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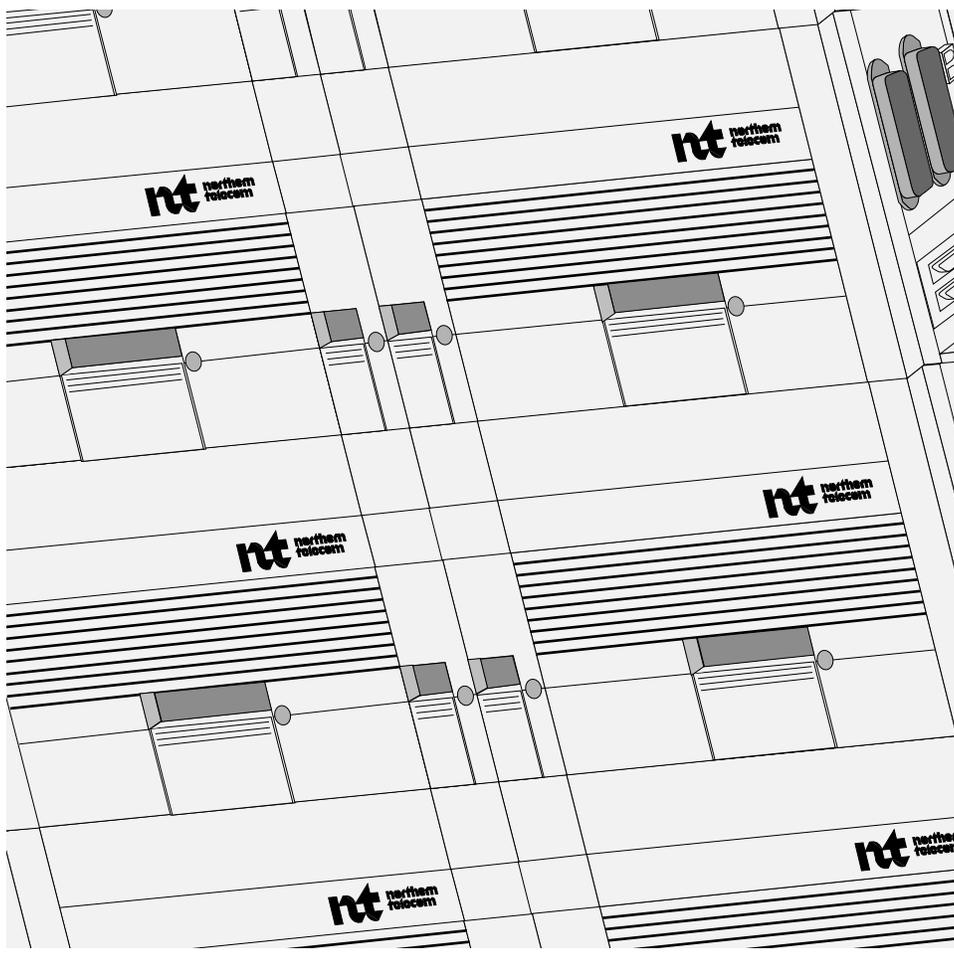
323-3001-180

SONET Products

AccessNode

System Specifications

Issue 1.0 February 1999



NORTEL
NETWORKS™

SONET Products

AccessNode

System Specifications

Publication number: 323-3001-180

Document release: Issue 1.0

Date: February 1999

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Printed in Canada

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Publication history

February 1999

AN16 Standard release of the document, Issue 1.0.

October 1998

AN16 standard release of the document, Issue 1.0. Updated Chapter 2 and Chapter 6 for cooling unit changes.

June 1998

AN15 Standard 01.01 release of the document. For this release, the following information was added:

- updates and clarifications to information in Chapter 3 regarding maximum temperatures

September 1997

AN14 Standard 01.01 release of the document. For this release, the following information has been added:

- reference to grounding and battery isolation to Chapter 6
- GR-303 information to Chapter 7

July 1996

AN12 Standard 01.01 release of the document. The following information has been added to support VTBM rings and other AN12 functionality:

- specifications for OC-12 VT manager optical interface circuit pack (NT7E05) in Chapter 1
- system gain for the OC-12 VT manager optical interface circuit pack (NT7E05) in Chapter 1
- power consumption of AccessNode common equipment and line cards in Chapter 6
- control network specifications in Chapter 7)
- network synchronization for the OC-12 VT manager optical interface circuit pack (NT7E05) in Chapter 9
- protection switching features for VTBM rings in Chapter 11
- updates to integrated remote test unit (IRTU) specifications in Chapter 14

- updates for FST-in-a-bay configurations in Chapter 17

November 1995

AN12 Standard 02.01 release of the document for both North American and Hong Kong systems.

April 1995

AN10 Standard release of the document.

December 1994

AN08 Standard release of the document.

November 1994

Reissue of AN07 Standard.

April 1994

AN07 Standard release of the document.

May 1993

FWP06 Standard release of the document.

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About this document

This document is written for planners and engineers who require technical specifications for the AccessNode hardware. This document is written for the current release for both North American and Hong Kong systems.

The AccessNode system is modeled according to Bellcore document TR-TSY-000303, Issue 1, Rev. 1, and TR-TSY-000057, Issue 1, Supplement 2.

Audience

The intended audience for this document includes the following groups:

- strategic and current planners
- provisioners
- transmission engineers
- network administrators

How to use this document

The chapters in this document provide the technical specifications for AccessNode common-equipment and bays. It also provides specifications for other enclosures such as modular business packages (MBP) and Series 800A outside plant (OSP) cabinets.

For additional specifications of the other enclosures, see the following appendices:

- Appendix A, “MBP specifications”
- Appendix B, “S800A OSP cabinet specifications”

Note: For information about AccessNode Express, see *Configuration and Equipment Description*, 323-3051-100, in the *AccessNode Express* volume.

References in this document

This document refers to the following documents.

Northern Telecom documents

- Northern Telecom Corporate Standard 1523.01, Section D.1
- *Addendum 1 to Site Installation Planning and Engineering Manual*, 323-3001-200

Bell Communications Research (Bellcore) documents

- GR-253-CORE, SONET Transport Systems, Generic Requirements
- TA-NPL-000436, “Digital Synchronization Network Plan,” Issue 1
- TA-TSY-000078, Issue 2
- TR-EOP-000063, “Network Equipment Building Systems (NEBS),” Generic Equipment Requirements, issue 1, section 4.3, and 4.3.3
- TR-NWT-001089, Issue 1, 1991
- TR-TSY-000057, “Functional Criteria for Digital Loop Carrier Systems”
- TR-TSY-000303, “Integrated Digital Loop Carrier Systems,” Generic Requirements, Objectives and Interface
- TR-TSY-000499, “Transport Systems Generic Requirements”

Underwriter Laboratories documents

- Underwriter Laboratories, standard “UL1459” (Telephone Equipment)
- Underwriter Laboratories, standard “UL478” (Standard for Safety— Information Processing and Business Equipment)

Documents from other organizations

- ANSI T1.102-1987
- Bell Canada DS-8465, Issue 2, 1989
- Canadian Standards Association, standard “CSA 22.2 #7” (Equipment Electrically Connected to a Telecommunication Network)
- Exchange Carrier Standards Association (ECSA) T1X1.4.
- Department of Health, Education and Welfare, Bureau of Radiological Health (BRH), 21 CFR 1040.10
- Interexchange Carrier (IEC) Draft 58
- Laser safety performance per 21 CFR, Chapter 1, Subchapter J, as a Class 1 laser product.
- Part 1910—Occupational Safety and Health Standards, (Title 29—Labor, Chapter XVII-OSHA, Dept. of Labor)
- Rural Electrification Administration (REA) Bulletin, 345-185
- Telecom Canada, Technical Specification for FOTS

Optical interface

This chapter lists the optical signaling specifications for OC-3 and OC-12 optical interface circuit packs.

Chapter contents

This chapter contains the following information:

Topic	See
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SONET format	page 1-1
Interface	page 1-1
OC-3 specifications - NT7E01 circuit packs	page 1-2
OC-12 specifications - NT7E02 circuit packs	page 1-5
OC-12 VTBM specifications - NT7E05 circuit packs	page 1-7

Note: For information about AccessNode Express, see *Configuration and Equipment Description*, 323-3051-100, in the *AccessNode Express* volume.

Rates and format

AccessNode conforms to the SONET rates and format specifications as standardized by the Exchange Carrier Standards Association (ECSA) T1X1.4.

SONET format

AccessNode conforms to the synchronous optical network (SONET) specifications, which define standard optical signals and synchronous frame format for multiplexed digital traffic and operation functions.

Interface

AccessNode conforms to the SONET single-mode optical interface specifications.

OC-3 specifications - NT7E01 circuit packs

This section contains specifications for OC-3 optical circuit pack interfaces (NT7E01xx).

OC-3 transmitter specifications (BER = 10⁻¹⁰)

Table 1-1 lists the transmitter specifications for the AccessNode OC-3 optical circuit packs.

**Table 1-1
OC-3 optical interface circuit pack specifications**

General	1310 nm Intermediate reach NT7E01DA/DB/DC/DD	1310 nm Long reach NT7E01CA/CB/CC/CD
Temperature controller FCC classification	Thermoelectric cooler IIIB	Thermoelectric cooler IIIB
Connector types	Biconic FC-PC ST/PC SC	Biconic FC-PC ST/PC SC
Pigtail General fiber type Class of fiber Mode-field diameter	Single mode Single mode 9.5 μm	Single mode Single mode 9.5 μm
Optical source Device type Material composition	MLM GaAs	MLM GaAs
Spectral characteristics Nominal central wavelength Spectral width Spectral width Central wavelength range (λ _{t min} -λ _{t max})	1310 nm (λ _{t nom}) 5 nm (Δλ _{MSTM}) 7.7 nm (Δλ _{RMS}) 1260-1360 nm	1310 nm (λ _{t nom}) 5 nm (Δλ _{MSTM}) 4 nm (Δλ _{RMS}) 1280-1335 nm
Optical signal Line rate Line code Extinction ratio (R _{E min})	OC-3 (155.52 Mb/s) NRZ 8.2 dB	OC-3 (155.52 Mb/s) NRZ 10 dB
Optical power Guaranteed launch power (P _{T min}) Maximum launch power (P _{T max})	-15 dBm -8 dBm	-5.0 dBm 0 dBm

OC-3 receiver specifications (BER = 10^{-10})

Table 1-2 lists the receiver specifications for the AccessNode OC-3 optical circuit packs.

Table 1-2
OC-3 optical interface receiver specifications

Specification	1310 nm Intermediate reach NT7E01DA/DB/DC/DD	1310 nm Long reach NT7E01CA/CB/CC/CD
General		
Temperature controller	Thermoelectric cooler	Thermoelectric cooler
Connector types		
	Biconic	Biconic
	FC-PC	FC-PC
	ST/PC	ST/PC
	SC	SC
Pigtail		
General fiber type	Multimode	Multimode
Optical detector		
Device type	PIN	APD
Material composition	InGaAs	III-V
Spectral characteristics		
Nominal central wavelength	1265-1355 nm (λ_t nom)	1280-1335 nm (λ_t nom)
Optical signal		
Line rate	OC-3 (155.52 Mb/s)	OC-3 (155.52 Mb/s)
Line code	NRZ	NRZ
Overload level (P_R max) Note 1	-8.0 dBm	-10.0 dBm
Damage level (Note 2)	N/A	-6.0 dBm
Maximum receiver reflectance	-14.0 dB	-14.0 dB
Optical path penalty (max) Note 3	1.0 dB	1.0 dB
Optical power		
Guaranteed receiver sensitivity (P_R min) Note 4	-28.0 dBm	-34.0 dBm
<p>Note 1: Miniature variable optical attenuators (mVOAs) may be required at the receiver depending on the link loss. Overload level is the maximum received optical power for which BER of 10^{-10} and all jitter tolerance specifications are met.</p> <p>Note 2: The damage level is the maximum optical power for which no long term damage to the components will occur.</p> <p>Note 3: The optical path penalty includes degradations in performance due to dispersions, reflections and optical jitter consistent with the requirements of Bellcore Specification TA-NWT-000253, Issue 2.</p> <p>Note 4: These are worst-case parameters, which include connector losses, aging, equipment impairments due to implementation, and temperature degradation. This presents the power level measured at the station fiber on the link side of the connector.</p>		

1-4 Optical interface

OC-3 guaranteed system gain (BER = 10^{-10})

Table 1-3 lists the guaranteed system gain specifications for the AccessNode OC-3 optical circuit packs.

**Table 1-3
OC-3 optical interface guaranteed system gain specifications**

Specification	1310 nm Intermediate reach NT7E01DA/DB/DC/DD	1310 nm Long reach NT7E01CA/CB/CC/CD
Attenuation	0 to 12 dB	10 to 28 dB
Optical return loss	14 dB	24 dB
Dispersion	96 ps/nm	185 ps/nm
Guaranteed launch power ($P_{T \min}$)	-15 dBm	-5.0 dBm
Maximum transmit power ($P_{T \max}$)	-8.0 dBm	0.0 dBm
Receiver sensitivity ($P_{R \min}$)	-28.0 dBm	-34.0 dBm
Maximum receiver power ($P_{R \max}$)	-8.0 dBm	-10.0 dBm
Receiver damage level	N/A	N/A
Guaranteed system gain ($G = P_{T \min} - P_{R \min}$) See note	13.0 dB	29.0 dB
<p>Note: These are worst-case parameters, which include connector losses, aging, equipment impairments due to implementation, and temperature degradation. These specifications do not include the customer unallocated link margin or the optical path penalty.</p>		

OC-12 specifications - NT7E02 circuit packs

This section contains specifications for OC-12 optical circuit pack interfaces (NT7E02xx). All parameters apply on the line side of the optical connector, as specified in Bellcore specification TR-NWT-000253, Issue 2.

OC-12 transmitter specifications (BER = 10^{-10})

Table 1-4 lists the transmitter specifications for the AccessNode OC-12 optical circuit packs.

Table 1-4
OC-12 optical interface transmitter specifications

General	1310 nm Intermediate reach NT7E02LA/LB/LC/LD	1310 nm Long reach NT7E02KA/KB/KC/KD
Temperature controller FCC classification	Thermoelectric cooler IIIB	Thermoelectric cooler IIIB
Connector types	Biconic SC ST/PC FC/PC	Biconic SC ST/PC FC/PC
Pigtail		
General fiber type	Single mode	Single mode
Class of fiber	Single mode	Single mode
Mode-field diameter	9.5 μm	9.5 μm
Optical source		
Device type	MLM	MLM
Material composition	GaAs	GaAs
Spectral characteristics		
Nominal central wavelength	1310 nm ($\lambda_{t \text{ nom}}$)	1310 nm ($\lambda_{t \text{ nom}}$)
Spectral width	2.5 nm ($\Delta\lambda_{\text{RMS}}$)	2 nm ($\Delta\lambda_{\text{RMS}}$)
Central wavelength range ($\lambda_{t \text{ min}}-\lambda_{t \text{ max}}$)	1295-1325 nm	1300-1325 nm
Optical signal		
Line rate	OC-12 (622.08 Mb/s)	OC-12 (622.08 Mb/s)
Line code	NRZ	NRZ
Extinction ratio ($R_{E \text{ min}}$)	8.2 dB	10 dB
Maximum tolerable optical reflection	-10 dB	-10 dB
Optical power		
Guaranteed launch power ($P_{T \text{ min}}$)	-4.5 dBm	-3.0 dBm
Maximum launch power ($P_{T \text{ max}}$)	1.5 dBm	2.0 dBm

OC-12 receiver specifications (BER = 10⁻¹⁰)

Table 1-5 lists the receiver specifications for the AccessNode OC-12 optical circuit packs.

**Table 1-5
OC-12 optical interface receiver specifications**

General	1310 nm Intermediate reach NT7E02LA/LB/LC/LD	1310 nm Long reach NT7E02KA/KB/KC/KD
Connector types	Biconic SC ST/PC FC/PC	Biconic SC ST/PC FC/PC
Pigtail General fiber type	Multimode	Multimode
Optical detector Device type Material composition	PIN InGaAs	APD III-V
Spectral characteristics Wavelength range	1265 - 1355 nm	1300 - 1320 nm
Optical signal Line rate Line code Overload level (P _R max) Note 1 Damage level (Note 2) Maximum receiver reflectance Optical path penalty (max) Note 3	OC-12 (622.08 Mb/s) NRZ -4.0 dBm N/A -14.0 dB 1.0 dB	OC-12 (622.08 Mb/s) NRZ -7.0 dBm -6.0 dBm -14.0 dB 1.0 dB
Optical power Guaranteed receiver sensitivity (P _{R min}) (Note 4) Guaranteed receiver sensitivity (G = P _{T min} - P _{R min})	-24.5 dBm -20.0 dBm	-32.0 dBm -29.0 dBm
<p>Note 1: Miniature variable optical attenuators (mVOAs) may be required at the receiver depending on the link loss. Overload level is the maximum received optical power for which BER of 10⁻¹⁰ and all jitter tolerance specifications are met.</p> <p>Note 2: The damage level is the maximum optical power for which no long term damage to the components will occur.</p> <p>Note 3: The optical path penalty includes degradations in performance due to dispersions, reflections and optical jitter consistent with the requirements of Bellcore Specification TR-NWT-000253, Issue 2.</p> <p>Note 4: These are worst-case parameters, which include connector losses, aging, equipment impairments due to implementation, and temperature degradation. This presents the power level measured at the station fiber on the link side of the connector.</p>		

OC-12 guaranteed system gain (BER = 10^{-10})

Table 1-6 lists the guaranteed system gain specifications for the AccessNode OC-12 optical circuit packs.

Table 1-6
OC-12 optical interface guaranteed system gain specifications

General	1310 nm Intermediate reach NT7E02LA/LB/LC/LD	1310 nm Long reach NT7E02KA/KB/KC/KD
Attenuation	5.5 to 19 dB	9 to 28 dB
Optical return loss	20 dB	20 dB
Dispersion	74 ps/nm	92 ps/nm
Guaranteed launch power ($P_{T \min}$)	-4.5 dBm	-3.0 dBm
Receiver sensitivity ($P_{R \min}$)	-24.5 dBm	-32.0 dBm
Guaranteed system gain ($G = P_{T \min} - P_{R \min}$)	20.0 dB	29.0 dB
See note		
Note: These are worst-case parameters, which include connector losses, aging, equipment impairments due to implementation, and temperature degradation. These specifications do not include the customer unallocated link margin or the optical path penalty.		

OC-12 VTBM specifications - NT7E05 circuit packs

This section contains specifications for OC-12 virtual tributary bandwidth manager (VTBM) optical circuit pack interfaces (NT7E05.xx). All parameters apply on the line side of the optical connector as specified in Bellcore Specification TR-NWT-000253, Issue 2.

OC-12 VTBM circuit pack support for OC-3c tributaries

The following VTBM circuit packs do not support OC-3c (concatenated) tributaries:

- intermediate-reach models NT7E05BB/BC/BD
- long-reach models NT7E05AB/AC/AD

For OC-3c tributary support, order the following models:

- intermediate-reach NT7E91005BF/BG/BH
- long-reach NT7E05AF/AG/AH

For ordering information, see *Engineering and Ordering Information*, 323-3001-032, in *Engineering, Configuration, and Ordering Guide*, Volume 1.

OC-12 VTBM transmitter specifications (BER = 10^{-10})

Table 1-7 lists the transmitter specifications for the AccessNode VTBM OC-12 optical circuit packs.

Table 1-7
OC-12 VTBM optical interface transmitter specifications

General	Intermediate reach NT7E05BB/BC/BD NT7E05BF/BG/BH	Long reach NT7E05AB/AC/AD NT7E05AF/AG/AH
Temperature controller	Uncooled	Thermoelectric cooler
FCC classification	I	IIIB
Connector types	FC/PC ST/PC SC	FC/PC ST/PC SC
Pigtail		
General fiber type	Single mode	Single mode
Class of fiber	Single mode	Single mode
Mode-field diameter	9.5 μm	9.5 μm
Optical source		
Device type	MLM	MLM
Material composition	InGaAsP	InGaAsP
Spectral characteristics		
Nominal central wavelength	1310 nm ($\lambda_{t \text{ nom}}$)	1310 nm ($\lambda_{t \text{ nom}}$)
Spectral width	2.5 nm ($\Delta\lambda_{\text{RMS}}$)	2 nm ($\Delta\lambda_{\text{RMS}}$)
Central wavelength range ($\lambda_{t \text{ min}}-\lambda_{t \text{ max}}$)	1274-1356 nm	1300-1325 nm
Optical signal		
Line rate	OC-12 (622.08 Mb/s)	OC-12 (622.08 Mb/s)
Line code	NRZ	NRZ
Extinction ratio ($r_{e \text{ min}}$)	8.2 dB	10 dB
Maximum tolerable optical reflection	-10 dB	-10 dB
Optical power		
Guaranteed launch power ($P_{T \text{ min}}$)		
- midspan meet	-15 dBm	-3.0 dBm
- NT-NT proprietary (Note)	-15 dBm	-1.5 dBm
Maximum launch power ($P_{T \text{ max}}$)	-8 dBm	+2.0 dBm
Note: The NT-NT proprietary values apply if Nortel Networks equipment is in use at each end.		

OC-12 VTBM receiver specifications (BER = 10^{-10})

Table 1-8 lists the receiver specifications for the AccessNode VTBM OC-12 optical circuit packs.

Table 1-8
OC-12 VTBM optical interface receiver specifications

General	Intermediate reach NT7E05BB/BC/BD NT7E05BF/BG/BH	Long reach NT7E05AB/AC/AD NT7E05AF/AG/AH
Connector types	FC/PC ST/PC SC	FC/PC ST/PC SC
Pigtail General fiber type	Multimode	Multimode
Optical detector Device type Material composition	PIN InGaAs	PIN InGaAs
Spectral characteristics Wavelength range	1274 - 1356 nm	1300 - 1325 nm
Optical signal Line rate Line code Overload level (P_R max) (Note 1) - midspan meet (Note 2) - NT-NT proprietary (Note 6) Damage level (Note 3) Maximum receiver reflectance Optical path penalty (max) (Note 4)	OC-12 (622.08 Mb/s) NRZ -8.0 dBm 0 dBm N/A N/A 1.0 dB	OC-12 (622.08 Mb/s) NRZ -8.0 dBm 0 dBm N/A -14.0 dB 1.0 dB
Optical power Guaranteed receiver sensitivity (P_R min) (Note 5) - midspan meet - NT-NT proprietary (Note 6) Maximum receiver power (P_R max)	-28.0 dBm -28.0 dBm -8.0 dBm	-28.0 dBm -29.5 dBm -8.0 dBm
Note 1: Miniature variable optical attenuators (mVOAs) may be required at the receiver depending on the link loss for long reach. Overload level is the maximum received optical power for which BER of 10^{-10} and all jitter tolerance specifications are met.		
Note 2: Fiber patch cords without mVOAs are required on the receive end of OC-12 VTBM intermediate reach optical circuit packs for use with normal traffic. Fiber patch cords with mVOAs are used with intermediate-reach models only when testing the optical circuit packs.		
Note 3: The damage level is the maximum optical power for which no long term damage to the components will occur.		
—continued—		

Table 1-8 (continued)
OC-12 VTBM optical interface receiver specifications

<p>Note 4: The optical path penalty includes degradations in performance due to dispersions, reflections and optical jitter consistent with the requirements of Bellcore Specification TR-NWT-000253, Issue 2.</p> <p>Note 5: These are worst-case parameters which include connector losses, aging, equipment impairments due to implementation, and temperature degradation. This presents the power level measured at the station fiber on the link side of the connector.</p> <p>Note 6: The NT-NT proprietary values apply if Nortel Networks equipment is in use at each end.</p>
—end—

OC-12 VTBM guaranteed system gain (BER = 10⁻¹⁰)

Table 1-9 lists the guaranteed system gain specifications for the AccessNode VTBM OC-12 optical circuit packs.

Table 1-9
OC-12 VTBM optical interface guaranteed system gain specifications

General	Intermediate reach NT7E05BB/BC/BD NT7E05BF/BG/BH	Long reach NT7E05AB/AC/AD NT7E05AF/AG/AH
Attenuation	0 to 12 dB	10 to 24 dB
Optical return loss	N/A	20 dB
Dispersion	74 ps/nm	92 ps/nm
Guaranteed launch power (P _{T min})		
- midspan meet	-15 dBm	-3.0 dBm
- NT-NT proprietary (Note 2)	-15 dBm	-1.5 dBm
Receiver sensitivity (P _{R min})		
- midspan meet	-28.0 dBm	-28.0 dBm
- NT-NT proprietary (Note 2)	-28.0 dBm	-29.5 dBm
Guaranteed system gain (G = P _{T min} - P _{R min}) (Note 1)	13.0 dB	28.0 dB
- midspan meet	13.0 dB	28.0 dB
- NT-NT proprietary (Note 2)		
<p>Note 1: These are worst-case parameters, which include connector losses, aging, equipment impairments due to implementation, and temperature degradation. These specifications do not include the customer unallocated link margin or the optical path penalty.</p> <p>Note 2: The NT-NT proprietary values apply if Nortel Networks equipment is in use at each end.</p>		

Physical

This chapter contains size and weight specifications for AccessNode bays.

Chapter contents

This chapter contains the following information:

Topic	See
Floor loading requirements	page 2-1
Bay frame dimensions	page 2-2
Shelf dimensions	page 2-2
Local craft access panel and cooling unit dimensions	page 2-3
Equipment weight	page 2-3

For size and weight specifications for other enclosures, see the following appendices:

- “Appendix A: MBP specifications”
- “Appendix B: S800A OSP cabinet specifications”

Floor loading requirements

To determine the maximum allowable weight of a fully loaded frame, use a floor loading of 730 kg/m² (150 lb/ft²).

Bay frame dimensions

Table 2-1 lists the bay frame dimensions.

Table 2-1
AccessNode bay frame dimensions

Dimension	Value
Width	659 mm (26.0 in.)
Depth	305 mm (12.0 in.)
Height	2130 mm (84.0 in.) 2743 mm (108 in.) 3505 mm (138 in.)
Clearance between uprights	546 mm (21.5 in.)
Horizontal mounting centers	566 mm (22.3 in.)
Base height	131 mm (5.15 in.)
Vertical mounting space	1930 mm (76.0 in.) excluding 25 mm (1.0 in.) for air filter panel

Shelf dimensions

This section provides the dimensions of the shelf.

Common-equipment shelf

Table 2-2 lists the common equipment shelf dimensions.

Table 2-2
Common equipment shelf dimensions

Dimension	Value
Width	533 mm (21.0 in.)
Depth	305 mm (12.0 in.)
Height	419 mm (16.5 in.)

Copper-distribution shelf

Table 2-3 lists the copper-distribution shelf dimensions.

Table 2-3
Copper-distribution shelf dimensions

Dimension	Value
Width	541 mm (21.3 in.)
Depth	305 mm (12.0 in.)
Height	176 mm (6.96 in.)

Local craft access panel and cooling unit dimensions

Table 2-4 lists the local craft access panel and cooling unit dimensions.

Table 2-4
Local craft access panel and cooling unit dimensions

Dimension	Value
Width	533 mm (21.0 in.)
Depth	305 mm (12.0 in.)
Height	178 mm (7.0 in.)

Equipment weight

Table 2-5 lists the common equipment weights.

Table 2-5
Common equipment weights

Item	Value
Bay frame (empty)	
2130 mm (84.0 in.) frame:	70 kg (154 lb)
2743 mm (108 in.) frame:	107 kg (237 lb)
3505 mm (138 in.) frame:	128 kg (283 lb)
Common-equipment shelf (empty)	16.5 kg (36 lb)
Common-equipment shelf (fully loaded)	33.6 kg (73.8 lb)
Breaker interface panel	10.5 kg (23 lb)
Copper-distribution shelf (no circuit packs)	14.6 kg (32 lb)
Copper-distribution shelf (fully loaded)	24.5 kg (54 lb)
Local craft access panel and cooling unit shelf (with filter tray)	19.8 kg (44 lb)

Environmental

This chapter contains environmental specifications for operating, shipping, and storing AccessNode equipment.

Chapter contents

This chapter contains the following information:

Topic	See
Temperature and humidity specifications for AccessNode bays and modular business package configurations	page 3-2
Temperature and humidity specifications for AccessNode bays and modular business package configurations	page 3-2
Altitude derating (operating)	page 3-4
Shipping and storage altitude	page 3-4
Atmospheric dust	page 3-4
Operations Controller (OPC) (NT7E24)	page 3-4
IRTU environmental specifications	page 3-5

Temperature and humidity specifications for AccessNode bays and modular business package configurations

This section describes the temperature and humidity ranges for the AccessNode. It covers the specifications for central office and for customer-located equipment.

These specifications cover the following equipment:

- AccessNode
- Modular Business Package (MBP)
- Remote Fiber Terminal (RFT)
- Fiber Central Office Terminal (FCOT)

These specifications *do not* cover the following equipment:

- AccessNode Express
- Operations Controller (OPC)
- Integrated Remote Testing Unit (IRTU)

Temperature and humidity

Table 3-1 lists the AccessNode temperature and humidity specifications.

Table 3-1
Temperature and humidity specifications

Specifications	CO and customer located equipment Includes all bays, MBPs, and indoor wall-mount products		Outside plant (see Note 3) Includes S800A and ModCab	
	Limits	Meets or exceeds specifications	Limits	Meets or exceeds specifications
Continuous operating temperature	+5°C to +40°C	Bellcore GR-63-CORE, Issue 1	-40°C to +46°C (plus solar load)	Bellcore GR-487-CORE, Issue 1 and TR-TSY-000487, Issue 1
Continuous operating relative humidity (see Note 2)	5% to 85%	Bellcore GR-63-CORE, Issue 1	5% to 95%	Bellcore TR-TSY-000487, Issue 1
Short-term operating temperature (see Note 1)	-40°C to +50°C	Bellcore GR-63-CORE, Issue 1	N/A	N/A
Short-term operating relative humidity (see Notes 1 and 2)	5% to 90%	Bellcore GR-63-CORE, Issue 1	N/A	N/A
Shipping and storage temperature	-40°C to +70°C	Bellcore GR-63-CORE, Issue 1	-40°C to +60°C (see Note 4)	Bellcore GR-487-CORE, Issue 1
Shipping and storage relative humidity (see Note 2)	95% (at 40°C)	Bellcore GR-63-CORE, Issue 1	95% (at 60°C) (see Note 4)	Bellcore GR-487-CORE, Issue 1 and TR-TSY-000487, Issue 1

Note 1: Short-term refers to a period of not more than 96 consecutive hours and a total of not more than 15 days in one year. (This refers to a total of 360 hours in any given year, but no more than 15 occurrences during that one year period.)

Note 2: Specific humidity is not to exceed 0.024 lbs-water/lbs-dry-air.

Note 3: Outside plant temperature limits shown are for external (outside) ambient temperature, and product testing includes consideration for solar load. Fully equipped cabinets with electronics operating in the maximum heat generation mode shall limit the temperature of the air spaces between the equipment and the cabinet interior surfaces to a maximum of 65°C under worst-case environmental conditions.

Note 4: If outside plant (OSP) equipment is required to be stored for an extended period (more than one week), it is strongly recommended that it be stored indoors (such as in a warehouse). The daily outdoor temperature and humidity cycles are somewhat unpredictable, and the effects on inactive equipment could lead to condensation and rust/corrosion of the equipment inside the cabinet.

Altitude derating (operating)

Table 3-2 lists the altitude temperature derating that applies to AccessNode. (The altitude specifications are referenced to mean sea level.)

Table 3-2
AccessNode altitude temperature derating

Altitude	Inlet temperature derating
0-1500 m (0 - 5000 ft)	none
1500-3000 m (5000-10000 ft)	0.6°C (1.08°F) per 300 m (1000 ft)
3000-4000 m (5000-10000 ft)	2°C (3.6°F) per 300 m (1000 ft)

Shipping and storage altitude

AccessNode can be shipped and stored at an altitude up to 15,000 m (50,000 ft).

Atmospheric dust

AccessNode has an air filter in the inlet of the bay that meets the ASHRAE 80% dust arrestance requirements.

Operations Controller (OPC) (NT7E24)

The following specifications apply to the OPC (NT7E24).

Ambient operating temperature

The following ambient operating temperature range applies to OPC:

- The disk drive NT7E24AA for OPC: +5°C to +50°C (41°F to +122°F)
- The tape drive NT7E24BA/CA for OPC: +5°C to +45°C (41°F to +117°F)

Note: The tape drive should not be used if the left fan has failed.

Storage and shipping temperature

The following specifications are for non-operating shipping and storage of the OPC:

- +60°C (140°F) High temperature IEC 68-2-2 Test Bb-Dry Heat
- -40°C (-40°F) Low temperature IEC 68-2-1 Test Ba-Cold

Relative humidity

Table 3-3 lists the relative humidity range that applies to the OPC.

Table 3-3
OPC relative humidity range

Operation state	Value
Operating	20% to 90% Not to exceed 3.6 kPa water vapor pressure over the normal operating temperature of the OPC.
Storage and shipping	10% to 90% Not to exceed 5.3 kPa water vapor pressure for temperatures above +35°C (95°F) for the OPC.

IRTU environmental specifications

Table 3-4 lists the environmental specifications that apply to the integrated remote testing unit (IRTU) circuit pack.

Table 3-4
IRTU environmental specifications

Item	Values
Circuit pack ambient temperature	<ul style="list-style-type: none"> • Normal range operating: 0°C to 50°C (32°F to 122°F) • Extended range operating: -40° C to 70° C (-40°F to 158°F) • Storage: -40°C to 70°C (-40°F to 158°F) • Forced air flow rate: 150 cu ft / min
Humidity	<ul style="list-style-type: none"> • Operating: 20% to 95%, 4.33 kPa pressure; no condensation • Storage: 10% to 95%, 5.33 kPa pressure; no condensation

Mechanical shock and vibration

AccessNode equipment withstands reasonable shock and vibration during operation and transportation (in its packed state).

Chapter contents

This chapter contains the following information:

Topic	See
Mechanical shock	page 4-1
Vibration	page 4-2
Transportation bounce	page 4-2
Earthquake	page 4-3
Acoustic noise	page 4-3

Mechanical shock

Mechanical shock is tested by dropping the equipment from a specified drop height. Table 4-1 lists the drop height specifications for the bay frame.

Table 4-1
Drop height specifications for the AccessNode bay frame

Bay frame	Drop height
Packed for shipping	30 cm (12 in.)
Unpacked for installation	2.5 cm (1 in.)
Note: These specifications are for a shelf in the frame with cabling and no circuit packs.	

Table 4-2 lists the drop height specifications for the access bandwidth manager (ABM) shelf.

Table 4-2
Drop height specifications for an ABM shelf

Shelf	Drop height
Packed for shipping	30 cm (12 in.) to 45 cm (18 in.), dependent on weight
Unpacked for installation	7.5 cm (3 in.) to 5.0 cm (2 in.), dependent on weight

Table 4-3 lists the drop height specifications for the circuit packs.

Table 4-3
Drop height specifications for the AccessNode circuit packs

Circuit packs	Drop height
Packed for shipping	75 cm (30 in.)
Unpacked for installation	10 cm (4 in.)

Vibration

Table 4-4 lists the vibration specifications for the AccessNode equipment.

Table 4-4
Vibration specifications for the AccessNode equipment

Item	Value
Operating environment	NEBS 5.6.3 test 5C 0.1 g (5 to 200 Hz, 3 axes)
Non-operating shelf	IEC 68-2-6 test Fc Curve B 5-7 Hz, 25.4 mm (1 in.) displacement 7-92 Hz, 2.5 g acceleration 92-110 Hz, 0.1448 mm (0.0057 in.) displacement 110-500 Hz, 3.5 g acceleration (packed for shipping, 3 axes)
Non-operating circuit packs	IEC 68-2-6 test Fc Curve B (packed for shipping, 3 axes)

Transportation bounce

Transportation bounce is tested according to Interexchange Carriers (IEC) Draft 58.

Earthquake

When mounted in a welded bay frame, AccessNode equipment operation is seismic resistant for zone-4 in accordance with Bellcore Network Equipment Building Standards (NEBS) specification document TR-EOP-000063, Section 4.

Acoustic noise

The system-generated sound level stays below 65 dBA as specified in the Occupational Safety and Health Act of 1970 and NEBS TR-EOP-000063, Issue 4.

Electrical protection

This chapter contains electrical protection requirements for AccessNode. These requirements describe the ability of AccessNode to withstand lightning transients, and disturbances related to conditions on the commercial power distribution network.

Chapter contents

This chapter contains the following information:

Topic	See
Disturbance examples	page 5-1
Electrical protection	page 5-1

Disturbance examples

The following are examples of disturbances related to conditions on the commercial power distribution system:

- 60 Hz voltages caused by induction on tip and ring conductors from a fault to ground of a power system phase conductor (North American systems)
- 60 Hz voltages caused by contact of a power system phase conductor to a telecommunication cable containing tip and ring conductors (North American systems)
- 50 Hz voltages caused by induction on tip and ring conductors from a fault to ground of a power system phase conductor (Hong Kong systems)
- 50 Hz voltages caused by contact of a power system phase conductor to a telecommunication cable containing tip and ring conductors (Hong Kong systems)

Electrical protection

The system shall not be damaged and shall continue to operate after being subjected to the first level lightning and ac power fault surges specified in Bellcore Standard TR-NWT-001089, issue 1, October 91, with the exception of surge 4 of section 4.5.6 being limited to a peak voltage of 2 kV.

Power and grounding

This chapter contains power and grounding requirements for AccessNode. For detailed power and grounding information, see *Site Installation Planning and Engineering*, 323-3001-200, in *Engineering, Configuration, and Ordering Guide*, Volume 1.

Chapter contents

This chapter contains the following information:

Topic	See
DC input voltage requirements	page 6-1
Overvoltage protection	page 6-2
Power distribution	page 6-3
Grounding and isolation	page 6-3
Power consumption of AccessNode equipment	page 6-3

DC input voltage requirements

Table 6-1 lists the AccessNode dc input voltage requirements.

Table 6-1
AccessNode dc input requirements

Item	Value
Range	-42.5 to -56.5 V dc
Transient overload voltage	to -60.0 V dc for 0.5 s
dc voltage step change	5.0 V max
dc voltage amplitude slew rate	1.0 V/ms max

Overvoltage protection

The AccessNode overvoltage protection meets standard T1D1-ANSI: dc voltage for all -48.0 V dc cable pairs as shown in Table 6-2.

Table 6-2
AccessNode's overvoltage protection

Item	Value
Amplitude	56.5 V
Current	0.5 A
Duration (on either polarity between interface conductors, or between interface conductors and ground)	5.0 min

Table 6-3 lists the AccessNode values for first level power exposure test for all outside interface cable pairs (Bellcore standard TR-TSY-000057).

Table 6-3
AccessNode's values for first level power exposure

Item	Value
Amplitude	0.0 to 50.0 V rms
Resistance	150 ohms for each conductor
Duration	15 min

The AccessNode system also meets the following requirements of Bellcore TR-TSY-000057, Issue 1, Revision 1:

- second-level power exposure test (Section 10.6.9)
- exposed conductive surfaces (Section 10.6.11)
- 60 Hz induction—line unit outputs (Section 10.7 for North American systems)
- 50 Hz induction at 20 V rms—line unit outputs (Hong Kong systems)
- DS1 60 Hz current carrying capability

The DS1 circuit pack withstands, without damage, the longitudinal current carrying test, as defined in Section 7.1.3.2 of the REA Bulletin 345-185. This test applies 700 V rms for 183 ms.

Power distribution

System input power of -48 V dc is terminated at the bay level by a breaker interface panel (BIP). The BIP distributes redundant power feeds to the common equipment and cooling units using dedicated circuit breakers so a failure of any one feed does not impact system functionality.

Power is fed to each copper-distribution shelf (CDS) using the appropriate circuit breaker to redundant power converters. If one converter loses power, the remaining unit provides uninterrupted system performance. Talk battery voltage is distributed to each CDS using one of two filter units in the BIP. All circuit pack point-of-use power supplies (PUPS) and line-shelf power converters are individually fused.

Grounding and isolation

AccessNode common-equipment uses an integrated frame and logic grounding system as follows:

- Copper-distribution shelves have a logic ground connected to the talk battery return, completely isolated from the frame ground.
- The frame cabinet has a single-point ground.
- The two-wire battery feed is not connected to the system ground.
- Coaxial cable shielding is terminated on the shelf ground.
- RS-232C grounding pins are connected to the shelf ground.

Note: See *Site Installation Planning and Engineering*, 323-3001-200, in *Engineering, Configuration, and Ordering Guide*, Volume 1, for more information about grounding and battery isolation.

Power consumption of AccessNode equipment

This section lists the power consumption of AccessNode common-equipment circuit packs and line cards.

Circuit pack power consumption

Table 6-4 lists the approximate power drain of AccessNode shelves and common-equipment circuit packs.

**Table 6-4
Shelf and circuit pack power drain**

Unit	Maximum power (in watts)
DS1 VT mapper	15.3
DS3 STS mapper	15.7
STS-1 interface	30.0
Protection switcher (see note)	0.0
OC-3 interface	35.8
OC-12 interface (intermediate range)	35.9
OC-12 interface (long range)	39.0
OC-12 VTBM (intermediate range)	72.0
OC-12 VTBM (long range)	77.0
COP cooling unit	19.6
Processor circuit pack (APC 2000)	16.7
Maintenance interface controller (MIC) circuit pack	10.9
Transport interface card	11.4
Access interface card	12.5
Test access card	16.6
Operations controller <ul style="list-style-type: none"> • with tape drive • without tape drive 	42.0 36.0
External synchronization interface (ESI) carrier and two ESI circuit pack units	11.2
Integrated remote test unit	21
Breaker interface panel (ABM bay)	0
Breaker interface panel (TBM bay)	16.4
Cooling unit (NT4K18AA) with three cooling modules	108
—continued—	

Table 6-4 (continued)
Shelf and circuit pack power drain

Unit	Maximum power (in watts)
Through-flow cooling unit (NT4K18BA) with three cooling modules	108
8-fan cooling unit (NT4K18CA)	80
Note: The protection switcher requires power during switching transitions only.	
—end—	

Line card power consumption

Table 6-5 lists the approximate power drain of AccessNode line cards.

Table 6-5
Line card power drain

Line card	Item	Power drain (in watts)
2-wire Omega source	FXS, POTS, UVG at 3 CCS	0.80
	FXS, POTS, UVG at 6 CCS	0.91
	FXS, POTS, UVG at 18 CCS	1.36
	Coin at 3 CCS	0.90
	Coin at 6 CCS	1.09
	Coin at 18 CCS	1.90
	ETO/TO at 36 CCS	2.03
	PLAR at 36 CCS	3.21
	ISDN basic line rate at 36 CCS	1.75
	EBS at 6 CCS	1.38
	EBS at 18 CCS	1.51
4-wire Omega	FXS at 6 CCS	2.23
	FXS at 18 CCS	2.79
	DDS, OCUDP at 36 CCS	2.81
	DX at from 0 to 36 CCS	2.81
2-wire Omega UVG	POTS, UVG at 3 CCS	0.80
	POTS, UVG at 6 CCS	0.91
	POTS, UVG at 18 CCS	1.36
2-wire Epsilon	POTS at 3 CCS	0.66
	POTS at 6 CCS	0.77
	POTS at 18 CCS	1.23
—continued—		

Table 6-5 (continued)
Line card power drain

Line card	Item	Power drain (in watts)
2-wire Omega sink	DPT at 6 CCS	0.58
	DPT at 18 CCS	0.77
6 and 8-wire Omega	E&M, PLR, and TDM from 0 to 36 CCS	2.52
Manual ring-down	MRD at 36 CCS	0.75
Key:		
CCS	Hundred call seconds	PLR Pulse link repeater
DDS	Digital data services	FX Foreign exchange
DX	Duplex	FXS Foreign exchange office
E&M	Ear and mouth	OCUDP Office channel unit data port
EBS	Electronic business services	POTS Plain old telephone service
ISDN	Integrated services digital network	TDM Tandem
		UVG Universal voice grade
—end—		

Digital interface

This chapter provides specifications for AccessNode digital interfaces as well as the control network.

Chapter contents

This chapter contains the following information:

Topic	See
DS1 specifications	page 7-1
DS3 specifications	page 7-3
STS-1Tributary specifications	page 7-4
Jitter specifications	page 7-5
Control network definitions	page 7-6
Control network specifications	page 7-6
GR-303 interface specifications	page 7-8
Line card specifications	page 7-8

DS1 specifications

The following specifications are for DS1 signals on the AccessNode.

DSX-1 electrical cross-connect signals

The line rate tolerance of the AccessNode DS1/VT mapper is ± 32 ppm (stratum 4) for byte-synchronous operation, and ± 130 ppm for asynchronous operation.

Distance to cross-connect

The maximum length of NT-ABAM cable (or equivalent) is 200 m (655 ft).

DS1 interface

The DS1/VT mapper accepts electrical synchronous DS1 inputs and transports these signals in byte-synchronous, VT1.5 synchronous payload envelope (SPE) format.

The following DS1 formats are supported:

- superframe, including T1DM
- extended superframe (ESF)
- DDL (used for TR-08 facility A-links)
- null
- non-standard DS1 formats, including all 1.544 Mb/s signals with modified framing or no framing, if the specifications are met for DSX-1 cross-connect, frequency, and jitter

Line build-out ranges

Table 7-1 lists line build-out ranges that are software selectable for AccessNode equipment located in bays, modular business packages, and S800A cabinets.

Table 7-1
Software selectable line build-out ranges for DS1s

Range	Values
Short	0 to 46 m (0 to 150 ft)
Medium	46 m to 137 m (150 to 450 ft)
Long	137 m to 200 m (450 to 655 ft)

Interconnect specifications

Table 7-2 lists the DS1 interconnect specifications.

Table 7-2
DS1 interconnect specifications

Item	Values
Line rate	1.544 Mb/s \pm 130 ppm (input - asynchronous mode) 1.544 Mb/s \pm 32 ppm (input - byte-synchronous mode) 1.544 Mb/s \pm 32 ppm (output)
Line code	B8ZS or AMI
Test load	100 ohms \pm 5%, resistive
Synchronization mode	byte synchronous or asynchronous
Alarm encoding	zeros or ones

Pulse characteristics

Table 7-3 lists the DS1 pulse characteristics.

Table 7-3
DS1 pulse characteristics

Item	Values
Amplitude	3 V (typical) measured at the center of the pulse and may be scaled by a constant factor.
Power level (for transmitted pattern of all ones)	In a band not wider than 3 kHz, centered at 772 kHz, the power level is between 12.6 and 17.9 dBm. In a band not wider than 3 kHz, centered at 1544 kHz, the power level is at least 29 dB below the power level centered at 772 kHz.
Imbalance	There is less than 0.5 dB difference between the total power of the positive and negative pulses

DS3 specifications

The following specifications are for DS3 signals on the AccessNode.

DSX-3 electrical cross-connect signals

AccessNode DS3 transmit and receive signals meet cross-connect signal requirements of ANSI T1.102-1987 and Bellcore TR-TSY-000499.

Distance to cross-connect

Table 7-4 shows the maximum length of cable between the AccessNode and the cross-connect.

Table 7-4
Distance to cross-connect specifications

Cable	Length
NE-728A cable or equivalent	137 m (450 ft)
RG-59B/U cable or equivalent	76 m (250 ft)
734A cable or equivalent	137 m (450 ft)

DS3 interface

The DS3/STS mapper accepts inputs from asynchronous DS3 signals and transports these DS3 signals in STS-1 synchronous payload envelope (SPE) format. SYNTRAN signals are handled as standard DS3 signals in the DS3/STS mapper circuit pack.

Line build-out ranges

Table 7-5 lists the line build-out ranges that are software selectable.

Table 7-5
Software selectable build-out ranges for DS3s

Range	RG59B/U	728/734
Short	0 to 50 m (0 to 164 ft)	0 to 68 m (0 to 225 ft)
Long	50 to 76 m (164 to 250 ft)	68 to 137 m (225 to 450 ft)

Interconnect specifications

Table 7-6 lists the DS3 interconnect specifications.

Table 7-6
DS3 interconnect specifications

Item	Value
Line rate	44.736 Mb/s \pm 20 ppm
Line code	B3ZS, B8ZS or AMI
Test load	75 ohms \pm 5%, resistive

Pulse characteristics

Table 7-7 lists the DS3 pulse characteristics.

Table 7-7
DS3 pulse characteristics

Item	Value
Amplitude	0.36 to 0.85 V peak
Power level (for transmitted pattern of all ones)	In a band not wider than 3 kHz, centered at 22.368 MHz, the power level is between -1.8 to +5.7 dBm. In a band not wider than 3 kHz, centered at 44.736 MHz, the power level is at least 20 dB below the power level centered at 22.368 MHz.
Imbalance	Less than 3.5 dB difference exists between the total power of the positive and negative pulses

STS-1Tributary specifications

The STS-1 electrical interface circuit pack accepts standard synchronous STS-1 signals. The specifications for the STS-1 cross-connect interface are listed in Table 7-8 through Table 7-10.

Distance to cross-connect

Table 7-8 shows the maximum length of cable between the AccessNode and the cross-connect.

Table 7-8
Distance to cross-connect specifications

Cable	Length
NE-728A cable or equivalent	137 m (450 ft)
RG-59B/U cable or equivalent	76 m (250 ft)
734A cable or equivalent	137 m (450 ft)

Line build-out ranges

Table 7-9 lists the line build-out ranges that are software selectable.

Table 7-9
Software selectable build-out ranges for STS-1

Range	RG59B/U	728/734
Short	0 to 50 m (0 to 164 ft)	0 to 68 m (0 to 225 ft)
Long	50 to 76 m (164 to 250 ft)	68 to 137 m (225 to 450 ft)

Interconnect specifications

Table 7-10 lists the STS-1 interconnect specifications.

Table 7-10
STS-1 interconnect specifications

Item	Value
Line rate	51.84 Mbit/s \pm 20 ppm
Line code	bipolar with B3ZS
Test load	75 W \pm 5%, resistive

Jitter specifications

AccessNode meets the following specifications for jitter.

Input jitter tolerance

The jitter tolerance of any nonoptical AccessNode port is in accordance with Bellcore TA-TSY-000253, Section 5.6.1.

Jitter transfer

The jitter transfer function is in accordance with Bellcore TA-TSY-000253, section 5.6.2.

Jitter generation

The jitter generation on any path through AccessNode is in accordance with Bellcore TA-TSY-000253, Section 5.6.3.

Control network definitions

A control network (CNet) contains all of the network elements (both OC-3 and OC-12 for either TransportNode or AccessNode) that are interconnected by the following means:

- SONET fiber
- CNet cable
- operations maintenance channel (OMC) links
- link access protocol—D channel (LAPD) data communication links

The following terms define CNet elements:

CNet local area network (LAN)	a maximum of 10 network elements daisy-chained together by CNet cable
CNet LAN bus	the CNet LAN plus the backplane tracking in each common equipment shelf
CNet station	a circuit pack containing a CNet driver. An OPC, an AccessNode shelf processor, or a TransportNode shelf processor each count as one CNet station. An AccessNode shelf with two shelf processors counts as two CNet stations.

Note: See *Signal Flow and Circuit Pack Description*, 323-3001-102, in *Description*, Volume 2A, for more information about CNet buses and links.

Control network specifications

A CNet termination plug must terminate any unused CNet port on an access bandwidth manager (ABM) or transport bandwidth manager (TBM) shelf. Both ABM and TBM shelves have two CNet ports: CNet Out and CNet In.

A CNet LAN can have up to 10 network elements daisy-chained by CNet cable.

The total number of stations in a CNet LAN must not exceed 32.

The total length of the CNet LAN bus (cables and backplane tracking) must not exceed 120 m (400 ft). To calculate bus lengths, use the following formula (lengths are in feet):

Total bus length = total cable length + (4' x shelves connected by CNet LAN)

A point-to-point AccessNode configuration or a linear TransportNode configuration cannot have multiple paths (loops) in the control network. They must have only one path from the operations controller (OPC) to the network element.

A control network can have a maximum of 150 CNet stations.

A control network can have a maximum of 32 consecutive SONET fiber hops between the OPC and the network element.

The OPC span of control must not exceed the maximum number of network elements: 16 network elements for AccessNode; 34 for TransportNode (including 24 LTEs and 20 STEs).

Note: You must engineer a control network carefully if it interconnects several different systems.

Summary of AccessNode data communication limits

Table 7-11 summarizes the recommended overall network element and OPC span of control characteristics for an AccessNode data communications network.

Table 7-11
Maximum number of nodes

Item	AccessNode	TransportNode OC-3	TransportNode OC-12
Maximum number of CNet stations in a network (see Notes 1 & 2)	150	150	
Maximum number of network elements connected by CNet cable	10	10	
Maximum number of SONET hops between an OPC and any network element	32	32	
Maximum number of network elements in a single span of control (OC-3 and OC-12 nodes must be in different spans of control)	16	34	
Maximum number of LTEs (see Note 3) in a span of control	not applicable	24	
Maximum number of add-drop multiplexers (ADM) in a ring	16	16	
Maximum number of shelves in a linear multi-shelf ADM	not applicable	2	4
—continued—			

Table 7-11 (continued)
Maximum number of nodes

Item	AccessNode	TransportNode OC-3	TransportNode OC-12
Maximum number of CNet stations in a CNet LAN	32	32	
Maximum length of a CNet LAN	120 m (400 ft)	120 m (400 ft)	
<p>Note 1: A SONET control network is a collection of OC-3 and/or OC-12 network elements that are interconnected using the SONET, CNet, OMC, and LAPD data communication links.</p> <p>Note 2: All of the network elements in a SONET control network are visible to each other.</p> <p>Note 3: LTEs (line terminating equipment) are TransportNode network elements that originate or terminate line (OC-n) signals. LTEs originate, access, modify and terminate the transport overhead.</p>			
—end—			

GR-303 interface specifications

AccessNode is compatible with the GR-303 interfaces given in Table 7-12.

Table 7-12
Compatibility with GR-303 interfaces

Item	GR-303 DMS	GR-303 MVI
Switch types supported	DMS SuperNode	DMS SuperNode, AT&T 5ESS, EWSD, GTD-5
Number of local digital switches of this type supported per RFT	five	five
<p>Note: The overall multihosting maximum per RFT is five local digital switches.</p>		
OAM&P communications	embedded operations channel (12th channel of first two DS1s)	embedded operations channel (12th channel of first two DS1s)
Signalling: Time-slot assignment	common signalling channel (24th channel of first two DS1s)	time-slot management channel (24th channel of first two DS1s)
Signalling: call supervision	common signalling channel	in-band ABCD robbed-bit signalling

Line card specifications

Line card specifications for the Epsilon NT4K65AB and Omega NT4K67, NT4K68, and NT4K79 line cards, remain unchanged for GR-303 MVI services. For additional information, refer to *Line Card Specifications*, 323-3001-181, in *Description*, Volume 2B.

Electromagnetic compatibility

This chapter describes the AccessNode equipment emissions and susceptibility as well as the protection against electrostatic discharge (ESD).

Chapter contents

This chapter contains the following information:

Topic	See
Radiated emissions and susceptibility	page 8-1
Radiated and conducted immunity and susceptibility on twisted-pair cables	page 8-2
Conducted emissions and susceptibility on main-powered equipment	page 8-2
Conducted emissions and susceptibility on battery conductors	page 8-2
Electrostatic discharge protection	page 8-2

Radiated emissions and susceptibility

AccessNode equipment shelves and all intershelf cables are shielded, and cable interface signals on all other nonshielded cables are filtered. Electromagnetic interference (EMI) shielding and filtering complies with FCC, Part 15, Subpart B, for Class A computing device.

The equipment also meets the narrow-band emission requirements of Bell Canada DS-8465 (issue 2, 1989). These design features also ensure that the EMI susceptibility, specifically radio frequency interference (RFI) immunity, is in accordance Bellcore TR 1089 (issue 1, 1991).

Note: Compliance with EMI emissions and immunity to RFI is guaranteed only when all line drawers are closed and the common-equipment shelf cover is correctly latched in place.

Radiated and conducted immunity and susceptibility on twisted-pair cables

AccessNode equipment is immune to the following environments:

- narrow-band longitudinal conducted interference on to twisted-pair cables using a balic cable injection method according to Bell Canada DS-8465 (issue 2, 1989), from 10 kHz to 30 MHz at up to 2 V rms or 83 dB μ A (whichever is less).
- narrow-band conducted interference injected onto -48 V dc power leads according to Bell Canada DS-8465 (issue 2, 1989), from 10 kHz to 30 MHz at up to 2 V rms applied individually between each power lead and ground. Also according to Bellcore document TR-NWT-001089 (issue 1, 1991), Section 3.3.4, “Conducted Immunity,” from 10 kHz to 100 MHz.
- narrow-band radiated electric field according to Bellcore document TR-NWT-001089 (issue 1, 1991).
- narrow-band radiated magnetic field according to Bell Canada DS-8465 (issue 2, 1989), and Bellcore document TR-NWT-001089 (issue 1, 1991) from 10 Hz to 100 kHz.

The following modulation schemes were used for testing (does not apply to magnetic field testing):

- 10 kHz to 1 GHz: 1 kHz tone at 50 percent amplitude modulation
- 1 GHz to 10 GHz: pulse modulation

Conducted emissions and susceptibility on main-powered equipment

AccessNode meets the conducted EMI requirements of FCC part 15, Subpart J, Class A limits on main-powered equipment only.

Conducted emissions and susceptibility on battery conductors

AccessNode meets the emissions and susceptibility requirements of TR-NWT-001089, issue 1, sections 3.2.5 and 3.3.4, respectively.

Electrostatic discharge protection

The shielded shelves, cables, and filtered interfaces provide some protection against disturbances and damage due to ESD. Additional ESD protection is provided by a frame-grounded banana plug jack on the local craft access panel (LCAP), to allow for connection of an ESD wrist strap by a craftperson.

The AccessNode devices and cards can withstand ESD levels that can be expected when you handle the cards using of the ESD wrist-strap protection.

Circuit pack handling requirements

Based on Bellcore TR-TSY-000078 Issue 3, up to 4 kV was applied to integrated circuit packs without damage.

System handling requirements

Locations normally accessible on AccessNode, including maintenance test points and controls, are immune to the direct ESD values shown in Table 8-1.

Table 8-1
AccessNode direct electrostatic discharge values

State	Shelf covers on (direct)	Shelf covers off (direct)
No frame loss or processor reset	up to 15 kV	up to 4 kV
Note: The system conforms to Bellcore TR-EOP-000063. The TR-NWT-001089 test method probe values were 330 ohms and 150 pF, according to IEC 801-2, 1st Edition.		

Synchronization

This chapter provides specifications for network synchronization and clocking.

Chapter contents

This chapter contains the following information:

Topic	See
Network synchronization	page 9-1
AccessNode oscillator with fiber optics pack (OC-3 or OC-12)	page 9-2
AccessNode oscillator with TXC pack	page 9-2
Synchronization to an 8 kHz signal	page 9-2
Source selection	page 9-2

Network synchronization

AccessNode network synchronization requirements are in accordance with Bellcore document TA-NPL-000436, "Digital Synchronization Network Plan," Issue 1, November 1986, Section 3.3.

AccessNode oscillator with fiber optics pack (OC-3 or OC-12)

The AccessNode oscillator meets the specifications listed in Table 9-1 for the OC-3 and OC-12 optical interface circuit packs.

Table 9-1
Oscillation specifications for optical interface circuit packs

Event	Values
OC-3 or OC-12 networking optical interface circuit pack (NT7E01 or 02)	<ul style="list-style-type: none"> • long-term free running accuracy of ± 20 ppm • short-term stability, a maximum rms phase variation of 300 ns for observation times of greater than 100 seconds • loop timed to an incoming OC-n signal • timed to an external source by an external synchronization interface (ESI)
OC-12 VTBM optical interface circuit pack (NT7E05)	<ul style="list-style-type: none"> • long-term free running accuracy of ± 20 ppm • holdover capability of ± 4.6 ppm for 24 hours, and ± 0.37 ppm for 5 minutes • line/loop timed to an incoming OC-n signal • timed to an external source by an ESI

AccessNode oscillator with TXC pack

The AccessNode timing and cross-connect circuit pack oscillator used in DS1-fed systems meets the following specifications:

- long-term free running accuracy of ± 32 ppm (Stratum 4)
- pull-in range of ± 65 ppm
- loop-timed to an incoming DS1

Synchronization to an 8 kHz signal

If an AccessNode network element has ESIs, the equipment can be synchronized to an 8 kHz signal from either of the following:

- building integrated timing supply (BITS) composite clock (64/8 kHz)
- DS1 timing reference signal from BITS

Source selection

If a clock source fails, the AccessNode system automatically switches to the next priority clock source. Switching clock elements does not cause errors on outgoing calls.

AccessNode meets the source selection values shown in Table 9-2.

Table 9-2
AccessNode source selection specifications

Event	Value
Clock failure detection time	2 s
Clock recovery detection time	4 s
Alternative source selection time	2 s
Long-term frequency stability during holdover mode	±20 ppm

External synchronization interface

Two ESI are in an external synchronization carrier (ESC) in a 1+1 protection configuration. The ESIs meet the requirements listed in Table 9-3.

Table 9-3
ESI specifications

Event	Value
Long-term frequency stability	Stratum 3
Phase acquisition time	2 s
Time to acquire alternate alignment source	2 s
Switch time to alternate phase aligned source	less than 125 μs from last 8 kHz clock pulse

ESI internal clock specifications

The ESI meets Stratum 3 requirements and is fully compatible with building-integrated timing supply (BITS) clock applications. The ESI characteristics are shown in Table 9-4.

Table 9-4
ESI characteristics

ESI characteristic	Value
Long-term stability	±4.6 ppm
Holdover stability	±0.37 ppm in first 24 hr (0°C to +50°C) ±2 ppm in first 24 hr (-40°C to +65°C)
Minimum pull-in range	±4.6 ppm

The ESI timing reference inputs accept framed DS1 signals or composite clock (64/8 kHz). The timing reference output provides a framed all-1s DS1.

OC-12 VTBM circuit pack internal clock specifications

A network element that contains OC-12 VTBM circuit packs can maintain synchronization based on the incoming SONET signals. The OC-12 VTBM circuit pack meets the clock accuracy specifications shown in Table 9-5.

**Table 9-5
OC-12 VTBM clock characteristics**

Characteristic	
Long-term stability	Long-term freerun accuracy of ± 20 ppm
Holdover stability	± 4.6 ppm for up to 24 hours. During this period, the clock can tolerate a variation of up to 17°C from the temperature at which the NE entered holdover, with a maximum rate of change of 8°C per hour.

DS1 timing interface specifications

The ESI DS1 timing interfaces comply with the DSX-1 specification defined in ANSI TI.102-1987 and Bellcore TR-TSY-000253. Tables 9-6 and 9-7 respectively list the DS1 interconnect characteristics and line build-out ranges.

**Table 9-6
Interconnect characteristics**

Interconnect characteristic	Value
Line code	B8ZS or AMI
Frame format	SF or ESF
Test load	100 Ω $\pm 5\%$, resistive
DS1 output AIS line rate	1.544 Mb/s ± 32 ppm

**Table 9-7
DS1 line build-out ranges for the ESI timing reference output**

DS1 LBO range	Value
Short	0 to 46 m (0 to 150 ft)
Medium	46 to 137 m (150 to 450 ft)
Long	137 to 200 m (450 to 655 ft)

Timing and cross-connect circuit pack

If a DS1 clock source fails, AccessNode timing and cross-connect circuit pack (TXC) automatically switches to the next selected DS1 reference source.

The TXC meets the requirements listed in Table 9-8.

Table 9-8
TXC specifications

Event	Value
Source clock failure detection time	14 ms
Alternative source selection time	10 ms (after detecting source clock loss)
Free-run stability when both timing sources fail	± 32 ppm (Stratum 4)

Protection and performance

This chapter provides protection switching and performance specifications.

Chapter contents

This chapter contains the following information:

Topic	See
Protection switching	page 10-1
Bit error rate performance	page 10-2
Display performance	page 10-2

Protection switching

All of the manual protection systems and exerciser functions are controllable from the network element user interface.

DS1, DS3 and STS-1 protection switching

The following protection switching features are provided for DS1 and DS3:

- 1:n revertive:
 - with a ratio of 1:7 for DS1 circuit packs
 - with a ratio of 1:3 for DS3 circuit packs
 - with a ratio of 1:4 for STS-1 circuit packs
- a reversion hysteresis factor of 200 seconds
- identification of incoming line failures
- a wait-to-restore period of 200 or 300 seconds
- protection switching completed in 50 ms

OC-12 and OC-3 protection switching

The following protection switching features are provided for OC-12 and OC-3:

- nonrevertive 1+1
- signal degradation thresholds between 10^{-5} and 10^{-10} can be independently set on all optical links. In a redundant pair, the threshold must be the same on the A and B circuit packs.
- protection switching is completed in 50 ms
- for VTBM rings, signal failure (for example, LOS, LOF) thresholds between 10^{-3} and 10^{-5} can be independently set on all optical links. In a redundant pair, the threshold must be the same on the A and B circuit packs.

Processor protection

The nonrevertive 1+1 protection switching feature is provided for the processor circuit pack.

TXC protection switching

The following protection switching features are provided for the TXC circuit pack:

- nonrevertive 1+1
- protection switching is completed in 50 ms

ESC protection

The two ESI cards, nonrevertive 1+1 protection switching feature is provided for the ESC.

Bit error rate performance

The long-term AccessNode bit error rate is less than 10^{-12} for each optical link.

Display performance

The display of the network element user interface updates in 600 ms.

Safety

This chapter defines the AccessNode system safety testing compliance.

Chapter contents

This chapter contains the following information:

Topic	See
Compliances	page 11-1
Hazard test	page 11-1
Flammability	page 11-2

Compliances

AccessNode complies with the applicable requirements for performance, construction, labeling, and information as outlined in the following documents:

- Canadian Standards Association standard CSA 22.2 No. 225, Equipment Electrically Connected to a Telecommunication Network
- Underwriters Laboratories standard UL1459, 2nd Edition, Telephone Equipment
- Part 1910—Occupational Safety and Health Standards (Title 29— Labor, Chapter XVII-OSHA, Dept. of Labor)
- Department of Health, Education, and Welfare, Bureau of Radiological Health (BRH), 21 CFR 1040.10
- Laser safety performance according to 21 CFR, Chapter 1, Subchapter J, as a Class 1 laser product

Hazard test

The system does not become a fire, safety, or electrical hazard after being subjected to the first or second level lightning and power fault surges specified in Standard TR-NWT-001089, Issue 1, October 91.

Flammability

All combustible materials, components, and cabling used in AccessNode are fire resistant to meet the following requirements:

- NEBS TR-EOP-000063, Issue 4, Section 4.3.3. All structural elements larger than 0.25" by 0.25" by 0.25" and 1 gram meet the following two requirements:
 - A minimum rating of 94V-1 according to Underwriters Laboratory Standard UL94
 - A minimum oxygen index rating of 28 percent when tested to ASTM D2863-77
- All discrete electronic components excluding LEDs meet the requirements for structural elements or NEBS TR-EOP-000063, Issue 4, Section 5.3.5, Bellcore Needle Flame Test.
- All wire and cabling meet the requirements of the applicable UL and CSA standards.

Orderwire

AccessNode systems provide a SONET orderwire and a T1 orderwire for craftperson communication.

Chapter contents

This chapter contains the following information:

Topic	See
SONET orderwire	page 12-1
VF-300 interface	page 12-2
Handset and headset interfaces	page 12-2

SONET orderwire

The SONET orderwire supports local orderwire (LOW) and express orderwire (XOW) circuits.

Table 12-1 lists AccessNode's support for each circuit type.

Table 12-1
SONET orderwire circuit support

Circuit	Support
Local orderwire circuit	<ul style="list-style-type: none"> • between T1 line repeaters and the FCOT • between T1 line repeaters and the public switched network • between the RFT and the public switched network • between two or more RFTs • carried on byte E1 in the section overhead
Express orderwire circuit	<ul style="list-style-type: none"> • between the RFT and the FCOT • carried on byte E2 in the line overhead

VF-300 interface

Table 12-2 lists the AccessNode VF-300 interface specifications.

Table 12-2
VF-300 interface specifications

Item	Specifications
Nominal input level	0 dBm
Nominal output level	0 dBm
Input/output impedance	600 ohms balanced
Signal to quantization noise	> 30 dB, 0 to -30 dBm > 24 dB, -40 dBm > 20 dB, -45 dBm
Frequency response	± 1 dB, 300 Hz to 3 kHz

Handset and headset interfaces

AccessNode orderwire interfaces use biasing levels and input/output impedances for standard carbon transmitter headsets and handsets. The local craft access panel accommodates 2-wire, 4-wire, and 6/8-wire headsets and handsets.

Alarms and surveillance interfaces

This chapter contains specifications for the AccessNode local alarms and remote alarms.

Chapter contents

This chapter contains the following information:

Topic	See
Office alarms	page 13-1
Remote alarms	page 13-3

Office alarms

Audible and visible office alarms connect to wire-wrap terminals on the breaker interface panel (BIP). Refer to the appropriate AccessNode installation NTP for instructions on how to connect office alarms.

Audible office alarms

The three Form-C relay contacts for audible office alarms are

- critical
- major
- minor

Visible office alarms

The three Form-C relay contacts for visible office alarms are

- critical
- major
- minor

Alarm cutoff

Audible office alarms can be turned off by the alarm cutoff (ACO) button on front of the BIP. Visible alarms cannot be extinguished.

Alarm contact electrical specifications

Table 13-1 lists the alarm contact electrical specifications.

Table 13-1
Alarm contact electrical specifications

Item	Specifications
Contact current	0.5 A maximum
Contact voltage	60 V dc maximum
Power	30 W maximum
Polarity	contacts are not polarity sensitive

Electrical characteristics of parallel telemetry ports

The following tables list the electrical characteristics of parallel telemetry input and output ports required to connect parallel telemetry ports to external equipment.

Table 13-2 lists the electrical characteristics of parallel telemetry input ports.

Table 13-2
Parallel telemetry input port electrical characteristics

Electrical characteristics of input ports	Acceptable condition
Source input isolation	isolated contacts with no connections to other voltages or grounds
Source input noise or voltage offset	less than 1 V

Table 13-3 lists the electrical characteristics of parallel telemetry output ports.

Table 13-3
Parallel telemetry output port electrical characteristics

Electrical characteristics of output ports	Acceptable condition
Total current for 18 outputs	1.8 A maximum
Individual output current	0.1 A maximum (common isolated return connection for 18 outputs)
Voltage polarity of load	negative only
Load voltage	-58 V dc maximum, relative to the return lead

Alarm severity

Alarm severity indicates the potential affect of an alarm on service.

Critical

Critical alarms are the most severe, and can affect 129 or more DS0s. For example, a missing OC-12 interface in an unprotected configuration generates a critical alarm.

Major

Major alarms correspond to failures that are not as severe as critical alarms, and can affect 24 to 128 DS0s. For example, loss of signal on a DS1 facility generates a major alarm.

Minor

Minor alarms correspond to failures that are not as severe as major alarms and can affect 23 or fewer DS0s. For example, the failure of a protected circuit pack generates a minor alarm.

Warning

Warnings correspond to a condition that is not as severe as a minor alarm, but indicates a condition that should be investigated.

Alerts

Alerts indicate that a performance threshold has been crossed. Alerts are less severe than alarms and do not affect service, but can indicate a condition that requires further investigation.

Remote alarms

Alarm information can be accessed remotely from anywhere within the same system, through different interfaces that have connectorized ports on the shelf.

Ports are provided for an operations controller (OPC) user interface, for a network element user interface (NEUI) for Serial E2A applications, and parallel telemetry applications.

Network element user interface specifications

The following tables list the NEUI specifications. The NEUI is used for operations, administration, maintenance, and provisioning activities of the AccessNode network element.

Table 13-4 lists the network element user interface specifications.

Table 13-4
Network element user interface specifications

Item	Specifications
Terminal type	VT100 or compatible
DTE interface (side interconnect left)	RS-232C for modem and VT100
DCE interface (on the LCAP)	RS-232C for VT100

Operations controller

Network-wide and local operation, administration, maintenance, and provisioning activities are accessed through the OPC user interface.

Table 13-5 lists the OPC user interface specifications.

Table 13-5
OPC user interface specifications

Item	Specifications
Terminal types	VT100 character mode, or bit-mapped graphics display
DTE interface	RS-232C

Serial telemetry

The telemetry byte oriented serial (TBOS), (serial E2A) interface provides remote monitoring of alarms.

Table 13-6 lists the serial E2A interface specifications.

Table 13-6
Serial E2A interface specifications

Item	Specifications
Interface	2, 4-wire RS-422 for TBOS 2, 4-wire RS-422 for TBOS, or network element user interface
Port capacity	Up to eight 64-bit displays
Total alarm points	2048

Parallel telemetry

The parallel telemetry allows external alarm inputs to be monitored and carried to an alarm center. Audible or visible alarm indicators are connected to any of eight Form-C relays on the breaker interface panel (BIP).

Table 13-7 lists the parallel telemetry external alarm specifications.

Table 13-7
Parallel telemetry external alarm specifications

Item	Specifications
Interface port	25-pin
Input	short to ground

Table 13-8 specifies the electrical characteristics of an access bandwidth manager (ABM) shelf's input ports.

Table 13-8
ABM shelf parallel telemetry input port electrical characteristics

Electrical characteristics of input ports	Acceptable condition
Interface port	isolated contacts with no connections to other voltages or grounds
Source input noise or voltage offset	less than 1 V

Table 13-9 specifies the electrical characteristics of an ABM shelf's output ports.

Table 13-9
ABM shelf parallel telemetry output port electrical characteristics

Electrical characteristics of output ports	Acceptable condition
Total current for 18 outputs	1.8 A maximum
Individual output current	0.1 A maximum (common isolated return connection for 18 outputs)
Voltage polarity of load	negative only
Load voltage	-58 V dc maximum, relative to the return lead

TR-08 alarms

The AccessNode remote fiber terminal (RFT) raises and displays TR-08 specific alarms to indicate alarms present on the transmit and receive TR-08 DDLs.

These alarms are raised as a transport interface card (TIC) Facility Alarm against the affected TR-08 VT and are categorized as major and service affecting.

Table 13-10 describes the AccessNode TR-08 alarms.

Table 13-10
TR-08 alarms

Alarm	Description
Receive DDL Major	<p>This alarm is raised when a DDL Major is received on the DDL from the LDS.</p> <p>The alarm text is TR-08 Sys X Farend Major, where <i>x</i> is the TR-08 system number.</p>
Receive DDL OOF	<p>This alarm is raised when an A-link with a DDL out-of-frame condition is detected.</p> <p>The alarm text is TR-08 Sys X Loss of Rx DDL, where <i>x</i> is the TR-08 system number.</p> <p>This alarm takes precedence over a Receive DDL Major alarm raised on a particular TR-08 system.</p>
Receive AIS	<p>This alarm is raised when AIS is present on an affected TR-08 VT (for example, due to DS1 AIS/LOS/OOF or loss of fiber feeder).</p> <p>The alarm text is TR-08 Sys X Rx Fail where <i>x</i> is the TR-08 system number.</p>

Integrated remote testing unit

This chapter contains technical specifications for the integrated remote testing unit (IRTU), which mounts in the common-equipment shelf of the AccessNode remote fiber terminal (RFT).

Chapter contents

This chapter contains the following information:

Topic	See
Measurement specifications	page 14-2
Shock and vibration	page 14-16
Flammability	page 14-16
Ground isolation	page 14-17
Thermal	page 14-17
Reliability	page 14-17
Electromagnetic compatibility	page 14-17
Electromagnetic interference	page 14-17
Safety	page 14-18
Voltage induction	page 14-18
Lightening surge	page 14-19
Interconnection	page 14-19

Measurement specifications

This section lists the performance requirements of the signal generation and measurement circuits on the IRTU.

Loop test

Table 14-1 lists the IRTU loop test specifications.

Table 14-1
Loop test specifications

Measurement	Specifications
ac voltage	<ul style="list-style-type: none"> • 0 to 9.9 V rms: ± 0.5 V rms • 10 to 200 V rms: $\pm 5\%$ of reading • Input Impedance: 100 kohms tip-to-ground (T-G), ring-to-ground (R-G) • Bandwidth: 16 to 400 Hz • Full dc rejection (peak voltage must be less than 270 V)
Frequency measurement	<ul style="list-style-type: none"> • Measures highest frequency tip-to-ground or ring-to-ground. • Range: 16 to 400 Hz, ± 1 Hz
dc voltage	<ul style="list-style-type: none"> • 0 to ± 19.9 V, ± 0.2 V • 20 to 270 V, $\pm 1\%$ of reading • Input impedance: 100 kohms tip-to-ground, ring-to-ground • ac rejection: <ul style="list-style-type: none"> —for 60 Hz (North American) systems, full rejection of 5 Hz and its harmonics up to 360 Hz; peak voltage must be less than 30 V rms —for 50 Hz (Hong Kong) systems, full rejection of 5 Hz and its harmonics up to 400 Hz; peak voltage must be less than 20 V rms
—continued—	

Table 14-1 (continued)
Loop test specifications

Measurement	Specifications
dc resistance	<ul style="list-style-type: none"> • 0 ohms to 499 ohms: ± 20 ohms • 500 ohms to 99.9 kohms: 2% of reading • 100 kohms to 999 kohms: 5% of reading • 1 Mohms to 10 Mohms: 10% of reading <p>Accuracy readings are applied only to the lowest resistance. If resistance is present in another branch, it must be at least 10 times larger than the resistance to be measured for the measurement to occur at the stated accuracy.</p> <ul style="list-style-type: none"> • dc rejection: ± 60 V dc; measurements are not taken for voltages greater than 60 V dc or less than -60 V dc. • ac rejection: <ul style="list-style-type: none"> —For 60 Hz (North American) systems, 30 V rms for multiples of 20 Hz and its harmonics up to 360 Hz; measurements are not taken for voltages greater than 30 V rms —For 50 Hz (Hong Kong) systems, 20 V rms for multiples of 25 Hz and its harmonics up to 400 Hz; measurements are not taken for foreign voltages greater than 20 V rms
Capacitance (calculated from dc resistance and ac impedance values)	<ul style="list-style-type: none"> • 0 mfd to 0.499 mfd: ± 0.005 mfd • 0.5 mfd to 10 mfd: $\pm 2\%$ of reading <p>Resistance applied to largest capacitance with a minimum of 100 kohms parallel resistance. Other legs must be ≥ 4 kohms.</p> <ul style="list-style-type: none"> • dc rejection: ± 60 V dc • ac rejection: <ul style="list-style-type: none"> —For 60 Hz (North American) systems, full rejection of 20 Hz and its harmonics up to 360 Hz; peak voltage must be less than 30 V rms —For 50 Hz (Hong Kong) systems, full rejection of 25 Hz and its harmonics up to 400 Hz; peak voltage must be less than 20 V rms
—end—	

Loop test with Remote Isolation Device operation

The Remote Isolation Device (RID) specification is the same as loop test, except dc bias or tone is available to activate the RID.

Signaling parameters

Table 14-2 lists the IRTU loop signaling, E&M signaling, and signaling supervision specifications.

**Table 14-2
Signaling parameters**

Measurement	Specifications
Loop signaling	<ul style="list-style-type: none"> • battery feed: 400 ohms tip-to-ground (T-G) and 400 ohms ring-to-battery (R-BAT) • reverse battery • DX signaling on and off hook • 2W 200 ohms T-G and R-BAT • LO (loop open), LC (loop close), LCG (loop close ground)
E&M signaling	<ul style="list-style-type: none"> • Type 1, 2, 3 signaling on and off hook • PLR signaling on and off hook • TDM (2 state and 3 state)
Signaling supervision	<ul style="list-style-type: none"> • ground start • loop start • SF signaling on and off hook

Pulse code modulation talk/monitor

This section explains the IRTU pulse code modulation (PCM) talk/monitor capabilities. The PCM talk/monitor supports 2-wire and 4-wire connections. It also supports Plunge for Dial Tone (PDT), callback with optional pound (#) key supervision (digital remote testing unit [DRTU] emulation only), and ring subscriber's line.

Table 14-3 lists the IRTU 2-wire talk/monitor specifications.

**Table 14-3
2-Wire Talk/Monitor specifications**

Item	Specification
Talk direction	Equipment or facility
Talk level	±10 dB from TLP limit
Listen level with talk	PCM limit +10 to -10 dB from TLP; TLP adjustable in 5 dB steps

Table 14-3
2-Wire Talk/Monitor specifications

Item	Specification
Listen level without talk	PCM limit +15 to -15 dB from TLP; TLP adjustable in 5 dB steps
Input impedance	600 or 900 ohms $\pm 10\%$, or > 10 kohms (monitor function)
Output impedance	600 or 900 ohms $\pm 10\%$

Table 14-4 lists the IRTU 4-wire talk/monitor test specifications.

Table 14-4
4-Wire Talk/Monitor specifications

Item	Specification
Talk direction	Equipment or facility
Talk level	+10 dB to -20 dB from TLP (independent of listen level)
Listen level	+10 dB to -25 dB from TLP in 5 dB steps (independent of talk level)
Monitor pair	A or B or both with summing
Filter	Optional 2600 Hz notch filter
Input impedance	150, 600, or 1200 ohms $\pm 10\%$, or > 10 kohms (monitor function only)
Output impedance	150, 600, or 1200 ohms $\pm 10\%$

Table 14-5 lists the IRTU Plunge for Dial Tone (PDT) test specifications.

Table 14-5
Plunge for Dial Tone (PDT) specifications (DRTU emulation only)

Item	Specification
Invocation	Ground start, loop start, X-party, or Y-party
Grounded ring	500 ohms to CO ground
Loop seizure	1.6 kohms
Voice path ac impedance	600 ohms
Voice path loss	< 3 dB

Tone generation

Table 14-6 lists the IRTU tone generation specifications.

**Table 14-6
Tone generation specifications**

Item	Specification
Output level range	-40 to +10 dBm in 0.1 dB steps
Output level accuracy at 1 kHz	±0.1 dB for power levels from -19 dBm to 0 dBm
Frequency response	404 Hz to 2804 Hz: ±0.2 dB with respect to 1 kHz
Frequency response	200 Hz to 10 kHz: ±0.5 dB with respect to 1 kHz
Frequency accuracy	±1 Hz
2-Wire impedance	600 and 900 ohms ±10%
4-Wire impedance	150, 600, and 1200 ohms ±10%
Distortion	< 50 dB

Level and frequency measurement

Table 14-7 lists the IRTU level and frequency measurement specifications.

**Table 14-7
Level and frequency measurement specifications**

Item	Specifications
Level measurement	<ul style="list-style-type: none"> • Measurement range: -40 dBm to +10 dBm • Accuracy at 1 kHz: ±0.1 dBm for power levels from -19 dBm to 0 dBm • Frequency response: 404 Hz to 2804 Hz: ±0.2 dB with respect to 1 kHz • Frequency response: 200 Hz to 10 kHz: ±0.5 dB with respect to 1 kHz
Frequency measurement	<ul style="list-style-type: none"> • Accuracy: 0.01% ±1 Hz • Range: 200 Hz to 10 kHz
Impedance	<ul style="list-style-type: none"> • 2-wire: 600 and 900 ohms ±10% • 4-wire: 150, 600, and 1200 ohms ±10%

Voiceband noise measurement

Table 14-8 lists the IRTU voiceband noise measurement specifications.

Table 14-8
Voiceband noise measurement specifications

Item	Specification
3 kHz flat weighting	<ul style="list-style-type: none"> Noise level: 20 dBrn to 70 dBrn \pm1 dB Frequency range: 50 Hz to 3 kHz
C-message weighting	<ul style="list-style-type: none"> Noise level: 20 dBrnC to 70 dBrnC \pm1 dB Noise level: 10 dBrnC to 20 dBrnC \pm2 dB
C-notch weighting	<ul style="list-style-type: none"> Noise level: 20 dBrnC to 70 dBrnC \pm1 dB

Voiceband impulse noise

Table 14-9 lists the IRTU voiceband impulse noise specifications.

Table 14-9
Voiceband impulse noise specifications

Item	Specification
Mode	Metallic or longitudinal
Types	<ul style="list-style-type: none"> C-message C-notch 3 kHz flat
Threshold	0 to 91 dBrn in 1 dB steps
Blanking interval	<ul style="list-style-type: none"> 125 ms (8 counts/sec) 10 ms (100 counts/sec)
Counters	Three levels with thresholds 4 dB apart

Sounder tone generation

Table 14-10 lists the IRTU sounder tone generation specifications for digital remote testing unit (DRTU) emulation only.

Table 14-10
Sounder tone generation specifications (DRTU emulation only)

Item	Specification
Mode	Metallic or longitudinal
Frequency	493 Hz and 500 Hz \pm 0.25 Hz
Frequency difference	7 Hz \pm 5%
Level	-6 dBm \pm 1 dB total power
Total harmonic distortion	< 40 dB (< 1% THD)
Supervision	Loop closed

Dial subscriber's line

Table 14-11 lists the IRTU dial subscriber's line test specifications for dial pulse signaling, DTMF signaling, and multifrequency (MF) signaling.

Table 14-11
Dial subscriber's line test specifications

Signaling type	Specifications
Dial pulse	<ul style="list-style-type: none"> • Dialing speed: programmable from 1 to 49 pps • Interdigit pause: programmable from 150 to 800 ms • Percent break: programmable from 1% to 99% • Break interval (1/speed * percent break): 28 to 100 ms • Make interval (1/speed * (1- percent break)): 16 to 82 ms • Off-hook resistance: 1.6 kohms
DTMF	<ul style="list-style-type: none"> • Tone duration: programmable from 10 to 500 ms • Interdigit pause: 50% on/off • Level: -7 dBm0 per component \pm1 dB • Twist: < 1 dB • Frequency accuracy: \pm0.1% of center frequency
MF	<ul style="list-style-type: none"> • Tone duration: programmable from 10 to 500 ms • Interdigit pause: 50% on/off • Level: -7 dBm0 per component \pm1 dB • Twist: < 1 dB • Frequency accuracy: \pm0.1% of center frequency

Receive dialing

Table 14-12 lists the IRTU receive dialing specifications.

Table 14-12
Receive dialing specifications

Item	Specification(s)
Dial tone frequency	350 and 440 Hz \pm 1% (DRTU emulation only)
Dial tone level	-16 dBm0 \pm 3 dB per tone into 900 ohms (DRTU emulation only)
Dial pulse signaling	<ul style="list-style-type: none"> • Dial pulse speed range: 5 to 25 pulses per second • Percent break: 46 to 74% • Interdigit pause: 150 ms minimum • Loop resistance: 0 to 2000 ohms
DTMF signaling	<ul style="list-style-type: none"> • Receive level range: -22 dBm to 0 dBm per tone • Frequency tolerance: \pm1.5% • Acceptable twist: < 5 dB • Tone duration: 50 ms minimum • Interdigit time: 50 ms minimum

AC current measurement

Table 14-13 lists the IRTU ac current measurement specifications.

Table 14-13
AC current measurement specifications

Item	Specification(s)
Mode	T or R
Pairs	A or B or C
Range	1 to 140 mA rms
Accuracy	5% of the reading \pm 1 mA
Resolution	1 mA
Bridged sense resistance	20 ohms
Bandwidth	20 to 400 Hz
Full dc rejection	Peak voltage must be less than 270 V

DC current measurement

Table 14-14 lists the IRTU dc current measurement specifications.

**Table 14-14
DC current measurement specifications**

Item	Specification(s)
Mode	T or R
Pairs	A or B or C
Range	1 to 140 mA
Accuracy	5% of the reading ± 1 mA
Resolution	1 mA
Bridged sense resistance	20 ohms (applicable only when IRTU is in bridged line mode)

Peak-to-average ratio generation and measurement

Table 14-15 lists the IRTU peak-to-average ratio (P/AR) generation and measurement specifications.

**Table 14-15
Peak-to-average ratio (P/AR) generation and measurement specifications**

Item	Specification(s)
P/AR generation level range	-40 dBm to +10 dBm
Level resolution	1 dB
Distortion	< 50 dB from 0 Hz to 4 kHz and < 40 dB above 4 kHz
Measurement range	0 to 120 P/AR units with 1 P/AR resolution
Accuracy	± 2 P/AR units from 40 to 110 P/AR units, ± 4 P/AR units otherwise

IMD generation and measurement

Table 14-16 lists the IRTU IMD generation and measurement specifications, which apply only to special service loops.

Table 14-16
IMD generation and measurement specifications (special service loops only)

Item	Specification(s)
IMD generation level range	-40 to 10 dBm
Level resolution	1 dB
Harmonic distortion	< 35 dB
Noise	< 70 dB in the passband of interest
Input level range	-40 to 0 dBm
Measurement range	2nd and 3rd order products 10 to 70 dB below the signal level (down to 15 dBmC)
Accuracy	±1 dB

Phase jitter

Table 14-17 lists the IRTU phase jitter specifications.

Table 14-17
Phase jitter specifications

Item	Specification(s)
Accuracy	±5% ±0.2 degree
Jitter bandwidth	20 to 300 Hz
Jitter range	0 degree; to 25 degree; p-p
Level range	-40 to 10 dBm
Input frequency range	990 to 1030 Hz

Transients

Table 14-18 lists the IRTU transient measurement specifications.

Table 14-18
Transient measurement specifications

Item	Specification(s)
Count rate	8 or 100 counts/sec
Phase hits	<ul style="list-style-type: none"> • Threshold range: 5 to 45 degree; in 5 degree steps • Threshold accuracy: $\pm 10\% \pm 0.5$ degree • Count register: 65,535 counts
Gain hits	<ul style="list-style-type: none"> • Threshold settings: 2, 3, and 6 dB • Threshold accuracy: ± 0.5 dB • Count register: 65,535 counts
Dropouts	<ul style="list-style-type: none"> • Threshold setting: 12 dB • Threshold accuracy: ± 1 dB • Count register: 65,535 counts

Line insulation test

There is no specific line insulation test; line insulation values are the same as the dc resistance values in Table 14-1 on page 14-2.

Ringling

Table 14-19 lists the IRTU ringling specifications.

Table 14-19
Ringling specifications

Item	Specification(s)
Mode	<ul style="list-style-type: none"> • Tip-to-ground with ring grounded • Ring-to-ground with tip grounded • Non-trippable pulse ringling for 2 state services (DX, EM, PLR, TDM)
Output impedance	≤ 1300 ohms
dc bias	+36 V to +52 V, -36 V to -52 V
Ringling voltage	86 V rms or 105 V rms $\pm 10\%$ into open circuit
Ringling frequencies ± 1 Hz	<ul style="list-style-type: none"> • Decimonic frequencies: 20, 30, 40, or 50 Hz • Harmonic frequencies: 16.7, 25, 33.3, or 50 Hz • Synchromonic frequencies: 20, 30, 42, or 54 Hz
—continued—	

Table 14-19
Ringling specifications (continued)

Item	Specification(s)
Ring trip	200 ms maximum with 1800 ohms load tip-to-ring (T-R)
Power ringing cadence	2 seconds on and 4 seconds off
Non-trippable pulse ringing cadence	1.5 second offhook and 2 seconds onhook
—end—	

Ringer presence test

Table 14-20 lists the IRTU ringer presence test specifications.

Table 14-20
Ringer presence test specifications

Item	Specification
Mode	Tip-to-ring, ring-to-ground, tip-to-ground
Method	Impedance measurement
Accuracy	99% for 500 type telephone sets

Voice detection

Table 14-21 lists the IRTU voice detection test specifications.

Table 14-21
Voice detection test specifications

Item	Specification(s)
Bandpass filter	200 Hz to 2 kHz
Accuracy	95%

Coin return and coin collect

Table 14-22 lists the IRTU coin return and coin collect test specifications.

Table 14-22
Coin return and coin collect specifications

Item	Specification(s)
Mode	Tip-to-ring, tip-to-ground, ring-to-ground
Trip current	55 mA \pm 2 mA
Voltage ramp slope	\pm 130 V

Return loss

Table 14-23 lists the IRTU return loss (ERL) specifications.

Table 14-23
Return loss (ERL) specifications

Item	Specification(s)
Filter types	<ul style="list-style-type: none"> • Echo return loss • Singing return loss low • Singing return loss high
Output power level	-2 to -10 dBm
Two-wire impedance	600 or 900 ohm with 2.16 uF
Return loss	0 dB to 40 dB \pm 1 dB
Four-wire impedance	150, 600, or 1200 ohm
Return loss	0 dB to 40 dB \pm 1 dB

ISDN-U interface

Table 14-24 lists the IRTU ISDN-U specifications planned for future implementation.

Table 14-24
ISDN-U interface specifications (future implementation)

Item	Specification(s)
Cold start verification performance monitoring	Test NT1 termination through a 13 kft, 26 AWG artificial line circuit
Power status bit control	<ul style="list-style-type: none"> • Power normal • Primary power out • Secondary power out • Dying gasp
Data link (eoc) control	<ul style="list-style-type: none"> • Data loopback: B1, B2, B1+B2, or 2B+D channels • CRC corruption
Sealing current measurement	Provided through 2-kohm resistors to simulate NT1 dc termination
NT1 maintenance mode control	As specified in ANSI T1.601

Datapath tone generation

Table 14-25 lists the IRTU Datapath tone generation specifications planned for future implementation.

Table 14-25
Datapath tone generation specifications (future implementation)

Item	Specification(s)
Frequency	dc, 50 Hz or 80 kHz sine wave
Level	+10 dBm \pm 0.5 dB
Impedance (dc and 80 kHz)	135 ohms \pm 10%
Impedance (50 Hz)	150 ohms \pm 10%

Loop conditioning

The IRTU performs loop conditioning in the following states:

- T/R, T1/R1 or EM battery and ground conditioning through 650 ohms
- tip ground with ring open
- ring ground with tip open
- tip ground with ring ground
- tip battery with ring open
- ring battery with tip open
- tip battery with ring battery
- tip battery with ring ground
- ring battery with tip ground
- T/R, T1/R1 or EM Short through 20 ohms

Call progress tone detection

The IRTU detects the following call progress tones:

- busy
- reorder
- audible ring
- dial tone
- test tone (1004 Hz)
- voice (-30 dBm or greater energy in 200 Hz to 4 KHz band)
- quiet (none of the above)

DC supervision detection

The IRTU detects the following dc supervision signals:

- onhook or offhook
- pulsing (less than 100 ms)
- wink start signal (100 ms to 350 ms onhook)
- delay dial signal (variable length onhook)

Shock and vibration

This section contains shock and vibration specifications for the IRTU.

Vibration

The IRTU meets the following vibration specifications:

- Operation: 0.1 g from 5 Hz to 100 Hz swept sine in each of the three orthogonal axes
- Transportation: as per Bellcore Network Equipment Building Standards document (NEBS TR-NWT-000063, Issue 05, September 1993), Section 5.4.1.4:
 - 0.1 g from 5 Hz to 100 Hz swept sine in each of the three orthogonal axes
 - 1.5 g from 50 Hz to 500 Hz swept sine in each of the three orthogonal axes
- Tested in accordance with NEBS Section 5.5

Shock

The IRTU meets the following shock specifications:

- Transportation and handling: as per NEBS Section 5.4 for packaged equipment
- Installation handling: as per NEBS Section 5.4 for unpackaged equipment

Flammability

All materials, components, and the printed wiring board meet all flammability requirements in TR-EOP-000063, Issue 3, and ANSI/UL1459, Issue 2.

All materials, including components and wiring, are rated UL 94-V1. The printed wiring board is rated UL 94-V0 and have a comparative tracking index (CTI) of at least 100. All power inputs are fused to limit the power input to the pack to no more than 100 volt-amperes (VA).

Ground isolation

The IRTU interfaces the access bandwidth manager (ABM) common-equipment shelf, which is referenced to logic ground (LGND), and line equipment, which is referenced to talk battery return (TBR).

The IRTU does not couple high voltage surges associated with the line equipment into the common-equipment LGND or common equipment battery return. The IRTU uses optical isolators to maintain logic signal isolation between the microprocessors and common-equipment shelf—which are referenced to LGND—and the metallic lead interface circuits and signal generation and measurement circuits, which are referenced to TBR.

High value resistors or transformers at the metallic lead interfaces maintain high voltage isolation and current limiting for the IRTU from the outside plant equipment. In addition, fuses, series resistors, and surge suppression Zener diodes dissipate foreign power surges that can occur on the metallic leads into the IRTU.

The PUPS converter has its own isolation scheme. The design ensures that there are at least 10 Mohms resistance between the Common Equipment battery return and returns for the derived voltage rails. Additionally, the design incorporates 10 Mohms resistance between each derived dc voltage return that it produces. The IRTU circuit references the derived voltage returns to either LGND or TBR, or leaves them floating, as required by the circuit implementation.

Thermal

The thermal dissipation specifications are as follows:

- Typical: 15-19 W
- Maximum: 23-28 W

Reliability

The expected mean time between failure (MTBF) for the IRTU is 20 years.

Electromagnetic compatibility

The IRTU, when installed in the AccessNode, meets the FCC Part 15, Subpart B, limits for a Class A device as well as the specifications described in “Electromagnetic compatibility” on page 8-1.

Electromagnetic interference

The IRTU, when installed in the AccessNode, meets the electromagnetic interference (EMI) limits for a Class A device.

Safety

The IRTU meets all safety requirements of the following documents:

- ANSI/UL1459 Issue 2
- Bellcore TR-TYS-000057, Issue 01
- “Bell-Northern Research Product Verification Guideline,” Issue 2
- CSA 22.2 No. 225

Voltage induction

For North American systems, the IRTU test access path (TAP) interface circuits meet the voltage induction (power cross) requirements of the following documents:

- ANSI/UL1459, Section 50A
- Bellcore TR-TSY-000057, Issue 01, Sections 10.6.8 and 10.6.9
- CSA C22.2, No. 225, Section 6.9

For Hong Kong systems, the IRTU test access path (TAP) interface circuits reject a 50 Hz power cross and its harmonics up to 400 Hz; peak voltage must be less than 270 V.

This section lists the worst case test configurations, impressed voltages, and test durations from those standards. The metallic interface circuit design accommodates these conditions, shunts the applied power, and provides the required measurement functionality.

Metallic voltage

The IRTU can sustain the following with no operational degradation:

$V_{ac} = 50 \text{ V}$, $Z_{source} = 150 \text{ ohms}$, duration = 15 minutes

The pack does not become a hazard when exposed to the test voltages listed in Table 14-26. However, the pack can become non-operational).

Table 14-26
Metallic test voltages

Test voltage	I_{max} / Z_{source}	Duration
600 V	40 A I_{max}	1.5 seconds
600 V	7 A I_{max}	5 seconds
600 V	2.2 A I_{max}	30 minutes
200 V to 600 V	2.2 A I_{max}	30 minutes
600 V	600 ohm Z_{source}	15 minutes

Longitudinal voltage

The pack sustains the following impressed voltages on both tip and ring of each TAP pair with no operational degradation:

$V = 50 \text{ V}$, $Z_{\text{source}} = 150 \text{ ohms}$, duration = 15 minutes

The pack does not become a hazard when exposed to the test voltages listed in Table 14-27 applied on both Tip and Ring of the pair under test (however, the pack is allowed to become non-operational).

Table 14-27
Longitudinal test voltages

Test voltage	$I_{\text{max}} / Z_{\text{source}}$	Duration
240 V	24 A I_{max}	30 minutes
600 V	40 A I_{max}	1.5 seconds
600 V	7 A I_{max}	5 seconds
600 V	2.2 A I_{max}	30 minutes
200 V to 600 V	2.2 A I_{max}	30 minutes
600 V	600 ohm Z_{source}	15 minutes

Lightening surge

The pack shall withstand the lightning surges described in Bellcore document TR-TSY-000057, Issue 01, Sections 10.6.3 and 10.6.4, and NT Corporate Standard 1523.01, Section D.1.

It shall withstand 50 applications of 10/1000 microseconds, 1000 V peak surges with no operational degradation.

These surges have a rise time of 10 microseconds and a decay time of 1000 microseconds to 50% of the peak voltage. The surges are repeated 50 times in succession. As with the power cross tests, the IRTU metallic interface is designed to meet these requirements without degrading the required signal measurement or generation characteristics of the pack.

The interface circuits withstand 1500 V surge pulses with 2 microseconds rise times and 10 microseconds decay times, as defined in the Bellcore documents TR-TSY-000057 and TR-TSY-001089.

Interconnection

The IRTU has not been tested and is not registered as terminal apparatus as defined by FCC rules, Part 68, and by DOC CS.03 for subscriber-owned applications.

Appendix A: MBP specifications

The modular business package (MBP) and modular power package (MPP) meet the requirements of Bellcore TA-NWT-000487.

Appendix contents

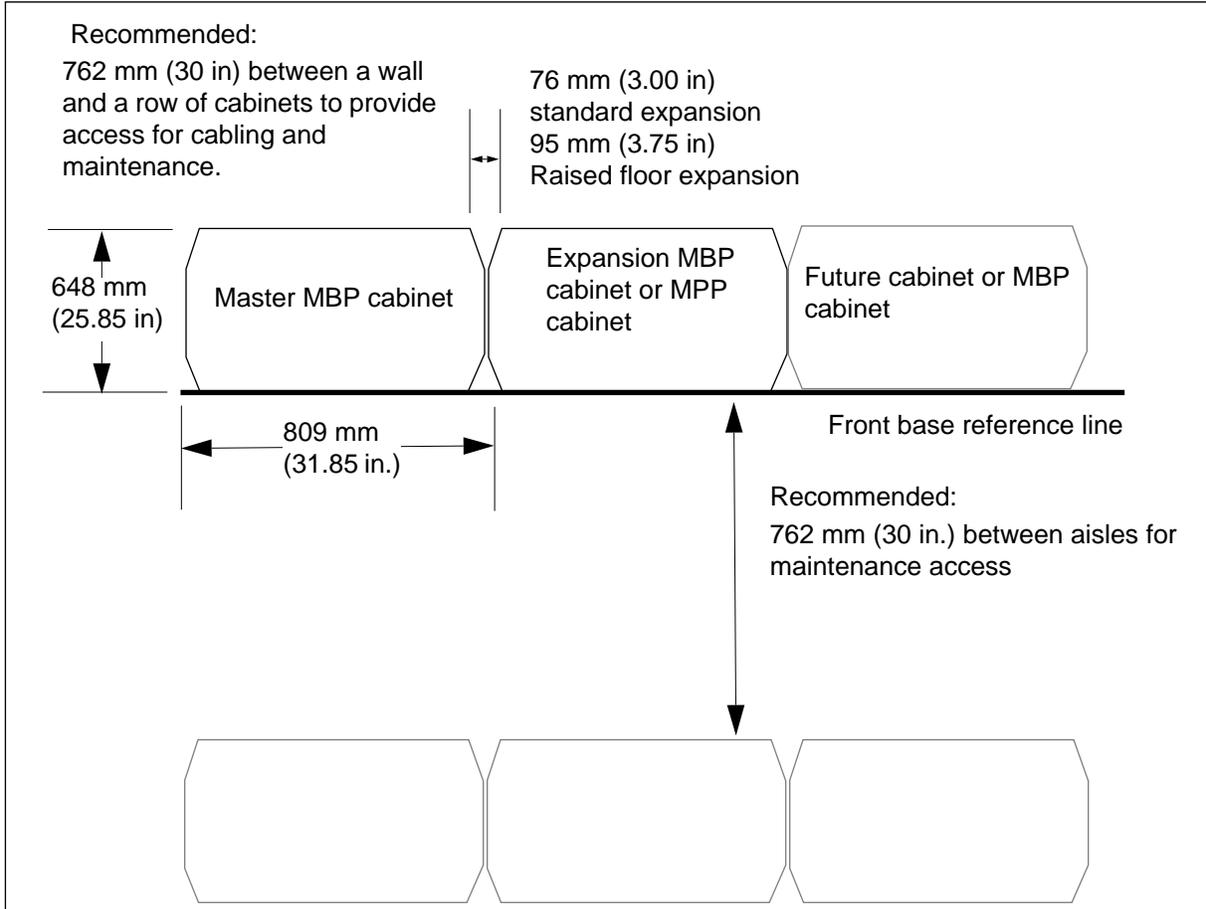
This appendix contains the following information:

Topic	See
Floor space requirements	page 15-2
Floor loading requirements	page 15-3
Cabinet dimensions	page 15-3
Equipment weights	page 15-4
Shock and vibration	page 15-4
Power and grounding	page 15-4

Floor space requirements

Figure 15-1 shows the floor space requirements for MBP and MPP cabinet lineups.

Figure 15-1
Floor space requirements for MBP and MPP cabinets (top view)



Floor loading requirements

The floor loading should be sufficient to bear both distributed and concentrated loading in accordance with Electronic Industries Association (EIA) and Canadian Standards Association (CSA) as shown in Table 15-1:

Table 15-1
Floor loading requirements

Duty	Distributed loading	Concentrated loading
Light	150 lbs/ft ²	2.7 lbs/in. ²
Medium	250 lbs/ft ²	4.4 lbs/in. ²
Heavy	350 lbs/ft ²	5.6 lbs/in. ²

Cabinet dimensions

Table 15-2 lists the approximate cabinet dimensions for MBP and MPP assemblies.

Table 15-2
Cabinet dimensions

Dimension	Value
Width	809 mm (31.85 in)
Depth	648 mm (25.5 in)
Height	The height of a cabinet varies from 762 mm (30.5 in) to 2037 mm (81.5 in) based on the number of single-equipment modules and dual-equipment modules in the cabinet. Heights of individual modules are as follows: top cap 87.5 mm (3.5 in.) single equipment module 416.7 mm (16.75 in.) dual equipment module 837.5 mm (33.5 in.) pedestal 254.4 mm (10 in.) allowance for: casters 87.5 mm (3.5 in.) levelling feet 32 mm (1.25 in.) allowance for shipping pallet and packaging material: 200 mm (8 in.)
Clearance between mounting rails	546 mm (21.5 in)
Horizontal mounting centers	566 mm (22.3 in)

Equipment weights

Table 15-3 lists the approximate weights for MBP and MPP assemblies.

Table 15-3
MBP and MPP weights

Item and description	Approximate weight
Packaging for shipping a cabinet (consists of the pallet, the carton, bubble pack, anchor brackets, and strapping)	27.3 kg (60 lb)
Top cap assembly	6.4 kg (14 lb)
Dual-equipment module (no equipment shelves, cables, or side panels, but with separator and equipment covers)	68.1 kg (149 lb)
With panels	72 kg (158 lb)
Single-equipment module (no equipment shelves, cables, or side panels, but with equipment covers)	34.0 kg (74 lb)
Pedestal assembly for MBP cabinet	39.7 kg (87 lb)
Pedestal assembly for MPP cabinet	31.9 kg (70 lb)
Side panel for SEM or DEM shelf	1.0 kg (2.2 lb)
FiberManager Compact 8 fiber patch	9.58 kg (21 lb)
Power distribution shelf	16.0 kg (35 lb)
Empty rectifier shelf	10.5 kg (23 lb)
Rectifier	6.7 kg (14 lb)

Shock and vibration

MBP and MPP cabinet equipment comply with section 4.5.2 of Bellcore TR-EOP-000063.

Power and grounding

An AccessNode system housed in an MBP cabinet powered by a MPP requires a 208/240 V ac, single-phase commercial power source rated at 15 A for each rectifier in the MPP cabinet.

Rectifier settings

- rectifier output voltage (float) 54.0 V dc
- rectifier output voltage (equalize) 55.5 V dc
- rectifier high-voltage shutdown 56.5 V dc
- rectifier output current limiting 100% \pm 10%

Appendix B: S800A OSP cabinet specifications

The S800A cabinet meets the requirements of Bellcore TA-NWT-000487. This appendix contains the specifications that apply to the S800A outside plant (OSP) cabinet:

Appendix contents

This appendix contains the following information:

Topic	See
Cabinet dimensions	page 16-1
Weight	page 16-3
Doors	page 16-3
Altitude	page 16-3
Radiated and conducted emissions	page 16-3

Cabinet dimensions

Table 16-1 lists the dimensions for a cabinet with air induction and without an ac power pedestal.

Table 16-1
Dimensions for a cabinet with air induction and without an ac power pedestal

Dimension	Value
Width	1800 mm (71 in.)
Depth	760 mm (30 in.)
Height	1650 mm (65 in.)

Table 16-2 lists the dimensions for a cabinet with air induction and an ac power pedestal.

Table 16-2
Dimensions for a cabinet with air induction and an ac power pedestal

Dimension	Value
Width	2100 mm (83 in.)
Depth	760 mm (30 in.)
Height	1650 mm (65 in.)

Table 16-3 lists the dimensions for a cabinet with a heat exchanger and without an ac power pedestal.

Table 16-3
Dimensions for a cabinet with a heat exchanger and without an ac power pedestal

Dimension	Value
Width	1800 mm (71 in.)
Depth	940 mm (37 in.)
Height	1960 mm (77 in.)

Table 16-4 lists the dimensions for a cabinet with a heat exchanger and an ac power pedestal.

Table 16-4
Dimensions for a cabinet with a heat exchanger and an ac power pedestal

Dimension	Value
Width	2100 mm (83 in.)
Depth	940 mm (37 in.)
Height	1960 mm (77 in.)

Weight

Table 16-5 lists the weights for empty and fully equipped cabinets.

Table 16-5
Weights for empty and fully equipped cabinets

Item	Value
Empty cabinet	680 Kg (1500 lbs)
Fully configured system without circuit packs and batteries	955 Kg (2100 lbs)
Fully configured system with circuit packs and batteries	1545 Kg (3100 lbs)

Doors

The cabinet doors are constructed of 12 and 14 gauge steel. A cover is fitted on the inside of each door to protect the insulation against damage. Each door is hinged with concealed hinge pins and the cabinet is locked using a three-point latching mechanism operated by a handle with a padlock.

The inside door panel makes direct contact with the door alarm switch. All doors feature a self-locking wind-relief mechanism located at the bottom edge of the door. The electronic and power compartment doors have AT&T hex socket locks and the termination door has a 216 hex nut lock.

Altitude

Table 16-6 lists the supported operating and shipping altitudes for the S800A cabinet.

Table 16-6
Altitude specifications

Item	Value
Operating	61 m (200 ft) below mean sea level to 4000 m (13,000 ft) above mean sea level
Shipping	Up to 12,000 m (39,370 ft) above mean sea level

Radiated and conducted emissions

The cabinet meets the EMI requirements of FCC regulations part 15 subpart B; Class A.

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System Specifications

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Publication number: 323-3001-180

Document release: Issue 1.0

Date: February 1999

Printed in Canada

