NORTEL

Nortel Multiservice Switch 7400/15000/20000

Fundamentals – FP Reference

NN10600-551

Sourced in Canada and the United States of America.

Contents

Frame-based function processors   91

Ethernet-based function processors   119

New in this release

The following sections detail what is new in *Nortel Multiservice Switch 7400/15000/20000 Fundamentals – FP Reference* (NN10600-551) for PCR 7.2.

- Features (page 9)
- Other changes (page 11)

Features

See the following sections for information about feature changes:

- FrATM support on 2pSTM1e, 2pSTM1eCh, and optical 2pSTM1Ch (page 9)
- 2547oISIS on FE/GE (page 9)
- RFC2547 FE Trunking (VLAN) (page 10)
- FE and GE Egress Scheduling (page 10)
- DiffServ Infrastructure for Ethernet VLAN (page 10)
- EVLS FE p-bit aware egress forwarding (page 10)
- EVLS GE p-bit aware egress forwarding (page 10)
- 2 port Voice Services Processor 4e (2pVSP4e) (page 10)

FrATM support on 2pSTM1e, 2pSTM1eCh, and optical 2pSTM1Ch
The following sections were updated:

- Applications/services supported by Multiservice Switch 7400 ATM-based and MSA FPs (page 16)
- STM-1 electrical ATM FP supported features (page 90)
- STM-1 CES/ATM/IMA FP supported features (page 205)

2547oISIS on FE/GE
The following sections were updated:

- Applications/services supported by Multiservice Switch Ethernet FPs (page 20)
- 10/100BaseT Ethernet FP supported features (page 126)

- Gigabit Ethernet FP supported features (page 130)

RFC2547 FE Trunking (VLAN)

The following sections were updated:

- Applications/services supported by Multiservice Switch Ethernet FPs (page 20)

- 10/100BaseT Ethernet FP supported features (page 126)

FE and GE Egress Scheduling

The following sections were updated:

- 10BaseT Ethernet FP supported features (page 124)

- 10/100BaseT Ethernet FP supported features (page 126)

- 10/100BaseT Ethernet FP configuration considerations (page 128)

- Gigabit Ethernet FP supported features (page 130)

- Gigabit Ethernet FP configuration considerations (page 131)

- Traffic management on 4-port gigabit and 4-port/8-port 10/100BaseT Ethernet FPs (page 134)

- Egress queue selection (page 136)

- 4-port gigabit and 4-port/8-port 10/100BaseT Ethernet migration considerations (page 143)

- Moved the Configuration considerations table after the Supported features considerations table for all FPs

DiffServ Infrastructure for Ethernet VLAN

The following sections were updated:

- 10/100BaseT Ethernet function processors (page 125)

- Gigabit Ethernet function processors (page 129)

EVLS FE p-bit aware egress forwarding

The following section was updated:

- 10/100BaseT Ethernet function processors (page 125)

EVLS GE p-bit aware egress forwarding

The following section was updated:

- Gigabit Ethernet function processors (page 129)

2 port Voice Services Processor 4e (2pVSP4e)

The following sections were updated:

- Voice server processor specifications (page 169)

- Voice server processor configuration considerations (page 174)
- Voice server processor supported features (page 180)

Other changes

See the following sections for information about changes that are not feature-related:

- Updated STM-1 CES/ATM/IMA FP configuration considerations (page 200) with information about the STM1 Optical Channelized card.

- Updated Gigabit Ethernet FP configuration considerations (page 131) with information about configuring the *autoNegotiation* attribute on a 4pGe port.

- Updated Buffer management on the 4-port/8-port 10/100BaseT FPs (page 140) with information about the relationship between the congestion control using discard thresholds at the global buffer level and at the link-EP queue level.

Attention: On July 1, 2006, the PEC codes for hardware components will change due to the Reduction of Hazardous Substances (RoHS) requirements. For more information and a description of these new codes, refer to the Nortel Multiservice Switch 15000/20000 Ordering Catalog, and the Nortel Multiservice Switch 6400/7400 Ordering Catalog.

Applications and services supported by function processors

Nortel Multiservice Switch 7400/15000/20000 Fundamentals – FP Reference (NN10600-551) contains reference information for all Nortel Multiservice Switch function processors (FP). For each FP, the document provides a description of its functionality, configuration parameters, supported applications and services, and OSI states.

The following tables depict the applications and services supported by each FP. An "X" indicates that a service (listed by row) is supported on a function processor (displayed in columns). However, not all applications and services may operate concurrently on an FP.

> **Attention:** An application is defined as a generic type, such as frame relay (FR). Each application is composed of individual services, such as FR UNI, and FR NNI in the case of frame relay.

> **Attention:** Some table column headings use MSS in place of Multiservice Switch to accommodate readability. The term "MSS" is not an official abbreviation.

Also, refer to the following sections for information contained in the tables:

- PQC1-based FPs (page 24)
- ATM Termination of FRATM, EVLS, EthernetTrunk, or Bridging (page 24)

Applications/services supported by Multiservice Switch Frame-based FPs

Applications/Services	Multiservice Switch 7400														MSS 15000 or 20000		
	SBIC/PM2 based FPs												PQC2		PQC		
X = supported	8-port V.11	8-port V.35	1-port HSSI	4-port DS1	4-port DS1Ch	8-port DS1	4-port E1	4-port E1Ch	4-port E1Ch FR-ISDN	1-port DS3	1-port DS3Ch	1-port E3	8-port DS1 or E1 MSA	32-port DS1 or E1 MSA *	4-port DS3 Ch FR PQC2	4-port DS3 Ch FR PQC12	1-port STM1 Ch FR PQC2
Frame Relay																	
FR UNI	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
FR NNI	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
FR-ATM (FRF.5, FRF.8)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
FR Trace	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
FR ISDN									X				X	X			
Transparent Data Services																	
HTDS	X	X	X	X		X	X			X		X	X	X			
BTDS	X	X		X		X	X										
Core Networking																	
DPRS trunks	X	X	X	X		X	X			X		X	X+	X+			
PORS trunks	X	X	X	X		X	X			X		X	X+	X+			
PORS Routing Gateway													X	X			
DPN Gateway over UTP	X	X		X		X	X										
DPN Gateway over FR	X	X		X			X										
MCS Manager (for FRF.5)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MPANL																	
Dedicated mode	X	X			X	X	X	X	X								
Tunnelled mode	X	X			X	X	X	X	X								
ISDN access					X			X									
(1 of 2)																	

Applications/services supported by Multiservice Switch Frame-based FPs (continued)

Applications/Services	Multiservice Switch 7400														MSS 15000 or 20000		
	SBIC/PM2 based FPs												PQC2		PQC		
X = supported	8-port V.11	8-port V.35	1-port HSSI	4-port DS1	4-port DS1Ch	8-port DS1	4-port E1	4-port E1Ch	4-port E1Ch FR-ISDN	1-port DS3	1-port DS3Ch	1-port E3	8-port DS1 or E1 MSA	32-port DS1 or E1 MSA *	4-port DS3 Ch FR PQC2	4-port DS3 Ch FR PQC12	1-port STM1 Ch FR PQC2
IP interface of VR (for VIPR or RFC2764)																	
IP over FR with Virtual Framer	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
IP over FR with Direct Connect													X	X	X	X	X
IP over FR with IP optimized DLCI													X	X	X	X	X
IP over PPP	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
IP over MLPPP++													X	X			
IP interface of VRF (for RFC2547)																	
IP over FR with IP optimized DLCI													X	X	X	X	X
IP over PPP													X	X	X	X	X
IP over MLPPP++													X	X			

This table does not apply to any PM1-based FPs or PQC1-based FPs. PM1-based FPs are not supported in software versions PCR5.2 and up. See PQC1-based FPs (page 24).

*The MSA32 column applies to both the 1-slot and 2-slot versions of MSA32.

+MSA32 and MSA8 support DPRS and PORS over ATM trunks, not frame-cell (unack) trunks.

++Multi-link point-to-point protocol (MLPPP) is supported on VIPR and RFC2547, but not on RFC2764.

(2 of 2)

Applications/services supported by Multiservice Switch 7400 ATM-based and MSA FPs

Applications/Services	CQC-based ATM FPs					PQC2-based ATM-IP FPs							
X = supported	8-port DS1 ATM	8-port E1 ATM	3-port DS3 ATM	3-port E3 ATM	3-port OC3/STM1 ATM	3-port DS3 ATM IP	3-port E3 ATM IP	2-port OC3/STM1 ATM IP	2-port STM1e ATM IP	2-port STM1e Ch CES/ATM/IMA	2-port STM1Ch CES/ATM/IMA	8-port DS1 or E1 MSA (MSA8)	32-port DS1 or E1 MSA (MSA32)
ATM													
ATM bearer service	X	X	X	X	X	X	X	X	X	X	X	X	X
ATM networking (UNI, PNNI, IISP, AINI)	X	X	X	X	X	X	X	X	X	X	X	X	X
ATM termination of FR-ATM**	X	X	X	X	X	X	X	X	X	X	X	X	X
ATM termination of EVLS**						X	X	X	X	X	X	X	X
ATM termination of EthernetTrunk**						X	X	X	X	X	X	X	X
ATM termination of Bridging**						X	X	X	X	X	X	X	X
IMA	X	X								X	X	X	X
Core Networking													
DPRS trunks	X	X	X	X	X	X	X	X	X			X	X
PORS trunks	X	X	X	X	X	X	X	X	X			X	X
PORS Routing Gateway						X	X	X	X			X	X
DPN Gateway													
MCS Manager (for FRF.5)	X	X	X	X	X	X	X	X	X			X	X
IP over ATM (AtmMpe): IP interface of:													
VR (VIPR)	X*	X*	X*	X*	X*	X	X	X	X	X	X	X	X
cVR (RFC2764 access)	X*	X*	X*	X*	X*	X	X	X	X	X	X	X	X
VCG (RFC2764 trunking)						X	X	X	X			X	X
VRF (RFC2547 access)						X	X	X	X	X	X	X	X
Router (RFC2547 trunking)						X	X	X	X	X	X	X	X
(1 of 2)													

Applications/services supported by Multiservice Switch 7400 ATM-based and MSA FPs (continued)

Applications/Services X = supported	CQC-based ATM FPs					PQC2-based ATM-IP FPs							
	8-port DS1 ATM	8-port E1 ATM	3-port DS3 ATM	3-port E3 ATM	3-port OC3/STM1 ATM	3-port DS3 ATM IP	3-port E3 ATM IP	2-port OC3/STM1 ATM IP	2-port STM1e ATM IP	2-port STM1e Ch CES/ATM/IMA	2-port STM1Ch CES/ATM/IMA	8-port DS1 or E1 MSA (MSA8)	32-port DS1 or E1 MSA (MSA32)
IP over ATM over IMA: IP interface of:													
VR (VIPR) or cVR (RFC2764) - IMA	X*	X*								X	X	X	X
VCG (RFC2764) - IMA												X	X
VRF or Router (RFC2547) - IMA										X	X	X	X
MPLS RFC2547 (Router model)													
LDP-DU LSR (P node)						X	X	X	X	X	X	X	X
LDP-DU LER (PE node)						X	X	X	X	X	X	X	X
IP over MPLS (Router model*)**													
RSVP-TE LSR													
RSVP-TE LER													
Virtual media													
Inter-VR hardware connectivity						X	X	X	X			X	X
* IP is supported on CQC-based FPs only if used with an ILS forwarder card.													
** See ATM Termination of FRATM, EVLS, EthernetTrunk, or Bridging (page 24).													
*** MPLS services on the VR Model are not supported in PCR5.2 and up.													
This table does not apply to any 8 Mbyte CQC-based FPs or PQC1-based FPs. 8 Mbyte CQC-based FPs are not supported in PCR4.1 and up. See PQC1-based FPs (page 24).													
(2 of 2)													

Applications/services supported by Multiservice Switch 15000 and Multiservice Switch 20000 ATM-based FPs

Applications/Services	Electrical			Optical								
X = supported	4-port DS3 Ch ATM/IMA (PQC2)	12-port DS3 ATM (PQC2)	12-port E3 ATM (PQC2)	4-port OC3/STM1 ATM (PQC2)	4-port OC3/STM1 ATM (PQC12)	16-port OC3/STM1 ATM (PQC2)	16-port OC3/STM1 POS and ATM*	1-port OC12/STM4 ATM (PQC2)	4-port OC12/STM4 ATM (PQC2)	4-port OC12/STM4 ATM (PQC12)	4-port MR POS and ATM (GQM)++	1-port OC48/STM16 ATM (PQC2)
ATM												
ATM bearer service	X	X	X	X	X	X	X	X	X	X	X	X
ATM networking (UNI, PNNI, IISP, AINI)	X	X	X	X	X	X	X	X	X	X	X	X
ATM termination of FR-ATM**	X	X	X	X	X	X		X	X	X		X
ATM termination of EVLS**	X	X	X	X	X	X	X			X	X	X
ATM termination of EthernetTrunk**					X		X			X	X	
IMA	X											
Core Networking												
DPRS trunks		X	X	X	X	X	X	X	X	X	X	X
PORS trunks		X	X	X	X	X	X	X	X	X	X	X
PORS Routing Gateway		X	X	X	X	X		X	X	X		X
DPN Gateway												
MCS Manager (for FRF.5)												
IP over ATM (AtmMpe): IP interface of:												
VR (VIPR)	X	X	X	X	X	X	X	X		X	X	X
cVR (RFC2764 access)		X	X	X	X	X	X	X		X	X	X
VCG (RFC2764 trunking)		X	X	X	X	X	X	X		X	X	X
VRF (RFC2547 access)		X	X	X	X	X	X	X		X	X	X
Router (RFC2547 trunking)					X		X			X	X	

(1 of 2)

Applications/services supported by Multiservice Switch 15000 and Multiservice Switch 20000 ATM-based FPs (continued)

Applications/Services	Electrical			Optical								
X = supported	4-port DS3 Ch ATM/IMA (PQC2)	12-port DS3 ATM (PQC2)	12-port E3 ATM (PQC2)	4-port OC3/STM1 ATM (PQC2)	4-port OC3/STM1 ATM (PQC12)	16-port OC3/STM1 ATM (PQC2)	16-port OC3/STM1 POS and ATM*	1-port OC12/STM4 ATM (PQC2)	4-port OC12/STM4 ATM (PQC2)	4-port OC12/STM4 ATM (PQC12)	4-port MR POS and ATM (GQM)++	1-port OC48/STM16 ATM (PQC2)
IP over ATM over IMA: IP interface of:												
VR (VIPR) - IMA	X											
cVR or VCG (RFC2764) - IMA												
VRF or Router (RFC2547) - IMA												
MPLS RFC2547 (Router model)												
LDP-DU LSR (P node)				X		X			X	X		
LDP-DU LER (PE node)				X		X			X	X		
IP over MPLS (Router model***)												
RSVP-TE LSR												
RSVP-TE LER												
Virtual media												
Inter-VR hardware connectivity+		X	X	X	X	X		X		X		X

*Some applications supported on this GQM FP are mutually exclusive. For more information, see table NPU service bundles available for the 16-port OC3/STM-1 POS ATM FP in *Nortel Multiservice Switch 7400/15000/20000 Configuration* (NN10600-550).

** See ATM Termination of FRATM, EVLS, EthernetTrunk, or Bridging (page 24).

*** MPLS services on the VR Model are not supported in PCR5.2 and up.

+ For Media Gateway applications, inter-VR hardware connectivity is only supported with VSP2 and VSP3-o cards, not VSP3. For 2pVSP4e cards, there is an inter-VR limitation on the number of G.711 10ms calls which may result in a loss of voice quality.

++ Services supported by this MR (multi-rate) FP are the same for the 4pOC12 or 1pOC48 mode.

This table does not apply to the PQC1 version of any FP. See PQC1-based FPs (page 24).

(2 of 2)

Applications/services supported by Multiservice Switch Ethernet FPs

Applications/Services	Multiservice Switch 7400				MSS 15000 or 20000
	SBIC/PM2-based FPs		PQC12-based FPs		FQM-based FPs
X = supported	6-port 10BaseT Ethernet	2-port 100BaseT Ethernet	4-port 10/100 BaseT Ethernet	8-port 10/100 BaseT Ethernet	4-port Gigabit Ethernet
IP over Ethernet with VIPR					
IP interface of VR	X	X	X	X	X
VLAN			X	X	X
LAG (802.3ad)					X
IP over Ethernet with RFC2764					
IP interface of cVR	X	X			
IP interface of VCG					
VLAN					
LAG (802.3ad)					
IP over Ethernet with RFC2547					
IP interface of VRF (port mode)			X	X	X
IP interface of VRF over VLAN			X	X	X
IP interface of Router (port mode)			X	X	X
IP interface of Router over VLAN			X	X	X
LAG (802.3ad)					
(1 of 2)					

Applications/services supported by Multiservice Switch Ethernet FPs (continued)

Applications/Services	Multiservice Switch 7400				MSS 15000 or 20000
	SBIC/PM2-based FPs		PQC12-based FPs		FQM-based FPs
X = supported	6-port 10BaseT Ethernet	2-port 100BaseT Ethernet	4-port 10/100 BaseT Ethernet	8-port 10/100 BaseT Ethernet	4-port Gigabit Ethernet
MPLS RFC2547 (Router model)					
LDP-DU LSR (P node): VLAN or port mode			X	X	X
LDP-DU LER (PE node): VLAN or port mode			X	X	X
IP over MPLS (Router model*)					
RSVP-TE LSR: port mode					
RSVP-TE LER: port mode					X
Layer 2 Ethernet Solutions					
Ethernet virtual line services (EVLS)			X	X	X
Ethernet Trunking (DPRS/PORS/ATM over Eth)			X	X	X
Bridging (VirtualBridge)			X	X	
Media Gateway					
Non-switched voice over ATM					
Switched voice over ATM					
Switched voice over IP					X
* MPLS services on the VR Model are not supported in PCR5.2 and up.					
This table does not apply to any PM1-based FPs. PM1-based FPs are not supported in software version PCR5.2 and up.					
(2 of 2)					

Applications/services supported by Multiservice Switch 7400 voice services and CES FPs

Applications/Services	MVP-E					Media Gateway			CES					
X = supported	1-port DS1 MVPe	1-port E1 MVPe	1-port TTC2M MVPe	4-port DS1 MVPe	4-port E1 MVPe	VSP2	32-port E1 TDM	2-port DS3 Ch TDM	4-port DS1 AAL1	4-port E1 AAL1	8-port DS1 or E1 MSA (MSA8)	32-port DS1 or E1 MSA (MSA32)	2-port STM1e Ch CES/ATM/IMA	2-port STM1ch CES/ATM/IMA
Voice-related services														
BTDS	X	X		X	X									
HTDS											X	X		
Voice service (VS)	X	X	X	X	X									
Voice Networking (Vnet)	X	X	X	X	X									
CAS	X	X	X	X	X									
DCME (Q.50)		X												
ETSI Qsig	X	X		X	X									
ETSI Qsig segmentation	X	X		X	X									
EuroIsdn		X			X									
NIS	X			X										
MCDN	X	X		X	X									
MPANL	X	X		X	X									
Protocol gateways	X	X		X	X									
Media Gateway														
Non-switched voice over ATM						X	X	X						
Switched voice over ATM						X	X	X						
Switched voice over IP						X	X	X						
(1 of 2)														

Applications/services supported by Multiservice Switch 7400 voice services and CES FPs (continued)

Applications/Services	MVP-E					Media Gateway			CES					
X = supported	1-port DS1 MVPe	1-port E1 MVPe	1-port TTC2M MVPe	4-port DS1 MVPe	4-port E1 MVPe	VSP2	32-port E1 TDM	2-port DS3 Ch TDM	4-port DS1 AAL1	4-port E1 AAL1	8-port DS1 or E1 MSA (MSA8)	32-port DS1 or E1 MSA (MSA32)	2-port STM1e Ch CES/ATM/IMA	2-port STM1ch CES/ATM/IMA
CES														
Unstructured (DS1/E1)									X	X	X	X	X	X
Basic Structured									X	X	X	X		
Structured with CAS									X	X	X	X		
Legacy voice (8 Megabyte PM1) FPs and MVP (non-MVPe) FPs are not supported in software versions PCR5.2 and up, so they are not listed here. These FPs are: 1-port DS1V, 1-port E1V, 1-port J2MV, 1-port DS1 MVP, 1-port E1 MVP, and 1-port TTC2M MVP.														
(2 of 2)														

Applications/services supported by Multiservice Switch 15000 and Multiservice Switch 20000 voice services and CES FPs

Applications/Services	Media Gateway				Media Gateway and CES	CES
X = supported	VSP2	VSP3/VSP3-o /2pVSP4e	2-port DS3 TDM	32-port E1 TDM	4-port OC3/STM1 Ch TDM/CES	4-port DS3 Ch CES
Media Gateway						
Non-switched Media Gateway over ATM	X		X	X	X	
Switched Media Gateway over ATM	X	X	X	X	X	
Switched Media Gateway over IP	X	X	X	X	X	
(1 of 2)						

Applications/services supported by Multiservice Switch 15000 and Multiservice Switch 20000 voice services and CES FPs (continued)

Applications/Services	Media Gateway				Media Gateway and CES	CES
X = supported	VSP2	VSP3/VSP3-o /2pVSP4e	2-port DS3 TDM	32-port E1 TDM	4-port OC3/STM1 Ch TDM/CES	4-port DS3 Ch CES
CES						
Unstructured (DS1/E1)					X	X
Basic Structured					X	X
Structured with CAS						
For 2pVSP4e, Switched Media Gateway is supported only with the 4pGIGE card.						
(2 of 2)						

PQC1-based FPs

The tables of supported services do not apply to PQC1-based FPs. Some Nortel Networks Multiservice Switch 7400/15000/20000 FPs have old PQC1 versions (also known as PQC1.0 or PQC6v1), as described in the FP Technologies section of each FP description in this NTP. Software support is available for PQC1-based FPs; however, not all services or features are supported.

In particular, for FP types that support IP, their PQC1 versions do not support RFC 2764 or RFC 2547 IP-VPNs. PQC1-based FPs can not be used on the access side (IP interface of the cVR or VRF) or trunk side (IP interface of the VCG or RFC 2547 Router) of RFC 2764 or RFC 2547 IP-VPNs. PQC1-based FPs are supported for VIPR (IP interface of a VR that does not connect to a VCG), except on FP types where the tables in this chapter show the PQC2 version does not support IP.

ATM Termination of FRATM, EVLS, EthernetTrunk, or Bridging

If the tables in this chapter show that an FP does not support the "ATM termination" of FRATM, this means its ATM links cannot carry FRATM connections from Frame FPs on the same shelf. So for example, PNNI links should not be configured on such an ATM FP, if there is any chance of FRATM SPVCs from Frame FPs on the same shelf being dynamically routed to these PNNI links. Tandem traffic from Frame FPs on other nodes is not a problem.

Likewise, if an FP does not support the "ATM termination" of EVLS, EthernetTrunk, or Bridging (VirtualBridge), it cannot carry connections from Ethernet FPs on the same shelf that originate/terminate these services. For example, a connection from an Ethernet FP that supports EVLS (Ethernet over ATM) cannot exit that same shelf via a CQC-based ATM FP. However, the end-to-end path for that connection can include CQC-based ATM FPs on the intermediate Multiservice Switch nodes, if they are only acting as a tandem hop for the ATM cells.

ATM-based function processors

Use information in this section to learn about configuration details for Nortel Multiservice Switch function processors (FPs) that support ATM.

ATM function processors and identifying characteristics

FP long name	PEC	Card type	Nortel Multiservice Switch	For more information
3-port DS1 ATM	NTNQ45	3pDS1Atm	Multiservice Switch 7400	DS1 and E1 ATM function processors (page 29)
8-port DS1 ATM	NTNQ49	8pDS1Atm	Multiservice Switch 7400	DS1 and E1 ATM function processors (page 29)
3-port DS3 ATM	NTNQ51	3pDS3Atm	Multiservice Switch 7400	DS3 and E3 ATM function processors (page 32)
3-port DS3 ATM IP	NTJS13BA NTJS13CA NTJS13DA NTNQ68AA	3pDS3Atm2	Multiservice Switch 7400	DS3 and E3 ATM function processors (page 32)
4-port DS3Ch ATM	NTHR31BA NTHR31CA NTHR31DA	4pDS3ChAtm	Multiservice Switch 15000∕20000	DS3 and E3 ATM function processors (page 32)
12-port DS3 ATM	NTHR23BA NTHR23CA NTHR23DA	12pDS3Atm	Multiservice Switch 15000∕20000	DS3 and E3 ATM function processors (page 32)
3-port E1 ATM	NTNQ46	3pE1Atm	Multiservice Switch 7400	DS1 and E1 ATM function processors (page 29)
8-port E1 ATM	NTNQ50	8pE1Atm	Multiservice Switch 7400	DS1 and E1 ATM function processors (page 29)
3-port E3 ATM	NTNQ52	3pE3Atm	Multiservice Switch 7400	DS3 and E3 ATM function processors (page 32)
(1 of 3)				

ATM function processors and identifying characteristics (continued)

FP long name	PEC	Card type	Nortel Multiservice Switch	For more information
3-port E3 ATM IP	NTJS11BA NTJS11CA NTJS11DA NTNQ67	3pE3Atm2	Multiservice Switch 7400	DS3 and E3 ATM function processors (page 32)
12-port E3 ATM	NTHR25BA NTHR25CA NTHR25DA	12pE3Atm2	Multiservice Switch 15000∕20000	DS3 and E3 ATM function processors (page 32)
2-port OC3/STM-1 ATM IP	single-mode: NTJS09BA NTJS09CA NTJS09DA NTNQ66AA multimode: NTJS07BA NTJS07CA NTJS07DA NTNQ65AA	single-mode: 2pOC3SmAtm2 multimode: 2pOC3MmAtm2	Multiservice Switch 7400	OC-3/STM-1 ATM function processors (page 44)
2-port STM-1 electrical ATM IP	NTNQ90	2pSTM1eAtm	Multiservice Switch 7400	STM-1 electrical ATM function processors (page 88)
3-port OC3/STM-1 ATM	single-mode: NTNQ55 multimode: NTNQ54	single-mode: 3pOC3SmAtm multimode: 3pOC3MmAtm	Multiservice Switch 7400	OC-3/STM-1 ATM function processors (page 44)
4-port OC3/STM-1 ATM	single-mode: NTHR21 multimode: NTHR17	single-mode: 4pOC3SmIrAtm multimode: 4pOC3MmAtm	Multiservice Switch 15000∕20000	OC-3/STM-1 ATM function processors (page 44)
16-port OC-3/STM-1 ATM	NTHW31 (with LC connectors) NTHW24 (Japan 16p variant with LC connectors) NTHW21 (with MT-RJ connectors)	16pOC3SmIrAtm	Multiservice Switch 15000∕20000	OC-3/STM-1 ATM function processors (page 44)
(2 of 3)				

ATM function processors and identifying characteristics (continued)

FP long name	PEC	Card type	Nortel Multiservice Switch	For more information
16-port OC3/STM-1 POS and ATM	NTHW44 NTHW48	16pOC3PosAtm	Multiservice Switch 15000⁄20000	OC-3/STM-1 ATM function processors (page 44)
1-port OC-12/STM-4 ATM	NTHR29BA NTHR29DA	1pOC12SmLrAtm	Multiservice Switch 15000⁄20000	OC-12/STM-4 ATM function processors (page 71)
4-port OC-12/STM-4 ATM	NTHW11 (PQC2-based) NTHW86 (PQC12-based)	4pOC12SMlrAtm	Multiservice Switch 15000⁄20000	OC-12/STM-4 ATM function processors (page 71)
4-port MR POS and ATM	NTHW46	4pMRPosAtm	Multiservice Switch 15000⁄20000	OC-12/STM-4 ATM function processors (page 71)
1-port OC-48/STM-16 ATM with APS	NTHW01EA	1pOC48ChSmlrAtm	Multiservice Switch 15000⁄20000	OC-48/STM-16 ATM function processors (page 85)
Attention: For MSA32, MSA8, 2pSTM1eCh CES/ATM/IMA and 2pSTM1ch CES/ATM/IMA functional processors, which also support ATM, refer to the chapter Multiservice access function processors (page 189)				
(3 of 3)				

DS1 and E1 ATM function processors

This section contains information on DS1 ATM function processors.

Navigation

DS1 and E1 ATM function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of DS1 and E1 ATM FPs.

DS1 and E1 ATM function processor specifications

	3-port DS1 ATM	8-port DS1 ATM	3-port E1 ATM	8-port E1 ATM
card type	3pDS1Atm	8pDS1Atm	3pE1Atm	8pE1Atm
port type	DS1	DS1	E1	E1
port number	0-2	0-7	0-2	0-7
channels per port	1	1	1	1
FP technologies	PDC1.1, CQC	PDC1.1, CQC	PDC1.1, CQC	PDC1.1, CQC
memory (normal)	16 Mbyte	16 Mbyte	16 Mbyte	16 Mbyte
memory (fast)	512 kbyte	n/a	512 kbyte	n/a
memory (shared)	2 Mbyte	2 Mbyte	2 Mbyte	2 Mbyte
line speed (max.)	1.544 Mbps	1.544 Mbps	2.048 Mbps	2.048 Mbps
effective data rate	1.536 Mbps	1.536 Mbps for ATM, or N x 1.523 Mbps for IMA	1.920 Mbps	1.920 Mbps for ATM, or N x 1.904 Mbps for IMA
access mode	direct framing	direct framing	G.704 direct framing	G.704 direct framing
clocking source	local, module	local, line, module	local, module	local, line, module
line type	esf			CCS
NCS	Y	Y	Y	Y
software level (min.)	n/a	n/a	n/a	n/a
(1 of 2)				

DS1 and E1 ATM function processor specifications (continued)

	3-port DS1 ATM	8-port DS1 ATM	3-port E1 ATM	8-port E1 ATM
sparing	one-for-one	one-for-one sparing available on up to four ports using one termination panel	one-for-one	one-for-one sparing
SSM	Y	Y	Y	Y
(2 of 2)				

DS1 and E1 ATM FP configuration considerations

The table below contains configuration considerations for DS1 and E1 ATM FPs.

DS1 and E1 ATM FP configuration considerations

DS1 or E1 ATM function processor type	Configuration considerations
All DS1 and E1 ATM	For all DS1 and E1 ATM FPs, except for the 32-port E1 TDM, you must link the ports to an ATM interface before they can provide any service. For more information, see the section on provisioning the AtmInterface component in *Nortel Multiservice Switch 7400/15000/20000 Configuration – ATM* (NN10600-710).
	The ports on all ATM FPs are individually provisionable.
	The cell payload is scrambled by default, according to ITU-T Recommendation I.432. You can turn cell payload scrambling off for a port on an ATM card. However, when cell payload scrambling is turned off for ATM ports, there is a possibility of false cell header delineation errors.
	An ILS Forwarder card is required for IP support on CQC-based FPs. The combination of a CQC-based FP and an ILS Forwarder card supports IP, but not IP VPN (tunneling with VCG). See *Nortel Multiservice Switch 7400 Fundamentals – Hardware* (NN10600-170) for information on the ILS Forwarder card.
	You must use all timeslots.
All DS1 ATM	For each port, the entire payload bandwidth is a single clear channel. The channel operates at 24 x 64 Kbit/s.
(1 of 2)	

DS1 and E1 ATM FP configuration considerations (continued)

DS1 or E1 ATM function processor type	Configuration considerations
All E1 ATM	For each port, the entire payload bandwidth is a single clear channel. This channel operates at: 30 x 64 kbit/s.
3-port DS1 ATM 8-port DS1 ATM	The 3-port and 8-port DS1 ATM FPs support ATM user-to-network-interfaces (UNIs) and ATM network-to-network-interfaces (NNIs) that can operate from either side of the user/network boundary. These FP types support Nortel Multiservice Switch node-to-Multiservice Switch node communication and communication between Multiservice Switch nodes and external ATM devices.
3-port E1 ATM	This FP supports ATM services on Nortel Multiservice Switch 7400 nodes. It supports ATM user-network-interfaces (UNIs) or ATM Multiservice Switch node-to-Multiservice Switch node-interfaces (MMIs). This FP can operate from either side of the user/network boundary.
8-port DS1 ATM	Certain provisioning restrictions apply when you configure both independent ATM links and IMA virtual links on the same FP. For more information see *Nortel Multiservice Switch 7400/15000/20000 Configuration – Inverse Multiplexing for ATM* (NN10600-730).
8-port E1 ATM	This FP also supports inverse multiplexing for ATM (IMA). It can support both independent ATM links and IMA virtual links on the same FP; however, certain provisioning restrictions apply. Each independent link or IMA virtual link supports ATM user-network-interfaces (UNIs) and ATM Multiservice Switch node-to-Multiservice Switch node-interfaces (MMIs) that can operate from either side of the user/network boundary. For more information, see *Nortel Multiservice Switch 7400/15000/ 20000 Configuration – Inverse Multiplexing for ATM* (NN10600-730).
8-port DS1 ATM 8-port E1 ATM	The 8-port DS1 ATM FP can be used by the inverse multiplexing for ATM (IMA) feature as part of an IMA virtual link with up to 8 physical links. The resulting bandwidth for the IMA virtual link on an 8-port DS1 ATM FP can be N x 1.524 Mbps, and on an 8-port E1 FP can be N x 1.920 Mbps, where N =1 to 8. If traffic shaping (per-VC queueing) is enabled, you can only use port instances 0 to 3 for independent ATM links. For IMA link groups, you can use any port.
(2 of 2)	

DS3 and E3 ATM function processors

This section contains information on DS3 and E3 ATM function processors.

Navigation

DS3 and E3 ATM function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of DS3 and E3 ATM FPs.

DS3 and E3 ATM function processor specifications

	3-port DS3 ATM	3-port DS3 ATM IP	4-port DS3Ch ATM	12-port DS3 ATM	3-port E3 ATM	3-port E3 ATM IP	12-port E3 ATM
card type	3pDS3Atm	3pDS3Atm2	4pDS3ChAtm	12pDS3Atm	3pE3Atm	3pE3Atm2	12pE1Atm
port type	DS3	DS3	DS3ch	DS3	E3	E3	E3
port number	0-2	0-2	0-3 (DS3)	0-11	0-2	0-2	0-11
channels per port	1	1	28 DS1s	1	1	1	1
(1 of 4)							

DS3 and E3 ATM function processor specifications (continued)

	3-port DS3 ATM	3-port DS3 ATM IP	4-port DS3Ch ATM	12-port DS3 ATM	3-port E3 ATM	3-port E3 ATM IP	12-port E3 ATM
FP technologies	PDC1.1, CQC	NTJS13BA - PPC, AQM1.0, PQC1.0 NTJS13CA - PPC, AQM1.1, PQC1.0 NTJS13DA - PPC, AQM1.1, PQC2.0 NTNQ68AA - PPC, AQM1.1, PQC2.0	NTHR31BA - PPC, AQM1.0, PQC1.0 NTHR31CA - PPC, AQM1.1, PQC1.0 NTHR31DA - PPC, AQM1.1, PQC2.0	NTHR23BA - PPC, AQM1.0, PQC1.0 NTHR23CA - PPC, AQM1.1, PQC1.0 NTHR23DA - PPC, AQM1.1, PQC2.0	PDC1.1, CQC	NTJS11BA - PPC, AQM1.0, PQC1.0 NTJS11CA - PPC, AQM1.1, PQC1.0 NTJS11DA - PPC, AQM1.1, PQC2.0 NTNQ67 - PPC, AQM1.1, PQC2.0	NTHR25BA - PPC, AQM1.0, PQC1.0 NTHR25CA - PPC, AQM1.1, PQC1.0 NTHR25DA - PPC, AQM1.1, PQC2.0
memory (normal)	16 Mbyte	64 Mbyte	128 Mbyte	128 Mbyte	16 Mbyte	64 Mbyte	128 Mbyte
memory (fast)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
memory (shared)	2 Mbyte	n/a	n/a	n/a	2 Mbyte	n/a	n/a
Attention: The value for shared memory refers to the amount of cell queue memory (CQC) available. The value of 2 Mbytes is partitioned into 1.0 Mbyte blocks, one block is used in the ingress direction and the other for egress							
line speed (max.)	44.736 Mbps	44.736 Mbps	44.736 Mbps	44.736 Mbps	34.368 Mbps	34.368 Mbps	34.368 Mbps
(2 of 4)							

DS3 and E3 ATM function processor specifications (continued)

	3-port DS3 ATM	3-port DS3 ATM IP	4-port DS3Ch ATM	12-port DS3 ATM	3-port E3 ATM	3-port E3 ATM IP	12-port E3 ATM
effective data rate	44.21 Mbps	44.21 Mbps	28 DS1s per port x 1.536 Mbps, or x 1.523 Mbps for IMA	44.21 Mbps	33.92 Mbps	33.92 Mbps	33.92 Mbps
clocking source	local, line, module, or otherPort	local, line, module	DS3: local, module tributary DS1: sameAs Ds3	local, line, module, otherPort	local, line, module, otherPort	local, line, module, otherPort	local, line, module, otherPort
NCS	Y	Y		module, line, local, otherPort	Y	local, line, module, otherPort	Y
software level (min.)	n/a	n/a	PCR 1.3	PCR 1.1.2	n/a	n/a	PCR 1.1
(3 of 4)							

DS3 and E3 ATM function processor specifications (continued)

	3-port DS3 ATM	3-port DS3 ATM IP	4-port DS3Ch ATM	12-port DS3 ATM	3-port E3 ATM	3-port E3 ATM IP	12-port E3 ATM
sparing	1-for-1	1-for-1 using 3-port DS3 ATM term. panels	1-for-n sparing where n is 1 to 4 1-for-n sparing behavior enhancement supports operation with a 1-for-6 sparing panel such as the NTQS31, where up to 6 FPs can be spared (backed up) by one FP, all of the same FP type in the same shelf	1-for-n sparing behavior enhancement supports operation with a 1-for-6 sparing panel such as the NTQS31, where up to 6 FPs can be spared (backed up) by one FP, all of the same FP type in the same shelf	1-for-1	1-for-1 sparing using 3-port E3 ATM IP termination panels	1-for-n sparing behavior enhancement operation with a 1-for-6 sparing panel such as the NTQS31, where up to 6 FPs can be spared (backed up) by one FP, all of the same FP type in the same shelf
SSM	Y				Y		Y
(4 of 4)							

DS3 and E3 ATM FP hardware information

The table below contains important information regarding the vintages of certain DS3 and E3 ATM FPs. For a full list of PECs (including vintages) for supported FPs, see *Nortel Multiservice Switch Release Notes*.

DS3 and E3 ATM FP hardware information

DS3 or E3 ATM function processor type	Hardware details
12-port DS3 ATM 12-port E3 ATM	For NTHR23CA and NTHR25CA and later versions, you must have a minimum software of CA01S2A before installing the FP. Inserting the FP into a system running an earlier load will damage the FP, requiring it to be returned to Nortel Networks for repair.

DS3 and E3 ATM FP configuration considerations

The table below contains configuration considerations for DS3 and E3 ATM FPs.

DS3 and E3 ATM FP configuration considerations

DS3 or E3 ATM function processor type	Configuration considerations
All DS3 ATM	For all ATM FPs you must link the ports to an ATM interface before they can provide any service. For more information, see the section on provisioning the AtmInterface component in *Nortel Multiservice Switch 7400/15000/20000 Configuration – ATM* (NN10600-710).
All non-channelized DS3 ATM	The ports on a DS3 ATM FP are not channelized. The entire payload bandwidth functions as a single clear channel. The cell payload is scrambled by default, according to ITU-T Recommendation I.432. You can turn cell payload scrambling off for a port on an ATM card. However, when cell payload scrambling is turned off for ATM ports, there is a possibility of false cell header delineation errors. If you do not want to use C-Bit Parity mode, use the command **set lp/<n> DS3/<m> cBitParity off** Cells are directly mapped into the DS3 payloads by default. You can use plcp cell mapping instead of the default direct mapping for a port on a DS3. Use the command **set lp/<n> DS3/<m> mapping plcp** The mapping affects the reference source used when line clocking source is selected. For direct mapping, the received DS3 bitstream at 44.736 MHz or 34.368 MHz determines the clock. For plcp mapping, the received PLCP framing at 8 kHz determines the clock.
All channelized DS3 ATM	The DS3Ch FPs support DS1 tributary ports beneath each DS3 port. Most generic procedures in this guide and the *Nortel Multiservice Switch 7400/15000/20000 Configuration* (NN10600-550) do not show commands that take into account a hierarchy of ports (DS1 under DS3). Remember to include the DS1 hierarchy when you issue commands. Nortel Multiservice Switch 15000 and Multiservice Switch 20000 nodes synchronize the transmit clock for all ports from the same reference. There is only one transmit clock on the card and all ports must share it. At the DS3 level, all DS3 components on the card must have the same *clockingSource*.
3-port DS3 ATM	The three ports are individually provisionable
(1 of 6)	

DS3 and E3 ATM FP configuration considerations (continued)

DS3 or E3 ATM function processor type	Configuration considerations
	An ILS Forwarder card is required for IP support on CQC-based FPs. The combination of a CQC-based FP and an ILS Forwarder card supports IP, but not IP VPN (tunneling with VCG). See *Nortel Multiservice Switch 7400 Fundamentals – Hardware* (NN10600-170) for information on the ILS Forwarder card.
	Up to seven 3-port DS3 ATM FPs can be configured in a Multiservice Switch 7480. It is recommended that no more than five active or Main FPs (with the attribute mainCard under the component Lp) occupy the same shelf assembly. The total of two excludes any spare FPs (with the attribute spareCard).
	Deploying more than five active 3-port DS3 ATM FPs risks affecting the shelf's capability to provide services. The amount of risk and the extent of impact depends on the engineering limitations imposed by any Multiservice Switch 7400 node and depends on all of the FPs in a shelf simultaneously bursting up to their maximum line rates. Each active port sending AAL1 CES constantly sends more than its line rate onto the backplane. Calculate the total bandwidth of all active ports to ensure that the backplane capacity is not exceeded.
	Nortel Multiservice Switch DS3 ATM FPs support ATM User-Network-Interfaces (UNIs) or ATM Multiservice Switch node-Multiservice Switch node-Interfaces (MMIs). Ports can operate on either side of a user/network boundary.
	These FPs provide interfaces for Multiservice Switch node-to-Multiservice Switch node communication, and for communication between Multiservice Switch and external ATM devices. They support an ATM interface that can support a number of Multiservice Switch trunks or ATM bearer services
3-port DS3 ATM IP	The three ports are individually provisionable
	Nortel Multiservice Switch DS3 ATM FPs support ATM user-network-interfaces (UNIs) or ATM Multiservice Switch node-Multiservice Switch node-Interfaces (MMIs). Ports can operate on either side of a user/network boundary.
	These FPs provide interfaces for Multiservice Switch node-to-Multiservice Switch node communication, and for communication between Multiservice Switch and external ATM devices. They support an ATM interface that can support a number of Multiservice Switch trunks or ATM bearer services.
	The 3-port DS3 ATM IP FP may also be referred to as the 3-port DS3 ATM2 SGAF or the 3pDS3A.
(2 of 6)	

- 39 -
ATM-based function processors

DS3 and E3 ATM FP configuration considerations (continued)

DS3 or E3 ATM function processor type	Configuration considerations
4-port DS3 ATM	The ports on the FP can be configured as channelized. It supports 28 DS1 within the DS3, in which the DS1s can be grouped together to a maximum of 8 DS1s per IMA group. A maximum of 14 IMA groups can be configured per DS3 port. When you add a port, the system automatically provisions C-Bit parity mode for the DS3 component. If you do not want to use C-Bit parity mode, turn it off. `set lp/<n> DS3/<m> cBitParity off` Cells are directly mapped into the DS3 payloads by default for the 4-port ATM-based DS3 FPs. The cell payload is scrambled by default, according to ITU-T Recommendation I.432. You can turn cell payload scrambling off for a port on an ATM card. However, when cell payload scrambling is turned off for ATM ports, there is a possibility of false cell header delineation errors.
12-port DS3 ATM	See also the chapter on configuring equipment protection (sparing) and the chapter on hitless services in *Nortel Multiservice Switch 7400/15000/20000 Configuration* (NN10600-550). Nortel Multiservice Switch DS3 ATM FPs support ATM user-network-interfaces (UNIs) or ATM Nortel Multiservice Switch node-to-node-interfaces (MMIs). Ports can operate on either side of a user/network boundary. These FPs provide interfaces for Multiservice Switch node-to-Multiservice Switch node communication, and communication between Multiservice Switch and external ATM devices. They support an ATM interface that can support a number of Multiservice Switch trunks or ATM bearer services. The 12-port DS3 ATM FP has three cable bundles with eight coax cables in each bundle and with an 8W8 mini-coax cable connector at one end and an 8W8 or BNC connectors at the other end.
All E3 ATM	For all ATM FPs you must link the ports to an ATM interface before they can provide any service. For more information, see the section on provisioning the AtmInterface component in *Nortel Multiservice Switch 7400/15000/20000 Configuration – ATM* (NN10600-710). The ports on an E3 ATM FP are not channelized. The entire payload bandwidth functions as a single clear channel.
(3 of 6)	

<div></div>

<p></p>

Copyright © 2006, Nortel Networks   Nortel Confidential

DS3 and E3 ATM FP configuration considerations (continued)

DS3 or E3 ATM function processor type	Configuration considerations
	The cell payload is scrambled by default, according to ITU-T Recommendation I.432. You can turn cell payload scrambling off for a port on an ATM card. However, when cell payload scrambling is turned off for ATM ports, there is a possibility of false cell header delineation errors.
	When you add a port, the system automatically creates subcomponents *AtmCell* and *G832*.
	The system directly maps cells into the E3 payloads by default. To use PLCP cell mapping instead of the default direct mapping for a port on an E3, set the *mapping* attribute:
	`set lp/<n> E3/<m> mapping plcp`
	The mapping affects the reference source when you select the line clocking source. For direct mapping, the received E3 bitstream at or 34.368 MHz determines the clock. For PLCP mapping, the received PLCP framing at 8 kHz determines the clock.
	E3 ATM FPs use the framing format defined by ITU-T G.832 by default, although the older format defined by ITU-T G.751 is still available. If the port is an E3 port, and you want to use the older framing format defined in ITU-T G.751, change the *framing* attribute:
	`set lp/<n> E3/<m> framing g751`
	After setting the framing format to G751, delete the G832 component (automatically generated when the VCC is created).
	Nortel Multiservice Switch E3 ATM FPs support ATM user-to-network-interfaces (UNIs) or ATM Multiservice Switch node-to-Multiservice Switch node-interfaces (MMIs). Ports can operate on either side of a user/network boundary.
	These FPs provide interfaces for Multiservice Switch node-to-Multiservice Switch node communication, and for communication between Multiservice Switch and external ATM devices. They support an ATM interface that can support a number of Multiservice Switch trunks or ATM bearer services.
3-port E3 ATM	The three ports are individually provisionable.
	An ILS Forwarder card is required for IP support on CQC-based FPs. The combination of a CQC-based FP and an ILS Forwarder card supports IP, but not IP VPN (tunneling with VCG). See *Nortel Multiservice Switch 7400 Fundamentals – Hardware* (NN10600-170) for information on the ILS Forwarder card.
	(4 of 6)

DS3 and E3 ATM FP configuration considerations (continued)

DS3 or E3 ATM function processor type	Configuration considerations
	Up to seven 3-port E3 ATM FPs can be configured in a Multiservice Switch 7480. It is recommended that no more than five active or Main FPs (with the attribute mainCard under the component Lp) occupy the same shelf assembly. The total of two excludes any spare FPs (with the attribute spareCard).
	Deploying more than five active 3-port E3 ATM FPs risks affecting the shelf's capability to provide services. The amount of risk and the extent of impact depends on the engineering limitations imposed by any Multiservice Switch 7400 node and depends on all of the FPs in a shelf simultaneously bursting up to their maximum line rates. Each active port sending AAL1 CES constantly sends more than its line rate onto the backplane. Calculate the total bandwidth of all active ports to ensure that the backplane capacity is not exceeded.
3-port E3 ATM IP	The three ports are individually provisionable.
	This FP provides a platform for ATM Forum traffic management phase 4 (TM4.0).
12-port E3 ATM	If you set the *clockingSource* attribute for one port to line, you must set the *clockingSource* attribute for the other port to otherPort.
	See also the chapter on configuring equipment protection (sparing) and the chapter on hitless services in *Nortel Multiservice Switch 7400/ 15000/20000 Configuration* (NN10600-550).
	The 12-port E3 ATM FP may also be referred to as the 12-port E3 ATM IP FP. This provides support for ATM services on Nortel Multiservice Switch 15000 and Multiservice Switch 20000 nodes. It has three cable bundles with eight coax cables in each bundle and with an 8W8 mini-coax cable connector at one end and 8W8 or BNC connectors at the other end.
	The cell payload is scrambled by default, according to ITU-T Recommendation I.432. You can turn cell payload scrambling off for a port on an ATM card. However, when cell payload scrambling is turned off for ATM ports, there is a possibility of false cell header delineation errors.
	98 timeslots (64-kbit/s each) plus framing bits
(5 of 6)	

DS3 and E3 ATM FP configuration considerations (continued)

DS3 or E3 ATM function processor type	Configuration considerations
	The node synchronizes the transmit clock for both ports on the JT2 ATM FP from the same reference. Therefore, you must set the *clockingSource* attribute for all the ports to local if you want to use the local clocking source. You must set the *clockingSource* attribute for all the ports to module if you want to use the module clocking source. If you set the *clockingSource* attribute for one port to line, you must set the *clockingSource* attribute for the other port to *otherPort*.
	If a CP reference clock is available, the default setting for the *clockingSource* attribute is module. Otherwise, the default setting is local, and you cannot select module.
	If a fault condition exists for a JT2 FP that uses the line or module timing reference, and that reference is not present, the system uses the local oscillator to synchronize the transmit clock.
	This FP supports ATM services on Nortel Multiservice Switch 7400 nodes. It provides access both to and from the public network, and interfaces between Multiservice Switch nodes within a private network. It supports user-network-interfaces (UNIs) or ATM Multiservice Switch node-Multiservice Switch node-interfaces (MMIs).
	The 2-port JT2 ATM FP also supports processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS).
(6 of 6)	

DS3 and E3 ATM FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see .

DS3 and E3 ATM FP supported features

DS3 or E3 ATM function processor type	Supported features
All DS3 ATM FPs	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
3-port DS3 ATM IP	feature rich ATM traffic management functions, including fair queuing and traffic shaping
	line rate frame forwarding on all ports and increased frame forwarding rates for many services
	platform for ATM Forum traffic management phase 4 (TM4.0)
(1 of 2)	

DS3 and E3 ATM FP supported features (continued)

DS3 or E3 ATM function processor type	Supported features
4-port DS3Ch ATM	inverse multiplexing for ATM with inverse multiplexing for ATM (IMA) groups spanning multiple DS1s within each DS3 port (2 to 28 links)
	supports up to 14 IMA groups within a DS3 port
	has four DS3 ports channelized at DS1 levels (4 DS3 ports x 28 DS1s/DS3 = 112 channels)
	supports up to 112 ATM user-to-network interfaces (UNIs)
	hitless service when configured for one-for-one equipment protection
	hitless software migration when configured for one-for-one equipment protection
12-port DS3 ATM	hitless service when configured for one-for-one equipment protection
	hitless software migration when configured for one-for-one equipment protection
3-port E3 ATM IP	feature rich ATM traffic management functions, including fair queuing and traffic shaping
	line rate frame forwarding on all ports and increased frame forwarding rates for many services
12-port E3 ATM	hitless services when configured for one-for-one equipment protection
	hitless software migration when configured for one-for-one equipment protection
(2 of 2)	

OC-3/STM-1 ATM function processors

This section contains information on OC-3/STM-1 ATM function processors.

Navigation

OC-3/STM-1 ATM function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of OC-3/STM-1 ATM FPs.

OC-3/STM-1 ATM function processor specifications

	2-port OC-3/STM-1 ATM IP	3-port OC-3/STM-1 ATM	4-port OC-3/STM-1 ATM	16-port OC-3/STM-1 ATM	16-port OC-3/ST-1 POS and ATM
card type	2pOC3SmAtm2, 2pOC3MmAtm2	3pOC3SmAtm, 3pOC3MmAtm	4pOC3SmIrAt, 4pOC3MmAtm	16pOC3SmIrAtm	16pOC3PosAtm
port type	Sonet (OC-3) Sdh (STM-1)	Sonet (OC-3) Sdh (STM-1)	Sonet (OC-3) Sdh (STM-1)	Sonet (OC-3) Sdh (STM-1)	Sonet (OC-3) Sdh (STM-1)
port number	0,2	0-2	0-3	0-15	0-15
channels per port	1	1	1	1	1
(1 of 11)					

OC-3/STM-1 ATM function processor specifications (continued)

	2-port OC-3/STM-1 ATM IP	3-port OC-3/STM-1 ATM	4-port OC-3/STM-1 ATM	16-port OC-3/STM-1 ATM	16-port OC-3/ST-1 POS and ATM
FP technologies	single-mode: PEC NTJS09BA - PPC, AQM1.0, PQC1.0 PEC NTJS09CA - PPC, AQM1.1, PQC1.0 PEC NTNQ66AA, NTJS09DA - PPC, AQM1.1, PQC2.0 multimode: PEC NTJS07BA - PPC, AQM1.0, PQC1.0 PEC NTJS07CA - PPC, AQM1.1, PQC1.0 PEC NTNQ65AA, NTJS07DA - PPC, AQM1.1, PQC2.0	PDC1.1, CQC	single-mode: PEC NTHR21BA - PPC, AQM1.0, PQC1.0 PEC NTHR21CA - PPC, AQM1.1, PQC1.0 PEC NTHR21DA - PPC, AQM1.1, PQC2.0 PEC NTHW15AA - PPC, AQM1.1, PQC12 multimode: PEC NTHR17BA - PPC, AQM1.0, PQC1.0 PEC NTHR17CA - PPC, AQM1.1, PQC1.0 PEC NTHR17DA - PPC, AQM1.1, PQC2.0 PEC NTHW05AA - PPC, AQM 1.1, PQC12	APC, PPC, PQC2.0, QRD1.1	GQM When the 16pOC3PosAtm FP is used as an access FP in an RFC 2764 IP VPN solution, any of the supported PQC-based ATM trunk FPs can act as a trunk FP. When the 16pOC3PosAtm FP is used as a trunk FP in an RFC 2764 IP VPN solution, any of the supported PQC-based FPs can act as an access FP.
memory (normal)	64 Mbyte	16 Mbyte	128 Mbyte	256 Mbyte	512 Mbyte
memory (fast)	n/a	n/a	n/a	n/a	n/a
memory (shared)	n/a	n/a	n/a	n/a	n/a
(2 of 11)					

OC-3/STM-1 ATM function processor specifications (continued)

	2-port OC-3/STM-1 ATM IP	3-port OC-3/STM-1 ATM	4-port OC-3/STM-1 ATM	16-port OC-3/STM-1 ATM	16-port OC-3/ST-1 POS and ATM
line speed (max.)	155.52 Mbps	155.52 Mbps	155.52 Mbps	155.52 Mbps	155.52 Mbps
effective data rate	149.76 Mbps	149.76 Mbps	149.76 Mbps	149.76 Mbps	149.76 Mbps
access mode	STM-1, STS-3	STM-1, STS-3			
ATM fault management					AIS RDI loopback
bandwidth management					same as all other MSS ATM FPs
CAC					CDV for CBR or VBR traffic types overbooking resources per port based on QoS and basic VPT
call latency (95th percentile)					25 milliseconds for a transit node or terminating node 30 milliseconds for an originating node
(3 of 11)					

OC-3/STM-1 ATM function processor specifications (continued)

	2-port OC-3/STM-1 ATM IP	3-port OC-3/STM-1 ATM	4-port OC-3/STM-1 ATM	16-port OC-3/STM-1 ATM	16-port OC-3/ST-1 POS and ATM
call set-up rate					300 calls per second per FP (with accounting and carrier grade off) 256 calls per second per FP (with accounting off and carrier grade on) 150 calls per second per FP (with accounting and carrier grade on)
(4 of 11)					

OC-3/STM-1 ATM function processor specifications (continued)

	2-port OC-3/STM-1 ATM IP	3-port OC-3/STM-1 ATM	4-port OC-3/STM-1 ATM	16-port OC-3/STM-1 ATM	16-port OC-3/ST-1 POS and ATM
class scheduling					8 emission priorities (EPs), including: Absolute priority for EP0 and EP1 with minimum delay and cell delay variation (CDV) EPs 2 to 7 with minimum bandwidth guarantees (MBGs) to avoid starvation Work-conserving allocation of unused bandwidth for high utilization
clocking source	local, line, module	local, line, module	local, line, module	module, local	module, local
(5 of 11)					

OC-3/STM-1 ATM function processor specifications (continued)

	2-port OC-3/STM-1 ATM IP	3-port OC-3/STM-1 ATM	4-port OC-3/STM-1 ATM	16-port OC-3/STM-1 ATM	16-port OC-3/ST-1 POS and ATM
connection space and call rate					16,000 connection end points per port. (For this FP, there is no longer a restriction of 16,000 PVCs per card, which now can be any combination of PVCs, SPVCs, or SVCs.)
logical trunks					32 per FP
memory (processor)		128 Mbyte SDRAM	128 Mbyte SDRAM	128 Mbyte SDRAM	512 Mbytes
multicast connections per card					16,384 leaves per FP 16 multicast leaf connections per root multicast connection
(6 of 11)					

OC-3/STM-1 ATM function processor specifications (continued)

	2-port OC-3/STM-1 ATM IP	3-port OC-3/STM-1 ATM	4-port OC-3/STM-1 ATM	16-port OC-3/STM-1 ATM	16-port OC-3/ST-1 POS and ATM
Multiservice Switch ATM statistics					all supported with additional statistics for the NTHW44 or NTHW48. For the list, see *Nortel Multiservice Switch 7400/ 15000/20000 Components Reference* (NN10600-060).
NCS	Y	Y	Y	Y	Y
networking connections supported					PVCs, PVPs, SPVCs, SPVPs, SVCs, and SVPs, VPTs
packet congestion per VC					EPD LPD PPD W-RED
port configuration	B-ISDN	B-ISDN	B-ISDN	B-ISDN	B-ISDN
(7 of 11)					

OC-3/STM-1 ATM function processor specifications (continued)

	2-port OC-3/STM-1 ATM IP	3-port OC-3/STM-1 ATM	4-port OC-3/STM-1 ATM	16-port OC-3/STM-1 ATM	16-port OC-3/ST-1 POS and ATM
PQC interworking capability (See Attention at the end of this table)					12-port E3 ATM FP (NTHR25) 12-port DS3 ATM FP (NTHR23) 16-port OC3 ATM FP (NTHW31) 1-port OC-12/ STM-4 ATM FP (NTHR29) 4-port OC-12/ STM-4 ATM FP (NTHW11) 4-port OC-12/ STM-4 ATM FP (NTHW86) 4-port OC-3/ STM-1 ATM FP (NTHR21, NTHW15, NTHR17, NTHW05) 4-port DS3 Ch FR FP (NTHR88, NTHR89)
protocol				g841AnnexB, standard, yProtection	g841AnnexB, standard, yProtection
queuing disciplines					common and per VC
(8 of 11)					

OC-3/STM-1 ATM function processor specifications (continued)

	2-port OC-3/STM-1 ATM IP	3-port OC-3/STM-1 ATM	4-port OC-3/STM-1 ATM	16-port OC-3/STM-1 ATM	16-port OC-3/ST-1 POS and ATM
routing and signaling					AINI 1.0 IISP 1.0 ILMI 4.0 PNNI and H-PNNI 1.0 UNI 3.0, 3.1, and 4.0 local and global rerouting
scheduling					link class connection
SFP configuration					OC3MmSr, OC3SmIr, OC3SmLr, none (only OC3SmIr is supported with yProtection)
				(9 of 11)	

OC-3/STM-1 ATM function processor specifications (continued)

	2-port OC-3/STM-1 ATM IP	3-port OC-3/STM-1 ATM	4-port OC-3/STM-1 ATM	16-port OC-3/STM-1 ATM	16-port OC-3/ST-1 POS and ATM
software level (minimum)	n/a	PCR1.0	single-mode: PEC NTHR17FA - PCR3.1 PEC NTHR21BA - PCR1.1.2 PEC NTHR21CA - PCR1.1.2 (CA01S2A or later) PEC NTHR21DA - PCR1.1.2 (CA01S2A or later) PEC NTHR21FA - PCR3.1 PEC NTHW15AA - PCR4.1 multimode: PEC NTHR17BA - PCR1.1.2 PEC NTHR17CA - PCR1.1.2 (CA01S2A or later) PEC NTHR17DA - PCR1.1.2 (CA01S2A or later) PEC NTHW05AA - PCR4.1	PCR2.1	PCR 5.2 (NTHW44) PCR 6.2 (NTHW48)
SSM	Y	n/a	Y	Y	Y
(10 of 11)					

OC-3/STM-1 ATM function processor specifications (continued)

	2-port OC-3/STM-1 ATM IP	3-port OC-3/STM-1 ATM	4-port OC-3/STM-1 ATM	16-port OC-3/STM-1 ATM	16-port OC-3/ST-1 POS and ATM
total egress ATM buffer (cells) per port @3K connections per FP			51.4k	32k	32, 000
traffic management					TM 4.1 supporting: CBR nrt-VBR rt-VBR UBR UBR-MDCR (with definable CLR, CLP0/1, CDV, and CTD)
traffic shaping					on any 4 emission priorities (EPs) linear dual-rate inverse usage parameter control (UPC) variable rates with a minimum of 100 cells per second
(11 of 11)					

> **Attention:** When the 16pOC3PosAtm FP is used as an access FP in an RFC 2764 IP VPN solution, any of the supported PQC-based ATM trunk FPs can act as a trunk FP. When the 16pOC3PosAtm FP is used as a trunk FP in an RFC 2764 IP VPN solution, any of the supported PQC-based FPs can act as an access FP.

OC-3/STM-1 ATM FP hardware information

The table below contains important information regarding the vintages of certain OC-3/STM-1 ATM FPs. For a full list of PECs (including vintages) for supported FPs, see *Nortel Multiservice Switch Release Notes*.

OC-3/STM-1 ATM FP hardware information

OC-3/STM-1 ATM function processor type	Hardware details
4-port OC-3/STM-1 ATM	The CA vintage or higher is required to support hitless software migration and equipment protection features.
	For NTNHR21CA, NTHR17CA, and later versions, you must load CA01S2A software before installing the FP. Inserting the FP into a system running an earlier load will damage the FP, requiring it to be returned to Nortel Networks for repair.
	For NTHR21BA and NTHR17BA, the maximum supported software level is PCR2.1.
16-port OC-3/STM-1 ATM	An NTHW21 or NTHW31 cannot spare an NTHW44 or NTHW48.
	Attention: When an LOP defect is detected on a 16pOC3 FP, an AIS-P alarm is reported instead of the LOP based on the current implementation where all path defects are reported by the PTE. The behavior is that both AIS-P and LOP defects trigger the same LOP alarm. A real AIS-P would mean an equipment problem on the far end. A LOP would mean that there is a problem on the line (noisy/dirty fibre). Though there is no workaround, when an AIS-P alarm is present on the 16pOC3 FP, always check to see if the far end is sending an AIS-P first. If no problem can be found that would cause an AIS-P, the next recommended procedure is to debug the problem as if it is a LOP defect rather than an AIS-P.
(1 of 3)	

OC-3/STM-1 ATM FP hardware information (continued)

OC-3/STM-1 ATM function processor type	Hardware details
16-port OC-3/STM-1 ATM (continued)	Unsigned cells or idle cells are discarded at an appropriate time such that they are not counted as part of the link utilization. The determination of which cells get discarded automatically occurs, whether Idle or Unassigned, such that the minimum number of links will have 99% RX Utilization. There are two important parts in this fix, the events to trigger a new decision, and the decision algorithm itself. Trigger Events: Any time one of the following is met, the Decision Algorithm will be run: - One path is deleted, regardless of its LCD status (which may be on). - One path is newly added and its LCD status has been off for 60 seconds - One path exists, its LCD status had changed from off to on - One path exists, its LCD status changed from on to off, and stays off for 60 seconds Decision Algorithm: The decision algorithm is based on a majority rule. Once the decision algorithm is triggered, utilization counts of all existing paths whose LCD status is off will be calculated. The rhine device can discard idle or unassigned cells. The discarded cells are not counted in the link utilization. The decision to discard idle or unassigned cells is based on the following algorithm. For all the provisioned paths that don't have LCD defect on: - memorize the number of path cells with linkUtilization >= 99% when discarding unassigned cells (numberUnassigned) - if the numberUnassigned > 0, flip the discard and memorize the number of path cells with linkUtilization >= 99% (numberIdle) - if numberIdle > numberUnassigned, flip back the discard - the number of links with linkUtilization >= 99% is calculated every second, and the decision to flip the discard is based on the previously stored number
16-port OC-3/STM-1 ATM with OAM cell conversion	The PEC for the 16-port OC-3/STM-1 with OAM cell conversion is NTHW24. This FP is for use only with customers who need to interconnect with NTT (Nippon Telegraph and Telecommunications) equipment in the Japanese market. All other customers should use either NTHW21 or NTHW31.
(2 of 3)	

OC-3/STM-1 ATM FP hardware information (continued)

OC-3/STM-1 ATM function processor type	Hardware details
16-port OC-3/STM-1 POS and ATM	An NTHW44 or NTHW48 operates only with CP3s in the same shelf.
	The NTHW48 16-port OC-3/STM-1 POS and ATM FP supports the next generation network processor. It provides more internal memory than the NTHW44 16-port OC-3/STM-1 POS and ATM FP.
	The NTHW48 16-port OC-3/STM-1 POS and ATM FP complies with the European Union Environmental Directive (EUED) for reducing hazardous substances (RoHS).
	When replacing an NTHW21 or NTHW31 with an NTHW44 or NTHW48, treat the decommissioning of the slot and the configuration of the NTHW44 or NTHW48 as a new FP deployment in the slot. Consider that physical port locations are different.
	An NTHW44 or NTHW48 cannot spare an NTHW21, NTHW24, or NTHW31.
(3 of 3)	

OC-3/STM-1 ATM FP configuration considerations

The table below contains configuration considerations for non-channelized OC-3/STM-1 ATM FPs.

OC-3/STM-1 ATM FP configuration considerations

OC-3/STM-1 ATM function processor type	Configuration considerations
All OC-3/STM-1 ATM FPs	For all ATM FPs you must link the ports to an ATM interface before they can provide any service. For more information, see the section on provisioning the AtmInterface (*AtmIf*) component in *Nortel Multiservice Switch 7400/15000/20000 Configuration – ATM* (NN10600-710).
	The cell payload is scrambled by default, according to ITU-T Recommendation I.432. You can turn cell payload scrambling off for a port on an ATM card. However, when cell payload scrambling is turned off for ATM ports, there is a possibility of false cell header delineation errors.
2-port OC-3/STM-1 ATM IP	When an Automatic protection switching (APS) component is created, the test component is automatically created for it, replacing the port test component under Sonet/Sdh.
	APS attributes workingLine and protectionLine must be linked to the Sonet (or Sdh) ports that will function as such. For more information on working with APS, see NN10600-550 Nortel Multiservice Switch 7400/15000/20000 Common Configuration Procedures.
	This FP supports ATM user-to-network-interface (UNI) or one ATM Multiservice Switch node-to-Multiservice Switch node-interface (PPI) for each port, from either side of the user/network boundary. It can provide access to and from a public network as well as provide an interface between Multiservice Switch nodes within a private network. It is available in single-mode and multimode formats.
	The 2-port OC-3 ATM IP FP may also be referred to as the 2-port OC-3 multimode ATM2 SGAF, 2-port OC-3/STM-1 ATM IP, or the 2 P OC-3A. It supports ATM services on Nortel Multiservice Switch 7400 nodes.
	This FP supports ATM user-to-network-interface (UNI) or one ATM Multiservice Switch node-to-Multiservice Switch node-interface (PPI) for each port, from either side of the user/network boundary. It can provide access to and from a public network as well as provide an interface between Multiservice Switch nodes within a private network. It is available in single-mode and multimode formats.
(1 of 7)	

OC-3/STM-1 ATM FP configuration considerations (continued)

OC-3/STM-1 ATM function processor type	Configuration considerations
2-port OC-3/STM-1 ATM IP 3-port OC-3/STM-1 ATM	You must set three types of attributes: • Set the Sonet or Sdh provisionable attributes using the generic process • Set the Sonet or Sdh Path component attributes using the command set lp/<n> <port>/<m> path/0 <attribute> <attributevalue> • Set the Sonet or Sdh Path AtmCell component attributes using the command set lp/<n> <port>/<m> path/0 cell <attribute> <attributevalue> Up to seven 2-port OC-3/STM-1 ATM IP OR 3-port OC-3/STM-1 ATM FPs can be configured in a Multiservice Switch 7480. It is recommended that no more than five active or Main FPs (with the attribute mainCard under the component Lp) occupy the same shelf assembly. The total of two excludes any spare FPs (with the attribute spareCard). Deploying more than five active 2-port OC-3/STM-1 ATM IP OR 3-port OC-3/STM-1 ATM FPs risks affecting the shelf's capability to provide services. The amount of risk and the extent of impact depends on the engineering limitations imposed by any Multiservice Switch 7400 node and depends on all of the FPs in a shelf simultaneously bursting up to their maximum line rates. Each active port sending AAL1 CES constantly sends more than its line rate onto the backplane. Calculate the total bandwidth of all active ports to ensure that the backplane capacity is not exceeded.
3-port OC-3/STM-1 ATM	An ILS Forwarder card is required for IP support on CQC-based FPs. The combination of a CQC-based FP and an ILS Forwarder card supports IP, but not IP VPN (tunneling with VCG). See NN10600-170 Nortel Multiservice Switch 7400 Hardware Description for information on the ILS Forwarder card. The 3-port OC-3/STM-1 ATM FP may also be referred to as the Three-port Single-mode OC-3/STM-1 ATM FP. This FP supports ATM services on Nortel Multiservice Switch 7400 nodes The 3-port OC-3/STM-1 ATM FP supports either one OC-3 ATM user-to-network-interface (UNI) or one ATM Multiservice Switch node-to-Multiservice Switch node-interface (MMI) for each port. These can operate from either side of the user/network boundary, and can provide access to and from a public network. They can also to provide an interface between Multiservice Switch nodes within a private network. It is available in single-mode and multimode formats.
(2 of 7)	

Nortel Confidential

OC-3/STM-1 ATM FP configuration considerations (continued)

OC-3/STM-1 ATM function processor type	Configuration considerations
3-port OC-3/STM-1 ATM 4-port OC-3/STM-1 ATM	Each 3-port OC-3/STM-1 ATM FP or 4-port OC-3 STM-1 ATM FP supports either one OC-3 ATM user-to-network-interface (UNI) or one ATM Multiservice Switch node-to-Multiservice Switch node-interface (MMI) for each port. These can operate from either side of the user/network boundary, and can provide access to and from a public network. They can also to provide an interface between Multiservice Switch nodes within a private network. It is available in single-mode and multimode formats.
4-port OC-3/STM-1 ATM	When configuring single-FP LAPS on the 4-port OC-3 ATM FP, the working and protection lines must be paired as follows: ports 0 and 1 must be paired on the same Laps component, and ports 2 and 3 must be paired on another Laps component.
	When configuring dual-FP line APS (LAPS) on the 4-port OC-3 ATM FP, configure a pair of ports on two adjacent FPs. For example, configure port 0 on the FP in slot 2, and port 0 on the adjacent FP in slot 3.
	Sparing, LAPS, and equipment protection are supported between FPs that have the same PQC base. For example, a PQC12-based FP to a PQC12-based FP or a PQC6-based FP to a PQC6-based FP is supported. However, a PCQ12-based FP to a PQC6-based FP is not supported.
	When you add a *Sonet* port, you must manually configure (provision) an *Sts* subcomponent. The system creates component *Cell* beneath component *Sts*.
	When you add an *Sdh* port, you must manually configure (provision) a *Vc4* subcomponent. The system creates component *Cell* beneath component *Vc4*.
	When using LAPS, the attribute *clockingSource* must be set to *module*.
	Each port has an OC-3 duplex SC fiber optic transceiver.
(3 of 7)	

OC-3/STM-1 ATM FP configuration considerations (continued)

OC-3/STM-1 ATM function processor type	Configuration considerations
16-port OC-3/STM-1 ATM	When you add a *Sonet* port, you must manually configure (provision) an *Sts* subcomponent. The system creates component *Cell* beneath component *Sts*.
	When you add an *Sdh* port, you must manually configure (provision) a *Vc4* subcomponent. The system creates component *Cell* beneath component *Vc4*.
	Configure processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS).
	When configuring dual-FP line APS (LAPS) on the 16-port OC-3/STM-1 ATM FP, configure a pair of ports on two adjacent 16-port OC-3/STM-1 FPs. For example, configure port 0 on the FP in slot 2, and port 0 on the adjacent FP in slot 3.
	When using LAPS, the attribute *clockingSource* must be set to *module*.
	Depending on the faceplate connectors, the 16-port OC-3/STM-1 ATM FP has 16 OC-3 duplex LC fiber optic transceivers or 16 OC-3 MT-RJ fiber optic transceivers. The 16-port OC-3/STM-1 ATM FPs are available only in single-mode (SM) intermediate reach (IR).
16-port OC-3/STM-1 ATM with OAM cell conversion (NTHW24)	The firmware changes modify the O.151 OAM cell header to allow the cells to pass through the NTHW24 card and arrive at the fabric, where they can be looped back using the standard Nortel Multiservice Switch looping capabilities. The firmware changes are always active, and will modify O.151 OAM cells whether or not the looping test is enabled.
16-port OC-3/STM-1 POS and ATM	This FP can be used for both ATM bearer services and as a multiservice over ATM access FP. Typically the FP would be deployed to aggregate ATM traffic on the access side to ATM trunks on the core network side.
	You must decide for each port whether it is to be cabled with single-mode or multimode fiber. The fiber cables must match the version of small-form pluggable (SFP) module that connects to each port of the FP, and each port must be configured in software to designate the SFP.
	For information about the SFP optical module, see *Nortel Multiservice Switch 15000/20000 Fundamentals – Hardware* (NN10600-120). For information about configuring an SFP module, see *Nortel Multiservice Switch 7400/15000/20000 Configuration* (NN10600-550).
	When you add a *Sonet* port, you must manually configure (provision) an *Sts* subcomponent. The system creates component *Cell* beneath component *Sts*, and component *OpticalModule*.
(4 of 7)	

OC-3/STM-1 ATM FP configuration considerations (continued)

OC-3/STM-1 ATM function processor type	Configuration considerations
	When you add an *Sdh* port, you must manually configure (provision) a *Vc4* subcomponent. The system creates component *Cell* beneath component *Vc4*, and component *OpticalModule*.
	The ports cannot have separate clocking sources therefore, loop timing is not supported.
	When configuring dual-FP (inter-card line automatic protection switching (line APS or LAPS) for SONET or SDH, configure each pair of ports on two adjacent NTHW44 or NTHW48 FPs and use the same port numbers per pair. The first FP must be installed in an even-numbered slot, and its mate must be in the adjacent slot to the right of it. For example, configure port 0 on the FP in slot 2, and port 0 on the adjacent FP in slot 3. More configuration information is provided in *Nortel Multiservice Switch 7400/15000/20000 Configuration* (NN10600-550), the chapter on configuring line equipment protection for Nortel Multiservice Switch 15000 and Multiservice Switch 20000 nodes.
	Attention: Currently, only layer 2 ATM services are supported for LAPS. There is no LAPS protection for Layer 3 services.
	When using LAPS, the attribute *clockingSource* must be set to *module*.
	When using LAPS, assigning the Y-protection capability to a pair of ports in a dual-FP configuration is optional. To enable Y-protection, the attribute *protocol* must be set to *yProtection* for each pair of ports that are to be connected to the far end by fiber optical Y-splitter cables. After this attribute is set other LAPS settings are automatically changed. The settings are identified in *Nortel Multiservice Switch 7400/15000/20000 Configuration* (NN10600-550) at the procedure for configuring Y-protection on dual FPs.
	When using *yProtection*, only the SFP optical module (om) *OC3SmIr* is supported.
	Y-protection does not support port tests, DPRS, or POS.
	For the description of how Y-protection functions as a kind of equipment protection, see *Nortel Multiservice Switch 7400/15000/20000 Configuration* (NN10600-550), the section on understanding Y-protection.
	Packet-wise discard is supported on VCs only at the egress end. Ingress packet-wise discards are not supported on this FP. Also, Packet-wise discard on either ingress or egress VPs is not supported because this FP cannot distinguish different VCs inside a VP.
(5 of 7)	

OC-3/STM-1 ATM FP configuration considerations (continued)

OC-3/STM-1 ATM function processor type	Configuration considerations
	Migration considerations The 16pOC3PosAtm FP has numerous field programmable gate arrays (FPGAs) that store a specific version of software. When the version of the FPGAs in the running software is different than the version of FPGAs in the new migrating software, the FPGAs will need to be updated with the new version before the migration can complete. Updating the version for the FPGAs is handled automatically as part of the migration, but it may extend the migration up to 45 minutes to complete when at least one 16pOC3PosAtm FP is present in the shelf. When more than one 16pOC3PosAtm FP is present in the shelf, the migration may take slightly longer because it depends on when the other 16pOC3PosAtm FPs start getting loaded relative to the other FPs in the shelf. During the extended time frame, the FP faceplate shows a slow flashing red LED, the status of the FP may be shown as enabled, and the status of the LP may be shown as unlocked and disabled. Enabling Y-protection on a dual FP configuration provides hitless software migration (HSM) when the far-end equipment does not support line automatic equipment protection (LAPS) or multiplex section protection (MSP). When a PCR migration occurs from a PCR for which there is no NPU provisioning support, to a level that requires NPU provisioning support, the NPU (NetworkProcessingUnit) component is automatically added to the LP for a 16-port OC-3/STM-1 POS ATM FP. Also, the service bundle selection is automatically made to allow for a smooth software migration. If the 16pOC3PosAtm FP is to be used as a trunk card in an RFC 2764 IP VPN solution, a new virtual connection gateway (VCG) must be provisioned and existing customer VRs must be migrated from the existing VCG to the new VCG. For information on how to provision a VCG, see *Nortel Multiservice Switch 7400/15000/20000 Configuration – IP VPN* (NN10600-803).
(6 of 7)	

OC-3/STM-1 ATM FP configuration considerations (continued)

OC-3/STM-1 ATM function processor type	Configuration considerations
	NPU service bundles
	A network processing unit (NPU) is a programmable device that specializes in the processing of data packets. NPUs are used in the ingress and egress datapaths of the 16-port OC-3/STM-1 POS ATM FP. The programmable nature of the NPUs gives flexibility to the GQM-based FPs in handling new and existing services as the behaviors of the NPUs can be altered by different service bundles. The NPU service bundle packages the application services offered by the NPUs into service bundles. The provisioning of the NPU component occurs under the LP component, and is required for this card.
	Selection of a NPU service bundle is enabled by the addition of the NPU subcomponent to the LP component. The *serviceBundleName* attribute within the NPU component allows for the service bundle selection. For more information about this attribute, see the procedure Adding the NPU service bundle in the *Nortel Multiservice Switch 7400/15000/20000 Configuration* (NN10600-550).
	Software upgrade behavior
	NPU service bundles have no effect on the outage impact or outage duration associated with the hitless software migration.
(7 of 7)	

OC-3/STM-1 ATM FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see

OC-3/STM-1 ATM FP supported features

OC-3/STM-1 ATM function processor type	Supported features
2-port OC-3/STM-1 ATM IP	ATM traffic management functions, including fair queuing and traffic shaping
	line automatic protection switching (line APS) between SONET interfaces on the same card (single-FP line APS)
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
3-port OC-3/STM-1 ATM	Processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
(1 of 7)	

OC-3/STM-1 ATM FP supported features (continued)

OC-3/STM-1 ATM function processor type	Supported features
4-port OC-3/STM-1 ATM	SONET or SDH inter-card or intra-card line APS (LAPS) for a single-FP or dual-FP setup between pre-designated pairs of ports
	equipment sparing of optical FPs by using a sparing bus between adjacent pairs of optical FPs. The sparing bus connects FPs that are located in the following card slots: 2 and 3, 4 and 5, 6 and 7, 8 and 9, 10 and 11, 12 and 13, and 14 and 15. In equipment sparing of optical FPs, the traffic of a port on an active optical FP is switched to a spare FP if:
	• the active FP fails
	• the port has been configured for dual-FP line APS (LAPS)
	• the FP of the spare port is in service and operating normally
	when configured for dual-FP inter-card or intra-card LAPS, the FP supports:
	• hitless services
	• hitless software migration
	port tests on the standby port provided the port is not also configured for Y-protection or port bridge group (PBG) -- the test types per FP type are identified in *Nortel Multiservice Switch 7400/15000/20000 Troubleshooting* (NN10600-520)
	the complete set of Multiservice Switch ATM statistics
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
	virtual router (VR) and IP (supported in the PVG using IP (VoIP) when VR interworking is used with a VR access point (AP) and the voice services processor 2 (VSP2) FP card on Multiservice Switch 15000 nodes)
	IP DiffServ services of the DiffServ domain for the router (Vr Dsd) and the DiffServ profile for the interface (Vr Ip DiffServ) on its PQC2 and PQC12 FPs
	In addition, the PQC12-based 4-port OC-3 ATM FP has the following distinct characteristics:
	• higher frame and cell processing capacity equivalent to OC-12 line rates
	• greater IP capabilities
	• fast hardware data path support for DPRS load-spreading
16-port OC-3/STM-1 ATM	ATM services with user-to-network interfaces (UNI), which enable using the FP for network access
(2 of 7)	

OC-3/STM-1 ATM FP supported features (continued)

OC-3/STM-1 ATM function processor type	Supported features
	ATM services with network-to-network interfaces (NNIs), which enable using the FP for trunking
	SONET or SDH dual-FP inter-card line APS (LAPS) and equipment protection provided you configure a pair of ports on two adjacent 16-port OC-3/STM-1 FPs and the pair shares the same port number. For equipment protection of optical FPs, the traffic of a port on an active optical FP is switched to a spare FP provided: • the active FP fails or the active FP is locked when upgrading both FPs • the port has been configured for dual-FP LAPS • the FP of the spare port is in service and operating normally ITU-T G.841 Annex B MSP (APS) protection when configured for dual-FP inter-card LAPS, the FP supports: • ATM hitless services • hitless software migration port tests on the standby port provided the port is not also configured for Y-protection or port bridge group (PBG) -- the test types per FP type are identified in *Nortel Multiservice Switch 7400/15000/20000 Troubleshooting* (NN10600-520) processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS) IP class of service (CoS) VR-to-VR and VCG-based IP VPNs IP DiffServ services of the DiffServ domain for the router (Vr Dsd) and the DiffServ profile for the interface (Vr Ip DiffServ)
16-port OC-3/STM-1 ATM with OAM cell conversion	In addition to providing the same services as the 16-port OC-3/STM-1, this customized card accommodates the NTT O.151 loopback cells, which allows for loopback testing. See *Nortel Multiservice Switch 7400/15000/20000 Troubleshooting* (NN10600-520) for more information on the O.151 OAM loopback test.
16-port OC-3/STM-1 POS and ATM (NTHW44 or NTHW48)	small-form pluggable (SFP) modules which connect multimode (MM), single-mode (SM) intermediate reach (IR), or SM long reach (LR) fiber cables to each port (socket) on the faceplate such that the FP can have a combination of SFPs, one type per port. confirmation that each inserted SFP matches the port configuration for it, and verifies operation (when the FP is powered from an installation or a replacement)
(3 of 7)	

OC-3/STM-1 ATM FP supported features (continued)

OC-3/STM-1 ATM function processor type	Supported features
	ATM services with user-to-network interfaces (UNI), which enable using the FP for network access
	ATM services with network-to-network interfaces (NNIs), which enable using the FP for trunking
	IP differentiated services of the components *DiffServDomain* and *DiffServProfile* when configured for VIPR networks (Vr Dsd, Vr Ip DiffServProfile), RFC 2547 networks (Rtr Dsd, Rtr Vrf Dsd, Rtr Vrf DiffServProfile), and RFC 2764 access and trunk (cVR, VCG)
	access FP or a trunk FP or both when configured in either an RFC 2764 or RFC 2547 IP VPN solution
	interworks with specific PQC-based FPs in an RFC 2764 IP VPN configuration. Refer to table OC-3/STM-1 ATM FP configuration considerations (page 58) for a list of which PQC-based FPs can interwork with the 16pOC3PosAtm FP.
	RFC 2547 MPLS IP VPN
	32,000 per VC queues per FP
	basic virtual path terminations (VPTs)
	logical trunks over ATM or DPRS (the same as PQC12-based FPs)
	Nortel Multiservice Switch networking (DPRS and PORS)
	supports ATM multi-protocol encapsulation (ATM MPE) over both PVC and SPVC connections
	Attention: Only *AtmMpe encapType* attribute with a value of llcEncap or ipVcEncap is supported on this FP. The *AtmMpe encapType* attribute with a value of llcBridgeEncap is not supported.
	supports virtual IP router (VIPR) functionality
	IP datapath media interworking with all PQC-based FPs
	Attention: For interworking with PQC-based FPs that support ATM MPE, traffic can only be forwarded to connections with the *AtmMpe encapType* attribute set to llcEncap or ipVcEncap. Interworking with connections that have an *AtmMpe encapType* attribute with a value of llcBridgeEncap is not supported.
	DPRS logical trunk frame forwarding in hardware at OC-3 line rate on all 16 ports
	IP forwarding in hardware at near OC-3 line rate on all 16 ports
	supports all routing protocols
(4 of 7)	

OC-3/STM-1 ATM FP supported features (continued)

OC-3/STM-1 ATM function processor type	Supported features
	hitless open shortest path first (OSPF) switchover
	hitless software migration (HSM) and hot equipment protection are supported for ATM services (layer-2) only
	When configured for dual-FP (inter-card) line automatic protection switching (LAPS) for SONET or SDH, the line and equipment protection for SONET and multiplex section protection (MSP) provide:
	Attention: Only inter-card LAPS is supported.
	• ATM hitless services (hot standby)
	• loss of signal (LOS) detection within 10 milliseconds
	• line protection switchover for ATM services within 50 milliseconds upon a line or FP failure or being locked, and provided the mate port is in service and not degraded
	• hitless software migration support for ATM services
	• new ATM connections within 500 milliseconds from a switchover (only for Succession nodes)
	• currently, layer 3 services do not support LAPS on this FP
	When configured for dual-FP (inter-card) LAPS and Y-protection, the equipment protection (EP) and hitless software migration (HSM) is the same as LAPS with the difference that one of the cards is service active while its mate is on hot standby, that is, there cannot be active ports on both cards simultaneously (as with standard LAPS), and other differences are identified in *Nortel Multiservice Switch 7400/15000/ 20000 Troubleshooting* (NN10600-520), the table about the status of Y-protection during maintenance actions or faults.
	supports port test on standby port in LAPS configuration
	supports ITU-T G.841 Annex B MSP (APS) for ATM services running on SDH provisioned ports. Support for this protocol enables Nortel Multiservice Switch nodes to interwork with networks that use the ITU-T G.841 Annex B protection scheme.
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
(5 of 7)	

OC-3/STM-1 ATM FP supported features (continued)

OC-3/STM-1 ATM function processor type	Supported features
	SONET and SDH fault and performance management for the FP includes:
	• alarm indication signal (AIS)
	• bit inter-leaved parity errors (BIP)
	• discard of ATM idle and unassigned cells
	• far end block errors (FEBE)
	• header error check sequence (HEC)
	• remote defect indicator (RDI)
	• loss of frame (LOF)
	• loss of pointer (LOP)
	• loss of signal (LOS)
	Handling operations, administration, and maintenance (OAM) ATM cells includes:
	• supporting the standardized OAM cells for end-to-end AIS, end-to-end RDI, segment loopback, and end-to-end loopback
	• not supporting the standard OAM cells for performance monitoring (FPM and BR), congestion control, segment AIS, and segment RDI by only transparently passing them through non-flow end points
	• supporting the non-standardized OAM cells for the proprietary end of transmission (EOT) cell used by rerouting connections on flow end points and transparently passes this cell on the non-flow end points and trace
	• not supporting the non-standardized OAM cells for the O.151 cell used by the NTHW24 FP (the 16-port OC-3/STM-1 FP with customized O.151 cells) by only transparently passing them through non-flow end points
	• not supporting the non-standardized OAM cells for the proprietary cell discards used for performance monitoring of cell loss ratio (CLR) calculations by only transparently passing them through non-flow end points
	for AAL5 ATM connections, accurate layer 2 cell statistics up to and including the point of AAL5 frame reassembly and delivery to layer 3 on ingress, and from the point of AAL5 frame segmentation into cells on egress (but not while the cells are processed on layer 3)
	(6 of 7)

OC-3/STM-1 ATM FP supported features (continued)

OC-3/STM-1 ATM function processor type	Supported features
	no need for the component *ConnMap*
	network processor units (NPUs) that enable new datapath capabilities when upgrading software
(7 of 7)	

OC-12/STM-4 ATM function processors

This section contains information on OC-12/STM-4 ATM function processors.

Navigation

OC-12/STM-4 ATM function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of OC-12/STM-4 ATM FPs.

OC-12/STM-4 ATM function processor specifications

	1-port OC-12/STM-4 ATM	4-port OC-12/STM-4 ATM	4-port MR POS and ATM
card type	1pOC12SmLrAtm	4pOC12SmIrAtm	4pMRPosAtm
port type	Sonet (OC-12) Sdh (STM-4)	Sonet (OC-12) Sdh (STM-4)	Sonet (OC-12, OC-48) Sdh (STM-4, STM-16)
port number	0,1	0-3	0-3 (4pOC12 mode), or 0 (1pOC48 mode)
channels per port	1	1	1
FP technologies	PEC NTHR29BA - PPC, PQC1.0, AQS PEC NTHR29DA - PPC, PQC2.0, AQS	PEC NTHW11 - PPC, PQC2.0, QRD1.1, APC PEC NTHW86 - PPC, PQC12, QRD1.1, QRD1.2, APC	GQM
memory (normal)	128 Mbyte	256 Mbyte	512 Mbyte
memory (fast)	n/a	n/a	n/a
memory (shared)	n/a	n/a	n/a
(1 of 6)			

OC-12/STM-4 ATM function processor specifications (continued)

	1-port OC-12/STM-4 ATM	4-port OC-12/STM-4 ATM	4-port MR POS and ATM
line speed (max.)	622 Mbps	622 Mbps	622 Mbps (4pOC12 mode) or 2.488 Gbps (1pOC48 mode)
effective data rate	599 Mbps	599 Mbps	599 Mbps (4pOC12 mode) or 2.396 Gbps (1pOC48 mode)
ATM fault management			• alarm indication signal (AIS) • remote defect indication (RDI) • loopback
bandwidth management			same as all other Multiservice Switch ATM FPs
call latency (95th percentile)			25 milliseconds for a transit node or terminating node 30 milliseconds for an originating node
(2 of 6)			

OC-12/STM-4 ATM function processor specifications (continued)

	1-port OC-12/STM-4 ATM	4-port OC-12/STM-4 ATM	4-port MR POS and ATM
call set-up rate			300 calls per second per FP (with accounting and carrier grade off) 265 calls per second per FP (with accounting off and carrier grade on) 150 calls per second per FP (with accounting and carrier grade on)
class scheduling			8 emission priorities (EPs), including: Absolute priority for EP0 and EP1 with minimum delay and cell delay variation (CDV) EPs 2 to 7 with minimum bandwidth guarantees (MBGs) to avoid starvation Work-conserving allocation of unused bandwidth for high utilization
clocking source	local, line, module	module, local	module, local, line
CAC			CDV for CBR or VBR traffic types overbooking resources per port based on QoS and basic VPT
(3 of 6)			

OC-12/STM-4 ATM function processor specifications (continued)

	1-port OC-12/STM-4 ATM	4-port OC-12/STM-4 ATM	4-port MR POS and ATM
connection space and call rate			16,000 connection end points per port. (For this FP, there is no longer a restriction of 16,000 PVCs per card, which now can be any combination of PVCs, SPVCs, or SVCs.)
egress ATM per VC queues per FP			32,000
logical trunks			32 per FP
multicast connections per card			16,384 leaves per FP up to 16 multicast leaf connections per root multicast connection
Multiservice Switch ATM statistics			all supported with additional statistics for the NTHW46. For the list, see *Nortel Multiservice Switch 7400/15000/20000 Components Reference* (NN10600-060).
NCS	Y	Y	Y
networking connections supported			PVCs, PVPs, SPVCs, SPVPs, SVCs, and SVPs, VPTs
packet congestion per VC			EPD LPD PPD W-RED
(4 of 6)			

OC-12/STM-4 ATM function processor specifications (continued)

	1-port OC-12/STM-4 ATM	4-port OC-12/STM-4 ATM	4-port MR POS and ATM
port configuration	B-ISDN		B-ISDN
memory (processor)	128 Mbyte SDRAM	256 Mbyte SDRAM	256 Mbyte
protocol			g841AnnexB, standard
queuing disciplines			common and per VC
routing and signaling			AINI 1.0 IISP 1.0 ILMI 4.0 PNNI and H-PNNI 1.0 UNI 3.0, 3.1, and 4.0 local and global rerouting
scheduling			link class connection
SFP configuration			OC12Smlr, OC12SmLr, OC48SmLr, OC48SmLr2, OC48Smlr
software level (minimum)	PEC NTHR29BA - PCR1.1 PEC NTHR29DA - PCR1.1, load CA01S2A or later	PEC NTHW11 - PCR2.2 PEC NTHW86 - PCR3.0	PCR 6.1
sparing supported	equipment sparing of optical FPs by using a sparing bus between adjacent pairs of optical FPs	equipment sparing of optical FPs by using a sparing bus between adjacent pairs of optical FPs	
SSM	Y	Y	Y
total egress ATM buffer (cells) per port @3K connections per FP	32k	512k	1000k
(5 of 6)			

OC-12/STM-4 ATM function processor specifications (continued)

	1-port OC-12/STM-4 ATM	4-port OC-12/STM-4 ATM	4-port MR POS and ATM
traffic management			TM 4.1 supporting: CBR nrt-VBR rt-VBR UBR UBR-MDCR (with definable CLR, CLP0/1, CDV, and CTD)
traffic policing			dual usage parameter control (UPC) policers that support policing of all traffic descriptor types.
traffic shaping			on any 4 emission priorities (EPs) linear dual-rate inverse usage parameter control (UPC) variable rates with a minimum of 100 cells per second
(6 of 6)			

OC-12/STM-4 ATM FP hardware information

The table below contains important information regarding the vintages of certain OC-12/STM-4 ATM FPs. For a full list of PECs (including vintages) for supported FPs, see *Nortel Multiservice Switch Release Notes*.

OC-12/STM-4 ATM FP hardware information

OC-12/STM-4 ATM function processor type	Hardware details
1-port OC-12/STM-4 atm	Loading the PEC NTHR29DA FP with loads that are earlier vintage than PCR1.1 CA01S2A may result in damage requiring the FP to be returned to Nortel Networks for repairs.
4-port MR POS and ATM	An NTHW46 operates only with CP3s in the same shelf.
	When replacing an NTHW11 or NTHW86 with an NTHW46, treat the decommissioning of the slot and the configuration of the NTHW46 as a new FP deployment in the slot. Consider that physical port locations are different.
4-port OC-12/STM-4 ATM	For the PQC12-based version of the OC-12/STM-4 FP:
	• to take advantage of the enhanced frame relay and DPRS performance capabilities, the loadspreadfast algorithm must be used. For more information about this forwarding policy, see *Nortel Multiservice Switch 7400/15000/20000 Configuration – DPRS* (NN10600-425).
	• Sparing, LAPS, and equipment protection are supported between FPs that have the same PQC base. For example, a PQC12-based FP to a PQC12-based FP or a PQC6-based FP to a PQC6-based FP is supported. However, a PCQ12-based FP to a PQC6-based FP is not supported.
	The PQC2 version of the 4-port OC12 (NTHW11) does not support IP.

OC-12/STM-4 ATM FP configuration considerations

The table below contains configuration considerations for OC-12/STM-4 ATM FPs.

OC-12/STM-4 ATM FP configuration considerations

OC-12/STM-4 ATM function processor type	Configuration considerations
All OC-12/STM-4 ATM	For all ATM FPs, you must link the ports to an ATM interface before they can provide any service. For more information see the section on provisioning an *AtmInterface* component in *Nortel Multiservice Switch 7400/15000/20000 Configuration – ATM* (NN10600-710).
	OC-12/STM-4 FPs are available only in single mode (SM) format.
(1 of 4)	

OC-12/STM-4 ATM FP configuration considerations (continued)

OC-12/STM-4 ATM function processor type	Configuration considerations
	OC-12/STM-4 FPs, excluding the 4-port MR POS and ATM FP, support equipment sparing by using a sparing bus between adjacent pairs of optical FPs. The sparing bus connects FPs that are located in the following card slots: 2 and 3, 4 and 5, 6 and 7, 8 and 9, 10 and 11, 12 and 13, and 14 and 15.
1-port OC-12/STM-4 ATM	The 1-port OC-12/STM-4 ATM FP has a single port for carrying traffic, along with an internal port for sparing.
	When configuring APS on the 1-port OC-12/STM-4 ATM FP, ports 0 and 1 must be paired on the same *Aps* component.
	When you add a *Sonet* port, you must manually configure (provision) an *Sts* subcomponent. The system creates component *Cell* beneath component *Sts*.
	When you add an *Sdh* port, you must manually configure (provision) a *Vc4* subcomponent. The system creates component *Cell* beneath component *Vc4*.
	The cell payload is scrambled by default, according to ITU-T Recommendation I.432. Cell payload scrambling can be turned off for a port on an ATM card. However, when cell payload scrambling is turned off for ATM ports, there is an increased risk of false cell header delineation errors.
	The 1-port OC12c/STM4 FP may also be referred to as the One-port OC12C TURBO FP. It has a single external OC12c port with two OC12c duplex SC fiber optic transceivers.
4-port MR POS and ATM	The 4pMRPosAtm FP can be used for both ATM bearer services and as a multiservice over ATM access FP. Typically the FP would be deployed to aggregate ATM traffic on the access side to ATM trunks on the core network side.
	The 4-port MR POS and ATM FP may be operated as a 1-port OC48/STM-16 STM FP in addition to the 4-port OC12-/STM4 ATM mode It can be populated with up to four OC-12 optical interface modules, or a single OC-48 optical interface module inserted into port 0. In the OC-48 mode, port 0 is operational, and ports 1 and 3 are turned off.
	You must decide whether the FP functions for ATM or for packet over SONET (POS). Only ATM functionality is currently supported by the software.
(2 of 4)	

OC-12/STM-4 ATM FP configuration considerations (continued)

OC-12/STM-4 ATM function processor type	Configuration considerations
	Each port is cabled with fiber. The fiber cables must match the version of small-form pluggable (SFP) module that connects to each port of the FP, and you must set the *opticalModule* type to match each inserted SFP module after adding the component *Sonet* or *Sdh*.
	Attention: For information about the SFP optical module, see *Nortel Multiservice Switch 15000/20000 Fundamentals – Hardware* (NN10600-120). For information about configuring an SFP module, see *Nortel Multiservice Switch 7400/15000/20000 Configuration* (NN10600-550).
	When you add a *Sonet* port, you must manually add an *Sts* subcomponent. The system creates component *Cell* beneath component *Sts*, and component *OpticalModule*.
	When you add an *Sdh* port, you must manually add a *Vc4* subcomponent. The system creates component *Cell* beneath component *Vc4*, and component *OpticalModule*.
	There is no need to select a service bundle.
	Operation mode considerations
	You can switch from 4-port OC12/STM-4 mode of operation to 1-port OC48/STM-16 and vice-versa.
	There are two steps you need to perform to change the SFP optical module type: the SFP (optical module) has to be physically replaced, and the value of the *OpticalModule type* attribute has to be provisioned to match the inserted SFP type.
	The value of the *Lp Sonet/0* or *Sdh/0 OpticalModule type* attribute determines the mode of operation. Changing this attribute value from any of the OC12 values (OC12SmLr or OC12SmIr) to any of the OC48 values (OC48SmIr, OC48SmLr, or OC48SmLr2), results in a change of operation mode from 4-port OC-12/STM-4 mode of operation to 1-port OC-48/STM-16mode. Similarly, changing the *OpticalModule typ*e attribute value from any OC48 value to any of the OC12 values results in a change of operation mode from 1-port OC-48/STM-16 to 4-port OC-12/STM-4 mode of operation.
	Attention: The 4-port MR POS and ATM FP is reset when you switch from 4-port OC-12/STM-4 mode of operation to 1-port OC-48/STM-16 mode, or vice versa. However, when you change the *OpticalModule type* attribute value from any of the OC48 values to another OC48 value, or from any OC12 value to another OC12 value, the FP does not reset.
	(3 of 4)

OC-12/STM-4 ATM FP configuration considerations (continued)

OC-12/STM-4 ATM function processor type	Configuration considerations
	Migration considerations
	The 4pMRPosAtm FP has numerous field programmable gate arrays (FPGAs) that store a specific version of software. When the version of the FPGAs in the running software is different than the version of FPGAs in the new migrating software, the FPGAs will need to be updated with the new version before the migration can complete. Updating the version for the FPGAs is handled automatically as part of the migration, but it may extend the migration up to 30 minutes to complete when one 4pMRPosAtm FP is present in the shelf. When more than one 4pMRPosAtm FP is present in the shelf, the migration may take slightly longer because it depends on when the other 4pMRPosAtm FPs start getting loaded relative to the other FPs in the shelf.
4-port OC-12/STM-4 ATM	The four ports are used for carrying traffic. Each STS, VC-4 component has to be provisioned explicitly. The system automatically creates an AtmCell beneath them.
	The ports cannot have separate clocking sources therefore, loop timing is not supported.
	When configuring dual-FP (inter-card line automatic protection switching (line APS or LAPS) for SONET or SDH, configure each pair of ports on two adjacent NTHW44 FPs and use the same port numbers per pair. The first FP must be installed in an even-numbered slot, and its mate must be in the adjacent slot to the right of it. For example, configure port 0 on the FP in slot 2, and port 0 on the adjacent FP in slot 3
	The cell payload is scrambled by default, according to ITU-T Recommendation I.432. Cell payload scrambling can be turned off for a port on an ATM card. However, when cell payload scrambling is turned off for ATM ports, there is an increased risk of false cell header delineation errors.
	The 4-port OC12/STM4 ATM FP may also be referred to as the 4pOC12SmIrAtm FP. It supports network-to-network and user-to-network interfaces (NNIs and UNIs) as well as a variety of services on Nortel Multiservice Switch 15000 and Multiservice Switch 20000 nodes, including the following service classes: ATM, FR (DPRS), IP and MPLS. Each port has duplex SC fiber transceivers.
(4 of 4)	

OC-12/STM-4 ATM FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see .

OC-12/STM-4 ATM FP supported features

OC-12/STM-4 ATM function processor type	Supported features
1-port OC-12/STM-4 ATM	network-to-network interfaces (NNIs)
	loopback monitoring
	SONET or SDH line APS between pre-designated pairs of ports.
	• single-FP line APS on the 1-port OC12c/STM4 FP APS is implemented with one optic transceiver representing the active port and the second optic transceiver representing the spare port.
	• dual-FP line APS has the original active port on the active FP and the spare port on an adjacent spare FP.
	hitless services when configured for dual-FP line APS
	hitless software migration when configured for dual-FP line APS
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
4-port MR POS and ATM FP	small-form pluggable (SFP) modules which connect single-mode (SM) intermediate reach (IR), or SM long reach (LR) fiber cables to each port (socket) on the faceplate such that the FP can have a combination of SFPs, one type per port
	only provides a single reference clock to be used as a network synchronization source
	confirmation that each inserted SFP matches the port configuration for it, and verifies operation
	ATM services which enable using the FP for network access or trunking
	32,000 per VC queues
	basic virtual path terminations (VPTs)
	logical trunks over ATM or DPRS (the same as PQC12-based FPs)
	Multiservice Switch networking (DPRS and PORS)
	full line rate of 2.5 Gbit/s for DPRS logical trunk frame forwarding
	hitless software migration (HSM) and hot equipment protection are supported for ATM services (layer-2) only
(1 of 4)	

OC-12/STM-4 ATM FP supported features (continued)

OC-12/STM-4 ATM function processor type	Supported features
	when configured for dual-FP (inter-card) line automatic protection switching (LAPS) for SONET or SDH, the line and equipment protection for SONET and multiplex section protection (MSP) provide:
	Attention: Only inter-card LAPS is supported.
	• ATM hitless services (hot standby)
	• loss of signal (LOS) detection within 10 milliseconds
	• line protection switchover for ATM services within 50 milliseconds upon a line or FP failure or being locked, and provided the mate port is in service and not degraded
	• hitless software migration support for ATM services
	• new ATM connections within 500 milliseconds from a switchover (only for Succession nodes)
	when configured for dual-FP (inter-card) LAPS, the equipment protection (EP) and hitless software migration (HSM) is the same as LAPS with the difference that one of the cards is service active while its mate is on hot standby, that is, there cannot be active ports on both cards simultaneously (as with standard LAPS). Other differences are identified in the table about the status of Y-protection during maintenance actions or faults in *Nortel Multiservice Switch 7400/15000/20000 Troubleshooting* (NN10600-520).
	supports ITU-T G.841 Annex B MSP (APS) for ATM services running on SDH provisioned ports. Support for this protocol enables Nortel Multiservice Switch nodes to interwork with networks that use the ITU-T G.841 Annex B protection scheme.
	ATM traffic management features including:
	• traffic policing
	• congestion control
	• packet-wise discards
	• perVc queuing and common queuing
	• traffic shaping
	• weighted fair queue connection scheduling
	• prioritized class scheduling with minimum bandwidth guarantees
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
	SONET and SDH fault and performance management for the FP
	(2 of 4)

OC-12/STM-4 ATM FP supported features (continued)

OC-12/STM-4 ATM function processor type	Supported features
	Handling operations, administration, and maintenance (OAM) ATM cells includes: • supporting the standardized OAM cells for end-to-end AIS, end-to-end RDI, segment loopback, and end-to-end loopback • not supporting the standard OAM cells for performance monitoring (FPM and BR), congestion control, segment AIS, and segment RDI by only transparently passing them through non-flow end points • supporting the non-standardized OAM cells for the proprietary end of transmission (EOT) cell used by local/global routing and/or edge-based rerouting (EBR) connections on flow end points and transparently passes this cell on the non-flow end points • not supporting the non-standardized OAM cells for the O.151 cell used by the NTHW24 FP (the 16-port OC-3/STM-1 FP with customized O.151 cells) by only transparently passing them through non-flow end points • not supporting the non-standardized OAM cells for the proprietary cell discards used for performance monitoring of cell loss ratio (CLR) calculations by only transparently passing them through non-flow end points for AAL5 ATM connections, accurate layer 2 cell statistics up to and including the point of AAL5 frame reassembly and delivery to layer 3 on ingress, and from the point of AAL5 frame segmentation into cells on egress (but not while the cells are processed on layer 3) component *ConnMap* is not required
4-port OC-12/STM-4 ATM	loopback monitoring SONET or SDH dual-FP inter-card line APS between pre-designated pairs of ports on adjacent 4-port OC-12/STM-4 FPs. All ports must be provisioned as SONET or SDH. You cannot mix SONET and SDH on the same FP. when configured for dual-FP inter-card LAPS, the FP supports: • hitless services • hitless software migration • port tests on the standby port provided the port is not also configured for Y-protection or port bridge group (PBG) -- the test types per FP type are identified in *Nortel Multiservice Switch 7400/15000/20000 Troubleshooting* (NN10600-520) processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
(3 of 4)	

OC-12/STM-4 ATM FP supported features (continued)

OC-12/STM-4 ATM function processor type	Supported features
	virtual router (VR) and IP (supported in the PVG using IP (VoIP) when VR interworking is used with a VR access point (AP) and the voice services processor 2 (VSP2) FP or VSP3 FP card on Multiservice Switch 15000 nodes)
	VR-to-VR and VCG-based IP VPNs on its PQC12 FPs
	IP DiffServ services of the DiffServ domain for the router (*Vr Dsd*) and the DiffServ profile for the interface (*Vr Ip DiffServ*) on its PQC12 FPs
	In addition, the PQC12-based version has the following distinct characteristics:
	• higher frame and cell processing capacity equivalent to OC-12 line rates
	• greater IP capabilities
	• fast hardware data path support for DPRS loadspreading and frame relay access
(4 of 4)	

OC-48/STM-16 ATM function processors

This section contains information on OC-48/STM-16 ATM function processors. Also see the previous section, OC-12/STM-4 ATM function processors (page 71) for details on the 4pMRPosAtm FP, which can function as either a 4-port OC-12/STM-4 FP or as a 1-port OC-48/STM-16 FP depending on the pluggable SFP optics modules inserted.

Navigation

OC-48/STM-16 ATM function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of OC-48/STM-16 ATM FPs.

OC-48/STM-16 ATM function processor specifications

	1-port OC-48/STM-16 ATM with APS
card type	1pOC48ChSmIrAtm
port type	Sonet (OC-48) Sdh (STM-16)
port number	0
channels per port	1
FP technologies	PPC, PQC2.0, QRD1.1
memory (normal)	256 Mbyte
memory (fast)	n/a
memory (shared)	n/a
line speed (max.)	2.488 Gbps
effective data rate	2.396 Mbps
clocking source	module, local
concatenation level	48 when configuring a single Sts component
	12 when configuring multiple Sts components
NCS	Y
PHY devices	TDAT
port configuration	B-ISDN
memory (processor)	128Mb SDRAM
(1 of 2)	

OC-48/STM-16 ATM function processor specifications (continued)

	1-port OC-48/STM-16 ATM with APS
software level (minimum)	PCR 2.1
SSM	Y
Sts component type	Sts, Vc4
Sts component instance	0, 12, 24, 36
usable cell rate	5.37 million cells per second
usable data rate	2.3 Gbit/s
(2 of 2)	

OC-48/STM-16ATM FP configuration considerations

The table below contains configuration considerations for OC-48/STM-16 ATM FPs.

OC-48/STM-16 ATM FP configuration considerations

OC-48/STM-16 ATM function processor type	Configuration considerations
All OC-48/STM-16 ATM	For both OC-48/STM-16 FP types, you must link the port to an ATM interface before it can provide any ATM service. For the 1-port OC-48/STM-16 POS FP, the ATM service is ATM PVC/PVP over MPLS service. For more information see the section on provisioning an *AtmInterface* component in *Nortel Multiservice Switch 7400/15000/20000 Configuration – ATM* (NN10600-710). The cell payload is scrambled by default, according to ITU-T Recommendation I.432. For the APS FP, cell payload scrambling can be turned off for a port on an ATM card; be aware that this will result in an increased risk of false cell header delineation errors and as such it is recommended that cell payload scrambling be left turned on. For the POS FP, cell payload scrambling cannot be turned off for a port on the 1-port OC-48/STM-16 POS FP.
1-port OC-48/STM-16 ATM with APS	When you add a *Sonet* port, you must manually configure (provision) an *Sts* subcomponent. The system creates component *Cell* beneath component *Sts*. When you add an *Sdh* port, you must manually configure (provision) a *Vc4* subcomponent. The system creates component *Cell* beneath component *Vc4*. You can define a maximum of four Sts components. You do not need to define all four if they are not all needed. The software capability for channelization is not available for the hardware.
(1 of 2)	

OC-48/STM-16 ATM FP configuration considerations (continued)

OC-48/STM-16 ATM function processor type	Configuration considerations
	The 1-port OC-48/STM-16 ATM with APS FP provides support for ATM services with automatic protection switching (APS) for network-to-network interfaces (NNI) on Nortel Multiservice Switch 15000 and Multiservice Switch 20000 nodes. The port has an OC-48/STM-16 duplex SC fiber optic transceiver. This FP is available only in single-mode format in intermediate reach.
(2 of 2)	

OC-48/STM-16 ATM FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see

OC-48/STM-16 ATM FP supported features

OC-48/STM-16 ATM function processor type	Supported features
1-port OC-48/STM-16 with APS	loopback monitoring
	dual-FP line APS and equipment protection (unidirectional and bidirectional, revertive and non-revertive)
	hitless software migration when configured for one-for-one equipment protection using inter-FP LAPS
	hitless software migration when configured for one-for-one equipment protection using inter-FP LAPS
	line and module timing
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
	PVC, SVC, SPVC, and SPVP connection types
	one path at OC-48/STM-16 payload capacity and four paths at STS-12/STM-4 capacity
	Multiservice Switch networking (DPRS and PORS)
	ATM classes of service: rt-VBR, nrt-VBR, UBR and CBR
	VR-to-VR and VCG-based IP VPNs
	IP class of service (CoS)

STM-1 electrical ATM function processors

This section contains information on STM-1 ATM function processors.

Navigation

STM-1 electrical ATM function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of STM-1 electrical ATM FPs.

STM-1 electrical ATM function processor specifications

	2-port STM-1 electrical ATM IP
card type	2pSTM1eAtm
port type	Sdh (STM-1)
port number	0,1
channels per port	1
FP technologies	PPC, AQM1.1, PQC2.0
memory (normal)	64 Mbyte
memory (fast)	n/a
memory (shared)	n/a
line speed (max.)	155.52 Mbps
effective data rate	149.76 Mbps
access mode	STM-1e
clocking source	local, module, line
NCS	Y
port configuration	B-ISDN
software level (minimum)	PCR 4.2
SSM	Y

STM-1 electrical ATM FP configuration considerations

The table below contains configuration considerations for STM-1 electrical ATM FPs.

STM-1 electrical ATM FP configuration considerations

STM-1 electrical ATM function processor type	Configuration considerations
2-port STM-1 electrical ATM IP	For all ATM FPs, you must link the ports to an ATM interface before they can provide any service. For more information, see the section on provisioning the AtmInterface component in *Nortel Multiservice Switch 7400/15000/20000 Configuration – ATM* (NN10600-710). When you add an SDH port, the system automatically creates a Path subcomponent. The system also creates an *ATMCell* component beneath the Path component. The 2-slot 2-port STM-1e ATM IP FP can be plugged into any pair of adjacent slots except slot 0 (zero), which must be occupied by a CP; a second CP would require slot 15 in a Multiservice Switch 7480. When configuring a 2-slot FP, only set the *cardtype* attribute of the lowest slot number of the pair.
	Up to seven 2-port STM-1e ATM IP FPs can be configured in a Multiservice Switch 7480. It is recommended that no more than five active or Main FPs (with the attribute mainCard under the component Lp) occupy the same shelf assembly. The total of two excludes any spare FPs (with the attribute spareCard). Deploying more than five active 2-port STM-1e ATM IP FPs risks affecting the shelf's capability to provide services. The amount of risk and the extent of impact depends on the engineering limitations imposed by any Multiservice Switch 7400 node and depends on all of the FPs in a shelf simultaneously bursting up to their maximum line rates. Each active port sending AAL1 CES constantly sends more than its line rate onto the backplane. Calculate the total bandwidth of all active ports to ensure that the backplane capacity is not exceeded. The 2-port STM-1 electrical ATM IP FP provides support for ATM services on Nortel Multiservice Switch 7400 nodes. This FP has interoperability with the Multiservice Switch 7400 2-port STM-1 electrical 1:1 sparing panel (NTPS92AA), providing one-to-one hitless equipment protection (hot standby). The 2-port STM-1 electrical ATM IP FP can connect to: • STM-1 electrical customer premises network equipment • another 2-port STM-1 electrical ATM IP FP card

STM-1 electrical ATM FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see .

STM-1 electrical ATM FP supported features

STM-1 electrical ATM function processor type	Supported features
2-port STM-1 electrical ATM IP	ATM traffic management functions, including fair queuing and traffic shaping
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
	VR-to-VR and VCG-based IP VPNs on its PQC 2.0 FPs
	Atm termination of FR-ATM

Frame-based function processors

Use information in this section to learn about configuration details for Nortel Multiservice Switch function processors (FPs) that support <service>.

Frame-based function processors and identifying characteristics

FP long name	PEC	Card type	Nortel Multiservice Switch	For more information
4-port DS1	NTNQ14	DS1	Multiservice Switch 7400	DS1/E1 Frame function processors (page 93)
4-port DS1 Ch	NTNQ17 NTNQ18 NTNQ19 (wireless applications)	DS1C	Multiservice Switch 7400	DS1/E1 Frame function processors (page 93)
8-port DS1	NTNQ16	8pDS1	Multiservice Switch 7400	DS1/E1 Frame function processors (page 93)
4-port E1	NTNQ15	E1	Multiservice Switch 7400	DS1/E1 Frame function processors (page 93)
4-port E1 Ch	NTNQ20 NTNQ21 NTNQ22 (for wireless applications)	E1C	Multiservice Switch 7400	DS1/E1 Frame function processors (page 93)
1-port DS3	NTNQ23 NTNQ24	DS3	Multiservice Switch 7400	DS3/E3 Frame function processors (page 98)
(1 of 2)				

Frame-based function processors and identifying characteristics (continued)

FP long name	PEC	Card type	Nortel Multiservice Switch	For more information
1-port DS3 Ch	NTNQ26	1pDS3C	Multiservice Switch 7400	DS3/E3 Frame function processors (page 98)
4-port DS3 Ch FR	NTHR88 (PQC2) NTHR89 (PQC12)	4pDS3Ch	Multiservice Switch 15000⁄20000	DS3/E3 Frame function processors (page 98)
1-port E3	NTNQ25	E3	Multiservice Switch 7400	DS3/E3 Frame function processors (page 98)
1-port HSS1	NTNQ27	HSSI	Multiservice Switch 7400	HSSI Frame function processors (page 106)
8-port V.11	NTNQ12 NTNQ13	V11	Multiservice Switch 7400	V.11 Frame function processors (page 108)
8-port V.35	NTNQ10 NTNQ11	V35	Multiservice Switch 7400	V.35 Frame function processors (page 112)
1-port STM-1 Ch	NTHR83	1pSTM1ChSmIr	Multiservice Switch 15000⁄20000	STM-1 Frame function processors (page 116)
(2 of 2)				

DS1/E1 Frame function processors

This section contains information on DS1/E1 Frame function processors.

Navigation

DS1/E1 Frame function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of DS1/E1 Frame FPs.

DS1/E1 Frame function processor specifications

	4-port DS1	8-port DS1	4-port DS1 Ch	4-port E1	4-port E1 Ch
card type	DS1	8pDS1	DS1C	E1	E1C
port type	DS1	DS1	DS1ch	E1	E1ch
port number	0-3	0-7	0-3	0-3	0-3
channels per port	1	1	24	1	30 or 31
FP technologies	PM2, SBIC	PM2, SBIC	PM2, SBIC	PM2, SBIC	PM2, SBIC
memory (normal)	16 Mbyte	16 Mbyte	PEC NTNQ17 - 16 Mbyte PEC NTNQ18 - 32 Mbyte PEC NTNQ19 - 64 Mbyte	16 Mbyte	PEC NTNQ20 - 16 Mbyte PEC NTNQ21 - 32 Mbyte PEC NTNQ22 - 64 Mbyte
memory (fast)	n/a	n/a	n/a	n/a	n/a
memory (shared)	0.5 Mbyte	0.5 Mbyte	8 Mbyte	0.5 Mbyte	8 Mbyte
line speed (max.)	1.544 Mbps	1.544 Mbps	1.544 Mbps	2.048 Mbps	2.048 Mbps
effective data rate	1.536 Mbps	1.536 Mbps	1.536 Mbps	1.920 Mbps or 1.984 Mbps	1.920 Mbps or 1.984 Mbps
(1 of 2)					

DS1/E1 Frame function processor specifications (continued)

	4-port DS1	8-port DS1	4-port DS1 Ch	4-port E1	4-port E1 Ch
access mode	single, fractional, combined	single, fractional, combined	single, fractional, fully channelized (any mix of these access modes is allowed on each port)	single, fractional, combined	single, fractional, fully channelized (any mix of these access modes is allowed on each port)
clocking source	local, line, module	local, line, module	local, line, module	local, line, module	local, line, module
minimum software level	n/a	n/a	n/a	n/a	n/a
network clock synchronization	yes. Reversion enhancement is not supported.	yes. Reversion enhancement is not supported.	yes.	yes. Reversion enhancement is not supported.	yes.
port configuration	fractional link or clear channel (non-channelized) mode	fractional link or clear channel (non-channelized) mode	fractional link or clear channel (non-channelized) mode	fractional link or clear channel (non-channelized) mode	fractional link or clear channel (non-channelized) mode
sparing supported	one-for-one	one-for-one	one-for-one	one-for-one	one-for-one
timeslot data rate	doNotOverride or 56K			doNotOverride or 56K	
(2 of 2)					

DS1/E1 Frame FP configuration considerations

The table below contains configuration considerations for DS1/E1 Frame FPs.

DS1/E1 Frame FP configuration considerations

DS1/E1 Frame function processor type	Configuration considerations
All DS1 Frame FPs	When you add a port, the system automatically adds the component chan/0 below the DS1 component.
	For the non-channelized FPs, the ports are individually provisionable.
(1 of 3)	

DS1/E1 Frame FP configuration considerations (continued)

DS1/E1 Frame function processor type	Configuration considerations
	For the non-channelized FPs, in single access mode, all ports can be used (each port supports one Nx56 kbit/s channel or one Nx64 kbit/s channel, where N=1 to 24). In fractional access mode, only two ports can be used (each port supports up to four Nx64). In combined access mode, three ports can be used (one fractional, two single channel).
	For the non-channelized FPs, you can assign a set of timeslots to a channel. For example, you can set <timeslots> to "4 6 8 10 14 22."
All E1 Frame FPs	Although the E1 standard provides 32 timeslots, only 30 or 31 timeslots are available for user data. The remaining 1 or 2 timeslots are reserved for signaling and control. Timeslot 0 is used for framing and cannot be used for data. If you use channel-associated signaling (CAS), only 30 channels are available.
	You can assign a set of timeslots to a channel. For example, you can set <timeslots> to "4 6 8 10 14 22." If you set the E1 *lineType* attribute to CAS (channel associated signaling), you cannot use timeslot 16.
	If you install an E1 trunk between two Nortel Multiservice Switch nodes, you must set the attribute *clockingSource* to one of the following combinations:
	• local at one end and line at the other
	• module at one end and line at the other
	• or module at both ends
4-port DS1	You can add up to 4 channels on ports 1 and 3 if the other two ports are disabled.
	For the timeslot data rate, if you select doNotOverride, the card type and zeroCoding attribute value determines the data rate. If you set the zeroCoding attribute to AMI, set the date rate to 56K. Otherwise, your channel can experience data errors.
8-port DS1	You can add up to four channels on ports 1 and 5 with the other six ports disabled. When you add a port, the system automatically adds the component chan/0 below the DS1 component. On the IMA interfaces, the system also adds a chan/0 cell component beneath the DS1 component.
4-port E1	In single access mode, all ports can be used (each port supports one Nx56 kbit/s channel or one Nx64 kbit/s channel, where N is 1 to 30). In fractional access mode, only two ports can be used (each port supports up to four Nx64). In combined access mode, three ports can be used (one fractional, two single channel).
(2 of 3)	

DS1/E1 Frame FP configuration considerations (continued)

DS1/E1 Frame function processor type	Configuration considerations
	You can add up to four channels on ports 1 and 3 if the other two ports are disabled.
4-port E1Ch	The system automatically adds channel 0.
(3 of 3)	

DS1/E1 Frame FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see

DS1/E1 Frame FP supported features

DS1/E1 Frame function processor type	Supported features
All DS1 FPs	The DS1 frame service FPs can provide data interfaces for T1 lines to external or third-party equipment. In addition, these FPs can connect to DPN-100 as primary rate peripheral interfaces (PR PIs) which allows Nortel Multiservice Switch nodes to act as a high-throughput packet router for DPN-100. The PR PIs are daisy-chained in DPN-100. The DS1 frame service FPs operate in fractional link mode, giving each PR PI its own fraction of the link bandwidth.
	Between two Multiservice Switch nodes, the non-channelized frame service FPs operate with multiplexed fractional channels where a lower bandwidth trunk is needed, or as a single clear or fractional channel where a higher bandwidth trunk is needed
	All DS1 frame service FPs support processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS).
4-port E1	The 4-port E1 FP provides frame relay access services, and transparent data requirements, such as bit and HDLC transparent data services on Nortel Multiservice Switch 7400 nodes. It provides a connection to external or third-party equipment.
	This FP connects to DPN-100 primary rate peripheral interfaces (PR PIs) which allows a Multiservice Switch node to act as a high-throughput packet router for DPN-100. The PR PIs are daisy-chained in DPN-100. The E1 FP operates in fractional link mode, giving each PR PI its own fraction of the link bandwidth.

DS1/E1 Frame FP supported features (continued)

DS1/E1 Frame function processor type	Supported features
	The 4-port E1 FP operates between two Multiservice Switch nodes with multiplexed fractional channels where a lower bandwidth trunk is needed, or as a single clear or fractional channel where a higher bandwidth trunk is needed.
	The 4-port E1 FP also supports processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS).
4-port E1Ch	up to 124 separate Frame Relay services
	fast one-for-one equipment protection
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)

DS3/E3 Frame function processors

This section contains information on DS3/E3 Frame function processors.

Navigation

DS3/E3 Frame function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of DS3/E3 Frame FPs.

DS3/E3 Frame function processor specifications

	1-port DS3	1-port DS3Ch	4-port DS3Ch FR	1-port E3
card type	DS3	1pDS3C	4pDS3Ch	E3
port type	DS3	DS3ch	DS3ch	E3
port number	0	0	0-3	0
channels per port	1	28 DS1s	256 in channelized mode, 1 in clear mode	1
FP technologies	PM2, SBIC	PM2, SBIC	PEC NTHR88 - PPC, PQC2.0 PEC NTHR89 - PPC, PQC12	PM2, SBIC
memory (normal)	PEC NTNQ23 - 16 Mbyte, PQC PEC NTNQ24 - 32 Mbyte	32 Mbyte	PEC NTHR88 - 128 Mbyte PEC NTHR89 - 256 Mbyte	16 Mbyte
memory (fast)	n/a	n/a	n/a	512 kbyte
memory (shared)	2 Mbyte	2 Mbyte	n/a	2 Mbyte
line speed (max.)	44.736 Mbps	44.736 Mbps	44.736 Mbps	34.368 Mbps
effective data rate	43.008 Mbps	43.008 Mbps	43.008 Mbps	34.09 Mbps
(1 of 2)				

DS3/E3 Frame function processor specifications (continued)

	1-port DS3	1-port DS3Ch	4-port DS3Ch FR	1-port E3
clocking source	local, module, line	DS3: local, module, or DS1: local, line, module	DS3: local, module, or DS1: sameAsDs3	local, line, module, or otherPort
minimum software level	n/a	n/a	PEC NTHR88 - PCR1.3 PEC NTHR89 - PCR3.0	n/a
network clock synchronization	yes. Reversion enhancement is not supported.	yes. Reversion enhancement is not supported.	line, local, module	yes. Reversion enhancement is not supported.
processor memory			128 Mbyte SDRAM	
sparing supported	one-for-one	one-for-one one-for-n, where n=1-4 one-for-n sparing behavior enhancement	one-for-n sparing behavior enhancement operation with a one-for-six sparing panel such as the NTQS31, where up to 6 FPs can be spared (backed up) by one FP, all of the same FP type in the same shelf	one-for-one
Timeslot data rate for DS1 port		doNotOverride, 56K	doNotOverride	
(2 of 2)				

DS3/E3 Frame FP configuration considerations

The table below contains configuration considerations for DS3/E3 Frame FPs.

DS3/E3 Frame FP configuration considerations

DS3/E3 Frame function processor type	Configuration considerations
1-port DS3	You must link the ports to a frame relay interface before they can provide any service. See provisioning a *Framer* component in *Nortel Multiservice Switch 7400/15000/20000 Configuration – Frame Relay* (NN10600-901)
	The entire payload bandwidth is used as a single clear channel that supports high-level data link control (HDLC) and Nortel Multiservice Switch proprietary trunk protocol.
1-port DS3Ch	You must link the ports to a frame relay interface before they can provide any service. See provisioning a *Framer* component in *Nortel Multiservice Switch 7400/15000/20000 Configuration – Frame Relay* (NN10600-901)
	You can configure the ports on DS3Ch FPs to operate in fractional mode. Fractional mode means that each port on a DS3Ch FP can support 1 to 28 DS1 tributaries, and each DS1 tributary can have 1 to 24 timeslots.
	When you add a DS3 component, the system automatically creates DS1/1 as a tributary port beneath a DS3 port.
	When you add a DS1 component, the system automatically adds a Channel/0 component that contains 24 provisioned timeslots.
	You can assign a set of timeslots to a channel. For example, you can set <timeslots> to "4 6 8 10 14 22."
	Each timeslot represents a 56 kbit/s or 64 kbit/s portion of the total bandwidth of a DS3Ch port. Timeslots can be grouped together to form fractions (also known as channels). Fractions allow you to provision n x 56 kbit/s or n x 64 kbit/s links on a DS3Ch port, where n is 1 to 24.
4-port DS3Ch	You must link the ports to a frame relay interface before they can provide any service. See provisioning a *Framer* component in *Nortel Multiservice Switch 7400/15000/20000 Configuration – Frame Relay* (NN10600-901)
	If you change the provisioning of a Nortel Multiservice Switch 15000 or Multiservice Switch 20000 DS3 from channelized to unchannelized or vice versa, you must reset the FP to ensure full connectivity.
	The 4-port DS3Ch FP does not support both channelized and unchannelized configurations at the same time.
	A DS3/x is configured as unchannelized by default. Once a DS1/y is provisioned under a DS3x, the DS3/x is automatically changed to channelized and the hardware is reconfigured. Deleting a DS1/y under the same DS3/x will change the DS3/x back to unchannelized and reconfigure the hardware.
(1 of 4)	

DS3/E3 Frame FP configuration considerations (continued)

DS3/E3 Frame function processor type	Configuration considerations
	To create an unchannelized virtual framer, each virtual framer must have an lp/* DS3/x port without an application linked to that port. If a port is not added, the virtual framer will be channelized.
	If you configure the FP for multi-link frame relay (MLFR), use the following values to help you set component attributes:
	• MLFR/0-27 must be linked to DS3/0
	• MLFR/28-55 must be linked to DS3/1
	• MLFR/56-83 must be linked to DS3/2
	• MLFR/84-111 must be linked to DS3/3
	If all the links of the same *Mlfr* component are not bound to *DS1 Channel/0* components under the same DS3, a semantic check error will be displayed.
	It is recommended that the largest allowed DPRS packet size (attribute *mod vcs maxSubnetPacketSize*) not be set larger than 4096 bytes. Additionally, the largest allowed frame size (attribute *fru/* dl/* sp maximumFrameSize*) should not be set larger than 4096 bytes. These settings will prevent frame segmentation and recombination for normal traffic.
	When you add a DS1 component, the system automatically adds a Channel/0 component that contains no provisioned timeslots.
	The following list outlines the channel limitations that exist due to the hardware limitations of the FP:
	• Each group of DS1s (DS1 to DS14 and DS15 to DS28) which consists of 14 components each, supports a maximum of 128 channels.
	• Each DS3 port supports a maximum of 256 channels.
	• Each 4-port DS3Ch FR FP supports a maximum of 1024 channels.
	The ports on the FP can be configured as either unchannelized or channelized. When unchannelized, the entire payload bandwidth functions as single clear channel. When channelized there are 28 DS1 within a DS3. Each DS1 can then be channelized to 24 DS0 timeslots.
	When a 4pDS3Ch LP is provisioned as unchannelized, only 4 Framer/VFramer connections are supported.
(2 of 4)	

DS3/E3 Frame FP configuration considerations (continued)

DS3/E3 Frame function processor type	Configuration considerations
	Each slice is dedicated to one Framer/VFramer connection. Therefore, no more connections can be set up on the slice. Because a Framer/VFramer connection is allocated in the order of slice0 to slice3, in a Framer/VFramer combination provisioning, a VFramer connection always take slice 0 and slice 1. Therefore, Framer can only be provisioned on slice 2 or slice 3. If provisioning more than 4 Framer/VFramer with 4pDS3Ch as unchannelized, only 4 Framer/VFramer connections are able to pass traffic.
	Therefore, in a Framer/VFramer provisioning combination, customers should provision Framer on slice 2 or slice 3.
	If at least one lp/ds3/ds1/ is provisioned, then Framer/VFramer is channelized. In an unchannelized mode, VFramer only works when all the slices are provisioned and each Framer/VFramer corresponds to one port.
	Whether a Framer/VFramer is a channelized or unchannelized cannot be checked through any operational attribute. An unchannelized Framer/ VFramer might have "silent" discards, since if the Framer/VFramer is channelized, it will not be able to handle all the traffic. "Silent" means the traffic discard is not tracked by any operational attribute. The DLCI VC might show the value of *combErrorsFromSubnet* increasing, which indicates that some packets are being lost somewhere in the network.
	You can assign up to 24 timeslots to a channel.
	The following list outlines the timeslot limitations:
	• Each timeslot assigned to a channel must be in the same DS1.
	• Each timeslot can only be assigned to a channel once.
	• Each group of DS1s (DS1 to DS14 and DS15 to DS28) which consists of 14 components each supports a maximum of 336 timeslots.
	• Each DS3 port supports a maximum of 672 timeslots.
	• Each 4-port DS3Ch FR FP supports a maximum of 2688 timeslots.
	If you download and display information from a provisioning file, the timeslot value of none displays as a "0". However, you can not use the value "0" to provision a timeslot.
	(3 of 4)

DS3/E3 Frame FP configuration considerations (continued)

DS3/E3 Frame function processor type	Configuration considerations
	You can provision a frame relay service, either FrUni, FrNni, or FrAtm, with channels defined with a timeslot value of none. This timeslot value allows for the pre-provisioning of frame relay services without assigning specific DS0 timeslots to a channel thereby saving bandwidth. Once the user creates a framer component with a timeslot value of none provisioned, the channel is in a ready, enabled, idle state and does not transfer data. Since there is no bandwidth for timeslot none and the link can not carry traffic, the following are inoperable or unprovisionable • LMI • DLCI The timeslot value of none requires Multiservice Switch software release 2.2 or later.
1-port E3	Within the Nortel Multiservice Switch subnet, the end-to-end E3 trunk facility must be a structured or framed, full, single clear-channel E3, that is used for non-substrate applications. The entire payload bandwidth is used as a single clear channel. This channel supports high-level data link control (HDLC) and Multiservice Switch proprietary trunk protocol. A receive clock is synchronized from the stream of data incoming on the line. The node can use this receive clock as a synchronization reference. Conversely, the clock used to transmit the data on the line can be generated with reference to the master synchronization clock of the node. Therefore, you can provision E3 FPs to act as synchronization interfaces between Multiservice Switch nodes.
(4 of 4)	

DS3/E3 Frame FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see .

DS3/E3 Frame FP supported features

DS3/E3 Frame function processor type	Supported features
1-port DS3	This FP provides support for frame-relay services on Nortel Multiservice Switch 7400 nodes. It is available in standard or premium format. Use the premium format for high capacity Frame Relay applications.
	The single port is comprised of a transmit coaxial cable connector and a receive coaxial cable connector.
	The 1-port DS3 FP also supports processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS).
1-port DS3Ch	This FP provides support for frame-relay services on Nortel Multiservice Switch 7400 nodes. It provides access to external or third-party network equipment and to a DPN-100 through an M13 multiplexer.
	The 1-port DS3Ch FP also supports processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS).
4-port DS3Ch	This FP supports frame relay and IP services on Nortel Multiservice Switch 15000 and Multiservice Switch 20000 nodes, including multi-link frame relay (MLFR) service for FR UNI and FR NNI connections, which provides physical interface emulation for frame relay devices.
	frame-based inverse multiplexing function, sometimes referred to as an IMUX
	FR to ATM network interworking or service interworking
	IP packet forwarding in hardware, access to Multiservice Switch virtual routers (VRs), and IP tunneling
	segmentation and reassembly of FR to AAL5 ATM cells
	four DS3 ports supporting unchannelized DS3 or channelized to 1024 DS0 channels per card
	up to 256 HDLC channels per DS3 port
	creation of superchannels containing up to 24 DS0
	up to 250 virtual framers per FP
	up to 4 unchannelized virtual framers per FP
	IP encapsulation over PPP (RFC 1661) and over FR (RFC 2427)
	VR-to-VR and VCG-based IP VPNs
	IP class of service (CoS)
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
(1 of 2)	

DS3/E3 Frame FP supported features (continued)

DS3/E3 Frame function processor type	Supported features
	The PQC12-based 4-port DS3 channelized FR FP (PEC NTHR89) has the following distinct characteristics: • higher frame and cell processing capacity equivalent to OC-12 line rates • greater IP capabilities • fast hardware data path support for DPRS loadspreading, frame relay access, and frame relay to ATM interworking, resulting in faster data transmission and higher data throughput To take advantage of the enhanced frame relay and DPRS performance capabilities of the PQC12-based FP, the loadspreadfast algorithm must be used. For more information about this forwarding policy, see *Nortel Multiservice Switch 7400/15000/20000 Configuration – DPRS* (NN10600-425).
1-port E3	The 1-port E3 FP provides support for frame-relay services on Nortel Multiservice Switch 7400 nodes. The single port is comprised of a transmit coaxial cable connector and a receive coaxial cable connector. This FP provides interfaces for Multiservice Switch node-to-Multiservice Switch node communication, and a connection for one E3 Multiservice Switch 7400 trunk. The 1-port E3 FP also supports processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS).
(2 of 2)	

HSSI Frame function processors

This section contains information on HSSI Frame function processors.

Navigation

HSSI Frame function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of HSSI Frame FPs.

HSSI Frame function processor specifications

1-port HSSI	
card type	HSSI
port type	HSSI
port number	0
channels per port	1
FP technologies	PM2, SBIC
memory (normal)	16 Mbyte
memory (fast)	n/a
memory (shared)	2 Mbyte
line speed (max.)	1 Mbps - 50 Mbps
effective data rate	up to 50 Mbps
minimum software level	n/a
network clock synchronization	no
port configuration	DCE or DTE (set using the DIP switch)
processor memory	128 Mbyte SDRAM

HSSI Frame FP configuration considerations

The table below contains configuration considerations for HSSI Frame FPs.

HSSI Frame FP configuration considerations

HSSI Frame function processor type	Configuration considerations
1-port HSSI	does not use a termination panel
	operates in DCE mode and can be configured to DTE through a DIP switch setting and the use of a null modem cable
	in DCE mode, you can achieve sourcing line rates slower than 50 Mbps by gapping a 50 Mbps clock stream
	the DCE mode port uses clocks generated by the gapped clock generator, with a provisional clock rate ranging from 1 Mbps to 50 Mbps

HSSI Frame FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see Applications and services supported by function processors (page 12).

HSSI Frame FP supported features

HSSI Frame function processor type	Supported features
1-port HSSI	interchange frame relay traffic to DTE devices such as routers, or DCE devices such as data/channel service units (DSU/CSUs)
	HSSI Local Digital Loopback (Loop A)
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)

V.11 Frame function processors

This section contains information on V.11 Frame function processors.

Navigation

V.11 Frame function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of V.11 Frame FPs.

V.11 Frame function processor specifications

8-port V.11	
card type	V11
port type	V11
port number	0-7
channels per port	1
FP technologies	PM2, SBIC
memory (normal)	PEC NTNQ12 - 16 Mbyte PEC NTNQ13 - 32 Mbyte
memory (fast)	n/a
memory (shared)	0.5 Mbyte
line speed (max.)	9.6 kbit/s to 7.68 Mbit/s for data circuit equipment (DCE) mode 9.6 Kbit/s to 8.4 Mbit/s for data termination equipment (DTE) mode
effective data rate	8.0 Mbps DTE, 7.68 Mbps DTE
minimum software level	n/a
network clock synchronization	yes. Reversion enhancement is not supported.
sparing supported	no

V.11 Frame FP configuration considerations

The table below contains configuration considerations for V.11 Frame FPs.

V.11 Frame FP configuration considerations

V.11 Frame function processor type	Configuration considerations
8-port V.11	Port configuration is DCE or DTE in groups of four; that is, ports 0 to 3 and ports 4 to 7. The configuration is determined by the type of connection at the termination panel port
	The speed of all ports in use must add up to less than (not equal to) 20Mbps.
	The 8-port V.11 FP supports V-port robustness speeds of 1 024 000 and 2 048 000 in addition to the common speeds within the configurable ranges. In some configurations where common speeds are combined with robustness speeds for ports on the same FP, there may be conflicts for the following speeds:
	• 7 680 000
	• 3 840 000
	• 2 560 000
	• 1 920 000
	• 1 280 000
	• 960 000
	• 640 000
	• 320 000
	Configuration of ports for lines speeds and link mode must follow these rules. If you do not follow these configuration rules, the check prov fails and the system lists the conflicting speeds:
	• all ports within a group (ports 0 to 3 for group 1 and ports 4 to 7 for group 2) are configured as either DCE (that is, DCE is supplying the line clock) or DTE through the *linkMode* attribute; one group can be DCE and the other DTE, or both groups can be of the same link mode
	• if the ports in a group are DTE, you can configure any common or robustness line speed with no conflicts occurring
	• if the ports in a group are DCE, the ports can be any speed except one of the conflicting speeds noted above
	(1 of 2)

V.11 Frame FP configuration considerations (continued)

V.11 Frame function processor type	Configuration considerations
	A group of ports in DCE mode can be configured to:
	• use clocks generated by one of two phase-locked loops (PLLs), with a configurable clock rate of exactly 9600, 19200, 32000, 48000, 56000, 64000, 112000, 128000, 168000, 192000, 224000, 256000, 320000, 336000, 384000, 448000, 512000, 640000, 672000, 768000, 960000, 1024000, 1280000, 1344000, 1536000, 1920000, 2048000, 2560000, 3840000, 7680000. If the entered value is different from the values listed above, the next highest value in the list is selected.
	The maximum supported speed for each port is 7.68 Mbps. If you use all eight ports, calculate the upper speed limitation by summing all the speeds for the ports and ensure this sum is less than 20 Mbps. This characterization is at the interface level, not the protocol level. The speeds for each protocol have not been altered.
	At speeds above 1.92 Mbps, the network sync mechanism does not synchronize to the clock provided. Without the network clock sync capacity, clocking for network sync must be received on a different interface to the module, or services requiring network clock sync cannot be used.
	Changing the port speed is not a critical change. After activating the configuration changes, lock and unlock the port.
	There are cabling constraints at high speeds. Refer to *Nortel Multiservice Switch 7400 Fundamentals – Hardware* (NN10600-170) if you are making V.11 cables.
(2 of 2)	

V.11 Frame FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see

V.11 Frame FP supported features

V.11 Frame function processor type	Supported features
8-port V.11	The 8-port V.11 may also be referred to as the 8 P V11 or the Eight-port V.11 FP. It supports frame relay services on Nortel Multiservice Switch 7400 nodes for Multiservice Switch-to-Multiservice Switch trunking. Each port can support data circuit (DCE) or data terminal (DTE) equipment. This FP is available in standard or premium format. Use the premium format for high capacity frame relay applications.
	high-level data link control (HDLC)-framed protocols such as frame relay, DPN-100 trunks, or network lines
	transparent data requirements, such as bit and HDLC transparent data services
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)

V.35 Frame function processors

This section contains information on V.35 Frame function processors.

Navigation

V.35 Frame function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of V.35 Frame FPs.

V.35 Frame function processor specifications

8-port V.35	
card type	V35
port type	V35
port number	0-7
channels per port	1
FP technologies	PM2, SBIC
memory (normal)	PEC NTNQ10 - 16 Mbyte PEC NTNQ11 - 32 Mbyte
memory (fast)	n/a
memory (shared)	0.5 Mbyte
line speed (max.)	9.6 kbit/s to 3.84 Mbit/s for data circuit equipment (DCE) mode 9.6 kbit/s to 4.0 Mbit/s for data termination equipment (DTE) mode
effective data rate	4.0 Mbps DTE, 3.84 Mbps DTE
minimum software level	n/a
network clock synchronization	yes. Reversion enhancement is not supported.
sparing supported	no

V.35 Frame FP configuration considerations

The table below contains configuration considerations for V.35 Frame FPs.

V.35 Frame FP configuration considerations

V.35 Frame function processor type	Configuration considerations
8-port V.35	Port configuration is DCE or DTE in groups of four; that is, ports 0 to 3 and ports 4 to 7. The configuration is determined by the type of connection at the termination panel port
	Each port supports a maximum speed of 3.84 Mbps. At speeds above 1.92 Mbps, the network sync mechanism does not sync to the clock provided. Without the network clock sync capacity, clocking for network sync must be received on a different interface to the module, or services requiring network clock sync cannot be used.
	There are cabling constraints at high speeds. See *Nortel Multiservice Switch 7400 Fundamentals – Hardware* (NN10600-170) if you are making V.35 cables.
(1 of 2)	

V.35 Frame FP configuration considerations (continued)

V.35 Frame function processor type	Configuration considerations
	The 8-port V.35 FP supports V-port robustness speeds of 1 024 000 and 2 048 000 in addition to the common speeds within the configurable ranges. In some configurations where common speeds are combined with robustness speeds for ports on the same FP, there may be conflicts for the following speeds: • 1 920 000 • 1 280 000 • 960 000 • 768 000 • 640 000 • 512 000 • 384 000 • 320 000 • 256 000 • 128 000 • 64 000 Configuration of ports for lines speeds and link mode must follow these rules. If you do not follow these configuration rules, the check prov fails and the system lists the conflicting speeds: • all ports within a group (ports 0 to 3 for group 1 and ports 4 to 7 for group 2) are configured as either DCE (that is, DCE is supplying the line clock) or DTE through the *linkMode* attribute; one group can be DCE and the other DTE, or both groups can be of the same link mode • if the ports in a group are DTE, you can configure any common or robustness line speed with no conflicts occurring • if the ports in a group are DCE, the ports can be any speed except one of the conflicting speeds noted above A group of ports in DCE mode can be configured to: • use clocks generated by one of two phase-locked loops (PLLs), with a provisionable clock rate of exactly 9600, 19200, 32000, 48000, 56000, 64000, 112000, 128000, 168000, 192000, 224000, 256000, 320000, 336000, 384000, 448000, 512000, 640000, 672000, 768000, 960000, 1024000, 1280000,1344000, 1536000, 1920000, 2048000, 2560000, 3840000. If the entered value is different from the values listed above, the next highest value in the list is selected.
	(2 of 2)

V.35 Frame FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see Applications and services supported by function processors (page 12).

V.35 Frame FP supported features

V.35 Frame function processor type	Supported features
8-port V.35	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
	high-level data link control (HDLC)-framed protocols such as frame relay, DPN-100 trunks, or network lines
	transparent data requirements, such as bit and HDLC transparent data services

STM-1 Frame function processors

This section contains information on STM-1 Frame function processors.

Navigation

STM-1 Frame function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of STM-1 Frame FPs.

STM-1 Frame function processor specifications

1-port STM-1Ch	
card type	1pSTM1ChSmlr
port type	STM1ch
port number	0
channels per port	768 (DS0, NxDS0, or E1, including up to 63 E1s)
FP technologies	PPC, PQC2.0
memory (normal)	128 Mbyte
memory (fast)	n/a
memory (shared)	n/a
line speed (max.)	155.52 Mbps
effective data rate	124.992 Mbps
clocking source	module, line
High order path	Vc4 (Adds a high order path to the port.)
low order path	Vc12 (Adds a low order path to the port, with 63 Vc12s multiplexed into a Vc4 high order path.)
minimum software level	PCR2.0
network clock synchronization	yes
path value	0, k,l,m; k=1..3, l=1..7, m=1..3
port configuration	B-ISDN
processor memory	128 Mbyte SDRAM
(1 of 2)	

STM-1 Frame function processor specifications (continued)

1-port STM-1Ch	
synchronization status messages supported	yes
Tributary	E1 (An E1 superchannel is mapped into a Vc12.)
(2 of 2)	

STM-1 Frame FP configuration considerations

The table below contains configuration considerations for STM-1 Frame FPs.

STM-1 Frame FP configuration considerations

STM-1 Frame function processor type	Configuration considerations
1-port STM-1Ch	An E1 channel can support full or partial usage of the total available timeslots. A maximum of 768 channels can be configured within an STM-1 with the limitation that an STM-1 has 3 groups of 21 E1s. Each group of 21 E1s is divided into two banks of 11 and 10 E1s. A maximum of 128 channels can be configured for each bank of E1s. The channels may be DS0 to the full E1 bandwidth consuming all the time slots of the E1.

1-port STM-1Ch channel configuration

Number of E1s		E1 numbers	maximum number of channels	Provision to maximize per-FP throughput
21	11	0 to 10	128	one-third of connections here
	10	11 to 20	128	
21	11	21 to 31	128	one-third of connections here
	10	32 to 41	128	
21	11	42 to 52	128	one third of connections here
	10	53 to 62	128	
63	63	63	768	

STM-1 Frame FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see

STM-1 Frame FP supported features

STM-1 Frame function processor type	Supported features
1-port STM-1 Ch	The 1-port STM-1Ch FP supports frame relay and IP services on Multiservice Switch and Nortel Multiservice Switch 15000 nodes. It is only available in single-mode (SM) intermediate reach (IR). The port has one single-mode SC fiber optic transceiver.
	This FP supports either one user-to-network interface (UNI) or one network-to-network interface (NNI). These can operate from either side of the user/network boundary, and can provide access to and from a public network. They can also provide an interface between Multiservice Switch nodes within a private network.
	frame relay to ATM interworking applications, as follows:
	• Network interworking allows two frame networks to connect over an ATM backbone network.
	• Service interworking allows ATM and frame relay users to interwork transparently.
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
	IP packet forwarding in hardware, access to Multiservice Switch virtual routers (VRs), and IP tunneling
	IP encapsulation over PPP (RFC 1661) and over Frame Relay (RFC 2427)
	VR-to-VR and VCG-based IP VPNs on its PQC2.0 FPs
	virtual framers with both ends on a single FP
	up to 250 virtual frames per FP

Ethernet-based function processors

Use information in this section to learn about configuration details for Nortel Multiservice Switch function processors (FPs) that support Ethernet.

Ethernet function processors and identifying characteristics

FP long name	PEC	Card type	Nortel Multiservice Switch	For more information
2-port 100BaseT Ethernet	NTNQ37	2pEth100BaseT	Multiservice Switch 7400	100BaseT Ethernet function processors (page 121)
6-port 10BaseT Ethernet	NTNQ36	6pEth10BaseT	Multiservice Switch 7400	10BaseT Ethernet function processors (page 123)
4-port 10/100 BaseT Ethernet	NTNQ95	4pEth100BaseT	Multiservice Switch 7400	10/100BaseT Ethernet function processors (page 125) Traffic management on 4-port gigabit and 4-port/8-port 10/100BaseT Ethernet FPs (page 134) 4-port gigabit and 4-port/8-port 10/100BaseT Ethernet migration considerations (page 143)
(1 of 2)				

Ethernet function processors and identifying characteristics (continued)

FP long name	PEC	Card type	Nortel Multiservice Switch	For more information
8-port 10/100BaseT Ethernet	NTNQ92	8pEth100BaseT	Nortel Multiservice Switch 7400	10/100BaseT Ethernet function processors (page 125) Traffic management on 4-port gigabit and 4-port/8-port 10/100BaseT Ethernet FPs (page 134) 4-port gigabit and 4-port/8-port 10/100BaseT Ethernet migration considerations (page 143)
4-port gigabit Ethernet	NTHW49	4pGe	Multiservice Switch 15000∕20000	Gigabit Ethernet function processors (page 129) Traffic management on 4-port gigabit and 4-port/8-port 10/100BaseT Ethernet FPs (page 134) 4-port gigabit and 4-port/8-port 10/100BaseT Ethernet migration considerations (page 143)
(2 of 2)				

100BaseT Ethernet function processors

This section contains information on 100BaseT Ethernet function processors.

Navigation

100BaseT Ethernet function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of 100BaseT Ethernet FPs.

100BaseT Ethernet function processor specifications

	2-port 100BaseT
card type	2pEth100BaseT
port type	eth100
port number	0, 1
FP technologies	PM2, SBIC
memory (normal)	16 Mbyte
memory (fast)	n/a
memory (shared)	2 Mbyte
line speed (maximum)	100 Mbits/s
access mode	see IEEE 802.3u specification
minimum software level required	n/a
network clock synchronization supported	no
sparing supported	one-for-one

100BaseT Ethernet FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see Applications and services supported by function processors (page 12).

100BaseT Ethernet FP supported features

100BaseT Ethernet function processor type	Supported features
2-port 100BaseT	half duplex and full duplex networking
	layer 2 hardware switching between ports
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)

100BaseT Ethernet FP configuration considerations

The table below contains configuration considerations for 100BaseT Ethernet FPs.

100BaseT Ethernet FP configuration considerations

100BaseT Ethernet function processor type	Configuration considerations
2-port 100BaseT	To use hardware switching, only provision one La component. Otherwise, provision one La component for each port. When you add a La component, the system automatically adds a Framer subcomponent.
	To use hardware switching, link the same instance of the Lan application (for example, la/0) to both ports on the FP. Otherwise, link a different instance of the Lan application to each port.
	The recommended configuration is to have the value of the *autoNegotiation* attribute set to enabled. However, if the remote device is unable to autonegotiate, set the value of the *autoNegotiation* attribute to disabled.

10BaseT Ethernet function processors

This section contains information on 10BaseT Ethernet function processors.

Navigation

10BaseT Ethernet function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of 10BaseT Ethernet FPs.

10BaseT Ethernet function processor specifications

	6-port 10BaseT
card type	6pEth10BaseT
port type	Enet
port number	0 to 5
FP technologies	PM2, SBIC
memory (normal)	16 Mbyte
memory (fast)	n/a
memory (shared)	1 Mbyte
line speed (maximum)	10 Mbps
access mode	see IEEE 802.3 specification
minimum software level required	n/a
network clock synchronization supported	no
sparing supported	one-for-one

10BaseT Ethernet FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see Applications and services supported by function processors (page 12).

10BaseT Ethernet FP supported features

10BaseT Ethernet function processor type	Supported features
6-port 10BaseT Ethernet	This FP supports software-configurable media access control (MAC) addresses.
	frame filtering hardware
	comprehensive loopback capabilities for fault isolation
	fast packet processor (FPP) capability
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)

10/100BaseT Ethernet function processors

This section contains information on 10/100BaseT Ethernet function processors.

Navigation

10/100BaseT Ethernet function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of 10/100BaseT Ethernet FPs.

10/100BaseT Ethernet function processor specifications

	4-port 10/100BaseT	8-port 10/100BaseT
card type	4pEth100BaseT	8pEth100BaseT
port type	ethernet	ethernet
port number	0 to 3	0 to 7
FP technologies	PPC, PQC12	PPC, PQC12
memory (normal)	128 Mbyte	128 Mbyte
memory (fast)	n/a	n/a
memory (shared)	n/a	n/a
line speed (maximum)	100 Mbits/s	100 Mbits/s
access mode	see IEEE 802.3 specification; Ethernet LAN-mode or VLAN-mode	see IEEE 802.3 specification; Ethernet LAN-mode or VLAN-mode
effective data rate	n/a	n/a
minimum software level required	PCR 6.1	PCR 6.1
network clock synchronization supported	no	no
sparing supported	n/a	n/a
SFP configuration	n/a	n/a

10/100BaseT Ethernet FP hardware information

The table below contains important information regarding the vintages of certain 10/100BaseT Ethernet FPs. For a full list of PECs (including vintages) for supported FPs, see *Nortel Multiservice Switch Release Notes*.

10/100BaseT Ethernet FP hardware information

10/100BaseT Ethernet function processor type	Hardware details
All 10/100BaseT Ethernet FPs	This FP requires that a second generation control processor (CP2) be operational on the shelf, one of NTNQ01, NTNQ03, or NTFN33.

10/100BaseT Ethernet FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see .

10/100BaseT Ethernet FP supported features

10/100BaseT Ethernet function processor type	Supported features
All 10/100BaseT Ethernet FPs	Multiple services on each Ethernet interface
	Full and half duplex networking
	Each Ethernet interface can operate in LAN-mode or VLAN-mode
	A standard frame size of up to 1518 bytes for LAN-mode and 1522 bytes for VLAN-mode
	Support of jumbo frame size of up to 1600 bytes
	Statistics per interface, per LAN, per VLAN, per P-bits
	Ingress and egress statistics in LAN, LAN-VLAN, and VLAN modes
(1 of 3)	

10/100BaseT Ethernet FP supported features (continued)

10/100BaseT Ethernet function processor type	Supported features
	When a redundant CP2 undergoes a switchover, the impact on each FP is: • a cold standby • once the back-up CP2 is active, the Ethernet FP resets and services are re-established on the FP • the Ifstatistics are reset to zero • the OSI operational states are all reset to their default values The MAC portion of the Ethernet interface for the 10/100BaseT FPs does automatic retransmission of faulty packets and discarding packets received in error. The characteristics of the MAC include these capabilities: • up to seven destination virtual MAC addresses per port • independent 10 or 100 Mbps port operation • programmable cyclic redundancy check (CRC) generation and removal • full collision support, including jamming, back off, and automatic retransmission • internal and external loopback • programmable automatic discard of badly received packets such as runts, CRC errors, and too-long packets Egress per ethernet user priority (VLAN p-bits) in LAN, LAN-VLAN, and VLAN modes for EVLS solutions Ethernet frame formats as follows: • an ingress frame as IEEE 802.3 or Ethernet v2.0 • an egress frame as Ethernet v2.0 • the capability to accept any combination of untagged and priority-tagged traffic on the same Ethernet interface in port-mode • the capability to accept untagged, priority-tagged, and VLAN-tagged traffic in VLAN-mode Ethernet virtual line service (EVLS) in LAN-mode and VLAN-mode transports Ethernet frames across an ATM backbone VIPR and RFC 2547 IP VPN access in LAN-mode and VLAN-mode Support of virtual router redundancy protocol (VRRP) for each Ethernet interface (RFC 3768) in LAN-mode and each VLAN in VLAN-mode. One VRRP instance is supported per Ethernet VLAN.
(2 of 3)	

10/100BaseT Ethernet FP supported features (continued)

10/100BaseT Ethernet function processor type	Supported features
	IGP support (ISIS Level 1 and OSPF, LAN-mode and VLAN-mode) on the Multiservice Switch 7400
(3 of 3)	

10/100BaseT Ethernet FP configuration considerations

The table below contains configuration considerations for 10/100BaseT Ethernet FPs.

10/100BaseT Ethernet FP configuration considerations

10/100BaseT Ethernet function processor type	Configuration considerations
All 10/100BaseT Ethernet FPs	The recommended configuration is to have the value of the *autoNegotiation* attribute set to enabled. However, if the remote device is unable to autonegotiate, set the value of the *autoNegotiation* attribute to disabled.

Gigabit Ethernet function processors

This section contains information on Gigabit Ethernet function processors.

Navigation

Gigabit Ethernet function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of Gigabit Ethernet FPs.

Gigabit Ethernet function processor specifications

	4-port Gigabit Ethernet
card type	4pGe
port type	ethernet
port number	0 to 3
line speed (maximum)	1.25 Gbit/s
effective data rate	1.0 Gbit/s
maximum bandwidth per 4pGe FP card	2.5 Gbit/s
SFP configuration	LX, SX, none

Gigabit Ethernet FP hardware information

The table below contains important information regarding the vintages of certain Gigabit Ethernet FPs. For a full list of PECs (including vintages) for supported FPs, see *Nortel Multiservice Switch Release Notes*.

Gigabit Ethernet FP hardware information

Gigabit Ethernet function processor type	Hardware details
4-port Gigabit Ethernet	requires that a small form factor pluggable (SFP) optical module be plugged into each of its four optical module ports (referred to as sockets in hardware terms) in order for the card to be functional
	For information about the SFP optical module, see *Nortel Multiservice Switch 15000/20000 Fundamentals – Hardware* (NN10600-120). For information about configuring an SFP module, see *Nortel Multiservice Switch 7400/15000/20000 Configuration* (NN10600-550).

Gigabit Ethernet FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see .

Gigabit Ethernet FP supported features

Gigabit Ethernet function processor type	Supported features
4-port Gigabit Ethernet	IP encapsulation over Ethernet (RFC 894)
	Processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
	Full-duplex with standard flow-control functionality. These FPs accept and react to PAUSE frames but do not support the generation of PAUSE frames.
	Ethernet virtual line service (EVLS) in LAN-mode and VLAN-mode transports Ethernet frames across an ATM backbone

Gigabit Ethernet FP supported features (continued)

Gigabit Ethernet function processor type	Supported features
	Ethernet frame formats as follows: • an ingress frame as IEEE 802.3 or Ethernet v2.0 • an egress frame as Ethernet v2.0 • the capability to accept any combination of untagged and priority-tagged traffic on the same Ethernet interface in LAN-mode
	the capability to accept untagged, priority-tagged, and VLAN-tagged traffic in VLAN-mode
	Egress per ethernet user priority (VLAN p-bits) in LAN, LAN-VLAN, and VLAN modes for EVLS solutions
	VIPR and RFC 2547 IP VPN access in LAN-mode and VLAN-mode
	RFC 2547 MPLS trunking in LAN-mode and VLAN-mode
	Statistics per interface, per LAN, per VLAN, per P-bits
	Ingress and egress statistics in LAN, LAN-VLAN, and VLAN modes
	IGP support (ISIS Level 1 and OSPF, LAN mode and VLAN mode)

Gigabit Ethernet FP configuration considerations

The table below contains configuration considerations for Gigabit Ethernet FPs.

Gigabit Ethernet FP configuration considerations

Gigabit Ethernet function processor type	Configuration considerations
4-port Gigabit Ethernet FP	must connect to a device that supports auto-negotiation
	The recommended configuration is to have the value of the *autoNegotiation* attribute set to enabled. However, if the remote device is unable to autonegotiate, set the value of the *autoNegotiation* attribute to disabled.
	Attention: If a 4pGe port is provisioned with the *autoNegotiation* attribute set to enabled, and is connected to a far-end node which is not compliant to the 802.3Ad remoteFault detection and clearing section, removing and reinserting the cable can cause the 4pGe port to stay down with a remote failure. To avoid this, lock/unlock the ethernet port.
(1 of 3)	

Gigabit Ethernet FP configuration considerations (continued)

Gigabit Ethernet function processor type	Configuration considerations
	Ethernet ports support either 1000BASE-SX or 1000BASE-LX fiber optic transceivers and function only in full duplex mode. The FP can interwork with the OAM Ethernet port of the CP and with selected VSP2, VSP3, VSP3-o, PSFP, and ATM PQC and GQM-based FPs that support ATM multi-protocol encapsulation (MPE) and are located within the same shelf.
	Attention: The 4-port gigabit Ethernet FP card can interwork with voice services processor (VSP2, VSP3, VSP3-o) FP cards in the Media Gateway (MG) configuration.
	Attention: The 4-port gigabit Ethernet FP can interwork with PQC-based ATM MPE instances that are configured with an *AtmMpe encapType* attribute with a value of llcEncap or ipVcEncap. Interworking with connections that have an *AtmMpe encapType* attribute with a value of llcBridgeEncap is not supported.
	This FP transmits a packet size between 64 and 1518 bytes for IP traffic when the Ethernet interface is operating in LAN-mode, a packet size between 64 and 1522 bytes when the Ethernet interface is operating in VLAN-mode, and a packet size between 64 and 1600 bytes for Ethernet virtual line service (EVLS) traffic. It has an operating capability of full data line rate (1 Gbit/s) for each port. However, the aggregate backplane interface throughput of the four ports is 2.5 Gbit/s, depending on packet size and traffic characteristics.
	For SNMP, currently only the 4-port Gigabit Ethernet (4pGe) FP supports 64-bit counters through a CAS command line interface. The SNMP standard MIB support for 64-bit counters is not supported. The 4pGe FP currently supports only four of the 64 counters.
(2 of 3)	

Gigabit Ethernet FP configuration considerations (continued)

Gigabit Ethernet function processor type	Configuration considerations
	When a 4pGe FP is configured to use link aggregation (LAG) and the FP or port is removed from service, the associated LAG links are automatically disabled. When a loss of service over a LAG link is due to the physical port going out of service, then a state change notification (SCN) is generated for the LAG link. The Ethernet port status LEDs do not change relative to LAG link status. When the FP is removed from service by other than a lock or a card reset, alarm 7012 0200 is generated to indicate the LP is disabled. When a reset occurs, alarm 7012 0101 is generated. When a 4pGe FP is configured to use link aggregation (LAG) and the FP is returned to service (unlocked), the LAG links are automatically enabled and traffic resumes. The typical FP enabling alarms occur (0000 1000, 7012 0100, and 0000 0000). For more information about LAG, see *Nortel Multiservice Switch 7400/15000/20000 Configuration – Ethernet Services* (NN10600-821).
	When a 4pGe is configured to use protected VR static routes, and one of the ports or an FP involved in the routes is removed from service (manually or due to a failure), each VR static route through the FP is dropped. The traffic on those routes is protected by being rerouted (maintained) according to the port or card protection configuration that was set up for the static routes. VR protected routes can be configured on the same 4pGe FP or between 4pGe FPs in the same shelf or in a shelf within one hop. When the port or FP is returned to service, its VR static routes automatically return to service and become available for traffic. To configure VR static routes, see *Nortel Multiservice Switch 7400/15000/20000 Configuration – IP* (NN10600-801).
	After the activation of a provisioning change that requires the reloading of a 4pGe FP, the loading of the new software may fail to complete. When this problem occurs, the 4pGe card will not, initially, successfully load the provisioned software. This problem extends the recovery time of a 4pGe card, but does not prevent the card from operating on the provisioned software.
	To correct, issue a **`reset shelf card/<card#>`** command. This will successfully load the provisioned software.
(3 of 3)	

Traffic management on 4-port gigabit and 4-port/8-port 10/100BaseT Ethernet FPs

The 4pGe and 4-port/8-port 10/100BaseT FPs are egress queueing FPs with traffic management (TM) capabilities that improve network performance and congestion control. The prioritization of data delivery makes efficient use of bandwidth resources. Congestion is controlled by assigning discard priorities to different types of traffic.

Navigation

Ethernet traffic management specifications

The table Ethernet traffic management specifications (page 134) contains traffic management considerations for the 4pGe and 4/8pEth100BaseT Ethernet FPs.

Ethernet traffic management specifications

Traffic capability	Description
filtering, ingress	filter on MAC port DA
	filter on multicast addresses
	filter on IP SA or DA (4-port/8-port 10/100BaseT FPs only)
	filter to prevent denial of service (DOS) attack (4-port/8-port, 10/100BaseT FPs only)
classification and congestion control	based on Ethernet port
	based on VLAN
	based on layer 4 protocol type
	based on IP SA or DA (4-port/8-port 10/100BaseT FPs only)
	based on L4 protocol type (4-port/8-port 10/100BaseT FPs only)
	based on TCP/UDP port (4-port/8-port 10/100BaseT FPs only)
(1 of 3)	

Ethernet traffic management specifications (continued)

Traffic capability	Description
Differentiated Services (DiffServ) for Ethernet networks	user configured mapping of standard DiffServ PHBs to eight scheduling classes and three drop precedences
	unique configuration per Ethernet interface to control per frame forwarding treatments
Differentiated Services (DiffServ) for VIPR and RFC2547	user configured mapping of standard DiffServ PHBs to eight scheduling classes and three drop precedences
	unique configuration per Vr, Rtr, Vrf to control per frame forwarding treatments
	user configured policies for IP classification and DSCP marking at ingress and egress access
	user configured policies for IP policing at ingress access (4-port/8-port 10/100BaseT FPs only)
EVLS solution use of egress scheduler	user configured mapping of Ethernet user priority bits to standard DiffServ PHBs
	fixed mapping of EVC to one of five egress scheduling queues based on the ePhb of the EVC
VIPR solution use of egress scheduler	user configured mapping of IP DSCP to standard DiffServ PHBs for access and trunks
	user configured mapping of ARP packets to DiffServ PHB for access and trunks
RFC 2547 solution use of egress scheduler	user configured mapping of IP DSCP to standard DiffServ PHBs for access and trunks
	user configured mapping of MPLS EXP to standard DiffServ PHBs for access and trunks
	user configured mapping of ARP and ISIS packets to standard DiffServ PHBs for access and trunks
queuing or discards, egress	eight queues per port, four discard priorities per queue
(2 of 3)	

Ethernet traffic management specifications (continued)

Traffic capability	Description
	multi-class egress queuing and scheduling
	eight Emission Priorities (EPs) - two Absolute Priority Queues and six Weighted Fair Queuing queues
	four discard priorities (DPs) per queue
	configurable WFQ queue weights, and configurable queue size
	dynamic buffer management, allowing the sum of the queue sizes to exceed physical buffer capacity (4-port/8-port 10/100BaseT FPs only)
	operational attributes of queue congestion state, usage, and minimum and maximum fill
	operational attributes for free list, similar to the ones for the individual queues (4-port/8-port 10/100BaseT FPs only)
	per Port/EP/DP egress statistics:
	• transmitted bytes
	• transmitted frames
	• discarded frames
IP configuration models	IP class of service (CoS) IP differentiated services (DiffServ)
(3 of 3)	

Egress queue selection

The IP, MPLS, and EVLS applications associate transmitted frames to a Scheduling Class (SC) value.The frame SC is then mapped to an emission priority (EP) queue. The EP determines the scheduling treatment of the frame relative to other EPs.

The table Application Scheduling Classes to egress EP queue values (page 136) shows the mapping between the scheduling classes defined in the traffic classes, and the service category and emission priority on the 4pGe and 4-port/8-port 10/100BaseT FPs. These mappings can be viewed in attribute *Lp Ethernet TrafficManagement ServiceCategory scToEpMappingOp*.

Application Scheduling Classes to egress EP queue values

SC value	Service Category	Emission Priority
7	7	0 (highest)
6	6	1
(1 of 2)		

Application Scheduling Classes to egress EP queue values (continued)

SC value	Service Category	Emission Priority
5	5	2
4	4	3
3	3	4
2	2	5
1	1	6
0	0	7 (lowest)
(2 of 2)		

For additional information, see the following documents:

- For information on Ethernet services in general, see *Nortel Multiservice Switch 7400/15000/20000 Configuration – Ethernet Services* (NN10600-821).

- For information on EVLS, see *Nortel Multiservice Switch 7400/15000/ 20000 Configuration – Ethernet Virtual Line Services* (NN10600-822).

- For information on IP and MPLS fundamentals, see *Nortel Multiservice Switch 7400/15000/20000 IP Fundamentals* (NN10600-800)

- For information on configuring VIPR and RFC 2547, see *Nortel Multiservice Switch 7400/15000/20000 Configuration – IP* (NN10600-801).

- For information on IP and MPLS differentiated services fundamentals, see *Nortel Multiservice Switch 7400/15000/20000 Fundamentals – Layer 3 Traffic Management* (NN10600-808).

- For information on configuring IP and MPLS differentiated services, see *Nortel Multiservice Switch 7400/15000/20000 Configuration – Layer 3 Traffic Management* (NN10600-809).

Emission priority queues

The 4pGe and 4-port/8-port 10/100BaseT TM queueing strategy offers better delay and loss performance for higher EPs and starvation avoidance/ minimum bandwidth guarantees for the lower EPs.

The 4pGe and 4-port/8-port 10/100BaseT FPs support eight emission priorities (EPs), referencing each of the eight different queues provided on each of the ports. EP0 and EP1 reference absolute priority queues (APQs) and EP2 to EP7 reference weighted fair queues (WFQs).

A percentage of the residual bandwidth can be assigned on a per weighted fair queue basis by provisioning the *minimumBandwidthGuarantee* (minBw) attribute. By default, the higher priority weighted fair queues are assigned a

larger proportion of the residual bandwidth to favour the traffic of a higher QoS. See table Default assignment of minimumBandwidthGuarantee (page 138).

> **Attention:** The BW is first allocated to EP0, and then to EP1 if EP0 does not use the entire link BW. The unused BW by EP0 + EP1, if any, is termed the residual bandwidth (RBW). The RBW is the one that's allocated to the WFQ EPs EP2 - EP2 in proportion to their MBG.

Default assignment of minimumBandwidthGuarantee

EP value	Default minBw
0 (APQ)	n/a
1 (APQ)	n/a
2 (highest WFQ)	50
3	25
4	10
5	7
6	5
7 (lowest WFQ)	3

If you want to change the default minBw settings for specific weighted fair queues, it is recommended that the sum of the minBw for all active weighted fair queues be equal to 100% of the residual bandwidth. The minBw range for each EP is 0 to 100. The following equation can be used to display the percentage of the residual bandwidth used by a weighted fair queue based on the minBw assigned for that queue:

$MBGx/minBwTotal$

where:
MBGx is the minBw for EP/<x>
minBwTotal is the sum of the minBw for all active weighted fair queues

For example, if EP2, EP3, and EP5 are the only queues transmitting traffic, the queues will consume 100% of the bandwidth. In this example, EP2, EP3, and EP5 are configured with minBw 70, 20, and 10, respectively.

The actual bandwidth of each EP is as follows:

EP2 minBw = 70 / (70 + 20 + 10) = 70% of link capacity
EP3 minBw = 20 / (70 + 20 + 10) = 20% of link capacity
EP4 minBw = 10 / (70 + 20 + 10) = 10% of link capacity

Attention: If a weighed fair queue no longer transmits traffic, its bandwidth is allocated among the remaining active weighted fair queues. This is due to the work conserving nature of the WFQ scheduler.

Congestion control

Congestion control on the 4pGe and 4/8pEth100BaseT FPs is based on packet discards using four drop precedence thresholds for each EP queue:

- DP3 = 35% of EP queue size

- DP2 = 75% EP queue size

- DP1 = 90% EP queue size

- DP0 = 100% EP queue size

Changes in queue size automatically adjust the DP thresholds of the queue. The thresholds control the queue length and congestion of each EP.

Associated with the four DP thresholds, there are four Congestion Control (CC) states. Each of CC state corresponds to a queue fill region that falls between two adjacent DP thresholds, as shown in the figure DP thresholds and CC states (page 139).

DP thresholds and CC states
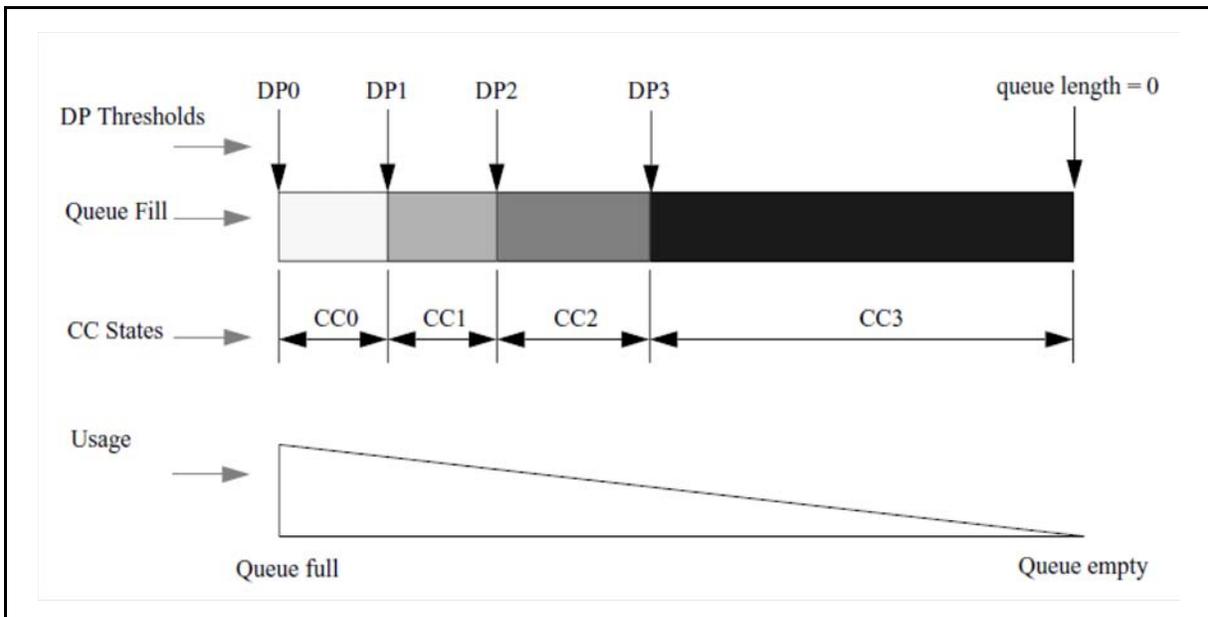
The decision to drop a packet before it is enqueued in an egress queue is based on the DP of the packet, size of the packet, and the fill level of the egress queue. A whole packet is dropped upon its arrival at the egress, if the current queue fill level plus the size of the newly arrived packet exceeds the threshold of the packets assigned DP. For example, a packet with a DP3 will be dropped if the occupancy of the EP queue with the newly arrived packet added would reach a congestion control state of ccdp0, ccdp1, or ccdp2. In this case, the queue length exceeds the DP3 threshold (35%) and congestion is alleviated by not allowing the packet to be queued. However, if the packet has a DP0, it will be queued in all congestion states of the queue.

When a port is congested with multiple oversubscribed WFQs (EP2 to EP7) competing for bandwidth, the queue assigned the higher minBw admits proportionately more packets than a queue assigned a lower minBw. Packets are stored in 80-byte memory blocks that each has a payload length of 72 bytes.

Buffer management on the 4-port gigabit FPs

The 4pGe FP supports a maximum egress buffer space of 80M bytes which is divided equally among its four ports and allocated further among the eight queues of each port. Queues are set to a default size with the main objective being to absorb transient burstiness and minimize loss under overload. Queue sizes are user configurable under the *txQueueSize* attribute. See the table .

Default and maximum queue sizes for 4-port gigabit FPs

txQueueSize	EP0	EP1	EP2	EP3	EP4	EP5	EP6	EP7
Default txQueueSize in payload bytes	100K	300K	300K	300K	7000K	4200K	3000K	2200K
Maximum txQueueSize in payload bytes	500K	500K	500K	500K	7000K	4200K	3000K	2200K

Buffer management on the 4-port/8-port 10/100BaseT FPs

The 4/8pEth100BaseT FPs supports a maximum egress buffer space of 16 MBytes, or 65356 fixed memory blocks of 256 bytes long. Each 256 memory block has 240 bytes of payload.

The buffer is dynamically managed among the all link-EP queues on the FP (up to 64 queues in total). This allows buffer overbooking, meaning that the sum of the link-EP queues sizes can exceed the physical buffer capacity.

The buffer overbooking can usually be enabled without the risk of memory exhaustion because of the statistical nature of traffic across the different links and among the different traffic classes of each link. However, to guard against the possible, but unlikely, buffer exhaustion case, the global buffer (sometimes referred to as free-list) implements four system-configured priority discard thresholds, set at 100%, 90%, 80%, and 60% of maximum buffer size. On free list build up, traffic with the highest drop precedence (DP3) is discarded before admitting into its target queue if the free-list utilization reaches 60% of total buffer size. Similarly, DP2 traffic is discarded if the free-list utilization reaches 80%, and DP1 traffic is discarded if the free-list utilization increases to 90%.

Attention: DP thresholds for the free-list are different from the threshold defined for the individual EP queues.

The *txQueueSize* is available as a provisionable attribute. It represents the maximum buffer size for a link-EP queue in bytes. The table Default values per EP txQueueSize on the 4-port/8-port 10/100BaseT FPs (page 141) shows the default link-EP queue size, or *txQueueSize*, defined for the 4/8pEth100BaseT FPs. The system may round up the queue size value by up to 3.1% of the configured value because of hardware granularity.

The *txQueueThresholds* operational attribute displays the actual hardware configured DP0, DP1, DP2 and DP3 thresholds for an EP queue. The DP0 threshold is the actual queue limit in hardware corresponding to the *txQueueSize* value configured by the user.

Default values per EP txQueueSize on the 4-port/8-port 10/100BaseT FPs

txQueueSize	EP0	EP1	EP2	EP3	EP4	EP5	EP6	EP7
Default *txQueueSize* in bytes	100K	300K	100K	300K	1.5M	1.5M	1M	1M
Maximum *txQueueSize* in bytes	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M

The relationship between the congestion control using discard thresholds at the global buffer level and at the link-EP queue level is as follows.

- When a frame arrives at the egress, the DP type of the frame is first examined against the utilization level of the global buffer, the free-list. If the global buffer utilization is below the threshold associated with the DP type, the frame is deemed eligible for buffering. Otherwise, the frame is discarded by the global buffer threshold before the frame reaches a link-

EP queue. A frame of a certain DP type, deemed as eligible for buffering by the global buffer, is subsequently subject to the control by the link-EP queue threshold associated with the DP.

- There are frame discard statistics for different DP types for the global buffer and the link-EP queues. These statistics are captured by the *txFramesDiscardedDpx* attributes; where x = 0, 1, 2 and 3. These attributes can be found under the *Lp Eng Ethrc Etm* component for the global buffer and the *Lp Eth Tm Ep* components for the link-EP queues.

- Since frame discards by the global buffer congestion control take place before the frames have the opportunity to be handled by their link-EP queues, these frame discards are only counted as the global buffer frame discards and are not counted as part of the link-EP queue frame discards. In other words, the link-EP queue frame discard statistics do not count the frames discarded by the global buffer discard thresholds.

- The frames discarded by the link-EP queue thresholds are not counted as part of the global buffer frame discards statistics.

Buffer management engineering guidelines

The following may be considered as engineering guidelines for the selection of the default EP queue limit values, for 4/8pEth100BaseT and 4pGe FPs.

- Assume that the customer wants class-based queuing, which offers better delay and loss performance for the higher EPs, and starvation avoidance/ minimum guarantees for the lower EPs.

- Assume that EPs 0, 1, 2 and 3 are to be used for real-time classes. Their queues are dimensioned based on maximum delay requirements. Since IP/Ethernet traffic may not be as well-behaved or controlled as ATM traffic, and that its performance targets are not as rigid as ATM, the real-time queues are dimensioned bigger than the corresponding ATM queues at the same speed. This will offer better burst tolerance at the expense of increased maximum delay.

- Assume EPs 4, 5, 6 and 7 are to be used for non-real-time classes. The main objective is to absorb transient burstiness and minimize loss under overload. These queues are dimensioned as large as possible based on available memory, with preference given to the higher EPs for improving their loss performance. (Maximum delay values are computed to ensure that they stay within acceptable limits for most data applications.)

4-port gigabit and 4-port/8-port 10/100BaseT Ethernet migration considerations

The 4pGe and 4/8pEth100BaseT Ethernet FPs have numerous field programmable gate arrays (FPGAs) that store a specific version of software.

When the version of the FPGAs in the running software is different than the version of FPGAs in the new migrating software, the FPGAs will need to be updated with the new version before the migration can complete.

Updating the version for the FPGAs is handled automatically as part of the migration, but it may extend the duration of the migration. For the 4pGe FP, this may be up to 45 minutes when one 4pGe FP is present in the shelf. The download time for one 4/8pEth100BaseT Ethernet FP is between 7 and 10 minutes. When more than one 4pGe or 4/8pEth100BaseT FP is present in the shelf, the migration may take slightly longer because it depends on when the other 4pGe and 4/8pEth100BaseT Ethernet FPs start getting loaded relative to the other FPs in the shelf. During the extended time frame, the FP faceplate shows a slow flashing red LED, the status of the FP may be shown as enabled, and the status of the LP may be shown as unlocked and disabled.

Attention: The Ethernet Traffic Manager (ETM) FPGA on 4p/8pEth100BaseT auto upgrade requires PCR6.2 and later software release. To upgrade ETM FPGA prior to PCR6.2, the firmware needs to be manually burned on the FP.

To successfully complete hitless software migration (HSM) to this release from previous releases, it is mandatory to apply a TAP patch to the previous release prior to initiating the migration. If this TAP patch is not applied prior to migration, HSM will not occur. As a result, it will require two nodal outages to successfully complete the migration.

Once the TAP patch is applied, the Ethernet application must be downloaded to the node and added to the software application version (sw avl) prior to initiating the migration.

Failure to follow this procedure to migrate to this release from previous releases will result in migration failure, or will require a two stage migration involving nodal outages.

Voice and CES-based function processors

Use information in this section to learn about configuration details for Nortel Multiservice Switch function processors (FPs) that support voice and CES services.

Voice and CES services function processors and identifying characteristics

FP long name	PEC	Card type	Nortel Multiservice Switch	For more information
1-port DS1 MVP-E	NTNQ85	1pDS1Mvpe (for DS1 MVP-E)	Multiservice Switch 7400	DS1/E1 voice and CES function processors (page 147)
4-port DS1 MVP-E	NTNQ89	4pDS1Mvpe	Multiservice Switch 7400	DS1/E1 voice and CES function processors (page 147)
4-port DS1 AAL1	NTNQ47	4pDS1Aal1	Multiservice Switch 7400	DS1/E1 voice and CES function processors (page 147)
1-port E1 MVP-E	NTNQ86	1pE1Mvpe (for E1 MVP-E)	Multiservice Switch 7400	DS1/E1 voice and CES function processors (page 147)
4-port E1 MVP-E	NTNQ88	4pE1Mvpe	Multiservice Switch 7400	DS1/E1 voice and CES function processors (page 147)
(1 of 3)				

Voice and CES services function processors and identifying characteristics (continued)

FP long name	PEC	Card type	Nortel Multiservice Switch	For more information
4-port E1 AAL1	NTNQ48	4pE1Aal1	Multiservice Switch 7400	DS1/E1 voice and CES function processors (page 147)
32-port E1 TDM	NT0461 and NT0464	32pE1Aal	Multiservice Switch 7400	DS1/E1 voice and CES function processors (page 147)
	NTHW92 and NTHW81	32pE1Aal	Multiservice Switch 15000/20000	
2-port DS3Ch TDM	NTFN91 and NTFN93	2pDS3cAal	Multiservice Switch 7400	DS3 voice and CES function processors (page 157)
	NTHW91 and NTHW90	2pDS3cAal	Multiservice Switch 15000/20000	
4-port DS3Ch AAL1 CES	NTHR91	4pDS3ChAal1	Multiservice Switch 20000	DS3 voice and CES function processors (page 157)
4-port OC-3/STM-1 Ch TDM/CES	NTHW70	4pOC3ChSmIr	Multiservice Switch 15000/20000	OC-3/STM-1 voice and CES function processors (page 161)
1-port TTC2M MVP-E	NTNQ87	1pTTC2mMvpe		TTC2M voice and CES function processors (page 166)
Voice services processor 2 (VSP2)	NT0482	VSP2	Multiservice Switch 7400	Voice server processors (page 169)
	NTHW87	VSP2	Multiservice Switch 15000/20000	
Voice services processor 3 (VSP3)	NTHW84	2pGeMmSrVsp3	Multiservice Switch 15000/20000	Voice server processors (page 169)
Voice services processor 3 with optical TDM interface (VSP3-o)	NTHW77	2pOc3ChSmIrVsp3	Multiservice Switch 15000/20000 Media Gateway 15000	Voice server processors (page 169)
(2 of 3)				

Voice and CES services function processors and identifying characteristics (continued)

FP long name	PEC	Card type	Nortel Multiservice Switch	For more information
Voice services processor 4e with 2 optical TDM interfaces (2pVSP4e)	NTHW26AA	2pOC3ChSmIrVsp4e	Media Gateway 15000	Voice server processors (page 169)
Voice services processor (VS)	NTHW78AA	2pVS	Media Gateway 15000	Voice server processors (page 169)
(3 of 3)				

DS1/E1 voice and CES function processors

This section contains information on DS1/E1 voice and CES function processors.

Navigation

DS1/E1 voice and CES function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of DS1/E1 voice and CES FPs.

DS1/E1 voice and CES function processor specifications

	1-port DS1 MVP-E	4-port DS1 MVP-E	4-port DS1 AAL1	1-port E1 MVP-E	4-port E1 MVP-E	4-port E1 AAL1	32-port E1 TDM
card type	1pDS1Mvpe	4pDS1Mvpe	4pDS1Aal1	1pE1Mvpe	4pE1Mvpe	4pE1Aal1	32pE1Aal
port type	DS1	DS1	DS1	E1	E1	E1	E1
port number	0	0 to 3	0 to 3	0	0 to 3	0 to 3	1 to 32
channels per port	0 to 23 or 1 to 24	0 to 23 or 1 to 24	0 to 23 or 1 to 24	0 to 30 or 1 to 31	0 to 31	0 to 30 or 1 to 31	0
FP technologies	PM2, SBIC	PPC, PQC2.0	PDC1.1, CQC	PM2, SBIC	PPC, PQC2.0	PDC1.1, CQC	PDC1.1, CQC
memory (normal)	16 Mbyte	64 Mbyte	16 Mbyte	16 Mbyte	64 Mbyte	16 Mbyte	16 Mbyte
memory (fast)	n/a		n/a	n/a		n/a	1 Mbyte
memory (shared)	8 Mbyte			8 Mbyte		0	n/a
line speed (max.)	1.544 Mbps	1.544 Mbps	1.544 Mbps	2.048 Mbps	2.048 Mbps	2.048 Mbps	2.048 Mbps
(1 of 2)							

DS1/E1 voice and CES function processor specifications (continued)

	1-port DS1 MVP-E	4-port DS1 MVP-E	4-port DS1 AAL1	1-port E1 MVP-E	4-port E1 MVP-E	4-port E1 AAL1	32-port E1 TDM
effective data rate	1.536 Mbps	1.536 Mbps	1.544 Mbits	1.920 Mbps	1.920 Mbps	2.048 Mbps	31.74 Mbps (per port)
access mode	24 channels	24 channels	single	31 channels	31 channels	single	G704 framing
clocking source	local, line, module	local, line, module	module	local, line, module	local, line, module	module	local, module
network clock synchronization supported	yes. Reversion enhancement is not supported.	yes	yes	yes. Reversion enhancement is not supported.	yes	yes	yes (at E1 level of hierarchy)
Port configuration					fractional link or clear channel (non-channelized)		
sparing supported	one-for-one only with same FP type (1-port MVP-E to 1-port MVP-E)	one-for-one only with same FP type (4-port MVP-E to 4-port MVP-E)	one-for-one	one-for-one sparing between MVP-E-to-MVP-E.	one-for-one sparing between like FPs only (that is, 4-port MVP-E to 4-port MVP-E)	one-for-one	one-for-one
				(2 of 2)			

DS1/E1 voice and CES FP hardware information

The table below contains important information regarding the vintages of certain DS1/E1 voice and CES FPs. For a full list of PECs (including vintages) for supported FPs, see *Nortel Multiservice Switch Release Notes*.

DS1/E1 voice and CES FP hardware information

DS1/E1 voice and CES function processor type	Hardware details
4-port E1 MVP-E	is supported only with a second generation control processor (CP2)

DS1/E1 voice and CES FP configuration considerations

The table below contains configuration considerations for DS1/E1 voice and CES FPs.

DS1/E1 voice and CES FP configuration considerations

DS1/E1 voice and CES function processor type	Configuration considerations
All DS1 voice and CES FPs	If you are setting up a DS1 trunk between two Nortel Multiservice Switch nodes that are co-located, you must set the attribute *clockingSource* as one of the following combinations: • local at one end and line at the other • module at one end and line at the other • module at both ends A 64 kbit/s timeslot is available for the 'D' channel on ISDN links or the signaling channel on common channel signaling (CCS) links.
4-port DS1 MVP-E	All ports must be configured as CAS or CCS rather than a combination of these two protocols.
4-port DS1 AAL1	This FP supports ATM services and carries constant bit rate (CBR) traffic over ATM networks. The 4-port DS1 AAL1 FP supports one circuit emulation service (CES) per channel as defined in the ATM Forum CES Interoperability Specification. However, the FP must be completely configured either for unstructured or structured services. A combination of services on an FP is not supported. For FPs configured with structured services, the connections can be a combination of basicStructured and casStructured services.
4-port E1 MVP-E	This FP supports interworking only with software levels PCR2.3 or higher. The 4-port E1 MVP-E in PCR 4.2 or higher can interwork with the 1-port MVP-E running Release 7.0. Note that this FP does not support interworking to any E1 voice FP. All ports must be provisioned as CAS or CCS rather than a combination of these two protocols.
(1 of 2)	

DS1/E1 voice and CES FP configuration considerations (continued)

DS1/E1 voice and CES function processor type	Configuration considerations
	There are 32 timeslots on each port. Timeslot 0 is used for framing and cannot be used for data. If the channel-associated signaling (CAS) is chosen, only 30 channels are available. Timeslot 16 is used exclusively for signaling in CAS and CCS.
4-port E1 AAL1	For unstructured services, you must provision all timeslots. The entire payload bandwidth is a single clear channel.
	When you add a port, the system automatically creates a Channel 0 component.
32-port E1 TDM	Each port of the 32-port E1 TDM FP is individually accessible and configurable in conjunction with the multiport aggregate device. Each port supports one channel. Each channel can have 1 to 31 timeslots. Each timeslot represents a 64 kbit/s portion of bandwidth.
	When you add an *E1* component, the system automatically creates a *Channel/0* component that contains 31 provisioned timeslots, numbered 1 to 31. The system also creates a *TrunkConditioning* (*TC*) component beneath the *Channel* component.
	The *timeslotDataRate* attribute beneath a *Channel* component must be set to doNotOverride.
	The *lineType* attribute beneath an *E1* component must be set to ccs.
(2 of 2)	

To prevent having too many timeslots exceeding the bandwidth of the FP, a semantic check in the software prevents too many timeslots from being configured when the FP is running structured services. There is no limit when the card is running unstructured services. The actual bandwidth that is used for each service on a card is calculated as follows.

((configured_timeslot times max_*partialFill*) + (configured_*partialFill* minus one)) divided by configured_*partialFill*

The attribute *partialFill* defines the configured (provisioned) partial fill level and is the number of octets of the AAL1 cell that will be used for data. The remaining octets are padded with the pattern specified by the attribute *idlePattern*. The formula provides the calculations for a DS1 card in the table

4-port DS1 AAL1 bandwidth limitations

Effective size of the largest service	At least one configured CAS structured service	No configured CAS structured service
1 to 12 timeslots	96 total timeslots	88 total timeslots
13 to 18 timeslots	96 total timeslots	77 total timeslots
19 to 24 timeslots	96 total timeslots	72 total timeslots

4-port E1 AAL1 bandwidth limitations

Effective size of the largest service	At least one configured CAS structured service	No configured CAS structured service
1 to 12 timeslots	72 total timeslots	106 total timeslots
13 to 18 timeslots	65 total timeslots	98 total timeslots
19 to 24 timeslots	62 total timeslots	94 total timeslots
25 to 30 timeslots	60 total timeslots	92 total timeslots

DS1/E1 voice and CES FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see

DS1/E1 voice and CES FP supported features

DS1/E1 voice and CES function processor type	Supported features
All DS1 voice and CES FPs	Nortel Multiservice Switch DS1 voice service FPs can be used to provide access from customer equipment such as a private automatic branch exchange (PABX), to the Multiservice Switch network. These FPs process any combination of voice and bit transparent data services.
	All DS1 voice service FPs support both channel associated signaling (CAS) and common channel signaling (CCS). They use adaptive differential pulse code modulation (ADPCM) to encode voice data at compression rates of 24, or 32 kbit/s and 2100 Hz inband tone detection to identify modem and facsimile data. They convert time-sliced transparent data into data channel packets without processing.
	bidirectional m-Law (North American) to A-Law (international) conversion of 64 kbit/s voice data
(1 of 6)	

DS1/E1 voice and CES FP supported features (continued)

DS1/E1 voice and CES function processor type	Supported features
	speech activity detection (SAD) to suppress the silence between speech bursts
	fax idle suppression (FIS) to suppress silent periods between data bursts
	echo cancellation on all voice channels
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
	the DS1 MVP-E FP supports audio handling capabilities for both ingress and egress traffic including congestion management and control of cell delay variation and network loss planning. For detailed information about the audio handling capabilities of the DS1 MVP-E FP, see *Nortel Multiservice Switch 7400 Configuration – Voice Transport* (NN10600-750).
	voice encoding rate to dynamically downspeed when congestion occurs within the network
	gain adjustment in 2 dB steps between +6 dB and -6 dB
	separate encoding rates for modem and facsimile data
All E1 voice and CES FPs	The E1 FPs that support voice services can be used to provide customer equipment access to Nortel Multiservice Switch networks. These FPs support any combination of voice and bit transparent data services.
	All E1 voice service FPs support processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS).
	For detailed information about the audio handling capabilities of the MVP-E FP, see *Nortel Multiservice Switch 7400 Configuration – Voice Transport* (NN10600-750), or *Nortel Multiservice Switch 7400 Configuration – DCME Voice Service* (NN10600-760).
1-port DS1 MVP-E	The DS1 MVP-E may also be referred to as the one-port DS1 Multipurpose Voice Platform enhanced on-Board ECAN. The DS1 MVP-E FPs support voice services for Nortel Multiservice Switch 7400 node using switched or permanent virtual connections (SVC or PVC), according to the service. They are capable of tandem node detection for processing voice data.
	The MVP-E contains a daughter card that supports internal echo cancellation in compliance with ITU-T G.165 and G.168.
(2 of 6)	

DS1/E1 voice and CES FP supported features (continued)

DS1/E1 voice and CES function processor type	Supported features
	voice compression at:
	• 24 and 32 kbit/s using ADPCM encoding, in compliance with ITU-T G.726
	• 16 kbit/s using low delay - coded excited linear predictive (LD-CELP), in compliance with ITU-T G.728
	• 8 kbit/s using conjugated structure algebraic code excited linear predictive (CS-ACELP) encoding, in compliance with ITU-T G.729
	modem and fax compression at 32 kbit/s using ADPCM encoding, in compliance with ITU-T G.726
	bidirectional *m*-Law (North American) to A-Law (international) conversion of 64 kbit/s voice data in compliance with ITU-T G.711
	fax modulation and demodulation (fax relay) at rates up to 9.6 kbit/s
4-port DS1 MVP-E	This FP supports voice networking and voice and bit transparent data services over permanent virtual circuit (PVC) connections. Each port can process 24 channels.
	The 4-port DS1 MVP-E works only with a second generation control processor (CP2). A maximum of eight FPs can be installed on the shelf due to restrictions of the CP. This FP interworks only with software levels PCR2.3 or higher. At PCR 4.2 or higher, it can interwork with the 1-port MVP-E running Release 7.0. Note that this FP does not support interworking to any DS1 voice FPs (VFP).
	voice, modem, and fax compression using standards-based encoding algorithms
	suppression of idle frames during speech calls and facsimile transmissions
	contains a daughter card that supports internal echo cancellation in compliance with ITU-T G.164, G.165, and G.168
	detects DTMF digits and supports out-of-band DTMF tone transmission
	CCS-to-CAS protocol gateway
1-port E1 MVP-E	The E1 MVP-E FP has a single port that provides access to Nortel Multiservice Switch networks from customer equipment, such as a Private Branch Exchange (PBX). The port can process 30 channels that support voice and bit transparent data services. The FP supports channel associated signaling (CAS) and common channel signaling (CCS) protocol.
	either switched or permanent virtual circuit (SVC or PVC) connections, according to the service
	(3 of 6)

DS1/E1 voice and CES FP supported features (continued)

DS1/E1 voice and CES function processor type	Supported features
	a number of audio handling capabilities for both ingress and egress traffic to conserve bandwidth and ensure quality, including the following: • compression of voice, modem and facsimile calls using standards-based encoding algorithms • congestion management • suppression of idle frames during speech calls and facsimile transmissions • internal echo cancellation. The E1 MVP-E FP contains a daughter card that supports internal echo cancellation according to ITU-T G.165 and G.168. • detection of 2100 Hz tones (identifying modem and facsimile transmissions) and DTMF digits • control of cell delay variation and network loss planning • m-Law (North American) to A-Law (international) conversion of 64 kbit/s voice data according to ITU-T G.711
4-port E1 MVP-E	Each port can process 31 channels that support voice networking and voice and bit transparent data services. This FP supports channel associated signaling (CAS) and common channel signaling (CCS) protocols. permanent virtual circuit (PVC) connections out-of-band DTMF tone transmission CCS-to-CAS protocol gateway
(4 of 6)	

DS1/E1 voice and CES FP supported features (continued)

DS1/E1 voice and CES function processor type	Supported features
	a number of audio handling capabilities for both ingress and egress traffic to conserve bandwidth and ensure quality, including the following: • compression of voice, modem and facsimile calls using standards-based encoding algorithms • congestion management • suppression of idle frames during speech calls and facsimile transmissions • internal echo cancellation. The 4-port E1 MVP-E FP contains a daughter card that supports internal echo cancellation according to ITU-T B.164, G.165 and G.168. • detection of 2100 Hz tones (identifying modem and facsimile transmissions) and DTMF digits • control of cell delay variation and network loss planning • bidirectional m-Law (North American) to A-Law (international) conversion of 64 kbit/s voice data according to ITU-T G.711
4-port E1 AAL1	carries constant bit rate (CBR) or 'circuit' traffic over ATM networks processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS) one circuit emulation service (CES) per channel as defined in the ATM Forum CES Interoperability Specification. However, the FP must be completely configured either for unstructured or structured services. A combination of services on an FP is not supported. For FPs configured with structured services, the connections can be a combination of basicStructured and casStructured services.
32-port E1 TDM	The 32-port E1 TDM FP supports PVG services on Nortel Multiservice Switch nodes as the interface to the TDM network. It supports switched and non-switched gateways between a TDM network and an ATM network. This FP has two sets of coax connectors (each set has a transmit and a receive connector) that each support 16 E1 ports, for a total of 32 structured E1 ports. The 32-port E1 TDM FP transports common channel signaling and can transport channel associated signaling using NSTA unsignaled trunks for non-switched voice gateways.
(5 of 6)	

DS1/E1 voice and CES FP supported features (continued)

DS1/E1 voice and CES function processor type	Supported features
	The 32-port E1 TDM FP provides support for PVG services on Multiservice Switch 15000 and Multiservice Switch 20000 nodes. You can use the monitor ports to connect to test equipment and test the card while it is in service. It carries a -26dB tap of the transmit (Tx) connector signal. The 9-pin subminiature D-type connector provides one-for-one sparing capability. For information on provisioning the monitor ports, see *Nortel Multiservice Switch 7400/15000/20000 Configuration* (NN10600-550).
	up to 992 64 kbit/s timeslots
	E1 level clocking and synchronization
	structured AAL service over the Nortel Multiservice Switch backplane
	supports access to VSP3
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
(6 of 6)	

DS3 voice and CES function processors

This section contains information on DS3 voice and CES function processors.

Navigation

DS3 voice and CES function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of DS3 voice and CES FPs.

DS3 voice and CES function processor specifications

	2-port DS3Ch TDM	4-port DS3Ch AAL1 CES
card type	2pDS3cAal	4pDS3ChAal1
port type	DS3ch	DS3ch
port number	0-3	0-3
channels per port		256 channels per port, 1024 channels per FP
FP technologies	PDC1.1, CQC	PPC, PQC2.0
memory (normal)	16 Mbyte	128 Mbyte
memory (fast)	0.5 Mbyte	n/a
memory (shared)	1 Mbyte	n/a
line speed (max.)	44.736 Mbps	44.736 Mbps
effective data rate	43.008 Mbps	43.008 Mbps
access mode	direct framing	
DS1 line type		unframed, d4, or esf
DS3 Port number	0, 1	0 to 3
clocking source	local, line for DS3 local, module for DS1 tributary port	local, module for DS3 sameAsDs3 for tributary DS1
minimum software required	PCR5.2 for PEC NTFN93 and NTHW90	
network clock synchronization supported	yes (DS1 level of channelization only)	
(1 of 2)		

DS3 voice and CES function processor specifications (continued)

	2-port DS3Ch TDM	4-port DS3Ch AAL1 CES
port configuration		channelized
sparing supported	one-for-one	• supports one-for-n sparing behavior enhancement • supports operation with a one-for-six sparing panel such as the NTQS31, where up to 6 FPs can be spared (backed up) by one FP, all of the same FP type in the same shelf • supports warm equipment protection with a one-for-one sparing panel such as the NTHR79

(2 of 2)

DS3 voice and CES FP configuration considerations

The table below contains configuration considerations for DS3 voice and CES FPs.

DS3 voice and CES FP configuration considerations

DS3 voice and CES function processor type	Configuration considerations
2-port DS3 Ch	When you add a *DS1* component, the system creates a *TrunkConditioning* (*TC*) component beneath the *Channel* component. The ports on the DS3C TDM FPs operate in fractional mode. Fractional mode means that each port can support 1 to 28 DS1 tributary ports. Each DS1 port supports one channel that can have 1 to 24 timeslots. Each timeslot represents a 64 kbit/s portion of bandwidth. The 4-port DS3Ch AAL1 CES FP is a time division multiplexed FP. For this TDM FP to provide a CES associated with an ATM FP (for example, CBR) you must link to an Aal1Ces interface. The attribute *mapping* can only be set to "direct" mapping. Cells are directly mapped into the DS3 payloads by default for the 4-port ATM-based DS3 FPs.

(1 of 2)

DS3 voice and CES FP configuration considerations (continued)

DS3 voice and CES function processor type	Configuration considerations
	When you add a port, the system automatically provisions C-Bit parity mode for the DS3 component. If you do not want to use C-Bit parity mode, turn it off. `set lp/<n> DS3/<m> cBitParity off` Default timeslot data rate for DS1 port is doNotOverride. When DS1 zero coding is none, the user data rate is 64K; when it is bit7stuffing, the user data rate is 56K. The DS1 *customerIdentifier* must be the same as the DS3's. The attribute *applicationFramerName* must remain empty.
	When configuring the Aal1Ces component: • The *dummyDataByte* attribute can only be set to the "OxFF" value • If the channel is linked to a CES component and its service type is unstructured, then there must not be a TC component under the channel component. That is, there can be one channel with 24 timeslots. • If the channel is linked to a CES component and its service type is structured, then there must be a TC component under the channel component. That is, there must be one timeslot per channel, up to 24 channels. • The channel attribute *timeslots* contains a list of 0-23 defined timeslots with values from 0-23. • The value of the attribute *customerIdentifier* and its parent DS1 component *customerIdentifier* must be the same. • The value of the *timeslotDataRate* attribute can only be "doNotOverride" It can be configured to provide cold standby, which, like any standby, can be used to spare similar types of FPs It supports a warm hitless migration of a software upgrade when configured for one-for-one equipment protection. See also the chapter on configuring equipment protection (sparing) and the chapter on hitless services in *Nortel Multiservice Switch 7400/15000/20000 Configuration* (NN10600-550).
(2 of 2)	

DS3 voice and CES FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see

DS3 voice and CES FP supported features

DS3 voice and CES function processor type	Supported features
All DS3 voice and CES FPs	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
2-port DS3Ch TDM	You can use the monitor ports (Tx monitor) to connect to test equipment and test the card while it is in service. It carries a -26dB tap of the transmit (Tx) connector signal. The 9-pin subminiature D-type connector provides one-for-one sparing capability. For information on provisioning the monitor ports, see *Nortel Multiservice Switch 7400/15000/20000 Configuration* (NN10600-550).
	structured AAL service over the node backplane
	access to VSP3
4-port DS3Ch AAl1 CES	The 4-port DS3Ch AAl1 CES FP provides AAL1 for CES over multiple DS1 channels through DS3 lines. This time division multiplexed (TDM) FP also provides a gateway interface to ATM FPs. The fanin and fanout of channelized service connections from the FP into a Nortel Multiservice Switch ATM network can provide multiple services on the same FP port. The FP
	four fully channelized ports
	DS1 trunk conditioning
	up to 28 DS1s per DS3 port with up to 24 channels per DS1, each channel with 1 to 24 Kbits/s (DS0) timeslots. Each of the 24 timeslots can be associated with only one channel. For example, you can have 24 channels with 1 timeslot each or 1 channel with 24 timeslots, or any combination in between.
	up to 24 channels per DS1 tributary, each supporting one time slot, one data channel for the full DS1 stream, or a combination
	up to 112 DS1 tributaries, or ATM user-to-network interfaces (UNIs)
	up to 254 CES virtual channel connections (VCCs) per DS3

OC-3/STM-1 voice and CES function processors

This section contains information on OC-3/STM-1 voice and CES function processors.

Navigation

OC-3/STM-1 voice and CES function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of OC-3/STM-1 voice and CES FPs.

OC-3/STM-1 voice and CES function processor specifications

	4-port OC-3/STM-1Ch TDM/CES
card type	4pOC3ChSmlr
port type	Sonet (for OC-3) Sdh (for STM-1)
port number	0-3
channels per port	765 channels per port, 3060 channels per FP
FP technologies	PQC12
Clocking source	module, local
Port configuration	TDM, CES
total egress ATM buffer (cells) per port @ 3k connections per FP	51.4k
processor memory	128 Mbyte SDRAM
network clock synchronization	supported
synchronization status messages	supported
minimum software level required (see Note)	PCR 4.1

OC-3/STM-1 voice and CES FP configuration considerations

The table below contains configuration considerations for OC-3/STM-1 voice and CES FPs.

OC-3/STM-1 voice and CES FP configuration considerations

OC-3/STM-1 voice and CES function processor type	Configuration considerations
4-port OC-3/STM-1Ch TDM/CES as either SONET or SDH	Ensure that the software running on the node meets the minimum software requirement for the FP. An incompatible software load can damage an FP beyond repair.
	The card operates as an ATM Forum standards compliant AAL1 CES card. When a CES remoteEndType is changed from its default value of **ces** to **pvgExclusive** or **pvgShared** it also operates in packet voice gateway (PVG) interworking mode. When configured for PVG interworking, the ports on the card can be used as PVG service interface streams (TDM streams) for carrying VoTDM bearer traffic. In this mode, there are semantic restrictions on the number of PVG interworking channels that can be provisioned on a per DS1 or E1 basis.
	Chan components must be linked to *Aal1Ces* before they can provide any service. For information on CES provisioning for PVG, see *Nortel Media Gateway 7480/15000 Non-switched Service Configuration Management* (NN10600-781) or *Nortel Media Gateway 7480/15000 Switched Service Configuration Management* (NN10600-782). For information on CES configuration in general, see *Nortel Multiservice Switch 7400/15000/20000 Configuration – AAL1 Circuit Emulation* (NN10600-720).
	When configuring LAPS on the 4-port OC-3/STM-1Ch TDM/CES FP, the working and protection FPs must occupy adjacent slots and the lower number must be an even number. For example, slots 2 and 3. For specifics on configuration see *Nortel Multiservice Switch 7400/15000/20000 Configuration* (NN10600-550).
	When using LAPS, the attribute *clockingSource* must be set to *module*.
	When the port type is *sonet*, the FP supports 84 DS1 channels per port, each with 24 64-Kbits/s timeslots per DS1. When the port type is sdh, the FP supports 63 E1 channels per port, each with 31 64-Kbits/s timeslots per E1.
	Trunk conditioning <tc> is used to provision trunk conditioning options for a DS1/E1 channel. Trunk conditioning is applicable to both structured CES, and PVG TDM interworking function CES.
	Test component <test> controls tests on physical or logical interfaces. There is one instance per SONET/DS1 or SDH/E1 component.
	(1 of 3)

OC-3/STM-1 voice and CES FP configuration considerations (continued)

OC-3/STM-1 voice and CES function processor type	Configuration considerations
	The override agent queue size for accounting, alarm, and scn record collection must be changed from the default values. Use the following FP and CP values: • accounting: 0 for the FP • alarm: 1500 for the FP and 500 for the CP • scn: 1000 for the FP and 1500 for the CP
4-port OC-3/STM-1Ch TDM/ CES as either SONET	Sts component <Sts>: represents an STS high-order path multiplexed into the OC-3. There are up to 3 instances of the STS component for an OC-3 interface <STS/n>: n=0-2. The concatNumber is an Sts provisionable attribute and should be set to 1.
	VT1dot5 low order path <VT1dot5/ l, m>: There are 28 instances of a VT1dot5 low order path multiplexed into the STS high order path. The 28 instances are distributed into virtual tributary groups 1-7. Each group has tributaries numbered 1-4 for mapping of DS1. VT1dot5 port numbers <l> <m>: When you add a VT1dot5 port, the system automatically creates a DS1 subcomponent. DS1 tributary component <DS1>: represents a DS1 tributary multiplexed into a virtual tributary VT1.5. There is one instance of this component per VT1.5. Channel on a DS1 tributary <chan>: 0-23 Controls the grouping of timeslots for CES service. There can be up to 24 chan components per DS1. For PVG, a maximum of 9 channels per DS1 is supported. Timeslot data rate for DS1 port <rate>: doNotOverride is the default. When DS1 zero coding is none, the user data rate is 64K; when it is bit7stuffing, the user data rate is 56K. The value of *timeslotDataRate* for a DS1 channel can only be "doNotOverride". Timeslots <timeslots>: 1-24. Each DS1 under the low order path is mapped into 24 timeslots. The channel component uses all timeslots by default. Timeslots can be deleted, for example, you can have 24 channel components each with one timeslot. There can be only one channel with 24 timeslots. When using the FP for CES, the value of the attribute *customerIdentifier* and its parent DS1 component *customerIdentfier* must be the same. The attribute *mapping* can only be set to "direct" mapping. The channel has no atmCell component.
4-port OC-3/STM-1Ch TDM/ CES port type as SDH	High order path <high_path>: *Vc4* (Adds a high order path to the port). There is only one Vc4 per STM-1
(2 of 3)	

OC-3/STM-1 voice and CES FP configuration considerations (continued)

OC-3/STM-1 voice and CES function processor type	Configuration considerations
	Low order path <low_path>: *Vc12* (Adds a low order path to the port)
	Path value <r>: *k, l, m,* (where *k=1-3, l=1-7, m=1-3,* for a possible total of 63 Vc12s)
	E1 component: represents an E1 tributary mapped into a VC-12 low-order path. There is only one instance of this component per VC-12.
	Channels on an E1 tributary <chan>: 0-31 Controls the grouping of timeslots for CES service. There can be up to 31 chan components per E1. For PVG, a maximum of 9 channels per E1 is supported.
(3 of 3)	

OC-3/STM-1 voice and CES FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see

OC-3/STM-1 voice and CES FP supported features

OC-3/STM-1 voice and CES function processor type	Supported features
4-port OC-3/STM-1Ch TDM/CES	This FP has four fully channelized OC-3/STM-1 ports. Each port has a duplex SC fiber optic transceiver. The FP can be configured for either OC-3 (with DS1 channels) or STM-1 (with E1 channels) but not both simultaneously.
	The FP does not support PORS routing.
	The FP supports dual-FP, unidirectional, non-revertive line automatic protection switching (LAPS) of optical ports by using a sparing bus between adjacent pairs of optical FPs. One *Laps* component is provisioned and associated with the SONET component pair that will participate in the protection switch. A LAPS switch will affect only the failed fibre. The traffic that would be carried over the failed fibre will be routed via the protection card ports. All other traffic will continue to be routed through the active card ports
(1 of 2)	

OC-3/STM-1 voice and CES FP supported features (continued)

OC-3/STM-1 voice and CES function processor type	Supported features
	supports warm equipment protection. This relates to a complete failure of the active card. In this case the services on the ports that are provisioned for LAPS will be transferred to the protection card. With warm equipment protection of optical FPs the traffic of a port on an active optical FP is switched to the spare FP if: • the active FP fails • the port has been configured for dual-FP LAPS • the FP of the spare port is in service and operating normally processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
4-port OC-3/STM-1 TDM FP	provides high density interface to PVG VSP FPs supports TDM to VSP intra-shelf connectivity provides 64 kbit/s ATM Forum compliant basic structured CES for signaling channel transport has up to 255 CES VCCs per STS1/TUG3 supports up to 3024 CES/PVG connections per FP supports hot equipment protection (HEP) on the Nortel Multiservice Switch 15000 Packet Voice Gateway (PVG) shelf using a 1 + 1 sparing configuration of the 4-port OC-3/STM-1Ch TDM/CES FP. In a 1 + 1 sparing configuration: • both cards are active but one card has active service and the other card has hot standby service • requires optical ports to be configured for inter-card linear automatic protection switching (LAPS) supports hitless software migration (HSM) on the Nortel Multiservice Switch 15000 Packet Voice Gateway (PVG) shelf
4-port OC-3/STM-1 CES FP	offers both basic structured and unstructured CES over DS1 or E1 circuits supports ATM Forum standards compliant CES over SVC, CES over PVC, and CES over SPVC provides the capability of ATM adaptation layer 1 (AAL1) for CES over multiple DS1 or E1 channels through OC-3/STM-1 ports has up to 255 CES VCCs per STS1/TUG3 supports up to 3060 CES connections per FP
(2 of 2)	

TTC2M voice and CES function processors

This section contains information on TTC2M voice and CES function processors.

Navigation

TTC2M voice and CES function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of TTC2M voice and CES FPs.

TTC2M voice and CES function processor specifications

	1-port TTC2M MVP-E
card type	1pTTC2mMvpe
port type	E1
port number	0
channels per port	0 to 30
FP technologies	PM2, SBIC
memory (normal)	PEC NTNQ87, 16 Mbyte
memory (fast)	n/a
memory (shared)	0.5 Mbyte
line speed (max.)	2.048 Mbps
effective data rate	1.920 Mbps
clocking source	local, line, module
sparing supported	no
access mode	TTC2M
network clock synchronization supported	yes. Reversion enhancement is not supported.
minimum software level required	n/a

TTC2M voice and CES FP configuration considerations

The table below contains configuration considerations for TTC2M voice and CES FPs.

TTC2M voice and CES FP configuration considerations

TTC2M voice and CES function processor type	Configuration considerations
<Highest level grouping>	
<Highest level port-type grouping>	
<FPs with common configuration considerations>	
<individual FP>	

TTC2M voice and CES FP supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see .

TTC2M voice and CES FP supported features

TTC2M voice and CES function processor type	Supported features
1-port TTC2M MVP-E	The TTC2M MVP-E FP may also be referred to as the One-port TTC2M Multipurpose Voice Platform enhanced on-Board ECAN or 1 P TTC2M MVP-E FP. It provides access to Nortel Multiservice Switch 7400 nodes from customer equipment such as a private branch exchange (PBX), using either switched or permanent virtual circuit (SVC or PVC) connections according to the service.
	The TTC2M MVP-E has one port that can process 30 channels for voice and bit transparent data services. The FP supports channel associated signaling (CAS) protocols.
	The TTC2M MVP-E does not support data calls.
	internal echo cancellation. The TTC2M MVP-E FP contains a daughter card that supports internal echo cancellation according to ITU-T G.165 and G.168
	compression of voice, modem and facsimile calls using standards-based encoding algorithms
	congestion management
	suppression of idle frames during speech calls and facsimile transmissions

TTC2M voice and CES FP supported features (continued)

TTC2M voice and CES function processor type	Supported features
	detection of 2100 Hz tones (identifying modem and facsimile transmissions) and DTMF digits
	control of cell delay variation and network loss planning
	bidirectional m-Law (North American) to A-Law (international) conversion of 64 kbit/s voice data according to ITU-T G.711
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)

Voice server processors

This section contains information on voice server processors (VSPs).

Navigation

Voice server processor specifications

The table below contains the configuration parameters, characteristics, and specifications of voice server processors.

VSP specifications

	Voice services processor	Voice services processor 2	Voice services processor 3	Voice services processor 3 with optical TDM port	2 port Voice services processor 4e	Voice services (2pVS)
channels				2016	4032	2016
backhaul channels				84 channels PRI for OC-3/DS1 63 channels PRI for STM-1/E1	132 channels of PRI and SS7	84 T1s with 24 channels per T1
echo cancellation				128 ms nominal tail length	128 ms nominal tail length	128 ms nominal tail length
port type	VSP	VSP2	VSP3	SDH or SONET	SDH or SONET	SONET
Number of DSPs fitted 64 max				22	44	52
(1 of 5)						

VSP specifications (continued)

	Voice services processor	Voice services processor 2	Voice services processor 3	Voice services processor 3 with optical TDM port	2 port Voice services processor 4e	Voice services (2pVS)
Number of TDM channels supported (DS0s)				2016	4032	2016
(2 of 5)						

VSP specifications (continued)

	Voice services processor	Voice services processor 2	Voice services processor 3	Voice services processor 3 with optical TDM port	2 port Voice services processor 4e	Voice services (2pVS)
sparing supported	• one-for-one • one-for-n (where n is 1 to 4) • one-for-n sparing behavior enhancement	• one-for-one (supports HEP) • one-for-n (where n is 1 to 4 for Multiservice Switch 7400 nodes, and n is 1 to 13 for MSS15000 /20000 nodes) (does not support HEP) • one-for-n sparing behavior (does not support HEP)	• one-for-one (supports HEP) • one-for-n (where n is 1 to 13) (does not support HEP) • one-for-n sparing behavior (does not support HEP)	• Linear one-plus-one inter (Dual) card APS for SONET • Linear one-plus-one inter (Dual) card MSP for SDH • one-plus-one (where cards are in adjacent even/odd numbered slots)	• Linear one-plus-one inter (Dual) card APS for SONET • Linear one-plus-one inter (Dual) card MSP for SDH • one-plus-one (where cards are in adjacent even/ odd numbered slots) • one-for-one sparing	• Linear one-plus-one inter (Dual) card APS for SONET • Linear one-plus-one inter (Dual) card MSP for SDH • one-plus-one (where cards are in adjacent even/ odd numbered slots)
(3 of 5)						

VSP specifications (continued)

	Voice services processor	Voice services processor 2	Voice services processor 3	Voice services processor 3 with optical TDM port	2 port Voice services processor 4e	Voice services (2pVS)
minimum software level required	n/a	n/a		base and aps	base and aps vgsIp vgsIpRtoCdma (max. 2016 channels) vgsIptrfo	vgsIpRtoCdma (max. 2016 channels)
network clock synch- ronization				• OC-3 level clock • STM-1 level clock • external building-integrated timing supply (BITS) • free-running	• OC-3 level clock • STM-1 level clock • external building-integrated timing supply (BITS) • free-running	• OC-3 level clock • STM-1 level clock • external building-integrated timing supply (BITS) • free-running
(4 of 5)						

VSP specifications (continued)

	Voice services processor	Voice services processor 2	Voice services processor 3	Voice services processor 3 with optical TDM port	2 port Voice services processor 4e	Voice services (2pVS)
switched VoAAL2 TDM-to-packet using G.711A or G.711U, G726, and/or G.729 Annex A and B packets				2016 connections (switched VoIP and switched VoAAL2 are mutually exclusive)	4032 connections (switched VoIP)	2016 connections (switched VoIP)
switched VoAAL2 packet-to-packet				not supported	not supported	not supported
switched VoIP TDM-to-packet using G.711A or G.711U packets				2016 connections	4032 connections	2016 connections
time slot relay				84 connections	84 connections	
tones for TDM side				2016 connections	4032 connections	2016 connections
tones for packet side				not supported	not supported	
virtual circuits (VC)				4096 VCs maximum		
(5 of 5)						

Voice server processor configuration considerations

The table below contains configuration considerations for voice server processors.

VSP configuration considerations

VSP type	Configuration considerations
All VSPs	The VSP2 FP card supports both switched or non-switched voice gateway services. The VSP3 and VSP3-o FP cards support switched voice gateway services only and do not support non-switched voice gateway services.Voice services include support for pulse code modulation (PCM) voice, adaptive differential pulse code modulation (ADPCM) voice compression, echo cancellation, and silence suppression.
	For switched and non-switched Media Gateway over ATM and switched Media Gateway over IP, the VSP2 FP card provides voice and voice band data processing functionality between a TDM data path and an ATM or IP network. For switched Media Gateway over ATM or IP, the VSP3 FP card provide voice and voice band data processing functionality between a TDM data path and an ATM or IP network.
	For switched Media Gateway over ATM, the VSP3-o FP card provide voice and voice band data processing functionality between a TDM data path and an ATM network. The 2pVSP4e does not support non-switched Media Gateway over ATM.
	All VSP-type FPs support processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS).
	The VSPs contain modules to handle the voice and voice band data and modules to handle signalling.
	• For the VSP and VSP2, one or more voice processing modules (VPM) handle the voice and voice band data.
	• Signalling for all VSPs is handled by a signal processing module (SPM). The SPM processes CAS and CCS information (support for signaling types depends on the software capabilities) and provides the capability for supporting supplementary services.
	• For the VSP3, a single digital signal processor (DSP) handles the voice and voice band data. The VSP3-o also uses DSPs to handle the voice and voice band data.
	All VSPs use virtual ports. In addition, the VSP3 can be configured to use the two gigabit Ethernet ports on its faceplate to interface with the IP network. The VSP, VSP2, VSP3-o and 2pVSP4e have no gigabit Ethernet ports on the faceplate to interface with the IP network.
VSP	There are three versions of the VSP, based on the number of VPMs in the hardware. All versions use the same PEC and card type.

(1 of 6)

VSP configuration considerations (continued)

VSP type	Configuration considerations
	To spare all of the connections for a given VSP, you must always spare it with the same version VSP. To verify that the number of VPMs on the spare FP matches the active FP, you can display and compare the values for the *insertedModuleType* attributes. To determine the number of VPMs on the VSP, display the operational attributes of the *PModule* component: `display lp/<n> Vsp PModule/*` where <n> is the LP number associated with the FP. The value of the *insertedModuleType* attribute for each PModule component specifies the actual hardware on the VSP and can be vpm, spm, or none. To ensure successful sparing, the settings for both FPs must match. The maximum number of timeslots you can configure when the VSP is used for non-switched Media Gateway is 192/240, 384/480, or 576/720 timeslots. To configure a VSP, set the *cardType* attribute first and then link an logical processor (LP) to the slot on the shelf before you add a port. When you add a port, the system automatically provisions all of the *PModule* subcomponents. The system also sets the *moduleType* attribute for each *PModule* component. On the version of the FP that supports 576/720 timeslots and contains nine VPMs and one SPM, the setting for each *moduleType* attribute matches the placement of hardware modules. If you are configuring a VSP that contains fewer VPMs, you must change the configuration to correctly reflect the number of VPMs and their positions on the FP. For the appropriate values for each version, see Settings for PModule components (page 180).
VSP2	The maximum number of timeslots that can be configured for non-switched Media Gateway over ATM and for switched Media Gateway over ATM without digit collection (feature vgsATM) is: • Nortel Multiservice Switch 7400 - 1008 timeslots • Multiservice Switch 15000 or Multiservice Switch 20000 - 1120 timeslots
	The maximum number of timeslots that can be configured for switched Media Gateway over ATM with digit collection (feature vgsATMDC) is: • Multiservice Switch 7400 - 864 timeslots • for Multiservice Switch 15000 or Multiservice Switch 20000 - 960 timeslots
(2 of 6)	

VSP configuration considerations (continued)

VSP type	Configuration considerations
	The maximum number of timeslots that can be configured for switched voice over IP is: • Multiservice Switch 7400 - 1008 timeslots • Multiservice Switch 15000 or Multiservice Switch 20000 - 1120 timeslots To configure a VSP2, set the *cardType* attribute first and then link an LP to the slot on the shelf before you add a port. When you add a port, the system automatically provisions all of the *PModule* subcomponents. The system also sets the *moduleType* attribute for each *PModule* component. The setting for each *moduleType* attribute matches the placement of hardware modules.
VSP3	When configured to use the two gigabit Ethernet ports on its faceplate, the VSP3 FP requires external cabling To configure a VSP3, set the *cardType* attribute first, add the *logicalProcessorType* and set the feature list, add the *logicalProcessor*, and then link an LP to the slot on the shelf before you add a port. When you add a port, the system automatically provisions all of the *PModule* subcomponents. The system also sets the *moduleType* attribute for each *PModule* component. The setting for each *moduleType* attribute matches the placement of hardware modules. The VSP3 supports 2016 timeslots of G.711U and G.711A voice call compression and 1512 timeslots of G.729 Annex A and B voice call compression on Nortel Multiservice Switch 15000 and Multiservice Switch 20000 nodes.
VSP3-o	Only one of the two OC-3/STM-1 TDM ports (ports 0 and 1) on the faceplate of the VSP3-o FP card is an active port. Port 0 is the active port. This active port 0 on the faceplate requires external cabling. TDM FP cards cannot connect internally over the backplane to the VSP3-o FP card. Other VSP2, VSP3, or VSP3-o FP cards cannot connect internally over the backplane to the active port 0 of the VSP3-o FP card.
(3 of 6)	

VSP configuration considerations (continued)

VSP type	Configuration considerations
	The VSP3-o FP card supports a maximum of 2016 timeslots of G.711, G.726 or G.729 Annex A and B voice call compression on Nortel Multiservice Switch 15000 and Multiservice Switch 20000 nodes. VSP3-o FP card supports the vgsIpRtoCdma and vgsIpTrFO features. When VSP3-O will be used in the RTO mode of operation, its capacity will reduce to 1008 channels. Codec types can be mixed on a single VSP3-o (note that there are restrictions on which codecs can be used for VoAAL2 and VoIP in this release of VSP3-o. The VSP3-o FP card supports G.711U and G.711A, G.726-32KITU, EVRC0, and G.729 Annex A and B for switched VoIP. The VSP3-o FP card supports G.711A and G.711U, G.726-24K, G.726-32KITU, and G.729 Annex A and B for switched VoATM. The VSP3-o FP card also supports Line Automatic Protection Switching (Laps) which has a mode attribute that can be configured as unidirectional or bidirectional with revertive or non-revertive behavior as required. Both ends of the Laps pair must be provisioned with the same mode and the same revertive behavior.
(4 of 6)	

VSP configuration considerations (continued)

VSP type	Configuration considerations
2pVS	The 2pVS operates as an RTOCdma enabled MG running the vgsIpRtoCdma feature. If this feature runs on a 2pVS card, it supports 2016 channels.
	The MG supports EVRC0 codecs in the SDP of the H.248 protocol on the 2pVS cards.
	The 2pVS FP card supports G.711U and G.711A, EVRC0, and G.729 Annex A and B for switched VoIP. Note, it does not support switched VoATM. The 2pVS FP card also supports Line Automatic Protection Switching (Laps).
	The 2pVS can also operate in the wireless solution and acts as a MG for CDMA Selection and Vocoding Subsystem (CSVS).
	The 2pVS DSP of the eBSC is responsible for bearer processing and the MG DSP of the eBSC-MG is mainly responsible for bearer relay between the TDM and packet networks. The MG is connected via the TDM interface to a 2pVS eBSC. TrFO is between an eBSC and an MG running vgsIpTrfo.
	The 2pVS supports Inband messaging between the eBSC and MG to switch from PCM to EVRC / EVRC0. In a wireless network, the 2pVS supports Inband messaging between the eBSC and the MG to carry voice traffic as EVRC over the network.
(5 of 6)	

VSP configuration considerations (continued)

VSP type	Configuration considerations
2pVSP4e	The 2-port Voice Services Processor 4e (2pOC3ChSmIrVsp4e, PEC NTHW26AA) Functional Processor (FP) offers double the capacity of the VSP3-o, adds more packet capabilities, and can be configured for both wireless and wireline applications. The two on-board active optical TDM ports (ports 0 and 1) have double the throughput and TDM connections and deliver a higher DS0 density per shelf at a lower cost per DS0. The FP can support up to a maximum of 4032 TDM channels (DS0s) on the two ports. That is, 2016 channels on each of ports 0 and 1, with support for up to 128 AAL5 control channels in addition to available bearer channels.
	The two onboard TDM ports of the 2pVSP4e interface directly at the SDH or SONET level to the network or equipment, however, STM-1 and OC-3 are not supported on the same card simultaneously. Connected to an SDH multiplexer you can have E1 interfaces. Connected to a SONET multiplexer you can have DS1 interfaces. The FP supports multiplexing as follows:
	• For SDH: STM-1, AUG, AU-4, VC-4, TUG-3, TUG-2, TU-12, VC-12, C-12, and E12
	• For SONET: OC-3, STS-1, VT1.5, and DS1
	The two STM-1/OC-3 TDM ports support intercard Laps only, however, you can have Laps protected and unprotected ports on the same FP. Either port can be provisioned to carry channelized traffic in an unprotected mode. Support for line protection requires that the FPs are provisioned in slots 2 to 15. A filler card, NTHR64CA, must be used in all empty slots. Line protection pairing for ports is 0 to 0 and 1 to 1 on the two FPs. The following protection schemes are supported for the FP:
	• SDH protection: Linear 1+1 Uni/Bi-directional, revertive/non-revertive, and inter (dual) card MSP
	• SONET protection: Linear 1+1 Uni/Bi-directional, revertive/non-revertive, and inter (dual) card line APS
	If the optical TDM ports of the 2pVSP4e are 1:1 paired,
	• both ports can be active at the same time (corresponding protected on the other card)
	• one port can be active at any time (corresponding protected on the other card) and one port can be protection (corresponding active on the other card)
	• both can be protection (corresponding active on the other card)
	Configuring the Virtual Router (VR) is required for IP Connectivity to the 4 port Gigabit Ethernet cards for bearer path and control path (VoIP). The VR supports all 4032 calls in a connection model where no calls are hairpinned on the same FP.
	(6 of 6)

Settings for PModule components

moduleType attribute setting	PModule components 3 VPM version	PModule components 6 VPM version	PModule components 9 VPM version
none	1, 2, 7 to 12	1, 2, 10 to 12	1, 2
spm	3	3	3
vpm	4 to 6	4 to 9	4 to 12

Voice server processor supported features

The table below contains information on the features supported by each VSP.

For the applications and services that are supported by these VSPs, see

VSP supported features

VSP type	Supported features
VSP	The VSP supports Media Gateway services for Nortel Multiservice Switch 7400 nodes. It is a 2-slot FP that may also be referred to as the ATM Voice Services FP. The VSP transports bearer traffic using AAL2. Transport media for signaling traffic depends on the type of voice gateway service.
VSP2	The VSP2 supports Media Gateway services on Nortel Multiservice Switch 7400, Multiservice Switch 15000, and Multiservice Switch 20000 nodes. The VSP2 is a 2-slot FP on Multiservice Switch 7400, but is only a single slot FP on Multiservice Switch 15000 and Multiservice Switch 20000 nodes
	For switched voice over ATM, the VSP2 provides voice and voice band data processing functionality between an ATM and a TDM data path. For switched voice over IP, the VSP2 provides connections between a TDM network and an IP network.
	For switched VoATM (*VgsAtm* and *VgsAtmG729* feature packages), the VSP2 FP transports bearer traffic using AAL2. The transport media for signaling traffic in VoATM depends on the type of voice gateway service.
	For VoIp (*VgsIp* and *VgsIpG729* feature packages), the VSP2 FP transports bearer traffic using AAL5 unless virtual router (VR) is used. Transport media for signaling traffic depends on the type of voice gateway service.
	virtual router (VR) interworking using an VR access point (AP) for switched Media Gateway using IP (VoIP) on Multiservice Switch 15000 nodes
	one or two VRs on a single VSP2 FP card

(1 of 8)

VSP supported features (continued)

VSP type	Supported features
	hardware-assisted IP forwarding
	interworking with ATM IP FP cards
	hot equipment protection (HEP) on Multiservice Switch 15000 and Multiservice Switch 20000 Media Gateway shelf using a 1:1 sparing configuration of the VSP2 FP. In a 1:1 sparing configuration: - one card is active and the other card is standby
	hitless software migration (HSM) and hot equipment protection (HEP) on Multiservice Switch 15000 Media Gateway shelf when used with the 4-port OC-3/STM-1Ch TDM/CES FP (software description of *4pOC3ChSmIr*) and ATM FPs that are carrier grade compliant
	H.248 version 1.0 protocol for connection control between the Media Gateway and the media gateway controller (MGC)
	interworking with the 4-port gigabit Ethernet FP card (4pGe, NTHW49)
	VSP HEP when used with VR access point (VrAp) and the 4-port gigabit Ethernet FP card (4pGe, NTHW49
	use of the *ping* command to another IP address from MG components *Nsta/x Vgs Ctrl/mg* and *Nsta/x Vgs Ctrl/sg*
	VSP2 supports originating and terminating continuity test (COT) tones on 4-wire circuits
VSP3	The VSP3 supports switched Media Gateway services for Nortel Multiservice Switch 15000 and Multiservice Switch 20000 nodes. It is a single slot FP.
	The VSP3 FP supports voice processing (voice, voice band data (VBD), and facsimile/modem) and call control processing. For switched voice services, the VSP3 provides connections between a TDM network and a packet network.
	switched Media Gateway voice services such as pulse code modulation (PCM) voice, echo cancellation, and silence suppression
	dual tone multifrequency (DTMF) relay for switched Media Gateway using IP functionality
	fax relay via ITU-T recommendation T.38 for switched Media Gateway using IP functionality
	voice band data (VBD) terminals for switched Media Gateway using IP functionality
	virtual router (VR) interworking using an VR access point (AP) for switched Media Gateway using IP (VoIP) on Multiservice Switch 15000 nodes
	supports all existing VSP2 switched VoAAL2 features
(2 of 8)	

VSP supported features (continued)

VSP type	Supported features
	support of state change signaling in accordance with ITU-T recommendation I.366.2
	voice-band connection admission control (VCAC)
	128 ms echo cancellation
	DTMF Relay support as per I.366.2 Annex K
	one or two VRs on a single VSP3 FP card
	hardware-assisted IP forwarding
	interworking with ATM IP FP cards
	hot equipment protection (HEP) on Multiservice Switch 15000 Media Gateway shelf using a 1:1 sparing configuration of the VSP3 FP
	hitless software migration (HSM) and hot equipment protection (HEP) on Multiservice Switch 15000 Media Gateway shelf when used with the 4-port OC-3/STM-1Ch TDM/CES FP (software description of *4pOC3ChSmIr*) and ATM FP that are carrier grade compliant
	ASPEN version 2.1 protocol or H.248 version 1.0 protocol for connection control between the Media Gateway and the MGC
	interworking with the 4-port gigabit Ethernet FP card (4pGe, NTHW49)
	VSP HEP when used with VR access point (VrAp) and the 4-port gigabit Ethernet FP card (4pGe, NTHW49)
	5 and 30-Minute performance measurement
	use of the *ping* command to another IP address from MG components *Nsta/x Vgs Ctrl/mg*, *Nsta/x Vgs Ctrl/sg*, *Nsta/x Vgs IpMConn*, and *Nsta/x Vgs DbgAccess*
	VSP3 supports originating and terminating continuity test (COT tones on 4-wire circuits
	VSP3 when used with the 4-port OC-3/STM-1 Ch TDM/CES FP card supports originating and terminating COT tones on 2-wire circuits based on the ANSI T1.113.4 Annex B.2 standard and the ANSI T1.113.4 Annex B.3 standard (ANSI T1.113 Annex B.3 can be used as transmit low receive high (TLRH) or transmit high receive low (THRL) configurations)
(3 of 8)	

VSP supported features (continued)

VSP type	Supported features
	The following text telephony terminals are supported on the VSP3 FP for Media Gateway using switched ATM or IP functionality when the peer gateway supports the G.711 voice compression. Media Gateway processes the call as voice band data (VBD).
	• V.18 text telephones
	• V.21 text telephones
	• Bell 103 text telephones
	• DTMF text telephones
	Baudot and European deaf telephone (EDT) text telephony terminals are also supported on the VSP3 FP for Media Gateway using IP functionality when the peer gateway supports the G.711U voice compression and if the current voice codec is not G.711U voice compression. Calls are processed as voice band data (VBD) for these conditions. If these conditions are not present, Media Gateway processes the call as a voice call.
	V.23 text telephony terminals are not fully supported on the VSP3 FP for Media Gateway using IP functionality.
VSP3-o	The VSP3-o FP supports switched Media Gateway (MG) services for Nortel Multiservice Switch 15000 and Multiservice Switch 20000 nodes. Non-switched MG services are not supported. The VSP3-o FP is not supported on Multiservice Switch 7400 nodes. The VSP3-o FP is a single slot FP.
	The VSP3-o FP supports switched Media Gateway (MG) configured as a local host in a dual homed dual router configuration.
	The VSP3-o FP supports voice processing (voice, voice band data (VBD), and facsimile/modem) and call control processing. For switched voice services, the VSP3-o provides connections between a TDM network and a packet network.
	Only one of the two OC-3/STM-1 optical TDM ports (ports 0 and 1) on the faceplate of the VSP3-o FP card is supported. Port 0 is the supported port. This optical port 0 of the VSP3-o FP behaves the same as the 4-port OC-3/STM-1Ch TDM/CES FP card (configured as a TDM card for Media Gateway) except where noted in this chapter.
(4 of 8)	

VSP supported features (continued)

VSP type	Supported features
	For VoIP (*VgsIp* feature package), the VSP3-o FP card can use virtual router (VR) interworking functionality by provisioning component *VrAp*. The VR interworking functionality supports the routing of traffic from a VSP3-o FP card to an Internet Protocol (IP) network through an ATM FP card and/or a 4-port gigabit Ethernet FP card that is on the same Multiservice Switch shelf as the VSP3-o FP card. If VR interworking functionality is not used, the VSP3-o FP card only needs an ATM FP card in the same Multiservice Switch shelf. When VR interworking functionality is not provisioned, the following connections are supported by the VSP3-o FP card: • soft permanent virtual circuits (SPVC) connections by provisioning component *SpvcAp* • endpoint-provisioned switched virtual circuits (SVC) connections by provisioning components *Aap* or *Pap* For VoATM (*VgsAtm* feature package), the following media path connections are supported by the VSP3-o FP card: • SPVC connections by provisioning component *SpvcAp* • endpoint-provisioned SVC connections by provisioning components *Aap* or *Pap* • dynamic SVC connections by provisioning component *Aal2SvcService* switched MG using IP functionality and switched MG using ATM functionality V 5.2 backhaul on the VSP3-o is managed differently than on the VSP2 and VSP3 FPs. It is realized as V5.2 over SCTP backhaul on VSP2, VSP3, and VSP3-o. The provisioning of V5UA over SCTP is different on the VSP3-o but the service is the same (V5UA over SCTP). TDM components with a different hierarchy have been developed to align with existing components that reside on the VSP3-o FP. The existing TDM components still function but they only apply to the VSP2 and VSP3 FPs. V5.2 support on VSP3-o is on a STM1 interface and is functionally equivalent to V5.2 protocol support on VSP3. Up to 1890 V5.2 interface ports are supported on the VSP3-o STM1 interface. non-switched MG is not supported switched MG voice services such as pulse code modulation (PCM), G.711 call compression, voice, echo cancellation, and silence suppression
	(5 of 8)

VSP supported features (continued)

VSP type	Supported features
	dual tone multifrequency (DTMF) relay for switched MG using IP functionality per document RFC 2833 of the Internet Engineering Task Force (IETF)
	dual tone multifrequency (DTMF) relay for switched MG using ATM functionality (VoAAL2)
	tone generation for the TDM side (packet-side tone generation is not supported)
	continuity testing with the public switched telephone network (PSTN)
	fax relay via ITU-T recommendation T.38 for switched MG using IP functionality (fax relay is not supported for switched VoAAL2)
	per-trunk signaling (PTS)
	channel associated signaling (CAS)
	timeslot relay (exception: timeslot relay is not supported for trunks that are PTS provisioned)
	voice band data (VBD) terminals for switched MG using ATM or IP functionality
	call compression per G.711U, G.726ITU, and G.729 annex A and B standards
	128 ms echo cancellation
	voice activity detector (VAD)
	G.711 packet loss concealment (PLC)
	DTMF Relay support as per I.366.2 Annex K
	text telephony terminals for switched MG using ATM or IP functionality
	virtual router (VR) interworking using component *VirtualRouterAccessPoint (VrAp)* for the bearer path and control path in switched MG using IP functionality on Multiservice Switch 15000 and Multiservice Switch 20000 nodes
	VR interworking using component *VirtualRouterAccessPoint (VrAp)* for the control path in switched MG using ATM functionality (VoAAL2) on Multiservice Switch 15000 and Multiservice Switch 20000 nodes
	interworking with VSP2 FP and VSP3 FP cards on Multiservice Switch 15000 and Multiservice Switch 20000 nodes
	primary rate interface (PRI) backhaul
	supports all existing switched VoAAL2 features of the VSP/VSP2/VSP3 FPs
(6 of 8)	

VSP supported features (continued)

VSP type	Supported features
	support of state change signaling in accordance with ITU-T recommendation I.366.2
	supports one or two VRs on a single VSP3-o FP card
	hardware-assisted IP forwarding
	interworking with ATM FP cards
	adjacent card automatic protection configuration (note: the lower slot number of the adjacent VSP3-o FP cards must be an even number)
	H.248 version 1.0 protocol for connection control between the Media Gateway (MG) and the Media Gateway Controller (MGC)
	support for Internet Protocol security (IPSec) for switched Media Gateway call control connections using the H.248 protocol between a Media Gateway (MG) and Media Gateway Controller (MGC)
	hot equipment protection (HEP) on a Multiservice Switch 15000 or Multiservice Switch 20000 Media Gateway shelf using a 1 + 1 sparing configuration for the TDM ports and using dual LP equipment protection (DLEP) sparing through the *Vsp* subcomponent of component *DualLpEquipmenyProtection (Dlep)*
	hitless software migration (HSM) and hot equipment protection (HEP) on the Multiservice Switch 15000 or Multiservice Switch 20000 Media Gateway shelf when used with ATM FP cards that are carrier grade compliant
	supports only one of the two OC-3/STM-1 TDM ports (port 0) on the faceplate of the VSP3-o FP card
	supports all the detection functionality for TDM fault conditions of the 4-port OC-3/STM-1Ch TDM/CES FP
	supports all the TDM data collection system (DCS) alarms that the 4-port OC-3/STM-1Ch TDM/CES FP card also supports
	supports the TDM DCS alarms at virtual container/virtual tributary (VC/VT) levels
	shelf synchronization based on clock signal extracted from the OC-3/STM-1 TDM port (synchronous optical network (SONET) uses clock signals at the OC-3 level and synchronous digital hierarchy (SDH) uses clock signals at the STM-1 level)
	interworking with the 4-port gigabit Ethernet FP card (4pGe, NTHW49)
	VSP HEP when used with VR access point (VrAp) and the 4-port gigabit Ethernet FP card (4pGe, NTHW49)
	5 and 30-Minute performance measurement
(7 of 8)	

VSP supported features (continued)

VSP type	Supported features
	use of the *ping* command to another IP address from MG components *Nsta/x Vgs Ctrl/mg*, *Nsta/x Vgs Ctrl/sg*, and *Nsta/x Vgs IpMConn*
	VSP3-o supports originating and terminating continuity test (COT) tones on 4-wire circuits
	VSP3-o supports originating and terminating COT tones on 2-wire circuits based on the ANSI T1.113.4 Annex B.2 standard and the ANSI T1.113.4 Annex B.3 standard (ANSI T1.113 Annex B.3 can be used as transmit low receive high (TLRH) or as transmit high receive low (THRL) configurations)
	The following text telephony terminals are supported on the VSP3-o FP for Media Gateway using switched ATM or IP functionality when the peer gateway supports the G.711 voice compression. Media Gateway processes the call as voice band data (VBD).
	• V.18 text telephones
	• V.21 text telephones
	• Bell 103 text telephones
	• DTMF text telephones
	Baudot and European deaf telephone (EDT) text telephony terminals are also supported on the VSP3 FP for Media Gateway using IP functionality when the peer gateway supports the G.711U voice compression and if the current voice codec is not G.711U voice compression. Calls are processed as voice band data (VBD) for these conditions. If these conditions are not present, Media Gateway processes the call as a voice call.
	V.23 text telephony terminals are not fully supported on the VSP3-o FP for Media Gateway using IP functionality.
2pVSP4e	The 2 port Voice Services Processor 4 with Optical TDM Interface Functional Processor (FP) offers double the capacity of the Voice Service Processor 3 with Optical TDM Interface (VSP3-o) and can be configured for both wireless and wireline applications.
	The 2pVSP4e supports all VoIP features of the VSP3-o with the exception of V5.2 backhaul and REX.
2pVS	The 2pVS FP can be configured for both wireless and wireline applications that need to accommodate EVRC traffic in Trancoder Free operation (TrFO) mode. The 2pVS can be configured for RTO for Wireline applications.
	The 2pVS FP supports all the VoIP features of the VSP3-o FP except the G726 codec and the MG15000 Periodic Routine Exercise (REX).
	Note that vgsAtm is not supported in 2pVS cards.
(8 of 8)	

Multiservice access function processors

Use information in this section to learn about configuration details for Nortel Multiservice Switch function processors (FPs) that support multiservice access.

Multiservice access function processors and identifying characteristics

FP long name	PEC	Card type	Nortel Multiservice Switch	For more information
32-port DS1 MSA 2-slot FP	NTNQ74 (formerly NTY180)	32pDs1Msa	Multiservice Switch 7400	DS1/E1 MSA function processors (page 191)
32-port DS1 MSA 1-slot FP	NTNQ94AA NTNQ94BA with the new framer for PCR 6.1 or later	32pDs1Msa	Multiservice Switch 7400	DS1/E1 MSA function processors (page 191)
32-port DS1 MSA 2-slot FP with 2-port (protected) OC-3 multimode	NTNQ76 (formerly NTY182)	32pDs1MsaMtp	Multiservice Switch 7400	DS1/E1 MSA function processors (page 191)
32-port DS1 MSA 2-slot FP with 2-port (protected) OC-3 single-mode	NTNQ78 (formerly NTY184)	32pDs1MsaStp	Multiservice Switch 7400	DS1/E1 MSA function processors (page 191)
8-port DS1 MSA FP	NTNQ61	8pDs1Msa	Multiservice Switch 7400	DS1/E1 MSA function processors (page 191)
32-port E1 MSA 2-slot FP	NTNQ69 (formerly NTJS80)	32pE1Msa	Multiservice Switch 7400	DS1/E1 MSA function processors (page 191)
(1 of 2)				

Multiservice access function processors and identifying characteristics (continued)

FP long name	PEC	Card type	Nortel Multiservice Switch	For more information
32-port E1 MSA 1-slot FP	NTNQ93AA NTNQ93BA with the new framer for PCR 6.1 and later	32pE1Msa	Multiservice Switch 7400	DS1/E1 MSA function processors (page 191)
32-port E1 MSA 2-slot FP with 2-port (protected) STM-1 multimode	NTNQ71 (formerly NTJS82)	32pE1MsaMtp	Multiservice Switch 7400	DS1/E1 MSA function processors (page 191)
32-port E1 MSA 2-slot FP with 2-port (protected) STM-1 single-mode	NTNQ73 (formerly NTJS84)	32pE1MsaStp	Multiservice Switch 7400	DS1/E1 MSA function processors (page 191)
8-port E1 MSA FP	NTNQ60	8pE1Msa	Multiservice Switch 7400	DS1/E1 MSA function processors (page 191)
2-port STM-1 electrical channelized CES/ATM/IMA	NTNQ91	2pSTM1eCh	Multiservice Switch 7400	STM-1 CES/ATM/IMA function processors (page 199)
STM-1 optical channelized CES/ATM/IMA FP	NTNQ96	2pSTM1Ch	Multiservice Switch 7400	STM-1 CES/ATM/IMA function processors (page 199)
(2 of 2)				

DS1/E1 MSA function processors

This section contains information on DS1/E1 MSA function processors.

Navigation

DS1/E1 MSA function processor specifications

The table below contains the configuration parameters, characteristics, and specifications of DS1/E1 MSA FPs.

DS1/E1 MSA function processor specifications

	32-port DS1 MSA	32-port E1 MSA	8-port DS1 MSA	8-port E1 MSA
adaptive clocking	supported		supported	
Card slot (for 2-slot FPs with 1 CP)	1 to 14 in a 16-slot Multiservice Switch 7480 1 to 6 in an 8-slot Multiservice Switch 7460 1 to 3 in a 5-slot Multiservice Switch 7440 1 in a 3-slot Multiservice Switch 7420		n/a	
Card slot (for 2-slot FPs with 2 CPs)	1 to 13 in a 16-slot Multiservice Switch 7480 1 to 5 in an 8-slot Multiservice Switch 7460 1 or 2 in a 5-slot Multiservice Switch 7440		n/a	
Card slot (for 1-slot FPs with 1 CP)	1 to 15 in a 16-slot Multiservice Switch 7480 1 to 7 in an 8-slot Multiservice Switch 7460 1 to 4 in a 5-slot Multiservice Switch 7440 1 or 2 in a 3-slot Multiservice Switch 7420		1 to 15 in a 16-slot Multiservice Switch 7480 1 to 7 in an 8-slot Multiservice Switch 7460 1 to 4 in a 5-slot Multiservice Switch 7440 1 or 2 in a 3-slot Multiservice Switch 7420	
(1 of 3)				

DS1/E1 MSA function processor specifications (continued)

	32-port DS1 MSA	32-port E1 MSA	8-port DS1 MSA	8-port E1 MSA
Card slot (for 1-slot FPs with 2 CPs)	1 to 14 in a 16-slot Multiservice Switch 7480 1 to 6 in an 8-slot Multiservice Switch 7460 1 to 3 in a 5-slot Multiservice Switch 7440		1 to 14 in a 16-slot Multiservice Switch 7480 1 to 6 in an 8-slotMultiservice Switch 7460 1 to 3 in a 5-slot Multiservice Switch 7440 **Attention:** A 3-slot Multiservice Switch 7420 does not support using 2 CPs.	
port types	DS1, and OC-3 on NTNQ76 or NTNQ78	E1, and STM-1 on NTNQ71 or NTNQ72	DS1	E1
port numbers	0 to 31 for DS1, 0 and 1 for OC-3	0 to 31	0 to 7	
channel numbers	0 to 23 or 1 to 24	0 to 30 or 1 to 31	0 to 23	0 to 30
FP technologies	PPC, AQM1.1, PQC2.0		155.52 Mbps	2.048 Mbps
clocking source for DS1/E1 ports	local, line, module, srts, and adaptive; board-level for the transmit clocks		local, line, module, srts, and adaptive; board-level for the transmit clocks	
clocking source for OC-3/STM-1 ports	line, local, module		n/a	
integrated OC-3 line speed	155.52 Mbps	2.048 Mbps	n/a	
line speed	1.544 Mbps	2.048 Mbps	1.544 Mbps	2.048 Mbps
minimum software level required	PCR 1.2.8 PCR 6.1 for NTNQ94BA		PCR 7.1	
network clock synchronization	supported		supported	
optical port maximum line speed	155.52 Mbps	2.048 Mbps	n/a	
port configuration for DS1/E1 ports	fractional link or clear channel (non-channelized) mode		fractional link or clear channel (non-channelized) mode	
(2 of 3)				

DS1/E1 MSA function processor specifications (continued)

	32-port DS1 MSA	32-port E1 MSA	8-port DS1 MSA	8-port E1 MSA
port configuration for OC-3/STM-1 ports	B-ISDN	B-ISDN	n/a	
processor memory	128 Mbyte		128 Mbyte	
Single bit HEC error correction	user-enabled, user-disabled (default is user-disabled)		user-enabled, user-disabled (default is user-disabled)	
sparing supported	• one-for-n cold equipment sparing, where n is one to six depending on the type of sparing panel (the limitations by panel are indicated in the section on MSA32 termination panels in *Nortel Multiservice Switch 7400 Fundamentals – Hardware* (NN10600-170)) • one-for-n sparing behavior enhancement		• one-for-n cold equipment sparing, where n is one to six depending on the type of sparing panel (the limitations by panel are indicated in the section on MSA32 and MSA8 termination panels in NN10600-170 Nortel Multiservice Switch 7400 Hardware Description) • one-for-n sparing behavior enhancement	
SRTS clocking	supported		supported	
synchronization status messages (SSM)	supported (optical port only)	supported (optical port only) transmission supported (processing supported on optical port only)		
timeslots	1 to 24	1 to 31	1 to 24	1 to 31
(3 of 3)				

DS1/E1 MSA FP hardware information

The table below contains important information regarding the vintages of certain DS1/E1 MSA FPs. For a full list of PECs (including vintages) for supported FPs, see *Nortel Multiservice Switch Release Notes*.

DS1/E1 MSA FP hardware information

DS1/E1 MSA function processor type	Hardware details
All DS1/E1 MSA FPs	The 32-port DS1 MSA FP or 32-port E1 MSA FP interworks with only CP2 control processors (or later types of CPs) in the same shelf assembly.
	When a Multiservice Switch 7480 has 14 DS1/E1 1-slot FPs, the maximum number of DS1/E1 ports is 448 (14 cards with 32 ports each), which is twice as many if the shelf had 7 DS1/E1 2-slot FPs. To accommodate the 14 cards, the connection space required by the FPs must not exceed the connection space that is supported by the available CP2 memory or by the total number of DLCIs in the shelf. The total number of DLCIs can be 24000.
32-port DS1 MSA	The 1-slot NTNQ94AA FPs and the 2-slot NTNQ74 FPs can replace each other or be deployed in the same sparing configuration. The NTNQ94BA cannot be used with FPs running software prior to PCR 6.1. The BA version operates with PCR 6.1 or later because of its different framer version.
32-port E1 MSA	The 1-slot NTNQ93AA FPs and the 2-slot NTNQ69 FPs can replace each other or be deployed in the same sparing configuration. The NTNQ93BA cannot be used with FPs running software prior to PCR 6.1. The BA version operates with PCR 6.1 or later because of its different framer version.
8-port DS1 MSA	An 8-port DS1 MSA8 NTNQ61 FP can replace an equivalent 8-port DS1 MSA8 FP. See *Nortel Multiservice Switch 7400 Installation, Maintenance, and Upgrade – Hardware* (NN10600-175) for replacement procedures.
	The NTNQ61 provides 1-for-N equipment sparing (N = 6 maximum) with other MSA8 FPs. Sparing MSA8 FPs with 32-port MSA FPs is not supported.
8-port E1 MSA	An 8-port E1 MSA8 NTNQ60 FP can replace an equivalent 8-port E1 MSA8 FP. See *Nortel Multiservice Switch 7400 Installation, Maintenance, and Upgrade – Hardware* (NN10600-175) for replacement procedures.
	An 8-port E1 MSA8 NTNQ60 FP can replace an equivalent 8-port DS1 MSA8 FP. See *Nortel Multiservice Switch 7400 Installation, Maintenance, and Upgrade – Hardware* (NN10600-175) for replacement procedures.

DS1/E1 MSA FP configuration considerations

The table below contains configuration considerations for DS1/E1 MSA FPs.

DS1/E1 MSA FP configuration considerations

DS1/E1 MSA function processor type	Configuration considerations
All DS1/E1 MSA FPs	For PQC2.0-based FPs, you must have a minimum software load of CA02S8A before installing the FP. Inserting the FP into a system running an earlier load will damage the FP, requiring it to be returned to Nortel Networks for repair.
	Each of the 32 DS1/E1 ports can be used channelized or unchannelized.
	Only ports 0 to 29 can be used for ATM UNI. IMA can use all 32 ports, but ports 30 and 31 can only be used in a group that also contains at least one of the ports 0 to 29. All 32 ports can be used for non-ATM services (for example, CES or FR).
	Traffic shaping is supported if the total number of timeslots selected is 7 or more.
	Setting the *ifAdminStatus* attribute under port or channel is not supported.
	Up to 15 DS1/E1 MSA 1-slot FPs can be configured in a Multiservice Switch 7480. It is recommended that no more than 8 active or Main MSA32 FPs (with the attribute mainCard under the component Lp) occupy the same shelf. The total of 8 excludes any spare FPs (with the attribute spareCard).
	• Deploying more than 8 active MSA32 FPs risks affecting the shelf's capability to provide MSA services. The amount of risk and the extent of impact depends on the engineering limitations imposed by any Multiservice Switch 7400 node. Calculate the total bandwidth of all active ports to ensure that the backplane capacity is not exceeded.
	• Accounting of services is available for only the first 8 MSA32 1-slot FPs in sequence from slot 1 (as opposed to the sequence of the CP becoming aware of the FPs or the position of a spare in a group).
	• Nortel Multiservice Data Manager (MDM) cannot handle receiving many alarms and accounting data simultaneously from more than 8 MSA32 FPs in the shelf.
	The combinations of 1-slot and 2-slot FPs for sparing configurations are listed in the section on MSA32 DS1 or E1 termination panels in *Nortel Multiservice Switch 7400 Fundamentals – Hardware* (NN10600-170).
	Nortel Multiservice Data Manager (MDM) version 14.3 displays both the 1-slot and 2-slot versions of the DS1/E1 FPs.
32-port DS1 MSA	When you add a port, the system automatically creates a Channel 0 component.
	(1 of 3)

196 -

access function processors

DS1/E1 MSA FP configuration considerations (continued)

DS1/E1 MSA function processor type	Configuration considerations
	For unstructured services, you must provision all timeslots. For Fractional ATM interfaces, use any combination of timeslots numbered from 1 to 24.
	You can use port type OC-3 only if the FP has the two integrated OC-3 ports.
	The 2-slot MSA32 FP can be plugged into any pair of adjacent slots except slot 0 (zero), which must be occupied by a CP; a second CP would require slot 15 in a Multiservice Switch 7480. When configuring a 2-slot FP, only set the *cardtype* attribute of the lowest slot number of the pair.
	When replacing a 2-slot FP (for example, NTNQ74) with a 1-slot FP (NTNQ94), configure the lower slot number and decommission the higher slot number in preparation for another FP. This method is supported by the FP maintenance procedures in *Nortel Multiservice Switch 7400 Installation, Maintenance, and Upgrade – Hardware* (NN10600-175).
32-port E1 MSA	For unstructured services, you must provision all timeslots.
	For unstructured CES, all 32 timeslots are available. For structured CES, HDLC and ATM services timeslot 0 is used for framing and cannot be used for data. If channel-associated signaling (CAS) is in use, only 30 channels are available, as CAS uses timeslot 16.
	For Fractional ATM interfaces, any combination of up to 30 timeslots numbered from 1 to 31 can be used. The only exception is with a CAS line type; in this instance, timeslot 16 (the E1 signaling channel) cannot be used.
	You can use port type STM-1 only if the FP has the two integrated STM-1 ports.
	The 2-slot card can occupy any pair of adjacent slots except slot 0 (zero), which must be occupied by a CP; a second CP would require slot 15 in a Multiservice Switch 7480. When configuring a 2-slot FP, only set the *cardtype* attribute of the lowest slot number of the pair.
	When replacing a 2-slot FP (for example, NTNQ69) with a 1-slot FP (NTNQ93), configure the lower slot number and decommission the higher slot number in preparation for another FP. This method is supported by the FP maintenance procedures in *Nortel Multiservice Switch 7400 Installation, Maintenance, and Upgrade – Hardware* (NN10600-175).
8-port DS1 MSA	You must have a minimum software load of PCR 7.1 before installing the 8-port DS1 MSA FP. If you insert the FP into a system running an earlier load, the FP will not boot up.

(2 of 3)

Nortel Multiservice Switch 7400/15000/20000
Fundamentals – FP Reference
NN10600-551   7.2S3   Standard
PCR 7.2   October 2006

© 2006, Nortel Networks

Nortel Confidential

DS1/E1 MSA FP configuration considerations (continued)

DS1/E1 MSA function processor type	Configuration considerations
	The 8-port DS1 MSA FP interworks with only CP2 control processors (or later types of CPs) in the same shelf assembly.
	Each of the 8 DS1 ports can be used channelized or unchannelized.
	When you add a port, the system automatically creates a *Channel* 0 component.
	For unstructured CES, you must provision all timeslots. For Fractional ATM interfaces, use any combination of timeslots numbered from 1 to 24.
	Setting the *ifAdminStatus* attribute under port or channel is not supported.
	In a sparing configuration, a DS1 MSA8 FP can only replace another DS1 MSA8 FP of the same vintage.
8-port E1 MSA	You must have a minimum software load of PCR 7.1 before installing the 8-port E1 MSA FP. If you insert the FP into a system running an earlier load, the FP will not boot up.
	The 8-port E1 MSA FP interworks with only CP2 control processors (or later types of CPs) in the same shelf assembly.
	Each of the 8 E1 ports can be used channelized or unchannelized.
	When you add a port, the system automatically creates a *Channel* 0 component.
	For unstructured services, you must provision all timeslots. For unstructured CES, all 8 timeslots are available. For structured CES, HDLC and ATM services timeslot 0 is used for framing and cannot be used for data.
	Traffic shaping is supported if the total number of timeslots selected is 7 or more.
	Setting the *ifAdminStatus* attribute under port or channel is not supported.
	In a sparing configuration, an E1 MSA8 FP can only replace another E1 MSA8 FP of the same vintage.
(3 of 3)	

DS1/E1 MSA FP supported features

DS1/E1 Multiservice Access FPs support many services including:

- Frame Relay, Frame Relay/ATM Interworking (FRATM), FR-ISDN dialup
- AAL1 CES
- ATM

- IP encapsulation over ATM (RFC 2684), Frame Relay (RFC 2427), PPP (RFC 1661), and ML-PPP (RFC 1990)

- IP packet forwarding in hardware, access to Multiservice Switch virtual routers (VRs)

- Flat VR, RFC2764 IP-VPN, RFC2547 IP-VPN

- up to 250 virtual framers per FP

- PPP/ATM interworking (pppIwf)

- Fractional ATM, allowing an ATM interface to share a port with other services (only one ATM interface can be configured per port)

- ATM traffic management features including traffic shaping, fair queuing, partial packet discard (PPD), late packet discard (LPD), early packet discard (EPD) and weighted random early discard (WRED)

For a detailed view of the applications and services supported on MSA32 and MSA8 FPs, refer to Applications and services supported by function processors (page 12)

Many combinations of these services can be run simultaneously on different ports of the same card. For channelized ports, different services can even be run on different channels of the same DS1/E1 port. Services that can be channelized include Frame Relay, FRATM, IP over Frame Relay, IP over PPP, PPP/ATM Interworking, and Fractional ATM. Refer to the MSA32 Engineering Guidelines for mixing limitations for some combinations.

STM-1 CES/ATM/IMA function processors

This section contains information on STM-1 CES/ATM/IMA function processors.

Navigation

STM-1 CES/ATM/IMA function FP specifications

The following table contains the configuration parameters, characteristics, and specifications of STM-1 CES/ATM/IMA FPs.

STM-1 CES/ATM/IMA FP specifications

	2-port STM-1e Ch CES/ATM/IMA	2-port STM-1 Ch CES/ATM/IMA
card type	2pSTM1eCh	2pSTM1Ch
port type	Sdh	Sdh
port number	0, 1	0, 1
FP technologies	PPC, AQM1.1, PQC2.0	PPC, AQM1.1, PQC2.0
memory (normal)	256 Mbyte	256 Mbyte
line speed	155.52 Mbps	155.52 Mbps
access mode	STM-1e channelized to E1	STM-1 optical channelized to E1
clocking	local, module	local, module
effective data rate	121 Mbps	121 Mbps
minimum software level required	PCR5.2	PCR7.1
network clock synchronization supported	yes	yes
port configuration	B-ISDN	B-ISDN
synchronization status messages supported	yes	yes

STM-1 CES/ATM/IMA FP configuration considerations

The table below contains configuration considerations for STM-1 CES/ATM/IMA FPs.

STM-1 CES/ATM/IMA FP configuration considerations

STM-1 CES/ATM/IMA function processor type	Configuration considerations
2-port STM-1e Ch CES/ATM/IMA	For this FP, you must link the port to an ATM, CES, or IMA interface before they can provide any service. For more information, see the section on provisioning the AtmInterface component in *Nortel Multiservice Switch 7400/15000/20000 Configuration – ATM* (NN10600-710). When you add an SDH port, the system automatically creates a Vc4 subcomponent. Up to 57 ATMIFs can be configured per port. The ATMIF cannot be used on E1 57 to 62 (or k=3, l = 2 to 7, and m=3). The 2-slot 2-port STM-1e Channelized FP can be plugged into any pair of adjacent slots except slot 0 (zero), which must be occupied by a CP; a second CP would require slot 15 in a Multiservice Switch 7480. When configuring a 2-slot FP, only set the *cardtype* attribute of the lowest slot number of the pair. Up to seven 2-port STM-1e Channelized FPs can be configured in a Multiservice Switch 7480. It is recommended that no more than two active or Main FPs (with the attribute mainCard under the component Lp) occupy the same shelf assembly. The total of two excludes any spare FPs (with the attribute spareCard). **Attention:** Deploying more than two active 2-port STM-1e Channelized FPs risks affecting the shelf's capability to provide services. The amount of risk and the extent of impact depends on the engineering limitations imposed by any Multiservice Switch 7400 node. Calculate the total bandwidth of all active ports to ensure that the backplane capacity is not exceeded. The version of field programmable gate arrays (FPGAs) in the FP must match the version in the software, so an automatic check occurs whenever the CP is reloaded or the FP is reset. If a higher FPGA version is found, the FP automatically downloads it to its flash memory. It is normal for the download to take up to 15 minutes per card. The download can occur concurrently on other STM-1e Channelized FPs within the same shelf assembly, but start times and endings may vary slightly.
(1 of 5)	

STM-1 CES/ATM/IMA FP configuration considerations (continued)

STM-1 CES/ATM/IMA function processor type	Configuration considerations
2-port STM-1 Ch CES/ATM/ IMA	This FP provides access and CES/ATM/IMA multi-service for up to 63 E1 circuits per STM-1 port.
	Line protection is provided between ports with the same instance numbers of adjacent FPs connected with the cross-connect cable (for example, port 0 of one FP protects port 0 of the other FP).
	Line and equipment protection is provided using the *Laps* component (APS/MSP protocol).
	For this FP, there is an one to one relationship between the Card and *Lp* components.
	This FP can have two instances of the *Sdh* component, one for each STM-1 interface. The *Sdh* instance can only be 0 and 1.
	The value line cannot be set for the *Sdh clockingSource* attribute.
	This FP can have two instances of the *OpticalModule* (*Om*) component, one for each STM-1 interface. The *Om* attribute type has to be provisioned, and can only be OC3SmLr, OC3SmIr or OC3MmSr.
	If the *cardType* is specified at the time the *Sdh* component is added, then the *Om* component is added automatically under the *Sdh* component. There can be only one *Om* component under the *Sdh* component.
	This FP can have two instances of the *Vc4* component, one for each STM-1 interface. The *Vc4* component has to be added manually, since it can be either under the *Sdh* component or under the *Laps* component. If under the *Sdh* component, there is only one *Vc4* component, with *concatNumber* equal to 1.
	The *Vc4 customerIdentifier* attribute needs to have the same value as its parent (*Sdh* or *Laps*).
	The *Vc12 customerIdentifier* attribute needs to have the same value as its parent (*Vc4*).
	The *Vc4* component must have at least one *Vc12* subcomponent.
	When the *Vc12* component is added, the *E1* component and the *Chan* component with all timeslots are automatically added as well. All timeslots are put under *Chan*/0 for all supported services.
	If the *Vc12 IfIndex* attribute changes the link to the *Aal1Ces* service is marked as critical.
	The *E1* component supports only ccs and unframed values for the *lineType* attribute: The ccs value is used for ATM and IMA, The unframed value is used for unstructured CES
(2 of 5)	

STM-1 CES/ATM/IMA FP configuration considerations (continued)

STM-1 CES/ATM/IMA function processor type	Configuration considerations
	An *E1* component bound to an *AtmIf* application cannot have the same k, l, m instance as an *Ima* component instance under the same *Lp*.
	The *E1 clockingSource* attribute must be the same as the one for *Sdh*.
	The *E1* port cannot be used as an NS reference source.
	The *E1 customerIdentifier* attribute needs to have the same value as its parent (*Vc12*).
	The *Chan* timeslots attribute needs to have all timeslots except 16 provisioned when used in ATM applications.
	The *Chan customerIdentifier* attribute needs to have the same value as its parent (*E1*).
	Set the default values for the system supplied attributes: *linkSelectionCriterion* = maxBandwidth *protocol* = atmForum11 *linkRetryTimeout* = 10
	Links in *Ima*/0..56 should interface with the *E1 Chan* on *Sdh*/0, and links in *Ima*/57..113 should interface with *E1 Chan* on *Sdh*/1.
	If *Ima* has links into an *Sdh* port then that port needs to have the clockingSource set to module.
	The *Test* component controls the diagnostics capabilities on physical interfaces. On the 2pSTM1Ch, each port can have one instance under the *Sdh* component and 63 instances under *E1* components (each *E1* component has its own *Test* component.)
	The *Laps* component provides the line and equipment protection capabilities. There can be two instances for a pair of protected 2pSTM1Chs.
	The *CrossConnect* (*Xc*) component monitors the sanity of the cross-connect cable between the mate 2pSTM1Chs. It is created automatically when the Laps component is added.
	This FP supports up to 114 IMA groups, 57 per STM-1 port. The maximum number of links per IMA group is 32. The minimum number of links per group is 1. If you decide to have 114 groups with one link each, there will be 12 E1 links not utilized by IMA and ATM.
	In order to avoid having non-utilized E1 links in a mixed ATM/IMA service configuration:
	• Provision ATM links before IMA groups. This prevents using an IMA group number that will be used as an independent ATM link
	(3 of 5)

STM-1 CES/ATM/IMA FP configuration considerations (continued)

STM-1 CES/ATM/IMA function processor type	Configuration considerations
	• Assign a number to the IMA group which equal to one of its E1 links on port 0 and equal to E1+57 on port 1
	In an ATM and IMA mixed configuration, since ATM and IMA share the same internal hardware devices, there is a restriction on the IMA group numbers and the independent E1 linked to an ATMIF. For Port 0, the IMA group number should be less or equal to 56, and the IMA group number should be different than an independent ATMIF E1 number. For Port 1, the IMA group number should be greater than 56 and less than or equal to 113, and the IMA group number should be different than an independent ATMIF E1 number. These restrictions are enforced by semantic checks during provisioning.
	This FP supports up to 114 ATMIFs, 57 per STM-1 port. An ATMIF can be provisioned on any E1 link on an STM-1 port except for E1 links corresponding to k=3, l=2 to 7 and m=3. The E1 link number uses the *Vc12* component indices k, l, m and is calculated using the following formula: $E1=(k-1)*21+(l-1)+(m-1)*7$.
	The 126 E1 links per FP are distributed across four ATM Queue Manager devices (AQM) for the ATM, IMA, and CES.
	For the ATM service (independent ATMIFs):
	• SDH/0 E1 link number 0-29: AQM/0, E1 link number 30-56: AQM/1
	• SDH/1 E1 link number 0-29: AQM/2, E1 link number 30-56: AQM/3
	The E1 link number is calculated using the following formula: link number=$(k-1)*21+(l-1)+(m-1)*7$ where k,l,m are the VC12 component indexes.
	For the IMA service, an entire IMA group maps to one AQM port depending on its IMA group instance number:
	• IMA/0-29: AQM/0
	• IMA/30-56: AQM/1
	• IMA/57-86: AQM/2
	• IMA/87-113: AQM/3
	For the CES, all AAL1CES instances on SDH Port 0 map to AQM/1, and all AAL1CES instances on SDH Port1 map to AQM/3.
(4 of 5)	

STM-1 CES/ATM/IMA FP configuration considerations (continued)

STM-1 CES/ATM/IMA function processor type	Configuration considerations
	The following constraints are enforced when using this card: • On both physical ports VC12/3 and k, the 3 E1 Chan/0 (where k=2,3,4,5,6,7) cannot be used for independent ATM interfaces. However, these links can be used for CES or they can be part of an IMA group. • IMA groups for Port 0 must only have instance numbers between 0 and 56. Likewise, for Port 1, the IMA group instance numbers must be between 57 and 113. • Each VC12 and its associated E1 component are internally assigned a unique number (called E1 link number) that can be calculated as follows: link number=$(k-1)*21+(l-1)+(m-1)*7$ where k,l,m are the VC12 component indexes. For example, VC12/2,4,and 3 are internally assigned link number=$21+3+14=38$. • When an ATM service (ATMIF) has been configured to use an independent E1 link (the ATMIF interface is directly linked to the *VC12 E1 Chan* component), an IMA group instance with the same value as E1 link number cannot be used and vice versa. For example, if an ATM service (ATMIF) has been configured to use E1 link number=38 (Lp/x Sdh/y Vc4/0 Vc12/2,4,3 E1 Chan/0), then Lp/x Ima/38 cannot be used. Likewise, if Lp/x Ima/38 has already been configured then E1 link number=38 cannot be used directly for ATM service. Note that E1 link number=38 can still be used for CES if it is not part of Ima/38 group. As a general recommendation, the IMA group instance number uses the following formula: $l=y*57+(k-1)*21+(l-1)+(m-1)*7$ where y is the physical port number (0 or 1) and k,l,m are the VC12 indexes which correspond to the first link in the IMA group. This FP supports up to 126 Aal1Ces interfaces, 63 per STM-1 port. No restrictions are applicable to a CES configuration. ATM Forum 1.0 cannot be used on this FP. The system supplies ATM Forum 1.1 as the default. Upon interworking with a 1.0 IMA, the FP automatically downgrades to 1.0. A subsequent upgrade back to 1.1 requires the FP to be reset, or the port that has the IMA group to be locked/unlocked.
(5 of 5)	

STM-1 CES/ATM/IMA FP supported features

The table below contains information on the features supported by each STM-1 CES/ATM/IMA FP.

For the applications and services that are supported by these FPs, see

STM-1 CES/ATM/IMA FP supported features

STM-1 CES/ATM/IMA function processor type	Supported features
2-port STM-1e Ch CES/ATM/IMA	The 2-port STM-1 electrical channelized CES/ATM/IMA FP provides support for ATM services on Nortel Multiservice Switch 7400 nodes. This FP has interoperability with the Multiservice Switch 7400 2-port STM-1 electrical 1:1 sparing panel (NTPS92AA), providing one-to-one hitless equipment protection (hot standby) for ATM, in addition to warm standby for CES and IMA. The 2-port STM-1 electrical channelized ATM FP can connect to: • STM-1 electrical channelized customer premise network equipment • another 2-port STM-1 electrical channelized CES/ATM/IMA card ATM traffic management functions, including fair queuing and traffic shaping Simultaneous support of multiple service types on the same FP (CES, IMA, ATM, IP) Processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS) Local and Global Rerouting capabilities are supported for the CES service and the ATM service. AINI capabilities are supported for the ATM service. Atm termination of FR-ATM
2-port STM-1 Ch CES/ATM/IMA	The 2-port STM-1 optical channelized CES/ATM/IMA FP (2pSTM1Ch) is a one-slot, multi-service FP that supports ATM, IMA and CES services on a Multiservice Switch 7400 shelf. This FP provides 1+1 inter-card line and equipment protection through an external cross-connect (XC) cable (intra-card line protection is not supported.) The spare 2pSTM1Ch has to be in the adjacent slot of the 2pSTM1Ch it is sparing. The 2pSTM1Ch provides the following capabilities: • 2 STM-1 optical ports channelized down to 126 E1 circuits (63 E1 channels per port) • Pluggable Optics (SFP) - PEC NTTP02ED: STM-1 L-1.1 compliant (Long Haul), PEC: NTTP02CD STM-1 S-1.1 compliant (Short Haul) • Multiplexing hierarchy: STM-1/VC-4/TUG-3/TUG-2/TU-12/VC-12/E1 • 1+1 line and equipment protection • Any CES, ATM, IMA service combination on the same port • Seamless inter-operability with existing Multiservice Switch 7400 and Multiservice Switch 15000 hardware cards
(1 of 2)	

STM-1 CES/ATM/IMA FP supported features (continued)

STM-1 CES/ATM/IMA function processor type	Supported features
	For the CES service, the 2pSTM1Ch provides the following capabilities:
	• Up to 126 CES interfaces per FP are supported for unstructured E1
	• CES over ATM
	• CES E1 UDT
	• CES synchronous timing
	• CES PVC, SPVC, persistent SVC connection types
	• Less than 15 seconds switchover time for warm EP
	• Local and Global Rerouting
	For the ATM service, the 2pSTM1Ch provides the following capabilities:
	• Maximum of 57 ATM interfaces per port
	• ATM UNI over E1
	• ATM TM (CBR, UBR, rt-VBR, nrt-VBR)
	• OAM F4 and F5
	• VCC, VPC, VPT connection types (standard and basic)
	• ATM Trace: OAM cell trace, PNNI path and connection trace
	• Restricted set of applications: ATM bearer service (ABS), PNNI, UNI, IISP, AINI, AtmMpe, Mpls, Test and Loop
	• Less than 50 milliseconds switchover time for hot EP
	• Local and Global Rerouting
	• Termination of FR-ATM
	For the IMA service, the 2pSTM1Ch provides the following capabilities:
	• IMA1.0 and 1.1 compliant
	• Maximum of 57 IMA groups per STM-1 port
	• Maximum of 32 E1 links per IMA group
	• Minimum of 1 E1 link per IMA group
	• For line protection, the IMA links do not change states during a line switchover
	• Less than 30 seconds switchover time for warm EP
(2 of 2)	

Platform function processors

Use information in this section to learn about configuration details for Nortel Multiservice Switch function processors (FPs) that support the platform.

Platform function processors and identifying characteristics

FP long name	PEC	Card type	Nortel Multiservice Switch	For more information
2-port GP with disk	NTHW10 NTPN10	2pGPDsk		General processors (page 208)

General processors

This section contains information on general processors.

Navigation

General processor specifications

The table below contains the configuration parameters, characteristics, and specifications of general processors.

General processor specifications

	2-port GP with Disk
DRAM memory	512 Mbyte
port number	0, 1
line speed (maximum)	determined by service
effective data rate	determined by service
Ethernet Port type	ethernet100BaseT
FLASH memory	1 Mbyte
hard drive	20 Gbyte EIDE
interfaceName	lp/<lp_number> ethernet100BaseT/<port_number>
Line sparing	enabled, disabled
minimum software level required	determined by service
no traffic wait	0 to 180 seconds
sparing supported	one-for-one (does not include the hard disk)

The table 2pGpDsk line sparing examples (page 209) shows when switchover may occur as a result of a failed port on the 2pGpDsk.

2pGpDsk line sparing examples

Failed port (other port ok)	Line sparing for active card		Port status for spare card		Switchover occurred
	Port 0	Port 1	Port 0	Port 1	
Port 0	enabled	enabled	ok	ok	YES
Port 0	enabled	enabled	ok	bad	NO
Port 0	enabled	disabled	bad	ok	NO
Port 0	enabled	disabled	ok	bad	YES
Port 0	disabled	enabled	ok	ok	NO
Port 1	disabled	enabled	ok	ok	YES
either port	disabled	disabled	ok	ok	NO
Port 0	enabled	disabled	ok	ok	YES

General processor configuration considerations

Before you begin configuring a 2pGPDsk, consider the following:

- Sparing is not supported between an NTHW10 2pGPDsk and an NTPN10 2pGPDsk

- The 1:1 card sparing between two 2pGPDsks of the same PEC does not include the hard disk

- An NTHW10 2pGPDsk can be migrated to an NTPN10 2pGPDsk only if two NTHW10 2pGPDsk FPs are provisioned in 1:1 sparing and the software load supports the NTPN10 2pGPDsk.

General Processor supported features

The table below contains information on the features supported by each FP.

For the applications and services that are supported by these FPs, see .

General Processor supported features

General Processor type	Supported features
2-port GP with disk	There are two versions of the 2pGPDsk available on the Multiservice Switch15000 and 20000, the NTHW10 and the enhanced NTPN10.
	The NTHW10 2pGPDsk consists of a motherboard, a memory daughter card, and a power supply daughter card. A hard disk is mounted on the motherboard.
	The NTPN10 2pGPDsk is equipped with a faster compute platform and a larger and faster hard drive than that used on the NTHW10 2pGPDsk.
(1 of 2)	

General Processor supported features (continued)

General Processor type	Supported features
	Wireless services will use the 2-port GP with disk to store call and user information. The uses of the 2-port GP can be expanded with the development of other services or applications.
	line sparing between two 2pGPDsk cards of the same PEC
	hitless software migration depending on the service you are running on the 2-port GP with disk
	processing and transmission of synchronization status messages (SSM) within the network clock synchronization system (NCS)
	IP DiffServ services of the DiffServ domain for the router (*Vr Dsd*) and the DiffServ profile for the interface (*Vr Ip DiffServ*)
	The 2pGpDsk supports line and card sparing. The redundant FPs do not need to be installed in adjacent slots. Packets are broadcast from the hub to both the active and spare FP simultaneously.
	With the 2pGpDsk card sparing, if the active card fails then the spare FP will take over for all functions of the failed card.
	Attention: Sparing is not supported between an NTHW10 2pGPDsk and an NTPN10 2pGPDsk.
	Attention: Information stored on the disk of the active FP is not automatically stored on the spare FP.
	The FP will switchover to the standby 2pGpDsk if an active port fails (with switchover enabled) and the spare FP can provide equal or better quality-of-service for all ports with switchover enabled. The FP will not switchover if the service quality is diminished for any operational port with switchover enabled. There will be no switchover if the line sparing is disabled when the port fails.
(2 of 2)	

Function Processor OSI States

This section contains the following OSI state tables:

DS1 FP OSI states

This section lists the following OSI state tables for DS1 FPs.

- For all DS1 FPs, see DS1 component state combination (page 212).
- For all DS1 FPs except ATM or AAL1 FPs, see DS1 Test component state combination (page 213).
- For all DS1 FPs except 3-port and 8-port ATM FPs, see DS1 Channel (Chan) component state combination (page 212).
- For 3-port and 8-port ATM FPs see:

- For 1-port DS1 voice FP, see .

DS1 component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The DS1 port is inoperable due to at least one of the following alarms. • losAlarm • lofAlarm • rxAisAlarm.
Unlocked, Enabled, Busy	The DS1 component is in use.
Locked, Enabled, Idle	A lock/lock operator command is in effect. The DS1 component is ready to service a user. A test is running.
Locked, Disabled, Idle	• Some hardware test failed. • The DS1 component is in the locked state. • External factors render the DS1 port inoperable.

DS1 Channel (Chan) component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	External factors render the Chan component inoperable because of DS1 alarms.
Unlocked, Enabled, Idle	The component is not in use. Provisioning or binding processes are possible causes.
Unlocked, Enabled, Busy	The Chan component is in use. The Chan component can only service one user at a time.
Locked, Enabled, Idle	A lock operator command is in effect. The Chan component is otherwise ready to service a user. A test is running.
Locked, Disabled, Idle	Some hardware test failed or the Chan component is in the locked state.

DS1 Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. Start test requests will be rejected.
Unlocked, Enabled, Busy	The Test component is in use. A DS1 or Chan component creates a Test component. The Test component services only that particular component. A test stops either when the prescribed timer expires or you issue a stop test command.

DS1 ATM Channel (Chan) component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The Chan component is inoperable because of DS1, E1 or lcdAlarm alarms. The associated port component is locked.
Unlocked, Enabled, Idle	The component is not in use. Provisioning or binding processes are possible causes.
Unlocked, Enabled, Busy	The Chan component is in use. The Chan component can only service one user at a time.
Unlocked, Enabled, Idle	The Chan component is not in use. The component is waiting for binding to an AtmIf component.
ShuttingDown, Enabled, Busy	A lock operator command is in effect. The system is waiting for a bound application to suspend.
Locked, Disabled, Idle	A hardware test failed or the Chan component is in the locked state.

DS1 ATM Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. Start test requests will be rejected.
Unlocked, Enabled, Busy	The Test component is in use. A Chan, DS1, or E1 component creates a Test component. The Test component services only that particular component. A test stops either when the prescribed timer expires or you issue a stop test command.

DS1 Framer component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	A component that the Framer component depends on is not available. A likely cause is that the port component (for example, a DS1 component) is locked for testing.
Unlocked, Enabled, Busy	The Framer component is in use. The Framer component services only one user (an application component) at a time.

DS3 FP OSI states

This section lists the following OSI state tables for DS3 FPs:

- For all non-ATM FPs, except the 4-port DS3Ch FR FP:

- In addition, for the 2-port DS3Ch TDM FP, see

- For all ATM, AAL1, and Frame-based FPs except the 4-port DS3Ch FR FP, see:

- For the 4-port DS3 Ch FR FP (NTHR88 and NTHR89) OSI states:

DS3 component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The DS3 interface is inoperable due to at least one of the following alarms: • losAlarm • lofAlarm • rxAisAlarm • rxRaiAlarm or the far end DS3 interface is requesting the local interface to loop back the incoming signal.
Unlocked, Enabled, Idle	The component is not in use. Provisioning or binding processes are possible causes. The line input is recognized as good. Clocks are available.
Unlocked, Enabled, Busy	The DS3 component is in use. The DS3 component services only one user (for example a Framer component) at a time.
Locked, Enabled, Idle	A port and line test is in progress.
Locked, Disabled, Idle	A hardware test failed and the DS3 component is put in the locked state. A lock operator command is in effect.

DS3 Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. Start test requests will be rejected.
Unlocked, Enabled, Busy	The Test component is in use. A V35, X21, DS1, E1, CHAN, DS3, or E3 component creates the Test component. The Test component services only that particular component. A test stops either when the prescribed timer expires or you issue a stop test command.

DS3 ATM component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The DS3 interface is inoperable due to at least one of the following alarms: • losAlarm • lofAlarm • rxAisAlarm • rxRaiAlarm • lcdAlarm • rxIdle Or the far-end DS3 interface sends a request to the local end to loop back the incoming signal. When the PLCP option is turned on, PLCP lofAlarm and PLCP rxRaiAlarm also disable the component.
Unlocked, Enabled, Idle	The component is not in use. Provisioning or binding processes are possible causes. The line input is recognized as good. Clocks are available.
Unlocked, Enabled, Busy	The DS3 component is in use. The DS3 component services only one user (an ATM interface component) at a time.
Unlocked, Enabled, Shutting Down	A lock command is in effect against the DS3 component. The DS3 component is waiting for the ATM interface component to go into a disabled mode before it completes the lock sequence and shuts down.
Locked, Enabled, Idle	A lock operator command is in effect. The DS3 component is operating in test mode (availabilityStatus: inTest).
Locked, Disabled, Idle	A lock operator command is in effect. The component is in one of the following conditions: • Left offline. (availabilityStatus: offline) • Some hardware test failed. (availabilityStatus: failed) • If running in test mode external factors cause errors (availabilityStatus: inTest). Bad line state and excessive line state changes are possible causes.

DS3 ATM Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. Start test requests will be rejected.
Unlocked, Enabled, Idle	The hardware component is locked. You can perform a port and line test.
Unlocked, Enabled, Busy	The Test component is in use. A Chan, DS1, E1, DS3, E3, V35, X21, Sonet, or Sdh component creates a Test component. The Test component services only that particular component. A test stops either when the prescribed timer expires or you issue a stop test command.

DS3 channelized component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The DS3 interface is inoperable due to at least one of the following alarms: • losAlarm • lofAlarm • rxAisAlarm • rxRaiAlarm • lcdAlarm • rxIdle Or the far-end DS3 interface sends a request to the local end to loop back the incoming signal.
Unlocked, Enabled, Idle	The component is not in use. Provisioning or binding processes are possible causes as is provisioning of the The line input is recognized as good. Clocks are available.
Unlocked, Enabled, Busy	The DS3 component is in use. The DS3 component services only one user (an Framer component) at a time.
Shutting Down, Enabled, Busy	A lock command is in effect against the DS3 component. The DS3 component is waiting for the Framer component to go into a disabled mode before it completes the lock sequence and shuts down.
Locked, Enabled, Idle	A lock operator command is in effect. The DS3 component is operating in test mode (availabilityStatus: inTest).
(1 of 2)	

DS3 channelized component state combination (continued)

Combination (Administrative, Operational, Usage)	Details
Locked, Disabled, Idle	A lock operator command is in effect. The component is in one of the following conditions: • Left offline (availabilityStatus: offline) • Some hardware test failed (availabilityStatus: failed) • If running in test mode external factors cause errors (availabilityStatus: inTest). Bad line state and excessive line state changes are possible causes.
On a 4-port DS3 channelized frame relay FP, provisioning the timeslot of the Framer component to the value of none and not locking its application result in the OSI state of Unlocked, Enabled, Idle.	
(2 of 2)	

DS3 channelized frame relay Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. Start test requests will be rejected.
Locked, Disabled, Idle	The hardware component is locked. You can perform a port and line test.
Locked, Enabled, Idle	The Test component is in use. A Chan, DS1, or DS3, component creates a Test component. The Test component services only that particular component. A test stops either when the prescribed timer expires or you issue a stop test command.

DS1 component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The DS1 port is inoperable due to at least one of the following alarms. • losAlarm • lofAlarm • rxAisAlarm
Unlocked, Enabled, Busy	The DS1 component is in use.
(1 of 2)	

DS1 component state combination (continued)

Combination (Administrative, Operational, Usage)	Details
Locked, Enabled, Idle	A lock/lock operator command is in effect. The DS1 component is ready to service a user. A test is running.
Locked, Disabled, Idle	• A hardware test failed. • The *DS1* component is in the locked state. • External factors render the DS1 port inoperable.
(2 of 2)	

DS1 Channel (Chan) component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	External factors render the Chan component inoperable because of DS1 alarms.
Unlocked, Enabled, Idle	The component is not in use. Provisioning or binding processes are possible causes.
Unlocked, Enabled, Busy	The Chan component is in use. The Chan component can only service one user at a time.
Locked, Enabled, Idle	A lock operator command is in effect. The Chan component is otherwise ready to service a user. A test is running.
Locked, Disabled, Idle	A hardware test failed or the Chan component is in the locked state.
On a 4-port DS3 channelized frame relay FP, provisioning the timeslot of the Chan component to the value of none and not locking the Chan component result in the OSI state of Unlocked, Enabled, Idle.	

DS1 Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. Start test requests will be rejected.
Unlocked, Enabled, Busy	The Test component is in use. A DS1 or Chan component creates a Test component. The Test component services only that particular component. A test stops either when the prescribed timer expires or you issue a stop test command.

E1 FP OSI states

This section lists the following OSI state tables for E1 FPs.

32-port E1 MSA OSI states

Use these tables to determine the OSI states for this FP:

E1 component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The E1 port is inoperable due to at least one of the following alarms: • losAlarm • lofAlarm • rxAisAlarm • multifrmLofAlarm • rxMultifrmRaiAlarm • txMultifrmRaiAlarm.
Unlocked, Enabled, Busy	The E1 component is in use.
Locked, Enabled, Idle	A lock/lock operator command is in effect. The E1 component is ready to service a user. A test is running.
Locked, Disabled, Idle	• Some hardware test failed. • The E1 component is in the locked state. • External factors render the E1 port inoperable.

E1 Channel (Chan) component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	External factors render the Chan component inoperable because of E1 alarms.
Unlocked, Enabled, Idle	The component is not in use. Provisioning or binding processes are possible causes.
Unlocked, Enabled, Busy	The Chan component is in use. The Chan component can only service one user at a time.
Locked, Enabled, Idle	A lock operator command is in effect. The Chan component is otherwise ready to service a user. A test is running.
Locked, Disabled, Idle	Some hardware test failed or the Chan component is in the locked state.

E1 Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. Start test requests will be rejected.
Unlocked, Enabled, Busy	The Test component is in use. An E1, or CHAN component creates a Test component. The Test component services only that particular component. A test stops either when the prescribed timer expires or you issue a stop test command.

E1 voice Framer component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	A component that the Framer component depends on is not available. A likely cause is that the port component (for example, a V35 component) is locked for testing.
Unlocked, Enabled, Busy	The Framer component is in use. The Framer component services only one user (an application component) at a time.

E1 ATM Channel (Chan) component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The Chan component is inoperable because of DS1, E1 or lcdAlarm alarms. The associated port component is locked.
Unlocked, Enabled, Idle	Not in use. Provisioning or binding processes are possible causes.
Unlocked, Enabled, Busy	The Chan component is in use. The Chan component can only service one user at a time.
Unlocked, Enabled, Idle	The Chan component is not in use. The Chan component is waiting for binding to an ATmIf component.
ShuttingDown, Enabled, Busy	A lock operator command is in effect. The system is waiting for a bound application to suspend.
Locked, Disabled, Idle	A hardware test failed or the Chan component is in the locked state.

E1 ATM Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. Start test requests will be rejected.
Unlocked, Enabled, Busy	The Test component is in use. A Chan, DS1, or E1 component creates a Test component. The Test component services only that particular component. A test stops either when the prescribed timer expires or you issue a stop test command.

E3 FP OSI states

These tables contain information about E3 OSI states:

-
-

E3 component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The E3 interface is inoperable due to at least one of the following alarms: • losAlarm • lofAlarm • rxAisAlarm • rxRaiAlarm or the far-end E3 interface requests the local interface to loop back the incoming signal.
Unlocked, Enabled, Idle	The component is not in use. Provisioning or binding processes are possible causes. The line input is recognized as good. Clocks are available.
Unlocked, Enabled, Busy	The E3 component is in use. The E3 component services only one user (for example, a Framer component) at a time.
Locked, Enabled, Idle	A port and line test is in progress.
Locked, Disabled, Idle	Some hardware test failed and the E3 component is in the locked state by the operator. A lock operator command is in effect.

E3 Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. The system will reject Start test requests.
Unlocked, Enabled, Busy	The Test component is in use. A V35, X21, DS1, E1, CHAN, DS3, or E3 component creates a Test component. The Test component services only that particular component. A test stops either when the prescribed timer expires or you issue a stop test command.

Ethernet FP OSI states

This section lists the following OSI state tables for Ethernet FPs:

• For the 2-port 100BaseT Ethernet FP, see .

- For the 4-port 10/100BaseT Ethernet FP, see Ethernet component state combination (page 225) and Vlan component state combination (page 225).

- For the 4-port gigabit Ethernet FP, see Ethernet component state combination (page 225).

- For the 6-port 10BaseT Ethernet FP, see Ethernet (En) 10BaseT component state combination (page 224).

- For the 8-port 10/100BaseT Ethernet FP, see Ethernet component state combination (page 225) and Vlan component state combination (page 225).

Ethernet (En) 10BaseT component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The component is disabled due to a broken physical disconnection or bad line state, etc.
Unlocked, Enabled, Idle	The component is not in use and is waiting to bind to the Framer component.
Unlocked, Enabled, Busy	The component is in use and can only service one Framer component at a time. No usage states are active.
Shutting Down, Enabled, Busy	The component is going from the unlocked to the locked state. The component is breaking the link to the Framer component.
Locked, Enabled, Idle	A lock command is in effect. You can test the component.
Locked, Disabled, Idle	A hardware test failed or a physical connection was broken while in the locked state.

100BaseT Ethernet (En) component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The component is disabled due to a broken physical disconnection or bad line state. The LP associated with the component is down.
Unlocked, Enabled, Idle	The component is not in use and is ready to bind to the LAN application component.
Unlocked, Enabled, Busy	The component is in use.
Shutting Down, Enabled, Busy	The component is going from the unlocked to the locked state. The component is breaking the link to the Framer component.
(1 of 2)	

100BaseT Ethernet (En) component state combination (continued)

Combination (Administrative, Operational, Usage)	Details
Locked, Enabled, Idle	A lock command is in effect. You can test the component.
Locked, Disabled, Idle	A hardware test failed or a physical connection broke while the component was locked.
(2 of 2)	

Ethernet component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	External factors render the Ethernet interface inoperable through either the detection and declaration of port alarms or the parent component is disabled and/or locked.
Unlocked, Enabled, Idle	The Ethernet interface is not in use. The line input has been recognized as being in good working order.
Unlocked, Enabled, Busy	The Ethernet interface is in use by the application.
Shutting Down, Enabled, Busy	The component is going from the unlocked to the locked state. The component is breaking the link to the Framer component.
Locked, Disabled, Idle	A lock operator command is in effect. The line input has been recognized as being in poor working order.
Locked, Enabled, Idle	A lock operator command is in effect. The line input has been recognized as being in good working order. The Ethernet is operating in test mode (availabilityStatus: inTest).

Vlan component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The *Vlan* component is not operational.
Unlocked, Enabled, Idle	The *Vlan* component is waiting for registration with the *Vr* or *Rtr Vrf*. The registration will complete when the *La* component is operational.
Unlocked, Enabled, Busy	The *Vlan* component is in use by the *La* component and has successfully registered with the *Vr* or *Rtf Vrf* to which it is associated.
(1 of 2)	

Vlan component state combination (continued)

Combination (Administrative, Operational, Usage)	Details
Locked, Disabled, Idle	A lock operator command is in effect and renders the *Vlan* component not operational when the *La* component is not operational.
Locked, Enabled, Idle	A lock operator command is in effect and renders the *Vlan* component not operational when the *La* component is operational.
(2 of 2)	

2-port GP with disk OSI states

See 100BaseT Ethernet (En) component state combination (page 224) for OSI state information for the 100BaseT Ethernet port. The 10BaseT debug port is not supported. See Ethernet (En) 10BaseT component state combination (page 224) for OSI state information for the 10BaseT debug port.

1-port HSSI OSI states

These tables contain information about 1-port HSSI FP OSI states.

1-port HSSI component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The HSSI port is inoperable due to at least one of the following alarms: • alarms related to actualLinkMode • incorrect link cable • input modem signal does not meet expected.
Unlocked, Enabled, Idle	The component is not in use. Provisioning or binding processes are possible causes. The line input has been recognized as good. Clocks are available.
Unlocked, Enabled, Busy	The HSSI component is in use. The HSSI component services only one user (a Framer component) at a time.
(1 of 2)	

Nortel Confidential

1-port HSSI component state combination (continued)

Combination (Administrative, Operational, Usage)	Details
Locked, Enabled, Idle	A lock operator command is in effect and the HSSI component is operating in test mode (availabilityStatus: inTest).
Locked, Disabled, Idle	A lock operator command is in effect and the component is in one of the following conditions: • Left offline. (availabilityStatus: offline) • A hardware test failed. (availabilityStatus: failed) If running in test mode external factors cause errors (availabilityStatus: inTest). Bad line state and excessive line state changes are possible causes.
(2 of 2)	

HSSI Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. The system will reject Start test requests.
Unlocked, Enabled, Busy	The Test component is in use. A HSSI component creates a Test component. The Test component services only that particular component. A test stops either when the prescribed timer expires or you issue a stop test command.

2-port JT2 ATM FP OSI states

The tables and contain information about JT2 ATM FP OSI states.

JT2 component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The JT2 interface is inoperable due to at least one of the following alarms: • losAlarm • lofAlarm • rxAisPhysicalAlarm • rxAisPayloadAlarm • rxRaiAlarm • lcdAlarm.
Unlocked, Enabled, Idle	The component is not in use. Provisioning or binding processes are possible causes. The line input is recognized as good. Clocks are available.
Unlocked, Enabled, Busy	The JT2 component is in use. The JT2 component services only one user (an ATM interface component) at a time.
ShuttingDown, Enabled, Busy	A lock command is in effect against the JT2 component. The JT2 component is waiting for the ATM interface component to go into a disabled mode before it completes the lock sequence and shuts down.
Locked, Enabled, Idle	A lock operator command is in effect. The JT2 component is operating in test mode (availabilityStatus: inTest).
Locked, Disabled, Idle	A lock operator command is in effect. The component is in one of the following conditions: • Left offline. (availabilityStatus: offline) • Some hardware test failed. (availabilityStatus: failed) • If running in test mode external factors cause errors (availabilityStatus: inTest). Bad line state and excessive line state changes are possible causes.

JT2 ATM Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. Start test requests will be rejected.
(1 of 2)	

JT2 ATM Test component state combination (continued)

Combination (Administrative, Operational, Usage)	Details
Unlocked, Enabled, Idle	The hardware component is locked. You can perform a port and line test.
Unlocked, Enabled, Busy	The Test component is in use. A JT2 component creates a Test component. The Test component services only that particular component. A test stops either when the prescribed timer expires or you issue a stop test command.
(2 of 2)	

OC-3/STM-1 OSI states

This section lists the following OSI state tables for OC-3/STM-1 FPs.

OC-3 Sonet/Sdh component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The SONET/SDH interface is inoperable through due to at least one of the following alarms: • losAlarm • lofAlarm • rxAisAlarm • rxRfiAlarm • lcdAlarm.
Unlocked, Enabled, Idle	The component is not in use. Provisioning or binding processes are possible causes. The line input is recognized as good. Clocks are available.
(1 of 2)	

OC-3 Sonet/Sdh component state combination (continued) (continued)

Combination (Administrative, Operational, Usage)	Details
Unlocked, Enabled, Busy	The Sonet/Sdh component is in use. The Sonet/Sdh component has one Path component under it.
Unlocked, Enabled, Shutting Down	A lock command is in effect against the Sonet/Sdh component but the Path component under it is not yet suspended.
Locked, Enabled, Idle	A lock operator command is in effect. The SONET/SDH component is operating in test mode (availabilityStatus: inTest).
Locked, Disabled, Idle	A lock operator command is in effect. The component is in one of the following conditions: • Left offline. (availabilityStatus: offline) • Some hardware test failed. (availabilityStatus: failed) • If running in test mode external factors cause errors (availabilityStatus: inTest). Bad line state and excessive line state changes are possible causes.
	(2 of 2)

OC-3 Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. Start test requests will be rejected.
Unlocked, Enabled, Idle	The hardware component is locked. You can perform a port and line test.
Unlocked, Enabled, Busy	The Test component is in use. A Chan, DS1, E1, DS3, E3, V35, X21, Sonet, or Sdh component creates a Test component. The Test component services only that particular component. A test stops either when the prescribed timer expires or you issue a stop test command.

OC-3 Path component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The Path component is inoperable due to at least one of the following alarms: • lopAlarm • rxAisAlarm • rxRfiAlarm • signalLabelMismatch Either a bad path state or the Sonet/Sdh is disabled. If the Sonet/Sdh is disabled either Sonet/Sdh is locked or there is a bad Sonet/Sdh signal.
Unlocked, Enabled, Idle	The component is not in use. The component is waiting for a binding to an ATM interface component.
Unlocked, Enabled, Busy	The Path component is in use. The Path component services only one user (an ATM interface component) at a time.
Unlocked, Enabled, Shutting Down	A lock command is in effect against the Path component. The Path component is waiting for the ATM interface component to go into a disabled mode before it completes the lock sequence and shuts down.
Locked, Disabled, Idle	A lock operator command is in effect.

OC-3/STM-1 STS component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The Sts component is inoperable due to at least one of the following alarms: • lopAlarm • rxAisAlarm • rxRfiAlarm • signalLabelMismatch Either a bad path state or the Sonet/Sdh component is disabled. If the Sonet/Sdh component is disabled, either the component is locked or there is a bad SONET or SDH signal.
Unlocked, Enabled, Idle	The component is not in use. The component is waiting for a binding to an ATM interface component.
(1 of 2)	

OC-3/STM-1 STS component state combination (continued) (continued)

Combination (Administrative, Operational, Usage)	Details
Unlocked, Enabled, Busy	The Sts component is in use. The Sts component services only one user (an ATM interface component) at a time.
Unlocked, Enabled, Shutting Down	A lock command is in effect against the Sts component. The Sts component is waiting for the ATM interface component to go into a disabled mode before it completes the lock sequence and shuts down.
Locked, Disabled, Idle	A lock operator command is in effect.
(2 of 2)	

OC-12/STM-4 FP OSI states

The following tables contain information about OC-12/STM-4 FP OSI states.

OC-12/STM-4 Sonet/Sdh component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The SONET/SDH interface is inoperable due to at least one of the following alarms: • losAlarm • lofAlarm • rxAisAlarm • rxRfiAlarm • lcdAlarm
Unlocked, Enabled, Idle	The component is not in use. Provisioning or binding processes are possible causes. The line input is recognized as good. Clocks are available.
Unlocked, Enabled, Busy	The Sonet/Sdh component is in use. The Sonet/Sdh component has one Sts component under it.
Unlocked, Enabled, Shutting Down	A lock command is in effect against the Sonet/Sdh component but the Sts component under it is not yet suspended.
(1 of 2)	

OC-12/STM-4 Sonet/Sdh component state combination (continued) (continued)

Combination (Administrative, Operational, Usage)	Details
Locked, Enabled, Idle	A lock operator command is in effect. The Sonet/Sdh component is operating in test mode (availabilityStatus: inTest).
Locked, Disabled, Idle	A lock operator command is in effect. The component is in one of the following conditions: • Left offline (availabilityStatus: offline) • Some hardware test failed (availabilityStatus: failed) • If running in test mode external factors cause errors (availabilityStatus: inTest). Bad line state and excessive line state changes are possible causes.
(2 of 2)	

OC-12/STM-4 Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. Start test requests will be rejected.
Unlocked, Enabled, Idle	The hardware component is locked. You can perform a port and line test.
Unlocked, Enabled, Busy	The Test component is in use. A Chan, DS1, E1, DS3, E3, V35, X21, Sonet, or Sdh component creates a Test component. The Test component services only that particular component. A test stops either when the prescribed timer expires or you issue a stop test command.

OC-12/STM-4 Sts component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The Sts component is inoperable due to at least one of the following alarms: • lopAlarm • rxAisAlarm • rxRfiAlarm • signalLabelMismatch Either a bad path state or the Sonet/Sdh is disabled. If the Sonet/Sdh is disabled either Sonet/Sdh is locked or there is a bad Sonet/Sdh signal.
Unlocked, Enabled, Idle	The component is not in use. The component is waiting for a binding to an ATM interface component.
Unlocked, Enabled, Busy	The Sts component is in use. The Sts component services only one user (an ATM interface component) at a time.
Unlocked, Enabled, Shutting Down	A lock command is in effect against the Sts component. The Sts component is waiting for the ATM interface component to go into a disabled mode before it completes the lock sequence and shuts down.
Locked, Disabled, Idle	A lock operator command is in effect.

OC-48/STM-16 OSI states

These tables contain information about OC-48/STM-16 OSI states.

1-port OC-48/STM-16 Sonet component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The *Sonet* interface is inoperable due to at least one of the following alarms: • losAlarm • lofAlarm • rxAisAlarm • rxRfiAlarm • lcdAlarm.
Unlocked, Enabled, Idle	The component is not in use. Provisioning or binding processes are possible causes. The line input is recognized as good. Clocks are available.
Unlocked, Enabled, Busy	The *Sonet* component is in use. The Sonet/Sdh component has one *Sts* component under it.
Unlocked, Enabled, Shutting Down	A lock command is in effect against the *Sonet* component but the *Sts* component under it is not yet suspended.
Locked, Enabled, Idle	A lock operator command is in effect. The *Sonet* component is operating in test mode (*availabilityStatus:* inTest).
Locked, Disabled, Idle	A lock operator command is in effect. The component is in one of the following states: • Left offline (*availabilityStatus:* offline) • Some hardware test failed. (*availabilityStatus:* failed) • If running in test mode external factors cause errors (*availabilityStatus:* inTest). Bad line state and excessive line state changes are possible causes.

1-port OC-48/STM-16 Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the *Test* component. Start test requests will be rejected.
(1 of 2)	

1-port OC-48/STM-16 Test component state combination (continued)

Combination (Administrative, Operational, Usage)	Details
Unlocked, Enabled, Idle	The hardware component is locked. You can perform a port and line test.
Unlocked, Enabled, Busy	The *Test* component is in use. A *Chan, DS1, E1, DS3, E3, V35, X21, Sonet*, or *Sdh* component creates a *Test* component. The *Test* component services only that particular component. A test stops either when the prescribed timer expires or you issue a stop test command.
(2 of 2)	

1-port OC-48/STM-16 Sts component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The *Sts* component is inoperable due to at least one of the following alarms: • lopAlarm • rxAisAlarm • rxRfiAlarm • signalLabelMismatch Either a bad path state or the *Sonet* component is disabled. If the *Sonet* component is disabled either the component is locked or there is a bad SONET signal.
Unlocked, Enabled, Idle	The component is not in use. The component is waiting for a binding to an ATM interface component.
Unlocked, Enabled, Busy	The *Sts* component is in use. The *Sts* component services only one user (an ATM interface component) at a time.
Unlocked, Enabled, Shutting Down	A lock command is in effect against the *Sts* component. The *Sts* component is waiting for the ATM interface component to go into a disabled mode before it completes the lock sequence and shuts down.
Locked, Disabled, Idle	A lock operator command is in effect.

STM-1 OSI States

The following tables contain information about STM-1 FP OSI states.

• For the 1-port STM-1Ch FP, see:

• For the 2-port STM-1 electrical ATM and 2-port STM-1 electrical channelized CES/ATM/IMA FPs, see:

STM-1 FP Sdh component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The *Sdh* interface is inoperable due to at least one of the following alarms: • losAlarm • lofAlarm • rxAisAlarm • rxRfiAlarm • lcdAlarm
Unlocked, Enabled, Idle	The component is not in use. Provisioning or binding processes are possible causes. The line input is recognized as good. Clocks are available.
Unlocked, Enabled, Busy	The Sdh component is in use. The Sdh component has one Sts component under it.
Unlocked, Enabled, Shutting Down	A lock command is in effect against the Sdh component but the Vc4 component under it is not yet suspended.
Locked, Enabled, Idle	A lock operator command is in effect. The Sdh component is operating in test mode (availabilityStatus: inTest).
Locked, Disabled, Idle	A lock operator command is in effect. The component is in one of the following conditions: • Left offline (availabilityStatus: offline) • Some hardware test failed (availabilityStatus: failed) • If running in test mode external factors cause errors (availabilityStatus: inTest). Bad line state and excessive line state changes are possible causes.

STM-1 FP Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. Start test requests will be rejected.
Unlocked, Enabled, Idle	The hardware component is locked. You can perform a port and line test.
Unlocked, Enabled, Busy	The Test component is in use. A Chan, DS1, E1, DS3, E3, V35, X21, or Sdh component creates a Test component. The Test component services only that particular component. A test stops either when the prescribed timer expires or you issue a stop test command.

STM-1 Path component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The Path component is inoperable due to at least one of the following alarms: • lopAlarm • rxAisAlarm • rxRfiAlarm • signalLabelMismatch Either a bad path state or the Sonet/Sdh is disabled. If the Sonet/Sdh is disabled either Sonet/Sdh is locked or there is a bad Sonet/Sdh signal.
Unlocked, Enabled, Idle	The component is not in use. The component is waiting for a binding to an ATM interface component.
Unlocked, Enabled, Busy	The Path component is in use. The Path component services only one user (an ATM interface component) at a time.
Unlocked, Enabled, Shutting Down	A lock command is in effect against the Path component. The Path component is waiting for the ATM interface component to go into a disabled mode before it completes the lock sequence and shuts down.
Locked, Disabled, Idle	A lock operator command is in effect.

STM-1 FP Vc4 component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The Vc4 component is inoperable due to at least one of the following alarms: • lopAlarm • rxAisAlarm • rxRfiAlarm • signalLabelMismatch Either a bad path state or the Sdh component is disabled. If the Sdh component is disabled, either the component is locked or there is a bad SDH signal.
Unlocked, Enabled, Idle	The component is not in use.
Unlocked, Enabled, Busy	The Vc4 component is in use. The Vc4 component services only one user at a time.
Unlocked, Enabled, Shutting Down	A lock command is in effect against the Vc4 component. The Vc4 component is waiting for a component to go into a disabled mode before it completes the lock sequence and shuts down.
Locked, Disabled, Idle	A lock operator command is in effect.

STM-1 FP Vc12 component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	External factors render the Vc12 component inoperable. Bad Vc12 state or one of the parent components is disabled.
Unlocked, Enabled, Idle	Not in use. Waiting for a binding to an application layer component to this component or one of the child components.
Unlocked, Enabled, Busy	The Vc12 component is in use. The Vc12 component services only one user at a time.
Unlocked, Enabled, Shutting Down	A lock command has been issued against a parent component but there is still an application layer component bound to it of to one of the child components.
(1 of 2)	

STM-1 FP Vc12 component state combination (continued)

Combination (Administrative, Operational, Usage)	Details
Locked, Disabled, Idle	A lock or lock -force operator command is in effect. Some hardware test may have failed while trying to unlock the parent component. If running in test mode, external factors render this component inoperable.
Locked, Enabled, Idle	A lock or lock -force operator command is in effect and one of the parent components is operating in test mode.
(2 of 2)	

TTC2M MVP-E FP OSI states

The tables E1 component state combination (page 220), E1 Channel (Chan) component state combination (page 241), and E1 Test component state combination (page 221) contain information about TTC2M MVP-E FP OSI states.

E1 component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The E1 port is inoperable due to at least one of the following alarms: - losAlarm - lofAlarm - rxAisAlarm - multifrmLofAlarm - rxMultifrmRaiAlarm - txMultifrmRaiAlarm.
Unlocked, Enabled, Busy	The E1 component is in use.
Locked, Enabled, Idle	A lock/lock operator command is in effect. The E1 component is ready to service a user. A test is running.
Locked, Disabled, Idle	- Some hardware test failed. - The E1 component is in the locked state. - External factors render the E1 port inoperable.

E1 Channel (Chan) component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	External factors render the Chan component inoperable because of E1 alarms.
Unlocked, Enabled, Idle	The component is not in use. Provisioning or binding processes are possible causes.
Unlocked, Enabled, Busy	The Chan component is in use. The Chan component can only service one user at a time.
Locked, Enabled, Idle	A lock operator command is in effect. The Chan component is otherwise ready to service a user. A test is running.
Locked, Disabled, Idle	Some hardware test failed or the Chan component is in the locked state.

E1 Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. Start test requests will be rejected.
Unlocked, Enabled, Busy	The Test component is in use. An E1, or Chan component creates a Test component. The Test component services only that particular component. A test stops either when the prescribed timer expires or you issue a stop test command.

8-port V.11 FP OSI states

The tables X21 component state combination (page 241) and V.11 Test component state combination (page 242) contain information about 8-port V.11 FP OSI states.

X21 component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The X21 interface is inoperable. Bad line state and excessive line state changes are possible causes. Lack of clocks will also disable the port.
Unlocked, Enabled, Idle	The component is not in use. Provisioning or binding processes are possible causes. The line input is good. Clocks are available.
(1 of 2)	

X21 component state combination (continued)

Combination (Administrative, Operational, Usage)	Details
Unlocked, Enabled, Busy	The X21 component is in use. The X21 component services only one user (a Framer component) at a time.
Locked, Enabled, Idle	A port and line test is in progress.
Locked, Disabled, Idle	Some hardware test failed or the X21 component is in the locked state. A lock operator command is in effect.
(2 of 2)	

V.11 Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. Start test requests will be rejected.
Unlocked, Enabled, Busy	The Test component is in use. A V35, X21, DS1, E1, CHAN, DS3, or E3 component creates a Test component. The test component services only the component that created it. A test stops either when the prescribed timer expires or you issue a stop test command.

8-port V.35 OSI states

The tables V35 component state combination (page 242) and V.35 Test component state combination (page 243) contain information about the 8-port V.35 FP OSI states.

V35 component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The V.35 port is inoperable. Bad line state and excessive line state changes are possible causes. Lack of clocks will also disable the port.
Unlocked, Enabled, Idle	The component is not in use. Waiting for a binding to a Framer component is a possible cause. The line input is good. Clocks are available.
Unlocked, Enabled, Busy	The V35 component is in use. The V35 component services only one user (a FRAMER component) at a time.
(1 of 2)	

V35 component state combination (continued)

Combination (Administrative, Operational, Usage)	Details
Locked, Enabled, Idle	A port and line test is in progress.
Locked, Disabled, Idle	Some hardware test failed or the V35 component is in the locked state. A lock operator command is in effect.
(2 of 2)	

V.35 Test component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	The hardware component is unlocked. No resource is available to the Test component. Start test requests will be rejected.
Unlocked, Enabled, Busy	The Test component is in use. A V35, X21, DS1, E1, CHAN, DS3, or E3 component creates a Test component. The Test component services only the component that created it. A test stops either when the prescribed timer expires or you issue a stop test command.

Voice services processor OSI states

This section lists the following OSI state tables for all VSP FPs:

-

-

Vsp component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	There has been a hardware failure on the processor card.
Unlocked, Enabled, Idle	This transitional state occurs before the component becomes active.
Unlocked, Enabled, Active	The component is operational. The processor card can carry traffic.
Locked, Enabled, Idle	This transitional state occurs when an operator locks the component. This state precedes the Locked, Disabled, Idle state.
Locked, Disabled, Idle	The component has been locked by an operator.

PModule component state combination

Combination (Administrative, Operational, Usage)	Details
Unlocked, Disabled, Idle	There has been a hardware failure on the processor card.
Unlocked, Enabled, Idle	No services have been allocated to the component.
Unlocked, Enabled, Active	At least one service has been allocated to the component.

Function Processor Compliances

This section contains the following FP compliance information:

DS1 FP compliance with standards

For information about compliance of each FP type, see:

1-port DS1 MVP-E compliance with standards

The DS1 MVP-E FPs comply with the applicable sections of these recommendations:

- FCC part 68/TIA 968-A

- Industry Canada CS-03-Issue 8 Part II

- ITU-T G.703 (excluding Annex B)

- ITU-T G.704

- ITU-T G.706

- ITU-T G.733

- JATE

4-port DS1 MVP-E compliance with standards

The 4-port DS1 MVP-E FPs comply with the applicable sections of these recommendations:

- FCC part 68/TIA 968-A

- Industry Canada CS-03-Issue 8 Part II

- ITU-T G.164

- ITU-T G.165

- ITU-T G.168

- ITU-T G.711

- ITU-T G.726

- ITU-T G.728

- ITU-T G.729 Annex A

- ITU-T T.30

- ITU-T V.17

- ITU-T V.21

- ITU-T V.27ter

- ITU-T V.29

- JATE

3-port DS1 ATM compliance with standards

The DS1 ATM FP complies with the applicable sections of these standards:

- ANSI T1.102-199X Section 6.4

- ANSI T1.107-1988 and T1.107a-1990 Sections 5.1 and 5.22

- ANSI T1.403-1989

- ANSI T1.231-1993, Section 6: all required and some optional parameters; Section 9: current, previous, and recent 15 minute and day counts and thresholding are not implemented

- ANSI T1E1.2/94-002R1, 1994 Sections 10 and 15.3

- ATM Forum ATM User-Network Interface Specification, Draft Version 3.1 Part II, 1994 Section II.3, except cell payload scrambling is enabled by default, with the option to disable it

- FCC part 68/TIA 968-A

- Industry Canada CS-03-Issue 8 Part II

- ITU-T G.703, 1991 Section 2

- ITU-T G.704, 1988 Section 2.1

- ITU-T G.706, 1988 Section 2

- ITU-T G.733, 1972 Section 4

- ITU-T I.432 Sections 4.3 to 4.5

- ITU-T G.804, 1993 Section 2

- ITU-T G.821

- ITU-T G.823

- JATE

- Telcordia TR-TSV-000773, 1993 Section 3

- Telcordia TR-NWT-000499, 1991 Sections 9.2 and 10.2

8-port DS1 ATM compliances

The 8-port DS1 ATM FP complies with the applicable sections of these standards:

- AF-PHY-0016.000 (except Section 3.2)

- ANSI T1.107-1995 Section 6.2

- ANSI T1.403-1995 (non-compliant with Section 7.4)

- ANSI T1.231-1993, Section 6: all required and some optional parameters; Section 9: current, previous, and recent 15 minute and day counts and thresholding are not implemented

- ANSI T.408-1990 (except Section 8.4.3.2)

- ANSI T1.646-1995, Sections 10,11,15.3
- ATM Forum ATM User-Network Interface Specification, Draft Version 3.1 Part II, 1994 Section II.3
- FCC part 68/TIA 968-A
- Industry Canada CS-03-Issue 8 Part II
- ITU-T G.703, 1991 Section 2
- ITU-T G.704, 1995 Section 2.1
- ITU-T G.706, 1991 Section 2
- ITU-T G.733, 1988 Section 4
- ITU-T I.432 1993 Sections 4.3 to 4.5
- ITU-T G.804, 1993 Section 2
- ITU-T G.821, 1988
- ITU-T G.824, 1993
- JATE
- Telcordia TR-TSV-000773, 1993 Section 3
- Telcordia TR-NWT-000499, 1991 Sections 9.2 and 10.2

4-port DS1 AAL1 compliance with standards

The DS1 AAL1 FP complies with the applicable sections of these standards:

- ANSI T1.107
- ANSI T1.403
- ANSI T1.627
- ANSI T1.630
- ATMF AF_SAA_0032.000
- FCC part 68/TIA 968-A
- Industry Canada CS-03-Issue 8 Part II
- ITU-T G.703
- ITU-T G.704
- ITU-T G.706
- ITU-T G.824
- ITU-T I.431
- ITU-T I.361
- ITU-T I.363.1

- JATE

- Telcordia TR-NWT-000170

4-port DS1 compliance with standards

The 4-port DS1 FP complies with the applicable sections of these North American DS1 interconnect standards:

- FCC part 68/TIA 968-A

- Industry Canada CS-03-Issue 8 Part II

- JATE

4-port DS1Ch compliance with standards

The 4-port DS1Ch FP complies with the applicable sections of these North American DS1 interconnect standards:

- FCC part 68/TIA 968-A

- Industry Canada CS-03-Issue 8 Part II

- JATE

8-port DS1 MSA compliance with standards

The 8-port DS1 MSA FP complies with the applicable sections of these North American DS1 interconnect standards:

- FCC Part 68 (DS1 interconnect)

- Industry Canada CS-03 (DS1 interconnect)

- ITU-T G.703

- ITU-T G.704

- ITU-T G.706

- ITU-T G.824

- ITU-T I.363.1

- ANSI T1.102

- ANSI T1.403

- ANSI T1.630

32-port DS1 MSA compliance with standards

The 32-port DS1 MSA FP complies with the applicable sections of these North American DS1 interconnect standards:

- ANSI T1.102

- ANSI T1.403

- ANSI T1.630

- FCC part 68/TIA 968-A

- IMA 1.0 af-phy-0086.000 - Inverse Multiplexing for ATM Specification Version 1.0

- Industry Canada CS-03-Issue 8 Part II

- ITU-T G.703

- ITU-T G.704

- ITU-T G.706

- ITU-T G.824

- ITU-T I.363.1

- JATE

OC-3 compliance with standards on a 32-port DS1 MSA FP

When a 32-port DS1 MSA FP has the optional optical ports, the OC-3 ATM portion of the 2-slot FP complies with the applicable sections of the following standards:

- SONET (page 250)

- SDH (page 251)

SONET
ATM Forum

- AF-UNI-0010.002 (ref. [28])

  — complies to section 2.1

- AF-TEST-0024.000 (ref. [31])

Telcordia

- GR-253-CORE (ref. [35]):

  — Complies to all required and applicable items for STS-3 ATM operation.

  — Note that the following optional bytes are not supported by OC-3 ATM IPs:
    E1: Orderwire
    F1: Section User Channel
    D1-D3: Section Data Communication Channel
    J1: STS Path Trace
    F2: Path User Channel
    N1: Tandem Connection Maintenance/Path Data Channel

- TR-NWT-001112 (ref. [38])

ANSI

- T1.105-1995 (ref. [12])

- T1.231-1993 (ref. [22]):

  — complies to section 8 for all SONET alarms and statistics listed in Section 3.2.3 on page 8.

- T1.646-1995 (ref. [24], supersedes T1.624)

- T1E1.2/96-002 (ref. [25])

- 216 MD-1998.0041 - Version 01.05 - released - 1998-07-31 (PP504, P6.0)

SDH
ITU-T

- ETS 300 417 (previously ETS DE/TM-01015) (ref. [40])

- G.707 (ref. [45], replaces G.708. G.709) complies except for section 9.2.2.11 Table 5 which states that on receipt of an MS-AIS signal, line-timing should not be used.

Attention: the following optional bytes are not supported by OC-3 ATM IPs:

  — E1: Orderwire

  — F1: Section User Channel

  — D1-D3: Section Data Communication Channel

  — J1: STS Path Trace

  — F2: Path User Channel

  — N1: Tandem Connection Maintenance/Path Data Channel

- G.782 (ref. [48])

- G.783 (ref. [49])

- G.813 (ref. [51])

- G.821

- G.825 (ref. [54])

  — complies, except may not meet wander requirements

- G.957 (ref. [56])

Attention: the OC-3 ATM IP single mode FP is classified as application code L-1.1

- G.958 (ref. [57])

- I.432 (ref. [58])

  — complies to section 2 (Physical Medium at 155 520 kbit/s)

  — complies to section 4 (TC Sublayer) except:

  — Section 4.2.1.2: Physical layer cells are not guaranteed to be inserted in the cell

  — stream every 27 cells

  — Section 4.2.1.3: Physical layer OAM cells are not implemented

- TS026

DS3 FP standards compliance

This section lists the standards compliance for the DS3 FPs:

1-port DS3 compliance with standards

The 1-port DS3 FP complies with the applicable sections of these standards:

- ANSI T1.102.1989

- ANSI T1.107A.1990

- ANSI T1.404

- Telcordia TR-TSY-000499

1-port DS3C compliance with standards

The 1-port DS3C FP complies with the applicable sections of these North American DS3 interconnect standards:

- ANSI T1.102.1989, Section 5

- ANSI T1.107A.1990, Section 8.1 DS3 Frame Structure, except for the following sections:

  — 8.1.2 Application Identification Channel Signal (DS3 M-Frame applications)

- — 8.1.4.1 Line Loopback
- — 8.1.4.2 Payload Loopback, and DS1 Tributary channelization
- — 8.2 DS3 Application: M23 Multiple 7 DS2 Channels
- — 8.3 DS3 Application: Synchronous DS3 M13 Multiplex - 28 DS1 Channels
- — 8.4 DS3 Application: Asynchronous DS3 C-bit Parity - 28 DS1 Channels
- • ANSI T1.404, 1989, except for the following sections:
  - — 5.4 Signal Formats (SYNTRAN)
  - — 6.2 DS3 Multiplex Formats
  - — 7.2 Synchronous DS3 Signal
- • Telcordia TR-TSY-000499, complies to the DS3 main framing structure, except for:
  - — DS1 Tributary channelization
- • CCITT G.703, Section 5 Interface at 44,736 kbit/s

The DS3 interface supports the following standards:

- • G.703 Section 5; Interface at 44.736 Mbps
- • G.753
- • T1.102-1993 Electrical Specification
- • T1.404-1994 DS3 Metallic Interface Specification
- • T1.107-1988 Format Specifications
  - — Section 8, excluding sections 8.2., 8.3
- • T1.107a-1990 section 8.2 M23 Multiplex - 7 DS2 channels, excluding section 8.2.1
- • T1.107a-1990 section 8.4 Asynchronous Cbit Parity - 28 DS1 channels. Section 8.4.7 is not supported. In section 8.4.3.1 only the following FEAC alarm codes are supported:
  - — DS3 Eqpt. Failure (SA)
  - — DS3 LOS, DS3 Out-of-Frame
  - — DS3 AIS rcvd
  - — DS3 Idle rcvd

The DS1 interface supports the following standards:

- • G.703; Section 2: Interface at 544 kbit/s

- G.704

    — Section 2.1, excluding section 2.1.3.1.3

    — Section 3.1, excluding sections 3.1.3.2

- G.706; Section 2

- G.733; Section 4

- G.821 All sections

- T1.107-1988 Format Specifications; Section 5, excluding sections 5.2.1.3.2, 5.6, 5.8, 5.9

4-port DS3Ch FR compliance with standards

The 4-port DS3Ch FR FP complies with the applicable sections of these standards:

- ANSI T1.102-199X, Section 6.4

- ANSI T1.107-1998 and T1.107a-1990, Sections 8.1, 8.4, except 8.4.7

- ANSI T1.404-19XX

- ANSI T1.231-1993 Sections 7 and 9 except 15 minute and day counts and thresholds

- ANSI T1E1.2/94-002R1, 1994, Sections 9 and 15.2

- ANSI T1.646-1995

- ATM Forum ATM User-Network Interface Specification Draft Version 3.1, 1994.

- ATM Forum AF-PHY-0054.000

- ATM Forum AF-TEST-0023.000, except items 3.3.7 and 3.3.8: C-bit terminal-to-terminal data link is not supported; and item 3.6.2: by default cell payload scrambling is enabled

- ATM Forum AF-TEST-0082.000

- ITU-T G.824

- Telcordia TR-TSV-000773, 1993, Section 4

- Telcordia TR-NWT-000499, 1991, Sections 10.5.1 and 10.5.3

- Telcordia TR-TSY000009, Sections 2.6 (DS3 coding) and 4.1 (Condition monitoring and failure detection thresholds)

2-port DS3C TDM compliance with standards

The DS3C TDM FP complies with the following DS3 standards:

- ANSI T1.102-1993

- ANSI T1.107-1988, Section 8; excluding section 8.2

- ANSI T1.107a-1990, Section 8; excluding sections 8.2, 8.3, and 8.4.7; in section 8.4.3.1, only the following alarm codes are supported: DS3 Eqpt. Failure (SA), DS3 LOS, DS3 Out-of-Frame, DS3 AIS rcvd and DS3 Idle rcvd

- ANSI T1.231-1993, Section 7; excluding section 9

- ANSI T1.404-1994

- ITU-T G.703, 1991, Section 5

- ITU-T G.753

The DS3C TDM FP complies with the following DS1 standards:

- ANSI T1.107-1988, Section 5; excluding sections 5.2.1.3.2, 5.3, 5.8, 5.9, and 5.10

- ANSI T1.231-1993, Section 6; excluding section 9

- ITU-T G.704, Section 2.1

- ITU-T G.706, Section 2

- ITU-T G.733, Section 4

- TR62415

3-port DS3 ATM compliance with standards

The DS3 ATM FP complies with the applicable sections of these standards:

- ANSI T1.102-199X, Section 6.4

- ANSI T1.107-1988 and T1.107a-1990, Sections 8.1, 8.4, except 8.4.7

- ANSI T1.404-19XX

- ANSI T1.231-1993, Sections 7 and 9 except 15 minute and day counts and thresholding

- ANSI T1E1.2/94-002R1, 1994, Sections 9 and 15.2

- ATM Forum ATM User-Network Interface Specification Draft Version 3.1, 1994

- ITU-T G.703, 1991, Section 5

- ITU-T G.752, 1988, Section 1.3 except justification

- ITU-T G804, 1993, Section 7

- ITU-T I.432 - B-ISDN, Sections 4.3 to 4.5

- Telcordia TR-TSV-000773, 1993, Section 4

- Telcordia TR-NWT-000499, 1991, Sections 10.5.1 and 10.5.3

3-port DS3 ATM IP compliance with standards

The 3-port DS3 ATM IP FP complies with the applicable sections of these standards:

ATM Forum

- AF-UNI-0010.002 (ref. [28])
    — complies with section 2.2 (DS3 Physical Layer Interface)
- AF-PHY-0054.000 (ref. [27])
- AF-TEST-0023.000 (ref. [30]). Complies except for:
    — items 3.3.7 and 3.3.8: C-bit terminal-to-terminal data link is not supported
    — item 3.6.2: By default cell payload scrambling is enabled
- AF-TEST-0082.000 (ref. [32])

ANSI

- T1.102-1993 (ref. [11]):
    — complies to section 6.4 (DS3 level specification)
- T1.107-1995 (ref. [21]):
    — complies to section 9.1 (DS3 frame structure)
    — complies to section 9.3 (C-bit parity) except:
    — Section 9.3.7 (Terminal-to-terminal path maintenance data link)
- T1.231-1993 (ref. [22]):
    — complies to section 7 for all DS3 alarms and statistics listed in Section 3.2.4 on page 10
- T1.404-1994 (ref. [23]):
- T1.646-1995 (ref. [24], supersedes T1.624):

Telcordia

- TR-TSV-000773, (ref. [36]):
- TR-TSY-000009 (ref. [34]):
    — complies to section 2.6 (DS3 coding)
    — complies to section 4.1 (Condition monitoring and failure detection thresholds)

ITU-T

- G.703 (ref. [44]):
  - — complies to section 5 (Interface at 44.736 Mbps)
- G.775 (ref. [47]):
  - — 218 MD-1998.0041 - Version 01.05 - released - 1998-07-31 (PP504, P6.0)
- G.804 (ref. [50]):
  - — complies to section 7 (Mapping of ATM cells into 44.736 Mbps)
- G.824 (ref. [53]):
- I.432 (ref. [58]):
  - — complies to section 4.3 (HEC)
  - — complies to section 4.4 (Idle cells)
  - — complies to section 4.5 (Cell delineation and scrambling)

4-port DS3Ch ATM compliance with standards

The 4-port DS3Ch ATM FP complies with the applicable sections of these standards:

- ANSI T1.107, April 1989 - "Digital Hierarchy Formats Specifications"
- ANSI T1.107a, 1990 - "Supplement to formats specifications (DS3 format applications)"
- ANSI T1.404, 1989 - "Network-to-Customer Installation - DS3 Metallic Interface Specification"
- Electromagnetic Radiation: FCC Part 15B Class B, EN5502 Class B
- Electromagnetic Immunity: EN50082-1
- Electromagnetic Discharge: Telcordia TR-NWT-1089, EN50082-1
- ITU-T G.704 "Synchronous Frame Structures used at Primary and Secondary Hierarchical Levels"
- ITU-T G.706 "Frame Alignment and Cyclic redundancy Check (CRC) Procedures Relating to Basic Frames Structures Defined in recommendation G.704
- Safety: UL 1950, CSA C22.2 No. 950-M89. IEC 950, EN60950

4-port DS3Ch with AAL1 CES compliance to standards

The 4-port DS3Ch with AAL1 CES complies with the applicable sections of these standards:

- ANSI T1.102-1993, "Digital Hierarchy - Electrical Interfaces"

- ANSI T1.107-1988, "Digital Hierarchy - Formats Specifications", excluding section 8.2 in Interface Rate (DS3)

- ANSI T1.107a, 1990 - "Digital Hierarchy - Supplements to formats specifications (DS3 format applications)", excluding sections 8.2 and 8.3 in Interface Rate (DS3), excluding terminal-to-terminal path maintenance data link in section 8.4.7, and for section 8.4.3.1, the supported FEAC alarm codes are DS3 Eqpt. Failure (SA), DS3 LOS, OOF, AIS received, and Idle received

- ANSI T1.231-1993, "Digital Hierarchy - Layer 1 in-service digital transmission performance monitoring, section 7 and excluding from section 9 current, previous, and recent 15-minute and day counts, and thresholding

- ANSI T1.404, 1994 - "Network-to-Customer Installation - DS3 Metallic Interface Specification"

- Electromagnetic Radiation: FCC Part 15B Class B, EN5502 Class B

- Electromagnetic Immunity: EN50082-1

- Electromagnetic Discharge: Telcordia TR-NWT-1089, EN50082-1

- ITU-T G.703, 1991, "Physical/Electrical Characteristics of Hierarchical Digital Interfaces", section 5, interface at 44.736 Mbps

- ITU-T G.753, all sections

- Safety: UL 1950, CSA C22.2 No. 950-M89. IEC 950, EN60950

12-port DS3 compliance with standards

The 12-port DS3 FP complies with the applicable sections of these standards:

- ANSI T1.102-199X, Section 6.4

- ANSI T1.107-1998 and T1.107a-1990, Sections 8.1, 8.4, except 8.4.7

- ANSI T1.404-19XX

- ANSI T1.231-1993 Sections 7 and 9, except 15 minute and day counts and thresholds

- ANSI T1E1.2/94-002R1, 1994, Sections 9 and 15.2

- ANSI T1.646-1995

- ITU-T G.824

- ATM Forum ATM User-Network Interface Specification Draft Version 3.1, 1994.

- ATM Forum AF-PHY-0054.000

- ATM Forum AF-TEST-0023.000, except items 3.3.7 and 3.3.8: C-bit terminal-to-terminal data link is not supported; and item 3.6.2: by default cell payload scrambling is enabled

- ATM Forum AF-TEST-0082.000

- Telcordia TR-TSV-000773, 1993, Section 4

- Telcordia TR-NWT-000499, 1991, Sections 10.5.1 and 10.5.3

- Telcordia TR-TSY000009, Sections 2.6 (DS3 coding) and 4.1 (Condition monitoring and failure detection thresholds)

E1 FP compliance with standards

This section lists the standards compliance for E1 FPs:

1-port E1 MVP-E compliance with standards

The E1 MVP-E FPs comply with the applicable sections of these international, European, and Australian E1 interconnect standards:

- ITU-T G.703 (excluding Annex B)

- ITU-T G.704

- ITU-T G.706

- ITU-T G.732

4-port E1 MVP-E compliance with standards

The 4-port E1 MVP-E FPs comply with the applicable sections of these recommendations:

- Australian Standard TS016

- CTR 12/13 and/or TBR 12/13 - Common Technical Requirements

- ITU-T G.164

- ITU-T G.165

- ITU-T G.168

- ITU-T G.711

- ITU-T G.726

- ITU-T G.728

- ITU-T G.729 Annex A

- ITU-T T.30

- ITU-T V.17

- ITU-T V.21

- ITU-T V.27ter

- ITU-T V.29

3-port E1 ATM compliance with standards

The 3-port E1 ATM FP complies with the applicable sections of these standards:

- Australian Standard TS016

- CTR 12/13 and/or TBR 12/13 - Common Technical Requirements

- ITU-T G.703, 1991 Section 6

- ITU-T G.704, 1988 Section 5

- ITU-T G.706, 1988 Section 4

- ITU-T G.732, 1972 Section 4

- ITU-T G.804, 1993 Section 3

- ITU-T I.432 Sections 4.3 to 4.5

- ITU-T G.821

- ITU-T G.823

8-port E1 ATM compliances

The 8-port E1 ATM FP complies with the applicable sections of these standards:

- CTR 12/13 and/or TBR 12/13 - Common Technical Requirements

- Australian Standard TS016

- ITU-T G.703, 1991, Section 6

- ITU-T G.704, 1995, Section 5.1

- ITU-T G.706, 1991, Section 4

- ITU-T G.732, 1988, Section 4

- ITU-T G.804, 1993, Section 3

- ITU-T I.432, 1993, Section 4.3, Section 4.4, Section 4.5

- ITU-T G.821, 1988
- ITU-T G.824, 1993

4-port E1 AAL1 compliance with standards

The 4-port E1 AAL1 FP complies with the applicable sections of these standards:

- ANSI T1.627
- ANSI T1.630
- ATMF AF_SAA_0032.000
- Australian Standard TS016
- CTR 12/13 and/or TBR 12/13 - Common Technical Requirements
- ITU-T G.703
- ITU-T G.704
- ITU-T G.706
- ITU-T G.823
- ITU-T I.431
- ITU-T I.361
- ITU-T I.363.1
- Telcordia TR-NWT-000170

32-port E1 TDM compliances

The 32-port E1 TDM FP complies with the following standards:

- Australian Standard TS016
- CTR 12/13 and/or TBR 12/13 - Common Technical Requirements
- ITU-T G.703, Section 6
- ITU-T G.704, Sections 2.3, 2.3.2, 2.3.3, 5.1.1, 5.1.2, 5.1.3, 5.1.3.1
- ITU-T G.706, Section 4
- ITU-T G.732, Section 4
- ITU-T G.821
- ITU-T G.823
- ITU-T 1.412, Sections 3.1, 3.3
- ITU-T 1.431, Section 5

Multiport aggregate device compliance

The multiport aggregate device complies with the following standards

- Australian Standard TS016

- CTR 12/13 and/or TBR 12/13 - Common Technical Requirements

- EN 55022, 1994

- EN 50082-1, 1992

- EN 60950/A4, 1996

- ITU-T G.703

- ITU-T G.753

- ITU-T G.823

- ITU-T G.824

4-port E1 compliance with standards

The E1 FP complies with the applicable sections of these international, European, and Australian E1 interconnect standards:

- CTR 12/13 and/or TBR 12/13 - Common Technical Requirements

- Australian Standard TS016

- ITU-T G.703 (excluding Annex B)

- ITU-T G.704

- ITU-T G.706

- ITU-T G.732

4-port E1C compliance with standards

The 4-port E1C FP complies with the applicable sections of these international, European, and Australian E1 interconnect standards:

- Australian Standard TS016

- CTR 12/13 and/or TBR 12/13 - Common Technical Requirements

- ETSI Specification No. TBR 12

- ETS 300 011 (ETSI TBR.4) European ISDN primary rate access (FP model NTNQ1CBA only)

- German Specification No. BAPT 221 ZV15 MU9a/b

- ITU-T G.703, 1991 Section 6

- ITU-T G.704, 1988 Section 5

- ITU-T G.706, 1988 Section 4

- ITU-T G.732, 1972 Section 4

- ITU-T G.804, 1993 Section 3

- ITU-T I.432 Sections 4.3 to 4.5

- ITU-T G.821

- ITU-T G.823

- UK Specification OTR001

E1 MSA32 compliance with standards

The E1 FP complies with the applicable sections of these international, European, and Australian E1 interconnect standards:

- Australian Standard TS016

- CTR 12/13 and/or TBR 12/13 - Common Technical Requirements

- IMA 1.0 af-phy-0086.000 - Inverse Multiplexing for ATM Specification Version 1.0

- ITU-T G.703 (excluding Annex B)

- ITU-T G.704

- ITU-T G.706

- ITU-T G.732

- ITU-T G.823

- ITU-T I.363.1

STM-1 compliance with standards on an E1 MSA32 FP

When an E1 MSA32 FP has the optional optical ports, the STM-1 ATM portion of the 2-slot FP complies with the applicable sections of the following standards:

-

-

SONET
ATM Forum

- AF-UNI-0010.002 (ref. [28])

    — Complies to section 2.1.

- AF-TEST-0024.000 (ref. [31])

Telcordia

- GR-253-CORE (ref. [35]):

    — Complies to all required and applicable items for STS-3 ATM operation.

— Note that the following optional bytes are not supported by OC-3 ATM IPs:

E1: Orderwire
F1: Section User Channel
D1-D3: Section Data Communication Channel
J1: STS Path Trace
F2: Path User Channel
N1: Tandem Connection Maintenance/Path Data Channel

- TR-NWT-001112 (ref. [38])

ANSI

- T1.105-1995 (ref. [12])

- T1.231-1993 (ref. [22]):

  — Complies to section 8 for all SONET alarms and statistics listed in Section 3.2.3 on page 8.

- T1.646-1995 (ref. [24], supersedes T1.624)

- T1E1.2/96-002 (ref. [25])

- 216 MD-1998.0041 - Version 01.05 - released - 1998-07-31 (PP504, P6.0)

SDH
ITU-T

- Australian Standard TS026

- G.707 (ref. [45], replaces G.708. G.709) complies except for section 9.2.2.11 Table 5 which states that on receipt of an MS-AIS signal, line-timing should not be used.

Attention: the following optional bytes are not supported by OC-3 ATM IPs:

— E1: Orderwire

— F1: Section User Channel

— D1-D3: Section Data Communication Channel

— J1: STS Path Trace

— F2: Path User Channel

— N1: Tandem Connection Maintenance/Path Data Channel

- G.782 (ref. [48])

- G.783 (ref. [49])

- G.813 (ref. [51])

- G.821

- G.825 (ref. [54])

  — complies, except may not meet wander requirements

- G.957 (ref. [56])

Attention: the OC-3 ATM IP single mode FP is classified as application code L-1.1.

- G.958 (ref. [57])

- I.432 (ref. [58])

  — complies to section 2 (Physical Medium at 155 520 kbit/s)

  — complies to section 4 (TC Sublayer) except:

  — Section 4.2.1.2: Physical layer cells are not guaranteed to be inserted in the cell

  — stream every 27 cells.

  — Section 4.2.1.3: Physical layer OAM cells are not implemented.

- ETS 300 417 (previously ETS DE/TM-01015) (ref. [40])

E1 MSA8 compliance with standards

The E1 MSA8 FP complies with the applicable sections of these international, European, and Australian E1 interconnect standards:

- ITU-T G.703 (excluding Annex B)

- ITU-T G.704

- ITU-T G.706

- ITU-T G.732

- ITU-T G.823

- ITU-T I.363.1

E3 FP standards compliance

This section lists the standards compliance for the E3 FPs:

1-port E3 compliance with standards

The 1-port E3 FP complies with the applicable sections of these standards:

- British Telecom RC 6367A
- ITU-T G.703, 1991, Section 8
- ITU-T G.751, 1988, Section 1.4 complies to the E3 main framing structure. Tributary (E1 channelization) is not supported
- ITU-T G.823, 1993, Section 2.1, except Network Operator and General Purpose Communication Channel service
- ETS 300 166 Version 3 (October 15, 1992)
- SIN 219

3-port E3 ATM compliance with standards

The 3-port E3 ATM FP complies with the applicable sections of the following standards:

- ETS 300 214, 1992, PLCP framing format
- ETS DE/BTC-02053, 1994, 34 Mbps service
- ETS DE/BTC-02055, 1994, D34S service
- ETS DE/BTC-02058, 1994, D34S service
- ITU-T G.703, 1991, Section 8
- ITU-T G.751, 1988, Section 1.4 complies to the E3 main framing structure. Tributary (E1 channelization) is not supported
- ITU-T G.823, March, 1993 (jitter and wander)
- ITU-T G.832, November, 1995 (Transport of SDH Elements on PDH Networks: Frame and Multiplexing Structures), Section 2.1, except Network Operator and General Purpose Communication Channel service
- ITU-T I.432 - B-ISDN, Sections 4.3 to 4.5
- ITU-T G804, 1993, Section 6

3-port E3 ATM IP compliance with standards

The 3-port E3 ATM IP FP complies with the applicable sections of the following standards:

ATM Forum

- AF-PHY-0034.000 (ref. [26])

ITU-T

- G.703 (ref. [44]):
    — complies to section 8 (Interface at 34.368 Mbps)
- G.751 (ref. [46]):
    — complies to section 1.4 (Multiplexing four digital signals at 8448 kbit/s)
    — complies to section 2.0 (Digital multiplex equipment operating at 34368 kbit/s)
- G.775 (ref. [47])
- G.783 (ref. [44])
    — complies to section 6.2 (G.703 interfaces)
- G.804 (ref. [50])
    — complies to section 6 (Mapping of ATM cells into 34.368 Mbps)
- G.823 (ref. [52])
- G.832 (ref. [55])
    — complies to section 2.1 (Frame structure at 34.368 Mbps) except:
    — does not support the NR (network operator) and GC (general purpose
    — communications channel) bytes of the E3 G.832 framing structure
- I.432 (ref. [58])
    — complies to section 4.3 (HEC)
    — complies to section 4.4 (Idle cells)
    — complies to section 4.5 (Cell delineation and scrambling)

ETSI

- ETS 300 214 (ref. [39])
- ETS 300 686 (ref. [41])
    — complies to section 4.2 (Electrical characteristics - 34 Mbps).
- ETS 300 687 (ref. [42]):
- ETS 300 689 (ref. [43]):

Telcordia

- GR-1110-CORE - Broadband Switching System (BBS) Generic Requirements

- GR-1113-CORE - Asynchronous Transfer Mode (ATM) and Adaptation Layer (AAL)

- Protocol Generic Requirements

- GR-1248-CORE - Generic Requirements for Operations of ATM Network Element

12-port E3 ATM compliance with standards

The 12-port E3 ATM FP complies with the applicable sections of the following standards:

- CTR24

- ITU-T G.703, 1991, Section 8

- ITU-T G.751, 1988, Section 1.4 complies with the E3 main framing structure. Section 2.0 (Digital multiplex equipment operating at 34368 kbit/s)

- ITU-T G.775

- ITU-T G.783

- ITU-T G.804

- ITU-T G.823, March, 1993 (jitter and wander)

- ITU-T G.832, November, 1995 (Transport of SDH Elements of PDH Networks: Frame and Multiplexing Structures), Section 2.1, except Network Operator and General Purpose Communication Channel service

- ITU-T 1.432 - B-ISDN, Sections 4.3 to 4.5

- TS016, except for the lack of isolated ground as a requirement for customer premises equipment (CPE); because Nortel Multiservice Switch 15000 and Multiservice Switch 20000 nodes are central office equipment, that ground is not required.

Ethernet FP standards compliance

This section lists the standards compliance for the Ethernet FPs:

2-port 100BaseT Ethernet compliance with standards

The 2-port 100BaseT Ethernet FP complies with these standards and conventions:

- IEEE 802.3 and 802.3u

4-port 10/100BaseT Ethernet compliance with standards

The 4-port 10/100BaseT Ethernet FP complies with relevant sections of the following standards:

- Ethernet v2.0
- IEEE 802.3-2002 Ethernet CSMA/CD
- IEEE 802.1Q-1998 for frame format and VLAN tag treatment
- RFC 894
- RFC 1042
- RFC 1213
- RFC 3768
- RFC 2684

4-port gigabit Ethernet compliance with standards

The 4pGe FP complies with relevant sections of the following standards:

- IEEE802.3-2002
- RFC 894
- RFC 1042
- RFC 1213
- RFC 3638

6-port 10BaseT Ethernet compliance with standards

The 6-port 10BaseT Ethernet FP complies with these standards and conventions:

- IEEE 802.3
- Digital/Intel/Xerox (DIX)

8-port 10/100BaseT Ethernet compliance with standards

The 8-port 10/100BaseT Ethernet FP complies with relevant sections of the following standards:

- Ethernet v2.0
- IEEE 802.3-2002 Ethernet CSMA/CD
- IEEE 802.1Q-1998 for frame format and VLAN tag treatment

- RFC 894

- RFC 1042

- RFC 1213

- RFC 2684

- RFC 3768

See also the tables

Safety requirements

Requirement	Compliance specification, test method, or comment
EN600950 for European Union	Verband Deutscher Elektrotechniker (VDE) or Technischer berwachungs-Verein (TUV) assessed
national versions of IEC950, IEC60950	a CB report is available when the CSA C22.2 No. 950, UL 1950, or EN 60950 is not accepted
lightning protection, earthing, and grounding	EN60950, ETS 300 253
mounting apparatus (frame or cabinet) fire resistance criteria	EN60950
fire-resistant materials, components, wiring, and cables	EN60950
protection provided by enclosures	EN 60 529, 1992 [IP20]

Electromagnetic compliance (EMC) requirements

Requirement	Compliance specification, test method, or comment
radiated emissions	EN 300-386-2 Sec. 5.1.1.3, (EN 55022, Class B)
conducted emissions	EN 300-386-2 Sec. 5.1.5.3, (ETS 300-386-1 subclause 7.2.3), EN55022
(1 of 2)	

Electromagnetic compliance (EMC) requirements (continued)

Requirement	Compliance specification, test method, or comment
radiated radio frequency (RF) immunity	EN 300-386-2 Sec. 5.1.1.2, (EN 61000-4-3)
conducted RF immunity	EN 61000-6-2 (replaces EN50082-2)
electrical fast transient signal cables (with RJ-45s)	EN 300-386-2 Sec. 5.1.3.1, 5.1.5.1, (EN 61000-4-4), EN55024
surges	EN 300-386-2 Sec. 5.1.3.2, (EN 61000-4-5, ETS 300 386-1 subclause 6.4.2), EN55024
electrostatic discharge (ESD)	EN 300-386-2 Sec. 5.1.1.1, 5.1.1.4 (EN 6100-4-2), EN55024
(2 of 2)	

Thermal requirements

Requirement	Compliance specification, test method, or comment
heat dissipation (by office fluoroscope)	USA GR-63-CORE Iss. 1 Oct. 1995, R4-11, 04-12, 04-13
operational altitude -60 to 1800 m (-196.8 to 5905.5 ft.) above sea level	USA GR-63-CORE Iss. 1 Oct. 1995, R4-8
operational altitude 4000 m (13,123.36 ft.) above sea level	USA GR-63-CORE Iss. 1 Oct. 1995, R4-9

Climatic requirements for weather-protected without temperature control

Requirement ETS 300 019 May 1994 (Storage Class 1.2)	Test method or comment
low temperature storage for 72 hours -25 degrees Celsius -13 degrees Fahrenheit	IEC 68-2-1 Ab: Cold
high temperature storage for 72 hours +55 degrees Celsius or +131 degrees Fahrenheit	IEC 68-2-2 Bb: Dry heat
high humidity storage for 4 days 93% at +30 degrees Celsius or 93% at +86 degrees Fahrenheit	IEC 68-2-56 Cb: Damp heat steady state
condensation humidity storage (relative) for 2 cycles 90 to 100% at +30 degrees Celsius or 90 to 100% at +86 degrees Fahrenheit	IEC 68-2-30 Db: Damp heat cyclic variant 1
storage vibration	IEC 68-2-6 Fc: Vibration sinusoidal

Climatic requirements for temperature controlled

Requirement ETS 300 019 May 1994 (Operation Class 3.1)	Test method or comment
low temperature operation for 16 hours +5 degrees Celsius or +41 degrees Fahrenheit	IEC 68-2-1 Ab/Ad: Cold
high temperature operation for 16 hours +40 degrees Celsius or +104 degrees Fahrenheit	IEC 68-2-2 Bb/Bd: Dry heat
air temperature change for half cycles +25 or +40 degrees Celsius per minute +75.2 or +104 degrees Fahrenheit per minute	IEC 68-2-14 Nb: change of temperature
high humidity (relative) for 4 days 85% at +30 degrees Celsius or 85% at +86 degrees Fahrenheit	IEC 68-2-56 Cb: Damp heat steady state
water (rain) at 6 mm (0.236 in.) per minute	IEC 68-2-18 Rb: Impacting water Method 2.2
shock, 3 in each direction	IEC 68-2-27 Ea: Shock

Climatic requirements for an unattended telecommunications room

Requirement ETS 300 753 Oct. 1997 (Operation Class 3.1)	Test method or comment
acoustic noise is 60 dBA	ISO 7779(1)

2-port GP with disk compliance with standards

The 100BaseT Ethernet ports comply with the following standards

- IEEE 802.3
- EN300 386-2, Performance Criterion A for shielded cable
- EN300 386-2, Performance Criterion B for unshielded cable
- Digital/Intel/Xerox (DIX)

The 2pGPDsk is compliant with ISO 8601 and Nortel Networks Corporate Standard 1805.00.

1-port HSSI compliance with standards

The 1-port HSSI FP, in combination with the appropriate cable, complies to these ITU-T standards:

- ANSI TIA/EIA-612 (1993)

- ANSI TIA/EIA-613 (1993)

- In all modes, DTE and DCE, pin 46 of connector P0 on the faceplate of the HSSI FP has applied to it a soft pull-up voltage of +5 V through a high impedance value. This is used for proprietary cable identification. Pin 46 is defined as unused by the above standards. At the far-end of all Nortel Networks HSSI cables, pin 46 is unconnected.

- In DTE mode, the HSSI FP can slave to a maximum burst rate of 50 Mbps. Otherwise, compliance is met at the end of the proprietary null modem cable described later in this document.

2-port JT2 ATM compliance with standards

The 2-port JT2 ATM FP complies with the applicable sections of these standards:

- NTT, Technical Reference for High-Speed Digital Leased Circuit Services (General Specification)

- ATM Forum, ATM User-Network Interface Specification, 6,312 Kbit/s UNI (General Specification)

- ITU-T G.703 (Physical/Electrical Interface Specification)

- TTC JT-G.703-a (Jitter and Wander)

- ITU-T G.704 (Framing)

- ITU-T G.804 (Cell mapping)

- ITU-T G.706 (Frame Alignment and CRC Procedures)

- ITU-T G.775 (LOS and AIS detection and clearing)

- ITU-T I.361 (B-ISDN ATM Layer Specification)

- ITU-T I.432 (B-ISDN User-Network-Interfaces)

OC-3/STM-1 FP standards compliance

For the compliance of each FP, see:

- 16-port OC-3/STM-1 ATM (with LC connectors) FP compliance with standards (page 279)
- 16-port OC-3/STM-1 POS and ATM FP compliance with standards (page 279)

2-port OC-3 ATM IP compliance with standards

The 2-port OC-3 ATM IP FP complies with the applicable sections of the following standards:

- SONET (page 274)
- SDH (page 275)

SONET
ATM Forum

- AF-UNI-0010.002 (ref. [28])

  — complies to section 2.1

- AF-TEST-0024.000 (ref. [31])

Telcordia

- GR-253-CORE (ref. [35]):

  — complies to all required and applicable items for STS-3 ATM operation

  — The following optional bytes are not supported by OC-3 ATM IPs:

- E1: Orderwire
- F1: Section User Channel
- D1-D3: Section Data Communication Channel
- J1: STS Path Trace
- F2: Path User Channel
- N1: Tandem Connection Maintenance/Path Data Channel
- TR-NWT-001112 (ref. [38])

ANSI

- T1.105-1995 (ref. [12]):
- T1.231-1993 (ref. [22]):

  — complies to section 8 for all SONET alarms and statistics listed in Section 3.2.3 on page 8

- T1.646-1995 (ref. [24], supersedes T1.624):
- T1E1.2/96-002 (ref. [25])
- 216 MD-1998.0041 - Version 01.05 - released - 1998-07-31 (PP504, P6.0)

SDH
ITU-T

- ETS 300 417 (previously ETS DE/TM-01015) (ref. [40])

- G.707 (ref. [45], replaces G.708. G.709) complies except for section 9.2.2.11 Table 5 which states that on receipt of an MS-AIS signal, line-timing should not be used

Attention: the following optional bytes are not supported by OC-3 ATM IPs:

— E1: Orderwire

— F1: Section User Channel

— D1-D3: Section Data Communication Channel

— J1: STS Path Trace

— F2: Path User Channel

— N1: Tandem Connection Maintenance/Path Data Channel

- G.782 (ref. [48])

- G.783 (ref. [49])

- G.813 (ref. [51])

- G.821

- G.825 (ref. [54])

    —   complies, except may not meet wander requirements

- G.957 (ref. [56])

Attention: The OC-3 ATM IP single mode FP is classified as application code L-1.1.

- G.958 (ref. [57])

- I.432 (ref. [58])

    — complies to section 2 (Physical Medium at 155 520 kbit/s)

    — complies to section 4 (TC Sublayer) except:

    — Section 4.2.1.2: Physical layer cells are not guaranteed to be inserted in the cell

    — stream every 27 cells.

    — Section 4.2.1.3: Physical layer OAM cells are not implemented

- ITU-T G.826 partial compliance by supporting ES and SES measurements for transmission performance, but not ESR, SESR, and BBER ratios

3-port OC-3 ATM compliance with standards

The 3-port OC-3 ATM FP complies with the applicable sections of these standards:

- ANSI T1.105.1988. Sonet, with the exception that the STS path trace channel, is not user-programmable.

- ANSI T1.646

- ANSI T1.231 Partial compliance

- ATM UNI Forum Standard 3.1

- ITU-T I.432

- ITU-T G.707

- ITU-T G.708

- ITU-T G.709

- ITU-T G.783

- ITU-T G.821

- ITU-T G.826 partial compliance by supporting ES and SES measurements for transmission performance, but not ESR, SESR, and BBER ratios

- Telcordia TR-NWT-000253

4-port OC-3/STM-1 ATM FP compliance with standards

The 4-port OC-3/STM-1 ATM FP complies with the applicable sections of these standards

- ANSI T1.105.1995

- ANSI T1.646

- ANSI T1.231 Partial compliance

- ANSI T1E1.2/96-002

- Telcordia GR-253-CORE, except for the optical power ratings

- Class 1 IEC 825-1 (International) and Class 1 FDA (North America) for optical power requirements

- ATM UNI Forum Standard 3.1

- ITU-T I.432

- ITU-T G.707

- ITU-T G.708

- ITU-T G.709

- ITU-T G.782

- ITU-T G.783

- ITU-T G.813

- ITU-T G.825

- ITU-T G.826 partial compliance by supporting ES and SES measurements for transmission performance, but not ESR, SESR, and BBER ratios

- ITU-T G.841 SDH Network Protection Architectures (support 1+1 MSP)

- ITU-T G.957

Attention: The OC-3 multimode FP is classified as having application code I-1, but is 6 to 7 dBm more sensitive in receive, and consequently provides up to 5 dBm less transmit power. The OC-3 single-mode FP is classified as having application code S-1.1.

- ITU-TG.958

- I.432, complies with section 2 (Physical Medium at 155 520 kbit/s), complies with section 4 with the exception of section 4.2.1.2 (physical layer cells are not guaranteed to be inserted in the cell stream every 27 cells) and section 4.2.1.3 (physical layer OAM cells are not implemented)

- TS026

4-port OC-3/STM-1Ch TDM/CES FP compliance with standards

The 4-port OC-3/STM-1 Ch TDM/CES FP complies with the applicable sections of these standards

- ANSI T1.107-1988

- ANSI T1.231-1993

- ANSI T1.106.06

- ATM Forum CES Interoperability Specifications

- ITU-T I.105

- ITU-T G.704.1995

- ITU-T G.706.1991

- ITU-T G.707

- ITU-T G.733

- ITU-T G.826 partial compliance by supporting ES and SES measurements for transmission performance, but not ESR, SESR, and BBER ratios

- ITU-T G.841 SDH Network Protection Architectures (support 1+1 MSP)

- ITU-T G.957

- Telcordia GR-253-CORE, except for the optical power ratings

16-port OC-3/STM-1 ATM (with MT-RJ connectors) FP compliance with standards

The 16-port OC-3/STM-1 with MT-RJ connectors (NTHW21) complies with the applicable sections of these standards

- ANSI T1.105.1995

- ANSI T1.105.01-1995

- ANSI T1.231-1997

- ANSI T1E1.2/96-002

- AF-UNI-0010.002

- AF-TM-0121.000

- ETS 300 417

- ETS 300 746

- ITU-T G.703

- ITU-T G.707

- ITU-T G.775

- ITU-T G.782

- ITU-T G.783

- ITU-T G.813

- ITU-T G.826 partial compliance by supporting ES and SES measurements for transmission performance, but not ESR, SESR, and BBER ratios

- ITU-T G.841 SDH Network Protection Architectures (support 1+1 MSP)

- ITU-T G.841 Annex-B MSP

- Telcordia GR-253-CORE, except for the optical power ratings

16-port OC-3/STM-1 ATM (with LC connectors) FP compliance with standards

The 16-port OC-3/STM-1 ATM FP with LC connectors (NTHW31 and NTHW24) complies with the applicable sections of these standards

- ANSI TI.640

- ANSI TI.646, SONET specification

- ETS 300 417, Generic Requirements of SDH Equipment

- ETS DE/TM-1015, Definition of Optical Interfaces

- FCC Part 15 class B, CISPR class B. CSA, UL, TUV

- IEC 825/CDRH Class 1, unconditionally eyesafe laser

- ITU-T G.703, Physical and Optical characteristics

- ITU-T G.707, SDH Characteristics, Overheads, Mapping

- ITU-T G.782, Characteristics

- ITU-T G.783, Characteristics

- ITU-T G.825, Jitter and Wander Specifications

- ITU-T G.826 partial compliance by supporting ES and SES measurements for transmission performance, but not ESR, SESR, and BBER ratios

- ITU-T G.841 SDH Network Protection Architectures (support 1+1 MSP)

- ITU-T G.841 Annex-B MSP

- ITU-T G.957, Optical Interfaces

- ITU-T G.958, Digital line systems for use with optical cables

- ITU-T I.432, Physical Layer Specification

- ITU-T I.610, fault management only

- NEBS Class 3 for A-48 Emulation Module: indoor office equipment

- Telcordia GR-253-CORE, except for the optical power ratings

- Telcordia GR-326, Optical Connectors

- Telcordia GR-1244, Clocking

16-port OC-3/STM-1 POS and ATM FP compliance with standards

The 16-port OC-3/STM-1 POS and ATM FP (NTHW44 and NTHW48) complies with the applicable sections of these physical layer standards.

- ANSI TI.640

- ANSI TI.646, SONET specification

- ETS 300 417, Generic Requirements of SDH Equipment

- ETS DE/TM-1015, Definition of Optical Interfaces

- FCC Part 15 class B, CISPR class B. CSA, UL, TUV

- IEC 825/CDRH Class 1, unconditionally eyesafe laser

- ITU-T I.432, Physical layer specification

- ITU-T G.707, SDH Characteristics, Overheads, Mapping

- ITU-T G.783, Characteristics of SDH equipment functional blocks, Jan 1994

- ITU-T G.813, Timing characteristics of SDH equipment slave clocks

- ITU-T G.825, Jitter and Wander Specifications

- ITU-T G.826 partial compliance by supporting ES and SES measurements for transmission performance, but not ESR, SESR, and BBER ratios

- ITU-T G.841 SDH Network Protection Architectures (support 1+1 MSP)

- ITU-T G.841, Annex B MSP

- ITU-T G.957, Optical Interfaces for Equipment and Systems Relating to SDH

- Telcordia GR-63-CORE, Network Equipment Building System (NEBS) Requirements: Physical Protection

- Telcordia GR-253-CORE, SONET Transport Systems

- Telcordia GR-326, Optical Connectors

- Telcordia GR-1244, Clocking

The NTHW44 and NTHW48 comply with these ATM Forum standards:

- af-phy-0062.000, 155 Mbps over MMF Short wave length Lasers, Addendum to UNI 3.1, july 1996

- af-tm-0056.000, Traffic Management 4.0 (except ABR), Apr 1996

- af-tm-0121.000, Traffic Management 4.1 (except ABR and GFR), March 1999

- af-tm-0150.000, Addendum to Traffic Management v4.1 optional minimum desired cell rate indication for UBR, July 2000

- af-uni-0010.001, ATM User-Network Interface Specification V3.0, Sept 1993

- af-uni-0010.002, ATM User-Network Interface Specification V3.1, Sept 1994

The NTHW44 and NTHW48 comply with these ITU-T ATM Telcordia standards:

- ITU-T I.150, B-ISDN ATM Functional Characteristics, Nov 1995 and Feb 1999

- ITU-T I.361, B-ISDN ATM Layer Specification, Nov 1995 and Feb 1999

- ITU-T I.363, B-ISDN ATM adaptation layer (AAL), March 1993

- ITU-T I.363.5, ATM adaptation layer-Type 5, July 1996

- ITU-T I.371, Traffic control and congestion control in B-ISDN, July 1996 and March 2000

- ITU-T I.372, Frame Relay Bearer Services on ATM, Feb 1998

- ITU-T I.610, B-ISDN operational and maintenance principles and functions, Nov 1995 and Feb 1999

- ITU-T I.731, Types and general characteristics of ATM equipment (except ABT and ABR), March 1996

- ITU-T I.732, Functional Characteristics of ATM equipment, March 1996

OC-12/STM-4 FP standards compliance

This section lists the standards compliance for the OC-12/STM-4 FPs:

1-port OC-12/STM-4 ATM FP compliance with standards

The 1-port OC-12/STM-4 ATM FP complies with the applicable sections of these standards

- ANSI T1.105.1995

- ANSI T1.646

- ANSI T1.231 Partial compliance

- ANSI T1E1.2/96-002

- ATM UNI Forum Standard 3.1

- I.432.2, complies with section 3 (Physical Medium at 622 080 kbit/s), complies with section 4 with the exception of section 4.2.1.2 (physical layer cells are not guaranteed to be inserted in the cell stream every 27 cells) and section 4.2.1.3 (physical layer OAM cells are not implemented).

- ITU-T I.432

- ITU-T G.707

- ITU-T G.708

- ITU-T G.709

- ITU-T G.782

- ITU-T G.783

- ITU-T G.813

- ITU-T G.825 with the exception of wander requirements

- ITU-T G.826 partial compliance by supporting ES and SES measurements for transmission performance, but not ESR, SESR, and BBER ratios

- ITU-T G.841 SDH Network Protection Architectures (support 1+1 MSP)

- ITU-T G.957

- ITU-T G.958

- Telcordia GR-253-CORE, except for the optical power ratings

- TS026

4-port OC-12/STM-4 ATM FP compliance with standards

The 4-port OC-12/STM-4 ATM FP complies with the applicable sections of these standards

- ANSI T1.105.1995

- ANSI T1.646

- ANSI T1.231 Partial compliance

- ATM UNI Forum Standard 3.1 and 4.0

- ATM Forum Traffic Management Specification 4.1

- ETS 300 417

- I.432.2, complies with section 2 (Physical Medium at 155 520 kbit/s), complies with section 4 with the exception of section 4.2.1.2 (physical layer cells are not guaranteed to be inserted in the cell stream every 27 cells) and section 4.2.1.3 (physical layer OAM cells are not implemented).

- ITU-T I.432

- ITU-T G.707

- ITU-T G.708

- ITU-T G.782

- ITU-T G.783

- ITU-T G.825 with the exception of wander requirements

- ITU-T G.826 partial compliance by supporting ES and SES measurements for transmission performance, but not ESR, SESR, and BBER ratios

- ITU-T G.841 SDH Network Protection Architectures (support 1+1 MSP)
- ITU-T G.957
- ITU-T G.958
- Telcordia GR-253-CORE, except for the optical power ratings
- Telcordia GR-1110-CORE
- Telcordia GR-1113-CORE
- Telcordia GR-1248-CORE

4-port MR POS and ATM FP compliance with standards

The 4-port MR POS and ATM FP complies with the applicable sections of these standards:

- ANSI T1.105.1995
- ANSI T1.646
- ANSI T1.231 Partial compliance
- ATM UNI Forum Standard 3.1 and 4.0
- ETS 300 417
- ITU-T I.150
- ITU-T I.361
- ITU-T I.363
- ITU-T I.363.5
- ITU-T I.371
- ITU-T I.372
- ITU-T I.432
- ITU-T I.610
- ITU-T I.731
- ITU-T I.732
- ITU-T G.783
- ITU-T G.826 partial compliance by supporting ES and SES measurements for transmission performance, but not ESR, SESR, and BBER ratios
- ITU-T G.841 SDH Network Protection Architectures (support 1+1 MSP)
- ITU-T G.957
- Telcordia GR-63-CORE
- Telcordia GR-253-CORE

- Telcordia GR-1110-CORE

OC-48/STM-16 FP standards compliance

This section lists the standards compliance for the OC-48/STM-16 FPs:

1-port OC-48/STM-16 ATM FP with APS compliance with standards

The 1-port OC-48/STM-16 ATM FP with APS complies with the applicable sections of these standards

- ANSI T1.105.1995, complies with SONET with the exception of the following bytes:

  — E1: Orderwire

  — F1: Section user channel

  — D1-D3: Section data communication

  — J1: STS path trace

  — F2: Path user channel

  — N1: Tandem connection maintenance/path data channel

- ANSI T1.646

- ANSI T1.231-1993, complies with section 8 for all SONET alarms and statistics with the exception of the following bytes:

  — E1: Orderwire

  — F1: Section user channel

  — D1-D3: Section data communication

  — J1: STS path trace

  — F2: Path user channel

  — N1: Tandem connection maintenance/path data channel

- ANSI T1E1.2/96-002

- Telcordia GR-253-CORE, except for the optical power ratings

- tested against CENELEC EN50 081 parts 1 and 2, FCC 15, Class B limits for emissions

- tested against CENELEC EN50 082 part 1 immunity requirements

- CFR 1040.10 Class I laser safety requirements

- Class I to IEC 825-1:1993

- ITU-T I.432

- ITU-T G.707

- ITU-T G.708

- ITU-T G.709

- ITU-T G.782

- ITU-T G.783

- ITU-T G.813

- ITU-T G.825

- ITU-T G.826 partial compliance by supporting ES and SES measurements for transmission performance, but not ESR, SESR, and BBER ratios

- ITU-T G.841 SDH Network Protection Architectures (support 1+1 MSP)

- ITU-T G.957

- ITU-T G.958

1-port OC-48/STM-16 POS FP compliance with standards

The 1-port OC-48/STM-16 POS FP complies with the applicable sections of these standards

- ANSI T1.105.1995, complies with SONET with the exception of the following bytes

    — E1: Orderwire

    — F1: Section user channel

    — D1-D3: Section data communication

    — J1: STS path trace

    — F2: Path user channel

    — N1: Tandem connection maintenance/path data channel

    — M1 Byte: Line REI is not generated or checked

    — K1 and K2: APS is not supported on the 1-port OC-48/STM-16 POS FP

- ANSI T1.646

- ANSI T1.231-1993, complies with section 8 for all SONET alarms and statistics with the exception of the following bytes

    — E1: Orderwire

    — F1: Section user channel

    — D1-D3: Section data communication

> — J1: STS path trace
>
> — F2: Path user channel
>
> — N1: Tandem connection maintenance/path data channel
>
> — M1 Byte: Line REI is not generated or checked
>
> — K1 and K2: APS is not supported on the 1-port OC-48/STM-16 POS FP

- ANSI T1E1.2/96-002
- Telcordia GR-253-CORE, except for the optical power ratings
- tested against Class A FCC Part 15b
- tested against Class A CISPR22
- tested against Class A CENELEC EN 300 386-2
- tested against Class A Telcordia GR-1089-CORE
- CFR 1040.10 Class I laser safety requirements
- Class I to IEC 825-1:1993
- FB-AIC-0178.000, "ATM-MPLS Network Interworking"
- ITU-T G.707
- ITU-T G.709
- ITU-T G.782
- ITU-T G.783
- ITU-T G.813
- ITU-T G.825
- ITU-T G.826 partial compliance by supporting ES and SES measurements for transmission performance, but not ESR, SESR, and BBER ratios
- ITU-T G.957
- ITU-T G.958
- the 1-port OC-48/STM-16 POS FP supports the following PPP encapsulation methods
- RFC 1662 PPP in HDLC framing

> — RFC 2615 PPP over SONET/SDH prior to insertion into SPE

STM-1 FPs standards compliance

This section lists the standards compliance for the STM-1 FPs:

-

- 2-port STM-1 electrical FPs compliance with standards (page 288)
- 2-port STM-1 electrical channelized CES/ATM/IMA specific compliance (page 288)
- 2-port STM-1 optical channelized CES/ATM/IMA compliance with standards (page 289)

1-port STM-1Ch FP compliance with standards

The 1-port STM-1Ch FP complies with the applicable sections of these standards

- ANSI T1.105.1995
- ANSI T1.646
- ANSI T1.231 Partial compliance
- ANSI T1E1.2/96-002
- ATM UNI Forum Standard 3.1
- BABT/TC/139
- I.432, complies with section 2 (Physical Medium at 155 520 kbit/s), complies with section 4 with the exception of section 4.2.1.2 (physical layer cells are not guaranteed to be inserted in the cell stream every 27 cells) and section 4.2.1.3 (physical layer OAM cells are not implemented)
- ITU-T G.707
- ITU-T G.708
- ITU-T G.709
- ITU-T G.782
- ITU-T G.783
- ITU-T G.813
- ITU-T G.825 with the exception of wander requirements
- ITU-T G.957

Attention: The STM-1 single-mode FP is classified as having application code S-1.1.

- ITU-TG.958
- Telcordia GR-253-CORE, except for the optical power ratings
- TS026

2-port STM-1 electrical FPs compliance with standards

The 2-port STM-1 electrical FPs comply with the applicable sections of the following standards (exceptions where noted):

SDH
ITU-T

- G.703 (ref. [12])

- G.707 (ref. [13], replaces G.708, G.709)
  complies except for clause 9.2.2.11 Table 5 when clockingSource is set to line. This clause specifies: On receipt of MS-AIS signal "Do not use for synchronization". Because the port is disabled on receipt of an AIS signal, there is no added customer value to make this comply for line timing.

  The following optional bytes are not supported:
  E1: Orderwire
  F1: Section User Channel
  D1-D3: Section Data Communication Channel
  J1: STS Path Trace
  F2: Path User Channel
  N1: Tandem Connection Maintenance/Path Data Channel

- G.825 (ref. [17])

- I.432 ([18]):
  complies to section 2 (Physical Medium at 155 520 kbit/s)
  complies to section 4 (TC Sublayer) except:
  Section 4.2.1.2: Physical layer cells are not guaranteed to be inserted in the cell stream every 27 cells
  Section 4.2.1.3: Physical layer OAM cells are not implemented.

ATM
ATM Forum

- af-pnni-0081.000 - PNNI v1.0 Errata and PICs

- af-uni-0010.002 - ATM User-Network Interface Specification V3.1

ITU-T

- I.361 (02/99) - B-ISDN ATM layer specification

- I.363 (03/93) - B-ISDN ATM adaptation layer (AAL) specification

2-port STM-1 electrical channelized CES/ATM/IMA specific compliance

CES

- af-vfoa-0078.000 - Circuit Emulation Service Interoperability Specification Version 2

IMA 1.1

- af-phy-0086.000 - Inverse Multiplexing for ATM Specification Version 1.0
- af-phy-0086.001 - Inverse Multiplexing for ATM Specification Version 1.1

2-port STM-1 optical channelized CES/ATM/IMA compliance with standards

The 2-port STM-1 optical channelized CES/ATM/IMA FP complies with the applicable sections of the following standards (exceptions where noted):

2pSTM1Ch comply with the standards

Standard	Description
CES ATM Forum	af-vfoa-0078.000 - Circuit Emulation Service Interoperability Specification Version 2 (January 1997)
ATM	ATM services on the 2pSTM1Ch comply with the standards listed in the following LiveLink document: ATM Global Compliance Matrix Link: http://cdnlive.ca.nortel.com/livelink/livelink.exe/1872546/ATM_Global_Compliance_Matrix.xls?func=doc.Fetch&nodeid=1872546
IMA ATM Forum	af-phy-0086.000 - Inverse Multiplexing for ATM Specification Version 1.0 (July, 1997) af-phy-0086.001 - Inverse Multiplexing for ATM Specification Version 1.1 (March, 1999)
Physical Layer ITU-T	G.704 - Synchronous frame structures used at 1544, 6312, 2045, 8448 and 44736 kbit/s hierarchical levels (October, 1998)
	G.707/Y.1322 - Network node interface for the synchronous digital hierarchy (SDH) (December, 2003) - Complies, except for clause 9.2.2.13 Table 9-2 when clockingSource is set to line. This clause specifies: Send "Do not use for synchronization" upon MS-AIS. Because the port is disabled due to the presence of the AIS signal, there is no added customer value to make this comply for line timing.
(1 of 2)	

2pSTM1Ch comply with the standards (continued)

Standard	Description
	The following optional bytes are not supported E1-E2: Orderwire F1-F3: User Channels D1-D12: Data Communication Channels J0-J1: Path and Section Trace N1-N2: Tandem Connection Maintenance K3 b1-4: VC-4 path APS K3 b7-8: High-Order path data link K4 b3-4: VC-12 path APS K4 b8: Low-Order path data link-V5 b4:Remote Failure Indication.
	G.783 - Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks (February, 2004)
	G.825 - The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH) (March, 2000)
	G.841 - Types and characteristics of SDH network protection architectures (October, 1998)
	G.957 - Optical interfaces for equipment and systems relating to the synchronous digital hierarchy (July, 99)
	I.432.1 - B-ISDN user-network interface - Physical layer specification: General characteristics (February, 1999)
Physical Layer ITU-T (continued)	I.432.2 - B-ISDN user-network interface - Physical layer specification: 155 520 kbit/s and 622 080 kbit/s operation (February, 1999) - Complies, except for: Section 7.2.2.1: Physical layer cells are not guaranteed to be inserted in the cell stream after 26 contiguous ATM layer cells or idle cells have been transmitted. Section 7.2.2.2: Physical layer OAM cells are not implemented.
Hardware ITU-T	G.813 - Timing characteristics of SDH equipment slave clocks (SEC) (March, 2003)
Environmental	ETSI 300-019, ETSI IEC 60068
EMC	ETSI EN 300-386, EN 55022, EN 61000
Telecom	ETSI EN 300-386, EN 300-2132, EN 300-253
(2 of 2)	

TTC2M MVP-E compliance with standards

The TTC2M MVP-E FPs comply with the applicable sections of these Japanese TTC standards:

- JJ-20-10

- JJ-20-11
- JJ-20-12

8-port V.11 compliance with standards

The V.11 FP conforms to ITU-T V.11 recommendations.

8-port V.35 compliance with standards

The V.35 FP conforms to ITU-T V.35 Recommendations.

Voice services processors standards compliance

This section lists the standards compliance for the VSP FPs:

- VSP compliance with standards (page 291)
- VSP2 compliance with standards (page 292)
- VSP3 compliance with standards (page 292)
- VSP3-o compliance with standards (page 293)

VSP compliance with standards

The VSP complies with the following standards:

- ITU-T G.711
- ITU-T G.164
- ITU-T G.165
- ITU-T G.168
- ITU-T G.726; 40 kbit/s and 16 kbit/s compression modes are not implemented
- ITU-T G.729 Annex A and B. Compliant with voice activity detection (VAD) and voice compression only.
- ITU-T Recommendation T.30
- ITU-T Recommendation 1.363.2
- BTD-VTOA LLTAAL2-0.01 (ATM Forum Draft)
- AT&T Technical Report 41459
- AT&T Technical Report 41458

Attention: Either the ITU-T G.726 standard or G.729 Annex A and B standard can be used with non-switched Media Gateway.

VSP2 compliance with standards

The VSP2 complies with the following standards:

- ITU-T G.711
- ITU-T G.164
- ITU-T G.165
- ITU-T G.168
- ITU-T G.726; 40 kbit/s and 16 kbit/s compression modes are not implemented
- ITU-T G.729 Annex A and B. Compliant with voice activity detection (VAD) and voice compression only.
- ITU-T Recommendation T.30
- ITU-T Recommendation 1.363.2
- BTD-VTOA LLTAAL2-0.01 (ATM Forum Draft)
- AT&T Technical Report 41459
- AT&T Technical Report 41458

VSP3 compliance with standards

The VSP3 complies with the following standards

- ITU-T G.711 Appendix I (packet loss concealment)
- ITU-T G.165
- ITU-T G.168
- ITU-T G.726
- ITU-T G.729 Annex A and B.
- ITU-T Recommendation T.30
- ITU-T Recommendation I.363.2
- ITU-T Recommendation I.366.2 Annex K
- IEEE RFC 826
- IEEE RFC 894
- IETF RFC 2833 interoperability
- ITU-T T.38
- ITU-T V.17
- ITU-T V.21
- ITU-T V.27
- ITU-T V.29

- ITU-T V.33

VSP3-o compliance with standards

The VSP3-o FP card complies with the following standards

- ITU-T G.165
- ITU-T G.168
- ITU-T G.726 (40 kbit/s, and 16 kbit/s compression modes are not implemented)
- ITU-T G.729 Annex A and B.
- RFC 3558 for EVRC (EVRC and EVRC0)
- ITU-T Recommendation T.30
- ITU-T Recommendation I.366.2 Annex K
- IEEE RFC 826
- IEEE RFC 894
- IETF RFC 2833 interoperability
- ITU-T T.38
- ITU-T V.17
- ITU-T V.21
- ITU-T V.27
- ITU-T V.29
- ITU-T V.33

2pVSP4e compliance with standards

The 2pVSP4e FP card complies with the following standards

- ITU-T G.165
- ITU-T G.168
- ITU-T G.726 (40 kbit/s and 16 kbit/s compression modes are not implemented)
- ITU-T G.729 Annex A and B.
- RFC 3558 for EVRC (EVRC and EVRC0)
- ITU-T Recommendation T.30
- ITU-T Recommendation I.366.2 Annex K
- IEEE RFC 826
- IEEE RFC 894
- IETF RFC 2833 interoperability

- ITU-T T.38
- ITU-T V.17
- ITU-T V.21
- ITU-T V.27
- ITU-T V.29
- ITU-T V.33

FP technology considerations

Nortel Multiservice Switch series products continue to introduce new, service-enhancing technologies to its function processors (FPs). Examples of these technologies are processors, application-specific integrated circuits (ASICs), field-programmable gate arrays (FPGAs), and modules that combine multiple technology components.

Some technologies have an impact on the way you configure an FP. The description of each FP type in this document includes a specifications table that indicates the distinguishing technology of the FP type. The FP technologies that are listed in the tables are described as follows:

- APC (page 295)
- AQM (page 296)
- Atlas (page 297)
- ATM IP (page 297)
- CQC (page 297)
- GQM (page 297)
- NCS (page 298)
- PDC (page 298)
- PM (page 298)
- PPC (page 299)
- PQC (page 299)
- QRD (page 300)
- RSP2 (page 300)
- SBIC (page 300)

APC

The ATM port controller (APC) ASIC provides ATM traffic management and related functions on some second-generation ATM function processors (which also include PPC and PQC technologies).

The APC ASIC allows for higher port densities than the AQM ASIC. FPs with the APC differ from FPs with AQM in the following ways: smaller set of ATM statistics, no OAM performance monitoring hardware support, virtual path termination (VPT) support is for basic VPT only, limited traffic shaping rates, different virtual circuit provisioning, and support for per-VCC queuing only.

Configuring an APC-based FP for ATM connections includes APC-specific procedures for resource management controls, configured mapping of connection instance values, and various APC-specific traffic management settings.

AQM

The ATM queue manager (AQM) ASIC provides feature-rich ATM traffic management and shaping capabilities on some second-generation Nortel Multiservice Switch ATM function processors (which also include PPC and PQC technologies). The AQM supports data rates up to OC-3.

Nortel Multiservice Switch systems support more than one version of the AQM ASIC. Refer to the specifications table for a specific FP; the PEC suffix will help you identify which version you have. The following versions are supported:

- AQM1.0

- AQM1.1, which provides improved policing and shaping functionality.

Before installing an AQM-based FP, ensure that the node is running the appropriate software version. The software version requirements, if applicable, are indicated in the specifications table for each FP.

Configuring an AQM-based FP for ATM connections includes AQM-specific procedures for resource management controls and various AQM-specific traffic management settings.

AQS

The ATM queue scheduler (AQS) ASIC provides ATM traffic management and related functions on the 1-port OC-12/STM-4 ATM FP (which also includes PPC and PQC technologies).

The AQS ASIC allows supports up to OC-12 data rates and higher port densities than the AQM ASIC, but does not provide the following features: per-connection queueing, traffic shaping, ABR VS/VD and ER, I.610 performance measurements, EPD/LPD congestion thresholds, WRED, virtual link VPT, standard VPT, or floating point.

Configuring the 1-port OC-12/STM-4 ATM FP for ATM connections is similar to configuring AQM-based FPs. Exceptions are noted in the NTPs, as necessary.

Atlas

The Atlas-3200 processor ASIC implements ATM layer functions that include header translation, cell rate policing, per-connection cell counting and I.610 compliance of OAM requirements for up to 64K virtual connections. The Atlas-3200 operates between the physical layer devices and the traffic manager to send or receive cells or packets. The Atlas-3200 supports the fixed-length cells of ATM traffic or the variable-length cells of packet over SONET (POS) traffic at the OC-48 line rate.

ATM IP

The term "ATM IP" is used to refer to the second generation of Nortel Multiservice Switch ATM FPs. These FPs include the PowerPC processor, PQC ASIC, and at least one additional traffic management ASIC.

CQC

The cell queue controller (CQC) ASIC is a component on the first generation of Nortel Multiservice Switch ATM FPs. CQC functionality includes connection identification, queueing and shaping, and as well as frame and cell forwarding.

Configuring a CQC-based FP for ATM connections includes CQC-specific procedures for resource management controls, configured mapping of connection instance values, and various CQC-specific traffic management settings.

Attention: A combination of ATM networking and core networking on the same 8Mbyte CQC ATM FP is not supported. Also, 8Mbyte CQC ATM FPs are not supported in PCR4.1 and up.

GQM

The generic queue manager (GQM) is a traffic management device (ASIC) which resides on the multiservice function processor (FP) cards. The GQM descends from other traffic management devices such as the AQM and QRD, and is capable of OC-48. It differs considerably from the other traffic management devices in that:

- it will schedule up to a single OC-48 channel

- its scheduling algorithms are frame or cell agnostic

- it can shape four emission priorities (EPs)

- it does not have a usage parameter control (UPC) function because that is done by a different ASIC called ATLAS (on the same card)

NCS

Network clock synchronization (NCS) allows the use of a port as a reference to the *NS* component. In each function processor specification table, the item "network clock synchronization supported" is set to yes or no. Yes means that network clock synchronization is supported on the card. If it is supported, but the reversion enhancement is not supported (based on the NS attributes *useableReferences* and *reversionDelay*), the message "Reversion enhancement is not supported" appears.

PDC

The processor daughter card (PDC) is an FP component which contains the i960 processor and associated circuitry for first-generation ATM cards (those with CQC technology).

Nortel Multiservice Switch systems support more than one version of the PDC. Refer to the specifications table for a specific FP; the PEC suffix will help you identify which version you have. The following versions are supported:

- PDC1.0 offers 8 Mbyte of processor memory. FPs with PDC1.0 support core networking services (such as PORS, DPRS, and VNS) only.

Attention: A combination of ATM networking and core networking on the same 8 Mbyte ATM FP is not supported.

- PDC1.1 provides up to 32 Mbyte of processor memory. FPs with PDC1.1 support ATM networking, core networking, and combinations of these services.

When installing FPs in a spared configuration, ensure that you use FPs with equivalent amounts of memory.

Attention: A combination of ATM networking and core networking on the same 8Mbyte CQC ATM FP is not supported. Also, 8Mbyte CQC ATM FPs are not supported in PCR4.1 and up.

PM

The processor module (PM) is a component of many Nortel Multiservice Switch 7400 series non-ATM FPs. It contains the processor, memory, service-providing components, and backplane connectivity on Multiservice Switch FPs.

Multiservice Switch systems support more than one version of the processor module. Refer to the specifications table for a specific FP; the PEC suffix will help you identify which version you have. The following versions are supported:

- PM1 offers 8 Mbyte of processor memory.

Attention: PM1 FPs are not supported in PCR5.2 and up.

- standard PM2 offers 16 Mbyte of processor memory.
- premium PM2 offers 32 Mbyte of processor memory.

The amount of processor memory on an FP is a factor when engineering services (particular combinations of services).

When installing FPs in a spared configuration, ensure that you use FPs with equivalent amounts of memory.

PPC

The powerPC (PPC) processor is supplied on second-generation ATM FPs, some CPs, and most of the FPs used with Multiservice Switch 15000 nodes. These FPs offer more processor memory than the first-generation FPs and allow for increased flexibility when engineering combinations of services.

PQC

Nortel Multiservice Switch queue controller (PQC) ASIC performs base layer functions, such as ATM cell forwarding and frame forwarding for frame relay and IP traffic. The PQC ASIC is a key component on second-generation ATM FPs, along with the PowerPC processor and additional traffic management ASICs.

Multiservice Switch systems support more than one version of the PQC. Refer to the specifications table for a specific FP; the PEC will help you identify which version you have. The following versions are supported:

- PQC1 (also known as PQC6v1 and PQC1.0)
- PQC2 (also known as PQC6v2 and PQC2.0) provides greater frame forwarding throughput over PQC1.
- PQC12 (also known as PQC12.0, and PQC12a) provides higher frame and cell processing capacity, and fast hardware data path support for DPRS load spreading, frame relay access, and MPLS.

Attention: PCR3.0 software release must be running on a Multiservice Switch 15000 or Multiservice Switch 20000 before PQC12 based FP.

QRD

The queue relay device (QRD) is a high-capacity cell queuing ASIC that bypasses the usual PQC cell relay datapath. The QRD appears on high-speed FPs where the benefits of fast forwarding rates (up to OC-48) outweigh the need for traffic management features.

RSP2

The route switch processor II (RSP2) is a second generation multi-layer packet processor ASIC that runs field upgradable firmware. The firmware performs packet or cell forwarding at the line rate. As the family of cards evolves, the RSP2 is key to providing the capability to upgrade cards of the same type in the field.

SBIC

The shared bus interface controller (SBIC) is an FP component that provides control of data movement between the shared memory and the bus and link controllers. The SBIC appears on first-generation frame-based FPs that provide voice and frame relay services.

List of Terms

This section contains an alphabetical list of acronyms and their expanded forms.

Terms

AAL5
ATM adaptation layer 5

AIS
alarm indication signal

AP
access point

BIP
bit inter-leaved parity errors

CAC
connection admission control

CDV
cell delay variation

CLR
cell loss ratio

EBR
edge-based rerouting

EOT
end of transmission

EP
emission priority

EPD

early packet discard

FEBE

far end block errors

FPGA

field programmable gate array

HEC

header error check sequence

HSM

hitless software migration

IMA

inverse multiplexing for ATM

IR

intermediate reach

LAPS

line automatic protection switching

LOF

loss of frame

LOP

loss of pointer

LOS

loss of signal

LPD

late packet discard

LR

long reach

MBG

minimum bandwidth guarantees

MM

multimode

MPE

multi-protocol encapsulation

MSP

multiplex section protection

NCS

network clock synchronization

NNI

network-to-network interface

NPU

network processor unit

OAM

operations, administration, and maintenance

OSPF

open shortest path first

PBG

port bridge group

POS

packet over SONET

PPD

partial packet discard

RDI

remote defect indication

SFP

small form pluggable

SM

single-mode

SSM

synchronization status messages

UNI

user-to-network interface

UPC

> usage parameter control

VIPR

> virtual IP router

VPT

> virtual path termination

VR

> virtual router

W-RED

> weighted-random early discard

Nortel Multiservice Switch 7400/15000/20000

Fundamentals – FP Reference

Sourced in Canada and the United States of America.

To provide feedback or report a problem with this document, go to www.nortel.com/documentfeedback.

NORTEL