Defense Switched Network Generic Switch Test Plan (GSTP)," 17 June 1999

## CERTIFICATION TESTING SUMMARY

- 1. SYSTEM TITLE.** ECI Telecom-Veraz Networks DTX-600 Digital Compression Multiplex Equipment (DCME), with Software Release JITC008.
- 2. PROPONENT.** Defense Information Systems Agency (DISA).
- 3. PROGRAM MANAGER.** Mr. Howard Osman, NS53, Room 5W23, 5275 Leesburg Pike, Falls Church, VA 22041, E-mail: Osmanh@ncr.disa.mil.
- 4. TESTERS.** Joint Interoperability Test Command (JITC), Fort Huachuca, AZ.
- 5. SYSTEM UNDER TEST DESCRIPTION.** The DTX-600 is a 16-slot DCME device. The DTX-600 can simultaneously compress toll quality voice, facsimile (Fax), voice band data (VBD), native data (e.g. V.35), and signaling. The system improves transmission media efficiency and helps achieve maximum bandwidth utilization of traffic payloads. The DTX-600 can take line interfaces comprised of 24/30 Digital System Level 0s (DS0s) respectively for T1/E1 and compress the DS0 level channels on the output aggregate (bearer) side. Non-secure voice channels can be compressed up to 20:1, secure voice 6:1, Fax 6:1, and VBD 2:1. The DTX-600 has a management platform called xMS that provides fault management, configuration management, security management, and performance management services. The xMS is a modular, PC-based (Windows NT) management application, designed to provide the operator with a management tool, covering all the functions required to configure and monitor multiple terminals - both locally and from any remote authorized location. Figure 2-1 depicts the JITC equipped DTX-600 and table 2-1 describes the cards contained within the chassis. DTX-600 cards are described by ECI Telecom - Veraz Networks as being either input/output cards (i.e., physical interfaces) or main cards (i.e., processing, compression, etc.).

DTX-600															
CMEI	D8CI	D8CI	SPARE	CP10	SPARE	SPARE	ALMI	SPARE	SPARE	DLCI	VSTI	TIDI	PEMX	1	2
MBPC	DL8M	DSPD	DL8M	DSPD	DSPD	CPSM	DSPD	SPARE	SPARE	SPARE	SPARE	VSTR	PWRX	1	2

**JITC equipped DTX-600**

**Input/Output cards**

**Main cards**

**Figure 2-1. JITC-Equipped DTX-600**

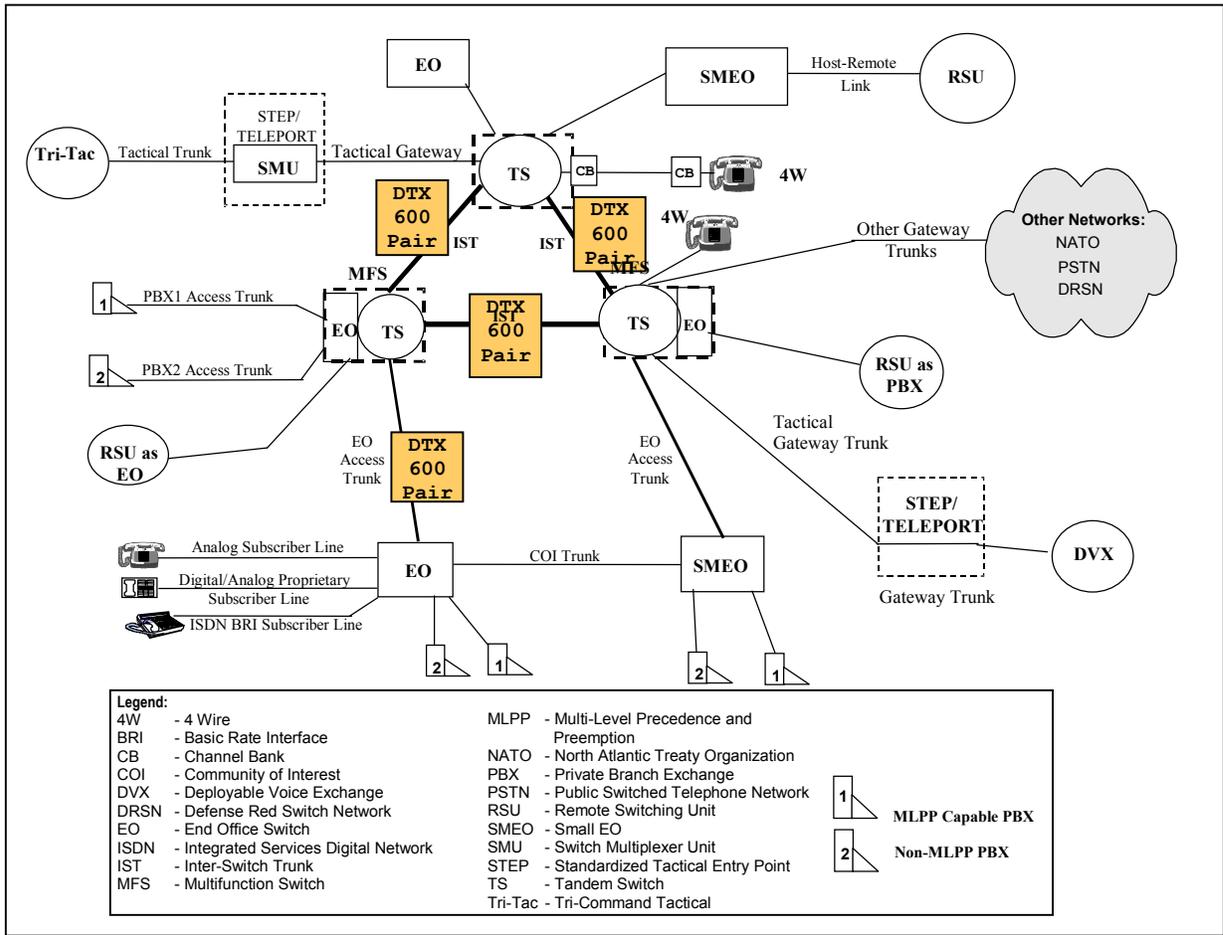
**Table 2-1. DTX-600 Card Description**

Card	Description
<b>Input/Output (I/O) Cards</b>	
ALMI	Alarms Interface Card
CMEI	Clock and Multi-Bearer Processing I/O
CPIO	CPU I/O
D8CI	I/O card for main DL8M – for service or backup terminal in a cluster configuration
DL8B <sup>1</sup>	I/O card for main DL8M – for standalone terminal with balanced E1/T1 interfaces
DL8U <sup>1</sup>	I/O card for main DL8M – for standalone terminal with unbalanced E1 interfaces
DLCI	Dynamic Load Control I/O Card
MOTI <sup>1</sup>	Monitor & Testing I/O Card
PEMX	DC Power Entry Interface Card
TIDI	Terminal Identification Card
VSTI	V-series Native Data I/O Card
<b>Main Cards</b>	
CPSM	CPU card
DL8M	Digital Line Interface T1/E1
DSPC <sup>1</sup>	Digital Signal Processing card 30 DSPs
DSPD	Digital Signal Processing card 62 DSPs
MBPC	Multi-Bearer Processing and Control card
PWRX	Power Supply
VSBR <sup>1</sup>	V-series Bearer Interface Card
VSTR	V-series Trunk Interface Card
Legend: CPU - Central Processing Unit DC - Direct Current DSP - Digital Signal Processor E1 - European Basic Rate (2.048 Mbps) I/O - Input/Output JITC - Joint Interoperability Test Command Mbps - Megabits per second T1 - Digital Transmission Link level 1 (1.544 Mbps)	
Note: 1 Neither installed nor tested at JITC.	

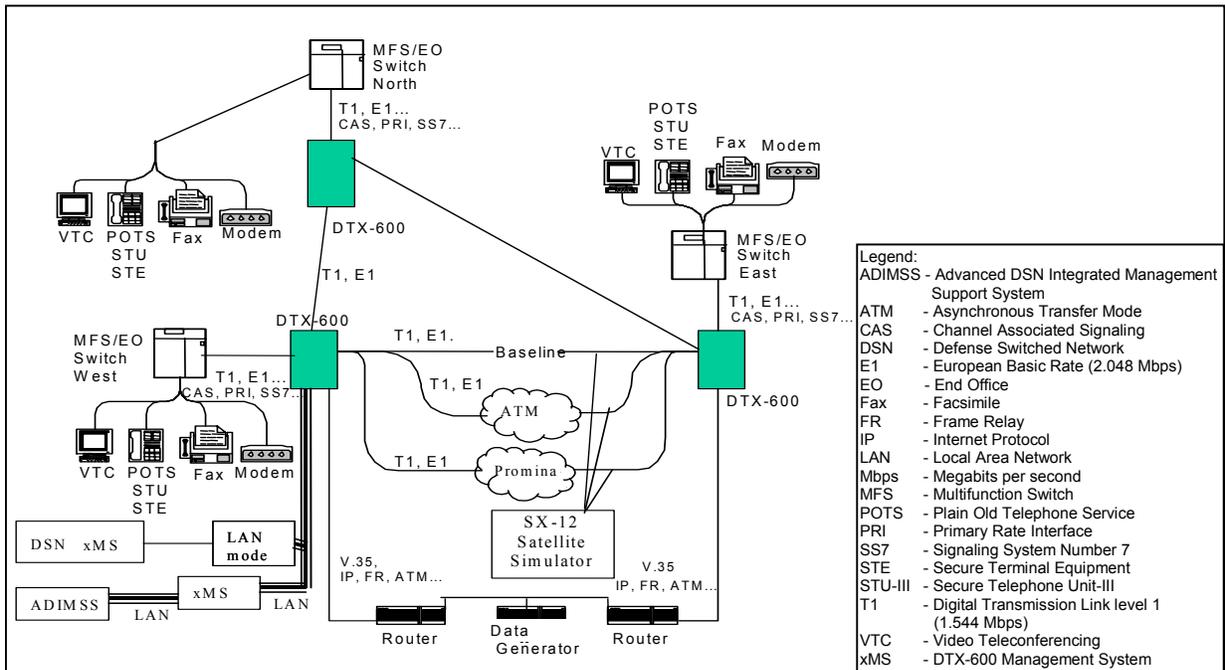
**6. OPERATIONAL ARCHITECTURE.** The Generic Switching Center Requirements (GSCR), Defense Switched Network (DSN) operational architecture including DTX-600s is depicted in figure 2-2. The DTX-600s are point-to-point devices that are fielded in pairs. The DTX-600s will be employed in the DSN backbone between tandem switches or Multifunction Switches (MFS). In long haul circuits that have a high cost (e.g. international circuits), the DTX-600s will be deployed between MFS and End Offices (EO).

**7. REQUIRED SYSTEM INTERFACES.** This interoperability certification is based upon evaluation of user-validated critical interfaces with associated interface Capability Requirements (CRs), and the overall system interoperability performance. Table 2-2 provides a list of the required interfaces and CRs based on GSCR and DISA network Services (NS) Program Manager (PM) requirements. Overall technical interface requirements for the DTX-600 were derived from the GSCR. User defined capability requirements were defined by the DISA PM.

**8. TEST NETWORK DESCRIPTION.** The DTX-600 was tested at the JITC Network Engineering and Integration Laboratory. The test was conducted using the test configuration shown in figure 2-3 which was based on emulating the DSN operational environment. Figure 2-3 accurately reflects the operationally realistic environment of the DSN.



**Figure 2-2. DSN Operational Architecture with DTX-600s**



**Figure 2-3. DTX-600 Test Network**

**Table 2-2. DTX-600 Capability Requirements**

	<b>Input/Output Interfaces</b>	
	<b>Interface &amp; Signaling<sup>1</sup></b>	<b>Capability Requirement {Critical (C)/Non-Critical (NC)}</b>
<b>Defense Switched Network</b>	PCM-24 T1 CAS DTMF	- Non-secure Voice (C) • G.711 PCM 64 kbps (C) • G.726 ADPCM 32/24/16 kbps (NC) • G.729 CS-ACELP 8 kbps (C)
	PCM-24 T1 CAS MFR1	- End-to-End Compression <sup>2</sup> (NC) - Digital Speech Interpolation/Silence Suppression (NC) - Modem Async VBD (C)
	PCM-24 T1 CAS DP	- Secure Voice (C) • STU-III (C) • STE (NC) • Satellite delay <sup>3</sup> (C)
	PCM-24 T1 SS7	- Secure Data (NC) - Non-secure Facsimile (C) - Secure Facsimile (C)
	PCM-24 T1 ISDN PRI	- MLPP (C) • ANSI T1.619a (ISDN and SS7 only) (C) - VTC (C) • Nx64 (ISDN and SS7 only) (C) • Nx56 (C)
	PCM-30 E1 CAS MFR1	- Alarms (C) • Carrier Group Alarms (C) • Channel Alarms <sup>4</sup> (C)
	PCM-30 E1 SS7	- Echo Cancellation - 64 msec tail delay (C) - QoS <sup>5</sup> (NC)
	<b>Network Management Interfaces</b>	
	<b>Interface &amp; Protocol<sup>1</sup></b>	<b>Capability Requirement {Critical (C)/Non-Critical (NC)}</b>
	CAT 5 TPC 10Base-T Ethernet, TCP/IP	- Alarms (C) - Man Machine Language (C) - Access Control (C)
TPC RS-232 Async	- Remote Management (C) - xMS <sup>6</sup> (NC)	
<b>Congestion Control Interface</b>		
<b>Interface</b>	<b>Capability Requirement {Critical (C)/Non-Critical (NC)}</b>	
TPC	- Congestion Control Scan Point (C)	
<b>DISN Transport (ATM)</b>	<b>Trunk Interfaces</b>	
	<b>Interface &amp; Line Code<sup>1</sup></b>	<b>Capability Requirement {Critical (C)/Non-Critical (NC)}</b>
	PCM-24 T1 B8ZS/ESF or AMI/SF	- Data Transport (C) - Alarms (C)
	PCM-30 E1 HDB3	- Data Transport (C) - Alarms (C)
<b>DISN Transport (Promina/IDNX)</b>	<b>Trunk Interfaces</b>	
	<b>Interface &amp; Line Code<sup>1</sup></b>	<b>Capability Requirement {Critical (C)/Non-Critical (NC)}</b>
	PCM-24 T1 B8ZS/ESF or AMI/SF	- Data transport (C) - Alarms (C)
	PCM-30 E1 HDB3	- Data transport (C) - Alarms (C)

**Table 2-2. DTX-600 Capability Requirements (continued)**

Legend:		Mbps	- Megabits per second
10BaseT	- Ethernet Based Operation, Twisted Pair	MFR1	- Multi-Frequency R1
ADPCM	- Adaptive Differential Pulse Code Modulation	MLPP	- Multi-Level Precedence and Preemption
AMI	- Alternate Mark Inversion	msec	- Milliseconds
ANSI	- American National Standards Institute	NM	- Network Management
Async	- Asynchronous	NX56	- Data format is restricted to multiples of 56K
ATM	- Asynchronous Transfer Mode	NX64	- Data format is restricted to multiples of 64K
B8ZS	- Bipolar Eight Zero Substitution	PCM	- Pulse Code Modulation
CAS	- Channel Associated Signaling	PCM-24	- Pulse Code Modulation 24 Channels
CAT	- Category	PCM-30	- Pulse Code Modulation 30 Channels
CS-ACELP	- Conjugate Structure-Algebraic Code Excited Linear Prediction	PRI	- Primary Rate Interface
DISN	- Defense Information Systems Network	QoS	- Quality of Service
DOD	- Department of Defense	RS	- Recommended Standard
DP	- Dial Pulse	SF	- Superframe
DSN	- Defense Switched Network	SS7	- Signaling System Number 7
DTMF	- Dual Tone Multi-Frequency	STE	- Secure Terminal Equipment
E1	- European Basic Rate (2.048 Mbps)	STU-III	- Secure Telephone Unit-III
ESF	- Extended Superframe	T1	- Digital Transmission Link level 1 (1.544 Mbps)
ETEC	- End-to-End Compression	TPC	- Twisted Pair Copper
GSCR	- Generic Switching Center Requirements	TCP/IP	- Transmission Control Protocol/Internet Protocol
HDB3	- High Density Bipolar Three	VBD	- Voice Band Data
IAW	- in accordance with	VTC	- Video Teleconferencing
IDNX	- Integrated Digital Network Exchange	xMS	- DTX-600 Management System
ISDN	- Integrated Services Digital Network		
kbps	- kilobits per second		
Notes:			
1 DSN requirements are specified as interfaces and signaling requirements and are IAW GSCR. NM requirements are specified as interface and protocol requirements and are IAW GSCR and NM memos. DISN ATM requirements are specified as interface and line code requirements IAW DOD ATM specification. DISN Promina/IDNX requirements are specified as interface and line code requirements and are user-defined.			
2 End-to-End Compression (ETEC) is an ECI proprietary technology; it is a user-defined non-critical requirement.			
3 This requirement is a user-defined requirement. One hop deemed critical; above one hop not critical.			
4 Common Channel Alarms not a critical capability.			
5 The DTX-600 has an internal proprietary QoS prioritization scheme; its incorporation for testing is a user-defined requirement.			
6 xMS is ECI's network management tool; its incorporation for testing is a user-defined requirement.			

**9. SYSTEM CONFIGURATIONS.** Table 2-3 provides the system configurations used in the test.

**Table 2-3. Tested System Configurations**

System Name	Architectural Role	Hardware	Software
ECI Telecom-Veraz Networks DTX-600	DCME	See figure 2-1	JITC008
MSL-100	TS, MFS, EO	RISC Processor	MSL-17
Avaya Definity G3R	SMEO	RISC Processor	Release G3V10r.7585.6.0.3
Siemens EWSD	TS, MFS, EO	CP 113C	Release 19 with Patch Set 25
Siemens KN (S) 4100	EO	SAB 8086 Processor	APS4V2.3
MARCONI ATM switch ASX-1000 and ASX-200BX	DISN Transport	SCP-1960 Processor	Versions 6.0.1 and 6.2
Promina/IDNX	DISN Transport	PRC (REV J) T1 TRK -3 (FW REV 4.299)	2.59.17
Legend:			
ATM	- Asynchronous Transfer Mode	MSL	- Meridian Switching Load
CP	- Central Processor	PRC	- Primary Rate Card
DCME	- Digital Compression Multiplex Equipment	REV	- Revision
DISN	- Defense Information System Network	RISC	- Reduced Instruction Set Computer
EO	- End Office	SMEO	- Small End Office
EWSD	- Elektronisches Wahl-System Digital	T1	- Digital Transmission Link level 1 (1.544 Mbps)
IDNX	- Integrated Digital Network Exchange	TS	- Tandem Switch
MFS	- Multifunction Switch	TRK	- Trunk

**10. TESTING LIMITATIONS.** None.

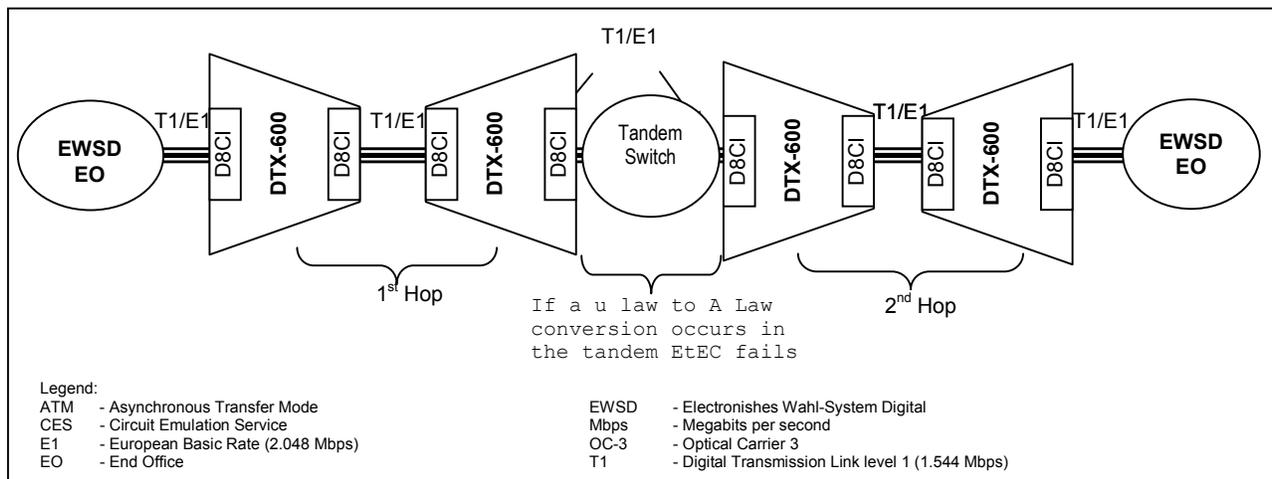
**11. TEST RESULTS.** The following paragraphs describe the test results for the certification testing summary. Summaries of the results are provided in tables 2-4 through 2-8.

**a. DSN Input/Output (I/O) Interfaces.** The DTX-600 I/O interfaces used to interoperate with the DSN are listed below. For clarification purposes the criticality of the interface and CR are listed below (i.e., (C)-critical or (NC)-non-critical).

**(1) Pulse Code Modulation-24 (PCM-24) T1 Channel Associated Signaling (CAS) Dual Tone Multi-Frequency (DTMF) (C).** The PCM-24 T1 CAS DTMF interface was configured to use either Extended Superframe (ESF) with Bipolar Eight Zero Substitution (B8ZS) line coding or Superframe (SF) with Alternate Mark Inversion (AMI) line coding. The following are the test results for each CR:

(a) Non-secure voice (C). Baseline testing of non-secure voice using G.711 PCM resulted in an average mean opinion score (MOS) of 4.4. Non-secure voice using G.726 Adaptive Differential PCM (ADPCM) and G.729 Conjugate Structure-Algebraic Code Excited Linear Prediction (CS-ACELP) resulted in an average MOS range of 3.9 to 4.2.

(b) End-to-End Compression (EtEC) (NC). EtEC worked for B8ZS line coding but did not work for AMI. This will have minimal operational impact because links using the DTX-600 can be configured for B8ZS instead of AMI and the majority of PCM-24 interfaces in the DSN are configured for B8ZS line coding. Any call that used a combination of both T1 and E1 links could not use EtEC. This problem is caused by bit integrity issues between T1 a-law and E1  $\mu$ -law companding and is not a DTX-600 problem (refer to figure 2-4). The T1/E1 EtEC will have a minor operational impact. In the European theatre, the DTX-600s will have to be deployed as to minimize T1/E1 conversions.



**Figure 2-4. ATM Test Configuration**

(c) Digital Speech Interpolation/Silence Suppression (NC). The DTX-600 was capable of detecting and removing the periods of silence in a call, thereby providing additional bandwidth for other calls.

(d) Modem Asynchronous (Async) Voice Band Data (VBD) (C). Using modems to send Async VBD, the DTX-600 was capable of compressing VBD calls 2 to 1.

(e) Secure Voice (C). The DTX-600 was capable of passing secure voice calls using compression between Secure Telephone Unit-III's (STU-III's) at 9.6 kilobits per second (kbps). STU-III to Secure Terminal Equipment (STE) calls were connected at 4.8 kbps and STE to STE calls completed at 9.6 kbps. Average MOS scores were 3.5, which are in the expected score range for a compressed secure call.

(f) Secure Data (NC). The DTX-600 was capable of passing secure data traffic. In uncompressed mode data rates of 19.2 kbps were obtained; when compressed, data rates of 9.6 kbps were obtained.

(g) Non-secure Facsimile (Fax) (C). The DTX-600 was capable of passing non-secure Fax traffic. In an uncompressed baseline test, faxes were transmitted at 14.4 kbps. In compressed mode, the DTX-600 compressed the fax transmission to 9.6 kbps.

(h) Secure Fax (C). The DTX-600 was capable of passing secure Fax traffic. Secure faxes were transmitted at 9.6 kbps in compressed mode.

(i) Multi-Level Precedence and Preemption (MLPP) (C). The DTX-600 was capable of transparently passing MLPP CAS signaling.

(j) Video Teleconferencing (VTC) (C). The DTX-600 was capable of passing the Nx56 VTCs. Based on dialed digits, the DTX-600 was capable of leaving VTCs in clear-mode operation (56 kbps for CAS trunks).

(k) Alarms (C). The DTX-600 was capable of passing Carrier Group Alarms (CGA) and channel alarms. The DTX-600 took approximately 15 seconds to acknowledge and respond to alarm conditions. The 15 seconds are within the allowed time limit of  $15 \pm 5$  seconds.

(l) Echo Cancellation (C). The DTX-600s built-in echo cancellers were capable of removing echoes caused by test equipment echo generation echo caused by injection of delay.

(m) Quality of Service (QoS) (NC). The DTX-600 demonstrated different levels of QoS. For DSN operation, the DTX-600 was capable of running data traffic at lower priorities at times when voice traffic was low. Once voice traffic was increased, it took precedence over data traffic.

**(2) PCM-24 T1 CAS Multi-Frequency R1 (MFR1) (C).** The PCM-24 T1 CAS MFR1 interface was configured to use either ESF with B8ZS line coding or SF with AMI line coding. The test results were the same as for PCM-24 T1 CAS above.

**(3) PCM-24 T1 CAS Dial Pulse (DP) (C).** The PCM-24 T1 CAS DP interface was configured to use either ESF with B8ZS line coding or SF with AMI line coding. The test results were the same as for PCM-24 T1 CAS above.

**(4) PCM-24 T1 Signaling System 7 (SS7) (C).** The PCM-24 T1 SS7 interface was configured using ESF with B8ZS line coding. The test results were the same as for PCM-24 T1 CAS above with the addition that VTC calls were capable of being passed at a 64 kbps rate.

**(5) PCM-24 T1 Integrated Services Digital Network (ISDN) Primary Rate Interface (PRI) (C).** The PCM-24 T1 ISDN PRI interface was configured to use ESF framing with B8ZS line coding. The test results were the same as for PCM-24 T1 CAS above with the addition that VTC calls were capable of being passed at 64 kbps.

**(6) PCM-30 E1 CAS MFR1 (C).** The PCM-30 E1 CAS MFR1 interface was configured with High Density Bipolar Three (HDB3). The test results were the same as for PCM-24 T1 CAS above with the addition that VTC calls were capable of being passed at 64 kbps.

**(7) PCM-30 E1 SS7 (C).** The PCM-30 E1 SS7 interface was configured with HDB3 framing. The test results were the same as for PCM-24 T1 CAS above with the addition that VTC calls were capable of being passed at 64 kbps.

**b. DSN Network Management (NM) Interfaces.** All DSN equipment is expected to provide a base set of information for NM purposes. This base set of information includes health and welfare (alarms) and a means to configure the device (man machine language). In addition to the DSN requirements, DISA defined user requirements for access control, remote management and use of the vendor provided management system (xMS). The following are the test results for the NM interfaces:

**(1) Category (CAT) 5 Twisted Pair Copper (TPC) 10Base-T (C).** An Internet Protocol (IP) test network was built to connect to the DTX-600 using CAT 5 cabling and 10Base-T Ethernet. The following capabilities were verified.

(a) Alarms (C). The DTX-600 was capable of providing Simple Network Management Protocol (SNMP) alarm information to the Advanced DSN Integrated Management Support System (ADIMSS) DSN network management system.

(b) Man Machine Language (C). Using an Ethernet connection, connectivity was made to the DTX-600. Operations and maintenance commands were issued to the DTX-600.

(c) Access Control (C). For planned deployment in the DSN, DISA wanted the DTX-600 to support access controls. The DTX-600 ensures that only authorized xMS applications are allowed access to DTX-600 network elements. Also, the DTX-600 supports a multi-tiered access control such that different levels of users can be created each with different access rights to the device.

(d) Remote Management (C). Remote management of the DTX-600 via an IP network was verified.

(e) xMS (NC). The xMS contains four functional modules: Status Manager - This module is in charge of gathering, formatting, and presenting status information from every network element. Configuration manager - This module is responsible for configuration and provisioning of the various services. Agent Access Control - This module is designed to perform network security tasks. The module ensures that only authorized xMS applications are allowed access to the network elements. Software Version Manager - This module controls software (S/W) downloads and manages the various versions of all the network element software. The functionality of each xMS module was verified over the IP connection.

**(2) TPC RS-232 Asynchronous (C).** NM capabilities of the DTX-600 were verified over a direct TPC RS-232 Async connection. Results were the same as presented above for the IP connection.

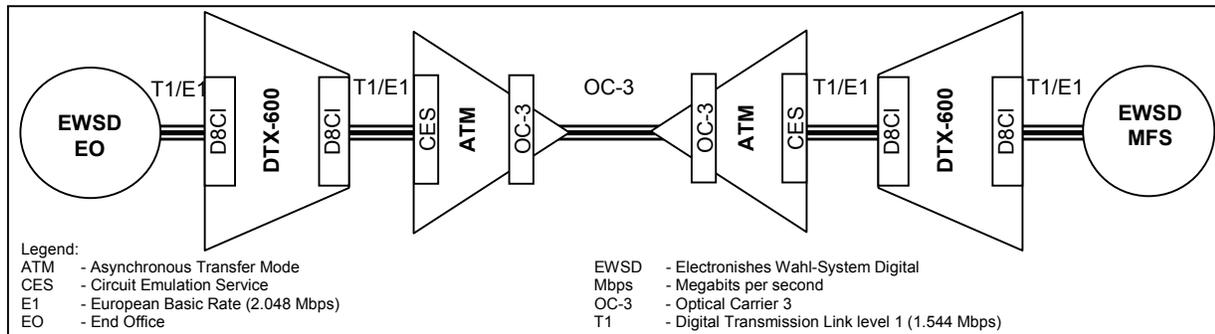
**c. DSN Congestion Control Interface (C).** DCME equipment is expected to provide an indication to the circuit switch that its 'bearer' links are congested. For use in DSN, DCME must provide a 'scan point' in the form of a predetermined voltage that the circuit switch uses to react to the congestion condition. Upon reaching a congested condition, the DTX-600 provided a dry-contact relay output to the circuit switch for dynamic load control. The DTX-600's dry-contact output was tested with multiple DSN switches and proved to control congestion.

**d. Defense Information Systems Network (DISN) Transport Asynchronous Transfer Mode (ATM)**

**(1) PCM-24 T1 B8ZS/ESF AMI/SF (C).** The DTX-600 was configured to connect to the DISN ATM Marconi ASX-200BX via a T1 Circuit Emulation Service (CES) module. End-to-end voice services were passed in accordance with (IAW) Department of Defense (DOD) ATM Standards (Version 2.0) dated September 1999. The voice services were configured to pass through the ATM cloud via a Permanent Virtual Circuit (PVC) IAW DOD DISN ATM Specification Version 1.2c, 17 April 1998. Proper alarm interaction between the DTX-600 and ATM devices was carried out. Figure 2-5 depicts the device and cards utilized to conduct the test.

**(2) PCM-30 E1 HDB3 (C).** The DTX-600 was configured to connect to the DISN ATM (Marconi ASX-200BX) via an E1 CES module. End-to-end voice services were passed IAW DOD ATM Standards (Version 2.0) dated September 1999. The

voice services were configured to pass through the ATM cloud via a PVC IAW DOD DISN ATM Specification Version 1.2c, 17 April 1998. Proper alarm interaction between the DTX-600 and ATM devices was carried out. Figure 2-5 depicts the device and cards utilized to conduct the test.

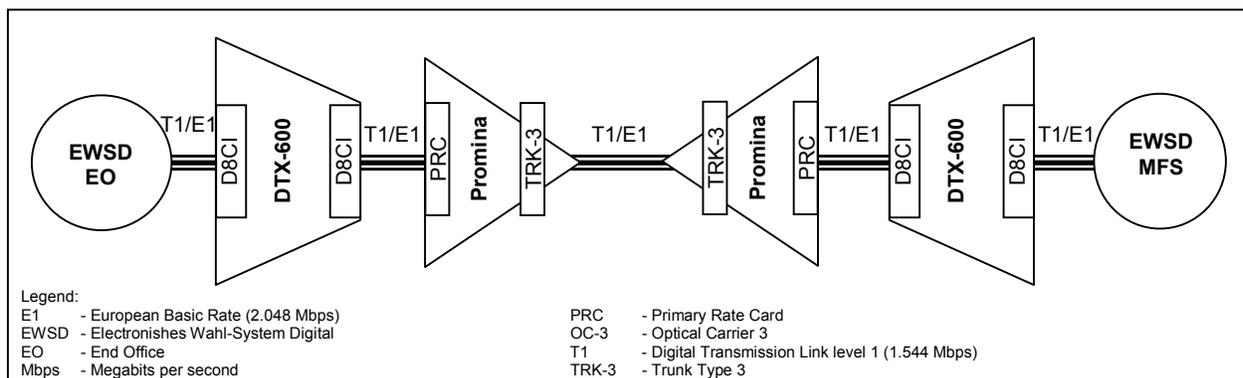


**Figure 2-5. ATM Test Configuration**

**e. DISN Transport Promina/ Integrated Digital Network Exchange (IDNX)**

**(1) PCM-24 T1 B8ZS/ESF AMI/SF (C).** The DTX-600 was configured to pass voice services via an emulated Promina/ IDNX network. The DTX-600 was interfaced to the Promina via a Primary Rate Card (PRC) using T1 signaling and passed between the Prominas using Trunk Type 3 (TRK-3) cards. The ability of the Promina to pass voice services as well as pass alarm info was verified. Figure 2-6 depicts the Promina test configuration.

**(2) PCM-30 E1 HDB3 (C).** The DTX-600 was configured to pass voice services via an emulated Promina network. The DTX-600 was interfaced to the Promina via a PRC using E1 signaling and passed between the Prominas using TRK-3 cards. The ability of the Promina to pass voice services as well as alarm information was verified. Figure 2-6 depicts the Promina test configuration.



**Figure 2-6. Promina Test Configuration**

**f. System Interoperability Results.** The DTX-600 meets all of its critical interoperability requirements and is certified as interoperable for joint use within the

Defense Switched Network (DSN). This interoperability certification is based upon evaluation of user-validated critical interfaces with associated interface Capability Requirements (CRs) and the overall system interoperability performance. The test discrepancies that remained open after software patches were applied and regression testing was completed that were discussed above only have minor operational impacts.

**12. TEST AND ANALYSIS REPORT.** No detailed test report was developed per the Program Manager's request. JITC distributes interoperability information via the JITC Electronic Report Distribution (ERD) system -- ERD uses unclassified (NIPRNET) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program (STP). The STP is accessible by .mil/gov users on the NIPRNET at <https://stp.fhu.disa.mil/>. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool (JIT) at <http://jit.fhu.disa.mil> (NIPRNET), or <http://199.208.204.125/> (SIPRNET). Information related to DSN testing is on the Telecom Switched Services Interoperability (TSSI) website at <http://jitc.fhu.disa.mil/tssi>.

**Table 2-4. DSN Interoperability Status Input/Output Interfaces**

DSN I/O Interfaces					
Interface & Signaling	Critical Interface	Capability Requirement (CR) Criticality (Critical (C)/Non-Critical (NC))	Test Results	Operational Impact	Interface Status
PCM-24 T1 CAS DTMF	Yes	<ul style="list-style-type: none"> <li>- Non-secure Voice (C)                             <ul style="list-style-type: none"> <li>• G.711 PCM 64 kbps (C)</li> <li>• G.726 ADPCM 32/24/16 kbps (NC)</li> <li>• G.729 CS-ACELP 8 kbps (C)</li> </ul> </li> <li>- End-to-End Compression (NC)</li> <li>- Silence Suppression (NC)</li> <li>- Modem Async voice band data (C)</li> <li>- Secure Voice (C)                             <ul style="list-style-type: none"> <li>• STU-III (C)</li> <li>• STE (NC)</li> <li>• Satellite delay (C)</li> </ul> </li> <li>- Secure Data (NC)</li> <li>- Non-secure Facsimile (C)</li> <li>- Secure Facsimile (C)</li> <li>- MLPP (C)                             <ul style="list-style-type: none"> <li>• ANSI T1.619a (ISDN and SS7 only)(C)</li> </ul> </li> <li>- VTC (C)                             <ul style="list-style-type: none"> <li>• Nx64 (ISDN and SS7 only) (C)</li> <li>• Nx56 (C)</li> </ul> </li> <li>- Alarms (C)                             <ul style="list-style-type: none"> <li>• Carrier Group Alarms (C)</li> <li>• Channel Alarms (C)</li> </ul> </li> <li>- Echo Cancellation - 64 msec tail delay (C)</li> <li>- QoS (NC)</li> </ul>	<ul style="list-style-type: none"> <li>- All critical CRs met.</li> <li>- Non-secure voice MOS 4.4 for PCM.</li> <li>- Non-secure voice MOS 3.9 to 4.2 for ADPCM/CS-ACELP.</li> <li>- EtEC does not work for AMI.</li> <li>- Secure voice ave MOS 3.5                             <ul style="list-style-type: none"> <li>• STU-III to STU-III @ 9.6 kbps</li> <li>• STU-III to STE @ 4.8 kbps</li> <li>• STE to STE @ 9.6 kbps</li> </ul> </li> <li>- Secure Data @ 19.2 kbps</li> <li>- Non-secure Fax 14.4 kbps</li> <li>- Secure Fax 9.6 kbps</li> <li>- Alarm restoral 15 seconds</li> </ul>	<ul style="list-style-type: none"> <li>- For EtEC will require B8ZS not AMI. Minor operational impact.</li> </ul>	Certified
PCM-24 T1 CAS MFR1	Yes	<ul style="list-style-type: none"> <li>- Non-secure Voice (C)                             <ul style="list-style-type: none"> <li>• G.711 PCM 64 kbps (C)</li> <li>• G.726 ADPCM 32/24/16 kbps (NC)</li> <li>• G.729 CS-ACELP 8 kbps (C)</li> </ul> </li> <li>- End-to-End Compression (NC)</li> <li>- Silence Suppression (NC)</li> <li>- Modem Async voice band data (C)</li> <li>- Secure Voice (C)                             <ul style="list-style-type: none"> <li>• STU-III (C)</li> <li>• STE (NC)</li> <li>• Satellite delay (C)</li> </ul> </li> <li>- Secure Data (NC)</li> <li>- Non-secure Facsimile (C)</li> <li>- Secure Facsimile (C)</li> <li>- MLPP (C)                             <ul style="list-style-type: none"> <li>• ANSI T1.619a (ISDN and SS7 only)(C)</li> </ul> </li> <li>- VTC (C)                             <ul style="list-style-type: none"> <li>• Nx64 (ISDN and SS7 only) (C)</li> <li>• Nx56 (C)</li> </ul> </li> <li>- Alarms (C)                             <ul style="list-style-type: none"> <li>• Carrier Group Alarms (C)</li> <li>• Channel Alarms (C)</li> </ul> </li> <li>- Echo Cancellation - 64 msec tail delay (C)</li> <li>- QoS (NC)</li> </ul>	<ul style="list-style-type: none"> <li>- All critical CRs met.</li> <li>- Non-secure voice MOS 4.4 for PCM.</li> <li>- Non-secure voice MOS 3.9 to 4.2 for ADPCM/CS-ACELP.</li> <li>- EtEC does not work for AMI.</li> <li>- Secure voice ave MOS 3.5                             <ul style="list-style-type: none"> <li>• STU-III to STU-III @ 9.6 kbps</li> <li>• STU-III to STE @ 4.8 kbps</li> <li>• STE to STE @ 9.6 kbps</li> </ul> </li> <li>- Secure Data @ 19.2 kbps</li> <li>- Non-secure Fax 14.4 kbps</li> <li>- Secure Fax 9.6 kbps</li> <li>- Alarm restoral 15 seconds</li> </ul>	<ul style="list-style-type: none"> <li>- For EtEC will require B8ZS not AMI. Minor operational impact.</li> </ul>	Certified

**Table 2-4. DSN Interoperability Status Input/Output Interfaces (continued)**

DSN I/O Interfaces					
Interface & Signaling	Critical Interface	Capability Requirement (CR) Criticality (Critical (C)/Non-Critical (NC))	Test Results	Operational Impact	Interface Status
PCM-24 T1 CAS DP	Yes	<ul style="list-style-type: none"> <li>- Non-secure Voice (C)                             <ul style="list-style-type: none"> <li>• G.711 PCM 64 kbps (C)</li> <li>• G.726 ADPCM 32/24/16 kbps (NC)</li> <li>• G.729 CS-ACELP 8 kbps (C)</li> </ul> </li> <li>- End-to-End Compression (NC)</li> <li>- Silence Suppression (NC)</li> <li>- Modem Async voice band data (C)</li> <li>- Secure Voice (C)                             <ul style="list-style-type: none"> <li>• STU-III (C)</li> <li>• STE (NC)</li> <li>• Satellite delay (C)</li> </ul> </li> <li>- Secure Data (NC)</li> <li>- Non-secure Facsimile (C)</li> <li>- Secure Facsimile (C)</li> <li>- MLPP (C)                             <ul style="list-style-type: none"> <li>• ANSI T1.619a (ISDN and SS7 only)(C)</li> </ul> </li> <li>- VTC (C)                             <ul style="list-style-type: none"> <li>• Nx64 (ISDN and SS7 only) (C)</li> <li>• Nx56 (C)</li> </ul> </li> <li>- Alarms (C)                             <ul style="list-style-type: none"> <li>• Carrier Group Alarms (C)</li> <li>• Channel Alarms (C)</li> </ul> </li> <li>- Echo Cancellation - 64 msec tail delay (C)</li> <li>- QoS (NC)</li> </ul>	<ul style="list-style-type: none"> <li>- All critical CRs met.</li> <li>- Non-secure voice MOS 4.4 for PCM.</li> <li>- Non-secure voice MOS 3.9 to 4.2 for ADPCM/CS-ACELP.</li> <li>- EtEC does not work for AMI.</li> <li>- Secure voice ave MOS 3.5                             <ul style="list-style-type: none"> <li>• STU-III to STU-III @ 9.6 kbps</li> <li>• STU-III to STE @ 4.8 kbps</li> <li>• STE to STE @ 9.6 kbps</li> </ul> </li> <li>- Secure Data @ 19.2 kbps</li> <li>- Non-secure Fax 14.4 kbps</li> <li>- Secure Fax 9.6 kbps</li> <li>- Alarm restoral 15 seconds</li> </ul>	<ul style="list-style-type: none"> <li>- For EtEC will require B8ZS not AMI. Minor operational impact.</li> </ul>	Certified
PCM-24 T1 SS7	Yes	<ul style="list-style-type: none"> <li>- Non-secure Voice (C)                             <ul style="list-style-type: none"> <li>• G.711 PCM 64 kbps (C)</li> <li>• G.726 ADPCM 32/24/16 kbps (NC)</li> <li>• G.729 CS-ACELP 8 kbps (C)</li> </ul> </li> <li>- End-to-End Compression (NC)</li> <li>- Silence Suppression (NC)</li> <li>- Modem Async voice band data (C)</li> <li>- Secure Voice (C)                             <ul style="list-style-type: none"> <li>• STU-III (C)</li> <li>• STE (NC)</li> <li>• Satellite delay (C)</li> </ul> </li> <li>- Secure Data (NC)</li> <li>- Non-secure Facsimile (C)</li> <li>- Secure Facsimile (C)</li> <li>- MLPP (C)                             <ul style="list-style-type: none"> <li>• ANSI T1.619a (ISDN and SS7 only)(C)</li> </ul> </li> <li>- VTC (C)                             <ul style="list-style-type: none"> <li>• Nx64 (ISDN and SS7 only) (C)</li> <li>• Nx56 (C)</li> </ul> </li> <li>- Alarms (C)                             <ul style="list-style-type: none"> <li>• Carrier Group Alarms (C)</li> <li>• Channel Alarms (C)</li> </ul> </li> <li>- Echo Cancellation - 64 msec tail delay (C)</li> <li>- QoS (NC)</li> </ul>	<ul style="list-style-type: none"> <li>- All critical CRs met.</li> <li>- Non-secure voice MOS 4.4 for PCM.</li> <li>- Non-secure voice MOS 3.9 to 4.2 for ADPCM/CS-ACELP.</li> <li>- EtEC does not work for AMI.</li> <li>- Secure voice ave MOS 3.5                             <ul style="list-style-type: none"> <li>• STU-III to STU-III @ 9.6 kbps</li> <li>• STU-III to STE @ 4.8 kbps</li> <li>• STE to STE @ 9.6 kbps</li> </ul> </li> <li>- Secure Data @ 19.2 kbps</li> <li>- Non-secure Fax 14.4 kbps</li> <li>- Secure Fax 9.6 kbps</li> <li>- VTC at Nx56 &amp; Nx64</li> <li>- Alarm restoral 15 seconds</li> </ul>	<ul style="list-style-type: none"> <li>- For EtEC will require B8ZS not AMI. Minor operational impact.</li> </ul>	Certified

**Table 2-4. DSN Interoperability Status Input/Output Interfaces (continued)**

DSN I/O Interfaces					
Interface & Signaling	Critical Interface	Capability Requirement (CR) Criticality (Critical (C)/Non-Critical (NC))	Test Results	Operational Impact	Interface Status
PCM-24 T1 ISDN PRI	Yes	<ul style="list-style-type: none"> <li>- Non-secure Voice (C)                             <ul style="list-style-type: none"> <li>• G.711 PCM 64 kbps (C)</li> <li>• G.726 ADPCM 32/24/16 kbps (NC)</li> <li>• G.729 CS-ACELP 8 kbps (C)</li> </ul> </li> <li>- End-to-End Compression (NC)</li> <li>- Silence Suppression (NC)</li> <li>- Modem Async voice band data (C)</li> <li>- Secure Voice (C)                             <ul style="list-style-type: none"> <li>• STU-III (C)</li> <li>• STE (NC)</li> <li>• Satellite delay (C)</li> </ul> </li> <li>- Secure Data (NC)</li> <li>- Non-secure Facsimile (C)</li> <li>- Secure Facsimile (C)</li> <li>- MLPP (C)                             <ul style="list-style-type: none"> <li>• ANSI T1.619a (ISDN and SS7 only)(C)</li> </ul> </li> <li>- VTC (C)                             <ul style="list-style-type: none"> <li>• Nx64 (ISDN and SS7 only) (C)</li> <li>• Nx56 (C)</li> </ul> </li> <li>- Alarms (C)                             <ul style="list-style-type: none"> <li>• Carrier Group Alarms (C)</li> </ul> </li> <li>- Channel Alarms (C)</li> <li>- Echo Cancellation - 64 msec tail delay (C)</li> <li>- QoS (NC)</li> </ul>	<ul style="list-style-type: none"> <li>- All critical CRs met.</li> <li>- Non-secure voice MOS 4.4 for PCM.</li> <li>- Non-secure voice MOS 3.9 to 4.2 for ADPCM/CS-ACELP.</li> <li>- EtEC does not work for AMI.</li> <li>- Secure voice ave MOS 3.5                             <ul style="list-style-type: none"> <li>• STU-III to STU-III @ 9.6 kbps</li> <li>• STU-III to STE @ 4.8 kbps</li> <li>• STE to STE @ 9.6 kbps</li> </ul> </li> <li>- Secure Data @ 19.2 kbps</li> <li>- Non-secure Fax 14.4 kbps</li> <li>- Secure Fax 9.6 kbps</li> <li>- VTC at Nx56 &amp; Nx64</li> <li>- Alarm restoral 15 seconds</li> </ul>	<ul style="list-style-type: none"> <li>- For EtEC will require B8ZS not AMI. Minor operational impact.</li> </ul>	Certified
PCM-30 E1 CAS MFR1	Yes	<ul style="list-style-type: none"> <li>- Non-secure Voice (C)                             <ul style="list-style-type: none"> <li>• G.711 PCM 64 kbps (C)</li> <li>• G.726 ADPCM 32/24/16 kbps (NC)</li> <li>• G.729 CS-ACELP 8 kbps (C)</li> </ul> </li> <li>- End-to-End Compression (NC)</li> <li>- Silence Suppression (NC)</li> <li>- Modem Async voice band data (C)</li> <li>- Secure Voice (C)                             <ul style="list-style-type: none"> <li>• STU-III (C)</li> <li>• STE (NC)</li> <li>• Satellite delay (C)</li> </ul> </li> <li>- Secure Data (NC)</li> <li>- Non-secure Facsimile (C)</li> <li>- Secure Facsimile (C)</li> <li>- MLPP (C)                             <ul style="list-style-type: none"> <li>• ANSI T1.619a (ISDN and SS7 only)(C)</li> </ul> </li> <li>- VTC (C)                             <ul style="list-style-type: none"> <li>• Nx64 (ISDN and SS7 only) (C)</li> <li>• Nx56 (C)</li> </ul> </li> <li>- Alarms (C)                             <ul style="list-style-type: none"> <li>• Carrier Group Alarms (C)</li> </ul> </li> <li>- Channel Alarms (C)</li> <li>- Echo Cancellation - 64 msec tail delay (C)</li> <li>- QoS (NC)</li> </ul>	<ul style="list-style-type: none"> <li>- All critical CRs met.</li> <li>- Non-secure voice MOS 4.4 for PCM.</li> <li>- Non-secure voice MOS 3.9 to 4.2 for ADPCM/CS-ACELP.</li> <li>- EtEC does not work for a-law/<math>\mu</math>-law conversions.</li> <li>- Secure voice ave MOS 3.5                             <ul style="list-style-type: none"> <li>• STU-III to STU-III @ 9.6 kbps</li> <li>• STU-III to STE @ 4.8 kbps</li> <li>• STE to STE @ 9.6 kbps</li> </ul> </li> <li>- Secure Data @ 19.2 kbps</li> <li>- Non-secure Fax 14.4 kbps</li> <li>- Secure Fax 9.6 kbps</li> <li>- Alarm restoral 15 seconds</li> </ul>	<ul style="list-style-type: none"> <li>- Use of DTX-600 will have to be engineered to minimize T1/E1 conversions. Minor operational impact.</li> </ul>	Certified

**Table 2-4. DSN Interoperability Status of Input/Output Interfaces (continued)**

DSN I/O Interfaces							
Interface & Signaling	Critical Interface	Capability Requirement (CR) Criticality (Critical (C)/Non-Critical (NC))	Test Results	Operational Impact	Interface Status		
PCM-30 E1 SS7	Yes	<ul style="list-style-type: none"> <li>- Non-secure Voice (C)                             <ul style="list-style-type: none"> <li>• G.711 PCM 64 kbps (C)</li> <li>• G.726 ADPCM 32/24/16 kbps (NC)</li> <li>• G.729 CS-ACELP 8 kbps (C)</li> </ul> </li> <li>- End-to-End Compression (NC)</li> <li>- Silence Suppression (NC)</li> <li>- Modem Async voice band data (C)</li> <li>- Secure Voice (C)                             <ul style="list-style-type: none"> <li>• STU-III (C)</li> <li>• STE (NC)</li> <li>• Satellite delay (C)</li> </ul> </li> <li>- Secure Data (NC)</li> <li>- Non-secure Facsimile (C)</li> <li>- Secure Facsimile (C)</li> <li>- MLPP (C)                             <ul style="list-style-type: none"> <li>• ANSI T1.619a (ISDN and SS7 only)(C)</li> </ul> </li> <li>- VTC (C)                             <ul style="list-style-type: none"> <li>• Nx64 (ISDN and SS7 only) (C)</li> <li>• Nx56 (C)</li> </ul> </li> <li>- Alarms (C)                             <ul style="list-style-type: none"> <li>• Carrier Group Alarms (C)</li> <li>• Channel Alarms (C)</li> </ul> </li> <li>- Echo Cancellation - 64 msec tail delay (C)</li> <li>- QoS (NC)</li> </ul>	<ul style="list-style-type: none"> <li>- All critical CRs met.</li> <li>- Non-secure voice MOS 4.4 for PCM.</li> <li>- Non-secure voice MOS 3.9 to 4.2 for ADPCM/CS-ACELP.</li> <li>- EtEC does not work for a-law/μ-law conversions.</li> <li>- Secure voice ave. MOS 3.5                             <ul style="list-style-type: none"> <li>• STU-III to STU-III @ 9.6 kbps</li> <li>• STU-III to STE @ 4.8 kbps</li> <li>• STE to STE @ 9.6 kbps</li> </ul> </li> <li>- Secure Data @ 19.2 kbps</li> <li>- Non-secure Fax 14.4 kbps</li> <li>- Secure Fax 9.6 kbps</li> <li>- Alarm restoral 15 seconds</li> </ul>	<ul style="list-style-type: none"> <li>- Use of DTX-600 will have to be engineered to minimize T1/E1 conversions. Minor operational impact.</li> </ul>	Certified		
<p>Legend:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <li>ADPCM - Adaptive Differential Pulse Code Modulation</li> <li>AMI - Alternate Mark Inversion</li> <li>ANSI - American National Standards Institute</li> <li>Async - Asynchronous</li> <li>C - Critical</li> <li>CAS - Channel Associated Signaling</li> <li>CAT - Category</li> <li>CR - Capability Requirement</li> <li>CS-ACELP - Conjugate Structure-Algebraic Code Excited Linear Prediction</li> <li>DP - Dial Pulse</li> <li>DSN - Defense Switched Network</li> <li>DTMF - Dual Tone Multi-Frequency</li> <li>E1 - European Basic Rate (2.048 Mbps)</li> <li>ESF - Extended Superframe</li> <li>EtEC - End to End Compression</li> <li>I/O - Input/Output</li> <li>ISDN - Integrated Services Digital Network</li> <li>kbps - kilobits per second</li> </ul> </td> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> <li>Mbps - Megabits per second</li> <li>MFR1 - Multi-Frequency R1</li> <li>MLPP - Multi-Level Precedence and Preemption</li> <li>MOS - Mean Opinion Score</li> <li>msec - Milliseconds</li> <li>NC - Non-Critical</li> <li>NX56 - Data format restricted to multiples of 56K</li> <li>NX64 - Data format restricted to multiples of 64K</li> <li>PCM - Pulse Code Modulation</li> <li>PCM-24 - Pulse Code Modulation 24 Channels</li> <li>PCM-30 - Pulse Code Modulation 30 Channels</li> <li>PRI - Primary Rate Interface</li> <li>QoS - Quality of Service</li> <li>SS7 - Signaling System Number 7</li> <li>STE - Secure Terminal Equipment</li> <li>STU-III - Secure Terminal Unit-III</li> <li>T1 - Digital Transmission Link level 1 (1.544 Mbps)</li> </ul> </td> </tr> </table>						<ul style="list-style-type: none"> <li>ADPCM - Adaptive Differential Pulse Code Modulation</li> <li>AMI - Alternate Mark Inversion</li> <li>ANSI - American National Standards Institute</li> <li>Async - Asynchronous</li> <li>C - Critical</li> <li>CAS - Channel Associated Signaling</li> <li>CAT - Category</li> <li>CR - Capability Requirement</li> <li>CS-ACELP - Conjugate Structure-Algebraic Code Excited Linear Prediction</li> <li>DP - Dial Pulse</li> <li>DSN - Defense Switched Network</li> <li>DTMF - Dual Tone Multi-Frequency</li> <li>E1 - European Basic Rate (2.048 Mbps)</li> <li>ESF - Extended Superframe</li> <li>EtEC - End to End Compression</li> <li>I/O - Input/Output</li> <li>ISDN - Integrated Services Digital Network</li> <li>kbps - kilobits per second</li> </ul>	<ul style="list-style-type: none"> <li>Mbps - Megabits per second</li> <li>MFR1 - Multi-Frequency R1</li> <li>MLPP - Multi-Level Precedence and Preemption</li> <li>MOS - Mean Opinion Score</li> <li>msec - Milliseconds</li> <li>NC - Non-Critical</li> <li>NX56 - Data format restricted to multiples of 56K</li> <li>NX64 - Data format restricted to multiples of 64K</li> <li>PCM - Pulse Code Modulation</li> <li>PCM-24 - Pulse Code Modulation 24 Channels</li> <li>PCM-30 - Pulse Code Modulation 30 Channels</li> <li>PRI - Primary Rate Interface</li> <li>QoS - Quality of Service</li> <li>SS7 - Signaling System Number 7</li> <li>STE - Secure Terminal Equipment</li> <li>STU-III - Secure Terminal Unit-III</li> <li>T1 - Digital Transmission Link level 1 (1.544 Mbps)</li> </ul>
<ul style="list-style-type: none"> <li>ADPCM - Adaptive Differential Pulse Code Modulation</li> <li>AMI - Alternate Mark Inversion</li> <li>ANSI - American National Standards Institute</li> <li>Async - Asynchronous</li> <li>C - Critical</li> <li>CAS - Channel Associated Signaling</li> <li>CAT - Category</li> <li>CR - Capability Requirement</li> <li>CS-ACELP - Conjugate Structure-Algebraic Code Excited Linear Prediction</li> <li>DP - Dial Pulse</li> <li>DSN - Defense Switched Network</li> <li>DTMF - Dual Tone Multi-Frequency</li> <li>E1 - European Basic Rate (2.048 Mbps)</li> <li>ESF - Extended Superframe</li> <li>EtEC - End to End Compression</li> <li>I/O - Input/Output</li> <li>ISDN - Integrated Services Digital Network</li> <li>kbps - kilobits per second</li> </ul>	<ul style="list-style-type: none"> <li>Mbps - Megabits per second</li> <li>MFR1 - Multi-Frequency R1</li> <li>MLPP - Multi-Level Precedence and Preemption</li> <li>MOS - Mean Opinion Score</li> <li>msec - Milliseconds</li> <li>NC - Non-Critical</li> <li>NX56 - Data format restricted to multiples of 56K</li> <li>NX64 - Data format restricted to multiples of 64K</li> <li>PCM - Pulse Code Modulation</li> <li>PCM-24 - Pulse Code Modulation 24 Channels</li> <li>PCM-30 - Pulse Code Modulation 30 Channels</li> <li>PRI - Primary Rate Interface</li> <li>QoS - Quality of Service</li> <li>SS7 - Signaling System Number 7</li> <li>STE - Secure Terminal Equipment</li> <li>STU-III - Secure Terminal Unit-III</li> <li>T1 - Digital Transmission Link level 1 (1.544 Mbps)</li> </ul>						

**Table 2-5. DSN Interoperability Status of NM Interfaces**

DSN NM Interfaces					
Interface & Protocol	Critical Interface	Capability Requirement (CR) Criticality (Critical (C)/Non-Critical (NC))	Test Result	Operational Impact	Interface Status
Cat 5 TPC 10 Base-T Ethernet TCP/IP	Yes	- Alarms (C) - Man Machine Language (C) - Access Control (C) - Remote Management (C) - xMS(NC)	All critical CRs met.	None	Certified
TPC RS-232 Async	Yes	- Alarms (C) - Man Machine Language (C) - Access Control (C) - Remote Management (C) - xMS(NC)	All critical CRs met.	None	Certified
Legend: Async - Asynchronous C - Critical Cat - Category CR - Capability Requirement DSN - Defense Switched Network NC - Non-Critical NM - Network Management RS - Recommended Standard TCP/IP - Transmission Control Protocol/Internet Protocol TPC - Twisted Pair Copper xMS - DTX-600 Management System					

**Table 2-6. DSN Interoperability Status of Congestion Control Interface**

DSN Congestion Control Interface					
Interface	Critical Interface	Capability Requirement (CR) Criticality (Critical (C)/Non-Critical (NC))	Test Result	Operational Impact	Interface Status
TPC	Yes	- Congestion Control Scan Point (C)	All critical CRs met.	None	Certified
Legend: DSN - Defense Switched Network C - Critical CR - Capability Requirement TPC - Twisted Pair Copper					

**Table 2-7. DISN Transport (ATM) Interoperability Status**

ATM Interfaces					
Interface & Signaling	Critical Interface	Capability Requirement (CR) Criticality (Critical (C)/Non-Critical (NC))	Test Result	Operational Impact	Interface Status
PCM-24 T1 B8ZS/ESF AMI/SF	Yes	- Data Transport (C) - Alarms (C)	All critical CRs met.	None	Certified
PCM-30 E1 HDB3	Yes	- Data Transport (C) - Alarms (C)	All critical CRs met.	None	Certified
Legend: AMI - Alternate Mark Inversion ATM - Asynchronous Transfer Mode B8ZS - Bipolar Eight Zero Substitution C - Critical CR - Capability Requirement DISN - Defense Information Systems Network E1 - European Basic Rate (2.048 Mbps) ESF - Extended Superframe HDB3 - High Density Bipolar Three Mbps - Megabits per second NC - Non-Critical PCM-24 - Pulse Code Modulation 24 Channels PCM-30 - Pulse Code Modulation 30 Channels SF - Superframe T1 - Digital Transmission Link Level 1 (1.544 Mbps)					

**Table 2-8. DISN Transport (Promina/IDNX) Interoperability Status**

<b>Promina/IDNX Interfaces</b>																					
<b>Interface &amp; Signaling</b>	<b>Critical Interface</b>	<b>Capability Requirement (CR) Criticality (Critical (C)/Non-Critical (NC))</b>	<b>Test Result</b>	<b>Operational Impact</b>	<b>Interface Status</b>																
PCM-24 T1 B8ZS/ESF or AMI/SF	Yes	- Data Transport (C) - Alarms (C)	All critical CRs met.	None	Certified																
PCM-30 E1 HDB3	Yes	- Data Transport (C) - Alarms (C)	All critical CRs met.	None	Certified																
<p>Legend:</p> <table> <tr> <td>AMI - Alternate Mark Inversion</td> <td>HDB3 - High Density Bipolar Three</td> </tr> <tr> <td>ATM - Asynchronous Transfer Mode</td> <td>IDNX - Integrated Digital Network Exchange</td> </tr> <tr> <td>B8ZS - Bipolar Eight Zero Substitution</td> <td>Mbps - Megabits per second</td> </tr> <tr> <td>C - Critical</td> <td>NC - Non-Critical</td> </tr> <tr> <td>CR - Capability Requirement</td> <td>PCM-24 - Pulse Code Modulation 24 Channels</td> </tr> <tr> <td>DISN - Defense Information Systems Network</td> <td>PCM-30 - Pulse Code Modulation 30 Channels</td> </tr> <tr> <td>E1 - European Basic Rate (2.048 Mbps)</td> <td>SF - Superframe</td> </tr> <tr> <td>ESF - Extended Superframe</td> <td>T1 - Digital Transmission Link Level 1 (1.544 Mbps)</td> </tr> </table>						AMI - Alternate Mark Inversion	HDB3 - High Density Bipolar Three	ATM - Asynchronous Transfer Mode	IDNX - Integrated Digital Network Exchange	B8ZS - Bipolar Eight Zero Substitution	Mbps - Megabits per second	C - Critical	NC - Non-Critical	CR - Capability Requirement	PCM-24 - Pulse Code Modulation 24 Channels	DISN - Defense Information Systems Network	PCM-30 - Pulse Code Modulation 30 Channels	E1 - European Basic Rate (2.048 Mbps)	SF - Superframe	ESF - Extended Superframe	T1 - Digital Transmission Link Level 1 (1.544 Mbps)
AMI - Alternate Mark Inversion	HDB3 - High Density Bipolar Three																				
ATM - Asynchronous Transfer Mode	IDNX - Integrated Digital Network Exchange																				
B8ZS - Bipolar Eight Zero Substitution	Mbps - Megabits per second																				
C - Critical	NC - Non-Critical																				
CR - Capability Requirement	PCM-24 - Pulse Code Modulation 24 Channels																				
DISN - Defense Information Systems Network	PCM-30 - Pulse Code Modulation 30 Channels																				
E1 - European Basic Rate (2.048 Mbps)	SF - Superframe																				
ESF - Extended Superframe	T1 - Digital Transmission Link Level 1 (1.544 Mbps)																				