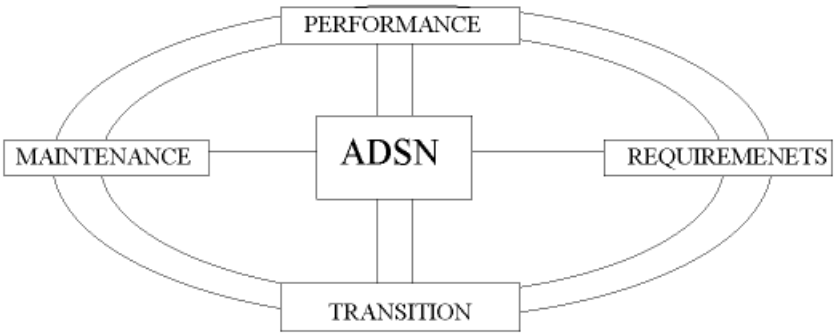
AM-TR-OAT-000037

Ameritech Digital Switching Network (ADSN)



TRANSMISSION PLAN

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Table of Contents

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FOREWORD

The ADSN (Ameritech Digital Switched Network) transmission plan provides for the transition from networks that are analog to networks that are digital.

The ADSN plan has as its genesis Bellcore coordinated Regional Digital Switched Network Transmission Plan SR-NPL-000833, which was presented to ECSA (Exchange Carrier Standards Association) - sponsored by the ANSI (American National Standards Institute) -

accredited T1 committee. The plan also provides for future interworking between ISDN (Integrated Service Digital Network) and non-ISDN portions of the network.

1. GENERAL

1.1. Purpose of Technical Report

The ADSN (Ameritech Digital Switching Network) Transmission Plan provides design objectives and requirements for an all-digital switching network. It is compatible with existing VNL (Via Net Loss) and FL (Fixed Loss) Plans and is designed to eventually replace them.

1.2. Background of Via Net Loss (VNL) Loss Plan

In the analog switching environment, the VNL trunk design concept worked well. VNL trunk designs were based on loss, noise, echo, balance and grade of service principles. Each trunk was assigned a loss value which was usually in proportion to circuit length (mileage).

1.3. ADSN Transmission Plan

The increasing use of digital facilities and switches has created the need for new standards in interoffice trunk design. The ADSN Transmission Plan has been developed to replace the VNL Plan in the digital network.

1.4. Intent of Plan

The plan distributes losses from each individual trunk to the final decode point (digital-to-analog Conversion Point) of an overall connection. A fixed loss value of 6 dB for long distance has already been universally accepted. See Figures 1 and 2.

1.5. Exceptions to Plan

The Plan will ultimately enable all digital connections to be a -6 dB overall level. However, until an all-digital network is established, there are six exceptions to the plan:

- End Office Trunks to and from a local analog tandem switch must remain at a 3 dB connection loss.
- Toll originating and toll completing trunks to an analog toll switch must also remain at a 3 dB loss as they were in pre-divestiture VNL (toll originating and toll completing are VNL terms).
- Trunk groups to Independent Telephone Companies should be designed to ADSN requirements unless otherwise requested by the Independent Telephone Company. The trunk group will then be designed using ADSN requirements at the Ameritech Operating Company end of the trunk group and use the requirements

supplied by the Independent Telephone Company at their end of the trunk group. The resulting trunk group may have asynchronous loss levels.

- Intra-Office Analog Line to Analog Line connection will remain at 0 dB loss.
- Connections via Digital Loop Carrier (DLC) may have additional loss.
- NXX Code Sharing and Co-located Analog/Digital Switches.
- DMS-10 offices (not capable of providing 6dB loss)

1.6. Benefits of ADSN

Utilize the ADSN Design on ALL TRUNKS for the following reasons:

- Test pads are not required except for toll trunks at an analog tandem.
- Simplicity of design saves time in Circuit Provisioning and in Network Operations.
- Bit Integrity is maintained.
- Digital Reference Signal (DRS) is used throughout the Network.
- If ADSN has been implemented, then design changes are not required when End Offices are converted to digital.
- There will be no contrast in level between local and toll (tandem routed) calls because all interoffice calls will have a loss of 6.0 dB.

2. TRUNK CONVERSION TO ADSN DESIGN

2.1. General

General Conversion of trunks to ADSN 6.0 dB loss design should be accomplished on a trunk-group by trunk-group basis using the following priority:

- New Digital Central Offices (CO) cutovers.
- Existing Digital CO trunk groups, digital to digital.
- Additions to Digital CO trunk groups, digital to digital.
- Existing Digital CO trunk groups, digital to analog.
- Additions to Digital CO trunk groups, digital to analog.

- Additions to Digital CO trunk groups, analog to analog.
- Existing Analog CO trunk groups, analog to analog.

2.2. New Digital CO Cutovers

New Digital CO Cutovers will be designed and cutover to ADSN specifications immediate implementation of this plan will eliminate trunk redesign for these offices.

2.2.1. Trunk Groups

Trunk groups to Independent telephone companies should be designed to ADSN requirements unless otherwise requested by the independent telephone company.

2.3. Existing Digital CO - Digital-to-Digital Trunk Groups

2.3.1. Existing Trunk Groups

Existing trunk groups will be redesigned to ADSN specifications by the Circuit Provisioning Center (CPC) and issued under a separate Circuit Layout Order (CLO).

2.3.2. Additions to Existing Trunk Groups

Trunk additions to existing groups will be designed to ADSN specifications, and when these additions are made, the existing trunks in these groups will also be uniformly updated.

2.4. Existing Digital COs - Digital-to-Analog Trunk Groups

Redesign of all remaining trunks in and out of existing digital central offices should be considered next. These trunk groups should be redesigned by CPC, and translation change orders should be prepared and issued. No physical work should be performed until CLO and Translation documents are received by Central Office Maintenance. This activity is required for all digital switch trunks groups not previously designed to the ADSN Plan. The Central Office Maintenance field personnel must be advised that the physical translations change should not be made until the Circuit Layout Records are issued to provide the corresponding transmission level. Changes should be made on one trunk group at a time. The changes must also be coordinated with all affected COs.

2.5. Analog CO Trunk Groups

The number of analog COs is declining rapidly. For this reason, redesigning trunks to ADSN specifications in the analog COs will be given the lowest priority. These trunk groups will be analyzed and redesigned only after existing digital Central Office trunk groups have been changed

to ADSN. The rate at which CPC redesigns these trunk groups will be governed by COMs ability to complete the changes in the field.

2.6. ADSN Application for Physical Facilities

Trunk groups working on physical (Direct Copper) facilities should also be designed to ADSN specifications. However, when the loss of the physical facility (without gain) and trunk circuit is less than 6 dB, the actual loss becomes the Estimated Measured Loss (EML).

3. SPECIFICATIONS

3.1. General

The following provides recommendations and specifications for implementation of the ADSN Design Plan:

- Trunks will be designed to exhibit a fixed loss of 6 dB end to end. The exceptions are listed in Paragraph 1.5.
- Intra-Office Analog Line to Analog Line connections will remain at 0 dB level. Intra-Office Digital Line (e.g., ISDN or equivalent facility) to Analog Line connection should be at -6dB level (Capacity may vary by switch vendor).
- Trunks are assumed to be switched through Digital Tandem Switches with digital integrity.
- In Combined Intra-LATA (Local Access and Transport Area) Tandem/End Office/ Switches, calls will terminate in the End Office (line side) of the terminating switch.
- No test pad testing is required at digital offices.
- When measuring trunk loss at a digital switch test position, the measuring device is treated as a line.
- Translations in End Office switches will be set to provide the recommended trunk-to-line loss and line-to-line loss.
- EML (expected Measured Loss) losses are test values, not talk connection values.
- Digital Reference Signal (DRS) will be used throughout the network. See Figure 3.

3.2. Trunk Prototype Design

Existing TIRKS (Trunk Inventory Record-Keeping System) prototype designs are still valid because they only show equipment arrangements and do not show transmission levels. The ADSN Plan effects change in transmission levels only, and does not require changes in the prototype design.

3.3. Design Requirements Illustrations

The Figures referenced below depict the recommended designs and requirements for the various types of trunk configurations:

- Figure 1 - Fixed Loss Implementation Design
- Figure 2 - Transmission Loss Implementation Design
- Figure 3 - Digital Reference Signal (DRS)
- Figure 4 - Digital Intra-Office Connection Loss
- Figure 5 - Tandem Connect Trunks
- Figure 6 - Inter-Tandem Trunks
- Figure 7 - Inter-End Office Trunks
- Figure 8 - interexchange Carrier Access Tandem Trunks
- Figure 9 - Interexchange Carrier End Office Trunks
- Figure 10 - Analog End Office to Digital Office colocated Switches (NXX Code Sharing)
- Figure 11 - Trunk Schematics Legend

Figure 1. FIXED LOSS IMPLEMENTATION DESIGN

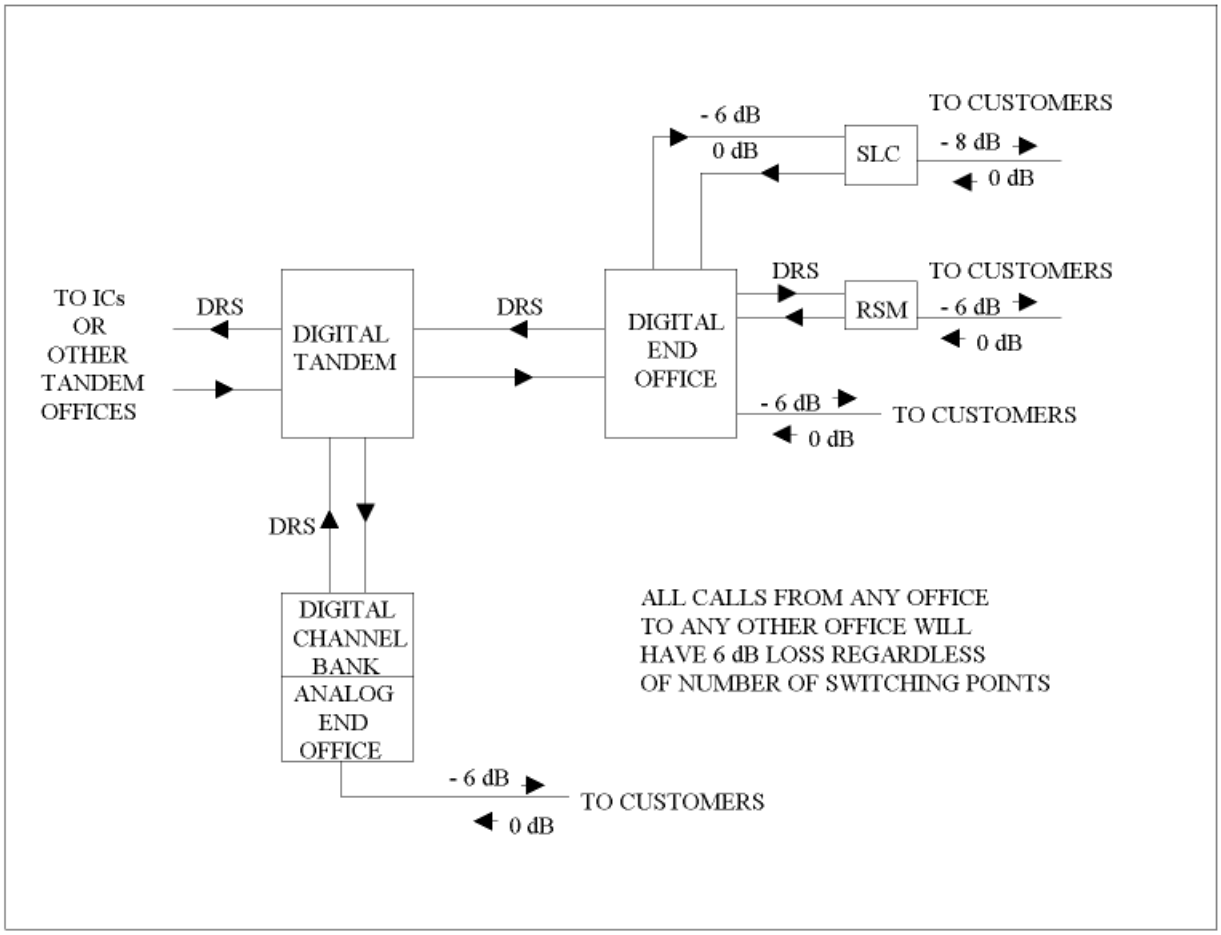


Figure 2. TRANSMISSION LOSS IMPLEMENTATION DESIGN

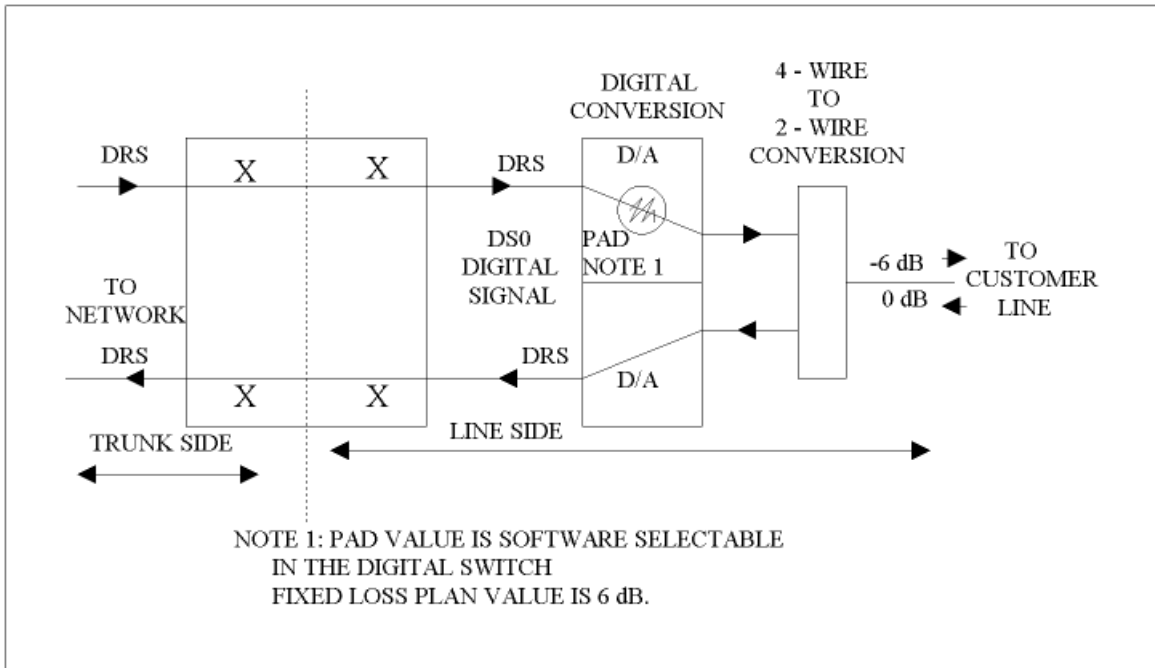


Figure 3. DIGITAL REFERENCE SIGNAL (DRS)

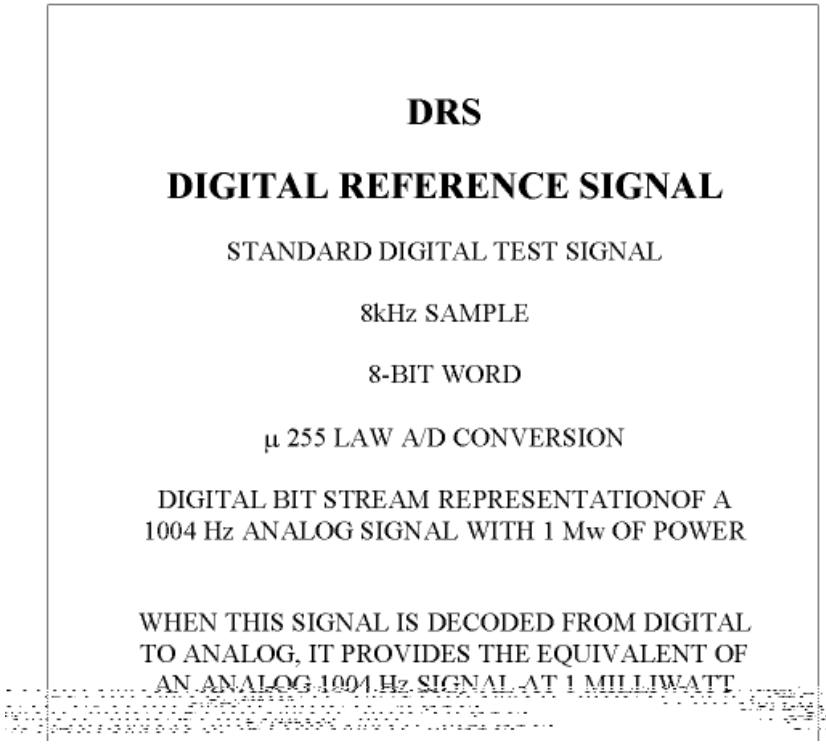


Figure 4. DIGITAL INTRA-OFFICE CONNECTION LOSS

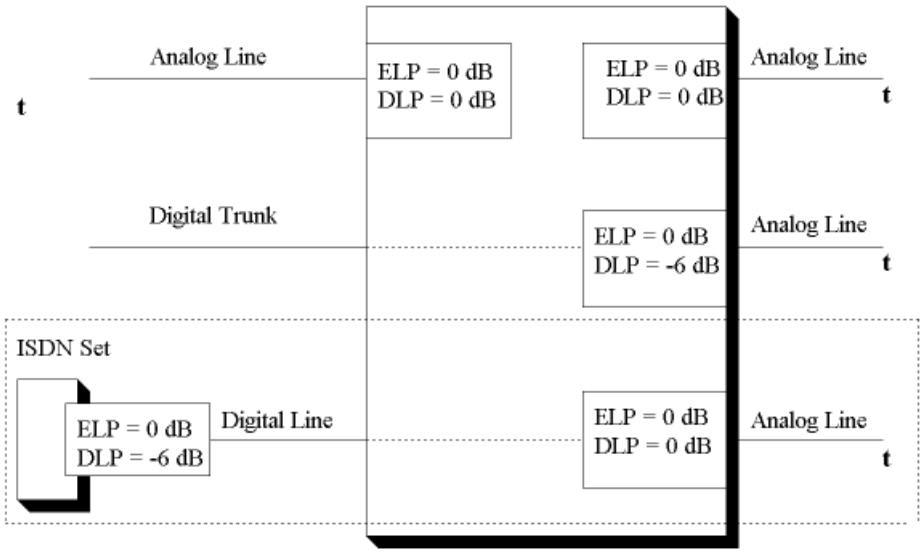


Figure 5. TANDEM CONNECTION TRUNK

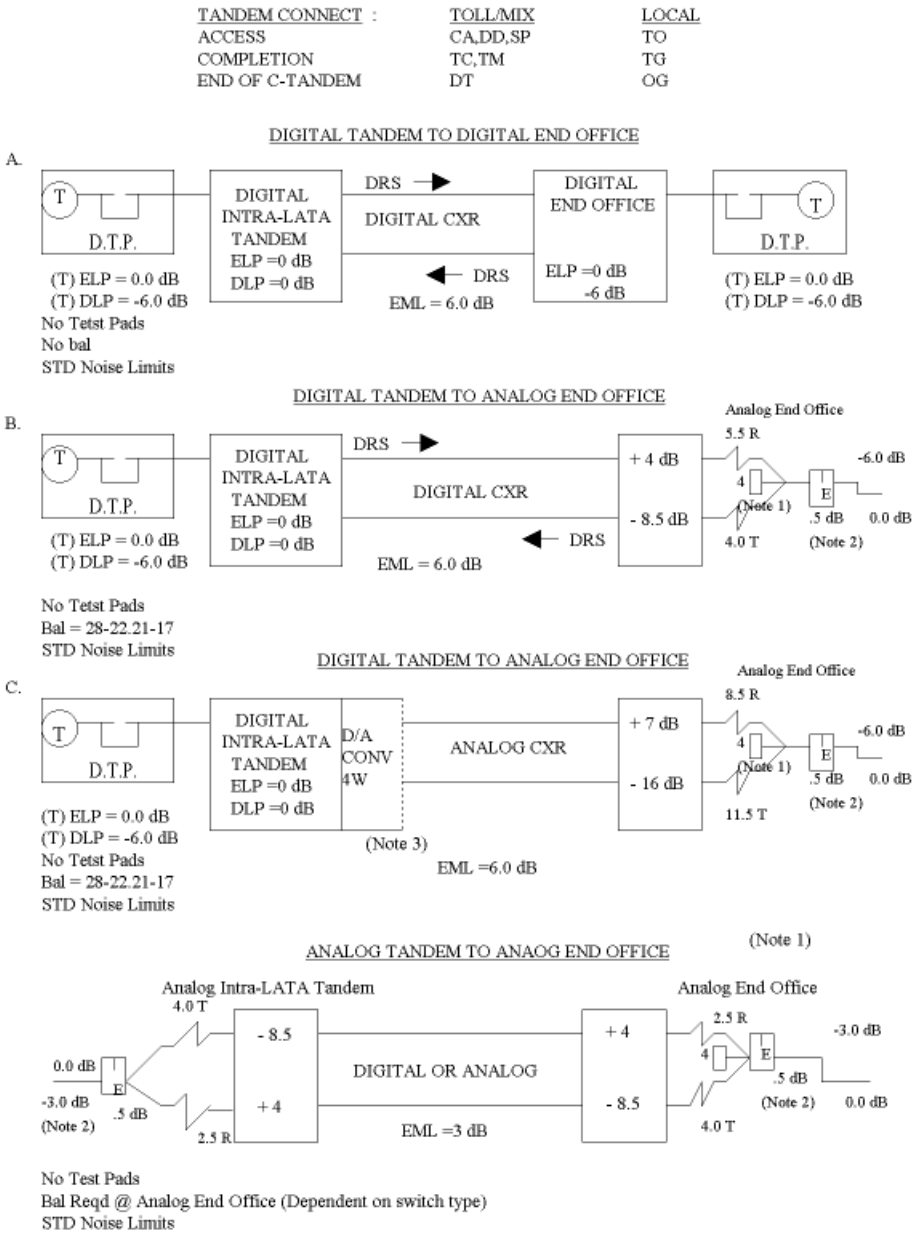


Figure 6. INTERTANDEM TRUNKS

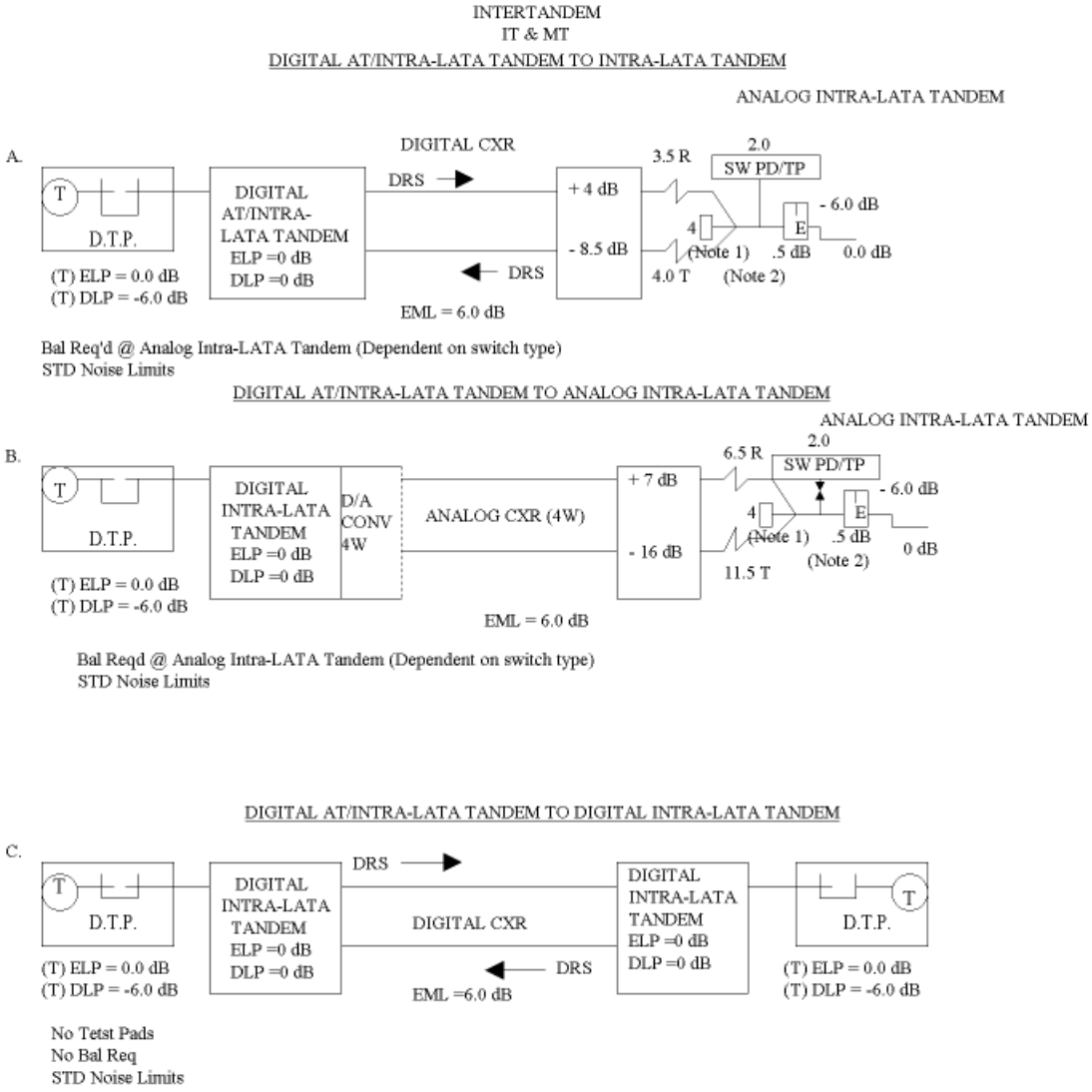


Figure 7. INTER-END OFFICE

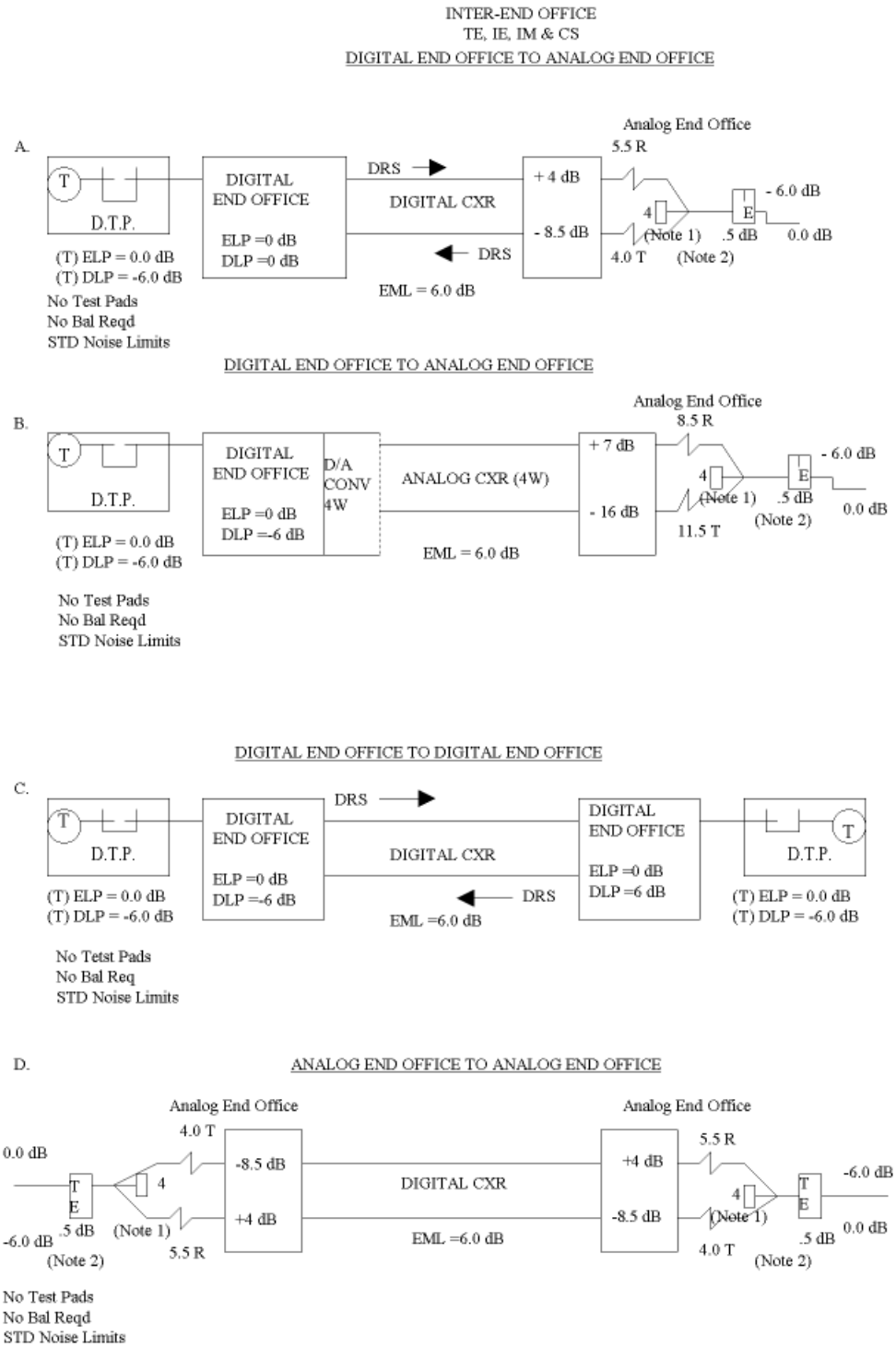


Figure 8. DIGITAL ACCESS TANDEM TO POP INTEREXCHANGE CARRIER TRUNKS

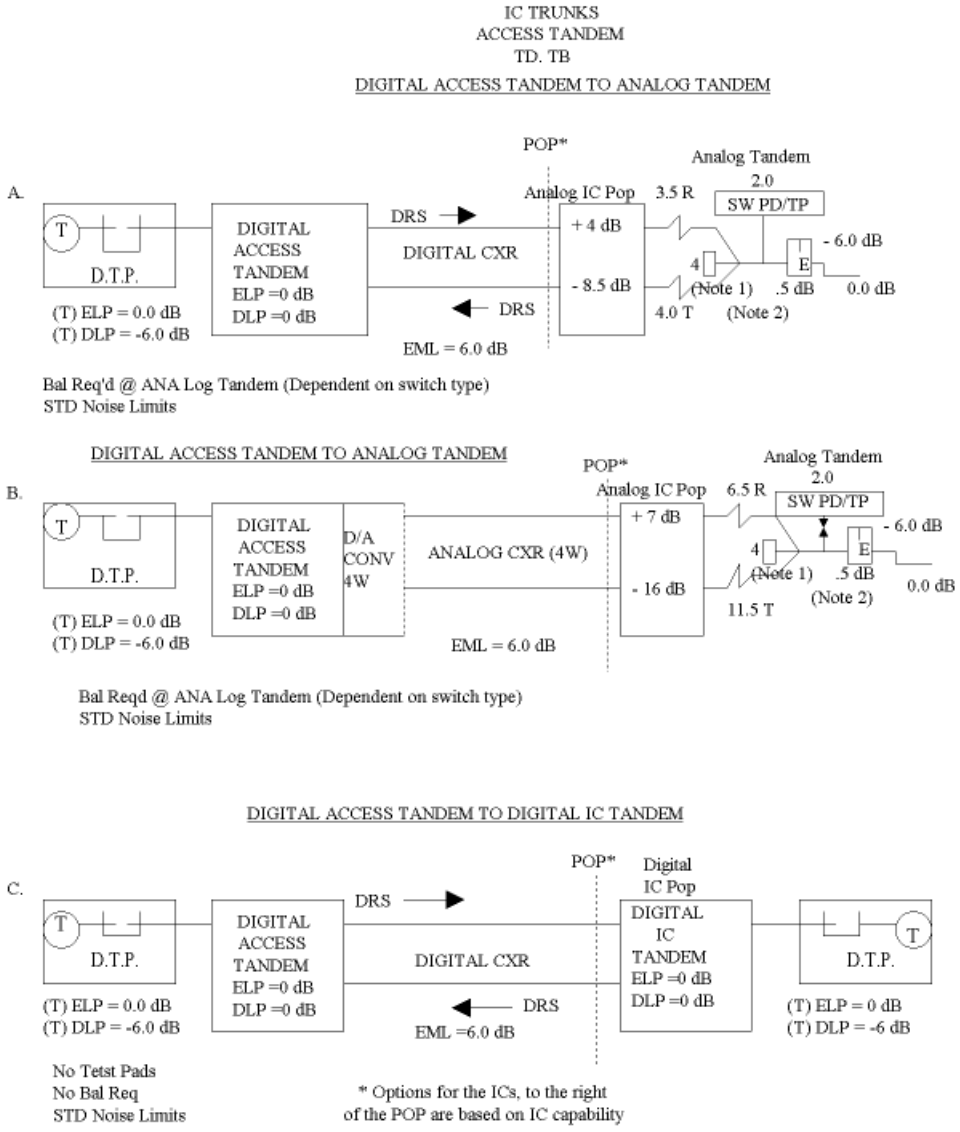


Figure 9. END OFFICE TO POP INTER-EXCHANGE CARRIER TRUNKS

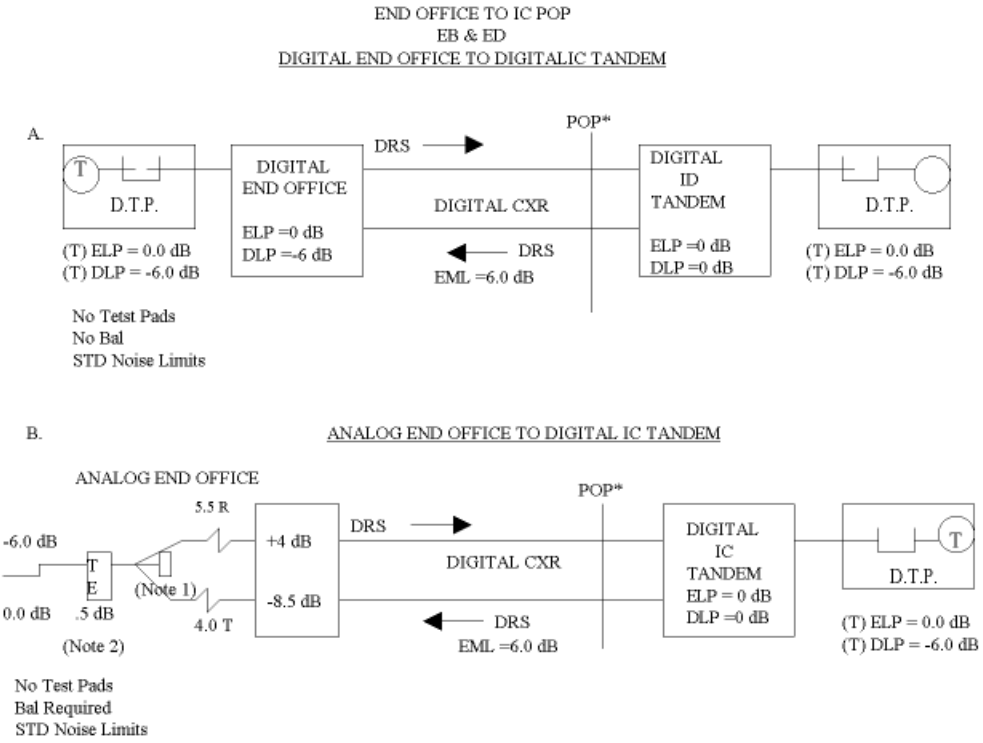


Figure 10. ANALOG END OFFICE TO DIGITAL REMOTE

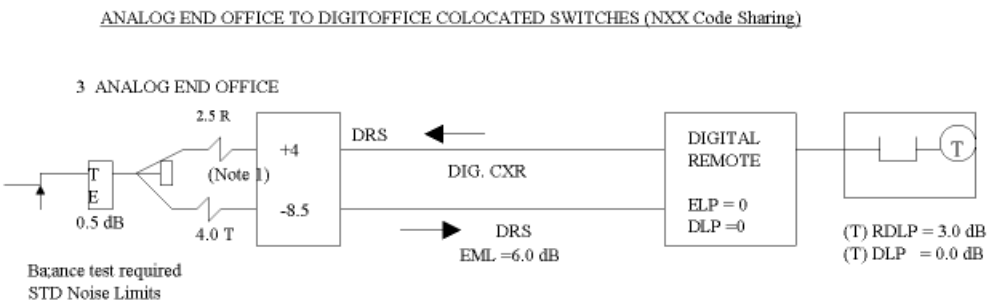
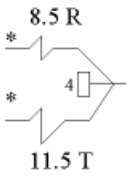


Figure 11. TRUNK SCHEMATICS LEGEND

LEGEND

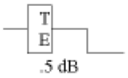
Note 1:



The 4 denotes 4 dB of Hybrid loss

* Adjustable Pad values

Note 2:

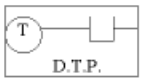


Trunk Equipment

Note 3:

Digital to Analog Converter, 4 Wire

Note 4:



Digital Test Position

ABBREVIATIONS

AT	Access Tandem	EML	Estimated Measured Loss
ELP	Encode Level Point	IC	Interexchange Carrier
DLP	Decode Level Point	ICL	Inserted Connection Loss
(T)ELP	(Test) Encode Level Point	TLP	Test Level Point
(T)DLP	(Test) Decode Level Point	TSP/RTA	Traffic Service Position/ Remote Trunking Arrangement
DMW	Digital Millwatt		
EO	End Office	DTP	Digital Test Position
ISDN	Integrated Services Digital Network	DRS	Digital Reference Signal
CXR	Carrier	POP	Point of Presence
SN PD/TP	Switch Pad Test Pad	DLC	Digital Loop Carrier

4. GLOSSARY

A/D Analog-to-Digital

ATAccess Tandem

BERBit Error Ratio

BSRFBasic System Reference Frequency

CAROTCentralized Automatic Reporting on Trunks

CCITTInternational Telegraph and Telephone Consultative Committee

CCSACCommon Channel Signaling Access Capability

CCS/SS7 Common Channel Signaling/System 7

CODECCoder/Decoder

CRCCyclic Redundancy Check

dBmCdecibels above referenced noise with C-message weighting

D/A Digital-to-Analog

DCSDigital Cross-connect System

DDDDirect Distance Dialing

DIDigital Interface

DLCDigital Loop Carrier

DLPDecode Level Point

DLUDigital Line Unit

DRSDigital Reference Signal

DTMFDual Tone Multifrequency

DTUDigital Trunk Unit

EIAElectronics Industries Association

ELPEncode Level Point

EOEnd Office

ERLEcho Return Loss

ESFExtended Super Frame

HCDSHigh Capacity Digital Service

ICInterexchange Carrier

IDLCIntegrated Digital Loop Center

IOFInteroffice Facilities

ISDNIntegrated Services Digital Network

kb/s Kilobytes per second

LATALocal Access Transport Area

LILine Interface

LIULine Interface Unit

LSOLocal Switching Office

LSSGRLATA Switching Systems Generic Requirements

LTOSLine Trunks and Off-Premises Stations

msmilliseconds

MFMultifrequency

MOSMean Opinion Score

NENetwork Element

MPWENet Present Worth of Expenditures

OSOperations Systems

OSHAOperational Safety and Health Administration

OSSGROperator Services Systems Generic Requirements

PAPrimary Access

PBXPrivate Branch Exchange

PCMPulse Code Modulation

PC-STATOC Personal Computer version of Service and Technology Analysis using Task Oriented Costing

PMOPresent Method of Operation

POTPoint-of-Termination

POTSPlain Old Telephone Service

PRSPrimary Reference Source

PSDSPublic Switched Digital Access

PSNPublic Switched Network

RDLRemote Digital Line

RDSNRemote Digital Switched Network

ROLRReceive Objective Loudness Rating

RSMRemote Switching Module

RSURemote Switching Unit

RTRemote Terminal

SCCSSwitching Control Center System

SESSeverely Errored Seconds

SMETDSStandard Message Trunk Design System

SSCSpecial Service Center

SSFSpecial Service Forecast

STPSignal Transfer Point

SXSStep by Step

TCTToll/Tandem Connecting Trunk

TIUTrunk Interface Unit

TLPTransmission Level Point

TOLRTransmit Objective Loudness Rating

TPMSTransmission Performance Monitoring System

TP00-dB Test Pad

TP22-dB Test Pad

TP33-dB Test Pad

TSITime Slot Interchange

TTRKTie Trunk

UDLCUniversal Digital Loop Carrier

VNLVia Net Loss

5XB No. 5 Crossbar

REFERENCES

1. *Region Digital Switched Network*, Special Report SR-NPL-000833, Bell Communications Research, December 1988.

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3. *Notes on the BOC IntraLATA Networks*, Technical Reference TR-NPL-000275, Bell Communications Research, Issue 1, April 1986.

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5. *Switched exchange Access Standard*, T1.506-1898.

6. TA-NPL-000908 *RDSN Switch General Requirements, 1989.*

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